

Volume 18 - 2018



iguana specialist group

NEWSLETTER



SSC
Species Survival Commission



The mission of the IUCN SSC Iguana Specialist Group is to prioritize and facilitate conservation, science, and awareness programs that help ensure the survival of wild iguanas and their habitats.

ISG Updates

Updates from the Co-chairs and Program Officer	2
ISG Code of Conduct	3
Red List Assessments	4
2018 ISG Meeting Summary	5

Iguana News

1,000th Iguana Released into the Wild.....	7
New Species of Iguana Found After Road Kill in Dominica	8

Field Reports

Anegada Rock Iguana (<i>Cyclura pinguis</i>)	9
Common Green Iguana (<i>Iguana iguana</i>).....	12
Fijian Crested Iguanas (<i>Brachylophus</i> sp.).....	16
Lesser Antillean Iguana (<i>Iguana delicatissima</i>).....	20
Montagua Spiny-tailed (<i>Ctenosaura palearis</i>).....	23
Roatán Spiny-tailed Iguana (<i>Ctenosaura oedirhina</i>)	25
Útila Spiny-tailed Iguana (<i>Ctenosaura bakeri</i>).....	28

Recent Literature	31
--------------------------------	----

ISG Contact Information	33
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Updates from the Co-chairs and Program Officer

Red List Assessments

In 2014, the ISG pledged by 2020 to complete IUCN Red List assessments for all iguana species while maintaining updated assessments for species within a 10-year publication window. These goals align with the wider IUCN assessment goals to reach 160,000 species, of which reptiles are a priority. We need active participation from ISG members to reach this goal and we thank members who helped submit and publish 13 Red List assessments in 2018. A notable status change includes *Iguana delicatissima*, which was reassessed to Critically Endangered because of the continuing threat of displacement by and hybridization with non-native Common Green Iguanas.

New Additions to ISG Leadership and Members

In 2016, the ISG Steering Committee (SC) approved a transition plan that provides a transparent and accessible path for members interested in serving on the ISG SC. The transition plan included 3-year, non-binding rotational terms. Each year, two SC members were slated to rotate off the committee, allowing new members with the highest vote tallies to join. After further reflection in 2018, we decided to extend the rotation to a six-year term to retain SC historical perspectives, allow new SC members to gain experience from existing members, and to reduce organizational burdens on Co-chairs and voting members. We expect to open the opportunity for new SC membership in early 2019. In 2018, we welcomed new ISG member Christina De Jesús Villanueva and returning member Karin Nelson. We look forward to their participation in ISG efforts to study and conserve iguanas.

Taxonomic Updates

In 2018, the ISG Iguana Taxonomy Working Group formally accepted a resurrected genus for Iguaninae. ISG members Catherine Malone, Victor Reynoso, and Larry Buckley (Mol. Phylogenet. Evol. 115:27–39) resurrected the original name of *Cachryx* for the Yucatán lineage of Spiny-tailed Iguanas as proposed by Cope in 1866. The resurrection of a genus is significant and the ISG now recognizes *Cachryx defensor* and *C. alfredschmidtii*.

In 2018, the ISG Iguana Taxonomy Working Group also formally accepted the taxonomic modification of *Amblyrhynchus*. Miralles *et al.* (2017. Zool. J. Linnean Soc. 181:678–710) proposed a single species with 11 divergent population clusters

at the subspecies level including five new subspecies described as *A. cristatus godzilla* subsp. nov. (San Cristóbal-Punta Pitt), *A. c. jeffreysi* subsp. nov. (Wolf and Darwin), *A. c. hayampi* subsp. nov. (Marchena), *A. c. trillmichi* subsp. nov. (Santa Fé), and *A. c. wikelskii* subsp. nov. (Santiago).

Finally, another species of *Brachylophus* was recognized following Fisher, Niukula, Watling, and Harlow (2017. Zootaxa 4273(3):407–422). The Gau (pronounced ngau) Iguana, *Brachylophus gau*, was described as a new species based on its unique coloration and morphology and is endemic to Gau Island.

Hurricane Maria and Consequences to Dominica

On 18 September 2017, Hurricane Maria, the strongest hurricane on record to make landfall on the Commonwealth of Dominica, struck the island as a Category 5 storm with sustained wind speeds over 252 km/hour. The governments and people of the Caribbean Community (CARICOM) Member States immediately mobilized teams and response mechanisms for Dominica. CARICOM countries contributed funds, security support, and relief supplies to the country. We believe that these relief responses facilitated the movement of invasive Common Green Iguanas and their *Iguana delicatissima* hybrids from surrounding islands to Dominica. In 2018, four non-native Common Green Iguanas were recorded opportunistically (from 4 April to 27 December) either as road kills (n = 3) along the coastal road on the Caribbean side of Dominica at Colihaut and Woodbridge Bay Port, plus a confirmed sighting <100m from the Woodbridge Bay Port. ISG members, Thijs van den Burg, Chuck Knapp, and Dominican project lead, Jeanelle Brisbane, will be investigating the scope of the problem and initiating mitigation strategies in 2019.

ISG Annual Meeting Venues and Auction

The ISG holds annual meetings with the intent to share information, develop collaborations, discuss group priorities, and develop action plans for iguana species. We typically convene our meeting in iguana range countries to raise local awareness of iguana-related issues, engage local stakeholders in discussing iguana conservation, and to offer the collective assistance of the ISG to local partners for conservation planning. We are always thankful to our local collaborators, who are deeply involved in

ISG Updates

planning the meetings. Our goal is to offer a meeting in the Lesser Antilles to address the increasing non-native Common Green Iguana invasions. Our plan to host the 2018 meeting in the Lesser Antilles was postponed and instead we held the meeting at the Fort Worth Zoo. We hope to return to the Lesser Antilles in the near future. Daniel Ariano graciously offered to host the 2019 ISG meeting in Guatemala, which provides an ideal venue to coordinate with the Latin American iguana group, facilitates an opportunity to work on Red Listing with within range-country collaborators, and offers the opportunity to develop a comprehensive action plan for the Iguaninae.

In 2018, we piloted an engaging auction to raise funds for the ISG travel awards, while also developing deeper bonds and camaraderie within the group. The ISG travel funding is critically important and provides the means for people to attend meetings who would normally not be able to afford it. Special thanks to Joe Wasilewski for being the emcee and making the auction such a fun success. We far exceeded expectations by raising \$4,389! Thank you all who participated. We are particularly grateful to John Bendon who donated dozens of incredible iguana-related artworks that he created. His pieces were a hit and contributed significantly to the overall success of the event.

International Iguana Foundation Support

We are thankful for the continued support of the International Iguana Foundation, which provided \$66,463 in funding for eight research and conservation projects with ISG member involvement in 2018.

All our best,
Chuck, Stesha, and Tandora



Amblyrhynchus cristatus venustissimus on Floreana, Galápagos. Photo by John Bendon.

IUCN SSC IGUANA SPECIALIST GROUP ETHICS AND CODE OF CONDUCT

To ensure the highest ethical and professional standards for the ISG, in 2018 we adopted a Code of Conduct that all members are expected to follow. The code is included below and on our website.

General Conduct

The IUCN SSC Iguana Specialist Group (ISG) is a coalition of iguana conservationists with diverse backgrounds and skillsets focused on a mission to prioritize and facilitate conservation, science, and awareness programs that help ensure the survival of wild iguanas and their habitats. Ethical behavior is important to accomplish this mission and ISG members are expected to display ethical conduct in all professional contexts. Members will be honest, respectful, and impartial and not discriminate against others, nor practice or condone harassment based on gender, sexual orientation, marital status, creed, religion, race, color, national origin, age, economic status, or disability. At its scientific meetings, the ISG will provide an inclusive, welcoming and safe environment for all delegates, and will not tolerate harassment in any form and expects professional behavior from all participants.

Conducting Research

ISG members will seek to minimize adverse effects of their work. In conducting their work, members will comply with all applicable standards, rules, and laws enacted to protect researchers and study organisms. This includes obtaining Animal Care and Use Committee (ACUC) permits, collection permits, export and import permits, and any additional required permission. In addition, ISG members are expected to be sensitive to local customs and needs.

Red List Assessments

Tandora Grant, San Diego Zoo Institute for Conservation Research

One of the main directives of the SSC Specialist Groups is to contribute their expert knowledge to evaluating species for the Red List of Threatened Species. Like other groups, the ISG has pledged to have all assessments completed and up to date for all iguana species by 2020. Thanks to the work of several of our members, four assessments were published in June 2018 and nine others were submitted for final approval by the Red List Unit and will be published in 2019.

Among those that were published, assessments for *Cyclura nubila nubila* and *Ctenosaura bakeri* were updated. Work on updating the Cuban Rock Iguana assessment, last published in 1994, began during our 2010 annual meeting. The team of Amnerys González Rossell, Vicente Berovides, Manuel Alonso Tabet, and Dorka Cobián Rojas continued to gather information from around the country to generate the 2018 update. While the status did not change (VU A2abce+A4abce), the new assessment contains more details on the current distribution, species decline, and threats to its future, primarily from development in its coastal strongholds.

The 2018 update for the endemic Útila Spiny-tailed Iguana was authored by Daisy Maryon, Diego Ardon, Andrea Martinez, Steven Clayson and Stesha Pasachnik. The status of this iguana has also remained unchanged and is considered Critically Endangered [B1ab(i,ii,iii,v)] because of its small extent of occurrence (41 sq. km.), persistent hunting, and declining habitat quality and loss from development.

Also published were a revision for *Iguana delicatissima* and a new assessment for *Iguana iguana* which completes our goal for that genus. The Common Green Iguana was assessed as Least Concern by Brian Bock, Catherine Malone, and Charles Knapp and also includes non-ISG authors who contributed to the distribution map during a 2012 Central American Red List workshop organized by Nature Serve. This assessment makes note of the 18 countries to which it has been introduced and contains extensive text sections describing the biology of the species, which is a valuable resource within the Red List.

Unfortunately, the revision for Lesser Antillean Iguana, by Mathijs van den Burg, Michel Breuil, and

Charles Knapp, showed an increase in the threatened status for the species and was moved to Critically Endangered (A3ce). On-going decline and extirpation of this iguana has been primarily caused by inter- and intra-island dispersal of the invasive alien Common Green Iguana and subsequent hybridization. Since the 2010 assessment, three additional pure *I. delicatissima* islands had been invaded by Common Greens, including the site of a recent native iguana reintroduction. Following the publication of this revision, it was learned that Green Iguanas were found on the last stronghold for the species, Dominica ([see Iguana News section](#)).

The assessments that were finalized and will be published in 2019 included four newly assessed species and five revisions. The two most out-of-date (1996), *Cyclura cornuta* and *Cyclura ricordii*, were completed by Stesha Pasachnik and Rosanna Carreras De León. Ricord's Rock Iguana was changed from CR to Endangered [B1ab(i,ii,iii,v)+2ab(i,ii,iii,v)] because of new information and application of revised guidelines rather than an improvement in conservation status. Ricord's Rock Iguanas are fragmented among three subpopulations in the Dominican Republic and a very small population in Haiti. Their numbers are continuing to decline due to habitat degradation, poaching, and invasive species. While the total numbers of Hispaniolan Rhinoceros Iguanas are greater, their status has markedly declined by mostly similar threats as Ricord's iguanas and prompted a change from Vulnerable to Endangered (A2abcde+A4abcde). Local extirpations are known to have occurred throughout the island and their density is low compared to their "common" occurrence over the last three generations. These threats are predicted to continue for both species.

Two revisions for the Spiny-tailed Iguanas, *Ctenosaura oedirhina* and *Ctenosaura palearis*, saw no change in their threat category: EN B1ab(v)+2ab(v) and EN A2acd; B1ab(i,ii,iii,v)+2ab(i,ii,iii,v), respectively, but contain new information within the sub-criteria. Authors Daniel Ariano-Sánchez, Johana Gil-Escobedo, Eduardo del Valle, and Stesha Pasachnik were able to further refine the area of occupancy for the Motagua Spiny-tailed Iguana as well as incorporate an abundance estimation from social

ISG Updates

interviews. In the re-assessment for Roatán Spiny-tailed Iguanas, Ashely Goode and Stesha Pasachnik described six fragmented subpopulations across Roatán that are heavily threatened by hunting for local subsistence and tourists, invasive predators, and habitat conversion from development.

Lastly, all five iguana species inhabiting the islands in the Gulf of California were assessed, including four newly assessed species and all but one in the *Sauromalus* genus. On San Esteban Island, *Ctenosaura conspicuosa* and *Sauromalus varius* were assessed as Vulnerable D2 due to their restricted distribution and the plausibility that climate change in this region will increase the severity and/or frequency of drought and influence their natural extreme mortality events. *Sauromalus klauberi*, found only on the small island of Catalina, is also assessed as Vulnerable D2 by the same rationale, as well as having been heavily impacted by the presence of feral cats until cats were eradicated in 2004.

Slevin's Chuckwalla is restricted to four islands in the southern Gulf and meets the thresholds for Endangered in extent of occurrence and area of occupancy. It is suspected that the populations of this species also undergo extreme fluctuations and have been reduced from historic highs due to invasive predators and competitors, however historic survey records documenting this are unknown. Therefore, this chuckwalla was assessed as Near Threatened for B1a+2a at this time.

The re-assessment for *Sauromalus hispidus* is now much more accurate thanks to new information and recent surveys in the area, but has unfortunately shown a higher level of threat than believed previously. Extreme declines in abundance and density are noted for some subpopulations, particularly for the largest range island (Ángel de la Guarda). Like other iguanas in the Gulf, they are predicted to be impacted by increased severity and frequency of drought cycles, but are also currently pressured by invasive alien species, particularly feral cats, throughout much of its range. At least two island subpopulations are believed to be extirpated. Spiny Chuckwallas are now listed as EN B1b(i,ii,iv,v)c(iv).

These Gulf assessments were completed by Brad Hollingsworth, Michael Kartje, Chad Montgomery, Wendy Moral-Uribina, Nohelia Pacheco-Hoyos, Stesha Pasachnik, Victor Reynoso, and Hugo Salinas Matus.

Overall, 2018 was a very productive year among Red List assessors in the ISG, and we are grateful to their contributions. Many assessments are in progress for 2019 including very out-of-date revisions for *Amblyrhynchus*, *Conolophus*, several *Cyclura* species, *Dipsosaurus*, and new assessments for remaining Ctenosaurs and the newly described species of *Brachylophus*.

2018 ISG Meeting Summary

Stesha Pasachnik, Fort Worth Zoo

The 2018 annual Iguana Specialist Group meeting was held from 4–8 November in Fort Worth, Texas. The group stayed at the Marriott Hotel, enjoying an evening icebreaker at the Woodshed on the Trinity River on November 4th. Over the following two days the annual meeting was held in the Fort Worth Zoo Gallery. This included 26 oral and four poster presentations by ISG members and collaborators. On the evening of November 6th, we held our first-ever live auction to raise funding in support of travel awards or other meeting costs. Joseph Wasilewski emceed a lively and fun auction, raising over \$4,300 dollars. We are grateful to all who participated, especially John Bendon who donated many incredibly beautiful original art pieces. On

November 7th, we discussed ISG business and had several vigorous conversations focusing on a code of conduct for our group, reptile smuggling, Mohamed bin Zayed Species Conservation Fund opportunities, and hurricane response and climate change concerns. We also discussed updating recovery plans for all iguanas and agreed to work towards this in the coming years. In the afternoon, we had a private tour of the Museum of Living Art (the Fort Worth Zoo's reptile house) and the Iguana Facility, organized by Diane Barber and Vicky Poole of the Fort Worth Zoo herpetology division. In the evening, we had a closing dinner at the iconic Joe T. Garcia's restaurant in the Fort Worth Stockyards. The meeting finished with a trip to the Dallas World

ISG Updates



Aquarium for a fantastic tour of their public facility. We are incredibly grateful to Tarren Wagener, Michael Fouraker, Diane Barber, Vicky Poole, and the Fort Worth Zoo for hosting a very productive meeting. The meeting would not have been possible without their gracious assistance and support.

The ISG considers it a priority to provide access to students, and members from range countries who do not have the financial support to attend our annual meeting. Their participation is crucial for a realistic goal of conserving iguana species

long-term. We awarded nine travel grants, ranging from \$250-750 each. We congratulate the 2018 awardees, including: Baptiste Angin, Jeanelle Brisbane, Wilfredo Falcón, Daisy Maryon, Mallory McKinney, Yoni Muggen-van Uden, Thijs van den Burg, Alison Webb, and Rachel Welt. Jeanette Moss was also offered an award but was unable to attend the meeting.

A list of meeting attendees, abstracts, and photographs can be found on our website: <http://www.iucn-isg.org/about/isg-conferences>.



The 2019 meeting will be held 2-9 November on Roatán, Honduras. This location is intended to facilitate added participation from the wide range of our members, especially those in Mexico and Central America. We thank Stesha Pasachnik, Daisy Maryon, and Kanahau Útila Research and Conservation Facility for organizing our next meeting.



Iguana News

1,000th Iguana Released into the Wild

Reprinted from Caymanian Times - 27 July 2018



Renegade, the 1,000th Blue Iguana released into the wild by Fred Burton. Photo by Nick Ebanks, Operations Manager Blue Iguana Recovery Programme.

The National Trust for the Cayman Islands is very proud to announce that the 1,000th Blue Iguana was released into the wild on Monday, July 23, 2018. Number 1000, dubbed “Renegade” was released at approximately 5:45pm into Collier’s Wilderness Reserve. Renegade was able to start his new life in the wild after being given a head-start at our specialist breeding unit at the Botanic Park in Frank Sound. The Blues, including Renegade that were released into the wild were microchipped and fitted with colourful bead markers for future identification purposes.

The Blue Iguana Recovery Programme is very proud to have bred and raised such a robust and healthy animal, but this release was decades in the making and would have not been possible without the assistance of hundreds of people and numerous organizations. Renegade was one of ten iguanas released on Tuesday, signifying a valuable addition to the recovery efforts for these once critically endangered animals.

It has taken many years of labour and dedication to finally reach this milestone of 1000. Now that marker has been reached, the Blue Iguana Recovery Programme is looking to the future of preserving

the Blue Iguanas through further sustained releases and with an increased focus on the monitoring of the wild population.

With around 50 more releases planned for this year, coupled with mounting evidence that the wild population are actively breeding, the Blue Iguana Recovery Programme and its partners can finally rest a bit more comfortably knowing that these unique reptiles are no longer teetering on the brink of extinction. However, they remain on the endangered list and new threats continue to emerge so constant vigilance is required.

The Blue Iguana Recovery Programme is now moving into phase two whereby more funding is required for research to ensure that we can maintain the genetic diversity that is essential for the survival of this species in the wild. There are also several iguanas that due to old age, injury or other health reasons will never be able to be released and so the National Trust is working hard to ensure their living conditions are as natural and as safe as possible.

Please consider donating to the programme or sponsoring and naming an individual iguana. Visit www.nationaltrust.org.ky or call 345-749-1121



Blue Iguanas are marked with colored beads before release for easier distance identification. Photo by BIRP.



New Species of Iguana Found After Road Kill in Dominica

Reprinted from CBN, 4-5 April 2018

CBN4, DOMINICA — A new and dangerous species of Iguana “the Striped Tail Iguana” has been identified here on the island of Dominica.

Jeanelle Brisbane, an Ecologist doing voluntary works with the Forestry Wildlife and Parks Division said the iguana was located at Coulibistrie from a road kill.

She said that the striped tail iguana is very close to Dominica’s native iguana and that’s a danger to our native species of Iguana.

“So not only do they compete and they are better competitors than our Iguana but they actually reproduce with our native Iguanas and when that happens, our native Iguanas no longer become ours. So that is a threat that is being posed with having this on the island,” Jeanelle Brisbane noted.

When asked about how did the striped tail iguana found itself in Dominica, Brisbane believes that the iguana could have migrated through the sand quarry.

“Well all the other islands surrounding us actually have an established population of the striped tail iguana’s except one offshore island, that’s part of Guadeloupe.”

“So after Maria, this Iguana could have come through containers into our ports, it could have come through the quarry near Coulibistrie where we found this individual. It could have come through private boats as is the case with other islands and sometimes this Iguana spreads to new places because of the pet trade.”

“So there are many options but we think this individual in particular probably got across through the quarry,” Jeanelle Brisbane stated.

The young ecologist laid out some of the steps that are going to be taken with respect to the findings of the striped iguana here on the island.



Green Iguanas, non-native to most of the Lesser Antilles are characterized by a striped tail and a large circular scale on their cheek.

“Well, this animal, in particular, we are going to first determine how many eggs she has because we found her pregnant.”

“So we haven’t determined how many eggs she has and we are hoping that she came to the island with these eggs, she hasn’t laid already and she’s a newcomer so that there was never a chance for her to lay because that would be another problem on its own.”

“Then we’re going to swab her just to ensure that she didn’t come in with any diseases that could be harmful to any of our species here and then take a blood sample for record-keeping sake,” the Ecologist stated.

Jeanelle further noted that raising awareness is going to be extremely crucial in ensuring that this species does not become a major threat in Dominica.



Anegada Rock Iguana (*Cyclura pinguis*)

Conservation, Applied Research, and Recovery of the Anegada Rock Iguana, *Cyclura pinguis*

IIF Grant Report submitted by Kelly A. Bradley, Fort Worth Zoo

Overview

The Anegada Iguana conservation project is a long-term conservation program centered on head-starting iguanas to combat high juvenile mortality due to the presence of feral cats. Unfortunately, Hurricane Irma devastated the entire British Virgin Islands (BVI) on 6 September 6 2017. Bradley proposed three main goals for 2018: 1) provide assistance to aid the recovery of the headstart program and our in-country partners, National Parks Trust of the Virgin Islands (NPTVI), 2) equip the headstart facility with an effective disaster preparedness system, and 3) continue ongoing activities so the program does not lose momentum while the country begins the long journey to full recovery. These activities included: continuing support of the headstart program through the collection of hatchlings and releasing size-appropriate iguanas back to the wild; collaboration with botanists from the Royal Botanic Gardens KEW to document the habitat's recovery from the 2017 hurricane season; maintain the long-term camera trapping program inside the core iguana area; hosting the sixth annual Iguana Festival; and assisting with the production of a short conservation film highlighting the plight of the Anegada Iguana in the BVI.

Analysis and publication

A paper titled "Growth and Body Condition of Headstarted Iguanas, *Cyclura pinguis*, in Captivity and Following Release in Two Distinct Habitats of Anegada, British Virgin Islands" was submitted for publication to the Journal of Tropical Conservation Science. Survival analysis of the first headstarted released and animals is ongoing. Preliminary Kaplan-Meier analysis for survival was restricted to the 55 animals that had internal radio-transmitters and was limited to 730 days post-release. Eight animals died and the mean days of survival for the whole group was 528 days (47 were censored). A log-rank test was used to compare survival distribution functions between gender, site, and year, none of which were significant. However, there were significant differences for females



A small headstarted female, released back to the wild in November 2017, was observed very close to her original release location in October 2018. Photo by Kelly Bradley.

dependent on site (log-rank test $X^2 = 4.99$, $P = .03$). Cox Proportional-Hazards analyses are ongoing to determine the impact of initial SVL, mass, and body condition score on survival duration.

Hurricane preparedness

A Fort Worth Zoo team traveled to Anegada in July to repair hurricane damage and install new hurricane preparedness components. Repair work included: rebuilding the facility perimeter fence, repairing storm damage to the large walk-in cages and eight individual wooden cages, rebuilding the large outdoor graphics kiosk, rebuilding the main outdoor work area, and hauling away storm debris. Hurricane preparedness tasks included: installing seven raised planter beds (for callaloo), building a goat exclusion fence/gate for the garden, installing a garden irrigation system, and creating hurricane covers for the visitors center's doors and windows.

Field Reports

Four hurricane kits were delivered to the headstart facility. The first was an iguana evacuation kit that includes tools and materials to quickly evacuate up to 80 captive iguanas and move them to a safe location during a major storm event. The second was a facility preparation kit that provides the tools and materials needed to secure the cages and visitors center to mitigate storms. The third was an emergency iguana food kit to ensure staff is able to feed the captive population in the event that inter-island travel is suspended and outside food resources are unavailable. This kit contains 200 pounds of Iguana Chow, one case of fruit baby food, five 5-gallon collapsible water carriers, two bags of Oxbow Herbivore Critical Care formula, and a large supply of callaloo seeds. The final kit was an iguana first aid kit that contains important medical supplies to aid staff in performing basic first aid to any iguanas injured during a storm.

The Fort Worth Zoo also supplied the NPTVI with solar chargers and three Garmin InReach Units that have two-way texting capability. The units use satellite networks and are able to communicate when local cellular systems are down. The first draft of an Anegada Iguana Hurricane Preparedness Manual has been created and is currently being reviewed by NPTVI staff.

Headstarting

Four nests were identified during nesting surveys in July, however only one nest hatched. Only eight new hatchlings were brought into the facility this year. Four hatchlings came from a nest located in Bones Bight. The remaining were random individuals K. Bradley came across while out in the field. Typically, 12-15 random hatchlings are collected per year, so it appears that 2018 conditions were not conducive to successful nests. One particular nest noted should have hatched since several nests have been collected in the same spot. K. Bradley was confident it was a viable nest, but it had not hatched by November. Following a facility inventory, 15 animals (7males, 8 females) were chosen to be released. Students from Claudia Creque Education Centre (grades 5-12) participated in the release on 24 October 2018. All 15 animals were released in Windlass Bight, bringing the total number of released animals up to 248.

The drought beginning in February 2018 likely contributed to low nesting success rather than the 2017 hurricanes. However, it cannot be ruled out that these are harmful effects from Irma. Currently, the facility only houses 34 individuals

which is a result of zero hatchlings collected in 2017, only eight in 2018, plus two consecutive large releases in 2017 and 2018. K. Bradley will put a heavy focus on locating nests in 2019 to increase the facility's numbers.

Iguana Fest 2018

This year's festival was a great success with approximately 175 attendees. Notable guests included Joseph Smith Abbott (Deputy Secretary to the Ministry of Natural Resources and Labour), Kim Takeuchi (Unite BVI Foundation), and Mr. Vincent Wheatley (former Sisters Island Programme Coordinator). An equally important guest was Darwin Potter, who in the past has been a reluctant supporter of the iguana conservation program. After the festival, Mr. Potter shared that the festival was a mind-changing event for him and strongly expressed his approval of the festival and what it brings to the residents of Anegada.



Kelly Bradley and Mr. Vincent Wheatley handing out an award to a 2018 iguana art contest winner, Kyle Wheatley. Photo by Lisa Lee.

Field Reports

This year's Iguana Fest included a free breakfast, hotdog cookout for children, two iguana cakes, and candy. In addition, Big Bolo Back Yard Grill set up a booth and sold barbecue lunches and drinks. Festival activities included an early morning fun-run/walk for local residents, a family-friendly DJ, spraying down the kids with the fire hose, ecology coloring station, and many iguana/ecology games. As in years past, almost 400 official Iguana Fest T-shirts were given out. The shirts are much sought after, and additional requests come in long after they are out of stock. The shirts keep the program visible and create opportunities for conversations between researchers and locals throughout the year. The festival has become a favorite regional event that showcases the uniqueness of Anegada and its iguana.



Tyler Levons with Kelly Bradley releasing a headstarted iguana in October 2018. Photo by Lisa Lee.

Future

The 2019 work (e.g., collecting new hatchlings/releasing iguanas, long-term monitoring, and iguana/flora interactions) will ensure the program does not lose momentum as the country works toward full recovery from the 2017 hurricanes. Additional efforts will move the program towards a meta-population approach. The first phase is to conduct an extensive habitat assessment of Fallen Jerusalem, BVI, to ensure the island still affords iguanas their basic needs: varied plant community,

appropriate nesting sites, absence of introduced species, and determine the presence of the Puerto Rican Racer.

Iguana Fest 2018 was a great success, but with such high numbers in attendance the festival's format needs to change to increase its education impact on attendees. The plan is to setup independent stations where smaller, more manageable groups can complete education activities. The festival will have a mini passport that will get stamped when an activity is completed. Small prizes will be given out for completely filled passports. This format will require more volunteers to have all the stations running at once, but will ultimately result in greatly improved learning experience for festival participants.

Finally, the project's car failed in 2018, and it was determined not cost-effective to repair it. The Fort Worth Zoo will donate and ship a car to Anegada in 2019. K. Bradley attempted to purchase a generator, but the demand for generators made them extremely overpriced in the BVI. A generator will be purchased in the US next year and shipped to finalize the hurricane preparedness.

A headstarted male, released back to the wild as a sub-adult in 2003. This animal has been in the wild for 15 years and is now a full-sized adult. Photo by Kelly Bradley.



Common Green Iguana (*Iguana iguana*)

Assessing the Taxonomic Status of the *Iguana iguana* population on Curaçao and the Threat of Hybridization with Already Present Non-native *I. iguana* Lineages

IIF Grant Report submitted by
Matthijs P. van den Burg, University of Amsterdam
Catherine Malone, Utah Valley University

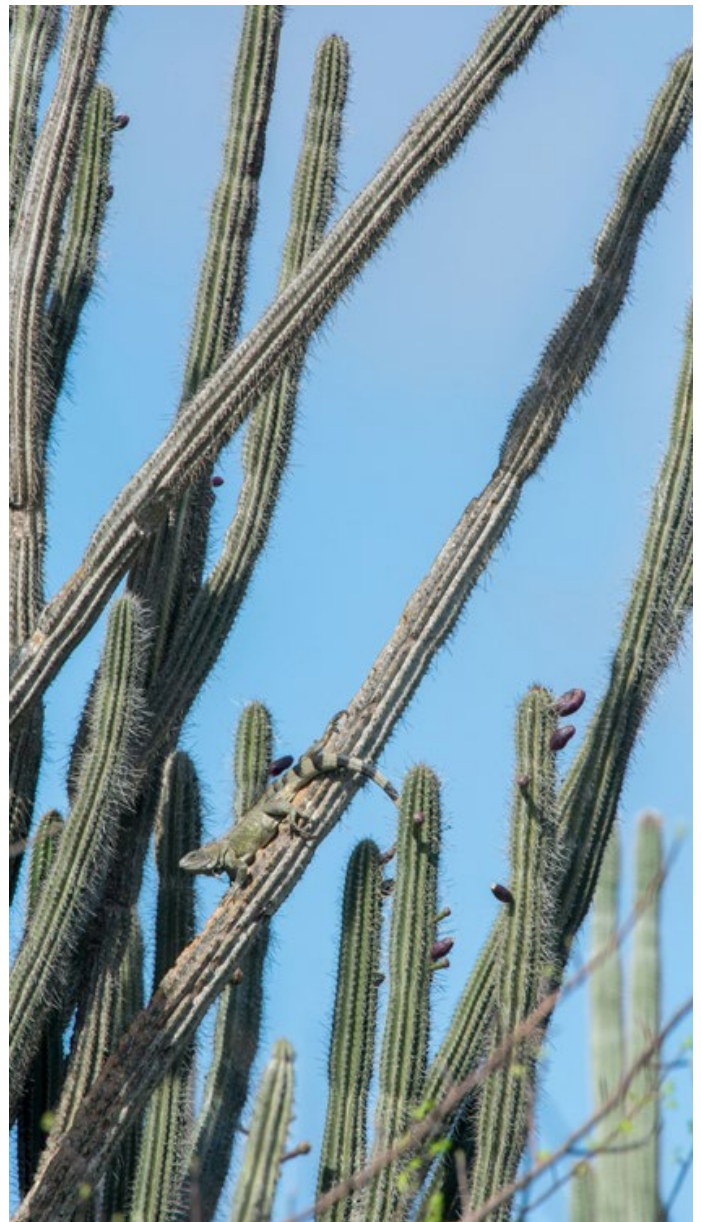
Objectives

Common Green Iguanas were studied on Curaçao to analyze their uncommon appearance. The following objectives outlined our aims.

1. We will collect genetic data from individuals across Curaçao, which will allow us to 1) identify if non-native iguanas are present within the *Iguana iguana* population on Curaçao, and 2) if so, whether hybridization between those non-native iguanas and native iguanas has occurred, and then 3) determine the source(s) of the non-natives.
2. Create and disseminate public education and outreach materials. Depending upon the connections and interest on the island, this may take the form of radio spots, newspaper editorials, and/or public presentations.
3. Collect morphometric data from specimens in museum collections, as well as from living iguanas on Curaçao and from regional populations. Using morphometric analyzes we will study the presence of locality/regional morphometric characteristics.
4. We will use our genetic and morphometric data to perform a taxonomic review of the Curaçao population and nearby regional populations.

Background

The extremely arid climate of the ABC islands makes it a surprising place to find Common Green Iguanas. The mean annual rainfall for Curaçao was 553 mm from 1971-2000. The islands have a distinct dry and wet season that peak between March-June and October-January, respectively. At the onset of the wet season, iguanas are in such a water deficit that they leave the safety of their perches and soak in the puddles. We began our fieldwork on Curaçao on the first days of rain for the season and witnessed the lethal consequences of iguanas soaking in the puddles that form in the



Adult iguana on Curaçao basking on large cactus. Photo by Thijs van den Burg.



*Landscape image of Curaçao.
Photo by Thijs van den Burg.*

road potholes. This was true for iguanas on the main highways, but also within the National Park.

Rainfall data from Curaçao, collected since 1830, shows a cyclic history of 2–4 year periods of extreme droughts every 12–15 years. During, or shortly after these periods, locals report seeing many emaciated and weak iguanas, including iguanas falling out of trees. Additionally, following the last two extreme droughts, local biologists and the public became so alarmed at the drop in iguana numbers that they initiated captive breeding programs and imposed hunting regulations in order to boost population numbers. Interestingly, these measures were undertaken as a response to “overhunting,” but it is equally plausible that the population size on the island naturally fluctuates with extreme drought events. Unfortunately, no systematic data was ever collected to test the impact of drought on iguana populations. However, anecdotal evidence and logic support the idea that these periods would have greatly affected iguana

survival as vegetation and fresh water was not, or only scarcely, available for prolonged periods.

Genetic Results

During seven fieldwork weeks we caught 263 iguanas on Aruba, Bonaire, and Curaçao (ABC islands) combined, and 56 iguanas in Colombia. DNA extraction from a subset of these samples was performed and DNA sequencing and analysis of the mitochondrial (ND4) and nuclear (PAC and MLH3) loci on a large subset of the samples (139, 127, and 6, respectively) has been completed. These data show that all iguanas captured on Curaçao and Bonaire, as well as a subset of iguanas on the Colombian mainland, share mitochondrial haplotypes that belong to the previously identified ‘Curaçao’ clade. At the PAC locus, in addition to ‘Curaçao’ clade haplotypes on Curaçao and Bonaire, we recovered haplotypes from South American clades West and East of the Andes. Given that nuclear DNA coalesces more slowly, this is not unexpected and is likely reflecting older

Field Reports

connectivity between populations. Altogether, these data suggest an absence of invasive iguanas on both Curaçao and Bonaire.

In Aruba, mitochondrial haplotypes of both the 'Curaçao' and the South American 'West Andes' clade were found. A shallow ocean floor and existence of a land bridge between Aruba and the mainland during glacial periods could have facilitated iguana dispersal. This has also been suggested to explain the presence of *Crotalus unicolor* on Aruba. Lastly, preliminary genetic data from sampling the circumference of Santa Marta mountains (~700km) in Colombia reveals three mitochondrial groups, one of which corresponds to the 'Curaçao' clade. Many of the Colombian individuals in the mtDNA 'Curaçao' clade also have nuclear haplotypes restricted to Curaçao and Bonaire. Though very preliminary, this could suggest assortative mating where these Colombian haplogroups come into contact.

Outreach

Within our outreach and education components, we published five articles in regional newspapers *Amigoe* and *Antilliaans Dagblad*, reaching all ABC islands. These articles were used to discuss our activities and the importance of iguanas in the islands' ecosystems. One additional article will be published to communicate our final findings to the local communities.

We created educational material for incorporation into the biology curriculum made available to schools through the local NGO, CARMABI. After consultation with their Educational Manager, Cor Hameete, we created documents and exercises for high school and primary school-age students that highlight the biology of iguanas and their importance in nutrient cycling and ecosystem connectivity. For primary school children, we commissioned illustrator Nienke Beets to create a coloring plate that visualizes the tropical dry forest habitat of the ABC islands including multiple parts of the carbon cycle that involve iguanas. Along with the plate, we created accompanying text and exercises for educators to incorporate into their curricula. These files were shared with all ABC island NGOs (CARMABI, Stinapa, Arikok) to be distributed to schools and also to National Park Offices for use with interested local visitors and tourists. Furthermore, we helped build on-island capacity by demonstrating and explaining our fieldwork techniques to park rangers on Curaçao (CARMABI) and on Aruba (Arikok). We spent two

days with CARMABI personnel and one day with Arikok personnel and aided their understanding of (iguana) ecology and ecosystem functioning. Lastly, at the Christoffel National Park (Curaçao) we bead-tagged two iguanas so that park rangers can educate visitors about iguanas, ongoing research, and methodology.

It is important to note that, prior to this project, no educational materials regarding island ecology of the ABC islands incorporated Common Green Iguanas.

Morphology Results

We visited the Smithsonian, D.C., and the Field Museum, Chicago, to collect morphological data from 72 specimens representing the range of *Iguana iguana*. These data were also collected during our fieldwork efforts.

Preliminary data analysis show that, in contrary to data published in the 1980s (Bakhuys 1982), Curaçao iguanas do show sexual size dimorphism and attain larger SVL size than previously published (Fig. 1). Potential reasons for this prior-to-current discrepancy are 1) higher hunting pressure on iguanas in the past that would have biased data toward a smaller size range, and 2) earlier data were collected during or just following an extensive drought, which could have resulted in

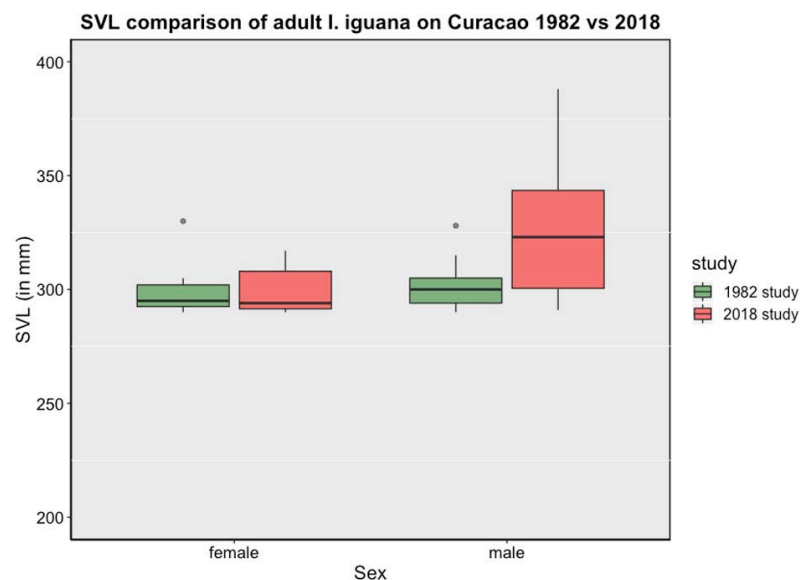


Figure 1. Data comparison of snout-vent lengths measured from adult iguanas on Curaçao during 1982 and 2018.

Field Reports

higher mortality of larger individuals. Currently, we are still processing our collected data and will complete this in the first half of 2019. However, preliminary morphological data indicates that genetically defined clades cannot be defined by morphology (Fig. 2).

Completion of this project component awaits full morphological and genetic data analysis. Our preliminary genetic data indicate that some boundaries of clades recovered from prior genetic studies on Common Green Iguanas have shifted, but the clades themselves remain intact and taxonomic revision seems warranted. In particular, the Curaçao and Bonaire populations maintain genetic integrity for one of the clades whose boundary now extends to the dry region of northeastern Colombia and likely into the Maracaibo delta (but data are not available from that region yet).

Future

In the immediate future we will continue perform data collection and analyses to complete the current project, after which we will disseminate its final results to funding organizations/parties, collaborators, local newspapers, and to the

scientific community. If taxonomically elevated, the Curaçao/Bonaire group would deserve high conservation and research attention, and a large range of projects would be of interest to gain insight into their ecological adaptations.

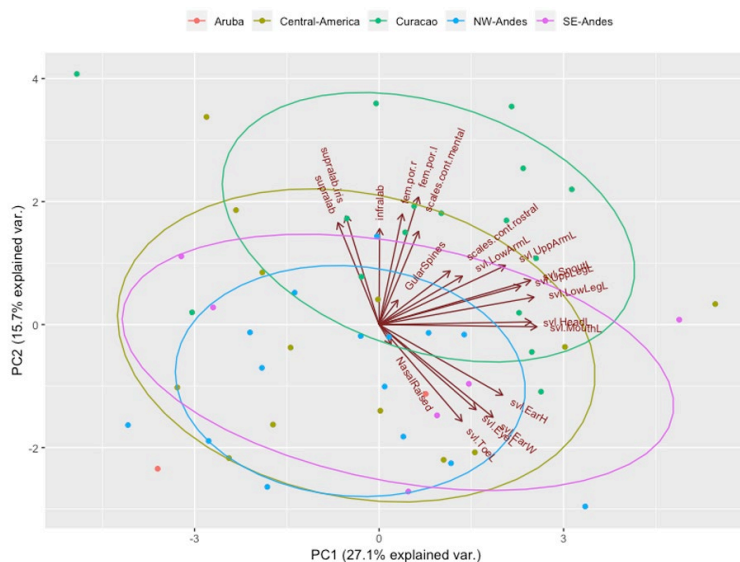


Figure 2. Principal component analyses plot for 27 morphological variables collected from 52 iguanas.



Catherine Malone (left) and Thijs van den Burg (right) collecting morphological data from an iguana on Curaçao. Photo by Wilfredo Falcon.



Fijian Crested Iguana (*Brachylophus sp.*)

Fijian Iguana conservation through long-term survivorship monitoring of captive head-started and released Crested Iguanas (*Brachylophus sp.*) to Monuriki Island

IIF Grant Report submitted by
Kim Lovich, San Diego Zoo Global
Robert Fisher and Joey Brown, USGS
Jone Niukula, National Trust of Fiji

Overview

The Monuriki Island Iguana is genetically and morphologically unique and its population has been determined to be of high risk of extinction due to its single location on Monuriki, a 40 hectare (100 acre) uninhabited island off the west coast of Fiji. For the past decade there has been increased conservation investment for this island to keep the iguanas from going extinct. Invasive goats and rats were removed and a captive rearing program started for the iguanas. In the spring of 2015, San Diego Zoo Global helped support a release and short-term telemetry study to see if released iguanas survived on their own in the wild (Chand *et al.* 2015). This short-term analysis showed some success as iguanas were tracked and surviving two months post-release, but the following year (2016) only a few were detected. The current study supported the closure of the captive rearing program and the release of the remaining founder stock, plus 32 captive-produced offspring. We followed iguanas for almost five months in this study, to determine longer-term survivorship and search for animals that were part of the 2015 release. The fieldwork component of the project was completed late July 2017, but the analysis and report will be continuing until early 2018 per agreement with the IIF.

Telemetry

We had previously developed a short-term radio attachment protocol, but for this project we needed to attach the transmitters for up to five months for continuous telemetry. Through some experimentation, trial, and error, we developed an attachment method to the tail, that although not optimal, worked to allow us to track most of the iguanas through the study period.

We attached transmitters to three study groups: 10 captive-reared and released iguanas, 10



Pre-release confirmation of the PIT tag number for an iguana on Monuriki Island. All iguanas captured and released on the island are marked with PIT tags and photographed so they can be tracked over time. If they are found off-island, the tags will pinpoint their origins as Monuriki Island. Photo by Robert Fisher.

released founder stock (born in the wild and captive for a few years), and 10 wild-captured iguanas (never captive). This study design allowed comparison of behavior and survivorship between these three groups. We presumed that the last group of wild animals would be the control of how iguanas normally behave on Monuriki. We were able to track most iguanas in the three groups, although there was attrition over time through transmitter loss and some mortality within the first two study groups.

Field Surveys

We conducted night surveys across the five study months to try to relocate PIT-tagged iguanas from the May 2015 release of 32 captive-bred iguanas.

Field Reports

We were able to find and capture only six of these iguanas and they appeared to be doing well, some of which were found paired with wild iguanas that had persisted on the island. During these surveys, we captured 39 wild iguanas. All that were large enough were photographed and PIT-tagged. This total count indicates the success of the rat and goat eradication was very positive for iguanas, with noticeable recruitment on island. Prior to 2016, no hatchling or young iguanas were detected on Monuriki Island. We are concerned that despite all the field effort during 2017 we only detected six of the 32 released iguanas from 2015, which, if correct is only an 18.7% survival rate over two years. Future captive breeding projects might need to include soft releases, or other cage modifications if survivorship really is this low among captive-produced animals. But, we are encouraged that we did get some long-term survivorship and will consider using this tool in the future, possibly with these modifications.

We had some issues with rechargeable batteries, making some surveys less successful than they could have been and led to a little data loss. We will use only non-rechargeable batteries into the future.

This will be an ongoing project; we are still working on analyzing the movement data. All data points have been moved into GIS and will be conducting spatial analysis soon to determine if the three study groups have different movement patterns and home-range sizes.

Training and Outreach

We trained and mentored a student from the University of Oklahoma on project management, radio-telemetry, and iguana biology specific to Monuriki. We also trained a local team on the project skills, especially telemetry. Unfortunately, we were not able to find a student from University of the South Pacific to participate in this project



Newly-released captive-born Monuriki Iguana assessing its new wild surroundings, prior to running up the tree. Photo credited to Robert Fisher.

Field Reports



Iguana processing at Kula Wild Adventure Park captive breeding facility prior to moving the iguanas to the release site. An assembly line was set up to ensure each iguana was handled properly. This event was a major collaboration with staff participating from Kula Wild Adventure Park, the National Trust of Fiji, Yanuya Village (traditional land owners of the island), Provincial Office, NatureFiji-MareqetiViti, San Diego Zoo Global, University of Oklahoma, and USGS. Photo by USGS.

as intended. The local community greatly appreciated our weekly presence on the island during the five months and spent a lot of time learning from our student in the field.

As part of relating the success of the Monuriki Island Iguana story, we are continuing to put out information about the program. In 2016, we published a short paper on the repatriation of iguanas to Monuriki (Chand et al. 2016). In 2017, we presented a poster at the IUCN Island Invasives Conference in Scotland highlighting the overall program and including some early study results (Fisher et al. 2019). We will present this same poster at the Iguana Specialist Group meeting in Cuba, November 2017.

Impact

This program shows that we can recover Fijian Crested Iguanas on an island with critically low numbers of individuals remaining. The population estimate was in the low 10s when the program started less than 10 years ago. Through captive rearing and invasive species removal, we now have a population of wild iguanas in excess of 100. This next reproductive season should really boost the population as it will be the first year some of the captive-produced and younger wild iguanas will breed, as they mostly hatched after 2012 when rats were removed. Seeing how rapidly the remaining native population recovered after rat eradication may help us better evaluate the need for captive breeding in the future. A

cost-benefit analysis will always be needed, and this study will help with decisions for other critically at-risk populations around Fiji. For the first time, we've shown we can repatriate founder animals and obtain a 2-year survivorship among captive-bred iguanas in the wild. Our outreach and training goals were met and the program stands as a great example of a community conservation approach with technical support from our team.

This program has clearly been initially successful but raises some additional questions, especially about the role of captive breeding in recovering iguanas. In this case, where invasive species were removed and captive breeding conducted, the value of captive breeding might be much less than in scenarios where invasives can not be removed, such as for the Grand Cayman Blue Iguana program. Since the small group of iguanas left on the island were so successful reproducing after rat eradication, we might have hindered recruitment by removing 10 pairs of animals to the captive facility where their reproductive output might have been less than if we had left them in the wild. This question may become more important if we find little reproductive contribution from the captive-bred iguanas in future genetic analyses. In contrast, if we had not been able to remove rats, we feel captive breeding would have been essential for recovery since no juveniles were previously observed since surveys began in 1998. This will be a consideration as we work to complete the recovery plan and assess other similarly

Field Reports

at-risk iguana populations. The Monuriki project was an objective in the 2008 Crested Iguana Recovery Plan, and its success gives us hope for future projects included in the new revised recovery plan.

Future

In the future, we plan to continue monitoring population growth of the island's iguanas. We will continue to collect genetic samples, such that in five or so years we can attempt to analyze the relatedness and genealogy of new iguanas on Monuriki Island. This will allow us to determine whether the captive-bred iguanas are contributing to current and possible future offspring on the island, or if they were not reproducing. We do have some guarded concerns about wild survivorship for captive iguanas, and we might recommend modifications to cage designs or suggest soft releases to ensure higher long-term success if we engage in these type of programs in the future. We will continue to analyze and publish this data so it can serve as an example in our recovery plan revision for this species.

Lastly, we are extremely grateful to the IIF for funding our research and restoration program for these critically endangered species. We are continuing basic research on systematics and this year described another new species from Fiji, the Gau Iguana (*Brachylophus gau*), increasing the diversity of living Fijian Iguanas by 25% and are currently working on additional descriptions (Fisher *et al.* 2017).

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The Monuriki Ranger, Jhaba Vadada, preparing to release a captive-born and raised iguana with an attached telemetry unit back to Monuriki. Jhaba is in his second year working as a Ranger. The Ranger Program on Monuriki Island was started with funding from a Disney Conservation Fund grant to the IIF in 2015. Photo by Robert Fisher.



Lesser Antillean Iguana (*Iguana delicatissima*)

Iguanas Fly First Class!

Tim van Wagensveld, Reptile, Amphibian, and Fish Conservation the Netherlands (RAVON)
Matt Goetz, Durrell Wildlife Conservation Trust/ Jersey Zoo
Mark de Boe, Diergaarde Blijdorp/ Rotterdam Zoo

Numbers of the Critically Endangered Lesser Antillean Iguana (*Iguana delicatissima*) are ever dwindling throughout their native range. In early 2016, the Durrell Wildlife Conservation Trust (Jersey Zoo), Diergaarde Blijdorp (Rotterdam Zoo), St. Eustatius National Parks (STENAPA), and Reptile, Amphibian, and Fish Conservation Group in the Netherlands (RAVON) got together to develop an ex-situ breeding project for this species. While this plan focuses on an ex situ breeding group, it also feeds into the Species Action Plan, which is being developed throughout the species' native range.

A small ex situ population of *I. delicatissima* is already being kept at a number of EAZA (European Association of Zoos and Aquariums) institutions. This population is currently coordinated through

an EAZA studbook managed by Matt Goetz (Jersey Zoo) to keep a sustainable and sufficiently robust genetic base. It would strongly benefit from the genetic input of several unrelated iguanas, which would have to be wild-caught without resulting in a detrimental effect on the wild subpopulation.

The main aims of this ex situ population are to safeguard a genetically robust captive population, to develop husbandry and breeding expertise to aid in situ initiatives developed under the Species Action Plan, and to display the species to zoo audiences to facilitate the raising of awareness and funds. There is the possibility that at some point offspring could return back to their native range if the situation in situ would require this and appropriate biosecurity measures would be in place.

A female Lesser Antillean Iguana by the STENAPA office, and seen with glass beads as part of the monitoring program by RAVON. Photo by Tim van Wagensveld.



Field Reports

We hope that in the near future we will be able to start an in situ breeding facility on St. Eustatius as well, and bring to it the knowledge gained from the breeding project in the European zoos. However, on St. Eustatius, and many other islands, it remains important that surveillance and biosecurity measures are upheld in order to protect the native *I. delicatissima* population, from (further) Common Green iguana (*Iguana iguana*) or hybrid incursions. Presence of invasive iguanas could make in situ breeding efforts of *I. delicatissima* futile if they are destined to eventually hybridize; therefore any invasive iguanas must be removed. This is still deemed possible on St. Eustatius as hybridization is still at an early stage, and to date only 10 hybrids have been located based on many hours in the field specifically on the lookout for invasive iguanas.

In 2016, the possibility arose to bring four *I. delicatissima* from the Dutch Caribbean island of St. Eustatius, to contribute to the ex situ breeding program. However, before any iguanas were to leave St. Eustatius, STENAPA, RAVON, and Rotterdam Zoo held numerous meetings with local stakeholders, regarding the proposed idea. It was agreed that we were to only take four adult iguanas (two males and two females), and the iguanas, although never able to return back to St. Eustatius, would ceremonially remain property of the Statian government. After approximately a year and many additional meetings, a consensus was reached among all the stakeholders on how to pursue with the project.

When all paperwork was arranged (CITES, customs, veterinary) allowing us to catch and bring four iguanas to The Netherlands, plans were made to initiate the project in September/October 2017. This initiative was timed to be in combination with a workshop hosted by the Anguilla National Trust (ANT) for regional and international partners for an *I. delicatissima* regional recovery plan on Anguilla. However, the original timing was disrupted when Hurricanes Irma and Maria struck the Antilles causing major damage to both infrastructure and nature, forcing us to cancel our trip. We scheduled a new date to

acquire iguanas from St. Eustatius to coincide with another iguana workshop in February–March 2018. However, two days before our departure, the airline stated that it was going to uphold an embargo on the transportation of reptiles and amphibians, due to a shipment of reptiles that were found mostly dead on arrival from Malaysia to The Netherlands a few day prior to our departure. A last-ditch effort was made to fly with a different carrier via other islands or countries so that the transport could still go through, but the sudden amount of paperwork and extra costs involved made it impossible. We flew back from St. Eustatius empty handed, but thankfully we were able to contribute to a very fruitful regional recovery plan at the workshop.

It seemed we were left without any options until we were informed that a Dutch government delegation, including the Dutch Prime minister Mark Rutte, was scheduled to visit St. Maarten, St. Eustatius, and Saba in early May 2018. We approached government officials and asked if it would be possible for four iguanas to travel in the government airplane on the flight back to The Netherlands. After a few weeks of waiting, the answer that we were hoping for came through and we would be allowed to transport the iguanas! A couple of days later we flew to St. Eustatius with a week's time to catch four iguanas. We tried to catch them as far apart from each other as possible, to minimize the chance of



Sandra Bijhold of Rotterdam Zoo is seen here checking the iguanas one last time before they head off towards the F.D. Roosevelt Airport on St. Eustatius. Two crates were used, each containing two iguanas. Photo by STENAPA.

Field Reports



One of the two crates being loaded on to the chartered Winair flight from St. Eustatius to St. Maarten. Photo by Tim van Wagenveld.

catching related iguanas. We also would not retain an individual if it was, for example, the only male in that particular area. After we had caught two adult females and a single adult male it seemed as though we were not going to find another male (many during that time had been run over by cars). But, upon arriving at the holding area in the early morning to feed the previously caught iguanas on our penultimate day, an approximately two-year old male was stuck in the chicken wire trying to get in. What was even more interesting was the fact that it was the same small male that got stuck in the same chicken wire exactly two months earlier when we also had two females in the holding area. On the day of departure, the iguanas were placed in large crates with the adjustability of sectioning-off different parts on the inside of each crate depending on the size of the iguanas. Before the flight, a very quick press interview with the local Stavian government was organized and the governor ceremonially carried one of the crates to the aircraft. The first flight from St. Eustatius to St. Maarten

was onboard a privately-chartered flight, which gave us breathing space to keep an eye on the precious cargo and provide as much peace for the iguanas as possible. Upon arrival on St. Maarten, the iguanas (accompanied by a RAVON and Rotterdam Zoo caretaker) were transferred on the tarmac to their next flight onboard the Dutch government airplane. It was an amazing experience to place the iguanas in the prime minister's on-board conference room. Not many people get to fly in such luxury, let alone iguanas! They arrived safely in Rotterdam, at the Hague Airport, and went straight into quarantine at Rotterdam Zoo. The iguanas are still doing well, and will remain for the time being until they are moved to a large new enclosure being specifically built for *I. delicatissima*, that will open at Rotterdam Zoo in early 2019.



Motagua Spiny-tailed Iguana (*Ctenosaura palearis*)

Community Outreach and Capacity Building for Long-term Conservation of the Endangered Motagua Spiny-tailed Iguana *Ctenosaura palearis*, 2017 Project Update

IIF Grant Report submitted by

Daniel Ariano, Johana Gil, Gilberto Salazar, and Eric Lopez, Zootropic
Edwin Castañon, Kervin Cardona, and Guido Rossi, Universidad del Valle de Guatemala

*This report is an update to research and community engagement started in 2015 with funding from the International Iguana Foundation (IIF), addressing serious conservation needs for the Motagua Spiny-tailed Iguana (*Ctenosaura palearis*) in the upper Rio Motagua Valley.*

Education Program

Because of the great success we had with the education component of this project in 2016, we visited elementary schools in four other small villages in 2017: San Luis, Quebrada Honda, Las Anonas, and El Tambor, which makes a total of around 300 children and teachers we have reached.



Johana Gil and Gilberto Salazar during education talk with the children of Quebrada Honda elementary school on how to identify *Ctenosaura palearis* from *Ctenosaura similis*. Photo by Erick López.

We carried out eight visits that included environmental education talks, group dynamics, songs, animated videos, presentations with wild animals, and a component we call the “treasure chest of



Awareness T-shirts given to children of La Puente elementary school. Photo by Johana Gil.

the dry forest”. In May, the children and teachers were given a promotional *C. palearis* conservation T-shirt (300 shirts) that reminds the community of these lessons for an extended period of time. In August, we held a drawing and short poem competition with the main theme focused on the role of the iguana and germination of its preferred food in the dry forest, the Organ Pipe Cactus. Through drawings and messages, the children expressed the importance of the iguana as part of the dry forest, the threats they face, and how they can be part of the conservation of this species by learning to identify it correctly. The contestants were separated by grade level and backpacks and educational books were given to the winners.

After the second year of this program, we already see positive results regarding the student’s knowledge of iguanas. Children as well as adults have learned to identify iguana species correctly, are knowledgeable about their habitat, food, reproduction, their importance in the dry forest,

Field Reports



Education talk with children of La Puente elementary school on the ecologic role of iguanas of the genus *Ctenosaura*, here interacting with an individual of *Ctenosaura similis*.

and the threats *C. palearis* is currently facing. It is gratifying to listen to teachers and parents who tell us they are no longer eating *C. palearis* because their children have absorbed the message of caring for the iguana. These children are in almost daily contact with iguanas now because the extent of deforestation taking place in the area forces iguanas to use refuges near houses and schools, so it is important they know more about the relevance of species conservation.

Some of the students have related to us they are interested in working in conservation for their professional careers, and particularly with endangered iguanas. To us, this exemplifies how a project like this, managed and carried out by locals, can have a huge impact on the lives of people involved in it and a great impact for species conservation within the country.

Genetic Assessment

We have completed research to determine the genetic structure and identify possible evolutionary significant units (ESUs) in *C. palearis* populations throughout the valley. A total of 45 individuals were sampled from six distinctive locations throughout the iguana's range, all within the Motagua Valley. We amplified two mitochondrial genes with primers that we designed: NADH dehydrogenase subunit 4 (ND4) and lactate dehydrogenase subunit 1 (Ldh1). A haplotype network was generated using POPART with a TCS network

algorithm. Three different ESUs have been identified with our analysis: one in the central and western part of Motagua Valley, a second from the eastern-most part of the species' distribution (on the southern Motagua river bank), and a third from the northern Motagua river bank. This information is important for better management of the species. Performing this analysis also served as an important capacity building trigger within the country for students interested in iguana conservation genetics.

Research and Interpretive Signs at Heloderma Natural Reserve

We continued camera trap monitoring of the iguana's daily activity patterns and radio-tracked four male iguanas during the dry season. Tracking occurred from 2 January to 19 May 2017, when the last radio failed.

Finally, we designed and installed four interpretive panels for the "iguana trail" inside the Heloderma Natural Reserve. We feel the signs have had a very strong impact on visitors by illustrating the relevance of *C. palearis* as a keystone species for dry forests in Guatemala.

One of four interpretive panels installed at the "iguana trail" inside Heloderma Natural Reserve. This panel discusses the relevance of iguanas as cactus seed dispersers in the dry forest. Photo by Johana Gil.



Future

Our outreach project has been so successful that the future directions will be aimed at strengthening the management of the Heloderma Natural Reserve. The Reserve has been shown to be a very important area for *C. palearis* conservation and may be developed as the environmental education center for the Motagua Valley. For these reasons, we plan to apply for an IIF grant in 2018 that will focus on covering management expenses of the HNR, to continue active conservation in situ and receive school groups for education talks. It is necessary to have funds directed to improve *C. palearis* management within the reserve to move forward on conservation of this endangered species in Guatemala.



Roatán Spiny-tailed Iguana (*Ctenosaura oedirhina*)

Monitoring an Endangered Iguana and Cultivating the Next Generation of Researchers and Managers, 2018 Report

IIF Grant Report submitted by Stesha Pasachnik, Fort Worth Zoo
Daisy Maryon, University of South Wales
Ashley Goode, USDA

Overview and Objectives

In order to create a sustainable monitoring program, as well as foster the next generation of iguana researchers and managers, we offer workshops in which students and interested members of governments and NGOs obtain intensive training in the field, while collecting vital natural history data in an ongoing project. Workshop participants gain experience in all the basic techniques of iguana research, but the workshops are specifically catered to the participants' needs for their programs and interests for study or management. Participants are also able to gain experience working as a team to conduct independent studies. These projects provide an opportunity to analyze and document the vegetation and diet of the Roatán Spiny-tailed Iguana, *C. oedirhina*, run flight distance and behavioral trials, use transect surveys, collaborate with local conservation organizations (e.g., Kanahau), provide information to the community through outreach activities, and prepare an IUCN Red List assessment for publi-

cation. Since the workshops are tailored to the participants, we accommodate a range of educational and field experience, while keeping everyone involved and excited about the research. Data collected during these workshops is continually added to the life table for this species in order to inform local management strategies.

Outcomes and Impact

To continue monitoring *C. oedirhina* and keep a visible presence on Roatán, as well as provide training, we held our standard ten-day workshop focusing on field techniques and general conservation and research concepts. We also held a second privately-funded workshop prior to our standard workshop, for a high school group (nine students and two teachers) from Houston, Texas.

Our standard workshop included five participants from five different countries. Our sixth participant had to cancel due to yellow fever related travel issues. One participant was an undergraduate student (Guatemala), two were conservation technicians (Nicaragua and Jamaica), one was a conservation program volunteer (Bahamas), and one was a museum curator (Cuba). After assessing the varied backgrounds and interests of the participants, we designed the field and lecture components of the workshop to cater to their interests and needs. By training participants, we help to build capacity in the region for those just beginning their research careers and those already involved in iguana projects and management. The undergraduate student was able to get hands-



The standard workshop participants at one of our long-term field sites. This site has been supportive of this work since 2010 and has even made informative signs for the iguanas. Photo by Stesha Pasachnik.

Field Reports



Daisy Maryon instructing two participants on processing techniques. Photo by Stesha Pasachnik.

on experience that will help them as they move forward in their academic career:

"I enjoyed a lot the group interactions and also the field work. My favorite part was the processing because I learned a lot and also because I have never done some of these things".

While one of the technicians had "the opportunity to work with a different species of iguanas," the other technician was excited to work on a capture/recapture survey, they said, "me gusto mucho la captura y recaptura de los species".

The participants came with diverse backgrounds in fieldwork, education, and career paths, but all were able to practice common field techniques and surveys they may not have had experience with in their current projects. Due to weather conditions we were not able to continue our ongoing dietary study but instead focused on an IUCN Red List assessment for *Ctenosaura quinquecarinata*. This assessment is one that has needed to be completed for some time, making this

Ultrasound exams were performed on captured female iguanas to look for eggs. Photo by Daisy Maryon.

activity a great help to the IUCN SSC Iguana Specialist Group. At the same time the participants gained valuable insight into the decision-making process of listing a species and will get a publication out of the experience. The Houston high school workshop was a less intensive program but still provided hands-on experience.

The data collected during these workshops marks our eighth year of mark-recapture research. In total, 151 new iguanas were captured and 45 were recaptured across our sites, including a new privately-owned site. The new site is small but has a high density of iguanas. Over the course of this study from 2010 onward, we have seen fluctuations in population size, so continued monitoring of demographic trends is vital to proper management of this species. In addition, maintaining a presence on the island helps to reinforce protection for iguanas, especially at study sites where hunting intrusions occur. The captured and tagged iguanas provide important data points for growth and survival analyses. The recaptured individuals in the last workshop show some of the originally captured iguanas from 2010 and 2011 are still alive, providing longevity information. These demographic data provide the first long-term monitoring effort for this genus and can be used as a model for other species within the genus.

Unfortunately, this year also marks the discovery of an invasive population of Útila Spiny-tailed Iguana, *C. bakeri*, the neighboring island endemic from Útila, Honduras. The cay where the popu-



Field Reports

lation occurs was briefly surveyed and several invasive iguanas were documented. We worked closely with the federal government of Honduras, discussed what actions to take, and have begun moving forward with our joint decision, recognizing that it is ultimately the responsibility of the government agency to take action.

This year we discovered a new population of Roatán Spiny-tailed Iguanas. Once again, this population is privately-protected by being on the grounds of a high-end resort that limits access to the site. Unfortunately, this population is threatened by the presence of a healthy cat population, which has been observed predating iguanas of all sizes. We are consulting with the owners of this property to eliminate the cat threat. This is not directly linked to an originally proposed objective but relates to the threats to this species.

A recaptured Roatán Spiny-tailed Iguana that was first marked in 2010. Photo by Daisy Maryon.



Participants hold an iguana that has been processed and is ready for release. Photo by Daisy Maryon.

Future

We plan to continue these workshops to ensure that monitoring of this species persists, while building capacity in iguana range countries. In future years, we will continue to complete IUCN Red List assessments and would like to include additional smaller projects, similar to our ongoing dietary study. This will allow participants to experience managing data collection, analyzing data, and give them the opportunity to publish short articles. We are also beginning a collaboration with Dr. Susannah French (Utah State University) to study stress physiology of iguanas across the sites. In addition to stress related data, we will work together to better understand the reproductive cycle and behavior of this species, something that has been lacking in our research to date. Lastly, due to our discovery of an invasive *Ctenosaura bakeri* population on a small cay off Roatán we will focus monitoring and management efforts on this population to reduce risk of hybridization and genetic swamping.



Útila Spiny-tailed Iguana (*Ctenosaura bakeri*)

Conservation Approaches, Population Monitoring, and Nesting Ecology of the Critically Endangered Útila Spiny-tailed Iguana *Ctenosaura bakeri* on the Island of Útila, Honduras

IIF Grant Report submitted by

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Overview

This project investigates the population size, demographics, and nesting ecology of the Útila Spiny-tailed Iguana (*Ctenosaura bakeri*). We also provide environmental education and conservation outreach to the community. To deliver these objectives, we conduct an updated population estimate by surveying the entire island through transects, obtain biometric data to assess population health, and collect genetic material to assess the current hybridization status between *Ctenosaura bakeri* and *Ctenosaura similis*. To enhance local knowledge about the species, we provide education lectures and activities to school children aged 5-14 in six schools, as well as organize nature-themed events and talks to enhance conservation awareness and community engagement.

Education Programme and Community Outreach

Thanks to our grant from IIF, we were able to provide an internship for an Environmental Education Officer in 2018. We had two interns throughout the year; the first intern was Daphne Merlo, a student from the Universidad Nacional Autonoma de Honduras (UNAH), was finishing her degree in environmental studies, and our current intern, Sapphira Jackson, a Útilan who has recently graduated school on the island. Both interns have been instrumental in enhancing community engagement not only about the plight of the iguanas on the island but in other environment issues and concerns. As well as delivering environmental lectures to over 700 school children in six schools, they organised workshops on nature photography and recycling at the Útila Handmade Cooperative (a Kanahau project) and in the schools.

Our interns also organized a now annual Eyes of Útila photography competition for the children of Útila. This year's event included a special category

for Best Iguana Photograph and the winning photo was by Blake Hernandez, a third-grade student from the public school on Útila. Blake's photograph depicts a hatchling *C. bakeri* next to a plastic cup in its mangrove home. This is the reality for the iguanas here on Útila, sharing their home with plastic trash which covers much of the beaches and coastal ecosystems on the island.

Winning photo in the 'Best Iguana' category for the Eyes of Útila photography competition. Photo by Blake Hernandez.



Daisy Maryon (left) with Blake Hernandez, the winner of the 'Best Iguana' category for the Eyes of Útila photo competition. Photo by Andrea Martinez.

Field Reports

Our field guide training is progressing well; we are continuing to provide an alternative income to our first field guide (Nahun Molina), and this year we were also able to pay and train a second guide, Landito Ayala. Beyond their work as field guides, Landito and Nahun performed conservation outreach through informal talks with the local community and social media posts.

For the annual Útila carnival in July, the team from Kanahau made a mobile “Recycling Swamper” float made from trash found on the beaches of Útila. The float was part of the parade and people could place any recyclable material inside the Recycling Swamper as we moved through the town. The float was featured on national news stations covering the carnivals and is now part of the “Promodias” video, a promotional video for the tourism of the island. The float has now been used for other events encouraging people to recycle throughout the year, and tourists have been taking selfies with the float and using the “#SaveTheSwamper” hashtag to further the campaign message.

Capture-Mark-Recapture and Distance Sampling Population Study

Our study caught its 1,000th *Ctenosaura bakeri* this year, bringing our total captures to 1,054 animals. Each iguana is marked by using a nape bead or PIT tag allowing identification over the years. This August, we recaptured iguana number four, which is a female first caught in 2011 and is likely between 9–12 years old, giving us some fantastic longevity data for this species. Distance sampling has been used throughout our project to estimate



Útila Spiny-tailed Iguana number 4; a female that was first caught in 2011 and recaptured August 2018. Photo by Daisy Maryon.

population size. This year we were able to visit a new site on the western side of the island to sample the iguana population which brings our total to 10 different survey sites and 32 transects across the island. We were also able to shortlist areas that may be suitable for a new protected area for *C. bakeri* and the other endemic species of Útila. All of this information was added to the IUCN Red List assessment for the species which was published in July and confirmed the Critically Endangered status of *C. bakeri*.

Nest Ecology

We discovered a new nesting ground for this year, in an area of the island previously thought to be unsuitable habitat for *C. bakeri* as it is surrounded by hardwood forests and agricultural land. One camera trap set up to record nesting behaviours within the current nature reserve (Turtle Harbor Wildlife Refuge) was unfortunately stolen, though other cameras gave us more insight on predator pressure facing nesting *C. bakeri*, regularly showing family groups of non-native raccoons on the images.

This year we discovered a new nesting beach for *C. bakeri* in the north of Útila that we previously thought was unsuitable due to its surrounding of hardwood forest and agricultural land. The area known as Pumpkin Hill has been undergoing rapid development over the past year with creation of a new road and many new housing plots. The



The Kanahau iguana field team and the 1,000th Iguana captured. Photo by Junior Williams.



A male *Ctenosaura bakeri* in the leaf litter of white mangroves on Útila. Photo by Tom Brown.

presence of a hatchling *C. bakeri* and a small number of adult male sightings raises the question of whether a small population has always existed in this area and is now more visible due to the deforestation of the site, or whether iguanas are moving from other areas due to other factors such as unsuitable nesting grounds elsewhere. Many *C. similis* are also found in this habitat and it may be possible that the *bakeri* seen are hybrids. Genetic analysis awaits at the University of South Wales to answer this question this autumn.

Hybridization Genetic Analysis

247 new *Ctenosaura bakeri* and 65 *Ctenosaura similis* were captured throughout 2016–2018. This summer, DNA was extracted from eight of these samples in the lab at the University of South Wales. DNA extraction will continue with the help of undergraduate students at the University and extracted DNA will be sent for sequencing this autumn to receive results of hybridization within the population. A further 40 *C. bakeri* blood samples were taken for phthalates analysis by veterinary students at the Cummings School of Veterinary Medicine at Tufts University, Massachusetts.

Future

In the future, we intend to expand the education program by employing a permanent team member to expand community outreach by planning more awareness events involving the iguanas, and create conservation awareness posters and signs to explain the conservation status and promote anti-poaching of the iguanas.

The original plan for the project was to have one intern act as the environmental education officer for the entire period from February to October. However, in 2018, we had one student from UNAH who carried out her internship for university credit for two months, and then one local island intern who started work in July. As such there was a lull between the two interns. It became clear to us that a full-time member of staff is required to implement the education program and have an intern to assist. This will program will continue work alongside the population research monitoring project.



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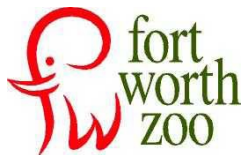
**Reminder: Next ISG Meeting
Dates**

**Annual ISG Meeting 2019
2-9 November
Roatan Island, Honduras**

Check the website for details



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