LIVING WORLD

Journal of The Trinidad and Tobago Field Naturalists' Club

Supplement 1

2016

THE TRINIDAD AND TOBAGO FIELD NATURALISTS' CLUB

The Trinidad and Tobago Field Naturalists' Club was founded on 10 July, 1891. Its name was incorporated by an Act of Parliament (Act 17 of 1991). The objects of the Club are to bring together persons interested in the study of natural history, the diffusion of knowledge thereof and the conservation of nature.
Monthly meetings are held at St. Mary's College on the second Thursday of every month except December.
Membership is open to all persons of at least fifteen years of age who subscribe to the objects of the Club.

Mission Statement
To foster education and knowledge of natural history and to encourage and promote activities that lead to the appreciation, preservation and conservation of our natural heritage.

Enquiries

All enquiries concerning the Club should be addressed to:
The Honorary Secretary
P.O. Box 642, Port of Spain
Republic of Trinidad and Tobago
E-mail: *admin@ttfnc.org*
Website: *www.ttfnc.org*

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Proceedings from the Department of Life Sciences
Faculty of Science and Technology
The University of the West Indies

6th Research Symposium

2016

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Organizing Committee for the Department of Life Sciences 6th Research Day Symposium

Department of Life Sciences

Professor Dave Chadee
Dr. Judith Gobin
Mr. Ryan S. Mohammed
Mrs. Lee Ann Beddoe
Ms. Kerresha Khan
Ms. Sarah Evelyn
Mr. Mike Rutherford
Ms. Abigail Joefield

Department of Physics

Ms. Xsitaaz Chadee

Department of Computing and Information Technology

Mrs. Diana Ragbir-Shripat

**Department of Life Sciences,
Faculty of Sciences and Technology,
St. Augustine Campus**

Guest Editors
Dr. Luke Rostant
Dr. Judith Gobin
Mr. Ryan S. Mohammed
Ms. Delizia Singh

Front cover photograph: *Tityus melanostictus*, with two juveniles on her back. The photograph was taken on the UWI St. Augustine campus gardens south of the tennis court about 7pm during February 2016. Photo Mr. Rakesh Bhukal.

ACKNOWLEDGEMENTS

The guest editors would like to thank the Principal of The University of the West Indies, St. Augustine Campus, Prof. Brian Copeland and our new Head of Department of Life Sciences, Dr. Adesh Ramsubhag for all their support and encouragement in making the 6th Research Symposia a success. We also give recognition to the assistance given by the Dean of the Faculty of Sciences and Technology, Prof. Indar Ramnarine.

The 2016 Symposium we continued to open the doors to other departments in an attempted to highlight cross departmental collaborations in multi-disciplinary research within the Faculty of Sciences and Technology. We saw this as an ideal opportunity to encourage this among the young generation of researcher and it is hoped this trend will follow. For the support from the other Head's of Departments, we say a heartfelt thank you.

We thank all dedicated committee members who worked extremely hard to make the vision a reality. To all academic, non-academic and ancillary staff that assisted, not only with the organizing but also the physical labour that came with making the symposium a reality, we give our sincere appreciation. Special thanks also go out to UWI's Marketing and Communication Office for help with promotional paraphernalia. To the executive of the Trinidad and Tobago Field Naturalists' Club, thank you for allowing us the opportunity to have our presenters' abstracts be part of the special edition supplement of the Living World. This document would not have been possible without the commitment of the Research Symposium Committee of the Department of Life Sciences. The dedication shown by the Post Graduates truly gives the symposium direction and shows we have research with a purpose in mind. Our sponsors have made this document materialize. We are thankful to both sponsors TT-Tilapia via the Aquaculture Association of Trinidad and Tobago (aQua-TT) and the Environmental Research Institute of Charlotteville (ERIC).

Lastly, our committee is indebted to both Dr. Keith W. Gibson of ERIC and Dr. Floyd Homer for using their experiences in the realms of academia and life by serving as our esteemed judges for the oral presentations by Department of Life Sciences.

Ryan S. Mohammed
Post Graduate Rep and Coordinator Research Symposium Committee,
Department of Life Sciences, FST, UWI.

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FOREWORDS

'Integrated and multi-disciplinary post graduate research and charting the way forward'

It is a great pleasure to welcome everyone to the 6th Annual Research Symposium of the Department of Life Sciences, UWI, St. Augustine. This year we are extremely happy to be collaborating with the Department of Physics and the Department of Computing and Information Technology in hosting this symposium. Research is at the core of the Department of Life Sciences and this symposium is an important annual event for undergraduate and post-graduate students, as well as academic staff, to showcase the work taking place in the department.

Looking at the abstracts submitted by the researchers and participants, I feel confident that we are in for a treat and great excitement again this year from the range of oral, poster and video presentations scheduled for over the next two days. I feel extremely satisfied that the department continues to make significant advances in research overall, but importantly has been successful in making its research relevant to the needs of the region. You will see how the work of the department is contributing towards conservation of the environment, development of integrated systems to disease management and enhanced crop yields, as well as conservation and exploitation our biodiversity for various biotechnological applications. Indeed, our extremely rich biodiversity is perhaps our greatest natural resource which can serve as a catalyst for new industries such as drug discovery and development, biological inoculants for agriculture and bioremediation. Given the challenges our economy is currently facing due to depressed oil prices, I think it would be prudent for the country to invest in research geared towards developing products and services from our bio-resources which can serve as an alternate source of significant revenues and to achieve self-sufficiency.

The department is eternally grateful to the previous Head of Department, Prof. John Agard and to Prof. Dave Chadee for initiating this symposium 5 years ago and who has served as the chair from its inception. This symposium has grown from strength to strength over the years and is now one of the premium events in the Faculty of Science and Technology, and UWI, St. Augustine.

Congratulations to all presenters and co-authors for your contributions. Special thanks to all members of the planning committee including the co-chair Dr. Judith Gobin and coordinator Mr. Ryan Mohammed together with his team of graduate students, who have been the workhorses in planning this symposium. Sincere thanks and appreciation to Prof. Indar Ramnarine, Dean, Faculty of Science and Technology and Deputy Dean, Dr. Margaret Bernard for their support and encouragement. Thanks to other staff members and students of the Department of Life Sciences and the Faculty of Science and Technology who provided assistance for hosting this event. Finally, thanks to all who have attended this session and who will be attending the other sessions, especially staff and students from other faculties of UWI and members of the public. In closing, I would like to welcome five new academic staff members who joined the department this year. We look forward to your most productive and rewarding stay with us in Life Sciences.

Adesh Ramsubhag, Ph.D.
Head, Department of Life Sciences
Faculty of Science and Technology
The University of the West Indies
St. Augustine

REMARKS FROM THE GUEST EDITORS

Department of Life Sciences 6th Research Symposium: Sustainable Development (2016)

In keeping with the St. Augustine Campus' strategic focus on re-invigorating and re-positioning its research agenda, the Department of Life Sciences (DLS) continued forging ahead with its 6th Research Symposium on April 7th and 8th 2016. The Symposium once again showcased the DLS's research together with the Department of Physics (DP) and the Department of Computing and Information Technology (DCIT). The Symposium is a forum to present some of the Faculty of Science and Technology's research to the rest of the campus community, at the same time it provides opportunities for postgraduate students (and undergraduate students) to acquire and develop academic skills. Such skills include preparation of oral presentations and/or posters or videos for peer review and critique- which are quite valuable for young researchers. At this year's Symposium, for the first time- we had a few presentations by new lecturers within the DLS. This was quite successful giving these young Faculty members an opportunity to present their research and interests to both staff and students.

The research presented at the 2016 Symposium were again the result of rigorous basic and applied research conducted and in this instance, was central to the theme for 2016 which was Sustainable Development. This is especially of relevance for small island developing states (SIDs) such as Trinidad and Tobago and other Caribbean territories. It is clear that our research and researchers are attempting to find solutions to solve local, regional and global problems which affect the environment and not least of all- people. In this respect some of the DLS's oral and video presentations focused on baseline wildlife data collection as well developmental and evaluation studies in botany and molecular ecology. Several poster presentations circled around molecular biotechnology and its various applications. On the other hand we had DCIT's oral presentations providing a predictive approach to solving life's challenges with various modeling applications and DP bridging the gap between the biological realms and a calculated approach to these challenges.

Collectively we had topics traversing multiple taxa and scientific disciplines ranging from lionfish habitat selection to misconceptions of our local scorpions and heart rate monitoring to diabetes, highlighting the integrated nature of our Faulty of Science and Technology. These are only just a few topics. We trust that we have intrigued you enough by now- this volume promises a good read of some very interesting research abstracts. Enjoy and see you at the 2017 event!

Guest Editors
Dr. Judith Gobin,
Prof. Dave Chadee
Mr. Ryan S. Mohammed

POSTER PRESENTATIONS
Department of Life Sciences
Post Graduate Poster Abstracts

SEXUAL MATURITY AND DIET OF *RHIZOPRIONODON* SHARKS LANDED BY THE ARTISANAL FISHERY OF TRINIDAD

Lauren Ali and Judith Gobin
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
lauren.ali@my.uwi.edu

This study examined the artisanal shark fishery of Trinidad with an emphasis on the *Rhizoprionodon* genus. Forty-six *Rhizoprionodon* sharks were collected from sites in Toco and Moruga from January to March 2016. Species, length, weight, gravidity, presence of ova, uterus width and length and calcification of claspers were recorded. A questionnaire was also given to fishermen to gather broad data on the shark fishery. Clasper calcification and sperm were observed in 77.78% of males. 67.68% of females possessed ova and 32.14% were gravid. The maximum number of embryos per female was 8. 48.48% of embryos were female and 51.52% were male. Of 22 stomachs containing food, 14 held identifiable prey including crustaceans as well as members of the Trichiuridae, Atherinopsidae and Clupeidae families. The questionnaire indicated the presence of a variety of sharks throughout the year, with increased landings during the dry season and a decline in the rainy season. It was noted that shark catches have declined overall. Commonly landed sharks include *Rhizoprionodon* spp. *Sphyrna* spp., *Mustelus* spp. and *Carcharhinus* spp. The questionnaire indicates that the overall shark population has been overexploited. *Rhizoprionodon* are widely considered more sustainable than other sharks since they mature relatively quickly, making them a good alternative to more vulnerable species. This study shows the majority of *Rhizoprionodon* were sexually mature within a size range of 50-117cm.

ASSESSMENT OF NATIVE SEAWEEDS FOR PHYTOSTIMULANT AND PHYTOELICITOR PROPERTIES IN TROPICAL VEGETABLE CROPS

Omar Ali, Jayaraj Jayaraman and Adesh Ramsubhag
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
omar.ali1@my.uwi.edu

To determine the mechanisms in which native seaweeds play in promoting overall plant health and yield in tropical vegetable crops.The research begins with collection of a few seaweed species in Trinidad, followed by alkaline extraction.Tomato and sweet pepper will be treated with extracts then inoculated with foliar pathogens (*Xanthomonas vesicatoria* and *Alternaria solani)* followed by measurements of growth and disease parameters. After, the best performing seaweed extracts will be used to determine the influence of defence enzymes and phenolic levels activity, the influence on defence pathway marker genes and defence genes expression-transcript levels through quantitative real time polymerase chain reaction (qRT-PCR) involved in the salicylic acid (SA), jasmonate (JA) and ethylene (ET) pathways and several defence and growth related genes. Duplicated field experiments for wet and dry seasons will also take place for measurements of growth, yield and disease incidences. The microbial communities in the rhizosphere and phyllosphere and endophytes of both crops as influenced by application of seaweed extracts will be determined by community profiling through DNA/RNA sequencing and qPCR for microbial population quantification. This investigation would unravel the mechanisms of plant growth and induced resistance influenced by seaweed extracts over a three year period. The study of the phytostimulant and phytoelicitor properties of the local seaweeds will provide effective means for efficient utilisation of this inexpensive resource since extensive use of agrochemicals leads to the accumulation of toxic residue in produce, development of resistance by pathogens, increased production costs and causes an enormous environmental concern.

A SITUATIONAL ANALYSIS OF BREAST CANCER EARLY DETECTION SERVICES IN TRINIDAD AND TOBAGO

Kimberly Badal*[1], Wayne A Warner[2], Marisa Nimrod[3], Adaila Russel*[1], Melissa Nathan*[1], Rajini Haraksingh[1] and Adetunji Toriola[4].

[1] Department of Life Sciences, The University of the West Indies, Trinidad and Tobago

[2]Oncology Division, Washington University School of Medicine, St. Louis, MO

[3]National Radiotherapy Centre, St James Medical Complex, Trinidad and Tobago

[4]Department of Public Health, Washington University School of Medicine, St. Louis, MO

*Co-presenters

kim.badal@gmail.com

T&T has the second highest breast cancer (BC) mortality rate in the Americas and BC incidence and mortality rates have steadily increased over time and are projected to further increase. One explanation for T&T's increasing BC rates is the lack of a health systems approach to cancer control aided by a comprehensive National Cancer Prevention and Control Plan. The World Health Organisation in its "Cancer Control: Knowledge into Action - WHO Guide for Effective Programmes" series, suggests that a country first assess the cancer problem, programs and services offered. To date, no research describes the services offered for BC prevention, treatment or diagnosis in T&T. As BC early detection increases survival by as much as 80%, screening measures should be emphasised as way to reduce BC mortality rates. The quality, availability, affordability and accessibility of BC screening services in the public and private sector will be assessed with a national survey. As a new measure, the survey's validity and reliability will be tested. Service availability and access, systems for patient reminders, public outreach, equipment quality control and program evaluation will be studied. Geographic disparities in the accessibility and affordability of BC screening services will be mapped across T&T. Gaps in service will be identified and recommendations put forth to turn individual efforts into a national planned effort.

THE IMPACT OF CLIMATE CHANGE AND SEA-LEVEL RISE ON THE WEST COAST OF TRINIDAD, WEST INDIES.

Shane Baldeosingh[1], Hamish Asmath[2], Ricardo Clarke[1], Joan M. Sutherland[3], John B. Agard[3] and Dave D. Chadee[3*]

[1] Environmental Physics Laboratory, Department of Physics

[2]Institute of Marine Affairs, Chaguaramas, Trinidad

[3]Department of Life Sciences, The University of the West Indies, St Augustine, Trinidad, W.I.

shane2096@yahoo.com

The main objective of this study is to investigate the impacts of climate change and sea-level rise on the west coast of Trinidad, West Indies; using Arc Geographic Information Systems (GIS) and the climate change modelling program SimCLIM. To determine the land area, land cover types, buildings and roads at risk from sea-level rise inundation, a digital elevation model (DEM) for the study area was created. The spatial modelling and analysis was conducted in ESRI ArcGIS 10.0 (ESRI 2010), only areas that were directly connected to the sea were analysed. The DEM of the study area was then used to evaluate the area that would be inundated by sea level rise for each SimCLIM scenario. SimCLIM is an integrated modelling system which assesses climate change impacts and adaptations. It provides a range of applications which can assist in climate proofing across various sectors including: Water, Agriculture, Health, Ecosystems, and Coastal zones (including sea-level rise and coastal erosion) (Li and Kouwenhoven et al. 2011). SimCLIM was used to generate sea level rise projections for each RCP scenario for the Gulf of Paria using the base line year, 1995, to the final simulation year of 2100.Impact models for sea level rise, for RCP scenarios in the year 2050 showed that between 26.67 and 148.10 kilometrers of road will be lost, between 1092 and 3378; buildings will be lost or submerged by water, between 990.49 and 7980.81

hectares of land will be affected by salt water intrusion, respectively. It is important, therefore, that adaptation strategies be developed and implemented to slow down or mitigate future impacts of climate change and sea-level rise. These results suggest that adaptation strategies should be phased presently and in the future, which will aid to cushion the impacts of the rising sea levels, for reducing the impact of salt water intrusions on agricultural lands, the destruction of crops, damage to fresh water ecosystem, and the potential loss of communications networks and infrastructure such as roads and bridges along the west coast of Trinidad, West Indies.

PREVALENCE AND CHARACTERISATION OF ANTIBIOTIC RESISTANT *KLEBSIELLA PNEUMONIAE* ISOLATED FROM PATIENTS IN THE MAJOR HOSPITALS OF TRINIDAD AND TOBAGO

Aarti Pustam, Adesh Ramsubhag and Jayaraj Jayaraman
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
aartipustam@hotmail.com

To investigate the prevalence and molecular characteristics of antibiotic resistant *Klebsiella pneumonia* isolated from patients in the major hospitals of Trinidad and Tobago. Using the Z- score formula at a 95% confident interval, 5% margin of error and 0.5 standard deviation a total of 385 samples are to be collected. In specific 148 samples are needed from Port of Spain and San Fernando general hospital, 36 from Mt. Hope and Sangre Grande and 19 from Scarborough General hospital. Molecular methods such as polymerase chain reaction (PCR) will be used to identify the species and to determine the presence of resistant markers and virulence. In addition, traditional biochemical methods such as the antibiotic sensitivity test will be done to determine resistance against antibiotics. Following these methods whole genome sequencing and comparative genomics will be done to determine the genetic variability of isolates and identity of the molecular markers for traits of clinical importance. It is expected that the study will be completed within a 36 month period. Samples will be collected through out in both the rainy and sunny seasons for an entire year. Experiments are to begin as soon as samples are conducted and a time frame of 18 months is given to complete determination of resistant markers and virulence after which the following 6months will focus on whole genome sequencing. This project intends to fill the gap in research for Trinidad and Tobago by the being the very first to look at the prevalence of the resistant markers *Klebsiella pneumoniae carbapenamases* (KPC), virulence factor capsular polysaccharide (CPS) as well as conduct whole genome sequencing of the species. Additionally, baseline data of infections caused by the species will be provided and a functional management system put into place to assist medical practitioners in managing infections caused by the bacteria.

MOLECULAR CHARACTERIZATION OF COPPER RESISTANCE IN *XANTHOMONAS CAMPESTRIS* PV. *CAMPESTRIS* STRAINS INDIGENOUS TO TRINIDAD, TRINIDAD AND TOBAGO W.I.

Stephen Ramnarine, Adesh Ramsubhag and Jayaraj Jayaraman
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
stephen.ramnarine@my.uwi.edu

This study seeks to characterise the levels of copper resistance of *Xanthomonas campestris* pv. *campestris* and evaluate the diversity of copper resistance genes and molecular mechanisms responsible for this phenomena. Bacteria will be isolated from soil collected at farms and from leaves showing symptoms of black rot. These will be screened to determine levels of copper resistance. Molecular analysis of total genomic DNA from the soil and copper resistance isolated will be done via metagenomics and PCR respectively. This will be used to determine the genetic diversity of *cop* genes in the local environment. Farming practices and management strategies currently used in the fields to combat phytopathogenic bacteria will be noted to correlate with the other data collected. Isolation and screening of bacterial isolates should be done by July, by that time some molecular work

will be done to give some idea of the genetic diversity of the *cop* genes in the environment. Field visits to look at management strategies will be ongoing. Previous work has indicated that there are unique variants of *cop* genes present in Trinidadian isolates of *Xanthomonas campestris* pv. *campestris* and worldwide, high levels of copper resistant bacteria have been identified. This study will give many isolates that are copper resistant and add to the ever increasing knowledge about genetic diversity of *cop* genes.

ANTIMICROBIAL ACTIVITY OF MARINE SPONGES AND THEIR ASSOCIATED BACTERIA FROM THE NORTH COAST OF TRINIDAD.

Judy Ramsoondar, Stephen Ramnarine, Jayaraj Jayaraman and Adesh Ramsubhag
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
judyramsoondar@hotmail.com

The screening of marine sponges and their isolated bacteria for antimicrobial activity was conducted. For this project, 16 sponges were collected from four different areas along the North coast of Trinidad. Bacteria were then isolated using two different media types. Crude extracts were obtained via solvent extraction of six sponges and isolated sponge bacteria were grown in broth. Screening was then done via spot plating of both the crude extracts and the broth cultures against eight human pathogens. Inhibition zones were measured in millimeters. It was observed that two out of the six sponge crude extracts and 11 out of 200 isolated bacteria were seen to have antimicrobial activity against one or more of the seven pathogens tested. It was observed that both marine sponges and their associated bacteria are potential sources of antimicrobial activity. The observed antimicrobial activity might be due to secondary metabolite production of the sponges and bacteria as part of their survival mechanisms.

Department of Life Sciences
Under Graduate Poster Abstracts

DIVERSITY OF MUD-DAUBER WASPS (*TRYPOXYLON*) IN A SECONDARY FOREST OF TRINIDAD, WEST INDIES

Pauline A. Geerah* and Christopher K. Starr
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
pauline.geerah@sta.uwi.edu

Our purpose was to record the species of *Trypoxylon* in a secondary forest of Trinidad, while observing seasonal abundance.Over a two-year period we operated two flight-intercept traps for insects in a well-developed secondary forest in the Arima Valley of Trinidad. Measurement of species diversity was determined using Shannon-Wiener indices of H', while f0 (Chao1 method) was calculated to estimate the number of species present but not recorded. A Paired t-test was conducted to test the null hypothesis of no significant difference between *Trypoxylon* abundance in the dry and wet season.

The traps yielded a total of 340 *Trypoxylon* (276 females and 64 males), representing 30 species with a diversity index of H' = 2.53. This was higher than that found in a comparable study of *Trypoxylon* at one locality on the small island of Tobago (15 species, H'= 2.09) and one on the even smaller Little Tobago (6 species, H'= 1.41). Analysis of the samples indicated species numbers recorded on the two smaller islands are complete or almost complete. In contrast, it was projected there are four additional species (f0 = 4.17) at the Trinidad locality. Of the five most abundant species (females) in our samples, all appeared to be active throughout the year, displaying no seasonal variation ($p<0.05$). Lack of seasonality in *Trypoxylon* is perhaps linked to food availability year-round.

A RAPID ASSESSMENT OF THE NEARSHORE CORAL COMMUNITY STRUCTURE AND DIVERSITY PATTERNS AT THE EASTERN SIDE OF PIRATE'S BAY, TOBAGO

Ann-Marie Carrol, David Toussaint, Danielle Allen and Niamh Vaughan
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago.
david.toussaint@my.uwi.edu

To assess the community structure with respect to nearshore depth-related zonation at Pirate's Bay, northeast Tobago. Shallow reefs (>5m) at 1m and 3m depth at Pirate's Bay, northeast Tobago, were surveyed from 5 to 6 March 2016. Standard AGRRA methods were employed to determine benthic coverage, where at each depth five 10-m transects, oriented perpendicular to the shore were assess using photoquats. Along each transect a total of five photo quadrats were done at every other meter and on alternating sides of the transect. Photographs were analysed using CPCe software to determine bottom cover and species diversity. Analysis of the data is still underway; however preliminary results indicate that the zoanthid, *Palythoa caribaeorum*is the dominating benthic species, accounting for over 45% live bottom cover at the 1m depth. However at the 3m depth, *Millepora alcicornis* was the dominant species, followed by the hard coral *Montastraea faveolata* and turf algae. A wider diversity of coral species and a more complex community structure are expected to be found at the 3m depth. Due to the remoteness and low human population density associated with Pirate's Bay reef, this shallow reef zonation assessment may provide useful comparisons with neighbouring reefs associated with a relatively high human population density.

VIDEO PRESENTATIONS
Department of Life Sciences

STRAIGHT OUTTA MARAC: AN INVESTIGATION INTO THE MICROBIAL DIVERSITY OF TAR PITS

Renee Ali, Akilah Stewart, Vishal Rangersammy, Anand Hanuman and Adesh Ramsubhag
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
ren.ali28.ra@gmail.com

Previous studies using culturable approaches have revealed the existence of genetically diverse microbial communities living under extreme environmental conditions. With the recent advances in metagenomic approaches, it is now possible to target the non-culturable portion that can be tapped for novel bioactive compounds, as well as genetically new species. Tar pits are unique, undisturbed natural ecosystems best suited for discovering such biodiversity. These natural seeps are formed from the upward seepage of hydrocarbons and mud, mixing with gases under high pressure. A total of ten samples of mud, liquid hydrocarbon and water samples were randomly collected throughout the study site. Genomic DNA was extracted and shipped for Illumina Miseq sequencing. The results revealed diverse microbial community structures present in Marac including a number of unclassified and non-culturable bacterial groups which accounts for the top genera isolated. The relative operational taxonomic unit abundance in the samples suggests that the top genera isolated may belong to a core community of organisms that contribute to the indigenous microbial community structure in this unique environment.

SCORPIONS: STALKERS OF THE NIGHT OR JUST MISUNDERSTOOD, 'AH SCORPION STING MEH, I FEELIN I GO DEAD…..'

Rakesh Bhukal, Kerresha Khan and Ryan S. Mohammed
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
rbhukal101@gmail.com

The analysis of niche separation among scorpions in low-land evergreen forests was investigated along with the determination of their microhabitat preferences was investigated. We also determined persons knowledge, attitude and perceptions (KAP) to scorpions. How do multiple species of scorpions exist in the same geographic location? Is the public generally misinformed about scorpions? Multiple species of scorpion will co-exist in a geographic location due to microhabitat selection.

Over a four month period during December 2015 to March 2016 a total of 16 sampling events were conducted; two per site (Arena and Bush Bush Forest) per month. The GPS coordinates and microhabitat of each species was noted. A GIS map was built indicating species distribution and this was followed by a correlation analysis between species and microhabitats. During the same sample period, 60 questionnaires were distributed in Tunanpuna/Piarco Regional Corporation and the Princes Town Regional Corporation. This data was also analysed to determine demographic changes in KAP of scorpions.

Each species shows a statistical preference for a particular mico-habitat however some generalist will show niche overlap. There are demographic differences regarding the KAP of scorpions. Each species would occupy a different microhabitat within the same geographic location in the low-land evergreen forest.The public is misinformed about scorpions however this may be rooted in cultural differences.

SUSTANABILITY OF THE FISHERY SECTOR IN TRINIDAD AND TOBAGO

Raajeshwaree Deolal, Amelia Fuentes, Philicia Martin, Jeremy Ramdass, Aaron Seemungal and Rishi Singh
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
raajeshwaree.deolal@sta.uwi.edu

The main objective of this short video presentation is to highlight the contributing factors leading to the decline in marine fish populations. This piece also serves to evaluate the need for sustainability within the fishery while proposing aquaculture as a possible mitigation measure.The research for this piece encompassed both primary and secondary sources of data. The primary source of data collection was obtained through a series of detailed interviews and rigorous questions of experienced fishermen to evaluate the state of the marine fishery and also a coordinator for a major aquaculture movement in Trinidad to evaluate its feasible as an alternative source of fish. The secondary sources include a myriad of online articles and journals from well versed sources.

The results obtained indicated that anthropogenic activities were the main contributing factor to the decline in the marine fishery. This includes man-made disasters (oil spills), use of small marsh trawling nets which has unnecessary by-catch and also destroy deltas and the lack of regulation regarding size where any size fish can be legally caught and marketed even if they have been allowed to reach sexual maturity and reproduce. In terms of the aquaculture project, it can play an auxiliary role to combat the problem proposed above however the program is still in its budding stage and more research is necessary. Updated fishery legislations and management systems as well as further resource allocations to aquaculture research and sub-sector fish farms are needed to increase the sustainability of the fishery sector in Trinidad and Tobago.

OUR EARTH IS "TYRED"

Kysean Phillip, Mariah Bayn, Nicholyn Bassan, Samantha Elliot and Kwesi Fournillier
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
kysean.s.phillip@hotmail.com

The investigation of the life cycle of a tyre by looking into the environmental impacts of its manufacturing, the disadvantages of its disposal and the advantages of its recycling was undertaken. Our aim is to educate and encourage the public to move from 'cradle to grave' thinking and focus on sustainable ways to recycle tyres and save our environment.

The study was conducted by firstly looking into the manufacturing of tyres while examining the environmental impacts of each raw material being utilised for the process. We then proceeded to show how tyres are disposed of in the environment such as dumping and burning along with their detrimental effects to humans and the Earth, this was done through the use of online research articles. The group also took a field trip to the EMA office, Port of Spain to further conduct research and collect images of poor disposal of tyres around Trinidad. The group also decided to look into innovative ways to utilise tyres in everyday life by coming together and creating a table made out of a used tyre. An animated video approach was used to demonstrate our data with a main character named Tyler the tyre to show case the birth and death of a tyre and its impacts throughout its life time.

In 2011 the Trinidad and Tobago Daily Express reported that 13,163 cars were sold for that year. These amounts to 52,625 tyres assuming that the vehicles sold are all four wheelers but this value does not even take into account the amount of tyres that's on newly imported vehicles and those that are already on our nation's roads. According to Trinidad and Tobago's Minister of the Environment and Water Resources appointed in 2012-2015, Mr Ganga Singh, 800,000 tyres are dumped per year in Trinidad and Tobago. Research showed that there are more advantages of recycling than there are disadvantages of dumping tyres in the environment therefore aiding in the drive towards a sustainable future.

THE EFFECTS OF FAMILY PRESSURE ON STUDENTS TERTIARY DECISIONS AT THE UNIVERSITY OF THE WEST INDIES

Aarti Pustam, Denny Singh, Omar Ali and Stephen Ramnarine
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
aartipustam@hotmail.com, dennysingh@live.com, brianali1230@gmail.com, stephen.ramnarine@gmail.com

We investigated and assessed how family choices play significant roles in Tertiary Education options for children and examine the relevant ethical issues present in such a case. The research will be done on the various faculties of The University of the West Indies St. Augustine Campus. Over a two-month period students will be randomly selected across different faculties and examined with the aid of interviews and questionnaires.

The results will be compiled, subjected to statistical analysis and observed trends presented in a video format. Studies have shown that some parents put certain expectations on their child, deciding which study pathway he/she should follow while others simply pressure their children to follow the so called elite pathway of education such as medicine, law or engineering, even though this may not have been the preferred field of study by the students. The number of students who suffer with anxiousness, depression and dissatisfaction are increasing and can be attributed to the messages sent by parents. The results of this research will assist in determining whether or not a significant number of students at The University of the West Indies St. Augustine Campus face family pressures in a manner that robs them of their personal autonomy in their Tertiary Education choices.

ORAL PRESENTATIONS
Department of Computing and Information Technology

APPLICATION FOR THE DETECTION OF DANGEROUS DRIVING AND AN ASSOCIATED GAMIFICATION FRAMEWORK

Keshav Bahadoor
Department of Computing and Information Technology, The University of the West Indies, Trinidad and Tobago, W.I
keshav.bahadoor@gmail.com

Vehicular accidents and accident prevention continue to be a major issue in many countries today. This project considers a smart phone based solution that is used to bridge the gap between negative driving detection and user motivation for safer driving behaviour. The solution, called Project Drive, consists of a smart phone based application that is supported by a hosted web application. GPS and Sensor data captured from the smart phone is relayed to the web application. Here, data partitioning and statistical analysis is conducted. This is then used to award points and badges to users based on their driving behaviour. Due to the small scale prototype testing of six users, a questionnaire was used to gather further analysis for the prototype.

In the aforementioned questionnaire, all users stated that they were interested in trading points earned for a discount at their insurance companies. While Project Drive is still under development, it is able to detect anomalies or outliers in the data collected during driving. After a sufficient build is completed, a larger sample size can be used for testing. By measuring driving behaviour with and without user motivation elements, the effectiveness of Project Drive will be highlighted. Project Drive aims to solve an important issue affecting Trinidad & Tobago and other countries. The useful data gathered from users can also be of benefit to governmental bodies, as well as insurance companies.

ENERGY AWARE AD HOC ON-DEMAND MULTIPATH DISTANCE VECTOR ROUTING

Koffka Khan and Wayne Goodridge
Department of Computing and Information Technology, The University of the West Indies, Trinidad and Tobago, W.I
koffka.khan@sta.uwi.edu

The current disjoint path Ad hoc On-Demand Multipath Distance Vector (AOMDV) routing protocol does not have any energy-awareness guarantees. When AOMDV is used in wireless sensor networks (WSNs) energy is an important consideration. To enhance the AOMDV protocol an extra energy metric is added along with the hop count metric. Simulations were run using the NS2 tool. A WSN network with 150 motes were tested with the additional routing metric.

This Energy aware or EA-AOMDV improves path selection using a trade-off between energy and hop count, thus giving more longevity to WSNs. EA-AOMDV is compared to the current AOMDV routing protocol to prove its worth in the context of WSNs. It is found that EA-AOMDV leads to better WSN energy-awareness in resource constrained WSNs.

ORAL PRESENTATIONS

Department Of Life Sciences

MSc. Biodiversity, Conservation and Sustainable Development in the Caribbean.

DIVERSITY AND SPECIES COMPOSITION OF AMPHIBIANS OF THE ARIPO SAVANNAS SCIENTIFIC RESERVE, TRINIDAD, WEST INDIES

Renoir J. Auguste and Adrian Hailey
Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad
renguste@gmail.com

The aim of this study was to evaluate the diversity and species composition of amphibians in the Aripo Savannas Scientific Reserve (ASSR) in relation to the two major habitat types there, savanna and marsh forest. We conducted nocturnal sampling (6-9 p.m.) in four periods from June to December 2015.Thirty 200 m long transects were sampled in each period (total 120 samples), with ten transects in savanna and 20 in marsh forest. While walking along transects, we visually and aurally sampled species richness and abundance. Microhabitat was noted for all visual records, and air temperature, relative humidity and wind speed at the start and end of each transect.We recorded 895 individuals representing 16 species, 11 genera and seven families. *Pristimantis urichi* was the most abundant species, followed by *Leptodactylus fuscus* and *Scinax ruber*, comprising more than half of the total individuals observed, whereas *Leptodactylus hylaedactylus* was least encountered (1 individual). Five individual *Hypsiboas boans* represent a new species record for the ASSR. We recorded greater diversity of amphibians in marsh forest (S = 16, N = 697, H'=2.12, D = 2.86) compared to savanna (S = 3, N = 198, H'=0.44, D = 2.33).Greater diversity in marsh forest was expected, given the larger area and greater variety of microhabitats for amphibians compared to savanna. These results can be used to implement more effective conservation measures for amphibian species within the ASSR.

NICHE SEPARATION OF SCORPIONS IN LOW-LAND EVERGREEN FORESTS IN TRINIDAD

Rakesh Bhukal, Christopher K. Starr and Luke Rostant
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
rbhukal101@gmail.com

The aim of this study was to analyse niche separation among scorpions in low-land evergreen forests in Trinidad and determine their microhabitat preferences.

Surveys were conducted between the hours of 8-12 pm over a four month period (December 2015 to March 2016) at two sample locations:Arena Forest and Bush Bush Forest Reserve. Ultra-violet flashlights of wavelengths 395nm were used to locate specimens and the GPS coordinates for sightings recorded. Set trails were walked at each sample location and microhabitats from the ground to the sub-canopy level were surveyed. Specimens were collected with large forceps by gently clasping their telson and species were identified in the field by visual observation. Only difficult to identify species were removed for microscopic analysis. The microhabitat of each specimen collected was identified over a total of six sampling events per sample location.

A total of 613 scorpions were found in the surveys conducted for the two sample locations, comprising of two families, four genera and seven species. Seven species of scorpions were found in Bush Bush and five species in Arena forest. It is expected that each species would show a preference for particular microhabitats indicating resource partitioning (eg. *Microtityus rickyi* was found exclusively on trees with loose bark) however some generalists will show niche overlap by having a preference for multiple microhabitats (eg. *Tityus tenuicauda*).

Each species would occupy a different microhabitat within the low-land evergreen forests of Arena and Bush Bush as a mechanism to facilitate resource partitioning as this reduces interspecific competition and allows for co-existence.

AN ASSESSMENT OF THE ENRICHMENT EFFECTS OF OIL SEEP FLUIDS ON FAUNA IN THE GULF OF PARIA

Terrence Greig and John Agard
Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad
terrance.greig@gmail.com

The effects of hydrocarbon input in the marine environment are an important consideration in the development of monitoring programs and oil spill action plans. The effects on persistent weathered hydrocarbon inputs from seeps on macrobenthic community structure are poorly understood. Large gaps in knowledge of seep macro-benthos exist. The primary objective of this study is to describe the community structure of macro-benthos exposed to persistent weathered petroleum hydrocarbon outputs at different distances from oil seeps in the Gulf of Paria. The study was designed to examine changes in seeps in macrobenthic community structure at different distances from an active oil seep. The study was conducted by collecting triplicate biological sample grabs along a 300 meter transect at 50 m intervals. Specimens collected were identified to the lowest possible taxonomic level and abundance measures recorded. Sediment grain size analysis and tests for total hydrocarbons were carried out using a fourth grab. Non-metric multidimensional scaling (nMDS) was used to examine the similarity of species compositions among sample sites and principle component analysis (PCA) to group sites with similar responses to abiotic characteristics. Stations appear to be grouped along a gradient of total hydrocarbon concentration. Macrobenthic communities at sites with the lowest concentrations of hydrocarbons showed the highest diversity in taxa and abundance in individuals while sites with high concentrations of hydrocarbon showed depressed diversity and abundance of macrofauna. The seep site showed macrobenthic community structure different from non-seep sites. Findings suggest hydrocarbons from oil seeps have a toxic effect on macrobenthic fauna and macrofauna present at seep sites are unique.

AN ASSESSMENT OF THE OILBIRD POPULATION AT THE DUNSTON CAVE IN TRINIDAD

Keshan Mahabir and Luke Rostant
Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad
keshan.mahabir@mysta.uwi.edu

The objectives of the study were to use broad-scale satellite imagery (EVI) as well as rainfall data to model population size and breeding patterns of Oilbirds, examine changes in the size of the Oilbird population, and determine whether the diet of the Oilbirds has changed from prior studies. Population data for the Oilbirds at the Dunston's Cave was recorded on a monthly basis for 10 years which included the numbers of adult birds and chicks observed each month. For the same period, Enhanced Vegetation Index (EVI) data from the MODIS satellite and rainfall data from the Water and Sewerage Authority (WASA) was obtained. Cross correlation analysis and ANOVA tests were carried out on the population, rainfall and EVI data. Seeds were collected from the Dunston Cave in October 2015 to compare to data collected in the 1960's. Cross correlation analysis revealed an inverse relationship between the numbers of adult Oilbirds and chicks, and the rainfall and EVI data. There was a significant declining trend in the EVI of the Arima Valley ($p<0.01$) and a general increase in the population of Oilbirds at Dunston's Cave ($p <0.01$). There were also significant differences in the composition of seeds collected to that of Snow, 1962 ($p<0.01$). EVI and rainfall data were successful at modelling the Oilbird population and the diet has changed regarding the ratio of fruit families consumed. There is a well-defined breeding season from December to May (the dry season) for the Oilbirds in Dunston's Cave.

ALTITUDINAL VARIATION IN BUTTERFLY COMMUNITY ASSEMBLAGE IN THE ARIMA VALLEY

Shahada Paltoo and Luke Rostant
Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad
shahadapaltoo@gmail.com

The objective of this study was to determine the effects of differential disturbance regimes on butterfly faunal community structure along varied elevation gradients in the Arima Valley. The study sites, Simla, Asa Wright and Morne Bleu (in increasing altitudinal order) each had seven (7) fruit baited inverted cone butterfly traps set up 10-15 m apart. Specimens were identified and marked in the field or collected for identification every three days during November 2015 to February 2016. Weather stations were placed at each site to monitor abiotic factors such as rainfall, temperature, humidity and altitude. This study allowed for a better understanding of the butterfly faunal community structure at various elevations (<500m, 500-1200m, >1200m). Quarry area was expected to have a lower population of butterflies. It was expected that abiotic factors such as rainfall, humidity, temperature and altitude influence butterfly faunal community structure. Rainfall influences butterfly abundance most across the different habitat types, with sites lower than 500m having higher abundance than <500 m. *Colobura dirce* is expected to be the indicator species

AN ASSESSMENT OF THE MARINE RESOURCES AT MACQUERIPE BAY.

Marianna Rampaul, Judith Gobin, Lee Ann Beddoe-Bhagan and Luke Rostant.
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
marianna.rampaul@outlook.com

The objective of this study was to develop a detailed characterisation of Macqueripe's reef ecosystem and examination of possible natural and anthropogenic threats. Study components: (1) Establishment of nine underwater transects for photo-quadrat and belt-transect surveys (August-October 2015.) (2) Examination of *E. coli* and Enterobacteriaceae contamination. (3) Physical water quality monitoring (during belt-transect and bacterial sampling.) (4) Questionnaire administration to determine stakeholder usage, observations and attitudes towards resource management. Preliminary analyses reveal varied benthic and non-benthic diversity (Shannon diversity: 1.10 1.86 (non-benthic) and 1.12-1.33 (benthic). Macqueripe is dominated by algal and zoanthid species (33.8% ± 4.9SE and 24.4% ±7.8SE) with low coral abundance (0.9% ± 0.4SE). Total herbivore biomass was positively correlated with algae ($p=0.021$) and benthic diversity ($p=0.036$). Correlation using parrotfish-surgeonfish biomass was not significant, suggesting damselfish contribute to overall herbivore correlation. Neither algae abundance nor depth correlated with benthic diversity, indicating other factors (water quality/wave energy) may be significant influences. Bacteriological analyses show evidence of sewage contamination. Algal dominance threatens cnidarians colonies expansion via natural and anthropogenic stressors. Herbivore population sizes may be ineffective in controlling algae. Naturally high wave energy and turbidity may also significantly influence benthic diversity. Further analysis will provide additional insight into anthropogenic-natural pressures and user conflicts. These data are necessary to elucidate whether long-term ecosystem viability and recreational uses are threatened and to recommend solutions.

TERRESTRIAL MAMMAL COMMUNITIES AND ACTIVITY PATTERNS OF THE ARIMA VALLEY, TRINIDAD

Richard Sorrillo and Luke Rostant
Department of Life Sciences, The University of the West Indies, St. Augustine, Trinidad
sorillo62@gmail.com

The objective of this study was to examine the communities and activity patterns of terrestrial mammals in the Arima Valley. A total of ten (10) camera traps were set in the Arima Valley over the period of 1 year. Three locations were targeted; Simla, Asa Wright and Morne Bleau, with three cameras in Simla and Asa Wright, and four in Morne Bleau. All cameras were spaced approximately two hundred (200) meters apart. Cameras were serviced once a month, and all pictures were processed to determine the structure of the terrestrial mammal communities at these three sites, and the activity patterns of these species. It was expected that the mammal community at the Morne Bleau site will be the most diverse as this site has the least human traffic. It was also expected that the rate of capture of terrestrial mammals will decline from October to December during the hunting season, compared to the period before this. The results of this study will provide important baseline information on the communities of terrestrial mammals in the Arima Valley, and will also provide information on species' activity patterns.

ORAL PRESENTATIONS

Department Of Life Sciences
MPhil's and PhD's

INTEGRATED DISEASE MANAGEMENT OF COWPEA (*VIGNA UNGUICULATA* L. WALP) IN TRINIDAD

Sophia DeAspa, Jayaraj Jayaraman and Adesh Ramsubhag
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
sophia.deaspa@sta.uwi.edu

The use of chemicals is common practice among farmers in Trinidad and since there are no laws in place to monitor their usage, they are often misused during a single growing season. Cowpea, a commonly grown vegetable in Trinidad which is susceptible to a number of diseases and viruses, is no exception to this practice. This research, using cowpea as a model, investigated the effectiveness of various Integrated Disease Management (IDM) strategies. The main aim of this study was to develop an IDM strategy that would be more sustainable and require less synthetic chemical input when growing this crop. To achieve this aim four (4) half acre field trials, in total, were set up with two (2) trials each conducted during the dry season and rainy season. The fields were treated with various combinations of cultural, bio-control, elicitor and chemical treatments at different stages of development. The fields were visited several times to undertake disease incidence scoring, which was done by employing a set scale.

On completion of the trials, the data collected revealed that the IDM strategies implemented were more effective than the common techniques used by local farmers. The IDM strategies in this study can be conveyed to farmers as a possible option through which cowpea farming can become more cost efficient, environmentally friendly and thus more sustainable.

UNDERSTANDING THE GENETIC ORIGIN AND DIVERSITY OF COCOA IN UGANDA

David Gopaulchan, Lambert Motilal and Pathmanathan Umaharan
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
davidleewriter@gmail.com

Cultivated cacao (*Theobroma cacao* L.) is an important cash crop grown in many tropical countries. Its fruits contain seeds which provide cocoa mass and butterfat, the raw materials of the multibillion-dollar confectionery industry. Traditionally, it was thought that cocoa was composed of three main types, Forastero, Criolloand Trinitario which are Forastero x Criollo hybrids. Cacao was introduced in Uganda in the 1880's and plants were believed to be of the Trinitario type. Efforts are being taken to develop the cocoa sector in Uganda, however trees with desirable breeding traits need to be identified for conservation and propagation. The aim of this study was to evaluate the genetic diversity and structure of cacao cultivated in Uganda. Using a high-throughput genotyping system for SNP markers, 125 cacao trees from Uganda were fingerprinted along with 115 reference trees representing the major genetic groups, maintained at the International Cocoa Genebank, Trinidad (ICG,T).

Genetic diversity and heterozygosity were high in the Ugandan collection and were comparable to ICG,T samples assayed. Analysis of molecular variance showed that the majority of genetic differentiation (87%) was attributed to the variation within individuals, while 12% was due to differences among individuals and 1% to differences between samples from central and western Uganda. This is the first study to characterise Ugandan cacao landraces at the molecular level. The findings provide new insights into the origin and diversity of the germplasm.

CHARACTERISATION OF THE REGIONS OF THE HUMAN GENOME THAT APPEAR INTOLERANT OF STRUCTURAL GENOMIC VARIATIONS.

Stefan Hosein[1] and Rajini Haraksingh[2]
[1]Department of Computing and Information Technology
[2] Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
stefan.m.hosein@gmail.com

Human genomes vary from each other by sequence variations and structural variations. Recently, the advent of high-resolution sequencing and microarray technologies has allowed more precise mapping of this variation among human genomes. While much attention has been given to defining the variable regions of the human genome, little work has been done to investigate the regions of the genome that do not seem to tolerate structural variations. We hypothesise that the reason these regions have not yet been observed to harbour SVs, despite the collective extensive efforts to map all the variable regions of the genome, is because they are responsible for critical processes of human life. Here, we have defining the regions of the human genome that have not been observed to harbour structural variation and analysed their gene content to gain an understanding of which biological processes are encoded in these regions.

NITROGEN FIXING VARIABILITY AND ITS ASSOCIATION WITH MORPHO-PHYSIOLOGICAL TRAITS IN VEGETABLE PIGEON PEA (*CAJANUS CAJAN* (L.) MILLSP.) BRED FOR YEAR – ROUND PRODUCTION

Albertha Joseph –Alexander[1], Pathmanathan Umaharan[2], Adash Ramsubhag[1] and Gregory Gouveia[3]
Department of Life Sciences, Faculty of Science and Technology[1], Cocoa Research Centre[2]
Department of Food Production, Faculty of Food and Agriculture[3]
alberthaj@hotmail.com

Previous research has shown that variation exists for Biological Nitrogen Fixation (BNF) in legumes, however the extent of BNF ability in short duration, dwarf, vegetable pigeon pea varieties developed at The UWI has not been investigated. This study thus investigated whether variation also exist for nitrogen fixation in these pigeon-pea varieties and assessed criteria that can be used for selection in breeding programmes. Recombinant inbred lines (RILs) produced from crosses involving two popular indeterminate traditional varieties and a high yielding dwarf variety were screened separately in N – rich and N – depleted soils using a randomised complete block design with two replicates and subsequently classified as good or poor fixers. Sixteen RILs, representing each cohort, was further evaluated for below ground morphological characteristics and leaf nitrogen content using a similar design. With a subset of 10 RIL's, BNF was determined using ^{15}N isotope techniques.

There was a general association between the classification groups determined based on response to N-application and total BNF/ ha. Percentage nitrogen derived from fixation (% Ndfa), was exceptional and ranged from 97 to 99% with an average of 98.4 ± 0.08%, indicating limited genotypic variation for this trait. In contrast there was a large and significant variation in total nitrogen fixed in seed, ranging between 3.3 - 35.5 kg/ha (18.5 ± 1.12kg/ ha) and was associated with total root and leaf dry matter and total leaf nitrogen. The ability to produce leaf dry matter in low N soils can be used as selection criteria for BNF in breeding.

DIVERSITY AND ACTIVITY PATTERNS OF MAMMALS AT SPRINGHILL ESTATE, ARIMA VALLEY, TRINIDAD

Mike G. Rutherford
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
mike.rutherford@sta.uwi.edu

The diversity and activity patterns of nonvolant terrestrial mammals along trails in a protected area in secondary forest in Trinidad were investigated. Camera traps were set up along a trail at the Asa Wright Nature Centre for a period of 19 months. Images were sorted to species and the metadata was analysed to examine variation in activity over a 24 hour period and in relation to the lunar cycle.

A total of 11 species/groups of mammals were recorded. The red-rumped agouti was the most numerous species followed by small rodents (unidentifiable to species), common opossum, lowland paca, nine-banded armadillo and ocelot. The agouti were strictly diurnal whilst the rodents, opossum, paca and armadillo were strictly nocturnal. The ocelot was mostly nocturnal. Only the armadillo was significantly more active during a new moon compared to a full moon. The other species that were seen were in such low numbers that they were not included in the activity analysis. The diversity of species recorded was as expected for the locality, all species had been previously recorded in the valley. The activity patterns also followed known patterns for the species that were analysed. Camera trapping at other sites with different forest types and levels of protection could provide more useful information on mammal activity and diversity.

KNOWLEDGE, ATTITUDES AND PRACTICES OF COMMUNITIES TO FLOOD PREVENTION IN NORTH AND SOUTH TRINIDAD, WEST INDIES.

Denny Singh and Dave Chadee
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
dennysingh@live.com

This study was conducted to determine the knowledge, attitudes and practices of two communities, Barrackpore and St. Augustine, Trinidad, which have a history of major flooding events. A KAP questionnaire was developed using both categorical and quantitative questions of open, closed, and semi-closed styles. Questions covered demography and socioeconomics parameters, as well as, knowledge and understanding of the causes of flooding, and to elicit the communities' attitudes and practices for preventing or coping with flooding episodes. A total of 359 questionnaires were administered in the two flood-prone areas of Trinidad, 45% (163) in Barrackpore and 55% (196) in St. Augustine. Ninety-eight percent of the respondents from Barrackpore and 55% from St. Augustine knew that where they lived was flood-prone. They identified the main causes of flooding as poor drainage and proximity to rivers, and they identified the time at which flooding was likely to occur, but did not develop flood protection strategies, or a flood recovery plan. Special attention should be paid to improving the drainage systems, implementing an early warning system for flood-prone areas, educating householders on flood prevention and developing community participation programs in collaboration with government to prevent dumping of garbage in water courses.

ORAL PRESENTATIONS
Department Of Life Sciences
Undergraduate BSc.

PREVALENCE OF INTESTINAL PARASITES (HELMINTHS) IN LOCAL DOMESTICATED DUCKS OF TRINIDAD.

Brandon R. Mohammed and Dave Chadee.
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago

Parasitic infections are often overlooked, in comparison to bacterial, fungal and, even viral diseases. Little to no research has been done, in terms of identifying parasites found within Trinidad and Tobago. Therefore this research seeks to fill the gap, by accessing the prevalence of intestinal helminths found in local domesticated ducks. Ten random samples sites were chosen, based on availability and willingness to participate in the research, of which ten stool samples of ducks will be taken and analysed for eggs and cyst of intestinal helminths. The stool samples would be treated using a concentrated sedimentation technique as described by Soulbsy, 1982, which would allow for better recovery of the eggs and cysts in the sample compared to direct analysis. Despite being in a tropical climate, since the research is being conducted during the dry season, it is expected that at least 50% of the sample size to be infected with intestinal helminths. This is assumed based on the fact that farmers, utilise free range management systems, or confined environments, where the water supply is stagnant and therefore will be contaminated since ducks are ideally waterfowls. These finding would be useful for produces, both commercial and small scale farmers, in terms of preventing unnecessary economic loss as well as consumers, in terms of general well-being and in worst case, mortality.

THE DIVERSITY AND ABUNDANCE OF *PHASMATODEA* IN A RANGE OF NEO-TROPICAL HABITATS IN TRINIDAD AND TOBAGO

Avion Phillips
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
avion.phillips@my.uwi.edu, avion_phillips@outlook.com

The Phasmatodea is a widely distributed order of which there is still much to learn. This paper sought to identify the species present in Trinidad based on the UWI Zoological Museum's collection and to examine and compare the diversity and abundance of the species of Phasmatodea present in Trinidad within a range of neo-tropical habitats. Data was collected using a modified transect method and involved the hand collection of specimens during night sampling. A total of ten sites were sampled in a range of habitats with differing forest types.

The most abundant species was found to be *Ocnophiloidea regularis* which accounted for 50.8% of all organisms sampled and was found at six of the ten sites sampled. The most diverse habitats were found to also have the highest abundance of organisms. Diversity ranged from 2.0 to 1.0 for sites at which Phasmatodea were present. Diversity was found to be greater in less disturbed habitats versus more disturbed habitats even if the forest type present was the same. Despite their defoliating ability, *Phasmatodea* are unlikely to pose a threat to agricultural crops. *Phasmatodea* were present in forested areas as well as teak plantations and so may pose a threat to forest tree crops.

EVALUATION OF MICROBES FROM NATURAL PETROLEUM SEEPAGES FOR BIOSURFACTANT ACTIVITY.

Carlos Rampersad and Adesh Ramsubhag
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago
carlos.rampersad@my.uwi.edu

Our aims were to isolate biosurfactants producing bacteria from a hydrocarbon contaminated sites inclusive of mud volcanoes; Marac, Moruga and marine sites; Coffee Beach, La Brea. Secondly to compare biosurfactant activity from hydrocarbon contaminated seepage sites. To identify genes encoding biosurfactant activity in isolates. Our third objective, wasto compare biosurfactant activity of microbes to commercial and known surfactants (COREXIT and TWEEN) and last weobserve the changes to crude oil by biosurfactant bacteria when compared to commercial brands or known surfactants.

The sampling was carried out on January 2016 were soil, water and mixed samples were collected from two sample areas: Marac, Moruga and Coffee Beach, La Brea; Trinidad and Tobago. Samples were collected in sterile bottles, soil bags and conical flasks. The samples were used to isolate microbes directly and via enrichment. Isolates chosen were then subjected to several assays to confirm biosurfactant activity. Assays included CTAB Blue agar, Blood Agar, Hydrocarbon agar, Oil spread assay, Drop Collapse assay, BATH assay, and Emulsification index assay. The most active isolates were then screened from genes encoding for biosurfactants using DNA extraction kits and gel electrophoresis. The most active isolates were then stored and dried. These active isolates were tested against synthetic surfactants to compare activity and practical application/uses. Using ANOVA and Chi Squared-test statistical methods, the results were analysed.

Isolation and identification of active biosurfactant producing microbes from samples were obtained. Results indicated that enriched samples were much more active for biosurfactant production versus that of the non-enriched. Primarily comparison of sample site for biosurfactant activities indicated that five samples showed the best

activity of the 33 isolates obtained. In order to determine if the microbial flora differs in each region sampled, the sequencing information was obtained. After identification and optimisation, the comparison of the sites activity to commercial brands was performed and indicated that commercial brand was a stronger surfactant than that of the bacteria when not extracted but using cell free culture. Samples from each region differed in terms of microbial flora for active isolates. Activity may vary due to the species and pathway used for biosurfactant production. Comparing synthetic surfactants to biosurfactants, indicated that biosurfactant were somewhat weaker and should be extracted and tested in equivalent to synthetic surfactant activity.

ISOLATION OF POTENT ANTIBIOTICS FROM BACTERIA OBTAINED IN THE NARIVA SWAMP

Isabella Salazar, Jessica Lastique, Nisamarie Singh, Janine Rahamut, Anna Tousaint and Antonio Ramkissoon
Department of Life Sciences, The University of the West Indies, Trinidad and Tobago

The upsurge in drug resistant infections coupled with fewer discoveries into novel antimicrobial chemotypes has led many experts to forecast that we are currently entering into a post antibiotic era. It is predicted that infectious disease related deaths would eventually surpass that of AIDS by 2050. Hence, there is a dire need for discovery of new drugs to combat infectious diseases. Mining bacteria for antibiotics is therefore of particular interest, as bacteria typically synthesise antibiotics to kill competitors in nature. Chemicals synthesised by bacteria are used in 70% of all antibiotic compounds currently marketed globally. There is now a push to explore novel environments in drug discovery exploits. The Nariva Swamp was chosen for its unique freshwater swamp environment which has never been studied in this aspect. In this study, soil samples from the Nariva Swamp were used to isolate antagonistic microbes. A single Gram positive bacteria "TSA9" displayed exceptional activity in preliminary screening and as such the bioactive compounds produced by this organism was isolated and identified. The results of these efforts would be presented.

ORAL PRESENTATIONS
Department Of Physics

STEADY AS SHE GOES: INVESTIGATING HEART RATE VARIABILITY NON-INVASIVELY IN DIABETICS IN TRINIDAD USING DYNAMIC TIME DOMAIN CORRELATION ANALYSIS

Michelle Amoroso
michelle.silverwolf@gmail.com

The high prevalence of diabetes and related risk of cardiovascular disease in Trinidad and Tobago places a significant burden on our healthcare system. Non-invasive cardiac monitoring methods can be useful in quickly assessing patient status and encouraging patients to adhere to therapeutic programmes. The correlation between the low frequency and integrated amplitude high frequency component was investigated as an index of heart rate variability for adults. Dynamic time domain correlation analysis was applied to instantaneous heart rate traces derived from cardiac data recorded by electrocardiogram and low-temperature superconducting quantum interference device (SQUID) magnetocardiogram, then used in assessment of 52 subjects in two groups of normal and diabetic adults before, during, and after a period of steady exercise.

Correlation between the components was >0.7 for the adult subjects at rest. The reduction in correlation at the onset of physical exercise was significantly larger for the diabetic group than the non-diabetics ($t(17)=2.715$, $p=0.0073$). This feature has diagnostic implications for diabetic patients.

HYDROPOWER POTENTIAL AT HOLLIS RESERVOIR.

Asif Mohammed
asifm321@gmail.com

We determined the viability of hydropower extraction from municipal water supply reservoir. This study looked at all potential sources of hydropower from the Hollis reservoir water supply system. This included the reservoir penstock, the distribution line, the spill way and water sources for the reservoir. For each potential source, the available historical data was reviewed and analysed. Where no data was available, flow rate sampling was done using a bucket and stopwatch. Maps, drawings and surveyed data were also used.

The reservoir penstock was found to be the only suitable source for hydropower. From the flow duration curve, there was a flow rate of 0.44139m3/s with an exceedance probability of 34.1%. The available head was found to be 20.98m. The conditional requirements for the system downstream with available head and flow rate allows for reaction type turbines to be considered, which includes the horizontal axis Francis turbine, Inline Francisturbine and pump as turbine (PAT). The maximum power that can be produced from a horizontal axis Francis turbine, with an efficiency of 87.5% is 79.5kW. The estimated total power consumption for the Hollis water treatment plant is 2395kWh for each day. The horizontal axis Francis turbine is capable of providing 80% of daily energy required for operation. The amount of energy being extracted is proportional to cost involved to implement the system. The energy consumption of the plant can become more efficient and fully functional on renewable energy.

STRIKING A BALANCE WITH THE LIONFISH: HABITAT SUITABILITY MODELLING AND SOCIAL AWARENESS MEASURES IN THE SOUTHERN CARIBBEAN

Shaazia Salina Mohammed
shaaziamohammed@hotmail.com

Arriving to Trinidad and Tobago in late 2010 the *Pterois volitans* (Red Lionfish) a native to the Indo-Pacific Region has raised environmental concerns to already stressed coral reefs. Since then the lionfish have been extensively documented through current management methods. These methods which mainly involved diver-based surveys highlighted differences in the population densities across various coral reefs in Trinidad and Tobago. To understand such differences we examined the spatial and temporal dynamics of the lionfish to create habitat suitability models for three reef sites (Buccoo Reef, Man-O-War Bay and Speyside) in Tobago.

Data collected for water quality variables (temperature, salinity, dissolved oxygen, total dissolved solids, current, depth, pH and rugosity) from the three reef sites were spatially interpolated for each study area using ArcGIS. Using the Analytical Hierarchy Process (AHP) method these spatially interpolated layers were then re-classed based on a suitability scale and multiplied with the respective weight calculated from the pair wise comparison matrix.

From the pair wise comparison matrix a consistency ratio (CR) of 0.00654 was produced for the eight variables that conformed to the 0.10 threshold of the AHP method. Analysis of the three models revealed little or no differences in the habitat suitability of each reef during the dry and wet seasons of Tobago. The most suitable areas for lionfish were found to be at depths greater than 10 m at all reefs. Of all three reefs Man-O-War Bay was considered to be the most suitable habitat for lionfish and Buccoo Reef the least suitable. The model outputs were verified with previously collected field data as well as information from local fishers.

In modelling different scales of habitat suitability for lionfish over spatial and temporal scales, current monitoring methods can now be focused to address a particular reef site which is more prone to the negative impacts of the invasive lionfish.

Notes to Contributors

Living World, the journal of The Trinidad and Tobago Field Naturalists' Club, publishes articles on studies and observations of natural history carried out in Trinidad and Tobago, and in the Caribbean Basin. Contributors to *Living World* are not limited to members of the Club.

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1. **Journals:**
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   Larsen, N.J. and **Levesque, A.** 2008. Range expansion of White-winged Dove (*Zenaida asiatica*) in the Lesser Antilles. *Journal of Caribbean Ornithology*, 21: 61-65.
   Quesnel, V., Farrel, T. F., Hilton, A., Hilton, J. and **Zuniaga, L.** 1996. The revegetation of the McClean Monument. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club,* 1995-1996: 9-12.

2. **Books and Monographs:**
   Kenny, J. 2008. The Biological Diversity of Trinidad and Tobago. Maraval, Trinidad and Tobago: Prospect Press. 265 p.

3. **Citation from Books and Monographs with Editors:**
   Collins, C.T. 2002. Notes on the biology of the Band-rumped Swift in Trinidad. p. 138-143. *In* **F.E. Hayes** and **S.A. Temple,** eds. Studies in Trinidad and Tobago's Ornithology Honouring Richard ffrench. St. Augustine, Trinidad and Tobago: Depart.
   of Life Sciences, Univ. of the West Indies, Occasional Paper No. 11.

4. **Online References:**
   Rutherford, M.G. 2012. Tucker Valley BioBlitz 2012 Summary. *Field Naturalist* 2012(4), p. 6-17 [Online]. Available at http://ttfnc.org/photojournals/2012-4.pdf (Accessed 02 February 2013)

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