

BELIZE FOUNDATION FOR RESEARCH AND ENVIRONMENTAL EDUCATION

THE BLADEN REVIEW₂₀₁₇





Letter from the Executive Director

Warm greetings to all friends of BFREE,

It gives me great pride to share this edition of the Bladen Review with the many people around the globe who share in our mission to “conserve the biodiversity and cultural heritage of Belize.” This edition describes some of the numerous education, research, and conservation initiatives that took place during 2016. Sincere thanks are due to the various contributors and especially the BFREE administrative staff who have worked so hard in its creation. I hope you find the articles both informative and inspiring.

2016 was, in many ways, a breakout year for BFREE, and we are happy to share some of our accomplishments in the pages herein. But it’s behind the scenes and out of the spotlight where many of these achievements are made possible. This past year, new and important staff positions have been filled. The organizational capacity and productivity is at its highest level in years, and the operations of both the field station in Belize and the US office in Gainesville, Florida are being managed better than at any time since I can remember. For a small non-profit organization, our impact continues to be both large and far-reaching.

Educational materials such as our newly published “Belize Cacao-based Agroforestry Handbook;” our efforts to lead in the formation of the newly established “Monkey River Watershed Association;” assisting the banana farm industry to comply with new international standards for environmentally friendly farming practices; continuing to offer world-class environmental education programs to high school and undergraduate students from all over the world; serving as a research site for master’s and Ph.D students; successful breeding and husbandry of one of the most critically endangered turtles on the planet; helping to establish wildlife and conservation policies with Belize government agencies. These are just some of our many achievements over the past twelve months.

Is BFREE conserving wildlife and forests? Are you kidding? Have you been lucky enough to visit the field station recently? Just ask one of the many animals that you might bump into. Walking around BFREE day or night is almost surreal. The property is teeming with wildlife, quite possibly more now than when we first began. Jaguars, Mountain Lions, Margays, Tapirs, Howler Monkeys, Peccary’s, over 350 species of birds, insects, frogs, reptiles of all types, and now even Harpy Eagles! It’s sometimes hard to believe, even for me. BFREE is truly a sanctuary for wildlife. If you visit, bring earplugs; it can be kind of noisy.

The Maya Mountains, our backyard, is now considered the largest continuous expanse of tropical rainforest north of the Amazon. Please help us keep it that way. Consider supporting BFREE if you haven’t before, and if you have, we sincerely thank you. A large part of our funding comes from donations and gifts from individuals like you. We work tirelessly every day to achieve our mission, but we can’t do it alone.

In stewardship and gratitude,

Jacob A. Marlin
Executive Director



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Eric Lo | Front cover photo
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A GROUND-BREAKING YEAR FOR THE HICATEE CONSERVATION AND RESEARCH CENTER



Sixteen month-old juvenile hicatee.

The Central American River Turtle, *Dermatemys mawii*, is a large, aquatic freshwater turtle found along the coastal lowlands of southern Mexico, northern Guatemala and Belize. Locally known in Belize as the Hicatee, *D. mawii* has been intensely harvested for its meat. It has been virtually eliminated from much of its former range in southern Mexico, while its status in Guatemala remains unclear. The lone surviving representative of the family Dermatemyidae, *D. mawii*, is a unique evolutionary lineage. Classified as Critically Endangered (facing an extremely high risk of extinction) by the IUCN Red List, it is ranked 15th in the report Turtles in Trouble: The World’s 25 Most Endangered Turtles and Freshwater Turtles – 2011, by the Turtle Conservation Coalition.

After a country-wide survey conducted by The Turtle Survival Alliance (TSA) and BFREE to determine the status of the Hicatee in Belize in 2010, the BFREE/TSA partnership began to launch a multi-prong conservation effort to halt the decline of the species. Shortly after the field surveys, BFREE and TSA along with the Belize Fisheries Department co-hosted a workshop in December, 2010 that led to the

formation of the National Hicatee Conservation and Monitoring Network (NHCMN). TSA approached BFREE during this time and planning began to construct the Hicatee Conservation & Research Center (HCRC) at BFREE, to create an assurance colony and investigate the reproductive biology and feasibility of breeding Hicatee in captivity.

Starting in 2011, construction of the HCRC began. Currently, two large breeding ponds and associated infrastructure have been built to support the breeding program. The HCRC currently houses 57 Hicatee: 17 adult males, 23 adult females, 5 unknown sub-adults, and 12 hatchlings bred at the facility (7 from 2015 and 5 from 2016). Successful reproduction began almost immediately after project implementation. One clutch of eggs was deposited in December 2014, one in 2015, and 10 in 2016-17. A total of 12 clutches (120 eggs) have been deposited since the program

began. The hope is that captive hatched turtles could be available to restock depleted wild populations, create new populations, and at the same time take pressure off of wild populations by developing sustainable methods for farming Hicatee that can be implemented easily throughout Belize and the entirety of their range.

The seven hicatee turtles hatched in June 2015 remain healthy and are growing rapidly, and were joined by five more hatchlings in May and June 2016. All 12 juveniles are housed in a custom-built galvanized aluminum flow-through tank and continue to be weighed and measured on a weekly basis to chart growth.



Jacob Marlin trained Belize Zoo staff members on proper methods of handling and measuring hicatee hatchlings in May. Richard and Carol Foster, along with Belize Zoo staff, cared for the hatchlings during their first few months of life, while the Fosters were acquiring footage for the forthcoming documentary on the plight of *Dermatemys mawii* across its range.



In early June, Belize Fisheries Department confiscated 16 Hicatees that were illegally harvested from the Belize River Valley based on an anonymous tip. BFREE was contacted by fisheries who requested that the turtles be included in the HCRC's captive breeding program. Thanks to Mrs. Vivian Belisle-Ramanarace, Mr. Rigoberto Quintana, Mr. Gilberto Young of Belize Fisheries Department for their efforts in the confiscation.

AN AERIAL IMAGE OF THE HICATEE CONSERVATION AND RESEARCH

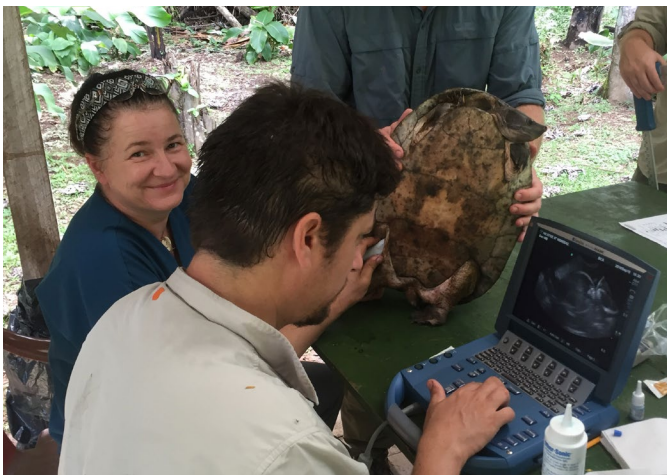
The aerial image on the right was taken from a fixed wing drone as part of the National Geographic/Waite Foundation grant program. Note the two breeding ponds with a man-made floating island (square green areas in center of each) in each pond. The solar array that provides fresh water daily to the ponds can be seen in the center area between the two ponds as a small rectangle.



Photo credit: Eric Lo of UCSD's Engineers For Exploration lab (E4E).



The picture above shows some of the many eggs that are currently incubating at BFREE. 10 clutches of eggs were deposited at the HCRC between November of 2016 and January 2017. A total of 105 eggs! Clutch sizes ranged from 8-14. This is the only successful and well documented captive breeding and nesting of the species recorded. For a critically endangered species on the verge of extinction in the wild, this successful captive management and breeding of Hicatee at BFREE gives hope for the future survival of this rare freshwater turtle.



Dr. Isabelle Paquet Durand of Belize Wildlife Referral Clinic and Dr. Shane Boylan of South Carolina Aquarium performed X-rays and Ultrasounds on turtles throughout 2016 to determine the general and reproductive health of turtles. Some of the newly introduced turtles had infections and injuries upon arrival to the HCRC but with care and monitoring have improved in recent months.



HCRC Manager, Thomas Pop, carefully retrieves eggs from the nest site. Mr. Pop has modified the edges of the ponds to more closely match conditions in the wild in order to encourage females to dig deep, narrow nests for their clutches. Clutch sizes have ranged between 8 and 14.

TRACKING LARGE MAMMALS

MICHAEL DOBBINS | PHD STUDENT
UNIVERSITY OF FLORIDA,
DEPARTMENT OF GEOGRAPHY

Situated in the Mesoamerican corridor, Belize is a hotspot for terrestrial and aquatic biodiversity and is home to more than 150 species of mammals, 540 species of birds, 151 species of amphibians and reptiles, and nearly 600 species of marine and freshwater fishes (BERDS, 2010). However, biodiversity is declining globally at an unprecedented pace, as current estimates put species loss at 100 to 1,000 times the natural background rate, with the possibility of increasing to 10,000 times the natural background rate in the coming years (Ceballos et al. 2015).

This loss can be almost entirely attributed to human impacts, most notably habitat loss, over hunting, introduction of invasive species, and climate change. As a subgroup, mammals are disappearing rapidly, with more than half of mammal species currently at risk of extinction (IUCN). Among them, medium and large sized mammals are especially at risk (Dirzo et al. 2014), as they require large home ranges and are also frequently hunted by humans as game or pests.

To preserve global - particularly mammalian - biodiversity, we need to better understand how mammals respond to human disturbance on a community and ecosystem level. Landscape level conservation methods, such as biological corridors, are vital tools for terrestrial mammal conservation, as they provide necessary connectivity between fragmented forests. Recently, the Southern Belize Corridor was created as a means for jaguars and their prey species to traverse between protected areas and intact forests. While this was an important first step to promote wildlife conservation across the landscape, very little ground data has been collected in this region, leaving a blank spot on the Belizean map for mammal conservation.

My research will focus on 19 terrestrial mammal species



Michael Dobbins and team secure a camera trap to a tree.

native to southern Belize, five of which appear on the International Union for the Conservation of Nature (IUCN) red list: jaguar, margay, Baird's tapir, white-lipped peccary, and neotropical otter. These mammals play critical roles in the ecosystem, and their reduction or loss could have drastic consequences for not only the functionality and health of the local ecosystem, but also for the indigenous Maya communities of southern Belize.

I will be conducting most of my field work at BFREE and the surrounding protected areas, as this is an ideal landscape to investigate human disturbance impacts on local mammal species. With the help of BFREE head ranger, Sipriano Canti, I have setup a grid of camera traps and sound meters throughout the BFREE preserve and across the Maya Golden Landscape to assess terrestrial mammal biodiversity and abundance in relation to human disturbance metrics. This will be the first time sound meters have been used to identify and correlate human sounds (e.g. gunshots, chainsaws, cars, etc) with mammal distributions, which is very exciting!

“To preserve global – particularly mammalian – biodiversity, we need to better understand how mammals respond to human disturbance on a community and ecosystem level.”



This ocelot was caught on the camera in the wee hours of the morning. Photo credit: Michael Dobbins

I am also working with Canti in his home village of Golden Stream to obtain sociodemographic, perception, and attitude data to better understand the drivers of human-wildlife interactions.

Collectively, these methodological approaches will provide a model of human-landscape interactions both within the study area and across the larger landscape. Each set of analyses will produce their own set of contributions to conservation in this region, but an integrated model of the landscape will provide a compelling systems approach to understanding the interaction of humans, wildlife, and conservation goals in the region. A more quantitative approach will be to construct a spatial logistic model of diversity and abundance metrics as a function of disturbance measures and weighted spatial human dimensions on the landscape. Importantly, this multi-methods approach will yield a framework for discussing current and future conservation actions with both the Maya people and the conservation concerned parties who drive much of the regional policy-making.

Data collection for this project began in summer 2016, so stay tuned for updates from the field!



Michael Dobbins' research project utilizes four camera traps and a sound meter on BFREE's property in addition to camera traps he has placed on other types of habitat around southern Belize. These motion detecting cameras show the abundance and diversity of large mammals (and large birds) moving through the BFREE reserve both day and night. The study began in late May 2016 and will continue for two years.

RATS IN THE RAINFOREST: MY BFREE INTERNSHIP

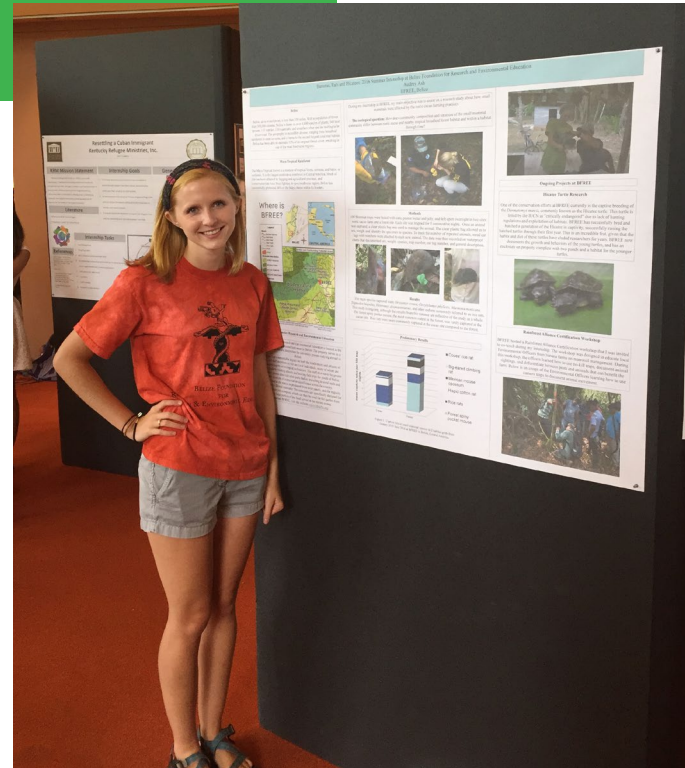
AUDREY ASH | UNDERGRADUATE STUDENT
CENTRE COLLEGE

As a student of Centre College, I am encouraged to complete summer internships that will apply to my future career goals. Hourly credit can be awarded for completion for such an internship, approved by each student's advisor. I am currently completing a major in International studies, with a minor in History and have an extensive record of avoiding the sciences. Consequently, it was a surprise to my advisor when I explained that during the months of May and June, I planned to intern at Belize Foundation for Research and Environmental Education, assisting with research on small mammal populations on the BFREE reserve.

At the time, I was unable to clearly articulate how catching small mammals at BFREE would apply to my International Studies major, aside from being in a foreign country. I knew the conservation efforts of BFREE had both local and international implications, but explaining this to my pre-law advisor was far from easy. Needless to say, I arrived at BFREE with unclear expectations of how it would apply to my degree. As planned, most of my days consisted of trapping and tagging animals in three habitats to survey small mammal populations, with the occasional field trip outside of BFREE. The study was completed through the use of one hundred Sherman traps, baited with fruit, oatmeal

and peanut butter, and arranged in a large 70 by 70 meter square. This is an ongoing study conducted by Dr. Sara Ash and several visiting student groups throughout the year. Our traps produced several interesting species of small mammals, including the Spiny Pocket Mouse, Big-Eared Climbing Rat, and the Mexican Mouse Opossum, one of which had recently given birth and, due to the severe dryness of the season, was inclined to take advantage of several of our oat-filled metal homes.

“My time at BFREE taught me a number of things that would be impossible to learn from a classroom.”



Audrey Ash presents a poster focused on her BFREE internship at a Centre College event. Photo Credit: Sara Ash

One of the sample sites was located in a rustic cacao farm, a technique used by the BFREE staff members which mimics the traditional farming by Mayan communities, who planted a variety of crops integrated within the forest. Rustic farming allows productive crop yields to be grown within the forest, while also preserving the canopy trees. The survey of small mammals is meant to track the impact of rustic farming on the small mammal community, answering whether or not the communities differ by habitat. The specimens trapped in the cacao farm are compared to those of the native forest site, also located in the BFREE reserve.

Farming techniques affect the people of Belize in an international context as well. My advisor and I were able to lead a small mammals techniques workshop for local banana farmers. Our workshop was a critical step for these farms becoming Rainforest Alliance Certified, a condition that many European states require before entering into trade agreements.



Spiny Pocket Mouse. Photo credit: Audrey Ash

In order to maintain the export relationship with Europe, Belizean banana farmers had to complete the certification process in five years or less; our workshop was a way for these farmers to be introduced to wildlife and learn how to appropriately handle and monitor what many farmers had previously viewed as pests.

My time at BFREE taught me a number of things that would be impossible to learn from a classroom. While my education has provided me with the tools I use to understand academic theories, meeting the people and participating hands-on with individuals from and around BFREE provided me with a clearer understanding of the connection between wildlife and human communities. Developing this understanding requires inputs from both the ecological and social sciences, a link I no longer choose to avoid.

We would like to express our gratitude for the commitment of BFREE volunteers and interns. Your dedication benefits us beyond measure!

US and Belize Interns

Audrey Ash
Jackson Barrett
Ashley Cevere
Jacqueline Kessler
Casandra Knox
Emma Hancock
Karissa Raymond

BFREE Content Volunteers

Gentry Mander
Gabriela Polo
Pratibha Singh
Chris Burney

US Event Volunteers

Juliana Carrillo
Mike Carrillo
Kelly Sanville
Wendy Wilber

FIELD COURSE FOCUS

Mrs. Abigail Parham-Garbutt |
Natural Resource Management Teacher
Independence Junior College
Stann Creek District

I was introduced to BFREE as a student myself in 2006 when I was enrolled at the University of Belize. It was then that I fell in absolute astonishment as I walked through an array of ecosystems until I arrived at BFREE itself. In 2011, I brought my first group of students to BFREE and was once again fell in love when, for the first time in my life, I saw two pairs of Scarlet Macaws flying right over the bunkhouse! I could barely contain myself at that point and knew I needed to come back every year in order to expose as many students as possible to this natural jewel.

Personally, I believe the most positive aspect of BFREE, apart from conservation, is its close connectivity to its stakeholder communities. Managing a protected area can only be successful if its buffer communities are also in sync with the vision and mission of the managers of the natural resources that they depend on. So imagine my excitement when I found out that two of my past students were hired by BFREE! This was the proudest moment for me when I brought more students to BFREE and my very own past students were presenting so intelligently to my students



Abigail Garbutt Parham (pictured here with white shirt and hat) brings Natural Resource Management students from Independence Junior College to BFREE for field experience on an annual basis.

(smiling). The most inspiring thing about BFREE is to see the amount of efforts placed in training the local Belizeans in various areas and having them present to the groups that come to BFREE. The staff itself at BFREE is always so accommodating, warm and humble which would encourage anyone to come back again, and so the Independence Junior College has been coming every year to BFREE and has never regretted that 6-mile hike to get there!

“ I believe the most positive aspect of BFREE, apart from conservation, is its close connectivity to its stakeholder communities. ”

2016 BFREE FIELD COURSES

University of Richmond

Eating locally: thinking Globally

Instructors Amy Treonis and Elizabeth Ransom

SUNY Potsdam

Biology

Instructor Glenn Johnson

University of the Cumberland

Tropical Ecology and Conservation in Belize

Instructor Sara Ash

Sterling College

Tropical Ecology

Instructors Farley Brown and Charlotte Rosendahl

Canterbury High School

Biology

Instructor Kelly Mahan Etcheverry

Independence Junior College, Belize

Protected Areas in Belize

Instructors Abigail Parham Garbutt and Godfrey Arzu

Lees McRae College

Wildlife Biology

Instructor Sean Collins

University of Massachusetts, Amherst

Tropical field Biology

Instructors Sean Werle and team

Keene High School

Tropical Ecology

Instructor Matthew Brady

Lakeland College, Wisconsin

Tropical Biology

Instructors Paul Pickhardt and Gregory Smith

Western Michigan University

Tropical Biology

Instructor Maarten Vohhof

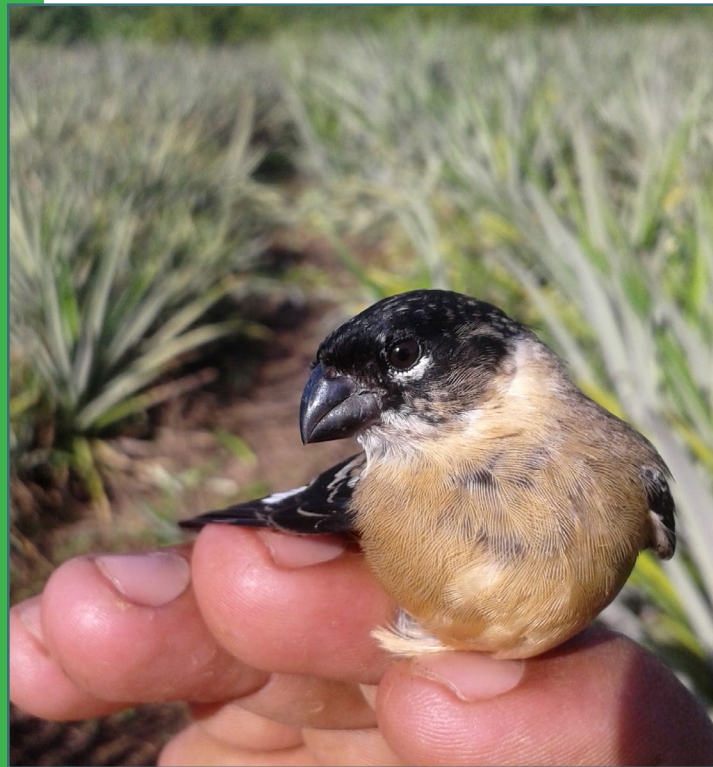


Bruce Cullerton Memorial Observation Tower. Photo credit: Joel Endge

Above the Canopy

In 1998, Jacob Marlin had an idea to build an observation tower to give visitors access to the rainforest canopy. After the acquisition of a US Forest Service Fire Tower in Georgia, work began shortly after to dismantle and transport the 6 ton steel structure to BFREE and erect it at a strategic location. With the help of many fearless friends and BFREE staff, the Bruce Cullerton Memorial Observation Tower was finally completed in late December 2015. Capped with a viewing platform at 112' feet above the rainforest floor, the tower is an ideal spot for viewing birds and other wildlife above and within different levels of the rainforest canopy. Birds commonly observed include the Great Potoo, Scarlet Macaws, Keel-billed Toucans, a variety of parrots, and many other species.

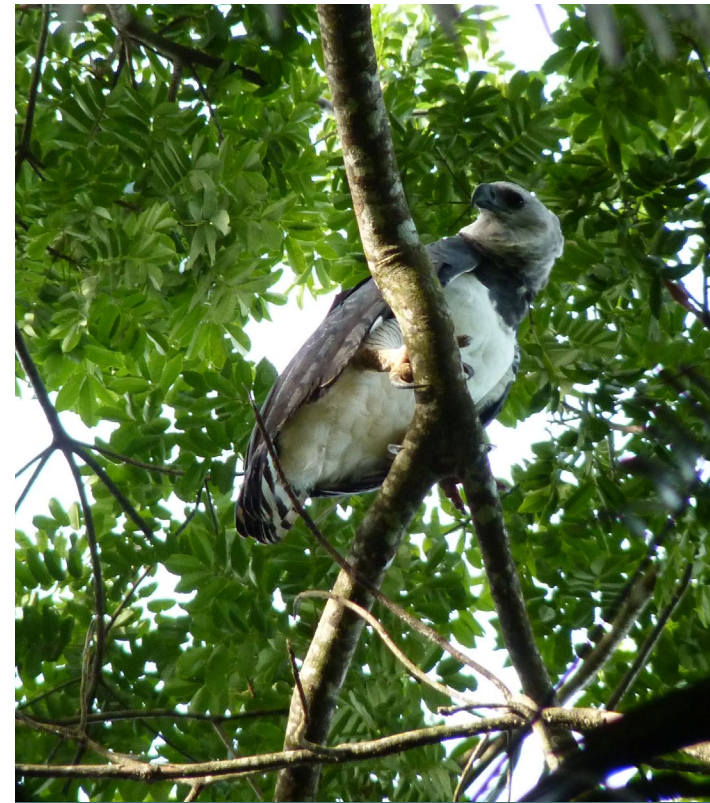
BIRD CONSERVATION



White-collared seedeater.
Photo Credit: William Garcia

What Makes a Good Bird Habitat?

As part of the Belize Cacao-based Agroforestry and Restoration Project (BCARP), BFREE completed its fourth year of neotropical migratory bird monitoring. In years three and four, we have expanded our research sites to include other types of agriculture in addition to cacao; including cattle, pineapple, citrus and bananas. Using mark-recapture, mist-nets and point-count surveys, our goal is to better understand habitat suitability of different types of agricultural practices for neotropical migratory birds and other wildlife.



The Harpy Eagle was first spotted at the Hicatee Conservation and Research Center. Photo credit: Amarta Choc

Harpy Eagle Finds a Home at BFREE

An adult Harpy Eagle has been observed on five separate occasions perched in the tall trees (including the giant Ceiba tree beside the bunkhouse!) and flying throughout the BFREE reserve from September through December 2016. This is the first time wild Harpy Eagles have been seen on the property. BFREE staff have been documenting these occurrences along with pictures and video. By recording the bird(s) activities, we hope to gain a better understanding of why it has chosen BFREE as part of its territory, whether there is more than one bird involved, and what impact its presence may have on the local wildlife.

Rare Heron Nesting Colony

Often described as one of the most beautiful Herons in the world, the Agami Heron is considered vulnerable to extinction, is rarely seen, and only a handful of nesting sites have been documented throughout its range from southern Mexico to central Brazil. One such site is only a short walking distance from the BFREE dining room. The site, called the Agami Lagoon, was included in the International Agami Heron Conservation Plan in 2016. Observations of the nesting colony were taken by BFREE staff throughout their breeding season to determine number of nests and adult and juvenile Agamis. The purpose of the plan is to provide a range-wide framework for the conservation and management of Agami Herons and their habitats. Monitoring activities like those at the Agami Lagoon, will provide data needed to allow the Working Group to advocate for better protection of colony sites.



Agami Heron at the lagoon. Photo credit: Richard Foster

Building Capacity for Bird Research

BFREE was approached by Cameron Boyd, a long-time bird enthusiast and conservationist, because of his interest in developing a bird-focused science and conservation program at his facility, Black Rock Lodge, in western Belize. In cooperation with Jamie Rotenberg of UNC Wilmington, we helped establish a Mosi site at the lodge and helped train the talented tour guides at the lodge in advanced bird research and monitoring. Jacob Marlin says, “As part of our mission, we are happy to provide training and other services to promote bird conservation efforts throughout the country and have been excited to help launch this new program.”



William Garcia (wearing the Black Rock Lodge t-shirt) providing training. Photo Credit: Cameron Boyd

PROMOTING AGROFORESTRY AND RAINFOREST CONSERVATION

HEATHER BARRETT | DEPUTY DIRECTOR

The Belize Cacao-based Agroforestry Restoration Project (BCARP) enters its fifth year in 2017. This small program has worked to expand habitat for over-wintering migratory birds and other wildlife by converting degraded environments such as farmland and secondary growth forests to wildlife friendly habitat with shade-grown organic cacao as the dominant understory crop.

During the final two years of the program, our focus will be to encourage more farmers to give shade-grown agroforestry a try and to provide tools that empowers them to do so. To that end, 2016 was spent creating resources. One exciting development has been the planning and construction of Mountain View Nursery, a 50 x 50 foot permanent nursery which will make available a variety of timber and fruit trees to farmers interested in growing their own tiered agroforests. This collaborative project between BFREE and the Gomez family is located at the Gomez and Sons Sawmill on the eastern side of the Southern Highway across from the entrance road to BFREE, and is slated to open in the spring of 2017.

Another valuable tool that will be made available to farmers in 2017 is The Belize Cacao Agroforestry Handbook. A joint effort between BFREE and UNC Wilmington's Department of Environmental Studies with significant input from experts at the Cocoa Research Centre, this 70-page manual is filled with illustrations and simple descriptions intended to guide farmers through the basics of land preparation, nursery management, planting, maintenance, harvest and post-harvest. The 'Resource,' section of the Handbook includes checklists, management schedules, and cultivation records, to help farmers track their farm activity and keep on schedule throughout the year.

Five hundred handbooks were produced during the initial printing and will be made available to farmers in the Toledo District through farmer cooperatives, during meetings and workshops, at Mountain View Nursery, in Farm Supply stores in Punta Gorda, and at the BFREE field station.

Partial funding for BCARP is provided by the US Fish and Wildlife Service, on behalf of the Nyanza Natural Resource Damage Trustee Council – comprised of the Service, Commonwealth of Massachusetts and the National Oceanic Atmospheric Administration.



Mr. Gomez at the site of Mountain View Nursery after the posts had been set.



Harvested cacao pods have been cracked and the cacao beans have been separated into buckets and are awaiting the next step – fermentation followed by drying.



The Belize Cacao Agroforestry Handbook is complete and will be available to farmers throughout Belize in 2017.



Brian Horsley of Maranon Cacao collects data from a BFREE

IS ALL CHOCOLATE THE SAME?

JACOB MARLIN | EXECUTIVE DIRECTOR

Is all chocolate the same? Certainly not. Fine flavor chocolate starts with the particular variety and quality of the cacao beans themselves, then factors such as soil, climate, fermentation, drying, roasting, handling, and the particular recipe of the chocolate maker; all play important roles in the flavor and quality of the final product. As part of BFREE's initiative to promote organic shade grown cacao as a means of conserving and restoring tropical forests, BFREE began investigating the varieties of cacao trees growing in the BFREE Cacao farm and property to ensure the highest quality of beans are grown and best farming practices are conducted.

In early September, Heather Barrett and Jacob Marlin traveled to the Cacao Research Centre at the University of the West Indies in Trinidad. The University has propagated a living gene bank of over 2000 varieties of cacao, and is one of the worlds' leading research institutes focused on the genetics of cacao, post-harvest processing, and the production of fine flavor chocolate. Dr. Pathmanathan Umaharan, Director of the Centre, as well as other staff and students spent the day sharing information, discussing strategies for the BFREE initiative, and providing a tour of facilities and the living gene bank. A kit for sampling the genetics of the BFREE cacao farm was provided, and within a month, samples from 80 Cacao trees from BFREE were sent to the University

for genetic testing.

In addition, Mr. Brian Horsley, co-owner of Maranon Cacao in Peru, South America, visited BFREE from September 30th to October 5th to collect similar genetic material (leaf samples.) These were then sent to the US Department of Agriculture's genetics lab in Virginia as part of an initiative sponsored by the Heirloom Cacao Preservation program in

“ If you are going to help save the rainforests by growing chocolate, why not make it the best? ”

collaboration with the Fine Chocolate Industry Association. The results from both collections will help guide management decisions and best practices for cacao based agroforestry both at BFREE and the surrounding areas that we work. If you are going to help save the rainforests by growing chocolate, why not make it the best?

HARPY EAGLES, SNAILS, AND A SINKHOLE

DR. JAMES ROTENBERG | ASSOCIATE PROFESSOR
UNC WILMINGTON

In early 2016, I was awarded a National Geographic Society – Waitt Foundation Grant to conduct research in Belize. The grant, entitled, “Harpy Eagles, snails, and a sinkhole: discovering how ecosystems work by looking through three unknown portals of the Bladen Nature Reserve, Belize” is the first grant from the Society and Foundation to my department, Environmental Studies, at University of North Carolina, Wilmington, and the second for myself and BFREE.

BFREE and I have been collaborating for over 10 years studying Harpy Eagles and the bird community. In March 2016, I led an international team of 20 researchers and porters on an expedition to study the biodiversity of this remote reserve. Backpacking 12-miles into the Maya Mountain rainforest, and aided by remote control drones, my team and I carried out biodiversity surveys of birds and snails, and explored a large sinkhole that turned out to be nearly as deep as the length of a football field. The expedition was a real success. We accomplished more than I ever imagined and the drones collected mountains of data.

Team members included researchers from the University of California San Diego’s (UCSD) “Engineers for Exploration (E4E)” based in the Qualcomm Institute, land snail experts Dan and Judy Dourson, members of the US Deep Caving Team, and staff, rangers, and local guides with BFREE. “This was a truly collaborative effort,” said Jacob Marlin, Executive Director of BFREE. “BFREE was able to add much needed logistical support, and it really paid off.” Marlin continued, “the type of data

Rotenberg’s team collected is information on the rainforest that we’ve needed for a long time. This has never been done before, and therefore it is a milestone in our 20-plus years to help conserve these important protected areas.”

Students played a major role in the expedition. UNCW Environmental Studies graduate student, James Abbott, and undergraduate student, Dalton Jackson, along with Dan Dourson, conducted systematic bird and snail surveys in and around a Harpy Eagle nest site discovered previously by myself and BFREE avian technicians, William Garcia and Liberato Pop.

“Dalton, the BFREE technicians and I ended up identifying about 2/3 of the known bird species found at this site during only 10 days in the rainforest,” said graduate student, Abbott. “At the same time, we carried out systematic ground surveys for snails with Dan, finding a high diversity of snails maintained

“ We used the fixed-wing Unmanned Autonomous Vehicle to gather data amounting to 700 hectares of rainforest to survey the breeding territory of this extremely rare Harpy Eagle that nests in the area”



Image of the sinkhole from above. Photo credit: Kasia Biernacka



Expedition team. Photo credit: Kasia Biernacka



Eric Lo and Sebastian Afshari launch drone.
Photo credit: Dr. James Rotenberg

in this rainforest as well as discovering six new species that are totally unknown to science.”

Concurrently, the UCSD – E4E team consisting of engineering undergraduate student, Sebastian Afshari, staff engineer, Eric Lo, and Principal Development Engineer, Curt Schurgers, operated fixed-wing and quadcopter drones to capture the first high-definition and near-infrared “Structure-from-Motion” photogrammetry images of the BFREE protected area and the Bladen Nature Reserve. “We used the fixed-wing Unmanned Autonomous Vehicle to gather data amounting to 700 hectares of rainforest to survey the breeding territory of this extremely rare Harpy Eagle pair that nests in the area,” said Afshari. “In addition, we were able to collect imagery with the drone airplane for the BFREE-protected reserve, allowing Rotenberg and BFREE Director, Jacob Marlin, to make comparisons of forest structure and health.”

The main focus of the grant work was directed at examining how the tropical rainforest ecosystem works. We wanted to find ecosystem connections for top-down and bottom-up ecosystem control. It is assumed that a large rainforest reserve like the Bladen protects everything, but just how well this is working is unknown. Our job was to find connections within the food chain from our top-predator, the Harpy Eagle, down the chain to its food, and so on down the line to who eats the snails.

My colleagues and I previously discovered the only known nesting pair of Harpy Eagles in Belize after the species was thought to be extinct in the region. From observations at the nest, the eagles eat mostly opossums and the raccoon-like coatimundi, as well as monkeys.



Members of the expedition team cross the river on their way to the upper Bladen. Photo credit: Pawel Skoworodko

Past studies have shown that these smaller mammals eat snails, especially several kinds of snails that my team found commonly at the field site. With these data and the data from the drone flyovers, I plan to eventually produce a model for the distribution of Harpy Eagle territory across its range in Belize.

The secondary focus was to explore a 240-foot deep sinkhole nearby the Harpy Eagle nest site and to discover what truly was “bottom up” in the Reserve. To achieve this, Rotenberg recruited Kasia Biernacka and Pawel Skoworodko, both members of the US Deep Caving Team from Poland, as experts to carry out the descent into the hole. After several days practice and preparation, the E4E team made the descent with all of their equipment and the quadcopter so the team could map and collect imagery of the hole. “It was like lowering ourselves into the lost world with ferns and small trees covering the bottom of the sinkhole,” said Eric Lo.

The entire team is now back from the rainforest but the exploration doesn’t stop there. My team and I are planning the next expedition, and in September 2016, presented expedition findings at a professional conference in Washington D.C., co-sponsored by the Smithsonian Institution.

Support provided by the National Geographic Society/Waite Grant Program



Richard Foster acquires footage during filming of “Wings of Hope.” Photo credit: Jacob Marlin.

BEST SHORT DOCUMENTARY

Wildlife Film Productions and BFREE were honored at the Belize International Film Festival with the award for Best Short Documentary for their collaborative effort, “Wings of Hope.” Now in its 11th year, the festival was held at the Bliss Centre for Performing Arts in Belize City.

Dedicated to showing feature length films, documentaries and music videos, the festival presented ten awards in seven categories. Festival Director Suzette Zayden, “While we intend to remain an international festival to keep Belizeans exposed to stories from around the world, we are still focused on maintaining high quality films from Central America, the Caribbean and Mexico as these are our neighbours, our region; and, where the stories and realities portrayed will most resemble us onscreen.”

Richard and Carol Foster of Wildlife Film Productions attended the event and received the award on behalf of the team. The Fosters spent seven years documenting the re-discovery of the wild Harpy eagle in Belize as well as the associated BFREE and UNC Wilmington initiative, the Integrated Community-based Harpy Eagle and Avian Conservation Program. The Fosters stated, “During the course of making this film we discovered the immense value of the Bladen River Valley to this country as



Juvenile Harpy Eagle in the Bladen Nature Reserve. Photo credit: Liberato Pop

“Wings of Hope wins award for the best short documentary.”

a natural sanctuary and the great work BFREE is doing to increase environmental awareness in the surrounding human communities.” “Wings of Hope,” was included in two additional international film festivals during 2016: Cinema Verde International Environmental Film Festival in Florida; and Wildlife Vaasa International Nature Film Festival in Finland where it was a finalist in the Special Award category of Best Ethnographic Film “Man and Nature.”

BFREE ON THE BIG SCREEN

ASHLEY CEVERE | PAST BFREE INTERN
CURRENT AMERICORP VOLUNTEER

This past year, BFREE and Jacob Marlin were featured on international television nature and travel programs. First on Wild Things with Dominic Monaghan during his search for Belize’s most feared venomous snake, the Fer-de-lance. Jacob’s skill as a herpetologist and expertise on this species made him the perfect guide. The episode documented Dominic Monaghan and his cameraman, Frank, as they made their way through Belize to BFREE in search of the infamous snake. The landscape of caves, sinkholes, pristine streams and rivers, undisturbed old growth rainforest and an abundance of highly diverse flora and fauna of the area made it an ideal place for Dominic to complete his search for “the deadliest viper.”

The Swedish nature program, Linda och Djurens Hjärtar (Linda and the Defenders of Wildlife), dedicated an entire episode to BFREE. During this one-hour documentary, Linda Lindorff, an experienced traveler, animal advocate, and famous television personality in Sweden journeyed to BFREE to learn about the reserve and current wildlife conservation efforts. Her visit spotlighted Jacob’s love and passion for snakes and reptiles, and described how that



Dominic Monaghan and Jacob Marlin search for the venomous fer-de-lance during an hour long episode of “Wild Things.”

passion drove him to start BFREE. Linda teamed up with Jacob and other BFREE staff to search for wildlife while learning about various projects around the field station like the Hicatee Conservation and Research Center, driving to a local village to remove a fer-de-lance from a local community members house, and other wildlife focused activities.

With over twenty-three years of dedication to the conservation of the unique natural environment in southern Belize, and a deep understanding of seemingly scary, but mostly misunderstood creatures, Jacob hopes that these television programs “help the general public gain a deeper appreciation and respect for all wildlife, and snakes, more specifically.”

Want to watch? Wild Things with Dominic Monaghan is available at travelchannel.com and Linda och Djurens Hjärtar is available on tv4play.se.



Linda Lindorff and her crew take a break from filming to pose for a picture with the BFREE staff.

Environmental Education, Land Stewardship, and Advocacy.

HEATHER BARRETT | DEPUTY DIRECTOR

Training Environmental Officers

For over a century, Belize has been a producer of bananas for export, primarily to the European market. In recent years, market forces, driven by consumer demand, put pressure on this industry to produce bananas that are less harmful to the environment. Bananas require intensive agro-chemical inputs, large volumes of water for irrigation, require large areas of tropical forests to be cleared, and often create extensive erosion of river banks where they are grown. As part of a process to mitigate these negative impacts on the environment, the local banana industry is working to become more eco-friendly.

During 2016, industry leaders contacted BFREE for help in training environmental officers from 13 banana farms located in the Toledo and Stann Creek Districts of southern Belize. BFREE offered two workshops in a new four-part series, “Introduction to Wildlife in southern Belize,” The first “Large and Small Mammals,” was taught in June by Dr. Sara Ash of University of the Cumberland, Kentucky and assisted by BFREE staff member Sipriano Canti. The second, “Reptiles and Amphibians,” followed in December and was instructed by Jacob Marlin with assistance from BFREE staff member Thomas Pop. Courses provided an overview of the natural history and ecology of specific wildlife and highlighted endangered species, as well as explained



Dr. Sara Ash teaches safe removal of a small mammal from a sherman trap.

basic monitoring and survey techniques and included training on data collection and safe handling of animals when needed. Future courses are planned for 2017 including “Migratory and Resident Birds” and “Fresh Water Ecosystems”.

The trainings are part of a five-year Rainforest Alliance certification process that will lead to improved conditions on banana farms and in the rivers and forests that surround them. By 2020, each farm must reach 95% compliance through a variety of environmental improvements including reforestation of buffer areas surrounding the farms, riverine restoration, better solid waste management, and reduction of toxic chemicals used on farms and in packing sheds.

Monkey River Watershed Association

During 2016, BFREE staff, along with assistance from the Toledo Institute for Development and Environment (TIDE), spearheaded the formation of the Monkey River Watershed Association (MRWA). The MRWA is a grass roots volunteer organization formed by residents who live and work within the Monkey River watershed (the watershed includes the Bladen River, Trio River, Swasey River, and the Monkey River.)

The MRWA provides a structure for individuals who care about the rivers, soils, forests, wildlife, and health of the watershed and its residents to share information, exchange concerns and ideas, voice opinions, work together to solve problems and find solutions, advocate as a group; all for the overall purpose of protecting, conserving, and restoring the health of the watershed.



Members of the Monkey River Watershed Association. Photo credit: Peter Esselman

Scholarships for Toledo District Students

Established in autumn of 2016, the Jacob A. Marlin Scholarship Program formalized the process of giving annual scholarships to children in the Toledo District as well as continuing education opportunities for staff members. Three scholarships were granted in 2016 for the fall semester to the following recipients: Ms. Esther Tzalam, Golden Stream Government Primary School; Mr. Florentino Rash, Julian Cho Technical High School; and Mr. Mark Canti, Independence Junior College.



Ms. Esther Tzalam of Golden Stream. Photo credit: Elmer Tzalam



Mr. Florentino Rash of Indian Creek. Photo credit: Pedro Rash

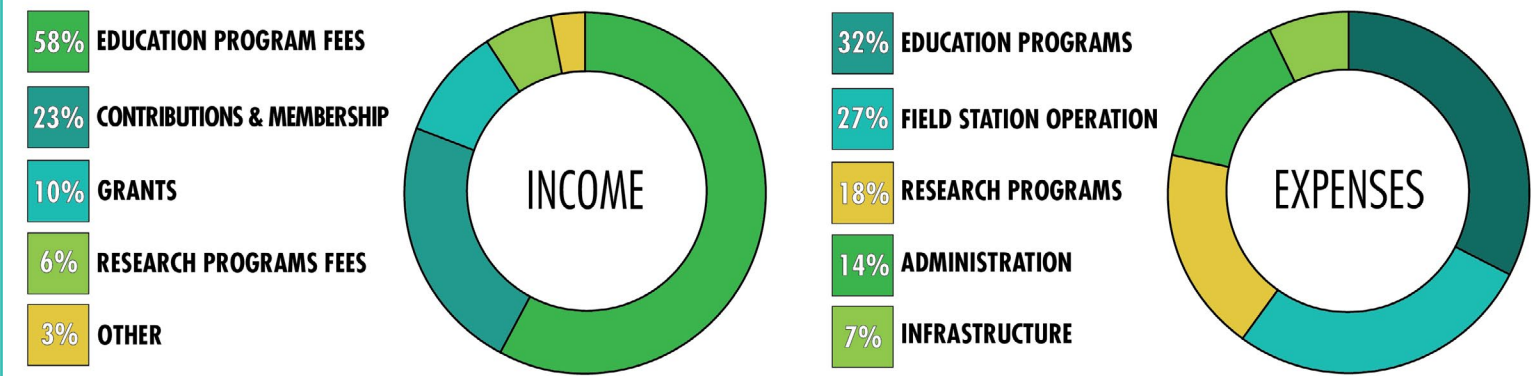


BFREE staff member, Nelly Cadle, poses with Golden Stream Government School Principal, Ms. Zungia, and students.

Expanding School Libraries

With the help of many volunteers and contributors in the US, during 2016 BFREE collected over 800 books and other resource materials to help three Toledo District schools in Belize expand their libraries. The schools include Medina Bank Government School, Golden Stream Government School and Bladen RC School. Each of these schools are located in villages with very limited resources (two of them don’t have electricity), and are the closest communities to BFREE.

The focus of the book collection was on general reading, science and the environment, geography, and personal health. Books were collected and sent first to the US for BFREE in Gainesville, Florida, then driven 6 hours to the port in Miami, then shipped via boat to Belize, then driven 4.5 hours to BFREE, and finally distributed to the schools. Toledo District Schools are the most under-resourced in the country. Often teachers are left to provide school books and materials by fundraising or by using their personal income. When possible, BFREE supports the efforts of these teachers and communities by helping with service projects and with the donation of items of all sorts including building materials, school books, learning aids and other supplies.



On February 4th, BFREE hosted a social and fundraiser at Levine Music in Washington D.C. The event was attended by over 120 supporters interested in hearing about chocolate’s connection to rainforest conservation. The event marked the launching of a new fundraising campaign to raise capital for the Cacao Discovery Center, a centralized multipurpose educational facility dedicated to enhancing the learning environment at BFREE and promoting cacao-based agroforestry as a strategy to conserve and restore tropical rainforests in Belize.

WE ARE GRATEFUL FOR BOTH THE FINANCIAL AND IN-KIND DONATIONS RECEIVED FROM SUMMER 2015 – DECEMBER 2016.

- HICATEE TURTLE

\$10,000

Turtle Survival Alliance
David and Jackie Marlin
The Mountain Corporation
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Jacksonville Zoo and Gardens
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Terry Biehl
- FRUIT-EATING BAT

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Michael Dobbins' research project utilizes four camera traps and a sound meter on BFREE's property in addition to camera traps he has placed on other types of habitat around southern Belize. These motion detecting cameras show the abundance and diversity of large mammals (and large birds) moving through the BFREE reserve both day and night. The study began in late May 2016 and will continue for two years. See associated article on page 5-6.

