



# Roatán spiny-tailed iguana (*Ctenosaura oedirhina*)

Conservation action plan 2020–2025

Edited by Stesha A. Pasachnik, Ashley B.C. Goode and Tandora D. Grant



INTERNATIONAL UNION FOR CONSERVATION OF NATURE



## **IUCN**

IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges.

IUCN works on biodiversity, climate change, energy, human livelihoods and greening the world economy by supporting scientific research, managing field projects all over the world, and bringing governments, NGOs, the UN and companies together to develop policy, laws and best practice.

IUCN is the world's oldest and largest global environmental organization, with more than 1,400 government and NGO members and almost 15,000 volunteer experts in some 160 countries. IUCN's work is supported by around 950 staff in more than 50 countries and hundreds of partners in public, NGO and private sectors around the world.

[www.iucn.org](http://www.iucn.org)

### **IUCN Species Programme**

The IUCN Species Programme supports the activities of the IUCN Species Survival Commission and individual Specialist Groups, as well as implementing global species conservation initiatives. It is an integral part of the IUCN Secretariat and is managed from IUCN's international headquarters in Gland, Switzerland. The Species Programme includes a number of technical units covering Wildlife Trade, the Red List, Freshwater Biodiversity Assessments (all located in Cambridge, UK), and the Global Biodiversity Assessment Initiative (located in Washington DC, USA).

### **IUCN Species Survival Commission**

The Species Survival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of more than 9,000 experts. SSC advises IUCN and its Members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation.

[www.iucn.org/species/about/species-survival-commission](http://www.iucn.org/species/about/species-survival-commission)

### **IUCN SSC Iguana Specialist Group**

The Iguana Specialist Group (ISG) is a volunteer member network of experts from various backgrounds and geographic areas around the world that are dedicated to the conservation of iguana species and their habitat. This group is one of more than 160 Specialist Groups organized through the IUCN Species Survival Commission (SSC). Specialist groups work with the SSC to enhance conservation of species by providing scientific advice to conservation organizations, government agencies, and other IUCN members, and support the implementation of multilateral environmental agreements. ISG members work with the IUCN to provide critical information on the status of iguana species for the IUCN Red List of Threatened Species. The IUCN Red List is used by experts, government agencies, educators, conservation-based non-government organizations, and others to obtain information on the status of biodiversity, species, and ecosystems. This information is often used to enhance research, create national and international laws, and draw attention to global conservation needs.

[www.iucn-isg.org](http://www.iucn-isg.org)

# Roatán spiny-tailed iguana (*Ctenosaura oedirhina*)

Conservation action plan 2020–2025

Edited by Stesha A. Pasachnik, Ashley B.C. Goode and Tandora D. Grant

The designation of geographical entities in this book, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of IUCN or other participating organizations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

IUCN encourages meetings, workshops and other forums for the consideration and analysis of issues related to conservation, and believes that reports of these meetings are most useful when broadly disseminated. The opinions and views expressed by the authors may not necessarily reflect the formal policies of IUCN, its Commissions, its Secretariat or its Members.

The views expressed in this publication do not necessarily reflect those of IUCN or other participating organizations.

IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

**Published by:** IUCN, Gland, Switzerland

**Copyright:** © 2020 IUCN, International Union for Conservation of Nature and Natural Resources

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder provided the source is fully acknowledged.

Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

**Citation:** Pasachnik, S.A., Goode, A.B.C. and Grant, T.D. (eds.) (2020). *Roatán spiny-tailed iguana (Ctenosaura oedirhina): Conservation action plan 2020–2025*. Gland, Switzerland: IUCN SSC Iguana Specialist Group.

**ISBN:** 978-2-8317-2042-5

**Cover photo:** Roatán spiny-tailed iguana (*Ctenosaura oedirhina*) ©Thijs van den Burg

**Layout by:** Tandora D. Grant and Stesha A. Pasachnik

**Produced by:** IUCN SSC Iguana Specialist Group

**Available from:** IUCN, International Union for Conservation of Nature  
IUCN SSC Iguana Specialist Group  
Rue Mauverney 28  
1196 Gland, Switzerland  
inquiries@iucn-isg.org  
www.iucn-isg.org/publications/actions-plans/  
www.iucn.org/resources/publications



## TABLE OF CONTENTS

ENDORSEMENT	iv
FOREWORD	v
EXECUTIVE SUMMARY	vi
ACKNOWLEDGEMENTS	vii
ACRONYMS	viii
1 INTRODUCTION	1
2 SPECIES ASSESSMENT	
2.1 TAXONOMY	4
2.2 STATUS	4
2.3 DESCRIPTION	5
2.4 NATURAL HISTORY	5
2.5 CONSERVATION ISSUES	5
2.6 CONSERVATION ACTIONS IMPLEMENTED	6
2.7 RESEARCH CONDUCTED	6
2.8 STRATEGIC PLANNING SWOT ANALYSIS	10
3 GOALS, OBJECTIVES, ACTION STEPS	
GOAL 1: MAKE THE ROATÁN SPINY-TAILED IGUANA A FLAGSHIP SPECIES	11
GOAL 2: MONITOR IGUANA POPULATIONS OVER THE LONG-TERM	13
GOAL 3: UNDERSTAND THE REPRODUCTIVE BEHAVIOUR OF THE SPECIES	14
GOAL 4: REDUCE THREATS ASSOCIATED WITH INVASIVE AND EXOTIC ANIMALS	16
GOAL 5: CREATE A NETWORK OF LOCAL LAND OWNERS/MANAGERS	17
GOAL 6: ENSURE THE PROTECTION OF THE ROATÁN SPINY-TAILED IGUANAS	19
GOAL 7: DEVELOP A MANAGEMENT PLAN FOR BARBARETA	20
ACTION PLAN OVERVIEW	21
REFERENCES	23



## ENDORSEMENT

The Bay Islands Conservation Association (BICA) was founded in 1990 by residents of the Bay Islands, Honduras, to initiate and coordinate efforts to protect the fragile and natural resources of the islands. BICA is a collaborating agency with the Honduran government, mandated to implement enforcement of environmental protection and management laws through active monitoring and litigative measures within the Bay Islands. BICA has three regional chapters, representing each of the three main Bay Islands. The Roatán chapter is especially concerned with the health and well-being of the Roatán spiny-tailed iguana as it is facing substantial and ever-growing pressure on the island and represents one of the most threatened endemic species on Roatán.

BICA is pleased to support the *Roatán spiny-tailed iguana conservation action plan*. This plan was developed in close collaboration with numerous local and regional stakeholders and international experts in November 2019. Their collective expertise on iguana biology, conservation, and local abilities and obstacles makes this plan a significant and achievable goal. Many of the actions outlined within this plan are top priority conservation measures for Roatán and can complement and enhance existing programs on Roatán. Several members of BICA contributed to this plan and have reviewed the final product. We are willing and eager to make every effort to see the actions outlined within the plan through to fruition.



Roatán spiny-tailed iguana, *Ctenosaura oedirhina*. © Thijs van den Burg.

BICA is hopeful that this plan will be used to help guide conservation, management, and education initiatives and serves as the framework to ensure the long-term survival of this species, making it an icon for the natural wonder of Roatán.

  
**Irma Brady**  
Executive Director  
Bay Islands Conservation Association

  
**DIRECTORA  
EJECUTIVA**



## FOREWORD

Mesoamerica is a well-known hotspot for biodiversity, making it an important focal point for conservation initiatives in which large impacts can be made while working on a small scale. Among Mesoamerican diversity are the spiny-tailed iguanas in the genus *Ctenosaura*. Of the 12 genera of true iguanas, the *Ctenosaura* is the most species rich, encompassing 16 distinct species. Although these species can be found in a variety of habitats from northern México to southern Panama, the threats they face are largely the same throughout their range. Habitat destruction and fragmentation, overharvesting for human consumption, and invasive species threaten the survival of the *Ctenosaura* species and of many species in Mesoamerica.

According to the International Union for Conservation of Nature (IUCN) Red List Assessment, nearly 80% of *Ctenosaura* that have been assessed are listed within a threatened category and 50% are thought to have decreasing population sizes. The Roatán spiny-tailed iguanas, *Ctenosaura oedirhina*, are among the most threatened of the genus. These iguanas occur only on the islands of Roatán, Barbareta, and surrounding cays, located in the Bay Islands, off of the north coast of Honduras. It is estimated that the total population size for this species is less than 4,500 mature individuals, with a highly fragmented distribution across the island of Roatán. Recent research demonstrates that protection from hunting pressure is the primary factor determining the distribution of this species. High-density populations are found primarily in areas that are privately protected, such as resorts, tourist parks, and private lands. Although it is prohibited to hunt iguanas in Honduras, the associated laws are rarely enforced and thus this threat remains severe. Fortunately, there is growing interest in privately protecting these iguanas across the island. These protection efforts, coupled with proper outreach and education, will allow this species to persist far into the future.

In November 2019, members of the IUCN SSC Iguana Specialist Group met on Roatán with local experts and stakeholders to draft this *Roatán spiny-tailed iguana conservation action plan*. The overall goal of the plan is to identify and prioritize conservation and management actions that are necessary to ensure the long-term survival of the Roatán spiny-tailed iguanas. The information presented herein details the steps necessary to create an impactful outreach and education program for locals and tourists, continue and expand on monitoring efforts for these iguanas, gain a better understanding of the reproductive biology of the species, reduce the threats associated with invasive and exotic species, and ensure the long-term protection of these unique iguanas. Achieving these objectives is monumental and will take the cooperation and dedication of many people and organizations, but it will ensure that this unique portion of Honduras biodiversity remains for generations to come. This document is intended to be adaptive, changing as the situation on Roatán and in Honduras changes, and as certain objectives are met or discovered unattainable. This plan is designed to be used to aid in management decisions and guide funding initiatives for this species, and to help raise awareness to this unique and understudied part of Mesoamerican biodiversity.

Stesha A. Pasachnik, Ph.D.  
Fort Worth Zoo,  
IUCN SSC Iguana Specialist Group,  
and  
International Iguana Foundation



## EXECUTIVE SUMMARY

The Endangered Roatán spiny-tailed iguana, *Ctenosaura oedirhina*, is found only on the islands of Roatán, Barbareta, and some surrounding cays. Although dense populations can be found in some privately protected locations, threats persist and management efforts are needed.

This document presents a comprehensive five-year plan for the conservation and management actions considered essential to ensuring the long-term survival of *Ctenosaura oedirhina* in the wild. This plan combines knowledge and expertise from government, non-governmental organizations, and the community of Roatán and greater Honduras, with the collective expertise of the IUCN SSC Iguana Specialist Group.

The Roatán spiny-tailed iguana was first described in 1987 and since then informal and detailed studies have been conducted to better understand its biology and status. In 2010, a long-term monitoring program began, elucidating fluctuations in population dynamics and threats. Collectively, these studies provide the foundational information to make basic management decisions. However, additional surveys and research are required to better understand the reproductive biology, distribution, and impacts of various threats to this species.

Community support has been obtained and will be maintained through public awareness and education campaigns led by local organizations. Local stakeholders have been involved throughout the development of this plan in order to guide reasonable and effective management strategies that will facilitate the long-term persistence of this species.

Funding to implement this plan will be secured from a variety of international grants, supplemented with contributions from local organizations and donors. Members of the IUCN SSC Iguana Specialist Group will assist with implementing the plan but the long-term success of this plan and the protection of this unique species hinges on local support and involvement.



Tagged adult *Ctenosaura oedirhina*. © Tandora Grant.



## ACKNOWLEDGEMENTS

Developed in a workshop held 7–8 November 2019 on Roatán, Honduras, in conjunction with the annual meeting of the IUCN SSC Iguana Specialist Group.

Facilitator for the 2019 workshop: Stesha A. Pasachnik  
Documentation at the 2019 workshop: Tandora D. Grant and Ashley B.C. Goode  
Coordinators for Publication: Stesha A. Pasachnik and Tandora D. Grant

---

Instituto de Conservación Forestal  
IUCN SSC Iguana Specialist Group  
Kanahau Wildlife Conservation Organization  
Roatán Wildlife  
Bay Islands Conservation Association  
Wild Roatán  
Grupo de Investigación de Reptiles y Anfibios de Honduras  
West Bay Golf Club and Villas  
Gumbalimba Park  
IUCN SSC Conservation Planning Specialist Group  
Fort Worth Zoo  
San Diego Zoo Institute for Conservation Research





## ACRONYMS

BICA	Bay Islands Conservation Association
FWZ	Fort Worth Zoo
ICW	Iguanas and Conservation Workshop
ICF	Instituto de Conservación Forestal
IIF	International Iguana Foundation
INTEC	Instituto Tecnológico de Santo Domingo
IRBS	Útila Iguana Research and Breeding Station
ISG	IUCN SSC Iguana Specialist Group
IUCN	International Union for Conservation of Nature
Kanahau	Kanahau Wildlife Conservation Organization
NGO(s)	Non-Government Organization(s)
RMP	Roatán Marine Park
SDZICR	San Diego Zoo Institute for Conservation Research
SSC	IUCN Species Survival Commission
USDA	United States Department of Agriculture
USU	Utah State University



## 1 INTRODUCTION

The overall goal of this conservation and management plan is **“To ensure the long-term survival of Roatán spiny-tailed iguanas as a flagship for biodiversity conservation on Roatán, and to perpetuate them as an iconic symbol of the island and Honduras in general.”**

Implementation of an effective management plan for Roatán spiny-tailed iguanas will take the support and coordination of the citizens of Roatán, the Honduran government, local conservation NGOs and landowners, and international organizations.

This species is endemic to the island of Roatán, Barbareta, and several of the surrounding cays (Figure 1). Roatán spiny-tailed iguanas are generalists, both in habitat and diet. They are known to use all available habitats on the island and eat a wide variety of vegetation and small prey. This species is likely an important seed disperser for native plants, as has been shown in other iguana species. Historically, these iguanas were found across Roatán, but presently, high-density populations are only found in a few locations. The primary threat to this species is harvesting for human consumption, and this pressure has resulted in the isolated high-density populations that can be seen today in privately protected areas. There are laws in place to protect this and other native wildlife, with significant repercussions for violation, but currently they are not uniformly enforced. Historically, this species was a staple food for island inhabitants, including descendants of Spanish and English settlers from the late 1600s, the Afro-indigenous culture that developed on Roatán in the late 1700s, and the Latin American culture that has migrated from the mainland more recently. Iguana remains a favourite and highly sought-after dish to date. Any conservation plan will need to address this issue in a culturally sensitive way, as there is considerable history of oppression of indigenous peoples and their culture in Honduras, and elsewhere in Central America.

The second greatest threat to this species is predation by free-roaming domesticated animals, specifically cats and dogs. Feral animals are a threat to many island iguana species. Dogs and cats actively hunt adult and juvenile iguanas. Even when these predators do not cause direct mortality, they often cause iguanas to emigrate from the area, potentially pushing them out of protected habitats. These feral populations must be controlled in order to protect iguanas and other native wildlife. Partnering with local and international animal organizations to institute control programs will be critical to making the island safe for native wildlife, including iguanas.

Population data on this species has been collected yearly since 2010, documenting fluctuations in population density and threats across Roatán. The management plan for Roatán spiny-tailed iguanas must include population size and distribution data collected over the long-term. Regular population surveys at these critical high-density sites are an important foundation for the long-term protection of this species. Surveys across the island to locate new populations, monitor smaller populations, and identify nesting areas are also critical for future management.

A promising management opportunity is presented by the ever-increasing tourism industry on Roatán. Over one million tourists visit the island yearly. Given the increased protection afforded by ecoparks and resorts, they are currently the best places to encounter Roatán spiny-tailed iguanas. This creates a wonderful opportunity to educate both the local and



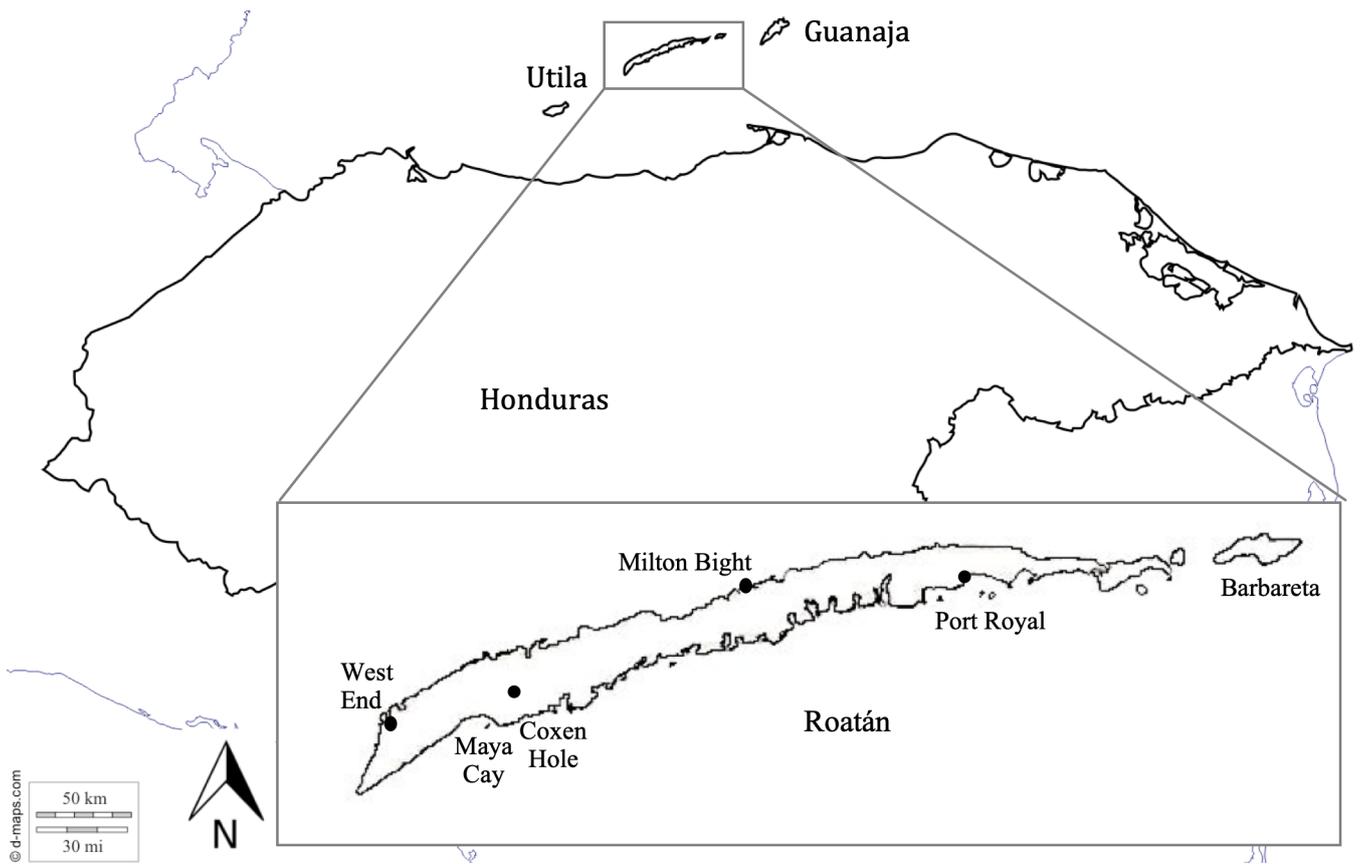
international communities, and potentially raise funds for conserving this species. Indeed, for many years Sherman Arch at the Arch's Iguana and Marine Park has been educating local school children and tourists about native terrestrial and marine species. Working with and expanding on existing programs such as this is recommended.

In the past, there have been other small-scale education and awareness campaigns on Roatán. The annual Iguanas and Conservation Workshop, hosted by the International Iguana Foundation and Kanahau Wildlife Conservation Organization, is part of an informal awareness campaign. This workshop has a dual function of educating local and international participants in iguana ecology and conservation, while adding to the long-term Roatán spiny-tailed iguana life-history dataset. Having external scientists, students, and workshop participants routinely on the island is an important reminder to the residents of Roatán that their endemic iguana is important to conserve and is essential support for land managers protecting iguanas daily. Formal island-based education programs will need to be developed in order to secure this species into the future.

Moving forward, this plan will be a foundation for the future conservation of this species. As the primary threat to the survival of Roatán spiny-tailed iguanas is illegal hunting, increased outreach and education in the local community and increased enforcement of current laws both need to be principal goals of this conservation action plan. Population monitoring at current study sites and regular searches for new sites must continue in order to properly understand both short- and long-term fluctuations in population dynamics. Additional information on iguana reproductive biology is vital to land preservation and acquisition decision-making, as well as preparing for the potential future need for captive breeding or headstart efforts.



*Ctenosaura oedirhina* on the coast. © Ashley B.C. Goode.



**Figure 1.** Map of Honduras and the Bay Islands, highlighting the study island, Roatán. D-Maps.com. 2014. Map of Honduras (boundaries). Reproduced from Goode et al., 2016. Available from [http://d-maps.com/pays.php?num\\_pay=146&lang=en](http://d-maps.com/pays.php?num_pay=146&lang=en)



## 2 SPECIES ASSESSMENT



Adult *Ctenosaura oedirhina*. © Ashley B.C. Goode.

### 2.1 TAXONOMY

Roatán spiny-tailed iguanas are scientifically referred to as *Ctenosaura oedirhina*. They are part of the *Ctenosaura palearis* genetic clade (Pasachnik et al., 2010a) and were originally historically sometimes thought to be *Ctenosaura bakeri*. In 1987, de Queiroz described *C. oedirhina* as a separate species from *C. bakeri* based on 21 morphological characteristics; mainly the unique appearance of a rounded snout, shorter crest scales, and lack of dewlap. Genetic analysis additionally confirmed the species delineation and its close relationship with *C. bakeri* (Pasachnik et al., 2010a). Because this species was recently described, it is sometimes referenced in the literature as *Ctenosaura bakeri* (or *Enyaliosaurus bakeri* in older texts), the sister species from which it was split.

### 2.2 STATUS

These iguanas were acknowledged as threatened in 1994 (Wilson & McCranie, 2004) and first listed as threatened in the IUCN Red List of Threatened species in 2004. In 2010, they were included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) by the Honduran government. In 2019, the CITES listing was upheld with a genus-wide Appendix II inclusion and they were listed as Endangered by reassessment for the IUCN Red List (Goode & Pasachnik, 2019) because of their small and severely fragmented distribution, and hunting pressure. The area currently utilized by the species may be as little at 6 km<sup>2</sup>, as it has been extirpated from much of Roatán. As the human population of the island and tourism increase, the pressure on this species caused by hunting for food for personal consumption and sale will likely increase.



### 2.3 DESCRIPTION

Roatán spiny-tailed iguanas are black to dark grey with “cream to white blotches arranged in bands” (de Queiroz, 1987). There is significant variation in the white or piebald pattern and the amount of white coloration often increases over the lifespan of the individual (Goode & Pasachnik, 2016). This natural colour variation is not known to have negative impacts on the iguanas. Hatchlings are dark green and grey and can have white or off-white spots. These iguanas have a rounded snout profile and short crest scales that start behind their head and run the length of their body; the tail has whorls of enlarged, spinous scales (de Queiroz, 1987). Adult males average  $232.2 \pm 3.50$  mm in snout-vent length (SVL) and  $562.2 \pm 25.24$  g in mass. Adult females average  $201.8 \pm 1.50$  mm in SVL and  $345.3 \pm 8.67$  g in mass (Pasachnik, 2013).

### 2.4 NATURAL HISTORY

Roatán spiny-tailed iguanas can inhabit all habitats found on Roatán, including dry tropical forests, mangroves, and anthropogenically-altered areas. They are omnivorous and have been documented eating fruits, grasses, insects, crabs, small lizards, and hatchling turtles (Pasachnik, 2013). The current population distribution, resulting from hunting pressure, is comprised of high-density populations that are almost completely isolated from each other (Goode et al., 2016; Pasachnik & Hudman, 2016). These high-density populations can contain as many as 140 individuals per hectare. Other areas on the island support as few as 1–5 iguanas per km<sup>2</sup>; however, many surveyed locations contain no iguanas at all (Goode et al., 2020). It is unknown what the historical population distribution of this species was, and if they congregated in high-density areas before being impacted by anthropogenic forces, but they were likely once found widely across the island. It is believed that reproduction occurs early in the year, with courting and mating occurring from February through April and nesting from March through June. Hatchlings emerge between May and September (Pasachnik, 2013). Additional research into the reproductive behavior of this species is under way.

### 2.5 CONSERVATION ISSUES

Iguana consumption is common for the island communities on Roatán. This species continues to be a favourite dish of locals on Roatán and is often offered to tourists as a local delicacy. While it is illegal to hunt, possess, or sell any native wildlife, hunting pressure continues to be the main threat to this, and other native species on the island. Any area not actively protected from hunting is exploited and the area accessible to hunters is increasing rapidly as development becomes more prevalent on the island. New roads and areas developed for tourism give hunters easy access to previously remote and/or privately held land.

Domesticated animals (dogs and cats) also impact iguana populations. Dogs are often used to hunt iguanas and both domestic species have been observed harassing and killing juvenile and adult iguanas.

Related *Ctenosaura* species have been brought to some cays off of Roatán for tourism or unknown purposes. A large population of *Ctenosaura similis* inhabits an animal park on Maya Cay off the coast from Coxen Hole, Roatán, and *Ctenosaura bakeri* has been established on a cay off Milton Bight, Roatán. The presence of closely-related species in such close proximity poses a hybridization threat that has recently been documented in the case of *C. bakeri* (Daisy Maryon pers. comm.).



The occurrence of Roatán spiny-tailed iguanas in the international pet trade may be cause for concern, as there are very few legally owned individuals outside of Honduras and poaching for international buyers can be a lucrative business. This species has been in captivity for a number of years, but has yet to become common, making this threat less pressing than other issues.

## 2.6 CONSERVATION ACTIONS IMPLEMENTED

Roatán spiny-tailed iguanas were first assessed for the IUCN Red List of Threatened Species in 2004 when it was listed as Critically Endangered (Köhler, 2004). When the species was evaluated in 2010, its listing was changed to Endangered (Pasachnik et al., 2010b), which was considered a “non-genuine” change, as the original assessment did not accurately reflect the data. The species was again evaluated in 2019 and confirmed as Endangered, reflecting its small area of occupancy and extent of occurrence, severely fragmented population, and population decline due to exploitation (Goode & Pasachnik, 2019). This species was included in Appendix II of CITES by the Honduran government in 2010. In 2019, this decision was upheld when the entire genus *Ctenosaura* was listed under Appendix II.

This species has been systemically monitored using yearly mark-recapture surveys since 2010 and distance sampling transect surveys since 2012. Critical conservation sites have been identified and scientists are working with land managers to ensure protection for these specific populations. Morphometry, genetics, diet, distribution, habitat usage, demography, and color patterns have been studied (see Table 1 below).

Educational materials have been distributed to local schools in the past. An outreach program, including a colouring competition for the iguanas, was conducted in collaboration with the Roatán Marine Park in 2010, but has not continued. An Iguanas and Conservation Workshop (ICW), hosted by the International Iguana Foundation and Kanahau Wildlife Conservation Organization, has been held on Roatán yearly since 2017. During this workshop, local and international students, land managers, and researchers collect natural history data on this species and bring awareness to the threats it faces. This workshop helps build capacity in countries where iguanas occur as well as reinforce a commitment to protecting this species to the residents of Roatán.

## 2.7 RESEARCH CONDUCTED

These iguanas were considered to be a disjunct population of the Útila spiny-tailed iguana, *Ctenosaura bakeri*, until 1987 when de Queiroz described the iguanas occurring on Roatán as a unique species, based on morphological differences (de Queiroz, 1987). Following this description, more focused research was not conducted until Köhler and others began studying the morphology and systematics of the species in the wild in the mid 1990s (Köhler, 1995). Additionally, some *C. oedirhina* were also brought to Germany to be studied in captivity at that time (Köhler & Rittmann, 1998; Rittmann, 2007). More recently, detailed systematic and phylogeographic studies have better identified the relationship between this species and its closely relatives (Köhler et al., 2000; Gutsche & Köhler, 2008; Pasachnik et al., 2010a). Interesting diet observations have been made and a more detailed study of their diet is being conducted (Gandola & Hendry 2011; Hendry & Gandola 2011; Pasachnik & Chavarria 2011; Pasachnik, 2013). A population-level genetic analysis (Pasachnik & Hudman, 2016) and a habitat use analysis (Goode et al., 2016, Figure 2) have been completed, elucidating the iguana’s distribution across the island. Adult home range has been preliminarily assessed (Pasachnik, 2013; Goode et al., 2020) and observations of limb regeneration (Pasachnik, 2011, Figure 3) and endoparasites have been made (Goldberg et al., 2011, see Table 1 for details).



Island-wide searches were conducted in 2010 and 2012. Annual mark-recapture surveys have been conducted yearly since 2010. Annual population density surveys have been conducted since 2012. Systematic surveys and ecological studies are conducted yearly across five high-density populations and surveys at other locations have been conducted opportunistically as iguanas were found or property access was permitted (Goode et al., 2020). New research on the reproductive biology and physiology of this species began in 2018 (Figure 4; see Table 1 for details).



**Figure 2.** Representative examples of habitat types on Roatán. (A) Shore; (B) “Cleaned” forest; (C) “Uncleaned” forest; (D) Mangroves; (E) Stripped land; (F) Agricultural land; (G) Anthropogenically-modified land; and (H) Rock cliff. Cleaned forest refers to areas in which leaf litter and other natural debris is removed from the forest floor. Photographs by Ashley B.C. Goode. Reproduced from Goode et al., 2016.



**Figure 3.** An individual *Ctenosaura oedirhina* from Roatán, Honduras, that presumably suffered from an incomplete tail wound. The “second” tail appears to have regenerated with no pigment. Photograph by Stesha A. Pasachnik and reproduced from Goode & Pasachnik, 2016, Figure 5.



**Figure 4.** Susannah French and Stesha Pasachnik show an eager young visitor how to perform an ultrasound on a female *Ctenosaura oedirhina* to determine reproductive state. © Daisy Maryon.



**Table 1.** Research conducted on *Ctenosaura oedirhina* since 1986. Time period refers to when the work was conducted, not published, if known.

Investigator(s)	General location	Time period	Focus
K. de Queiroz	Roatán	1986	Species description
G. Köhler	Roatán	1995	Morphology and ecology
G. Köhler, D. Rittmann	Germany	1998, 2007	Captive husbandry and breeding
G. Köhler, W. Schroth, B. Streit	Roatán	2000	Systematics
S.A. Pasachnik	Roatán	2003–2007	Phylogenetics
R. Gandola, C. Hendry	Roatán	August 2008	Diet
A. Gutsche, F. Köhler	Roatán	2008	Phylogeography
S.A. Pasachnik, Z. Chavarria	Roatán	May 2010	Diet
S.A. Pasachnik	Roatán and Barbareta	August 2010– November 2011	Natural history, adult home range
S.A. Pasachnik, A.B.C. Goode	Roatán and Barbareta*	2010–present	Mark-recapture
S.A. Pasachnik	Roatán	October 2010	Limb regeneration
S.A. Pasachnik, S. Hudman	Roatán and Barbareta	2010–2011	Population genetics
S.R. Goldberg, R. Bursey, S.A. Pasachnik	Roatán	March 2011	Endoparasites
S.A. Pasachnik, A.B.C. Goode	Roatán	2012–2013	Habitat usage, adult home range, flight response
S.A. Pasachnik, A.B.C. Goode, D.F. Maryon	Roatán	2017–present	IAC Workshops
S.A. Pasachnik, D.F. Maryon, S. French	Roatán	2018–present	Reproductive ecology

\*Mark-recapture on Barbareta was only conducted from 2010–2011



## 2.8 STRATEGIC PLANNING SWOT ANALYSIS

Factors are assessed here for the Roatán spiny-tailed iguana as of March 2020.

### 2.8.1 STRENGTHS

- Iguanas are generalists and can make use of many habitat types and food resources
- There is an abundance of privately-owned land that can be independently protected
- Many private land-owners and managers are interested in protecting native species
- Roatán is a tourist destination and people may be willing to pay to view iguanas or make donations to protect them
- Baseline population and distribution data are known
- Laws are in place to protect this species on the national level
- A subpopulation of iguanas is present on Barbareta, which has increased protection

### 2.8.2 WEAKNESSES

- Lack of conservation/ecology education in the general public and schools
- Strong cultural history of iguana consumption
- Lack of law enforcement to protect wildlife
- Lack of funding
- Owner of Barbareta has concerns about outside researcher involvement
- Lack of information on iguana reproduction

### 2.8.3 OPPORTUNITIES

- Land owners/managers of existing study sites very willing to help conservation and education efforts
- Additional privately-owned land with owners willing to protect wildlife are available
- Existing environmental education programs (e.g., RMP, BICA) could be expanded to include iguanas
- Large-scale ecotourism, targeting cruise ships, could be used as an education and donation platform
- Local conservation organizations are present on Roatán (RMP, BICA) and regionally within the Bay Islands (BIF, IRBS, Kanahau)
- Barbareta staff willing to conduct independent monitoring program

### 2.8.4 THREATS

- Opportunistic and dedicated iguana hunting
- Feral and free-roaming domestic predatory mammals (primarily dogs and cats)
- Destruction of habitat and road building causes increased hunting pressure from work crews and easier access for hunters
- Potential hybridization or competition with *C. similis* and *C. bakeri*, which are both already on/near the main island of Roatán



### 3 GOALS, OBJECTIVES, AND ACTION STEPS

The overall goal is to “**Ensure the long-term survival of Roatán spiny-tailed iguanas as a flagship for biodiversity conservation on Roatán, and to perpetuate it as an iconic symbol of the island and Honduras in general.**”



Roatán spiny-tailed iguana. © Ashley B.C. Goode.

#### **GOAL 1. Turn the Roatán spiny-tailed iguana into a flagship species for biodiversity conservation, stimulating local pride in this iconic species and spreading awareness.**

**OBJECTIVE 1.1.** Increase local awareness of Roatán spiny-tailed iguanas and the importance of biodiversity.

**ACTION 1.1.1.** Develop and produce educational materials to be used in schools. International partners to provide information on iguanas and consultation for program development. Incorporate into BICA’s existing materials and programs. Investigate interactive digital package in collaboration with BICA.

**Point person/organization:** Giselle Brady (BICA), Nidia Webster (Because We Care)

**Funding:** Reduced cost of production available from Wild Roatán and Tortuga Digital. Possible funding from ZOLITUR through inclusion in larger program proposal. Stesha Pasachnik can provide grant writing assistance in collaboration with local partners.

**Timeline:** 2020

**ACTION 1.1.2.** Develop and produce educational materials for local adults. International partners to provide information on iguanas and consultation for program development. Collaborate with RMP, BICA, and Infosolar.

**Point person/organization:** Giselle Brady (BICA), Nidia Webster (Because We Care)

**Funding:** Michelle Fernandez (ZOLITUR)

**Timeline:** 2021



**ACTION 1.1.3.** Share materials with local authorities as it becomes available (environmental unit at the municipalities, local ICF, local fire departments).

**Point person/organization:** *Cindy Florez (via Leo Consuegra – Maya Cay), Nidia Ramos (Unidad Municipal Ambiental), and Paola Castillo (via Michelle – ZOLITUR), Michelle Fernandez (ZOLITUR)*

**Funding:** *N/A*

**Timeline:** *2021 and ongoing*

**ACTION 1.1.4.** Develop a conservation awareness event, which includes iguana-focused activities. Start with adding the iguana event to Ocean Week (first week of June) and then decide if it's possible to do a stand-alone event. Move Iguana and Conservation Workshop to coincide with this event (summer optimally). Collaborate with the local brewery if possible.

**Point person/organization:** *Karen Leahy (Wild Roatán), Megan Moulder (The Meridian), BICA, RMP*

**Funding:** *Investigate international funding (Ty Park via Bruce Weissgold), costs TBD depending on event*

**Timeline:** *2021*

**OBJECTIVE 1.2.** Increase tourist awareness of the Roatán spiny-tailed iguanas and the importance of biodiversity.

**ACTION 1.2.1.** Develop and produce educational materials to be distributed to tourists, vacation property owners/managers, and tour operators. Pocket-sized book for sale in tourist areas, with nice photos of endemic and popular species, fun facts, threats, dos and don'ts. Versions in English and Spanish, separately. Also collaborate with Wild Roatán to add information to the leaflets they already circulate. Explore the option of an eBook.

**Point person/organization:** *Elaine A. Powers (Lyric Power Publishing, LLC), Stesha Pasachnik (FWZ), Carlos Lopez (Grand Roatán), Karen Leahy (Wild Roatán), Megan Moulder (The Meridian), Joel Amaya (Roatán Wildlife), Michelle Fernandez (ZOLITUR)*

**Funding:** *~USD 5,000 to start, Elaine willing to donate time, investigate hotels paying initial costs (~USD 1/book). Proceeds to feed back into iguana protection and free distribution of materials to local community.*

**Timeline:** *2021*

**ACTION 1.2.2.** Identify locations where materials can be distributed and ensure materials are readily available. Locations should include hotels, airport, cruise ship ports, dive shops, and Eldon's supermarkets.

**Point person/organization:** *Daisy Maryon (Kanahau), Stesha Pasachnik (FWZ), Karen Ludlow (Roatán Tourist Association)*

**Funding:** *~USD 5,000 to start, investigate hotels paying initial costs (~USD 1/book). Printing and shipping costs thereafter to be covered by profits.*

**Timeline:** *2021*

**ACTION 1.2.3.** Develop and produce electronic educational materials to be distributed to tourists, vacation property owners/managers, and tour operators.

**Point person/organization:** *Karen Leahy (Wild Roatán)*

**Funding:** *TBD depending on items developed*

**Timeline:** *2021*



**OBJECTIVE 1.3.** Develop a social media campaign focusing on the Roatán spiny-tailed iguana and its habitat.

**ACTION 1.3.1.** A Facebook page has been developed. Determine if other platforms are needed.

**Point person/organization:** *Joel Amaya (Roatán Wildlife), Karen Leahy (Wild Roatán), Daisy Maryon (Kanahau), Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras)*

**Funding:** *N/A*

**Timeline:** *2020*

**GOAL 2. Monitor long-term fluctuation in population dynamics and implement conservation action as needed.**

**OBJECTIVE 2.1.** Continue systematic surveys across the range of the species.

**ACTION 2.1.1.** Monitor known high-density populations across Roatán.

**Point person/organization:** *Stesha Pasachnik (FWZ), Susannah French (USU), Claudia Ki (USU), Ashley Goode (USDA), BICA*

**Funding:** *~USD 10,000/workshop: in-kind equipment and salary from IIF, FWZ, and USU, donation from Black Iguana Golf Course, paying students attending Iguanas and Conservation Workshop*

**Timeline:** *Ongoing*

**ACTION 2.1.2.** Search for new populations across Roatán, including the use of community reports of sightings. Explore the use of a smartphone app/website to report sightings.

**Point person/organization:** *Training to be done by Stesha Pasachnik (FWZ), local biologists and community to be recruited for surveying, data accumulation to be done by Joel Amaya (Roatán Wildlife), BICA*

**Funding:** *Equipment in-kind from IIF*

**Timeline:** *Ongoing*

**ACTION 2.1.3.** Monitor low-density areas across Roatán and satellite cays.

**Point person/organization:** *Stesha Pasachnik (FWZ), Susannah French (USU), Claudia Ki (USU), Ashley Goode (USDA), Daisy Maryon (Kanahau), BICA*

**Funding:** *Equipment in-kind from IIF*

**Timeline:** *Ongoing*

**OBJECTIVE 2.2.** Standardize monitoring protocols for local NGOs, property owners, and land managers.

**ACTION 2.2.1.** Develop monitoring protocols, including temporal framework, for property owners and land managers.

**Point person/organization:** *Stesha Pasachnik (FWZ), Ashley Goode (USDA)*

**Funding:** *N/A*

**Timeline:** *2021*



**ACTION 2.2.2.** Provide training for local monitors.

**Point person/organization:** Stesha Pasachnik (FWZ), Daisy Maryon (Kanahau)

**Funding:** N/A

**Timeline:** 2021 – ongoing, in conjunction with ICWs

**OBJECTIVE 2.3.** Use population data to influence conservation decision making.

**ACTION 2.3.1.** Ensure data are centrally available and reported frequently. Annual report to be sent to all stakeholders. Locality data available on request only.

**Point person/organization:** Stesha Pasachnik (FWZ), Ashley Goode (USDA), Daisy Maryon (Kanahau), Susannah French (USU), Claudia Ki (USU), BICA

**Funding:** N/A

**Timeline:** 2022

**ACTION 2.3.2.** Determine conservation actions needed and implement them.

**Point person/organization:** Stesha Pasachnik (FWZ) in collaboration with local stakeholders, i.e. BICA

**Funding:** Dependent on actions needed

**Timeline:** 2022

**GOAL 3. Understand the reproductive behavior of the species, such that adequate land is protected, and the information is available for captive breeding or headstarting.**

**OBJECTIVE 3.1.** Document the reproductive cycle of the species.

**ACTION 3.1.1.** Use blood chemistry analysis to gain information on timing of reproductive events.

**Point person/organization:** Susannah French (USU), Claudia Ki (USU), local biologists

**Funding:** TBD depending on research conducted; funds provided from USU, IIF, additional grants

**Timeline:** Ongoing

**ACTION 3.1.2.** Use radio-telemetry, camera traps, and field observations to understand the location of nesting and nest success.

**Point person/organization:** Susannah French (USU), Claudia Ki (USU), Ashley Goode (USDA), Stesha Pasachnik (FWZ), Daisy Maryon (Kanahau), Joel Amaya (Roatán Wildlife), BICA

**Funding:** ~USD 10,000 from international grants, in-kind time and equipment from USU, FWZ, and IIF

**Timeline:** 2021



**ACTION 3.1.3.** Use community reporting and interviews with hunters to acquire knowledge of nest site locations. BICA to incorporate into workshops.

**Point person/organization:** Mikel Belcaries (Bulldog Security), Joel Amaya (Roatán Wildlife), local biologists (via Mario Solís), Daisy Maryon (Kanahau), BICA

**Funding:** ~USD 2,000 for transportation: international grants

**Timeline:** 2021

**OBJECTIVE 3.2.** Protect nesting areas and corridors to nesting areas.

**ACTION 3.2.1** Determine if nesting areas are protected with data from Objective 3.1.

**Point person/organization:** Claudia Ki (USU), Stesha Pasachnik (FWZ)

**Funding:** N/A

**Timeline:** 2022

**ACTION 3.2.2.** Acquire permission to protect nesting areas and use signs where appropriate. Use private security of given property where possible.

**Point person/organization:** Stesha Pasachnik (FWZ), Susannah French (USU), Claudia Ki (USU), Ashley Goode (USDA), BICA

**Funding:** ~USD 5,000 for signage: International grants and local stakeholders

**Timeline:** 2022

**OBJECTIVE 3.3.** Develop a captive breeding or headstarting plan.

**ACTION 3.3.1.** Determine the point at which captive breeding or headstarting is necessary to begin, when it can end, and which strategy (captive breeding or headstarting) is more appropriate.

**Point person/organization:** Stesha Pasachnik (FWZ), Tandora Grant (SDZICR)

**Funding:** N/A

**Timeline:** 2022

**ACTION 3.3.2.** Identify appropriate founders for captive breeding that will preserve the known diversity.

**Point person/organization:** Stesha Pasachnik (FWZ), Tandora Grant (SDZICR)

**Funding:** ~USD 20,000 needed for genetic studies: seek international funding, potential master's student project

**Timeline:** 2022

**ACTION 3.3.3.** Determine the location for facility(ies). Discuss options with current stakeholders (e.g., Arch's, Maya Cay, Gumbalimba). Research permitting needs.

**Point person/organization:** Stesha Pasachnik (FWZ), Ashley Goode (USDA), Iris Acosta for permitting (ICF)

**Funding:** Estimate funding for building enclosure, permitting, and day-to-day labor and food

**Timeline:** 2022



**ACTION 3.3.4.** Write the captive breeding or headstart plan using the information from the above actions.

**Point person/organization:** Stesha Pasachnik (FWZ), Tandora Grant (SDZICR)

**Funding:** N/A

**Timeline:** 2023

#### **GOAL 4. Reduce the threats associated with invasive and exotic animals.**

**OBJECTIVE 4.1.** Ensure biosecurity measures are adequate.

**ACTION 4.1.1.** Assess current biosecurity rules and regulations.

**Point person/organization:** BICA, ICF, ZOLITUR

**Funding:** N/A

**Timeline:** 2021

**ACTION 4.1.2.** Use information from 4.1.1 to make recommendations for biosecurity improvements as needed. Provide information to relevant authorities.

**Point person/organization:** BICA, ICF, ZOLITUR

**Funding:** N/A

**Timeline:** 2021

**OBJECTIVE 4.2.** Assess the status of non-native mammals (opossums, raccoons, armadillos, coatis).

**ACTION 4.2.1.** Use camera traps and community reports to understand distribution, types of species, and impact.

**Point person/organization:** Joel Amaya (Roatán Wildlife), Mikel Belcaries (Bulldog Security), Ashley Goode (USDA), Stesha Pasachnik (FWZ), and Daisy Maryon (Kanahau) to gather information

**Funding:** Equipment in-kind

**Timeline:** 2021

**ACTION 4.2.2.** Use the gathered information in 4.2.1. to inform appropriate management in collaboration with local authorities.

**Point person/organization:** Cindy Florez (ICF), Michelle Fernandez (ZOLITUR), local municipalities, West Bay Business Association (Megan Moulder), West Bay Patronado (Megan Moulder)

**Funding:** TBD depending on actions needed

**Timeline:** 2022

**OBJECTIVE 4.3.** Assess the status of non-native iguanas (*Ctenosaura bakeri* and *Ctenosaura similis*).

**ACTION 4.3.1.** Use camera traps and community reports to understand distribution.

**Point person/organization:** Stesha Pasachnik (FWZ), Daisy Maryon (Kanahau), Leonardo Consuegra (Maya Cay), Joel Amaya (Roatán Wildlife)

**Funding:** In-kind equipment

**Timeline:** On-going



**ACTION 4.3.2.** Use the gathered information to develop management plans in collaboration with local authorities. Plans must be submitted to ICF before action can be taken.

**Point person/organization:** *Stesha Pasachnik (FWZ), Daisy Maryon (Kanhau), Leonardo Consuegra (Maya Cay), Cindy Florez (ICF), Iris Acosta (ICF)*

**Funding:** *TBD depending on actions possible*

**Timeline:** *2020*

**OBJECTIVE 4.4.** Create control programs for known invasive (specifically dogs and cats) predators.

**ACTION 4.4.1.** Partner with local organizations and persons to implement effective control programs island wide.

**Point person/organization:** *Michelle Fernandez (ZOLITUR), Megan Moulder (The Meridian)*

**Funding:** *TBD depending on actions possible*

**Timeline:** *2021*

**Action 4.4.2.** Develop specific control programs directly with property owners at iguana high-density sites.

**Point person/organization:** *Megan Moulder (The Meridian), Michelle Fernandez (ZOLITUR), Iris Acosta (Departamento de Vida Silvestre), Stesha Pasachnik (FWZ) to reach out to control and eradication experts as needed, and other pertinent stakeholders*

**Funding:** *TBD depending on actions possible*

**Timeline:** *2021*

**OBJECTIVE 4.5.** Create an education campaign focusing on biosecurity and the damage caused by invasive species.

**ACTION 4.5.1.** Work with local organizations to distribute materials to the appropriate locations and authorities.

**Point person/organization:** *Luis Carranza (UMA Roatán), Ashley Goode (USDA)*

**Funding:** *~USD 2,000 for printing materials: international grants*

**Timeline:** *2021*

## **GOAL 5. Create a network of local landowners/managers that work together to protect local wildlife.**

**OBJECTIVE 5.1.** Create a network of existing landowners/managers involved in the iguana program and expand to include new individuals/organizations. Identify a leader/point person for group.

**ACTION 5.1.1.** Identify key contact people for existing organizations and island regions.

**Point person/organization:** *Stesha Pasachnik (FWZ) to start with current list, Leonardo Consuegra (Maya Cay), Worth Jennings (Black Iguana Golf Course), Cara Dunbar (Barbareta) to help manage database*

**Funding:** *N/A*

**Timeline:** *2020*



**ACTION 5.1.2.** Utilize a listserv and closed social media platform for communication. A private Facebook page has been set up but determine if this is sufficient or another option is needed. A Google Group Listserv has been created but determine if this is sufficient or another option is needed.

**Point person/organization:** *Stesha Pasachnik (FWZ), Cara Dunbar (Barbareta), Joel Amaya (Roatán Wildlife), Daisy Maryon (Kanhau)*

**Funding:** *N/A*

**Timeline:** *2020*

**ACTION 5.1.3.** Identify external experts to join the group and provide guidance as needed. Include invasive species experts and tourism bureau.

**Point person/organization:** *Stesha Pasachnik (FWZ)*

**Funding:** *N/A*

**Timeline:** *2020*

**ACTION 5.1.4.** Schedule annual meetings in conjunction with ICW so that progress can be reported and issues discussed.

**Point person/organization:** *Stesha Pasachnik (FWZ), Daisy Maryon (Kanhua)*

**Funding:** *N/A*

**Timeline:** *2021*

**OBJECTIVE 5.2.** Devise incentives for protecting wildlife and land for current and new group members.

**ACTION 5.2.1.** Brand the group, including guidelines for membership and membership package. This brand should also be used in educational materials in Goal 1 and could be designed through a local competition.

**Point person/organization:** *Worth Jennings (Black Iguana Golf Course), BICA, Tandora Grant (SDZICR), Karen Leahy (Wild Roatán)*

**Funding:** *N/A*

**Timeline:** *2020*

**ACTION 5.2.2.** Create branded signs/stickers that demonstrate a given location is dedicated to conserving the Roatán spiny-tailed iguanas and other wildlife.

**Point person/organization:** *Worth Jennings (Black Iguana Golf Course), BICA, Tandora Grant (SDZICR), Karen Leahy (Wild Roatán)*

**Funding:** *TBD depending on materials to be used*

**Timeline:** *2021*

**ACTION 5.2.3.** Discuss incentives with federal and local governments, including necessary information to designate private reserves. Investigate carbon offsets, tax relief, and Travel Life opportunities.

**Point person/organization:** *Private preserves: Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras), Iris Acosta (Departamento de Vida Silvestre); additional incentives: Leonardo Consuegra (Maya Cay), Michelle Fernandez (ZOLITUR)*

**Funding:** *TDB depending on actions*

**Timeline:** *2020*



## GOAL 6. Ensure the protection of Roatán spiny-tailed iguanas.

**OBJECTIVE 6.1.** Work with local municipalities to prevent hunting and/or illegal possession of Roatán spiny-tailed iguanas.

**ACTION 6.1.1.** Develop initiatives to spot-fine people to increase enforcement of the law.

**Point person/organization:** *Giselle Brady (BICA), Michelle Fernandez (ZOLITUR)*

**Funding:** *N/A*

**Timeline:** *2022*

**OBJECTIVE 6.2.** Work with private security guards to prevent iguana hunting on private property.

**ACTION 6.2.1.** Review current laws regarding property rights, trespassing, and private enforcement for large-scale development versus personal construction.

**Point person/organization:** *Megan Moulder (The Meridian), Cindy Florez (ICF), Mikel Belcaries (Bulldog Security), Leonardo Consuegra (Maya Cay)*

**Funding:** *N/A*

**Timeline:** *2020*

**ACTION 6.2.2.** Conduct a workshop for local security guards and property owners/managers.

**Point person/organization:** *Leonardo Consuegra (Maya Cay), Cindy Florez (ICF)*

**Funding:** *Transport costs to be covered by stakeholder organizations, training done in partnership with existing ICF workshops*

**Timeline:** *2022*

**OBJECTIVE 6.3.** Ensure that foreigners are aware of the current laws pertaining to environmental assessments of land with Roatán spiny-tailed iguanas.

**ACTION 6.3.1.** Translate environmental laws pertaining to development so that they can be provided to foreign developers. Ensure foreign developers receive documents.

**Point person/organization:** *Michelle Fernandez (ZOLITUR), Leonardo Consuegra (Maya Cay), Megan Moulder (The Meridian), Cindy Florez (ICF), Bruce Weissgold*

**Funding:** *N/A*

**Timeline:** *2021*

**OBJECTIVE 6.4.** Explore possible alternative livelihoods for people who hunt iguanas.

**ACTION 6.4.1.** Determine if there are hunters that rely on iguana hunting as their primary income or as their primary form of subsistence. Discuss potential alternatives with hunters.

**Point person/organization:** *Mikel Belcaries (Bulldog Security), Joel Amaya (Roatán Wildlife)*

**Funding:** *N/A*

**Timeline:** *2021*



## GOAL 7. Develop a management plan for Barbareta.

**OBJECTIVE 7.1.** Initiate a baseline population assessment, train local biologists, and monitor the population regularly.

**ACTION 7.1.1.** Use methods from Objective 2.2, including training from experienced researchers.

**Point person/organization:** *Barbareta biologist team, Stesha Pasachnik (FWZ), Ashley Goode (USDA), Daisy Maryon (Kanahau), Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras)*

**Funding:** *Monitoring equipment to be covered by Barbareta*

**Timeline:** *Spring 2021*

**ACTION 7.1.2.** Routinely meet with researchers to discuss progress and issues that arise. Ensure that monitoring information is shared and incorporated into the larger dataset for the species.

**Point person/organization:** *Barbareta biologist team, Stesha Pasachnik (FWZ), Ashley Goode (USDA), Daisy Maryon (Kanahau), Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras)*

**Funding:** *N/A*

**Timeline:** *2021*

**ACTION 7.1.3.** Assess interactions and impact of Roatán spiny-tailed iguanas on habitat and other wildlife (specifically Common Green Iguanas).

**Point person/organization:** *Barbareta biologist team, Stesha Pasachnik (FWZ), Ashley Goode (USDA), Daisy Maryon (Kanahau), Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras)*

**Funding:** *Equipment to be covered by Barbareta*

**Timeline:** *2021*

**OBJECTIVE 7.2.** Assess need and feasibility of translocations to augment Roatán populations.

**ACTION 7.2.1.** If determined to be beneficial, ensure that translocations are completed considering population genetic structure, animals are not moved outside of their historical range, and reintroduction sites have protection.

**Point person/organization:** *Barbareta Biologist team, Stesha Pasachnik (FWZ), Ashley Goode (USDA), Daisy Maryon (Kanahau), Mario Solis (Grupo de Investigación de Reptiles y Anfibios de Honduras)*

**Funding:** *All translocation costs to be covered by Barbareta*

**Timeline:** *2021*

**Table 2.** Roatán spiny-tailed iguana action plan overview.

Action	Project steps
1	Make the Roatán spiny-tailed iguana a flagship species.
1.1.1	Develop and produce educational materials for local schools.
1.1.2	Develop and produce educational materials for local adults.
1.1.3	Share information with local authorities.
1.1.4	Develop conservation awareness event.
1.2.1	Develop and produce educational materials for tourists.
1.2.2	Identify locations to distribute materials.
1.2.3	Develop and produce electronic educational materials for tourists.
1.3.1	Develop social media campaign.
2	Monitor iguana populations over the long-term.
2.1.1	Continue systematic population surveys.
2.1.2	Search for new populations.
2.1.3	Monitor low density populations.
2.2.1	Standardize monitoring protocols.
2.2.2	Provide training for local monitors.
2.3.1	Ensure data is centrally located.
2.3.2	Determine conservation actions.
3	Understand the reproductive behaviour of the species.
3.1.1	Use blood chemistry to determine timing of reproductive events.
3.1.2	Determine nest locations and success.
3.1.3	Interview local community to better understand reproduction.
3.2.1	Determine if nesting areas are protected.
3.2.2	Protect nesting areas.
3.3.1	Determine when captive breeding/headstarting should start and end.
3.3.2	Identify appropriate founders for captive breeding.
3.3.3	Determine location for facility(ies).
3.3.4	Write the plan.
4	Reduce the threats associated with invasive and exotic animals.
4.1.1	Assess biosecurity rules and regulations.
4.1.2	Make biosecurity recommendations.
4.2.1	Assess the status of non-native mammals.
4.2.2	Make management recommendations.
4.3.1	Assess the distribution of non-native iguanas.
4.3.2	Develop plans to remove invasive iguanas.
4.4.1	Partner with local organizations to implement control programs for dogs and cats island wide.
4.4.2	Develop specific control plans for private properties.
4.5.1	Work with local organizations to distribute educational materials on invasive species.



5	Create a network of local land owners/managers.
5.1.1	Identify key contacts.
5.1.2	Create a listserv and social media platform.
5.1.3	Identify external experts to join group.
5.1.4	Hold annual stakeholder meetings.
5.2.1	Brand the group and define membership.
5.2.2	Create branded signs for membership locations.
5.2.3	Investigate incentive for habitat protection.
6	Ensure the protection of Roatán spiny-tailed iguanas.
6.1.1	Develop spot fines from local municipalities.
6.2.1	Review laws regarding property rights.
6.2.2	Conduct workshop with private security guards.
6.3.1	Translate environmental property laws into English.
6.4.1	Determine if hunters rely on iguana and investigate alternative livelihoods.
7	Develop a management plan for Barbareta.
7.1.1.	Train local biologist to monitor population.
7.1.2	Routinely meet with researchers.
7.1.3	Assess interactions and impact of Roatán spiny-tailed iguanas on Barbareta ecosystem.
7.2.1	If needed, ensure translocations consider genetics, historic range, and site protection.



Roatán spiny-tailed iguana, *Ctenosaura oedirhina*. © Tandora Grant.



## REFERENCES

### All full text references can be found here:

[https://www.dropbox.com/sh/s9s3u43h7mbkkzx/AABz\\_SdhXvP9mTPsxlAuyjoZa?dl=0](https://www.dropbox.com/sh/s9s3u43h7mbkkzx/AABz_SdhXvP9mTPsxlAuyjoZa?dl=0)

- de Queiroz, K. (1987). 'A New Spiny-Tailed Iguana from Honduras, with Comments on Relationships within *Ctenosaura* (Squamata: Iguania)'. *Copeia* 1987(4): 892–902. <https://doi.org/10.2307/1445552>
- Gandola, R. and Hendry, C. (2011). '*Ctenosaura oedirhina* (Roatán spiny-tailed iguana). Diet'. *Herpetological Review* 42(3):428–429.
- Goldberg, S.R., Bursey, C.R. and Pasachnik, S.A. (2011). '*Ctenosaura oedirhina* (Roatan's Spiny-Tailed Iguana). Endoparasites'. *Herpetological Review* 42(4):600–601.
- Goode, A.B.C. and Pasachnik, S.A. (2016). 'Piebaldism in Roatán Spiny-tailed Iguanas, *Ctenosaura oedirhina*'. *The Herpetological Bulletin* 136:23–28.
- Goode, A.B.C. and Pasachnik, S.A. (2018). 'Flight response and human habituation in an insular endemic lizard'. *Herpetological Review* 49(2):215–218.
- Goode, A.B.C. and Pasachnik, S.A. (2019). '*Ctenosaura oedirhina*'. The IUCN Red List of Threatened Species: e.T44191A122558520. <https://doi.org/10.2305/IUCN.UK.2019-2.RLTS.T44191A122558520.en>. (Accessed: 9 August 2019).
- Goode, A.B.C., Pasachnik, S.A. and Maple, T.L. (2016). 'Habitat utilization of Roatán Spiny-tailed Iguanas (*Ctenosaura oedirhina*) and its implications for conservation'. In: J.B. Iverson, T.D. Grant, C.R. Knapp and S.A. Pasachnik (eds.), *Iguanas: Biology, Systematics and Conservation*. Volume 11, monograph 6, *Herpetological Conservation and Biology*, pp.79–89.
- Goode, A.B.C., Pasachnik, S.A. and Maple, T.L. 2020. 'Assessing the status of a threatened island endemic, *Ctenosaura oedirhina*, on Roatan, Honduras'. *Wildlife Research* 47(2):137–145. <http://doi.org/10.1071/WR18195>
- Gutsche, A. and Köhler, F. (2008). 'Phylogeography and hybridization in *Ctenosaura* species (Sauria, Iguanidae) from Caribbean Honduras: insights from mitochondrial and nuclear DNA'. *Zoosystematics and Evolution* 84(2):245–253.
- Hendry, C. and Gandola, R. (2011). '*Ctenosaura oedirhina* (Roatán Spiny-tailed Iguana). Saurophagy'. *Herpetological Review* 42(2):273–274.
- Köhler, G. (1995). 'Freilanduntersuchungen zur Morphologie und Ökologie von *Ctenosaura bakeri* und *C. oedirhina* auf den Islas de la Bahia, Honduras, mit Bemerkungen zur Schutzproblematik'. *Salamandra* 31(2):93–106.
- Köhler, G. (2004). '*Ctenosaura oedirhina*'. The IUCN Red List of Threatened Species: e.T44191A10859838. <https://doi.org/10.2305/IUCN.UK.2019-2.RLTS.T44191A122558520.en>. (Accessed: 9 August 2019).
- Köhler, G. and Rittmann, D. (1998). 'Beobachtungen bei der erstmaligen Nachzucht des Roatán-Schwarzleguans *Ctenosaura oedirhina* de Queiroz, 1987'. *Herpetofauna* 20(115):5–10.
- Köhler, G., Schroth, W. and Streit, B. (2000). 'Systematics of the *Ctenosaura* group of lizards (Reptilia: Sauria: Iguanidae)'. *Amphibia Reptilia* 21(2):177–192.
- Pasachnik, S.A. (2011). '*Ctenosaura oedirhina* (Roatan's Spiny-tailed Iguana). Limb regeneration'. *Herpetological Review* 42(4):600.
- Pasachnik, S.A. (2013). 'Growth, reproduction, and diet of Roatán Spiny-tailed Iguanas, *Ctenosaura oedirhina*, with notes on the status of the species'. *Herpetological Conservation and Biology* 8(1):191–198.
- Pasachnik, S.A. and Chavarria, Z. (2011). '*Ctenosaura oedirhina* (Roatan's Spiny-tailed Iguana). Diet'. *Herpetological Review* 42(3):429.



- Pasachnik, S.A. and Hudman, S. (2016). 'Conservation genetics of Roatán Spiny-tailed Iguanas, *Ctenosaura oedirhina*'. In: J.B. Iverson, T.D. Grant, C.R. Knapp and S.A. Pasachnik (eds.), *Iguanas: Biology, Systematics and Conservation*. Volume 11, monograph 6, *Herpetological Conservation and Biology*, pp.187–196.
- Pasachnik, S.A., Echemnach, A.C. and Fitzpatrick, B.M. (2010a). 'Gene trees, species, and species trees in the *Ctenosaura palearis* clade'. *Conservation Genetics* 11(5):1767–1781.
- Pasachnik, S., Ariano-Sánchez, D., Burgess, J., Montgomery, C.E., McCranie, J.R. and Köhler, G. (2010b). '*Ctenosaura oedirhina*'. The IUCN Red List of Threatened Species: e.T44191A10859930. <https://doi.org/10.2305/IUCN.UK.2015-1.RLTS.T44191A73610844.en>. (Accessed: 9 August 2019).
- Rittmann, D. (2007). 'Langjährige Haltung, Pflege und Nachzucht des Roatan-Schwarzleguans *Ctenosaura oedirhina* de Queiroz, 1987 sowie Beobachtungen in dessen Lebensraum'. *Elaphe* 15(3):33–40.
- Wilson, L.D. and McCranie, J.R. (2004). 'The conservation status of the herpetofauna of Honduras'. *Amphibian and Reptile Conservation* 3(1):6–33.





**INTERNATIONAL UNION  
FOR CONSERVATION OF NATURE**

WORLD HEADQUARTERS  
Rue Mauverney 28  
1196 Gland, Switzerland  
mail@iucn.org  
Tel +41 22 999 0000  
Fax +41 22 999 0002  
[www.iucn.org](http://www.iucn.org)

