



**LATIN AMERICA AND CARIBBEAN CONGRESS FOR
CONSERVATION BIOLOGY**

JULY 25 -27, 2018

THE UNIVERSITY OF THE WEST INDIES

TRINIDAD AND TOBAGO

PROGRAM

&

BOOK OF ABSTRACTS

Wednesday 25th July				
7:30-8:00	Registration (TLC)			
8:00-8:30	Registration (TLC)			
8:30-9:00	Whale Shark Workshop (WS1) (LTA)	Linking Livelihoods (WS2) (LTB)	GIS Workshop (WS4) (TR5)	Exhibitor Setup (TLC)
9:00-9:30				
9:30-10:00				
10:00-10:30		Break		
10:30-11:00				
11:00-11:30		Climate Resilience (WS3) (LTB)		
11:30-12:00				
12:00-12:30	Lunch/Registration (TLC)			
12:30-13:00	Lunch/Registration (TLC)			
13:00-13:30	Whale Shark Workshop (WS1) (LTA)	Speaking The Truth Workshop (WS5) (LTB)	GIS Workshop (WS4) (TR5)	Exhibitor Setup (TLC)
13:30-14:00				
14:00-14:30				
14:30-15:00				
15:00-15:30				
15:30-16:00		Chasing Coral Film Screening And Panel Discussion (WS6) (LTB)	GIS Workshop (WS4) (TR5)	Exhibitor Setup (TLC)
16:00-16:30	CLiC Session (SY1) (LTA)			
16:30-17:00				
17:00-17:30				
17:30-18:00			Registration (TLC)	
18:00-18:30	Opening Ceremony (LTA)			
18:30-19:00	Plenary (Prof Gerardo Ceballos) (LTA)			
19:00-19:30	Plenary (Prof Gerardo Ceballos) (LTA)			
19:30-20:00	Opening Reception (LTA/TLC)			
20:00-20:30	Opening Reception (LTA/TLC)			
20:30 - 21:00	Opening Reception (LTA/TLC)			

SY: Symposium

TS: Themed Session

WS: Workshop

Registration Period

LTA: Lecture Theatre A

LTB: Lecture Theatre B

TR5: Tutorial Room 5

TLC: Teaching and Learning Centre

WEDNESDAY 25TH JULY

WS1 THE WHALE SHARK AS A FLAG FOR THE SCIENTIFIC AND EDUCATIONAL INTEGRATION OF THE AMERICAS AND CARIBBEAN FOR THE CONSERVATION (8:30 – 15:00) (LTA)

Session Organisers: Leonardo E. Sanchez Criollo, Carlos Polo, Yurasi A. Briceño & Izabela Stachowicz

Migratory species require joint management among countries. For these reasons, the following objectives are proposed:

- 1) Identify whale shark research and conservation priorities in the Caribbean and Latin America region.
- 2) Identify the training needs of human personnel to carry out the research, conservation and educational campaigns related to the whale shark in the Caribbean and Latin America.
- 3) Consolidate a joint strategy to facilitate access to international cooperation agreements on education in the member states of international organizations
- 4) Combine the international training program for scientific-technical personnel in the area of biology, fishery and shark conservation carried out by the Venezuelan Shark Research Center since 2005.

WS2 LINKING LIVELIHOODS, CITIZEN SCIENCE AND CONSERVATION: A PRACTICAL APPROACH (8:30 – 10:00) (LTB)

Session Organisers: Aljoscha Wothke & Lanya Fanovich

Since commencing operations in 2014, Environmental Research Institute Charlotteville (ERIC)'s mission sought to connect sustainable development, conservation and livelihoods within the ridge-to-village-to-reef system in northeast Tobago through citizen science. The presenters will share ERIC's approach and experiences in implementing its monitoring and conservation programmes as it pertains to small island coastal Caribbean communities. The audience is introduced to ERIC's mission and role in engaging community-based organisations, community members and local governing agencies to successfully implement ecosystem monitoring, demonstrate livelihoods benefits and support protected area management.

WS3 BUILDING CLIMATE RESILIENCE INTO CARIBBEAN FOREST RESOURCES MANAGEMENT AND ASSOCIATED LIVELIHOODS (10:30 – 12:00) (LTB)

Session Organisers: Natalie Boodram, Nicole Leotaud & Keisha Sandy

During this session the Caribbean Natural Resources Institute (CANARI) will share case studies and lessons learnt from its many years of experience in forest resources management, highlighting tools and best practices that engender climate resilience. Participants will also be invited to share relevant initiatives that they have worked on. This will be followed by a facilitated process to identify those initiatives with potential for scaling up and out across the Caribbean region, including the institutionalisation of best practices and tools within relevant national and regional policies and programmes. Thus, not only will participants at the workshop benefit from the knowledge sharing, but they will also collectively analyse and generate recommendations on future directions for the management of forest resources and associated livelihoods in the Caribbean. The session's outputs will

be used in development of a United Nations Food and Agriculture Organisation (FAO) Caribbean Regional Strategy to secure and channel appropriate human and financial resources to build climate resilience into the region's forestry sector.

WS4 BASIC GEOGRAPHIC INFORMATION SYSTEM FOR CONSERVATION BIOLOGISTS (8:30 – 15:00) (TR5)

Session Organiser: Mariana Vale

This one-day short course before the conference is tailored to ecologists and conservation biologists with little or no experience with geographic information systems (GIS). The objective of the course is to get participants started on basic GIS. It will be a hands-on course where participants will learn the basics of how to build a simple GIS project, where to find and how to import online datasets, how to perform basic GIS analysis with vector (shapefile) data, and how to layout and export results in map format. The course will use ArcGIS software, showing the basic elements of the software and how to overcome licensing limitations. Participants will have step-by-step guiding material to follow the proposed activities in their own rhythm with the help of the instructor, and keep as a memory of the tools explored during the course. The material will be in English but instructor speaks English, Spanish, French and Portuguese. Participants will need to use their own laptops and install a free trial version of the ArcGIS software. Additionally, participants may opt to register on the one-day interactive section after the LACCCB 2018 conference to work on individual GIS projects focused on the participant's own research data and needs.

WS5 SPEAKING THE TRUTH: ADDRESSING COMMUNICATION CHALLENGES BETWEEN SCIENTISTS, REGIONAL COLLABORATORS, AND POLICYMAKERS IN CONSERVATION SCIENCE(13:00 – 15:30) (LTB)

Session Organisers: Nicolette Roach, Thomas E. Lacher Jr. & Nicole Angeli

This Interactive Session will focus on the importance of addressing regional conservation challenges through public education programs and advocacy to inform policymakers of the need for scientific based solutions to anthropogenic biological threats.

The proposed interactive session shall have three objectives:

- 1) Present a number of short talks that address these issues and frame critical challenges, and then form breakout sessions where attendees can wrestle with the issues in their own countries.
- 2) Produce reports in breakout groups submitted to session organizers and relate these reports back to the full session to generate a synthesis of challenges and potential solutions.
- 3) Identify the various roles and avenues for advocacy in the scientific community.

**WS6 INTERNATIONAL YEAR OF THE REEF T&T: CHASING CORAL
(15:30 – 18:00) (LTB)**

Session Organisers: Jahson B. Alemu I. , Farahnaz Solomon, Anjani E. Ganase, Amy Deacon

Coral reef ecosystems are important to sustaining tropical, marine environments and the socio-cultural and economic well-being of those that depend on them. Yet, they are declining worldwide. In order to raise awareness about the value and importance of coral reefs, the threat of climate change to their existence and to engender greater marine stewardship join us at a screening and panel discussion of the Netflix documentary film “Chasing Coral”. Chasing Coral documents the acute reality that coral reefs worldwide are dying at an unprecedented rate because of coral bleaching, and the attempt to use underwater time-lapse photography to record this mass bleaching. Following the screening will be a panel discussion with local and regional experts focusing on the scientific outlook for the future of coral reefs, regional collaborations to improve resilience and conservation and lessons learned for greater partnerships. This screening will be part of a larger programme (outside of LACCCB) to engage with the wider public on coral reef and ocean health.

Expert panel will consist of: Dr. Mark Eakin (Coral Reef Watch Programme, NOAA, joining us by Skype), Ms. Katherine Seigel (Ph.D Candidate, Dept. of Env. Sci, Policy and Mg't, UC), Dr. Anjani Ganase (Wild Tobago and Global Change Institute, UQ) and Dr. Jahson Alemu I (SpeSeas)

**SY1 CONSERVATION LEADERSHIP IN THE CARIBBEAN (CLIC):
MAKING CONSERVATION “CLIC” BOTH PERSONALLY AND
PROFESSIONALLY! (16:00 – 17:30) (LTA)**

Moderators: Nadra Nathai-Gyan & Joaquin de la Torre

Biodiversity conservation in the Wider-Caribbean has been stymied by a lack of real-world biodiversity conservation capacity building opportunities. The goal of this symposium is to bring together current Fellows and alumni of the Conservation Leadership in the Caribbean (CLiC) Fellowship Program to deconstruct how their professional lives have been affected by this interdisciplinary, capacity-development, experiential, mentoring training program. The symposium aims to facilitate participant's active engagement in deepening their understanding of value of such programs that support the acquisition of foundational skills across a suite of proficiencies needed by contemporary conservation leaders, and which are largely lacking at the region's existing institutions offering coursework/training in the conservation sciences.

Participating CLiC Fellows:

1. Agnessa Laurelle Lundy, Bahamas
2. Luz Elena Rodríguez Vargas, Colombia
3. Renoir J. Auguste, T&T
4. Kimberly Chu Foon, T&T
5. Aliya Hosein, T&T

PROF. GERARDO CEBALLOS

Professor Ceballos is a world-renowned environmental scientist. He is known for his pioneering and extraordinarily diverse ecological and conservation research, his unparalleled efforts to bring ecological knowledge to crucial societal issues, his building of bridges between ecology and conservation in order to find humane paths to ecological sustainability, and his untiring efforts to increase the ecological literacy of the general public. His publications include close to 500 scientific and popular papers and 45 books, which have been cited more than 13,000 times. He is a member of the Mexican Academy of Sciences and the US National Academy of Sciences and is a professor at the Universidad Nacional Autonoma de Mexico.



Vertebrate population and species losses, the sixth mass extinction, and the future of biodiversity in the Neotropics

The loss of biological diversity as a result of the impact of the growing human population is one of the most severe global environmental problems, and probably the only one truly irreversible. Thousands of species and hundreds of thousands of populations of mammals (and all other life forms) are being driven to extinction every year. The Neotropics is one of the most biodiverse biogeographic regions and is also one with higher populations and species at risk. Current vertebrate extinction rates at global level are increasingly higher than the “background extinction” rates prevailing in the Pleistocene, estimated at 1 mammal extinction per 5,000 species per 100 years (that is, 1 E/MSY). So, vertebrate species that become extinct in the last 100 years would have taken up to 7,000 years to disappear. But focusing exclusively on species extinction undermines the magnitude of the extinction crises. A sample of all vertebrates indicates that more than 32% of all species have declining populations, including both common and rare species. These estimates reveal an exceptionally current rapid loss of biodiversity indicating that a sixth mass extinction is already under way. This “biological annihilation” highlights the current magnitude of Earth’s ongoing sixth major extinction event. It is still possible to avert the dramatic decay of biodiversity and the subsequent loss of ecosystem services intensified through conservation efforts. The window of opportunity is, however, rapidly closing.

	Thursday 26th July		
7:30-8:00	Registration (TLC)		
8:00-8:30	National Geographic Society Grants Program (LTA)		
8:30-9:00	Plenary (Dr Howard Nelson) (LTA)		
9:00-9:30			
9:30-10:00	Break		
10:00-10:30	Mechanisms Of Conservation On Private Lands (SY3) (LTA)	Orinoco Mining Arc (SY2) (LTB)	Roads Workshop (WS7) (TR5)
10:30-11:00			
11:00-11:30			
11:30-12:00	Speed Talks (TS1) (LTA)		
12:00-12:30	Lunch	Macaws Workshop (WS8) (TR5)	UWI Zoology Museum Visit (UWIZM)
12:30-13:00			
13:00-13:30			
13:30-14:00	Species Protection And Reintroduction (TS2) (LTA)	Conservation-Faith Interaction (WS9) (LTB)	
14:00-14:30			
14:30-15:00			
15:00-15:30	Break		
15:30-16:00	Mammal Conservation (SY4) (LTA)	Mangroves And Savannah Ecosystems (TS3) (LTB)	
16:00-16:30			
16:30-17:00			
17:00-17:30	Poster Sessions (TLC)		
17:30-18:00			
18:00-18:30			
18:30-19:00			
19:00-19:30			
19:30-20:00	Social Events (UG)		
20:00-20:30			
20:30- 21:00			

SY: Symposium
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TR5: Tutorial Room 5

TLC: Teaching and Learning Centre

UWIZM: UWI Zoology Museum

UG: Urban Grounds

THURSDAY 26TH JULY

DR. HOWARD NELSON

Conserving biodiversity beyond protected areas - valuing indigenous landscape solutions.

Howard P. Nelson earned his BSc. and MPhil. in Zoology at the University of the West Indies – St Augustine, and a dual PhD in Wildlife Ecology and Forestry from the University of Wisconsin – Madison. Howard is a Senior Lecturer in Conservation Biology and Programme Leader for the Master’s in Wildlife Conservation at the University of Chester, in the United Kingdom. He was CEO of the Asa Wright Nature Centre in Trinidad, and worked as a policy specialist on wildlife, forests and protected areas for Trinidad and Tobago’s Ministry of the Environment. Dr. Nelson currently serves as a member of the Darwin Expert Committee of the UK government’s Department of Environment, Food and Rural Affairs and on the boards of the Caribbean Natural Resources Institute (CANARI), and BirdsCaribbean. He and his students work on diverse conservation questions in the Caribbean



including genetics of Grenada dove, abundance and distribution of Trinidadian cetaceans, climate-change impacts on dry forests and sustainable hunting. Howard has worked in the Caribbean for almost 30 years, including as a consultant for the FAO and UNDP, and his specialities include wildlife, forest and protected areas policy, planning and management, sustainable wildlife use, endangered species conservation, ecotourism and conservation training.

SY3	MECHANISMS OF CONSERVATION ON PRIVATE LANDS (LTA) <i>Moderators: German Forero-Medina, Sebastian Orjuela, Bibiana Salamanca & Mark Hoogeslag</i>		
SY3a	10:00	Sebastian Orjuela	Case Study: Santa Rosa Watershed, Conservation and Sustainable Production.
SY3b	10:15	Bibiana S Salamanca	Socioecological connectivity for the conservation and restoration of dry forests and their threatened tree species. Case study Santa Marta.
SY3c	10:30	Andrés Quintero-Angel	GEF-Satoyama Project: Mainstreaming Biodiversity Conservation and Sustainable Management in Priority SEPLS : Tropical Andes Hotspot Case Study
SY3d	10:45	Ana Reboredo Segovia	Does land tenure clarification and delimitation decrease deforestation in protected areas? A case study from an intervention in Guatemala
SY3e	11:00	German Forero-Medina	Biodiversity conservation at the landscape scale: common benefits in private lands
SY3e	11:15	Carlos Saavedra	Conservation agreements and incentives in rural areas of Colombia
TS1	SPEED TALKS (LTA) <i>Moderator- Michelle Taylor</i>		
TS1a	11:30	Sarah-Lee A Manmohan	The psychological effect of bushfires on local people: a study on the perception of bushfires in Trinidad, West Indies.
TS1b	11:35	Jack D Torresdal	Using Sky-Island Biogeography to understand the distribution of the Golden Tree Frog and its habitat.
TS1c	11:40	Reshma Persaud	Population dynamics of earthworms in Guyana
TS1d	11:45	Nicole F Angeli	Species Status Assessments are a new collaborative population modeling exercise to improve the U.S. Endangered Species Act
TS1e	11:50	Heetasmin S Singh	The effects and management of saline water intrusion in the arable rice lands of Mahaica, Guyana
	11:55	Speed talk questions	
SY2	AN INSIGHT INTO THE ORINOCO MINING ARC: ITS IMPLICATIONS FOR VENEZUELA AND THE EASTERN CARIBBEAN (LTB) <i>Moderators: Vilisa Moron Zambrano & Francoise Cabada</i>		
SY2a	10:00	José R Lozada	Environmental and Social Aspects Associated with the various types of mining in the Venezuelan Guayana.
SY2b	10:15	Bram Ebus	Digging into the Mining Arc
SY2c	10:30	Vilisa I Morón-Zambrano	Southern Orinoco's protected areas, in risk?
SY2d	10:45	Juan C Amilibia	Deforestation in the Venezuelan Amazon and the advancement of illegal mining
SY2e	11:00	Francoise Cabada	The Orinoco Mining Arc and the Caribbean: possible impacts over marine ecological processes
SY2f	11:15	José R Ferrer-Paris	Risk of ecosystem collapse under different scenarios of management as a measure of conservation opportunities and challenges in Venezuela's Mining Arc

WS7 ROADS, ROAD PLANNING AND ROADLESS AREAS: CHALLENGE FOR WILDLIFE CONSERVATION AND CONNECTIVITY(15:30 – 17:00)

Session Organisers: Stefan Kreft, Lucila Belen Castro, Evi A.D. Paemelaere

Landscape and population connectivity are central themes in the conservation of wildlife populations, with fragmentation leading to disruption of gene flow and accelerated extinction rates. These wildlife populations form part of ecosystems, whose functionality and resilience, and thus reliable delivery of ecosystem services, are influenced by their size and shape. One of the largest threats to connectivity and ecosystem functionality is the network of roads, which is currently expanding at an increasing pace in Latin America and elsewhere. This session will organise semi-structured discussions on how to improve current research, policy and management of roads and the conservation of roadless areas on approaches. This includes exploring possible more concrete outcomes and outputs, such as a handbook-type document on wildlife-friendly roads and road planning for dialogue with policy-makers and engineers, or the creation of an 'early-alert' system for new (transboundary) infrastructure programmes. Discussions will be complemented by expert inputs mitigation of road impacts and roads and roadless areas in Latin America and globally.

12:00 Lunch

WS8 A STAKEHOLDER - FOCUSED REFLECTION OF THE MACAW TRADE IN TRINIDAD (12 – 13:30) (TR5)

Session Organisers: Kimberly Wishart Chu Foon, Bernadette Plair, Aliya Hosein & Mark Gibson

The Conservation Leadership in the Caribbean (CLiC) Program proposes to host an interactive session to publicly present, discuss, and reflect upon research findings from its on-going investigation into the illegal pet trade of Blue and Gold Macaws (BGMs) in Trinidad. The proposed interactive session shall have three objectives:

- 1) To present to the LACA/SCB community and key local stakeholders, the CLiC Macaw project's initial research findings from its on-going investigation into the illegal pet trade of Blue and Gold Macaws (BGMs) in Trinidad.
- 2) To generate discussion on the project's current research findings among a panel of key local stakeholders, and then among the broader LACA/SCB community.
- 3) To generate collaborative reflection among the attendees on the implications of the CLiC Macaw Project's research findings and the CLiC Program's operational model for wildlife conservation elsewhere in LAC region. Very little is known about the illegal wildlife trade in Latin America and the Caribbean, and little effort is currently expended on the part of conservation researchers to study this trade.

A session of this nature is of great importance, as it will allow emerging ideas and findings on the topic to be presented in a public forum for the first time, and also give interested persons the opportunity to engage in meaningful discussions on the illegal pet trade.

OPTIONAL: VISIT TO THE UWI ZOOLOGY MUSEUM (UWIZM)

The University of the West Indies Zoology Museum is the largest and most significant collection of zoological specimens in Trinidad & Tobago. The collections held by the Zoology Museum date back to the 1920s. UWIZM maintains and improve the collections and make them more accessible to staff, students and researchers. The main activities UWIZM is involved in are: identification of animals, field collecting trips, specimen preservation, collection restoration and maintenance, databasing of the museum specimens and research on the fauna of Trinidad and Tobago.



Tours will be conducted by Mr. Mike Rutherford (Curator of UWIZM) and is free of charge to all participants of UWIZM. Signup can be done at Registration.

WS9 ASSESSING AND USING THE PROPOSED GUIDELINES FOR INTERACTING WITH FAITH-BASED LEADERS AND COMMUNITIES IN CONSERVATION RESEARCH AND PRACTICE PROJECTS (13:30 – 15:00) (L T B)

Session Organisers: Jame Schafer, Robert Sluka & A. Rocha

This interactive session will provide an opportunity for LACCCB participants to assess and discuss ways of using the proposed Guidelines for Interacting with Faith-Based Leaders and Communities (February 2018) developed by and for SCB members to consider following in their research and practice projects.

Because 84% of people in the world identify with religions and spiritualities, profess ultimate reasons for acting ethically, and can be mobilized to act, they may be helpful to conservation biologists in their research and practice projects. The Best Practices Project was initiated in March 2016 by the Religion and Conservation Biology Working Group of the SCB to solicit successful practices members have used when interacting with faith leaders and communities and to encourage all members to consider implementing these practices in their conservation projects. After an iterative process that included a Society-wide survey, various sessions at international and regional congresses, contextualized affirmations of specific guidelines by individual members based on their projects, and comments by faith leaders, the proposed Guidelines for Interacting with Faith-Based Leaders and Communities when planning, initiating, implementing, closing, and following up conservation projects was completed in February 2018 and will be the focus of this workshop. Participants will (1) examine the proposed guidelines, (2) volunteer to share their experiences when implementing similar practices, (3) collaborate in developing a basic outline for case studies using the guidelines for presentation in a symposium to be proposed for the 2019 International Congress for Conservation Biology, and (4) recommend promising possibilities for disseminating the guidelines.

15:00 Break

TS2 SPECIES PROTECTION AND REINTRODUCTION (LTA)			
<i>Moderator: Nicolette Roach</i>			
TS2a	13:30	Lauren M Gibson	An island divided: humans, not climate, determine the differential present and future distribution of the endemic <i>Hispaniolan solenodon</i>
TS2b	13:45	Christopher Cambrone	Census and first genetic analysis of the Guadeloupean population of white-crowned pigeon, <i>Patagioenas leucocephala</i>
TS2c	14:00	Renoir Auguste	Amphibians and their conservation in Trinidad and Tobago
TS2d	14:15	Maud C Quinzin	Genetically-informed captive breeding and introduction program of hybrids with ancestry from the extinct Galapagos giant tortoise of Floreana Island
TS2e	14:30	Nicole Angeli	Repatriating species where threats still exist
TS2f	14:45	Ferenc Jordan	Searching for keystone species complexes: a food web approach in King George Island (Antarctica)
15:00 Break			
SY4 MAMMAL CONSERVATION (LTA) <i>Moderator: Mariana Vale</i>			
SY4a	15:30	Mariana M Vale	Patterns of diversity, threat and protection of mammals in Latin America and the Caribbean
SY4b	15:45	Constanza E Napolitano	The impact of free-roaming domestic cats on a threatened wild felid in Chile: Spatio-temporal overlap and pathogen transmission
SY4c	16:00	Paul E Ouboter	Impact of eco-tourism on terrestrial mammal communities at Brownsberg Nature Park, Suriname
SY4d	16:15	Hannah Hoskins	Impacts of anthropogenic disturbance on mammalian distribution within a neotropical cloud forest
SY4e	16:30	Luke Rostant	Taking stock: Red-rumped agouti (<i>Dasyprocta leporina</i>) population density and relative abundance in Trinidad and Tobago.
SY4f	16:45	Vanessa S Kadosoe	Population status of Jaguars (<i>Panthera onca</i>) and Pumas (<i>Puma concolor</i>) at the Brownsberg Nature Park, Suriname
TS3 MANGROVE AND SAVANNAH ECOSYSTEMS (LTB) <i>Moderator: Delezia Singh</i>			
TS3a	15:30	Justine K Deonaraine	An investigation of hydrocarbon pollution and its relationship with mangrove root epifauna: a case study of two rivers in Trinidad.
TS3b	15:45	Aidan Farrell	Chlorophyll fluorescence as a biomarker for pollution stress in red mangrove (<i>Rhizophora mangle</i>)
TS3c	16:00	Mark Ram	Impacts of mangrove habitat degradation on fish assemblages along Guyana's coastal regions
TS3d	16:15	Gem Thomas	Seasonal changes in rhizobacteria community structure associated with dominant plant species in the Aripo savannas
TS3e	16:30	Linton Arneaud	Seed dispersal of <i>Mauritia flexuosa</i> : a comparison of mainland and island stands
TS3f	16:45	Chelsie Romulo	The influence of technological transitions on socio-environmental market dynamics of <i>Mauritia flexuosa</i> harvest in the Peruvian Amazon.

POSTER SESSION(17:30 – 19:30) (TLC)

1	Amy Deacon	Using museum data to estimate species richness of freshwater tropical fish
2	Ana Reboredo Segovia	Who studies where? Boosting tropical conservation research where it is most needed
3	Andres Quintero Angel	Establishment of a reserve for the conservation of endangered and endemic amphibians of Tropical Dry Forest ecosystems in Valle del Cauca, Colombia
4	Anupana Puran	Mammalian diversity in different habitats in Guyana
5	Avryl Brophy	Benefits of using common tropical species as focus for public outreach
6	Bibi Neisha	Incidental capture of sea turtles by fishing gears in Guyana
7	Cindy Dasrat	Bio-control of mosquito population: exploiting predator-prey relationships between mosquitoes and dragonflies
8	David Bass	Aquatic crustaceans associated with subterranean environments from Grand Cayman
9	Diana Seecharan	The diversity and heavy metal content of stingrays caught by the fyke net between Ogle and Better-Hope, Guyana
10	Douglas Fraser	A strong biotic interaction confers resistance to invasion
11	Evana Douglas	Mapping a marginal coral habitat in North-east, Trinidad using Sentinel-2A MSI, Side scan sonar and in-situ data
12	Godfrey Bourne	Morphological sexual dimorphism contributes to diet dimorphism in Guianan sakis (<i>Pithecia pithecia</i>) during the wet season on coastal Guyana
13	Gyanpriya Maharaj	Movement patterns of freely foraging passionflower butterflies, <i>Heliconius melpomene</i> and <i>Dryas iulia</i> , native to Guyana.
14	Hannah Hoskins	Disparity in cultural attitudes and compliance to conservation-based law in Cusuco NP, Honduras
15	Leslie Hay	Camera Trap Monitoring to Detect Abundance and Distribution of Felids and Prey Species in Two Costa Rican Neotropical Rain Forests
16	Jaeson Clayborn	Mortal combat between ants and caterpillars: An ominous threat to the endangered <i>Heracles aristodemus ponceanus</i> in the Florida Keys, USA
17	Jordan Rogan	Assessing mammalian biodiversity patterns in the tropical montane ecoregion of Monteverde, Costa Rica
18	Kimberley Wetten	Ecological Release and Morphology of Grenada House Wrens
19	Kimberley Coore	The importance of water quality in the coral reef health assessment of the Port Royal Cays, Jamaica
20	Maria Molina	Identification of relevant agricultural coverage for the conservation of neotropical primates
21	Michelle Taylor	Eating plastic: microplastics in grenadian poriferan species
22	Natalia Buriticá Mejía	Evaluation of priority areas for the conservation of Pavas (Crácidos), in the face of habitat loss and climate change scenarios Neotropics
23	Osvaldo Ramírez Bravo	Market segmentation a useful tool to increase environmental education impact in schools
24	Ravindra Mohandeo	Effects of mining activities on fish diversity and community structure in mining impacted and non-mining areas of the Mazaruni District, Guyana.
25	Rayana John	A comparative study of population density and the behavior of agoutis in Bartica, Guyana.
26	Rovindra Lakenarine	Impacts of climate change on farmers and their adaptive strategies along the Essequibo
27	Shanna Challenger	The impacts of invasive species removal on a remote Caribbean island ecosystem
28	Stefan Kreft	Pervasive altitudinal bird movements in the Bolivian Andes - Implications for conservation

	Friday 27th July	
7:30-8:00	Registration (TLC)	
8:00-8:30	Biodiversity Conservation And Management In The Caribbean (TS4) (LTA)	
8:30-9:00		
9:00-9:30		
9:30-10:00	Break	
10:00-10:30	Freshwater Fish Conservation (SY5) (LTA)	Protected Areas: Selection and Design (TS5) (LTB)
10:30-11:00		
11:00-11:30		
11:30-12:00		
12:00-12:30	Lunch	Women in Nature Network (WS10) (TR5)
12:30-13:00		
13:00-13:30		
13:30-14:00	Marine Biodiversity Across Borders (SY6) (LTA)	UWI Zoology Museum Tours (UWIZM)
14:00-14:30		
14:30-15:00		
15:00-15:30	Break	
15:30-16:00	International Year of the Reef: Caribbean Coral Reef Conservation (SY7) (LTA)	Miscellaneous and Speed Talks (TS7) (LTB)
16:00-16:30		
16:30-17:00		
17:00-17:30	Break	
17:30-18:00	Members Meeting & Student Award Ceremony (LTA)	
18:00-18:30		
18:30-19:00	Plenary (Dr Diva Amon) (LTA)	
19:00-19:30	Closing Ceremony & Reception (LTA/TLC)	
19:30-20:00		
20:00-20:30		
20:30 - 21:00		

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FRIDAY 27TH JULY**TS4 BIODIVERSITY CONSERVATION AND MANAGEMENT IN THE REGION (LTA)***Moderator: Fadilah Ali*

TS4a	8:00	Jaime Burbano-Girón	Differences in spatial conservation prioritization: a comprehensive assessment of Neotropical biodiversity
TS4b	8:15	Rachel Golden Kroner	Protected area downgrading, downsizing, and degazettement (PADDD) in Amazonia: regional profile of legal rollbacks to protected areas
TS4c	8:30	Stefan Kreft	A role for SCB in biodiversity research and conservation policy work in the Caribbean and South American Overseas Entities of the EU
TS4d	8:45	Alexis Mychajliw	Recent extinctions and current threats: using the fossil record to guide conservation of Caribbean biodiversity
TS4e	9:00	Frédérique Fardin	Developing the Critical Ecosystem Partnership Fund Ecosystem Profile for the Caribbean Islands hotspot: a year-long participatory assessment process
TS4f	9:15	Candice H Ramkissoon	Information and Communication Technologies (ICTs) for supporting participatory natural resources management and climate action in the Caribbean
	9:30	Break	

SY5 FROM ENDEMIC TO INVASIVES: FRESHWATER FISH CONSERVATION IN THE CARIBBEAN (LTA)*Moderators: Ingo Schlupp & Amy Deacon*

SY5a	10:00	Ingo Schlupp	Invasion irony: livebearing fishes threatening livebearing fishes in the Caribbean
SY5b	10:15	Rodet Rodriguez Silva	Challenges for freshwater fish conservation in the Cuban system of natural protected areas: the case of two biological reserves in western Cuba
SY5c	10:30	Amy E Deacon	How to be a successful invader: lessons from the Trinidadian guppy
SY5d	10:45	Kerri-Ann L Bennett	Trouble in Paradise? Jamaica's Native and Introduced Poeciliids
SY5e	11:00	Jack D Torresdal	Human induced turbidity and sedimentation affect fish community composition across Trinidadian streams.
SY5f	11:15	Pablo E Weaver	Diversity, habitat, and conservation of the Hispaniolan Poecilia clade
SY5g	11:30	Brian Langerhans	Inland blue holes of The Bahamas: windows into evolution in the wild
SY5h	11:45	Keshan Mahabir	Heterospecific shoaling in an invasive poeciliid: shared history does not affect shoal cohesion
	12:00	Lunch	

TS5 PROTECTED AREAS: SELECTION AND DESIGN (LTB)			
<i>Moderator: Jaeson Clayborn</i>			
TS5a	10:00	Ellie Devenish-Nelson	Increased vertebrate coverage of Trinidad and Tobago's new proposed protected area system
TS5b	10:15	Joshua A Spiers	Using species distribution modelling to optimize protected area design for endemic plants
TS5c	10:30	Juliana Pereira	Landscape connectivity: using network analysis to improve reserve selection with modest data requirements
TS5d	10:45	Javier Fajardo	Priority conservation areas for a comprehensive representation of tropical Andes species diversity in the face of climate change
TS5e	11:00	Oswaldo Ramírez Bravo	Community participation and natural protected areas: linking community knowledge and biodiversity conservation
TS5f	11:15	Gabrielle Thongs	Using GIS to Model and Monitor Sustainable Forest Management in Trinidad
TS5g	11:30	Wanjohi Kabukuru	Community Managed Marine Parks
TS5h	11:45	Melanie Andrews	Enhancing participatory management planning for protected areas: lessons and best practice guidelines from Trinidad and Tobago
12:00 Lunch			
WS10 WOMEN IN NATURE NETWORK (12:00 -13:30) (TR5)			
<i>Session Organisers: Karla Pelz Serrano + Tsitsi McPherson</i>			
In this workshop we expect to show and discuss the different experiences good or bad as woman in the field of Conservation Biology. This workshop is organized to aid young conservationist to learn from more experienced colleagues. Furthermore, the Women in Nature Network is an organization that seeks to mentor young conservationist in their endeavor to achieve research in conservations, to try to empower women in Conservation of Biodiversity.			
SY6 MARINE BIODIVERSITY ACROSS BORDERS: CHALLENGES AND SOLUTIONS (LTA)			
<i>Moderators: Michelle Cazabon-Mannette, Farahnaz Solomon & Kelly Kingon</i>			
SY6a	13:30	Hamish MN Asmath	The Caribbean Marine Atlas (CMA): Providing a Platform for Conservation and Management of the Caribbean Sea
SY6b	13:45	Melanie K Andrews	Enhancing stakeholder participation in management of the Eastern Caribbean flyingfish fishery
SY6c	14:00	Fadilah Ali	The ecological and socio-economic impacts of the lionfish invasion in the Southern Caribbean
SY6d	14:15	Olga Koubrak	The Caribbean Legal Seascape for Shared Marine Living Resources: Treaty obligations, examples of implementation and suggestions for the course forward
SY6e	14:30	Kelly Kingon	Occurrences of black spots (ectoparasitic infection) in herbivorous, coral reef fishes: a potential indicator of reef health in the Caribbean
SY6f	14:45	Miquel Garcia	Investigation of sea turtles' foraging and migration behavior in the Caribbean using satellite tagging

TS6 FOREST ECOSYSTEMS (LTB) <i>Moderator: Aidan Farrell</i>			
TS6a	13:30	Janeth Lessmann	The biocultural diversity we could lose with deforestation
TS6b	13:45	Izabela Stachowicz	Different faces of disturbances - habitat loss, fragmentation and wildfire in la Gran Sabana, Venezuela
TS6c	14:00	Mahendra Doraisami	Carbon concentrations in wood across the world's trees and forests: implications for forest carbon accounting
TS6d	14:15	Leslie Hay	Jaguar, puma and humans as structuralists in Costa Rican tropical forested ecosystems
TS6e	14:30	Mark F Hulme	Improving cocoa harvest can mitigate for crop damage by wildlife in a forest-agriculture matrix
TS6f	14:45	Mariana M Vale	Bird altitudinal migration patterns in the Neotropical cannot be generalized to other zoogeographic regions
15:00 Break			
SY7 INTERNATIONAL YEAR OF THE REEF: CARIBBEAN CORAL REEF CONSERVATION(LTA) <i>Moderators: Fadilah Ali, Jahson Alemu & Anjani Ganase</i>			
TS7a	15:30	Jahson B Alemu I	The role of even poorly managed marine protected areas in mediating ecosystem service trade-offs on coral reefs: A Tobago case study
TS7b	15:45	Michelle Taylor	High relative abundance of coral recruits on mooring blocks, coral rubble and vertical coral rock in a natural reef setting.
TS7c	16:00	Franziska Elmer	Caribbean wide temporal and spatial distribution of the dermal fish parasite <i>Scaphanocephalus expansus</i> .
TS7d	16:15	Katherine J Siegel	Marine resource management and social-ecological vulnerability to coral bleaching in the Caribbean
TS7e	16:30	Anjani Ganase	The effects of wave action on patterns of coral reef structural complexity
TS7f	16:45	Reia Guppy	Visualization of the coral mucus surface layer
TS7 MISCELLANEOUS AND SPEED TALKS (LTB) <i>Moderator: Mark Hulme</i>			
TS7a	15:30	Delezia Singh	Cardiac activity variability of <i>Poppiana dentata</i> in response to temperature change
TS7b	15:45	Nicholas Mohammed	Stats and Bats: Estimating the population size of <i>Desmodus rotundus</i> in Trinidad using a statistical model.
TS7c	16:00	Jaeson Clayborn	Butterfly gardening at Miami (Florida, USA) urban schools: Plugging students into nature through habitat rehabilitation on school grounds
TS7d	16:15	Luz Rodriguez-	Leadership and marine conservation: lessons from a field case on

		Vargas	the control of the lionfish invasion
TS7e	16:30	Trina Halfhide	Algal Bioprospecting to Feedstock Production: The Trinidad and Tobago Case Study
TS7f	16:45	Karla Pelz Serrano	Insights to promote enhanced norms for mitigation of highway construction impacts in Mexico
TS7g	16:50	Vilisa Morón-Zambrano	Protected Area downgrading, downsizing, and degazettement (PADDD) in Venezuela: a first systematic national profile
	16:55	Speed talk questions	

DR. DIVA AMON

Under de Sea: Exploring the hidden depths of the Caribbean

Diva Amon is a Trinidadian deep-sea biologist who studies chemosynthetic habitats and human impacts on the deep ocean, including from deep-sea mining and oil and gas extraction. She is currently undertaking a two-year Marie Skłodowska-Curie research fellowship at the Natural History Museum in London, UK. In 2013, she completed her PhD at the University of Southampton, UK, after which, she spent three years at the University of Hawai'i, USA, researching the largely unknown abyssal fauna of the Clarion-Clipperton Zone, an area targeted for deep-sea mining in the Pacific Ocean. Throughout her career, Diva has participated in deep-sea expeditions around the world, including several that explored the Caribbean depths. She has done a considerable amount of science communication and public engagement, with her work featured on CNN International, National Geographic, BBC World and more. Diva is also a co-founder of the non-profit NGO, [SpeSeas](https://speseas.org/), dedicated to marine science, education and advocacy in Trinidad and Tobago and the wider Caribbean. You can find her on Twitter (@DivaAmon) or visit her website (<https://divaamon.com/>).



	Saturday July 28 th	Sunday July 29 th	Monday July 30 th	Tuesday July 31 st	
9:00-9:30		SPONGE WORKSHOP DAY 1	SPONGE WORKSHOP DAY 2	SPONGE WORKSHOP DAY 3	SPONGE WORKSHOP DAY 4
9:30-10:00					
10:00-10:30	GIS WORKSHOP DAY 2				
10:30-11:00					
11:00-11:30					
11:30-12:00					
12:00-12:30					
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16:30-17:00					
WS11	BASIC GEOGRAPHIC INFORMATION SYSTEM FOR CONSERVATION BIOLOGISTS CONTINUED (10:00 – 17:00) (DLS) <i>Session Organisers: Mariana Vale</i>				
<p>This one-day interactive section after LACCCB 2018 is tailored to people that have participated in the homonymous short course before the conference. The objective of the interactive section is to work on GIS projects focused on participant's own research data and needs, using the techniques learned on the short course. Participants will be paired and the instructor will guide projects individually, speaking in English, Spanish, French or Portuguese. Participants will need to use their own laptops with a free trial version of the ArcGIS software installed, and discuss their GIS needs with the instructor prior to the interactive section.</p>					
WS12	SHORT COURSE ON THE THEORY AND PRACTICE OF TROPICAL E. ATLANTIC SPONGE (PORIFERA) IDENTIFICATION (9:00 – 17:00) (DLS) <i>Session Organisers: Eduardo C M Hajdu & Gisele Lôbo Hajdu</i>				
<p>This course aims to train participants in marine sponge identification, introducing them to the theory behind the current and past classifications, as well as on the forefront of research into a more stable system. Participants will learn about sponge morphology and phylogeny, and will be briefly acquainted with their biology and ecology. The current classification will be presented in detail, with plenty of examples selected among Tropical Western Atlantic taxa. Hand's on activities will include the preparation of dissociated spicules slides as well as thick anatomical sections, the elaboration of short descriptions and schematic illustrations of architectural patterns, essential for communication with specialists if samples cannot be sent overseas for any reason. If feasible, a field trip to a nearby area may be organized for the acquisition of fresh samples, and training on their preservation for subsequent taxonomic study. Please view the Sponge ID Course Program for scheduling and details.</p>					



ABSTRACTS

The role of even poorly managed marine protected areas in mediating ecosystem service trade-offs on coral reefs: A Tobago case study

Alemu I, Jahson

The increasing demand for multiple coral reef ecosystem service benefits by human populations continues to create conflicts that threaten the ability of coral reefs to continue to providing these services. Even with human management, competition between ecosystem services is inevitable and the management of trade-offs is needed in order to optimise the long-term delivery of multiple ecosystem services for human wellbeing. Here we explore the role of marine protected areas in mediating supply and benefit side trade-offs, ecosystem service bundling and hotspots of production for shoreline protection, fisheries production and recreational opportunities. Overall, most ecosystem services could be managed or co-managed along production frontiers, however improvements in one often resulted in losses in the other.

The ecological and socio-economic impacts of the lionfish invasion in the Southern Caribbean

Ali, Fadilah

The Indo-Pacific lionfish (*Pterois volitans*) is a venomous predator with a high dispersal capacity. In the space of 30 years, it has infiltrated an array of habitats, inhabited a depth range of >300 m and exceeded the size and density reported in the native range. If left unmanaged, lionfish pose a significant, but still uncertain, threat to Caribbean ecosystems thereby warranting the need for effective and efficient management schemes. Since their confirmation in Bonaire and Curacao in October 2009, an extensive monitoring program was established whereby >11,000 lionfish were documented and their population dynamics, reproductive and feeding ecology analysed in relation to local management strategies. Socio-economic questionnaires were also conducted to determine the profile and motivations of lionfish hunters, and a cost-benefit- analysis performed to assess economic effects of the invasion. This work revealed that dusk was the most effective time for lionfish removal and that by focusing removal efforts in the 15 – 25m depth range, this allowed for the depletion of a higher proportion of individuals in the 101 -200mm size class. This research also revealed how valuable a prepared and rapid response to management was and how important a dedicated volunteer removal effort is to controlling the lionfish populations in the future.

Deforestation in the Venezuelan Amazon and the advancement of illegal mining

Amilibia, Juan C.; Zager, Irene; Carvajal, Sara. J.

The Venezuelan Amazon (VA) is a predominantly forest region of high natural complexity that covers nearly 50% of the country's land surface (453,915 km²). More than 1.7 million people inhabit it, including 24 indigenous peoples, although anthropic influences have been historically less marked than in the north of the country. This situation has changed over the last decades, as extractive activities intensify and expand. A milestone of the extractive upswing was the creation in 2016 by the National Government of the "Orinoco Mining Arc", with the objective of extracting and exploiting mineral resources in an area of 111,843 km² (about 25% of the VA). In addition, illegal mining has also experienced a boom in recent years. These changes result in extensive and acute environmental and cultural impacts across the region, which are important to estimate and monitor. Here we present the results of a deforestation analysis for the period 2000-2015 based on the interpretation of Landsat satellite images following the methodology established by the Amazon Geo-referenced Socio-Environmental Information Network (RAISG). Results show that deforestation has increased continuously, with the greatest forest loss occurring in the period 2010-2015. Much of the forest loss detected coincides with new open-pit mining areas identified from high-resolution images, which confirms that illegal mining is one of the main causes of recent deforestation in the region during the last decade.

Enhancing stakeholder participation in management of the Eastern Caribbean flyingfish fishery

Andrews, Melanie; Phillips, Terrence C.

Given the significance of the Eastern Caribbean flyingfish fishery, the Caribbean Regional Fisheries Mechanism (CRFM) and Western Central Atlantic Fishery Commission (WECAFC) finalised a Sub-regional Eastern Caribbean Flyingfish Fisheries Management Plan. While, the Plan was endorsed by the 15th Session of WECAFC and CRFM Ministerial Council, actions to create awareness and engage stakeholders in its implementation have been limited. In response, CANARI and the Centre for Resource Management and Environmental Studies of the University of the West Indies are implementing a CRFM funded project aimed at enhancing awareness and facilitating involvement of key stakeholders in Plan implementation, using an ecosystem approach to fisheries. In the absence of National Fisheries Advisory Committees, a representative sample of stakeholders that mirror such an arrangement has been set up in these four countries, with awareness and engagement firstly being gauged by Knowledge, Attitude and Practice surveys, and subsequently enhanced through innovative communication products and mini-consultations on the Plan. This presentation outlines the methods and results and best practices from this project executed in Barbados, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago.

Repatriating species where threats still exist

Angeli, Nicole, Fitzgerald, Lee A.

A complex conservation challenge is how to repatriate extirpated species when persistent threats still exist in historic ranges. Even when threats persist at broad scales, reconfigured landscapes, such as when forests have regenerated, often contain patches of habitat for threatened biodiversity with relatively low levels of threats. On St. Croix, U.S. Virgin Islands, the St. Croix ground lizards (*Pholidoscelis polops*) was extirpated from the main island. The small Indian mongoose (*Herpestes auro-punctatus*) caused the extirpation, probably in synergy with conversion of habitat to agriculture. Today, forest and anthropogenic land cover types re-emerged. We predicted sufficient habitat for St. Croix ground lizards exists for repatriation to St. Croix based on a spatially explicit binomial mixture model. We explored the potential for mongoose control in protected areas and stakeholder investment. We ranked sites in a prioritization schema and make recommendations for the repatriation of the species. This case demonstrates the importance of landscape transitions in changing the spatial configuration of threats to species and creating opportunities for repatriation and rewilding. Presuming that areas may never again be habitable may be overlooking how landscapes have reset the stage for recovery of species. We suggest there is

great potential for repatriation of native species when the current landscape of threats is considered.

Species Status Assessments are a new collaborative population modelling exercise to improve the U.S. Endangered Species Act

Angeli, Nicole; McGowan, Conor P.

To increase the transparency of decisions under the Endangered Species Act, the Fish and Wildlife Service (FWS) has developed the Species Status Assessment (SSA). Many FWS biologists tasked with developing SSAs must gather and synthesize data from many sources, are generally not trained in quantitative techniques, and are unsure what analyses are appropriate for the data. Reproducible, transparent modeling for conservation assessments are of central importance to conservation biology. Herein, we discuss completed and on-going projects to collaboratively assess the current and future status of species like Sonoran Desert Tortoises, Black Rails, and Puerto Rican Boas with the FWS, academic biologists, and managers.

Seed dispersal of *Mauritia flexuosa*: a comparison of mainland and island stands

Arneaud, Linton; Oatham, Mike P.; Farrell, Aidan D.

The presence and abundance of granivores strongly affects palm recruitment at the landscape level, as scatter hoarding aids in seed dispersal. Here we examine the role of different seed dispersers in *Mauritia flexuosa* L.f (Arecaceae) palms and compare Savanna margins in Guyana (mainland) and Trinidad (its closest Caribbean island), during the wet and dry season. The main vertebrate species that consumed palm-fruit were identified using camera traps positioned in front of clusters of arranged fruit, while dispersal distance was examined by thread-marking 200 fruit. In Trinidad, *Dasyprocta leporina* L was recorded as the main disperser of *M. flexuosa* fruit (the first time it has been recorded to disperse *M. flexuosa* fruit); while in Guyana, *Cuniculus paca* L. was recorded as the main disperser. Fruit were dispersed the furthest in closed canopied margins. The success of *M. flexuosa* palm population expansion may be dependent on small-sized mammals such as *D. leporina* for effective dispersal where large-sized mammals are absent.

The Caribbean Marine Atlas (CMA): Providing a Platform for Conservation and Management of the Caribbean Sea

Asmath, Hamish; Gaskin, Aaron; Donaldson, Andrea; Lysenko, Nina; Torres, Carlos; Klein, Eduardo

The Caribbean Sea provides a wide range of ecosystem services which are shared by some 33 states and territories. The marine space is increasingly threatened by habitat loss and degradation, unsustainable exploitation of living marine and coastal resources, pollution, climate change, weak governance, and a lack of data for informed decision-making. The Caribbean Marine Atlas (CMA) is an online digital platform that provides spatial data, maps, indicator information, external data links, and a document repository to support the Caribbean Large Marine Ecosystem (CLME) project, ICZM, marine spatial planning, improved policy and decision making. Participating countries submit base datasets which are used to develop spatiotemporally distributed indicators of change in coral reef health, mangrove, coral reef and seagrass extent, fisheries catch, invasive and threatened species, and extent of protected coastal ecosystems. The CMA is contributing to a number of Aichi Biodiversity Targets. These include: #2 by providing a reporting platform for biodiversity values; #5 by monitoring the change in natural habitats; #11 by monitoring of the percent of conserved coastal and marine areas; and #19 by disseminating biodiversity information, trends and consequences of its loss. It is contributing to monitoring progress for SDG 14 for the 13 pilot countries. The CMA is an initiative of IODE (IOC-UNESCO) funded by the Government of Flanders, and executed through the INVEMAR in Colombia.

Amphibians and their conservation in Trinidad and Tobago

Auguste, Renoir; Downie, Roger J.; Lehtin, Richard M.; Jowers, Michael J., Mohammed, Ryan S., Murphy, John C.

Amphibians are a group of conservation concern, especially in the Neotropics where approximately 40% are threatened with extinction; higher than the global average. Trinidad and Tobago currently has 35 known species of amphibians, from 21 genera and 11 families, all belonging to the order Anura. Six of these 35 species are currently considered endemic. Most of country's amphibians are tentatively listed as Least Concern on the IUCN Red List (27/35), which is lower than the global average. However, some species may be more accurately described as data deficient, and future monitoring may show that they are threatened with extinction. Nonetheless, given the large variety of frogs on the islands, no single monitoring approach can be done and thus key questions for priorities to their conservation need considering for more effective management. Although legislation and practice by managing bodies in the country play a role in their conservation, there is a lack of appreciation for frogs in the country by the general public and this may contribute to hindrances to the conservation of amphibians in the country.

Aquatic crustaceans associated with subterranean environments from Grand Cayman

Bass, David; Tedford, Kinsey N.

Biodiversity investigations of Cayman Islands invertebrates have led to the discovery of several populations of crustaceans in subterranean waters of Grand Cayman. *Anopsilana crenata* (Cirolanidae) and *Bahadzia caymanensis* (Hadziidae) are endemic to anchialine habitats on Grand Cayman. A third anchialine species, *Stygiomysis* sp. (Stygiomysidae), has been collected from one of these cave sights during three different years. Numerous incomplete specimens of three additional species of shrimps, *Barbouria cubensis* (Hippolytidae), *Naushonia manningi* (Laemoniidae), and an unidentified Atyidae, were recently collected in filters from desalination wells drawing subterranean marine water at depths 150-210m below the surface. Although these shrimps trapped in the filters have been reported from other Caribbean islands, they have not been reported previously from Grand Cayman. A population of *Macrobrachium carcinus* (Caridea), another species previously unknown from the Cayman Islands, was recently discovered near the opening of Beach Bay Cave. It is presumed this species became established by moving inland from the sea through the subterranean connections of the karst environment to the opening where they were collected. Monitoring of the endemic species is important to insure their populations remain robust and continued investigations of these habitats may yield additional taxa previously unknown from the island.

Trouble in paradise? Jamaica's native and introduced poeciliids

Bennett, Kerri-Ann; Hyslop, Eric J., Brager, Stefan; Schlupp, Ingo

Jamaica has only four endemic freshwater fish species. Three of the four species- *Gambusia melapleura* Gosse 1851, *Gambusia wrayi* Regan 1913 and *Limia melanogaster* Günther 1913 are livebearers from the family Poeciliidae. The fourth is the killifish *Cubanichthys pengelleyi* Fowler 1939. The Poeciliidae, as a group, has been widely studied in many different contexts. Unfortunately little published information exists about the biology and life history of Jamaica's endemic and native poeciliids. This paucity of information makes it difficult to assess potential threats to these species. To begin to address these knowledge gaps gonopodial morphometrics and mitochondrial DNA sequencing were used to confirm differences among the native and endemic *Gambusia* species. This resulted in the discovery of a new population of the rare *G. melapleura* which was previously reported from only one location. Seven freshwater habitats along the south of the island were surveyed in June 2017. All but two sites were found to have large numbers of at least one introduced fish species, including known invasive species. In some locations the most common fishes encountered were introduced species. *L. melanogaster* was observed in much lower numbers or not at all from sites where it had been previously observed to be abundant. This study highlights the need for a better understanding of the ecology of endemic poeciliids as well as the dynamics of their interactions with introduced species.

Morphological sexual dimorphism contributes to diet dimorphism in Guianan sakis (*Pithecia pithecia*) during the wet season on coastal Guyana

Bourne, Godfrey; Alsyouf, Lena Z.

Competition for resources is greatest among conspecifics because they occupy and share similar niche dimensions. Thus, we studied similarities and differences in food selection by the sexually size dimorphic and dichromatic Guianan saki (*Pithecia pithecia*). Males are significantly larger, have bigger skulls, jaw muscles, and teeth than females. Specifically, we determined whether sexual dimorphism extended to diet selection during the wet season by comparing male and female consumption of softer ripe and tougher unripe fruit when they foraged in the same fruiting trees at CEIBA Biological Center, Guyana. A 1-Way ANOVA indicated that females consumed greater quantities of softer, ripe fruit than males, and males consumed greater quantities of unripe, tougher fruit than females did. Qualitative observations also support statistical differences in fruit selection. When eating cashews (*Anacardium occidentale*), females only ate ripe false fruit while males ingested the tough, caustic true fruit, and unripe false fruit. Male sakis have larger teeth and bigger jaw muscle mass that facilitated their handling of unripe tougher fruit which females avoided. Thus, sexual selection by female choice of larger males as mates seemed to influence differential diet selection by the sexes supporting the evidence for dimorphic diets in Guianan sakis during a rainy season.

Benefits of using common tropical species as focus for public outreach

Brophy, Avryl ; Wetten, Kimberley; Koper, Nicola

Public outreach as part of environmental and conservation research can be an important link between science and community, and a venue for scientific results to reach a broader audience. This can be especially beneficial when working in developing countries where communities may not otherwise have access to conservation and environmental programs. Outreach programs can help increase environmental literacy and promote conservation ideals and engagement in local communities. Bird banding is a well-known scientific technique of monitoring bird populations and is used extensively as a tool for public outreach. This case study looks at how we can use methods necessary for current research to better promote conservation ideals and environmental knowledge in Grenada using the Grenada House Wren (*Troglodytes aedon grenadensis*) as a focal species. This species is found commonly in urban areas, breeds in and around houses, and has a loud and obvious song. To link science and community, we conducted public outreach in the form of a bird festival for school children, multiple bird banding demonstrations to community members and tourists, bird banding workshops at Saint George's University, and bird-watching events; a focus of these events was on the Grenada House Wren. Using common birds that people see all the time as a focal point for public outreach can serve as a reminder for people to think about environmental and conservation issues on a daily basis.

Differences in spatial conservation prioritization: a comprehensive assessment of Neotropical biodiversity

Burbano-Girón, Jaime; Etter, Andres; Jantke, Kerstin

The current biodiversity crisis requires strategic and efficient investments in conservation. A core principle in systematic conservation planning is the comprehensive representation of biodiversity. Here, we present a spatial conservation prioritization approach for the most biodiverse region globally, the Neotropics. Our comprehensive study accounts for the three attributes of biodiversity: geographical distribution (composition), habitats (structure), and ecological groups (function), of around 9,000 species of amphibians, birds, mammals, and reptiles. We solved a minimum set cover problem using integer linear programming (Prioritizr software) to compare spatial conservation priorities among the three approaches. We found significant differences in spatial correspondence, e.g., most planning units were selected for the habitats approach as the features do not overlap. Complementarity is highest for the Amazon using the ecological groups approach, while irreplaceability is

greatest in the northern part of the Andes, the Brazilian Cerrado, and the north of Mexico for the species-composition approach. These patterns follow the levels of richness, dominance, evenness, and endemism correspondingly. We conclude that habitats are useful surrogates for biodiversity for spatial conservation prioritization in highly biodiverse regions. However, in areas with lower diversity, this approach tends to overestimate the number of planning units necessary to meet conservation targets.

The Orinoco Mining Arc and the Caribbean: possible impacts over marine ecological processes

Cabada, Françoise; Agudo, Esteban

In coastal areas, which are the interface between the land and the sea, the function and status of ecosystems could greatly depend upon terrestrial influence, where rivers connect their watersheds with the sea. The extent of this influence varies according to river discharge and oceanographic processes. The Orinoco river is the world's third river in terms of discharge, with 38,000 m³/s of water entering the sea, and varying in response to the rain-drought regime within its vast watershed in central and southern Venezuelan. The Orinoco river's influence over coastal-marine systems is both local and regional. In the Caribbean, this influence range from biological productivity, to regional current patterns and the dispersion of species with planktonic life stages such as commercial fishes and crustaceans, and reef-building corals. Thus, the development of large-scale open sky mining activities in part of the Orinoco tributaries and watershed within the so called Orinoco Mining Arc, might produce environmental and social-economic consequences beyond Venezuelan's borders. In this presentation we will talk about several of the ecological processes the Orinoco influences in the eastern Caribbean, and will discuss the implications that pollution and deforestation within its watershed might have over coastal-marine ecosystems and the people whose livelihood depend upon the ecosystem services they provide.

Census and first genetic analysis of the Guadeloupien population of white-crowned pigeon, *Patagioenas leucocephala*

Cambrone, Christopher; Bezault, Etienne; Guillemot, Blandine; Cezilly, Frank

Providing information about population dynamics and genetic diversity is of prime importance for the conservation and management of threatened species. The White-crowned Pigeon (WCPi) *Patagioenas leucocephala* is a Caribbean endemic species, classified as "Near-threatened" (IUCN red list), for which data on the ecology and demography are very sparse, fragmentary and unequal across its distribution area. In particular, very few data are available for the Lesser Antilles despite the fact that the species is much appreciated by local hunters and exposed to habitat loss and fragmentation. Using 10 different transects, we compared the call-broadcast and passive census method in order to provide reliable tools for the monitoring of population trends in Guadeloupe. Additionally, we performed a preliminary genetic study to examine genetic diversity and structure of the species population using two mitochondrial genes. Although the overall density of individuals was low, the call-broadcast method appeared to be more efficient at detecting pigeons than the passive one. Therefore, it could be a reliable census method to monitor population trends of this species. Genetic diversity appeared to be high relative to that measured in other threatened columbid species, suggestive of a weak genetic structuration across the Caribbean region. This has to be confirmed through further sampling in other Caribbean islands.

The impacts of invasive species removal on a remote Caribbean island ecosystem

Challenger, Shanna; Steele, Sophia M; Daltry, Jenny C; Lawrence, Natalya K.

Worldwide, invasive species pose one of the largest threats to native wildlife. Black rats (*Rattus rattus*) have been incrementally introduced to islands as humans explored the world's oceans. On a remote island, lacking predators or competition, these crafty animals can easily distort ecosystems. This was dramatically demonstrated on the island of Redonda, the third island of Antigua & Barbuda - which was identified as the Caribbean's Top Priority

Island for Restoration. One mile long and completely uninhabited, it is recognized as an Important Bird Area - important nesting site for seabirds, and home to three species of Critically Endangered lizards. Literally transformed from lush forests to a moonscape devoid of any vegetation. The cause of its demise was a herd of feral goats and 6,000 black rats. After years of logistical planning, our ambitious conservation project was launched. Goats were captured and helicoptered off the island. For over 2 months, our rat team laid down toxic bait and monitored uptake. On the sheer cliffs, mountaineers sling-shotted bait and did helicopter throws to ensure that no rats remained. Within a year, vegetation growth has exceeded all expectations, lizard populations have doubled and landbirds and invertebrates not seen in decades, have returned. Even at this early stage, Redonda proves to be a model for island restoration. It is sure to provide valuable lessons for other biodiversity conservation and climate resilient projects in the region.

Butterfly gardening at Miami (Florida, USA) urban schools: Plugging students into nature through habitat rehabilitation on school grounds

Clayborn, Jaeson; Koptur, Suzanne; O'Brien, George

Habitat loss is a major factor contributing to the decline of butterflies and other insects globally. Schools provide an opportunity to restore green space in local communities. Three Miami schools participated in a South Florida butterfly garden project. The "Schaus and Coastal Hardwood Hammock" curriculum unit focused on active-learning and collaboration within the school community. The lessons aimed to: 1) inform students about the Schaus' swallowtail, a federally endangered butterfly in Florida, 2) increase the number of butterfly gardens at schools and homes, and 3) thwart "extinction of experience" at schools. Two 5th grade classes were separated into experimental and control groups. At each school, both groups were administered pre- and post-content exams, pre- and post-surveys, and pre- and post-interviews. The experimental groups received butterfly identification guides, host and nectar plants to take home (while control groups did not) for two months. Collectively, students in the experimental group scored significantly higher on the post-exam in contrast to no significant increase for the control group. Post-surveys revealed students favored plants and the environment more and were less interested in insects. Interviews revealed students recognized monarchs and milkweed in gardens, but not other butterfly and plant species. Overall, experimental groups had a net increase of eight gardens established at home compared to a net loss of two for the control group.

Mortal combat between ants and caterpillars: An ominous threat to the endangered *Heraclides aristodemus ponceanus* in the Florida Keys, USA

Clayborn, Jaeson; Koptur, Suzanne

The federally endangered *Heraclides aristodemus ponceanus* has reached critically low numbers. Exotic ants are a potential threat to *H. a. ponceanus* and other rare butterflies as they can attack immature stages. Ant surveys conducted in tropical dry forests in Biscayne National Park documented ant species diversity and relative abundance. A caterpillar predator exclusion experiment using physical barriers in different combinations evaluated caterpillar survivorship of both early and late instar caterpillars exposed to different threats. Ant-caterpillar interactions were also documented by placing caterpillars on plants and observing physical interactions between caterpillars and ants. A total of 1,418 ants comprising 25 ant species was captured and identified. In canopies of *H. a. ponceanus* host plants, 243 ants comprising 12 species were found. The predator exclusion experiment revealed survivorship was significantly lower for early and late instar caterpillars without any physical barrier, as well as for early instars not protected by a mesh cage. *Pseudomyrmex gracilis* and *Camponotus floridanus* were more aggressive towards caterpillars in comparison to other ant species; these two species ranked first and second in the "ant danger index" ranking predatory abilities of the four most common ant species. *Pseudomyrmex gracilis* is a common arboreal exotic ant in Biscayne National Park and presents a major threat to caterpillars during their earliest life stages.

The importance of water quality in the coral reef health assessment of the Port Royal Cays, Jamaica

Coore, Kimberley; Palmer, Suzanne E.

Coral reefs are vital to the health of the Caribbean Sea, however, sedimentation and nutrification threaten the biodiversity of coastal coral reefs. The Port Royal Cays (PRC) coral reefs are located just south of Kingston Harbour, Jamaica, a well-documented eutrophic harbour with ongoing dredging activities. This study aims to provide the first detailed assessment of coral reef health and water quality variation across PRC. Survey sites lie with differing proximity to the shipping channel and harbour outflow. Detailed coral and benthic surveys of 5 coral reef sites were completed in November 2017 using the Atlantic and Gulf Rapid Reef Assessment (AGRRA). Distinctions have been made between the distant exposed forereef of the PRC barrier reef, dominated by relatively high coral cover of encrusting coral species, in comparison to the cays located closer to the shipping channel and harbour mouth which are characterized by higher coral diversity but lower coral cover, and high fleshy macroalgae and aggressive invertebrates. Water quality at each coral reef site has been distinguished based on annual variation in concentrations of nitrates and phosphates of reef waters, sediment accumulation rates, turbidity, and water movement. The results of this study provide the most up-to-date and comprehensive assessment of coral reef health for the PRC, and the first in this area to provide linkages between coral reef health and water quality imperative for national ecosystem management.

Bio-control of mosquito population: exploiting predator-prey relationships between mosquitoes and dragonflies

Dasrat, Cindy; Maharaj, Gyanpriya

Mosquitoes coexist with humans since civilizations live on the border of and in naturally forested areas. They have plagued the lives of tropical residents as pests and vectors of diseases. Control of their population is necessary, especially in the Caribbean and Equatorial regions. In Guyana, we employ chemical treatments sub-regionally to eradicate mosquitoes. However, this treatment has limited success and is harmful to the environment. Alternative treatments that are more environmentally friendly such as biological control should be implemented. In biological control one organism is used to limit the population growth of another. Dragonflies are natural predators of mosquitoes. They are ideal candidates to be used in the biological management of mosquitoes. My primary objectives are to investigate the efficiency of naiads as a biological control against mosquitoes; to study feeding behavior of dragonflies in natural and laboratory setting and to determine feeding preferences of dragonflies for the juvenile life stages of mosquitoes. Collection will occur in rice fields found in Hague Settlement, West Demerara. My controlled experiments, which investigates feeding preference, predator efficiency and feeding behaviors, will be achieved in aquarium arenas at the University of Guyana. I hope my results will develop mosquito biological control in Guyana. Thereby reducing mosquito populations; occurrence of vector diseases and improving integrated pest and vector management.

Using museum data to estimate species richness of freshwater tropical fish

Deacon, Amy; Jones, Faith A.M.; Rutherford, Mike G.; Magurran, Anne E.

Tropical regions often lack sufficient species richness estimates, particularly for traditionally less well-sampled taxa such as freshwater fish. Historical data, for instance collections held in museums, can provide a cost effective and potentially powerful tool for estimating species numbers. This method has demonstrated value in well-sampled temperate regions, but its utility for tropical regions is less clear. We assessed estimates of freshwater fish species richness (Class Actinopterygii) in Trinidad and Tobago using museum collection data held at The University of the West Indies Zoology Museum. We compare non-parametric species estimates from the museum data to similar estimates calculated from an independent intensive two year sampling of the same region. The museum collection contained records of 40 species; the sampling data found 37 species. 33 species were found in both datasets. Species number estimates from the museum collection data range from 40-51 species, whereas

estimates from the intensive sampling data are in the range of 39-49. Both datasets underestimate the true number of fish species (believed to be in the region of 70 species), but neither dataset performed better than the other. Museum data can therefore be as useful as intensive sampling to estimate regional species richness in the tropics. This will be particularly useful where resources are unavailable for undertaking intensive sampling, or where species number estimates are required quickly.

How to be a successful invader: lessons from the Trinidadian guppy

Deacon, Amy; Magurran, Anne E.; Ramnarine, Indar W.

As a result of their invasive tendencies, Poeciliids, a family of livebearing fish that originate from the Americas, now enjoy a global presence. Here, I will examine how one poeciliid in particular, the Trinidadian guppy (*Poecilia reticulata*), offers a unique opportunity to learn more about invasiveness. Native to Trinidad and parts of north-eastern South America, the guppy has been introduced throughout the tropics both as a mosquito control agent and as a discarded aquaria fish. This species possesses an extraordinary flexibility in behavioural and life history traits. This flexibility, a product of its evolutionary history in the predator-rich ephemeral pools and streams of its native habitat, predisposes the guppy to establish and survive in a wide range of exotic habitats. Here, I review the traits that facilitate the invasive success of the guppy and describe recent experiments that have added to our understanding of the traits most important to the guppy's invasive success. Finally, I will discuss ways in which the behaviour of introduced poeciliids can be directly connected to their negative ecological impact.

An investigation of hydrocarbon pollution and its relationship with mangrove root epifauna: a case study of two rivers in Trinidad

Deonaraine, Justine; Mohammed, Ryan; Mohammed, Azad

The increase in demand for and the dependency on petroleum hydrocarbons have resulted in an increasing threat of hydrocarbon pollution of mangrove ecosystems in Trinidad. Fauna of *Rhizophora mangle* roots are particularly sensitive to pollution due to their habitat in the intertidal zone, sedentary nature and filter feeding ability. The study aims to assess the taxonomic composition of the community and quantify the hydrocarbon concentrations in aquatic environment. The biotic and environmental variables were compared to determine if petroleum hydrocarbons are impacting community composition. Water and epifaunal samples were collected at the river mouth and 200m inland at the Madame Espagnol and Neg Rivers. The water was analysed for hydrocarbons using solvent extraction and gravimetry. Epifauna was identified to lowest possible taxon and counted. Statistical analyses of the biotic and environmental variables revealed differences in species composition and abundance between the rivers but similar hydrocarbon concentrations in both rivers. The BIOENV procedure indicated that salinity is the major determinant of community composition at both rivers and not the hydrocarbons. Regardless the presence of hydrocarbons in the mangroves have implications for the epifaunal community composition and management of the mangrove ecosystem.

Increased vertebrate coverage of Trinidad and Tobago's new proposed protected area system

Devenish-Nelson, Ellie; Nelson, Howard

Trinidad and Tobago has exceptionally high species diversity given its size. The country's current system of protected areas covers approximately 30% of terrestrial landmass, however, gaps in coverage exist for conserving this high level of biodiversity. No new areas have been added to this network since the 1960s and many of the existing protected areas are threatened by habitat degradation. In 2018, a new system of protected areas was proposed for Trinidad and Tobago to address gaps in ecological representation, uniqueness and viability. We assessed this proposed system's capacity to maintain terrestrial vertebrate species richness. Using MAXENT, we modelled species distributions as a proxy for suitable habitat for vertebrate assemblages across Trinidad and

Tobago, based on over 270,000 occurrence records, and climate and habitat suitability predictors. We evaluated the existing and proposed coverage of the protected areas relative to their designation category and the predicted species distributions. We demonstrate the new protected area system provides increased coverage and representation of vertebrate species richness, protecting hotspots of narrow-ranged and threatened vertebrate species. Our results provide evidence for the urgent need to gazette the proposed protected areas, in order to conserve the full range of Trinidad and Tobago's terrestrial biodiversity.

Carbon concentrations in wood across the world's trees and forests: implications for forest carbon accounting

Doraisami, Mahendra; Martin, Adam R.; Thomas, Sean C.

Wood carbon concentration values are integral for accurately estimating forest C stocks and fluxes. Interspecific differences in wood carbon (C) concentrations play a central role in refining systematic errors forest C accounting protocols, and potentially in understanding physiological and life history variation among tree species. Yet to date there remains no comprehensive assessment of variation in wood C among trees globally, and very coarse approximate values (e.g., 50%) are still commonly used in forest C inventories. We consolidated the world's largest database for any wood chemical trait in order to 1) provide the most robust wood C fractions for forest C accounting to date; 2) evaluate the importance of inter- vs. intraspecific variation in wood C for forest C accounting; and 3) evaluate the adaptive significance of wood C by testing for phylogenetic signal, and exploring relationships between wood C and wood density (WD; a key functional trait in trees). Wood C fractions calculated here, including newly derived values for temperate- and boreal biomes, differ significantly from any previously published values, and will further refine systematic over- and underestimations in forest C accounting of up to ~9%. Across species, wood C expressed both significant phylogenetic signal and correlated evolution with WD, representing among the first lines of evidence indicating that wood chemical traits comprise an ecologically important dimension of tree functional biology.

Mapping a marginal coral habitat in North-east, Trinidad using Sentinel-2A MSI, Side scan sonar and in-situ data

Douglas, Evana; Ramsewak, Deanesh; Kingon, Kelly; Phillip, Dawn A.T.

Trinidad's North-eastern coastline is fringed by the Toco Coral Reef Complex (TCRC), a collection of sediment tolerant coral reefs, rocky reefs and coral communities. It has been documented the closest Caribbean coral habitat to South America and is under threat by anthropogenic and hydrological influences. Although marginal, it has high ecological, cultural and economic significance for Trinidad and Tobago. Observations have also suggested the existence of additional reefs further than what was previously recorded. Remote Sensing (RS) is famous for mapping similar ecologically significant habitats. RS techniques have guided the effective management and development of marine parks in coastal communities like Toco. This research integrated multispectral Sentinel-2A imagery with side-scan sonar and in-situ data, to accurately map the extent of the TCRC. For the satellite data, a maximum likelihood classifier was used for analysis. A simple random validation approach and 'mowing-the-lawn' sampling design were applied for the side-scan data collection and dive surveys were employed for identifying the habitat's extent boundary. The results revealed an unexpected spatial extent. 36.5 hectares (ha) were delineated from Sentinel-2A imagery and roughly 82 ha using the side-scan technique. This is a clear indication much farther habitat boundary. Further research is needed to complete a detailed habitat mapping of the area, particularly given recently proposed development plans.

Digging into the Mining Arc

Ebus, Bram

In this presentation I will critically assess Venezuela's Mining Arc and argue that the legal framework created around mineral exploitation south to the Orinoco river facilitates illicit economies that have a very significant impact on protected ecosystems, unconsulted indigenous communities and victimizes a by the economical crisis impoverished population that often has no other choice than working in (illegal) mines. The Mining Decree' concerns an area of 112.000 square kilometres full of gold, coltan, copper and diamonds. The Mining Arc project should be an attempt to legalise the sector but the highly corrupt army already massacred and displaced populations in resource rich areas. Their violent behaviour, involvement in both legal and illegal mining together with a a conflicting and barely developed legal framework around mining facilitate state-corporate crimes where deviant and socially injurious actions in pursuit of economic gain by mutually reinforcing corporate-state actions might cause severe social and environmental harm. I will discuss the impacts identified in a fieldwork period of three months, analyse the involved state, corporate and criminal actors involved. In the discussion there is an opportunity to debate the pitfalls and opportunities of mining for Venezuela, a country in crisis.

Caribbean wide temporal and spatial distribution of the dermal fish parasite *Scaphanocephalus expansus*.

Elmer, Franziska; Kohl, Zachary F.; Peachey, Rita B.J.

Parasite infections often lead to a decrease in the fitness of the host. It is therefore of interest to study and monitor parasite infections. *Scaphanocephalus expansus*, a dermal parasite found in reef fish, is well suited for monitoring as its infection creates distinguishable black spots on the skin of the fish. Two types of distribution assessments were performed, a picture search for Ocean surgeonfish on Google to determine spatial and temporal distribution of the *S. expansus* infection throughout the Caribbean and fish counts in 2012/13 and 2017 at 21 dive sites located on Bonaire. Binominal logistical regression modelling revealed that the proportion of Ocean surgeonfish infected by *S. expansus* did not change over time in Bonaire or the greater Caribbean. However, the proportion of Ocean surgeonfish with >11 spots increased over time in Bonaire. Differences in infection rates were found between islands/countries as well as between sites and depths within Bonaire. Curacao, Bonaire and Turks and Caicos showed high infections rates compared to other locations. Of the fish surveyed on Bonaire in 2017, ocean surgeonfish had the highest infection rate followed by redband parrotfish and bar jack. These results show that even though *S. expansus* infection is widespread in reef fish in the Caribbean, its infection rate appears to be stable.

Priority conservation areas for a comprehensive representation of tropical Andes species diversity in the face of climate change

Fajardo, Javier; Lessman, Janeth; Devenish, Christian; Bonaccorso Elisa; Marquet, Pablo A., Felicísimo, Angel M.

Tropical Andean countries protected areas undertake the gigantic responsibility of sustaining the region's species diversity in the face of global change. Despite efforts made in the last decades, this network still fails at including all species and is projected to lose representation as a result of climate change. We have conducted a regional prioritization analysis to identify conservation areas that maximise the representation of 15,848 species of vertebrates and plants at present and climate change scenarios, in one of the most comprehensive exercises of this kind conducted at fine scale. By taking advantage of species distribution models and the new prioritization tool Prioritizr, we found that a substantial expansion of the conservation networks (40-45%) is needed throughout the region to achieve a comprehensive system. Priority areas are particularly important at xeric and mountain habitats at medium elevations (3000-5000 m) to adequately include all species at present, while they are also required upward (4000-6000 m) to maintain species representation in climate change scenarios if distributions migrate as forecasted. Directing efforts to these areas is expensive and expected to conflict with alternative land uses. Acting timely according to conservation planning prioritization before the opportunity to preserve these areas is lost is crucial to achieve a comprehensive and adaptable conservation network for the tropical Andes in the current context of global change.

Developing the Critical Ecosystem Partnership Fund Ecosystem Profile for the Caribbean Islands hotspot: a year-long participatory assessment process

Fardin, Frédérique, Brown, Nicole A., Leotaud, Nicole M., Boodram, Natalie N.

The Critical Ecosystem Partnership Fund (CEPF) is a collaborative initiative providing civil society groups with grants to support their biodiversity conservation work. The CEPF, US\$6.9 million first phase of investment in the Caribbean Hotspot finished in 2016, with a new phase scheduled to start in 2018. The Caribbean Natural Resources Institute (CANARI) implemented the first CEPF and along with several partners has subsequently executed an ecosystem re-profiling exercise of the Caribbean Hotspot to inform the second phase of investment. This ecosystem profile assessed the status of biodiversity in the Caribbean, outlining biodiversity threats, the current regional conservation investment portfolio, climate change impacts as well as overarching the policy, socioeconomic and civil society context of the region. The development of the re-profile has been a highly participatory process. At least 175 Caribbean biodiversity experts and stakeholders from academia, civil society, the public and private sector have been engaged in the process. Engagement methods have included interviews, national in-country consultations, online surveys and on-line consultations. Engagement efforts culminated in a regional validation workshop in Jamaica in January 2018 to review and provide feedback on the draft ecosystem profile.

Chlorophyll fluorescence as a biomarker for pollution stress in red mangrove (*Rhizophora Mangle*)

Farrell, Aidan; Edgehill, Natalie; Gopie, Shaleni; Mohammed, Azad

Mangrove systems worldwide are threatened by deliberate destruction and by dieback due to physiological stress. In countries where mangrove trees are protected, such as Trinidad & Tobago, early detection of stress is important to prevent tree loss. Remote sensing is often used for this purpose, but there are still many cases where mangrove dieback occurs without warning. Here we explore the use of chlorophyll fluorescence as a biomarker for early detection of stress due to anthropogenic pollution in mangroves. The health of *R. mangle* seedlings was assessed across six contrasting sites, including a pristine site and a site heavily polluted with hydrocarbons. Each site was visited in the wet season and again in the dry season to measure, growth rate, morphology, chlorophyll content and chlorophyll fluorescence (dark-adapted Fv/Fm). Growth rate and chlorophyll content varied across the sites, but only the most polluted site showed significant reductions; with height growth 9 % of that at the pristine site. Chlorophyll fluorescence was optimal in four of the sites, including the pristine site. In the most polluted site chlorophyll fluorescence was significantly altered, with half the plants showing severe damage to the photosynthetic apparatus. The results suggest that chlorophyll fluorescence is a good biomarker for severe pollution stress in *R. mangle* seedlings.

Risk of ecosystem collapse under different scenarios of management as a measure of conservation opportunities and challenges in Venezuela's Mining Arc

Ferrer-Paris, José; Zager, Irene; Stachowicz, Izabela

The different forest formations along the Orinoco river and the Guiana Shield have had wide distributions and low exposure to threats. The future development plans of the Venezuela's Mining Arc (VMA) have raised serious concern about the future of these ecosystems, with contrasting optimistic and pessimistic outlooks from different sectors of the society. Here we use standard ecosystem risk assessment protocols to calculate base line threat categories (calculated prior to VMA decree) for forest ecosystem in Venezuela and summarize results using national and regional threat scores. We then apply a scenario analysis to explore how different assumptions on management and conservation actions would impact these threat scores in the future. Based on current base-line data, Venezuela has a high proportion of Least Concern (LC) forest ecosystems, most of them present in the VMA (Threat score T=1.54; mean for South America T= 2.21+/- 0.88). Under assumptions of low to moderate exploitation of the VMA, the optimal conservation strategies should focus on the forest in the Llanos and andean regions. But

under most pessimistic scenarios, protected areas within the VMA will play a key role in determining future threat scores: effective and concrete conservation action is needed, even large “paper parks” will not be enough.

Biodiversity conservation at the landscape scale: common benefits in private lands

Forero-Medina, German; Valenzuela, Leonor; Saavedra, Carlos; Herrera, Ana M.; Valencia, Igor

Conservation agreements have become an important tool for implementing conservation actions in private lands. They provide an effective mechanism for influencing the management of multiple properties, and allow the civil society to engage in conservation. However, agreements are usually done in relatively small areas. A landscape approach, where agreements are part of a set of strategies aimed at larger scale objectives, is recommended in order to increase the impact of this mechanism. We present the case of the Wildlife Project in Colombia, as a model for biodiversity conservation at the landscape scale, based in conservation agreements. The project was developed in two regions, during three years. In the Orinoco region, we established a conservation corridor through agreements and private reserves, that protects over 35,000 hectares. Within these properties, we implemented sustainable cattle ranching practices and restoration activities in over 500 hectares. In the Magdalena Valley, we developed conservation agreements with 14 land owners, that cover more than 17,000 hectares. Results from the monitoring program indicate that several vertebrate species have maintained or increased their occupancy within the landscape. Land cover change within properties with conservation agreements has been lower than in the rest of the landscape. These results indicate the contribution of this mechanism to broader objectives when properly designed and implemented at the landscape scale.

A Strong Biotic Interaction Confers Resistance to Invasion

Fraser, Douglas; Ehlmar, Sean M., Torresdal, Jack

Biotic resistance to invasion continues to be broadened beyond the long-held view that species richness negatively affects invasibility. In one direction, it is increasingly recognized that individual species and their relationships can provide strong resistance to invaders on local scales, especially when an invader enters habitat occupied by a resident that is both a heterospecific and an intraguild predator (IGP). We investigated such an incipient IGP relationship in south Florida where the notoriously invasive guppy, *Poecilia reticulata*, has repeatedly failed to colonize despite enormous propagule pressure (e.g. many releases of large numbers from fish farms) and nearly ideal abiotic conditions. Previous observations have pointed to strong biotic resistance from the ubiquitous mosquitofish (MF), *Gambusia Holbrook*. We used 24 field mesocosms to directly test for invasion probability, via recruitment, over a range of propagule sizes of the guppy invader and densities of the MF resident. We also did aquarium studies to examine their behavioral interactions. The results show that guppies invariably failed to establish in the presence of MF, despite their being predators of MF babies. MF were found to be the stronger predator of the other's babies and, by fin-nipping, debilitated the founding adult guppies. This decisive example of biotic resistance via a single, strongly-interacting IGP species provides a compelling model with predictive power.

The effects of wave action on patterns of coral reef structural complexity

Ganase, Anjani; Gonzales-Rivero, Manuel; Mumby, Peter J., Dove, Sophie; Hoegh-Guldberg, Ove

Wave action is a major driver of the 3D structural complexity of shallow coral reefs. Patterns of structural complexity have significant impacts on ecosystem function. However, less understood are the spatial scales at which observed patterns of complexity extend across wave environments and the potential effects on the structural connectivity of reef communities. Here, we measured structural complexity of coral reefs at high resolutions (cm) over large spatial scales (km) to explore spatial patterns in reef structure. Rugosity measurements were obtained along shallow forereefs of Belize exposed to an array of wave action. Spatial autocorrelation

analyses identified suitable scales for exploring variations in rugosity with two broad-scale physical drivers of wave action, wind driven wave exposure and hurricane history. Coral reefs in areas of high wave exposure had reduced rugosity, while sites of intermediate hurricane history had the highest rugosity values. The structural connectivity of complex reefs, and therefore the potential to house higher biodiversity, declined with higher wave exposures as sections of shallow complex reefs became smaller and spaced farther apart. Relating patterns of reef structural complexity across wave environments to dispersal patterns of ecologically valuable reef organisms will reveal preferred habitats for recruitment. Managers can then prioritise protection of areas with higher potential connectivity and ability to reseed other sites.

Investigation of Sea Turtles' Foraging and Migration Behavior in the Caribbean Using Satellite Tagging

Garcia, Miquel; Tseng, Yaoting; Audroing, Kathryn

The use of satellite tagging in observing animal behavior has been one of the core drivers in gaining knowledge of animal migration patterns. We applied this technique to investigate the movement of sea turtles, a highly migratory species. This project utilized satellite tracks of the sea turtle, *Eretmochelys imbricata*, and correlated them to various oceanographic parameters to see which factors (sea surface temperature, chlorophyll a or bathymetry) had the biggest influence on migration and foraging behavior, looking specifically at track straightness and average speed. This study aimed at identifying which parameters had the most significant results and the specific relationship between the turtles' movement and each ocean parameter. The results from this study provide important information on what influences turtle migration and foraging ground selection. This may then aid identification of hotspots for conservation and areas of ecological importance for the highly migratory animals.

An island divided: humans, not climate, determine the differential present and future distribution of the endemic Hispaniolan solenodon

Gibson, Lauren; Mychajliw, Alexis M., Rupp, Ernst; Leon, Yolanda; Hadly, Elizabeth A.

During the Holocene, the Caribbean lost over half of its native terrestrial fauna to extinction. The Hispaniolan solenodon (*Solenodon paradoxus*) is one of two endemic terrestrial mammals on Hispaniola to survive to the present day. Despite the species' 72-million-year history and its IUCN endangered status, little is known about its distribution or the factors driving its distribution. This study employs a maximum entropy (MaxEnt) framework to create species distribution models (SDMs) of *S. paradoxus* during the past (late Quaternary) and present (1950-2016). For each time period, two models were built. The first model included only the bioclimatic variables typically included in SDMs. The second model added in landscape and anthropogenic variables. While the bioclimate-only model outperformed the more complex model when predicting past distribution, the model containing the additional variables far outperformed the bioclimate-only model for the present time period. In the present, human population density was the sole significant distribution determinant. These results suggest that *S. paradoxus* distribution may now be limited by human impacts rather than by a strict bioclimatic envelope. Human population expansion is therefore projected to threaten their future survival more than climate change. Furthermore, the increased relevance of anthropogenic factors in determining *S. paradoxus* distribution hints at the need to account for these influences in future species modeling.

Protected area downgrading, downsizing, and degazettement (PADDD) in Amazonia: regional profile of legal rollbacks to protected areas

Golden Kroner, Rachel; Qin, Siyu; Mascia, Michael, B.

Amazonia is the largest tropical forest in the world, safeguarding globally important cultural and biological diversity and mitigating climate change. To support and manage these resources, protected areas have been established across Amazonia and now cover one quarter of the region. Despite assumptions that protected areas

are permanent fixtures on the landscape, research reveals widespread legal weakening (downgrading), reduction (downsizing), and elimination (degazettement) of protected areas – or PADDD. We developed the first training workshop on PADDD, which convened 20 researchers from all Amazonian countries. Through the workshop, we prepared participants to collect data on PADDD using standardized methods, including archival research and mapping. Following data collection by participants in each country, we compiled the first-ever comprehensive regional profile of PADDD. We identified 438 enacted and 78 proposed PADDD events which occurred between 1961 and 2017 in eight countries. Overall, 15% of protected areas in Amazonia experienced at least one PADDD event, with some experiencing multiple events. Most events were proximally caused by industrial-scale resource extraction and development, while a smaller portion were related to local land claims. Temporal analysis reveals that the rate of PADDD is accelerating in the region. We recommend further capacity building to track PADDD paired with policy solutions to safeguard robust systems of protected areas in Amazonia.

Enhancing participatory management planning for protected areas: lessons and best practice guidelines from Trinidad and Tobago

Granderson, Ainka; Ramkissoon, Candice H.; Andrews, Melanie K.

Participatory models for protected area (PA) management planning are widely advocated in the Caribbean region and beyond. To date, however, there has been limited progress in translating these models into action towards improved management and conservation in Trinidad and Tobago (T&T). To enhance the capacity and readiness of stakeholders to move forward with participatory management planning of PAs in T&T, a road map was designed by the Caribbean Natural Resources Institute under a United Nations Food and Agriculture Organisation initiative detailing key principles, steps and best practice guidelines for the process. The road mapping process was participatory, incorporating input from surrounding local communities, key resource users and multi-stakeholder management committees for PAs to ensure that it reflected stakeholders' knowledge and experiences. It was also informed by a needs assessment and strategy to build stakeholder capacity for participation in PA management planning in T&T, and a comprehensive desk review of global and regional guidelines and cases studies on PA governance and management. Key lessons from the road mapping process included the need to ensure there is a common understanding of stakeholders' roles and related capacity constraints, promote information and communication technologies (ICTs) to capture local and indigenous knowledge and values to inform decision-making, and improve knowledge sharing for joint learning and adaptive management.

Visualization of the coral mucus surface layer

Guppy, Reia

Coral health is inexplicitly linked to its biophysical structure – the bacteria contained within the coral surface mucus layer (SML), as well as the mucus matrix in itself. Most studies on coral health is limited to only the bacterial community structure within the SML matrix, however previous studies have shown that this microbial community can and is affected by the mucus composition. If we are to conserve corals and protect them against diseases, then it is important to not only study the associated microbial assemblage, but the matrix that possibly defines this assemblage. Fluidity and acidity are just two factors that may impact microbial residency on the coral SML. However, previously any structural and/or acidic information on the SML has been missing due to the use of typical dehydration techniques as these processes compromise the SML integrity. A novel histological embedding technique has been developed that faithfully preserves the in situ structure of the surface mucus layer. This novel methodology clearly shows structure in surface mucus layer, suggesting different structural and functional properties of different layers. Verification of the mucus layer was done using standard histological stains (PAS/AB) for mucopolysaccharides.

Jaguar, puma and humans as structuralists in Costa Rican tropical forested ecosystems

Hay, Leslie; Hiatt, Kayla J.; Hersch, Michaela R., Hay-Smith, Johanna L.; Hargos, Eliot T.

Jaguar (*Panthera onca*) are considered keystone species, ecosystem structuralists, and/or indicator species. Puma (*Puma concolor*) are ubiquitous and are a dominant predator. These two large felids demonstrate spatial and/or temporal patterns for coexistence. To evaluate landscape disturbances on large cats, we collected data on relative abundance (RAIs) in 3 protected areas in Costa Rica. We rotated 60 Bushnell trail cameras on trails and logging roads in a high elevation site (La Amistad Biosphere Reserve) and two low elevation sites (Osa and La Selva). The 3 sites differed by landscape fragmentation and disturbance, characterized as high, moderate, and low. Our monitoring efforts demonstrated that jaguar (5.4%) and puma (15.9%) coexist in highest abundance at La Amistad lowest landscape fragmentation and disturbance. Conversely, at Osa where landscape fragmentation and human disturbance is moderate, the big cats are less abundant (jaguar=0.1% and puma (2.8%), but at La Selva where landscape fragmentation and human disturbance is highest puma are more abundant (jaguar=0%, puma=4.5%). Other smaller felids demonstrated similar trends with: margay (LA= 1.3%, Osa= 0.5%, LS= 0.3%) and jagourundi (LA=0.5%, Osa= 0%, LS= 0.2%), but ocelot differed with higher abundance in more disturbed sites (LA=0.8%, Osa= 0.6%, LS= 1.5%). In summary, abundance of big cats was higher at sites with lower fragmentation and human disturbance but prey species diversity was highly variable by site.

Camera trap monitoring to detect abundance and distribution of felids and prey species in two Costa Rican neotropical rain forests

Hay, Leslie; Hiatt, Kayla J.; Hersch, Michaela R., Hay-Smith, Johanna L.; Hargos, Eliot T.

We evaluated differences in presence, relative abundance and distribution of 5 felids and prey species in two Costa Rican protected areas. We monitored trails with 80 Bushnell cameras and scent lures from Jan 2016 to December 2017 in low-elevation sites (Osa Peninsula (OSA) and La Selva Research Station (LS)). Five felid species were recorded: jaguar (*Panthera onca*), puma (*Puma concolor*), ocelot (*Leopardus pardalis*), margay (*Leopardus weldii*), and jagourundi (*Puma yagouaroundi*) along with prey species. Relative abundance indices (RAIs) varied widely. In 2016-17, we recorded only 1 jaguar (RAI%=0.74 OSA; 0 LS). Puma demonstrated higher abundance at OSA (n=38; RAI%=19.3 OSA; 5.7 LS). Likewise, other felines exhibited varied abundance per protected area: ocelot (n=34; RAI%=3.7 OSA; 13.8 LS), margay (n=6; RAI%=2.2 OSA; 1.4 LS) and jagourundi (only sighted on OSA roads). We recorded 19 prey species with varied abundance by site: collared peccary (*Pecari tajacu*) (n=746; RAI%=12.6 OSA; 347.1 LS), tapir (*Tapirus bairdii*) (n=10; RAI%=0 OSA; 4.8 LS), paca (*Cuniculus paca*) (n=83; RAI%=0.74 OSA; 39.1 LS), agouti (*Dasyprocta punctata*) (n=401; RAI % =10.4 OSA; 184.3 LS), and 9-banded armadillos (*Dasyprocta novemcinctus*) (n=71; RAI%=3.7 OSA; 31.4 LS). In summary, feline and prey species were widely distributed and abundance varied according to presence or absence of large cats in both lowland sites.

Impacts of anthropogenic disturbance on mammalian distribution within a neotropical cloud forest

Hoskins, Hannah; Reid, Neil; Jocque, Merlijn

Neotropical cloud forests represent one of the most unique habitat types on earth, characterised by high endemism and biodiversity. However, they are also among the most threatened ecosystems. Consequently, many areas of neotropical forest have received protected area status, this includes Cusuco National Park (CNP), Honduras. Protective legislation prohibits both hunting and deforestation within CNP and its buffer zone. In fact, hunting is largely banned throughout Honduras. The organisation Operation Wallacea, has been working within CNP for over a decade, and continually records signs of hunting and new areas of deforestation. In the present study, we use data collected through two methodologies: i) camera traps deployed throughout the park at established distances from transects over 3 field season (2015-2017), and ii) tracks and signs data collected yearly since 2006. This study investigates the relationship between the occurrence of mammal species and distance to various sources of anthropogenic influence; for example transects of possible hunting paths and areas of deforestation. The

work aims to determine how mammal species may respond behaviourally to these human disturbances and habitat alterations. We discuss how results may be used to inform future management of CNP.

Disparity in cultural attitudes and compliance to conservation-based law in Cusuco NP, Honduras

Hoskins, Hannah; Reid, Neil

In Cusuco National Park (CNP), seasonal biodiversity research has been carried out for the past 15 years by both national (i.e. Panthera Honduras) and international (i.e. Operation Wallacea) conservation organisations. A small percentage of residents from the numerous urban settlements located within CNP's buffer zone are employed during this research to assist both in field work and logistical support. Due to long term employment and close collaboration with conservation NGOs those involved are aware of CNP's protected status. Both hunting and deforestation within protected areas are illegal under Honduran law however enforcement is often lacking. Such lack of enforcement of environmental law is evident within CNP and perpetrators of hunting and deforestation are easily recognized within communities. We carried out structured interviews with buffer zone residents covering attitudes to hunting, deforestation and the cultural value of CNP. We aimed to understand whether employment by research organisations affected attitudes to illegal activity and/or the understanding of local biodiversity value. Interviews revealed a disparity between knowledge and compliance of related laws. We aim to address key motivations for (non-)compliance, willingness to respond truthfully and to identify key avenues for further capacity building within CNP and the surrounding area.

Improving cocoa harvest can mitigate for crop damage by wildlife in a forest-agriculture matrix

Hulme, Mark; Salliss, Daniel; Konneh, Mohammed s.; Dauda, Patrick; Witcutt, Emma; Sanderson, Fiona J.

Shade-cocoa has been suggested as a more carbon and biodiversity friendly land use around protected forests compared with slash-and-burn farmland, and may be suitable for achieving livelihood, biodiversity and forest protection goals of REDD+ projects. However, loss of cocoa to wildlife perceived to come from forest protected areas can result in lower profits, reduced livelihood benefits from development projects and negative perceptions of conservation initiatives. We collected and analysed data on cocoa pod numbers and damage by animals over 2 months, coinciding with peak harvesting season, from 39 plots at 3 forest edge communities around a national park in West Africa. We estimate that 20% of pods across the cocoa plantations studied were damaged by wildlife, though there was high spatial variation. Of damaged pods where the animal group responsible could be identified, 88.9% of the damage was by primates and 11.1% by rats or squirrels. Modelling indicated the proportion of pods damaged was higher closer to settlements and where pod density was lower. This indicates that the species causing the most damage in this system are disturbance-tolerant generalists which are not dependent on the protected forest, that mitigation measures should be concentrated where damage is highest, particularly close to settlements, and that increasing cocoa yield in these communities could offset damage by wildlife and could therefore still be a viable option for REDD+ projects worldwide.

A comparative study of population density and the behavior of agoutis in Bartica, Guyana.

John, Rayana; King, Tameka A.; Maharaj, Gyanpriya

As some mammals become extinct and threatened, agoutis (*Daspyprocta* spp.) are one of the groups of animals that continue to be ubiquitous. However, this may change if anthropogenic activities are not considered, assessed, mitigated and monitored. They are also an important species since they help to grow and maintain our forests by their cache feeding, burying of seeds, and carrying seeds away from the mother plant. Therefore, if the agoutis begin to disappear, the plants that depend on these animals for seed dispersal will be affected. In order to investigate the status of these agoutis, the differences between the number of agoutis need to be assessed in three sites: disturbed, semi disturbed and undisturbed areas. This will be done with the aid of transect walks, scat

identification, foot prints and use of burrow counts to estimate the population density. Additionally, their behavior will be analyzed during fixed time slots to assess the effects of human activities. Currently in Guyana, although there are many general biodiversity studies there is little published work on agoutis. This study hopes to shed light on whether or not we should be concerned about the agoutis' population size and behavior.

Searching for keystone species complexes: a food web approach in King George Island (Antarctica)

Jordan, Ferenc; Hermosillo-Nunez, Brenda; Ortiz, Marco

A keystone species complex is a small set of interacting species that play an outstandingly important role in community organization. Some simple approaches are suggested and presented for the coastal benthic/pelagic ecosystem of Fildes Bay (King George Island, Antarctica). Based on the network analysis of the food web, we identify small groups of keystone species by functional indices based on steady-state and dynamic quantitative trophic models, by structural indices, by semi-quantitative loop analysis and by topological centrality indices. As a consensus among the various approaches, we identified seastars (top-predators), the sea urchin *Sterechinus neumayeri* (herbivore) and phytoplankton (primary producers) as the functional core of this ecosystem. Our approach is based on the holistic, multi-species attitude of systems-based conservation efforts.

Community Managed Marine Parks

Kabukuru, Wanjohi; Razafindsionana, Harry

Close to 30 communities in the Western Indian Ocean have adapted a unique conservation model that is transforming livelihoods. They are adapting ocean spaces and turning them into community managed marine parks with a simple controlled system that declares these special zones as "off-Take" for a while. This method has helped spawn fish and enriched marine conservation while at the same time boosting community livelihoods. From Rodrigues Islands in Mauritius to Lamu Island in Kenya unique conservation models are being pioneered by coastal communities to aid in species conservation, public awareness and even policy changes. This seemingly unnoticed "change from below" is what we wish to share as inventive homegrown methods by coastal communities boosting conservation education.

The Children of the Ocean

Kabukuru, Wanjohi

Schools Conservation of Oceans Program of Education (SCOPE). This Ocean literacy programme targets schools and colleges organising awareness and mass public outreach campaigns covering and understanding of ocean specific species. All science in the western Indian Ocean right from primary school to graduate studies is packaged as boring stuff, uninteresting and stoic. This presentation focuses on India Ocean Observatory's commitment to alter this narrative and transform environmentalism in the region. For ocean literacy to secure a permanent place in Africa's public sphere, schools must find a common ground that seeks to demystify and elevate ocean science to interest children. It is for this reason that unbundling science remains the best and only shot that scientists and research organisations can use to reach their respective publics and encourage students and children to view the ocean afresh. The second step is to harness media platforms in passing out the ocean literacy knowledge to all segments of the general public capturing children, youth and even the elderly in the messaging. Our presentation brings to light newer ways to engage the youth in ocean literacy and ocean conservation with the aim of realising SDG14. Marine species survival campaigns, engaging schools in activities that instill environmentalism and building a network of schools committed to ocean conservation and literacy is the best way to speak to communities on oceans and livelihoods.

Population status of Jaguars (*Panthera onca*) and Pumas (*Puma concolor*) at the Brownsberg Nature Park, Suriname

Kadosoe, Vanessa; Ouboter, Paul E.

Jaguars (*Panthera onca*) and Pumas (*Puma concolor*), have remained cryptic species due to their elusive nature, providing a challenge for researchers to study their population dynamics and interactions within their distribution area. As keystone species they have a strong impact on the trophic cascade of an ecosystem. A decline in their population can also affect the overall health of the ecosystem. The biggest threats to the existence of these two felids in the Neotropics is caused by loss of habitat and habitat fragmentation due to human activities and illegal hunting. At Brownsberg Nature Park the population of jaguars and pumas is most likely threatened by habitat loss through gold mining and by illegal hunting for meat and for ornamentals. During a 5-year continuous camera trap study at Brownsberg Nature Park, the population density of jaguars and pumas was assessed. A total of 27 cameras were placed at 16 locations alongside man-made roads and hiking trails. The specimens on the photographs were identified to individuals based on their unique rosette patterns for jaguars or based on specific markings and coloration for pumas. There are indications that the jaguar population is declining based on observations of camera trap triggers, while the population of pumas remains stable. Population density calculations supports this assumption. The jaguar is currently under threat throughout its distribution area as the illegal trade in this species is increasing.

Occurrences of black spots (ectoparasitic infection) in herbivorous, coral reef fishes: a potential indicator of reef health in the Caribbean

Kingon, Kelly; Olton, Meaghan

Coral reefs around the world are stressed and degrading from factors such as climate change, overfishing and pollution. Fish health appears to be declining as well with species in the Acanthuridae family often infested with ectoparasites and exhibiting associated black spots. We surveyed these important reef herbivores at 11 sites around the islands of Tobago, Grenada, Carriacou and the Tobago Cays using underwater surveys where all encountered Acanthurids were photographed and their potential predators counted. *Acanthurus tractus* was the most abundant Acanthurid, followed by *A. coeruleus* and *A. chirurgus*. The percentages of infected *Acanthurus* sp. ranged from 0-48% and was highest at Mt. Irvine, Tobago. *A. tractus* exhibited the black spots more frequently than the other two species ($P=0.051$). No significant correlations were revealed between black spot occurrence and predator abundance. Other surveys done in Curacao found high occurrences of black spots, while surveys in Mexico and Belize had 0 and only a few infected individuals present (Bernal et al. 2015). A study done in the U.S./British Virgin Islands also found high ectoparasite loads but predominately in *A. coeruleus*, not *A. tractus*; these fishes were also without noticeable black spots (Sikkel et al. 2009). Our research indicates further study is needed at the regional scale to determine the underlying causes of the high rates of infestation in some areas and the potential ecological impacts on coral reef ecosystems.

The Caribbean Legal Seascape for Shared Marine Living Resources: Treaty obligations, examples of implementation and suggestions for the course forward

Koubrak, Olga

Marine species do not know political borders creating challenges for resource managers bound by the legal rules. This presentation will look at three case studies of highly migratory species and highlight the instruments and institutions in place in the Caribbean Region that are relevant to their cooperative conservation and management. The example of endangered sea turtles will illustrate the workings of Annex II of the Specially Protected Areas and Wildlife Protocol (SPA) as well as the Inter-American Sea Turtle Convention. Billfishes, important commercial and recreational species, fall under the jurisdiction of the International Commission for the Conservation of the Atlantic Tunas (ICCAT). But since ICCAT measures cover the Atlantic Ocean as a whole, the presentation will

focus on the non-binding mechanism that developed the Caribbean Billfish Conservation and Management Plan. Finally a look at the instruments governing shark and ray use will cover Annex III of SPAW, Convention on Migratory Species' Sharks MOU and the Western Central Atlantic Fisheries Commission's Regional Plan of Action. The case studies will illustrate the diverse and at times fragmented approaches to protection and management of shared marine species in the Region. Recommendations will identify opportunities for synergies between conservation and fisheries institutions, such as an MOU between the SPAW Secretariat and WECAFC as well as activities under the Caribbean Large Marine Ecosystem project.

A role for SCB in biodiversity research and conservation policy work in the Caribbean and South American Overseas Entities of the EU

Kreft, Stefan

Over 80 % of the European Union's biodiversity reside in the associated 34 Overseas Entities (OEs). By far the largest concentration of OEs is found in the Caribbean Sea (linked to three EU member states): Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Falkland Islands/Islands Malvinas, Montserrat, South Georgia and the South Sandwich Islands, Turks and Caicos Islands (United Kingdom), French Guiana, Guadeloupe, Martinique, Saint-Martin, Saint Barthélemy (France), Aruba, Bonaire, Curaçao, Sint Maarten, Sint Eustatius, Saba (Netherlands). While all these OEs are islands, there is a large continental OE in South America, French Guiana. I will put forward a series of hypothesis related to conservation of the Caribbean and South American OEs: 1) Significant differences exist among OEs in the conservation status of the local ecosystems. 2) The OEs own individual conservation regulations, many of these being relatively weak, in comparison to the EU Nature Directives. 3) Conservation governance differs across UK, France and Netherlands and the associated OEs. 4) There is a lack of knowledge of biodiversity and of conservation policy in the OEs among EU-resident conservationists. 5) This lack of knowledge translates in a conservation advocacy gap. 6) SCB-LACA and SCB-Europe should collaborate in raising awareness among conservation scientists and policy-makers of the aforementioned knowledge and policy gaps, and work towards closing those gaps.

Pervasive altitudinal bird movements in the Bolivian Andes - Implications for conservation

Kreft, Stefan

The Ecosystem Approach of the United Nations Convention on Biological Diversity realigns conservation management strictly according to ecosystems and the ecological processes comprised within. Consequently, one important feature of the Ecosystem Approach is the design of conservation measures in dimensions of space and time adequate for safeguarding these ecological processes. The study scrutinises what can be learnt from altitudinal bird movements to improve management effectiveness in montane ecosystems and local protected areas. The field study was carried out in Carrasco National Park and its surroundings in the Chapare region, Dept. Cochabamba, Bolivia, in the years 2000 to 2003. The altitudinal transect for field ornithological surveys of humid tropical forest reached from lowlands (300 m asl) to timberline (around 3,500 m asl). One third of these species were found to be partial altitudinal migrants. Vagrancy was observed for more than half of all bird species studied. Birds of at least ten populations (11 %; n=89) breeding in the national park seek refuge in the adjacent lowlands, which are experiencing severe deforestation. According to the Ecosystem Approach, conservation management has to encompass the areas adjacent to the national park. Conservation management should also be adaptive and open, not the least to the participation of the local inhabitants. This is a complex task far beyond biological expertise.

Impacts of climate change on farmers and their adaptive strategies along the Essequibo Coast, Guyana

Lakenarine, Rovindra; Ram, Mark A.; Seecharan, Diana

Climate change is impacting people and their environment at an ever-growing rate. Underdeveloped countries like Guyana, which are heavily dependent on agriculture for sustenance are most vulnerable to the effects of climate change compared to developed countries. Globally, climate change negatively impacts agriculture with serious implications on livelihoods. A total of 114 semi-structured interviews were conducted across 18 villages in Region two (Pomeroon-Supenaam), Guyana, where agriculture is the major economic activity. Climate data (temperature and rainfall) was obtained for the past three decades from the Hydrometrological Office, Guyana. Results indicated that temperature has been increasing over the years. Rainfall patterns were observed to be fluctuating with a general increase over time. A majority of the farmers, while they experienced the effects of climate change were unaware as to why these were occurring. Most farmers were affected by floods, which is becoming much more prevalent as a result of climate change. This resulted in major crops losses and had high financial impacts on farmers. Farmers have been using various methods to adapt to the changes. In the past, farmers used leaves and bushes to get rid of pest and diseases. Presently, farmers were using more chemicals and fertilizers. They were also practicing crop rotation. It is recommended that emphasis be placed on awareness to better equip farmers to cope with climate change challenges. This study complemented similar studies from different regions of Guyana and globally to offer resources to farmers and policy makers on strategies for climate change impact and mitigation in farming.

Inland blue holes of The Bahamas: windows into evolution in the wild

Langerhans, Brian

Despite having no flowing freshwater anywhere in the archipelago, The Bahamas harbors a unique freshwater environment that provides a remarkable model system for understanding evolutionary processes in the wild. The islands of The Bahamas are sprinkled with blue holes—water-filled vertical caves that were dry caves until ~15,000 years ago. The blue holes that today occur on land (inland blue holes) can have a large freshwater environment owing to the island's aquifers, particularly in the northern parts of Andros Island. Focusing on two fish species inhabiting the freshwater zone of blue holes, my lab uses these stable environments to study the predictability of evolution, complex-trait evolution, and the causes of speciation. Bahamas mosquitofish (*Gambusia hubbsi*) inhabit many blue holes similar in most respects other than the presence of a predatory fish, the bigmouth sleeper (*Gobiomorus dormitor*). Using this natural experiment, I will discuss a number of key findings regarding the role of predation regime in driving (un)predictable and (non)parallel phenotypic evolution in Bahamas mosquitofish, and the evolution of reproductive isolation among populations. Owing to their extraordinary ability to provide insights into biological evolution—in addition to other reasons (e.g. anthropological)—combined with their vulnerability to human activities, these unique blue holes deserve protection from human-caused harm.

The biocultural diversity we could lose with deforestation

Lessmann, Janeth; Fajardo, Javier; Martinez, Marti O.; Marquet, Pablo

Human cultural and biological diversity are connected. They have co-evolved, continue to change interdependently, and are often threatened by the same industrialized development pressures. Yet, most management decisions aimed at reversing global trends of diversity erosion treat biological and cultural diversity as distinct and separate issues. These dual approaches lead to diverging, conflicting and inefficient agendas. Here, we address this gap in integration by quantifying the impact that the deforestation of this century may have on the biocultural diversity of Latin America. We assessed the extent of forest cover loss (2000-2016) within the distributions of forest-dependent vertebrate species and languages (as an indicator of cultural diversity). As a result, we identified biocultural hotspots in the Southwestern Amazon, the Atlantic Forest, and Southwestern Mexico, where high richness of languages and species, and deforestation overlap. Specifically, speakers of over 40 indigenous languages may be experiencing cultural loss as a result of deforestation of their habitats. Moreover, species threatened by deforestation are concentrated in the tropical Andes, co-occurring with a high language

diversity. Preserving such an astounding biocultural diversity will require: (1) to encourage the protection of spaces governed by indigenous peoples, and (2) to strengthen and monitor the transmission of their knowledge systems and cultural practices.

Environmental and social aspects associated with the various types of mining in the Venezuelan Guayana.

Lozada, José

In the Venezuelan Guayana there are minerals that have been exploited for hundreds of years. In the case of gold mining it can be done in several ways: Handcraft, Water Monitors, Mining Rafts, Small Galleries, Industrial Galleries and Industrial Superficial Excavation. The gold-bearing material is processed with mercury or cyanide to extract the gold. Some of these procedures are performed without any state control and generate environmental impacts that are not being controlled. In other cases there is an orderly mining and there are successful practices of water treatment and ecological restoration in the affected land. Some experiences indicate that mining could opt for complying with environmental legislation, like other industrial activities currently being implemented in Venezuela. But the Arch Mining proposal is unacceptable because there are no institutions that enforce environmental regulations.

Heterospecific Shoaling in an Invasive Poeciliid: Shared history does not affect shoal cohesion

Mahabir, Keshan; Ali, Jarome R.; Deacon, Amy E.; Ramnarine, Indar W.; Magurran Anne, E.

Social behaviour potentially plays an important role in invasion success. New colonists may glean useful information about predators and food by interacting with native heterospecifics. The extent to which invaders benefit from such social interactions could hinge on their prior exposure to other species. In order to assess whether or not the shoaling decisions of the Trinidadian guppy (*Poecilia reticulata*) a successful invasive species, are mediated by their shared history with a heterospecific, the phenotypically similar *Micropoecilia picta*, we monitored shoal cohesion in single-species treatments and then in treatments where *M. picta* was present. We hypothesized that shoal cohesion would be greater in single- than in mixed-species shoals and that mixed-species shoals consisting of fish with a shared history would be more cohesive than those where the two species had hitherto occurred allopatrically. Shoal cohesion did not differ between single- and two-species treatments, or in relation to shared history with *M. picta*. While guppies were more often found in mixed-species than single-species shoals, they were more likely to have a conspecific individual as their nearest neighbour within mixed-species shoals. These results show that guppies willingly shoal with heterospecifics, even in the absence of a shared history, but also that the resulting shoals are not randomly assembled. This flexibility in shoaling may confer a crucial advantage in the initial stages of invasion.

Movement patterns of freely foraging passionflower butterflies, *Heliconius melpomene* and *Dryas iulia*, native to Guyana.

Maharaj, Gyanpriya; Wu, Yeufeng; Bourne, Godfrey R.

We investigated movement patterns of two syntopic passionflower butterflies, *Heliconius melpomene* and *Dryas iulia* at a long-term site where they faithfully fed on *Lantana camara*. We experimentally altered the feeding habitat by creating changes in floral availability, and determined that the movement patterns of both butterflies varied spatially and temporally, influenced by nectar availability, each other's presence and territorial hummingbirds (Trochilidae). *Heliconius melpomene* was more sensitive to nectar availability, and the presence of hummingbirds than was *D. iulia*. *Heliconius melpomene* responded by exhibiting three foraging tactics—increased number of floral visits, increased time foraging, as nectar available decreased, and complete hummingbird avoidance. However, *D. iulia* responded by increasing the number of their floral visits, decreasing time spent foraging, and avoiding some but not all hummingbirds. Both butterfly species varied their foraging movement patterns by incorporating new

plants into their feeding routes when previously accessible plants were made unavailable, and both continued to visit these new plants even after previous plants were once again accessible. In summary, foraging movement patterns differed by species but were modified by the presence of territorial hummingbirds competing for the same floral resources with fluctuating nectar rewards. Yet, movement patterns by both butterfly species always minimized interplant flight travel distances.

The psychological effect of bushfires on local people: a study on the perception of bushfires in Trinidad, West Indies.

Manmohan, Sarah-Lee

Hundreds of bushfires occur annually in Trinidad and Tobago. Previous research reported higher incidences of anxiety, depression and trauma among populations threatened by bushfires which significantly alter landscapes, resulting in the loss of identity and comfort associated with one's surroundings. Human perception or the lens through which a person sees the world is formed by the interaction of factors like past experiences, knowledge, attitudes, culture and emotions. Hence, an individual's perception of bushfires influences how they are affected by bushfires. Therefore, this study investigates the psychological effect of bushfires in Trinidad, West Indies by examining bushfire perception in 2 communities; Fondes Amandes (affected group) and Lange Park (control group). One hundred respondents were randomly selected and interviewed using a questionnaire with Likert statements and closed and open-ended questions. Descriptive statistics were used to explore data trends and Mann-Whitney U tests were performed to compare the attitudes, culture and emotions of both study groups. Similar past experiences, knowledge, culture, attitudes and emotions were reported across both study groups with the majority of respondents (65%) reporting negative past experiences with bushfires and all respondents reporting negative emotions such as fear, anxiety or anger towards bushfires. The perception of bushfires and associated psychological effect was found to be negative throughout this study.

Stats and Bats: Estimating the population size of *Desmodus rotundus* in Trinidad using a statistical model.

Mohammed, Nicholas; Seetahal, Janine F.R.; Rostant, Luke V.

The *Desmodus rotundus* is a species of great concern in Trinidad owing to its interaction with the nation's livestock. This study sought to develop a model which can project the population density of *D. rotundus* within Trinidad. Turner, in 1975, based vampire bat density estimates on the number of bitten animals in a region. A shortcoming of Turner's approach is that the assumption that one bat feeds on one animal is incorrect, so that our model instead relied on the total number of bites at a given site. Data was collected at 12 sites, and field observations and video recordings were made to validate the proposed model. At the sites, 64 animals had bites, with 167 bite wounds found predominantly on the necks of cattle. The applied model estimated a population density of 1.19 to 2.37 bats/km² with an average value of 1.78 ± 0.24 , comparable to that found in other Neotropical sites. The greatest projected densities were noted in South West and South Central Trinidad. Supplementary questionnaire data revealed a great disdain for all bats, as well as a tremendous amount of misinformation. Farmers also reported the death of over 100 animals which in turn resulted in over TT\$20,000 in financial losses between January 2016 and September 2017. The effect of the bats' feeding has also led to the closure of one farm and the fear of foreclosure in two others. The model postulated in this study can be used to better assess whether or not management interventions are working.

Effects of mining activities on fish diversity and community structure in mining impacted and non-mining areas of the Mazaruni District, Guyana.

Mohandeo, Ravindra ; Elford, Alwin Liverpool,

The streams, rivers and tributaries of the Middle and Lower Mazaruni district of Guyana have been intensely

affected by mining operations. A small portion of study was conducted in this area prior to the publication of data from the present study, so there are little to no comparison of data with previous work. This study analyzed the effects of mining activities on fish species diversity and community structure in mining impacted and non-mining impacted areas of the Middle and Lower Mazaruni district. A total of 6,833 individuals, belonging to 75 species were captured. The areas sampled included 16 mining impacted sites and 12 non-mining impacted sites. The sampled streams in the mining impacted areas presented a smaller species diversity than the non-mining impacted areas. However, this comparison saw no statistical significance among the two types of sites. The environmental parameters which depicted significant changes included temperature, electrical conductivity and total dissolved solids. The other parameters showed little to no significance when tested for changes. The relationships between environmental parameters and fish species diversity were found to be significant for temperature. In terms of significance among environmental parameters, quite a few statistical significance were observed for relationships regarding temperature, total dissolved solids, electrical conductivity, dissolved oxygen, pH, depth and riparian cover.

Protected Area downgrading, downsizing, and degazettement (PADDD) in Venezuela: a first systematic national profile

Morón-Zambrano, Vilisa; Yereña, Edgard A; Golden-Kroner, Rachel

Venezuela is among the world's top-ranking countries with respect to the coverage of protected areas (PAs), which cover 28% of its lands and nearly 265,000 km². This has been accomplished through 80 designated PAs under 4 IUCN management categories. There is a growing global concern regarding the widespread legal weakening (downgrading), reduction (downsizing), and elimination (degazettement) of PAs, known as PADDD. We conducted the first systematic PADDD assessment for Venezuela, and detected 4 enacted and 3 formal PADDD proposals. Enacted events affected 3 national parks and one wildlife refuge, taking place from 1975 to 2004 and affecting 87 km². The largest event was a downsizing derived from a land claim as a consequence of a formal mistake within the legal designation procedure. Other enacted events were related with mismatch of minimum naturalness designation criteria for a PA, ecosystem degradation and industrialization. Considering that enacted events affected -1% of total PAs coverage we conclude that PADDD has not been a significant phenomenon. Nevertheless, new PADDD events are under consideration, specifically downsizing events involving ecosystem degradation, urban sprawl, and conservation planning. In addition, it is of concern that 60% of PAs in Venezuela lack management plans, as downgrading may be applied non-transparently to those. We recommend criteria to address proposed PADDD events, avoiding the weakening of the institutional strength of the PA system.

Southern Orinoco's protected areas, in risk?

Morón-Zambrano, Vilisa; Isasi-Catala; Emiliana; Garcia, Rafael

The southern Orinoco harbours the biggest protected areas (PAs) in Venezuela. These PAs are meant to be a refuge for many species and to keep the function of the region's unique ecosystems. Additionally, they contribute with the local and national economy in many ways, such as through hydroelectric power and tourism. For many of the PAs and Forestry Reserves (FRs) in this region the main threats have been the expansion of agriculture and urbanisation, mining and uncontrolled tourism. Out of these threats, mining is the one that most negatively impacts biodiversity. Incidents relating with illegal mining within PAs are known from many years now, like the ones in Canaima, Yapacana and La Neblina. A 12% of the Southern Orinoco have been now delimited as the Orinoco Mining Arc National Strategic Zone (ZDEN-AMO), within which 6,296 km² of the Caura FR lies in, once considered as the most pristine watershed in the tropics. The effect of the expansion of mining activities will not only affect PAs within the ZDEN-AMO, but also those that share borders or that are connected (i.e. through rivers). Which will the strategies be to stop the impact from mining inside PAs? Officially it is unknown, that is why we only rely upon citizen comptrollership to push for the fulfilment of environmental law.

Recent extinctions and current threats: using the fossil record to guide conservation of Caribbean biodiversity

Mychajliw, Alexis

Conservation biologists are increasingly looking to the past to guide planning for the future. An approach that incorporates paleontological, archaeological, and geohistorical records is especially critical for island systems, where recent extinctions and invasions can bias our understanding of true ecological baselines. The Caribbean islands experienced the largest postglacial mammal losses of any region worldwide; 130 Late Quaternary species were reduced to today's 13 terrestrial mammals and 60 bats. The Caribbean's rich fossil record documents lessons of how species responded to climate change and the arrival of indigenous and European peoples. I summarize the dynamics of Caribbean mammal extinctions and discuss two distinctive size-biased selective pressures evident in the past 7,000 years. Such analyses allow us to pinpoint traits that promote resilience or vulnerability in modern populations. I focus on case studies from ongoing collaborations between paleontologists and conservation biologists on Hispaniola, with particular emphasis on the Hispaniolan Solenodon, *Solenodon paradoxus*. I discuss how an interdisciplinary set of techniques have informed solenodon conservation, including stable isotope analysis, historic DNA, and species distribution modeling. I end with a roadmap of how conservation biologists can better harvest data from these long-term experiments found in the Caribbean fossil record, with examples for other taxa including reptiles and fish.

The impact of free-roaming domestic cats on a threatened wild felid in Chile: Spatio-temporal overlap and pathogen transmission

Napolitano, Constanza; Sacristan Irene; Lopez, Maria J.; Maron, Francisca; Contreras, Partricio; Silva-Rodriguez, Eduardo

Domestic cats exert different negative effects over wildlife. In Chile, increasing human landscape perturbation may facilitate pathogen transmission from domestic cats to wildlife. The Guigna (*Leopardus guigna*) is a threatened small wild felid endemic to Chile and Argentina, closely associated with native rainforests. Extensively affected by habitat loss and fragmentation, they inhabit fragments surrounded by a human matrix, potentially increasing encounter probabilities with domestic cats. We sampled 97 Guignas across their range and 264 owned, free-roaming domestic cats from rural communities near Guigna habitat, for PCR and sequencing of feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV). 49 domestic cats were tracked with GPS devices and 66 cat owners were interviewed. Spatial movements, environmental variables and the owners' levels of care were analyzed. FeLV and FIV infected Guigna populations across geographic areas, associated with proximity to houses and fragmented landscapes. High genetic similarity between viral sequences suggested recent cross-species transmission. Spatio-temporal overlap between both species was recorded. Domestic cat populations were abundant, with low birth control (13.1%) and poor health care (14.3%). Most of the cats had a local origin (89.2%); Low immigration supports the implementation of successful birth control and immunization campaigns. We provide mitigation recommendations to environmental agencies in Chile.

Incidental capture of sea turtles by fishing gears in Guyana

Neisha, Bibi; Seecharan, Diana; Liverpool, Elford

The incidental capture of sea turtles by fishing gears is one of the greatest threats to sea turtles worldwide. Despite recognizing the problem that sea turtles are at risk because of these fishing gears and different fishing techniques, there is little assessment and work being done to protect them. This study will investigate the impacts of fishing gears on sea turtles, determine the average number of sea turtles that is captured by each fishing gear and investigate how the turtles that are captured by each fishing gears being released. Questionnaires and interviews will be used to collect information. This research will be conducted on wharfs found in Georgetown, Parika and Charity because fishing is the main economic activity in these areas. The data that is collected will be thoroughly examined and the responses will be classified and categorized qualitatively and quantitatively. This project will serve as an important asset that will contribute to improving biodiversity protection because more information will be available on the impacts of fishing gears on sea turtle by catch.

Case Study: Santa Rosa Watershed, Conservation and Sustainable Production.

Orjuela, Sebastian; Quintero-Angel, Andres; Fernandez Hurtado, Jesus I.;

The tropical dry forest is one of the threatened ecosystems in the world. In Colombia, it is in a critical state due to the transformation of the landscape and the changes in land use that have occurred since the last century. The soils of this ecosystem are fragile and highly erodible. Without mitigation actions, this ecosystem can tend towards desertification, generating effects on the water resource and contributing to the loss of productivity and biodiversity. In response to this problem, CORFOPAL has been working with the communities of the Santa Rosa Watershed (SRW) that supply two aqueducts that benefit more than 800 families. With the objective of linking the conservation of SRW with the improvement of human well-being, a participatory intervention process was developed that allowed the implementation of conservation, restoration and sustainable production actions through livestock reconversion in an approximate area of 86ha to improve the environmental offer and the ecosystem services of the territory. The implementations focused on four outcomes: i) Isolation of forest patches (2.5km), ii) Expansion of protective forest strip (4ha) through passive and active restoration with native plants, iii) Reconversion of livestock production systems (4,5ha) and iv) Community empowerment through training workshops. It is important to highlight that this is the first experience that involves community participation in the conservation and restoration of the tropical dry forests.

Impact of eco-tourism on terrestrial mammal communities at Brownsberg Nature Park, Suriname

Ouboter, Paul; Kadosoe, Vanessa S.; Ouboter, Dimitri A.

Few studies have focused on the impact of tourism on biodiversity. In Suriname Brownsberg Nature Park is the most visited area for eco-tourism. We carried out a six-year study on the impact of eco-tourism on large terrestrial mammals. Camera traps (Reconyx PC900) were placed at 16 locations with varying human activity, including roads with some traffic, trails with heavy tourist presence, roads and trails closed for the public and everything in between. The analysis of four years of data (22,323 camera trapping days) documented 15,055 triggers of 29 species of large terrestrial mammals. The data shows that eco-tourism has a significant impact on biodiversity (Simpson's Diversity index), but not on absolute species numbers. Several species avoided areas with heavy human presence, e.g. Brazilian Tapir, Peccaries and Jaguar. Eco-tourism also has an impact on behavior. Both the Jaguar and Puma changed from a cathemeral activity in undisturbed areas to an almost 100% nocturnal activity in tourist areas.

Insights to promote enhanced norms for mitigation of highway construction impacts in Mexico

Pelz Serrano, Karla

Road and highway construction cause deforestation, habitat fragmentation, deaths of wildlife, and loss of ecological functions. In Mexico, there is legislation that either pretends to prevent the environmental impacts, or tries to mitigate or compensate the damage caused. One of these actions includes the replacement in units of removed trees. This means that if 1000 trees 100 years old were removed, the construction company will have to plant around 10,000 trees to compensate for the damage caused. However, this does not replace for the ecological function that the lost trees performed, such as carbon sequestration, oxygen production, and habitat for wildlife. This study proposes a mathematical model that will aid in the calculation of the amount of trees needed to replace and compensate for the loss of the ecological function, of carbon sequestration. This model is given by an allometric equation constructed for two species, *Abies religiosa*, and *Quercus* sp., that allows to estimate over a specified period, the estimated number of replaced trees that will compensate the amount of carbon sequestration that the removed trees used to contribute to the ecosystem. This is an urgent approach that needs to be taken into consideration by environmental agencies, managers and consultants to effectively mitigate for the damage caused by the increasing transport infrastructure.

Landscape connectivity: using network analysis to improve reserve selection with modest data requirements

Pereira, Juliana; Jordan, Ferenc

Habitat connectivity is a key spatial property that needs to be taken into consideration in the selection of reserves for biodiversity conservation. This is especially relevant in highly fragmented landscapes. However, connectivity is also particularly complex to measure and to model. Network analysis is a simple and powerful tool that can facilitate the representation and quantification of connectivity, allowing the identification of priority areas for protection. Although network models may be as sophisticated as available data allow, basic analyses can be done using simply habitat patch areas and estimated dispersal ability of the species of interest, and still yield useful information for conservation planning. Here, we present an improved approach for the identification of priority areas for connectivity, based on two new features: 1) In most studies, patches are evaluated and ranked individually. Instead, we apply multi-node analysis, which finds the optimal group of patches for connectivity, taking into account their complementarity to avoid redundancy. 2) Traditionally, connectivity has mostly been equalled to preventing the fragmentation of populations into isolated portions. We add to this the additional aspect of reachability, which aims to maximize accessibility to all available sites, and protect peripheral populations as well as core ones. The method is illustrated with a case study of Mediterranean bird species, performed in R environment.

Population Dynamics of Earthworms in Guyana

Persaud, Reshma

Earthworms are regarded as bio-indicators of soil quality and are perhaps the most important regulators of soil structure and organic matter content in a variety of terrestrial soil ecosystems, paving the way for sustainable green agriculture and land rehabilitation. Their population dynamics are impacted by a number of factors, some of which are environmental while the others are anthropogenic in nature resulting chiefly from land-use, soil pollution and disturbance. Despite their obvious array of benefits to soil morphodynamics and the ecosystem, extensive research into their population dynamics and the factors affecting it, has not been extensively done, particularly in Guyana. This study aimed to establish the composition of earthworms present in Guyana while exploring their relationship with the biotic and abiotic components. Earthworms and soil samples were collected from 15 sites per natural region. 64 morphospecies were identified phylogenetically and taxonomically. Population dynamics were found to be of both biological and statistical significance, while a handful of established factors were found to have a significant impact on said population dynamics. Certain species of earthworms were found to be associated with particular soil morphotypes and habitat, while only one specie, *Pontoscolex corethrurus*, was found in all of the sampled soil morphotypes.

Mammalian diversity in different habitats in Guyana

Puran, Anupana

This study investigated the relationship between habitat-types and elevation, and the diversity of mammalian species in this region using existing data from nine locations across Guyana. A total of 28 different species of mammals were identified across all sites. Habitats varied by species abundance and composition where the savanna fox (*Cerdocyon thous*) dominated the savanna landscape, and the agouti (*Dasyprocta leporina*) dominated the lowland forest landscape. We analyzed the data using; Species richness and diversity analysis, Regression analysis, NMDS, BIOENV, ANOSIM and Simper Analysis. Species diversity was found to be significantly different among sites. Lowland mixed low and high forest, with a total of 23 mammalian species had the highest accumulative species richness and evenness, while, the tall evergreen seasonal forest had the lowest diversity index. We found no significant difference based on elevation (P-value = 0.1, df= 1). This may be the result of the small elevation range of the available data, all being below 1000m. We also looked at species richness in relation to hunting pressure for each site, and found that the sites where no hunting or only where subsistence hunting was

practiced had the highest cumulative species richness. Moreover, we found a significant difference among habitat types (P-value=0.05, df=4). This was further proven by an ANOSIM analysis showing a difference between the lowland forest and seasonally flooded savanna (R=0.62).

Establishment of a reserve for the conservation of endangered and endemic amphibians of Tropical Dry Forest ecosystems in Valle del Cauca, Colombia

Quintero-Angel, Andres; Orjuela, Sebastian; Gaitan-Naranjo, Maria C.

Valle del Cauca department is located in one of the most biodiverse regions in the world, the biogeographic Choco, and in its territory there are some of the most significant Tropical Dry Forest (TDF) relicts, and associated unique and threatened biodiversity, such as the Cauca Poison Frog (*Andinobates bombetes*) and the Ruiz's Robber Frog (*Strabomantis ruizi*). The Dagua municipality, where the project take place, faces many problems that threaten this ecosystem, rare per se. The main problems in the project area is the habitat fragmentation, deforestation, and the expansion of the agricultural and cattle-raising frontier, as well as the contamination of important water sources. With the Purchase of 60 hectares of a farm with forest and cattle pastures whit confirm presence of the endemic amphibian we secure the maintenance of the forest fragment in it and contribute with the conservation of this species. With this Purchase of land as a conservation mechanism we contribute with the conservation of nine IUCN threatened species, five Endemic species and six species with national or regional threats. In addition, the land is in the process to be register as a Natural Reserve of the Civil Society, which means it would become a protected area. This will be helpful for implementing conservation and restoration actions in future projects with the support of environmental authorities and local stakeholders.

GEF-Satoyama Project: Mainstreaming Biodiversity Conservation and Sustainable Management in Priority SEPLS : Tropical Andes Hotspot Case Study

Quintero-Angel, Andrés; Dublin, Devon

Global conservation of biodiversity will not be achieved without the sustainable management of areas in which people and nature interact (Production landscapes and seascapes). Among the production scenarios, those that integrate the values of biodiversity and social aspects harmoniously with production activities, such that production activities support biodiversity and vice versa, are termed the socio-ecological production landscapes and seascapes (SEPLS). This project intends to address the barriers that SEPLS faces globally, such as insufficient recognition of their values and dynamic nature and weak governance, and contribute to the achievement of multiple Aichi Biodiversity Targets and Sustainable Development Goals. In the case study of The Tropical Andes hotspots we will focus on showing the actions developed by the Project partners in : 1) the Consolidation of the participatory management of the Alto Huayabamba Conservation Concession in the Peruvian Amazon. 2) Improvement of the livelihoods of the communities through the sustainable management of productive landscapes in the dry forest and rainforest of Ecuador and 3) Reconciling biodiversity conservation and agricultural production in agroforestry cultivation systems in the Colombian Andes: a model for Colombia's post conflict era.

Genetically-informed captive breeding and introduction program of hybrids with ancestry from the extinct Galapagos giant tortoise of Floreana Island

Quinzin, Maud; Sandoval-Castillo, Jonathan; Miller, Joshua; Beheregaray, Luciano; Caccone, Adalgisa

Galapagos giant tortoise (*Chelonoidis* spp.) are endemic to the Galapagos islands and their populations have been strongly affected by human activities. Giant tortoises play a crucial role as "ecosystem engineers". Therefore, efforts to restore the Galapagos islands ecosystems seek to recover resilient tortoise populations. Recently, the genomic signature (ancestry) unique to the extinct species from Floreana island, *C. niger*, was discovered in hybrid

tortoises on a neighboring island. Tortoises with high *C. niger* ancestry were brought to captivity to start a breeding program aiming to introduce their offspring on Floreana. Using genetic information of 35 potential breeders, we simulated the genetic makeup of their offspring to identify what breeding strategy retains the most genetic diversity, adaptive potential, and *C. niger* ancestry. Our results show that a breeding strategy can balance contrasting needs of preserving species integrity and overall genetic diversity while allowing for a rapid introduction of tortoises essential for the ecosystem recovery. This captive breeding study, the first to use individuals with ancestry from an extinct species, informs on the assets and challenges of using such individuals for reintroduction in the wild. As species displacement and extinction rate globally accelerate, similar opportunities for other taxa will appear. We also provide empirical evidence for the value of hybrids, which may be valuable archives of unique genomic diversity.

Impacts of Mangrove Habitat Degradation on Fish Assemblages along Guyana's Coastal Regions

Ram, Mark; Taphorn, Donald C.; Ansari, Abdullah A.

Mangrove forests are unique habitats that function as feeding grounds and nurseries for numerous fish which includes commercial and subsistence species. Over the past decades, mangrove forest cover has been greatly reduced in Guyana due to the construction of rip-raps and dams, tree harvesting, grazing of livestock and the natural processes of erosion and accretion. Different mangrove habitat types (natural, restored& degraded) along Guyana's coast were surveyed to investigate fish species diversity, community structures and ecosystem degradation impacts in order to protect and to improve the mangrove fish resources. Per habitat type, nine random plots of 1ha were established at each site for habitat evaluation, followed by sampling during both wet and dry season, using cast nets, gills and hand nets of different mesh sizes. A total of 24 species from 14 families were recorded, with the sea catfishes, Ariidae, (6 species) being the most speciose family. The mean Simpson Diversity Index showed that the natural habitats had the greatest fish diversity in both the dry and wet season followed by the degraded and restored mangrove habitats respectively. Significantly higher fish abundance, biomass and mean length were observed in natural and restored mangrove habitats in comparison to the degraded habitats. These results indicate that mangrove restoration significantly increases fish diversity and abundance. It also demonstrates the need for an integrated approach to mangrove resource management/conservation, including intensive mangrove restoration, and habitat protection for ecosystem recovery of degraded mangrove ecosystems.

Community participation and natural protected areas: linking community knowledge and biodiversity conservation

Ramírez Bravo, Osvaldo; Canargo Rivera, Eugenia E.; Morales Manuel, Osmar E.

Public participation is an important tool to generate information about ecosystems and species at regional level. However, a limitation is the lack of opportunities to get involved, lack of knowledge on surveys and low credibility by government officials. We have been working with local communities to generate an effective and reliable monitoring methodology to determine species presence, distribution and abundance in the Natural Protected Area of Rio Necaxa. We organized a workshop validated by the State University during which we covered themes on biodiversity and its monitoring, important species for monitoring in the area and what information should be included in a community data sheet. We worked with 16 volunteers from different communities to generate 5 different projects, two of them on fish populations and the other three on regional biodiversity. As part of the results, we compiled a community identification guide with the principal species in the area and those important for the communities. Field work has demonstrated that communities can correctly undertake biodiversity monitoring. Further capacitation include two workshops on sustainable use and biodiversity management. We expect that further work could produce base line information on species presence, distribution and changes related to climate and other changes. Moreover, we expect to generate a replicable methodology to include citizen scientists in the monitoring of other protected areas.

Market segmentation a useful tool to increase environmental education impact in schools

Ramírez Bravo, Osvaldo; Canargo Rivera, Eugenia E.; Sanchez Corona, Maria G

In marketing, segmentation involves grouping potential clients according to their characteristics to create a differentiated offer which adapts to their necessities. In environmental education it is possible to apply the same methodology as schools can be considered as potential clients with different needs and profiles. Thus, a differentiated campaign could maximize outreach efforts and resources. We classified 386 middle and high level schools in the city of Puebla, Central Mexico according to “green” characteristics. We evaluated 15 items in three categories: “institutional identity” (mission, vision and objectives), facilities, curricula and extracurricular activities looking for key words such as sustainability, ecology and environment among others. Information was obtained through official web pages, and in case of public schools from the education ministry. We used a cluster analysis using the algorithm of Ward, based on the Euclidean distance. The maximum score obtained by a school was 9 and the minimum was 0 due the lack of information available on the internet. Six big groups were generated based mostly in extracurricular activities and school infrastructure. Despite the importance that institutional identity could have in environmental interest, information available through the websites is scarce. However, we consider that these methodology could help to determine which activities could have more impact for environmental education in different schools.

Information and Communication Technologies (ICTs) for supporting participatory natural resources management and climate action in the Caribbean

Ramkissoon, Candice; Sandy, Keisha

Managing scarce natural resources under changing climatic conditions requires a multi-faceted approach. Participatory decision making is one such approach often utilising participatory Information and Communication Technologies (ICTs) as new tools to harness - capture, manage, package and disseminate knowledge for effective participatory decision-making. The Caribbean Natural Resources Institute (CANARI) has been using such tools in the Caribbean region for many years, supporting policy makers to better engage stakeholders in natural resources and climate change related policy and action. Participatory ICTs have also been used to facilitate the inclusion of communities and their local knowledge, so that those involved in resource-based livelihoods have a voice in decision making processes. This presentation profiles two ICT tools – participatory three-dimensional modelling (P3DM) and participatory video (PV). These ICTs help ensure that local knowledge is factored into natural resources research, assessments and policy making. Specific examples of their use in capturing local knowledge are detailed, along with lessons and opportunities for further action. Recommendations are made for enhancing the role of ICTs in supporting equitable participation of Caribbean stakeholders in natural resources management and climate action.

Does land tenure clarification and delimitation decrease deforestation in protected areas? A case study from an intervention in Guatemala

Reboredo Segovia, Ana; Nolte, Christoph

Improving land tenure security is a conservation tool that has shown mixed outcomes. The Republic of Guatemala, with financing from the Inter-American Development Bank, implemented a \$22M USD project that clarified, mapped, and delineated land use rights in nationally protected areas. The desired outcome was a better knowledge of the legal limits of protected areas, and the discouragement of illegal forest clearing. We estimate the impacts of this conservation intervention on deforestation and forest degradation in Guatemala with the use of remote sensing data and on-the-ground interviews. We develop a novel dataset of annual deforestation and forest degradation in Guatemala with 17 years temporal and 30 meters spatial resolution. We estimate the impacts of the

project on deforestation and forest degradation, using quasi-experimental matching techniques and panel data statistical models. We compare areas that received treatment with a counterfactual characterized by similar observable confounders, including market access, slope, altitude, rainfall, and initial forest cover. Quantitative findings were substantiated through field visits and interviews. Preliminary results show that project impacts on deforestation vary across land protection types, space and time, with interesting implications for differing levels of effectiveness. This research adds to the growing empirical evidence base on the effects of tenure interventions on deforestation and forest degradation.

Who studies where? Boosting tropical conservation research where it is most needed

Reboredo Segovia, Ana ; Armsworth, Paul R.; Romano, Donato; Catani, Filippo

Despite the mounting threats that tropical ecosystems face, conservation in the tropics remains under-researched relative to temperate systems, and is concentrated in few locations. Efforts to address this research gap have failed to analyze an important point-to-point dynamic, whereby international researchers travel to tropical countries and boost efforts by local researchers. We examine which factors attract foreign scientists and which factors drive local research productivity, using a sample of nearly 3000 tropical conservation research articles. Factors affecting geographical preferences by foreign authors, as well as factors affecting authorship by local scientists, are evaluated using multivariate generalized linear models. Results show that many past barriers to attracting international research effort appear to have been overcome, although U.S. scientists still respond to safety concerns and proximity. The productivity of in-country scientists is affected by corruption and institutional support. Both remote and in-country scientists are working more in places with more listed threatened species. However, many locations still lack adequate conservation research despite having high numbers of threatened species. To ameliorate the knowledge gap in these locations, foreign scientists could be attracted to lesser-studied areas through targeted grants. However, the long-term solution must be to train and employ more local scientists in understudied areas.

Challenges for freshwater fish conservation in the Cuban system of natural protected areas: the case of two biological reserves in western Cuba

Rodriguez Silva, Rodet

Freshwater fish are the most neglected vertebrates of the Cuban fauna in terms of conservation priorities. Although Cuba has a well-established system of natural protected areas, freshwater groups are underestimated in current conservation programs. In this study, I executed a survey of freshwater fish communities in two important regions for the conservation of biodiversity in western Cuba: Biosphere Reserve Sierra del Rosario and Ramsar Site Ciénaga de Zapata. The research involved inventorying of fish communities in these areas, identification of conservation threats and assessment of challenges for freshwater fish conservation. The two studied areas represented key sites for the conservation of fish species because of the high occurrence of endemic fish. Habitat transformation due artificial water impoundments was showed to affect fish populations. However, introduced fish species that prey upon native fish was the main factor threatening entire freshwater fish communities mainly in lowland ecosystems. Rapid conservation measures are required to avoid the continued loss of biodiversity in freshwater habitats in Cuba. The main challenge for implementing conservation programs that protect Cuban fish fauna is the lack of trained personnel. Wildlife competent professionals are essential to execute proper management and monitoring fish populations. In addition, local communities should be linked to conservation efforts to ensure a long-lasting effect of conservation actions.

Leadership and marine conservation: lessons from a field case on the control of the lionfish invasion

Rodriguez-Vargas, Luz; Sierra-Sabalza, Nireth P.; Nava, Mabel; Eves, Heather; Sanjuan-Munoz, Adolfo; Sulton, Machel

In 2015, the Interdisciplinary, Capacity-Developing, Experiential, Mentored Regional Conservation Leadership in the Caribbean (CLiC) program supported the development of a project on the control of the invasive lionfish (*Pterois volitans*) in Taganga, Colombia. Using the Open Standards for the Practice of Conservation (OS) learned during the training, two conservation strategies were defined: lionfish control and research, and outreach and awareness. Five leadership lessons have been learned during the last three years that the project went from being an academic exercise to become an entrepreneurial project for conservation, namely 1) partnerships are an excellent opportunity for beginners in conservation, and a key to approach communities; 2) constant exchange of knowledge between members of the group, is critical to keep cohesion, develop new ideas, and solve problems; 3) strengthening the capacities and the relationships among the members of the community increases motivation and interest in conservation activities; 4) constant presence in the area, sharing results, and enthusiasm are key to keep the community as well as the work team motivated, and 5) there will be downs but if the previous four lessons are learned you will make it through. Although the lionfish was previously seen by the community as a threat, this perception is changing into one of a dish that is being sold in Taganga. This could result in effective control of this invasive species in the area.

Assessing Mammalian Biodiversity Patterns in the Tropical Montane Ecoregion of Monteverde, Costa Rica

Rogan, Jordan

Habitat loss and fragmentation are the key drivers of biodiversity loss today. Tropical montane ecosystems in particular contain high levels of unique biodiversity, while facing some of the greatest levels of anthropogenic threat. Monteverde, Costa Rica is one such ecosystem. Harboring a wide range of biodiversity, it has also experienced significant levels of land cover change and fragmentation. The potential for further land conversion poses a major threat to the health and sustainability of this ecosystem and the species it supports. Assessing the potential effectiveness of protected areas to support species persistence is of particular importance in these otherwise fragmented regions. The following research aims to assess mammalian biodiversity patterns in response to environmental covariates in the Monteverde ecoregion. From June-August 2017, mammal presence was determined in a protected region using camera traps. Species were categorized into functional guilds to assess individual responses based on differential habitat requirements. Species occupancy (Ψ) was assessed using PRESENCE 12.10 to determine species detection probability and the proportion of sites occupied by each species. Percent forest cover around each site was determined using satellite imagery in ArcMap 10.4. Occupancy for each species was compared amongst sites with different percentages of forest cover and within different distances to environmental features. We found differences in responses of species to environmental covariates on probability of occupancy and detection in this region. Understanding the influence of forest cover and important landscape features is critical for effective conservation planning within these vulnerable ecosystems

The influence of technological transitions on socio-environmental market dynamics of *Mauritia flexuosa* harvest in the Peruvian Amazon.

Romulo, Chelsie

Technological advances can change the dynamics of socio-environmental systems. One such system experiencing significant changes is the harvest and market of *Mauritia flexuosa* fruit. *M. flexuosa* is a long-lived, dioecious palm that forms expansive stands covering ~10% of the Peruvian Amazon. The palm provides habitat and food for wildlife and income for rural communities. There are widespread ecological concerns related to harvest as cutting female trees is common, resulting in male-dominated stands. *M. flexuosa* is the target of several conservation initiatives, and understanding the complex market interactions are important for designing effective management. Research conducted from 2012–15 highlights significant losses due to market inefficiency and the need to address

market access, flow, and fluctuations. The region traditionally has few roads or infrastructure development connecting communities and cities. Communication across the market chain for many forest products is slow or nonexistent, which can exacerbate market failures and inefficiencies. However, two phone companies began constructing cell phone towers in 2017, with recent activation. This presentation (a) reviews the influence of communication infrastructure on natural resource markets, (b) presents hypotheses on how the *M. flexuosa* market will react to the transition to consistent communication networks, (c) and describes replication of the original market surveys for pre/post-analysis.

Taking stock: Red-rumped agouti (*Dasyprocta leporina*) population density and relative abundance in Trinidad and Tobago.

Rostant, Luke; Agard, John B.R.; Nelson, Howard P.; Beddoe, Lee Ann; Nathai-Gyan, Nadra

The assessment of game species populations is often argued as a critical component in their management, yet few studies have been conducted on the status of hunted game species in Trinidad and Tobago. Our research focuses on the population density and relative abundance of red-rumped agouti, *Dasyprocta leporina* in Trinidad and Tobago. From 2014 to 2016, approximately 1300 km of transects were walked in 6 areas of Trinidad using distance surveying techniques. From 2016 to 2017, camera traps were deployed at 130 sites in Trinidad, and 20 in Tobago using the Terrestrial Vertebrate (Camera Trapping) Monitoring protocol of the Tropical Ecology Assessment and Monitoring (TEAM) network. The population density of red-rumped agouti was calculated using King's estimator, and programme DISTANCE. Camera trap data was analysed using Camerasweet software, and relative abundance values calculated and compared between sites. The density of red-rumped agouti was found to vary across the island of Trinidad, but on average was found to be between 23 and 32 individuals/km². When compared to other neotropical sites, density values approach the middle of the range. Relative abundance calculated from the camera trap data revealed that Chaguaramas in Northwestern Trinidad had the lowest value at about 7/100 trap days, while Trinity Hills in Southwestern Trinidad had the highest value at about 44/100 trap days. This study can be used as the basis for monitoring and management in the future.

Socioecological connectivity for the conservation and restoration of dry forests and their threatened tree species. Case study Santa Marta.

Salamanca, Bibiana

In two priority basins of the tropical dry forest of Santa Marta, strategies are applied to promote the recovery of five species of fine wood trees at local threat level: *Caesalpinia ebano*, *Aspidosperma polyneuron*, *Pachira quinata*, *Hymenaea courbaril*, *Handroanthus dillbergii*. Strategies are applied at different intervention scales: Nursery net, participatory agroforestry systems, restoration or enrichment of riparian forests in urban public areas and rural areas with participatory restoration, and protection and restoration of springs. A methodology of characterization of local actors for the recovery of the dry forest and its ecological connectivity is produced. The ways of interrelation of the local communities with the landscape in exceptional cases maintain the conservation of the forests. The results of this work show that the most demanding strategies are related to nursery networks, and that the climate change context is not favorable for the recovery of species with low tolerance to drought conditions. Recommendations of species and types of suitable plots are produced for projects of recovery of threatened species of dry forest in the local and regional scale.

Conservation agreements and incentives in rural areas of Colombia

Saavedra, Carlos

Private areas can contribute to the preservation of ecosystems while there are incentives for conservation (not necessarily money) that respond to the economic, productive and / or socio-cultural needs of the owners. In

Magdalena Medio and the Orinoquía of Colombia, two regions with high biodiversity and where there are no public protected areas, voluntary conservation agreements were signed with owners of properties that had documents proving their property and that were willing to contribute time, effort and resources in preserving natural areas within their properties, in carrying out restoration activities and improving their properties. As incentives, materials were provided for property management, training, construction of fences, nurseries, plant material for plantations, livestock production systems were implemented, advice was provided, training in management and community work. There were 28 conservation agreements with more than 42,800 hectares. The monitoring of the agreements shows that there has been contribution in restoration and on biodiversity, and that conservation interest persists in the owners thanks to the trust and commitment, but the need to include a sustainable productive management that counteracts the pressures of development that arise in the territories. In this sense, productive projects that are conditioned to sustainability are shown as possible incentives to achieve permanent private participation in conservation.

Invasion irony: livebearing fishes threatening livebearing fishes in the Caribbean

Schlupp, Ingo

The Caribbean is a natural treasure that is perfect for studying large-scale biogeography and speciation. I am particularly interested in the freshwater fishes of the region, and among those in Livebearing fishes (Poeciliidae). Several genera and many species in that group are endemic to the Caribbean, among them the genus *Limia*. My group wants to understand the biogeography of this group, in particular a rather unusual pattern that seems to be in general disagreement with Island Biogeography. While we find around 15 species on Hispaniola, Cuba and Jamaica have only one species each. Studies like this in basic biology rely on being able to observe natural fish assemblages in the field. This however is increasingly threatened by human activities, ranging from Climate Change, to Habitat Alteration, to Invasive Species. I want to discuss our relative paucity of knowledge of freshwater taxa in the Caribbean, but especially focus on the threats emanating from invasive species. Among those I want to especially discuss invasive species from the Poeciliids, and the unique pathway of introductions they often take. Finally, I want to propose and discuss a network of scientists and citizen scientists that can help document the invasions and potentially mitigate negative effects.

The diversity and heavy metal content of stingrays caught by the fyke net between Ogle and Better-Hope, Guyana

Seecharran, Diana; Sooklal, Mohini; Liverpool, Eldford

Globally, stingrays are either threatened, vulnerable or endangered. This research investigated the diversity and heavy metal contents of stingrays on the coast of Guyana, between Ogle and Better-Hope. The samples were obtained using the fyke net. A total of twenty-seven (27) individual stingrays representing six (6) species including *Dasyatis guttata*, *Dasyatis geijkesi*, *Gymnura micrura*, *Narcine bancroftii*, *Himantura schmardae* and *Rhinoptera bonasus* were documented over a nine (9) month period. The results showed that wet season had a greater abundance and catch per unit effort (CPUE) than dry season. The abundance of sting rays increased as tide increased. There was a strong positive correlation in the length to weight relationship for both wet and dry seasons, indicating that the biomass increased as length increased. The muscle tissues were analyzed for iron, magnesium, lead and mercury. Seasonal variation affects the heavy metal contents in sting rays muscle tissue. These parameters were higher in wet season than dry when contamination from runoff and leaching are more dominant. Highest concentration was obtained for magnesium, followed by iron. However, lead was not detected in this study.

Marine resource management and social-ecological vulnerability to coral bleaching in the Caribbean

Siegel, Katherine; Cabral, Reniel; McHenry, Jennifer; Ojea, Elena; Owashi, Brandon; Lester Sarah E.

Climate change impacts coral reef systems and the human communities that depend on them. Social-ecological

systems have varying levels of vulnerability to climate change, mediated by different levels of exposure to climatic threats, ecological and socioeconomic sensitivity to those threats, ecological recovery potential, and socioeconomic adaptive capacity. Using data on coral reefs, reef-based economies, and marine resource management, we assess variation in social-ecological vulnerability to climate change-related coral bleaching in thirty Caribbean island nations and territories. The Caribbean region's social, political, and ecological diversity present opportunities for analysis of different factors contributing to vulnerability. We find important variation in levels of ecological and socioeconomic exposure, sensitivity, and adaptive capacity across the Caribbean, with relevance for regional- and island-level efforts to reduce vulnerability. Independent islands have reduced socioeconomic sensitivity and enhanced adaptive capacity compared to islands that are territories; these differences stem from different governance and economic characteristics. Our results also provide an unprecedented compilation of ecological and socioeconomic indicator data for the Caribbean that will be useful for addressing questions related to climate exposure, ecosystem vulnerability, and social-ecological resilience.

Cardiac activity variability of *Poppiana dentata* in response to temperature change

Singh, Delezia; Alkins-Koo, Mary; Rostant, Luke V.; Farrell, Aidan D.

Variations in temperature, associated with climate change, can indirectly impact aquatic populations. Additionally, cardiac activity in freshwater invertebrates is a key physiological facet that is highly influenced by ambient temperature changes. Therefore, this investigation sought to provide baseline variations of cardiac activity for a freshwater crab, *Poppiana dentata*, in order to highlight potential risks faced by this species to temperature change. Juvenile crabs from a freshwater site in north-west Trinidad were obtained and subsequently exposed to three temperature conditions involving a control temperature of 26°C and two higher temperatures of 30°C and 32°C. Mean heart rate and diurnal cardiac activity were determined from continuous recordings of each crab. Average heart rate decreased during changes of 4 and 6°C higher than the optimum and substantial fluctuations were noted during the highest temperature, in relation to the mean resting rate. Heart rate variations among crabs exposed to the higher temperatures was significant ($p < 0.05$) as well as for individual variability within each temperature treatment ($p < 0.05$). Modification of diurnal cardiac activity was also noted among crabs exposed to the different temperature conditions ($p < 0.05$). These changes in rates may be linked to thermoregulatory adaptations, thus providing insight into (1) the physiological survival mechanisms of *P. dentata* and (2) possible conservation strategies for this native species.

The Effects and Management of Saline Water Intrusion in the Arable Rice Lands of Mahaica, Guyana

Singh, Heetasmin; Velloza, Theodosius; Adams, Ashley

Climate change is expected to cause a rise in sea levels and thus intrusion of saline water into coastal aquifers and riverine systems. This is expected to occur in the low coastlands of Guyana where prime agricultural lands exist and major agricultural activities take place. The use of saline irrigation water will have severe effects on crop growth and agricultural productivity and if not managed properly, the impacts can be detrimental to Guyana's rice industry. This study investigated a) the extent to which saline water has intruded into the Mahaica River; b) the knowledge and extent of farmers' management of soils and water for saline water intrusion and c) its current effects on rice yields. Soils and water were analysed for electrical conductivity, pH, sodium and chloride. Rice yields were obtained from the Guyana Rice Development Board. Qualitative data were then obtained through surveys with farmers which determined their knowledge and management practices regarding saline water intrusion (SWI). Evidence of SWI was found up to 17.6 km upstream. Farmers had moderate SWI knowledge and were found to practise some soil remediation. Soil salinity was found to have a moderate correlation to yield but both management and salinity were found to have a combined effect on yield. Yields were found to range from 69% to 85% of potential yield. There has been considerable intrusion of SWI into coastal rice lands of Mahaica which has impacted yields and the practices of farmers.

Using species distribution modelling to optimize protected area design for endemic plants

Spiers, Joshua; Oatham, Mike P.; Rostant, Luke V.; Farrell, Aidan D.

To successfully conserve a species, habitat loss must be controlled. This requires a Protected Area network that adequately covers areas where the most vulnerable species are found. Here, the suitable habitat of all of Trinidad and Tobago's endemic vascular plants was estimated using the Species Distribution Model Maxent. The model was parametrized using freely available environmental layers and species occurrences from published sources (including a recently completed rapid botanical survey). Binary presence and absence maps for each species were used to create maps showing an aggregated endemic heat score, which was overlaid with the Protected Area network and a land use map. More than half of the 66-endemic plant species could not be modelled with confidence. For the remaining species, the current Protected Area network contains just $13 \pm 7\%$ of the total modelled habitat. The aggregated endemic heat score indicated that most of the endemic plant species are found on the central regions of the islands highest mountain ranges (the Northern Range in Trinidad and the Main Ridge in Tobago). The inclusion of part of Trinidad's Northern Range in the proposed Protected Area network would expand the coverage to include $>25\%$ of the total modelled habitat, increasing the long-term sustainability of these populations.

Different faces of disturbances - habitat loss, fragmentation and wildfire in la Gran Sabana, Venezuela

Stachowicz, Izabela; Ferrer, Jose R.

Habitat loss, fragmentation and wildfire are among disturbances that pose direct threat to wildlife and its conservation. According to the Intermediate Disturbance Hypothesis (IDH), middle level of disturbance could promote higher diversity. Similarly, Hypothesis of Shifting Agriculture (HSC): modification of the plant community favours wildlife populations. We deployed arrays of camera traps in six blocks of landscape with vast savannas in la Gran Sabana at the border of the Canaima NP, where forest cover loss is highest among NP in Venezuela. We analysed richness and occupancy of medium and large mammals and incidence of fires and habitat fragmentation from time series of remote sensors spanning the past 16 years. 29 species of mammals were registered with camera traps. Species accumulation curves showed highest richness in un- and intermediately disturbed habitat, partially conforming to the IDH. Sequence of lower to higher richness according to the proportion of habitat were present and moderate habitat fragmentation in sites with high forest cover can have a positive effect on species richness. Carnivores, insectivores and large bodied species (beta diversity) disappear first as fragmentation increases, while herbivores are more resistant. The vicinity of shifting cultivation had a positive impact on presence of species paca, matacán deer, armadillo, contributing to HSC. These results need to be included in a new, comprehensive and updated management plan for Canaima NP.

High relative abundance of coral recruits on mooring blocks, coral rubble and vertical coral rock in a natural reef setting.

Taylor, Michelle; Gershtenson, Maya; Newton, Kristen; O'Mara, Sarah; Elmer, Franziska; Peachey, Rita B.J.

Coral larvae can differentiate between different substrata and choose settlement locations that enhance their survival rates. Most previous research into coral larvae preferences is conducted on settlement tiles, and larvae show clear preferences for macro and micro topographies such as vertical surfaces and crevices. However, not much research on topography preferences has been conducted on the reef itself. In this study, we used two novel techniques, structure-from-motion 3D modelling and fluorescence census, to determine both available topographies and those on which coral recruits are found. Using Manley's alpha index to compare settled upon with available micro and macro topography, we calculated settlement preference and avoidance. On the natural reef, we found that recruits showed no clear preference for any micro topographies, but preferred vertical surfaces. On mooring blocks, they avoided flat micro topographies. Our results support previous research that found that

coral recruits prefer vertical surfaces. Like other studies conducted on the natural reef, our study could not confirm a settlement preference for crevices that is often found on settlement tiles. To our knowledge, this is the first study to compare settlement onto natural topographic features to their availability. Understanding coral recruitment and survivorship allows us to provide the most suitable environment to coral larvae, which in turn will ensure successful conservation efforts.

Eating Plastic: Microplastics in Grenadian Poriferan Species

Taylor, Michelle; Morrall, Clare E.

Microplastics are small (generally less than 5 mm) particles that are either manufactured for a specific purpose or are a result of larger pieces of plastic breaking up. The particles are numerous in the world's oceans and studies have shown the negative effects they have on marine organisms. Coral reefs, and all their components, are vital to the health of the ocean. Data on the incidence of microplastics in Poriferan species has not previously been reported. As filter-feeding organisms, exposure to anthropogenic particles is expected to result in consumption. I collected sponge samples on 10 m transects from coral reefs around the island of Grenada. I then digested the samples in 10% KOH, passed them through a 180 µm sieve, and examined the remaining particles via microscopy. Visual confirmation was used to identify microplastics. I also collected a water sample to compare microplastic abundance in the water immediately above the transect to the Poriferan samples. Preliminary results show a high proportion of samples contain microplastic fibres, and all water samples contain microplastics. As yet no sample has contained microplastic film pieces. Microplastics are considered ubiquitous in the marine environment, and this research indicates that Poriferan species in Grenada are exposed to microplastics in their natural environment. Understanding the contamination of Poriferan species is vital to enable protection and conservation of the entire coral reef ecosystem.

Seasonal changes in rhizobacteria community structure associated with dominant plant species in the Aripo savannas

Thomas, Gem; St. Martin, Chaney; Rouse-Miller, Judy

The rhizosphere is of central importance not only for plant nutrition, health and quality but also for microorganism-driven carbon sequestration, ecosystem functioning and nutrient cycling in terrestrial ecosystems. A multitude of biotic and abiotic factors influence the structural and functional diversity of microbial communities in the rhizosphere. In this experiment next-generation, illumina-based sequencing approach was used to characterize the bacterial community in Aripo savannas one and five, from the rhizosphere of five dominant plant species (*Rhynchospora barbarta*, *Rhynchospora curvula*, *Largenocarpus rigidus*, *Largenocarpus guianensis* and *Paspalum pulchellum*), across the wet and dry seasons. Two hundred and seventy-seven operational taxonomic units (OTUs) were identified, which composed of seven dominant groups (*Alphaproteobacteria*, *Deltaproteobacteria*, *Gammaproteobacteria*, *Betaproteobacteria*, *Acidobacteria*, *Thermoanaerobacterales* and *Thermolephilia*). The results showed that plant genotype, spatial and temporal scales significantly influence rhizobacteria species richness composition and abundance.

Using GIS to Model and Monitor Sustainable Forest Management in Trinidad

Thongs, Gabrielle; Alexander, Jamala; Edwards, Kasajia; Pope, Deston

The World Conservation Monitoring Centre research has shown that Trinidad's forests are a unique biosphere of than 678 species of amphibians, birds, mammals and reptiles. Moreover, this biosphere is also the habitat to at least 2259 species of vascular plants with more than 10% endemic to Trinidad. This small island developing state however, has an annual population growth change of 52000. Driven by the population growth and increasing demands for urban land uses, Trinidad has experienced many anthropogenic environmental changes. One of the most significant and discernible of these is land cover change. Spontaneous rapid urban growth with little systematic planning control has spurred the conversion of forest habitat to urban land uses. This land cover

conversion threatens endemic biodiversity. The land cover conversion rate, though previously investigated, has yet to be updated within the last the decade. It follows that the main aim of this research is to quantitatively investigate the conversion rate of forest habitat in Trinidad. Using a holistic approach, the research will use GIS techniques to discern a relationship between land cover conversion rates and their impacts on the biodiversity biosphere. Three different epochs at different spatial and temporal scales will be analysed to discern this relationship. Results from these analyses can be used to guide sustainable forest management strategies allowing for a more informed decision-making process.

Using Sky-Island Biogeography to understand the distribution of the Golden Tree-frog and its habitat.

Torresdal, Jack; Farrell; Aidan D; Goldberg, Caren

Island biogeography gives us a conceptual framework to understand the consequences of climate change in sky islands. In such habitats the probabilities of persistence, local extinction, and colonization are a product of island size and isolation. Climate change is predicted to cause sky-islands to shrink and perhaps disappear. The Northern Range mountains of Trinidad provide a model system to study how sky island ecosystems are responding to climate change. The isolated peaks of this cordillera contain unique cloud forest ecosystems which are home to the giant tank bromeliad *Glomeropitcairnia erectiora*, which harbors many organisms including bacteria, algae, invertebrates, and the endangered golden tree frog (*Phytotriades auratus*). We developed a successful eDNA assay for *P. auratus* that is more successful than traditional detection methods. The presence of the host bromeliad predicts the presence of *P. auratus* but not on the smallest or most remote sky islands. We discovered four of the now six known *P. auratus* populations and found that as isolation increased and habitat size declined, the detection rate (proportion of samples positive for *P. auratus*) and concentration of DNA (qPCR results) both decreased. A preliminary assessment based on past climate data suggests that *G. erectiora*'s current niche, restricted to small and widely dispersed islands of habitat above 750 m, will be highly sensitive to changes in climate.

Human induced turbidity and sedimentation affect fish community composition across Trinidadian streams.

Torresdal, Jack; Deacon, Amy E.; Ehlman; Sean; Reznick; David

Headwater streams and rivers in Trinidad are known to have diverse fish assemblages. In recent decades, many of these rivers have experienced altered sediment regimes. I examined fish communities as well as abiotic and biotic habitat characteristics in six Trinidadian rivers to determine the downstream consequences of increased turbidity and sediment transport due to mining/quarrying. Diurnal predatory fish occupancy is decreased in stream reaches below point sources of sediment pollution. In experimental feeding trials, nocturnal predatory fish performed better than diurnal feeders in turbid water, suggesting a mechanism for patterns observed in fish communities across streams. Evidence suggests passive restoration may be adequate for the recovery of fish communities.

Bird altitudinal migration patterns in the Neotropical cannot be generalized to other zoogeographic regions

Vale, Mariana; Dos Santos Alves, Maria A.; Barcante, Luciana

Bird altitudinal migration (BAM) is the seasonal altitudinal movement of birds from breeding areas to non-breeding or wintering areas at different elevations. Although BAM is widely reported, questions remain concerning why birds migrate altitudinally. We conducted an extensive bibliographic survey to shed light over this issue. We found a strong geographic bias in publications toward the United States and Costa Rica, and identified 1238 species of altitudinal migrants worldwide. Seasonal availability of fruit and nectar was widely cited as a general explanation for BAM. Most altitudinal migrants, however, were invertivores rather than frugivores or nectarivores. The prevalence of invertivores is not unexpected because this is the most common foraging guild among birds in general. This general pattern held true for all zoogeographic realms except the Neotropics, where most altitudinal migrants were indeed frugivores and nectarivores. Seasonal availability of fruit and nectar, therefore, cannot be generalized as an explanation for BAM worldwide. Altitudinal migrants are of particular conservation concern, because they make use of multiple habitats over a wide area, thus requiring conservation of an array of habitats along altitudinal gradients. To better understand the mechanisms underlying

BAM, broadening the geographic scope of studies is paramount, especially in the megadiverse tropical regions of sub-Saharan Africa, Southeast Asia, and South America.

Patterns of diversity, threat and protection of mammals in Latin America and the Caribbean

Vale, Mariana; Rocha, Taina, C

In this opening talk for the symposium we present an overview of the patterns of diversity, threat and protection of mammals in Latin America and the Caribbean. We use three standard global online databases: biodiversitymapping.org, Land-use Harmonization (LUH2), and World Database on Protected Areas (WDPA). Latin America and the Caribbean have an exceedingly high mammal diversity as compared to other regions of the globe, particularly in northern and southeastern South America. Currently, 12.4% of the region's land cover has been modified by human activities, with most human modified lands concentrated in northern Central America and central and southern South America. This figure is likely to increase to 15.8% by 2100 due to climate change. At the same time, 22.4% of the region's land and 11.5% of the region's sea is within protected areas. Patterns of diversity, threat and protection varies a lot among countries. We end the talk discussing the differences among South America, Central America and the Caribbean Islands, and highlighting the areas where high diversity coincides and high land conversion and low protection.

Diversity, habitat, and conservation of the Hispaniolan Poecilia clade

Weaver, Pablo; Cruz, Alexander

The West Indian island of Hispaniola houses an endemic clade consisting of three *Poecilia* species, each with a unique distribution pattern across the island. We examine the relationship between abiotic habitat variables and the presence of *Poecilia elegans*, *Poecilia dominicensis*, and *Poecilia hispaniolana*. We collected data on large scale distribution patterns as well as within stream microhabitat distribution of the three species from across their ranges. We found that among the variables measured, only elevation differed significantly across species. *P. dominicensis* was consistently found at the lowest elevation sites, with the warmest water, lowest flow, lowest dissolved oxygen, and the highest conductivity and salinity. *P. elegans* was found at intermediate elevations, temperatures, levels of dissolved oxygen and flow, and in sites with the lowest conductivity and salinity. *P. hispaniolana* occupied the highest elevation sites, with the coldest water, intermediate levels of dissolved oxygen, the fastest flow, and intermediate levels of conductivity and salinity. *P. elegans*, which was the most restricted in its spatial distribution, was also found in the narrowest range of abiotic conditions, while *P. hispaniolana* and *P. dominicensis* showed wider tolerances, as well as greater distributions across the island. The three species may be limited by a combination of historical biogeography, tolerance to abiotic variables, and by competition with one another.

Ecological Release and Morphology of Grenada House Wrens

Wetten, Kimberley; Heathcote, Alexandra; Sosa-Lopez, J. Roberto; Mennill, Daniel; Koper, Nicola

House wrens (*Troglodytes aedon*) can be found in North, Central and South America, and the Lesser Antillean islands. Islands provide unique ecological and environmental pressures, which can lead to ecological release, where songbirds on island tend towards larger bill dimensions, longer tarsi and shorter wings as a result of lower interspecific competition and predation pressure. Insular populations of House Wrens have been understudied. To study how the morphology of Grenada House Wrens (*Troglodytes aedon grenadensis*) is impacted by local island conditions, we compared mainland and island subspecies of House Wrens using birds caught via mist-nets and museum specimens. We captured and banded Grenada House Wrens between 2015 to 2018 at various locations throughout the island. We measured bill dimensions, wing chord, tail length and tarsus length. Preliminary analysis of data suggests that Grenada House Wrens have significantly longer tarsi and bill length than mainland subspecies, which is consistent with predictions associated with ecological release on species-depauperate islands. However, Grenada House Wrens also have significantly longer wings than mainland conspecifics, which may

indicate that predation pressure is high on Grenada and thus long wings are necessary for quick escape.