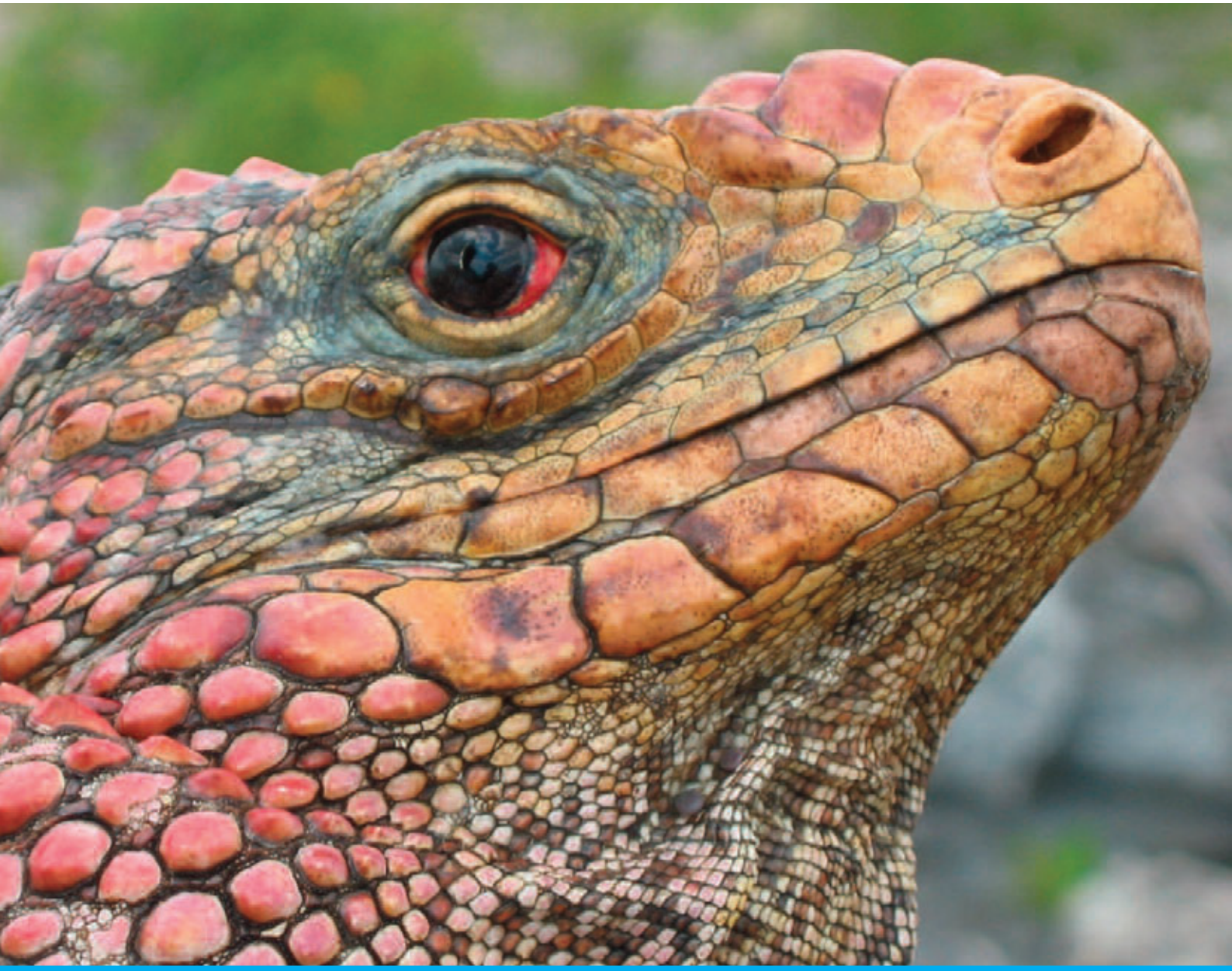
Andros Iguana

Conservation Action Plan, 2005—2011

Edited by Charles Knapp and Lee Pagni



International Union for Conservation of Nature

SSC Species Survival Commission

ISG iguana specialist group

IUCN

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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 100 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.

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Andros Iguana

Cyclura cychlura cychlura

Conservation Action Plan
2005-2011

Developed in a workshop held on 5-9 November 2005 on South Andros Island, Bahamas in conjunction with the 9th annual meeting of the IUCN/SSC Iguana Specialist Group, and hosted by the Bahamas National Trust, John G. Shedd Aquarium, and Tiamo Resorts of South Andros.

Facilitators for 2005 Workshop: Frederic J. Burton and Quentin M.C. Bloxam
Coordinators for Plan Publication: Charles Knapp and Lee Pagni
Photographs: Charles Knapp; Andros Iguana Drawing in Header: John Bendon

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Bahamas National Trust

John G. Shedd Aquarium

International Iguana Foundation

IUCN/SSC Iguana Specialist Group

San Diego Zoo Institute for Conservation Research

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Abbreviations

BEST	Bahamas Environmental Science and Technology Commission
BNT	Bahamas National Trust
BSCA	Bahamas Sportfishing Conservation Association
IIF	International Iguana Foundation
ISG	Iguana Specialist Group
IUCN	International Union for the Conservation of Nature
SANP	South Andros National Park
SSC	Species Survival Commission
TNC	The Nature Conservancy
USFWS	United States Fish and Wildlife Service

Endorsement

The Bahamas National Trust (BNT), mandated by the Bahamas Government as the manager of the Bahamas National Park System, was established by an Act of Parliament in 1959 as a statutory body. The Bahamas National Trust is an agency within the Ministry of Environment whose broader mandate includes the protection of wild animals in The Bahamas under the authority of the Wild Animals Protection Act. The BNT is especially concerned about the Andros Iguana because until recently it was the species with the least information while at the same time facing substantial conservation pressures.

The BNT is pleased to support the Andros Iguana Conservation Action Plan. Indeed aspects of the plan are considered to be one of the highest priority research and conservation projects proposed for these islands. This action plan is the collective product of numerous iguana experts and local stakeholders who met on Andros in November 2005. Their expertise, experience, and knowledge of local realities make the plan such a significant document. In addition, the plan has been reviewed and approved by the BNT's Science Advisory Committee whose role is to serve as a resource for information on science and technology for the BNT and advise on establishing scientific policy, strategy, and programs.

The BNT encourages that this plan is used to help guide conservation initiatives and serve as a blueprint to ensure that the Andros Iguana will remain as a symbol of unique pride for Bahamians in general and Androsians in particular.

Eric Carey
Executive Director
Bahamas National Trust

1 Foreword

As a group, West Indian iguanas of the genus *Cyclura* are among the most endangered lizards in the world, primarily because much of their habitat has been eliminated by human development or severely degraded by invasive species. Nine species comprise the group with a total of 15 subspecies. According to International Union for the Conservation of Nature (IUCN) Red List criteria, all but two subspecies are listed as Critically Endangered or Endangered, with a risk of becoming extinct in the absence of immediate and intensive conservation intervention. The Andros iguana, *Cyclura cychlura cychlura*, found only on Andros Island in The Bahamas, and with an estimated population size between 2,500–5,000 individuals, is considered endangered. Fortunately, the iguana inhabits a diverse suite of ecosystems, and there are still areas on the island free from the most egregious threats. Thus, if conservation measures are enacted quickly, both the iguana and its variety of associated habitats can be protected with minimal effort or expense. Inaction will most likely exacerbate conditions for iguana decline on Andros and increase the likelihood of required intervention in the future.

We know from recent studies that West Indian iguanas, as the dominant native herbivores on islands where they occur, play a vital ecological role by promoting foliage growth through cropping, providing nutrients to developing seedlings, and dispersing seeds to new areas. The subtropical dry forest communities of the West Indies are among the most imperiled plant communities in the world, and Andros plant communities in particular are home to important socioeconomic species for Bahamians (e.g., land crabs, *Cardisoma guanhumi* and *Geocarcinus lateralis*; White-crowned pigeon, *Columba leucocephala*). In general, Andros Island still harbors a vast amount of terrestrial biological diversity and intact habitat. Preservation of the native iguana population on Andros represents a significant step toward maintaining these natural habitats and associated wildlife species in a healthy and self-sustaining state.

In November 2005, members of the IUCN/Species Survival Commission (SSC) Iguana Specialist Group met on South Andros Island with local experts and stakeholders to draft this comprehensive species conservation and management plan for the Andros iguana. The overall goal of the plan is to prioritize the conservation actions necessary to ensure the long-term survival of the Andros iguana throughout its natural range. The work presented here details managing the wild population, implementing education awareness programs, establishing and managing a national park, and mobilizing financial, technical and human resources. Achieving these objectives will preserve an important and unique component of Bahamian natural heritage for future generations to appreciate and enjoy. This document is not static, but instead is designed to be fluid and updated as specific objectives are met and as conditions in the Bahamas and within the conservation community change. The recovery plan is also intended to guide decision makers in government, and inspire funding agencies and the international conservation community to provide the attention this unique iguana species deserves.

Charles Knapp, Ph.D.
John G. Shedd Aquarium, and
San Diego Zoo's Institute for Conservation Research

2 Executive Summary

The Endangered Andros iguana, *Cyclura cychlura cychlura*, is the largest native terrestrial vertebrate, and the only iguana (of 3 species) in the Bahamas that is not confined presently to small cays. The Andros iguana is unique to Andros Island and despite the recent formation of a national park on North Andros Island in 2002, the population is declining.

This document presents a comprehensive plan for conservation measures considered essential to the long-term survival of this flagship species in the wild. It combines the knowledge and expertise of highly qualified experts from government and non-government organizations within The Bahamas, with the collective conservation experience and scientific expertise of the IUCN/SSC Iguana Specialist Group.

Since 1999, a detailed natural history and socioeconomic study has been conducted on the Andros iguana. Results from this study have allowed managers to make informed decisions based on science. However, Andros Island is vast and remote, requiring additional surveys and research conducted by NGOs and students to better understand the ecology and distribution of this unique species.

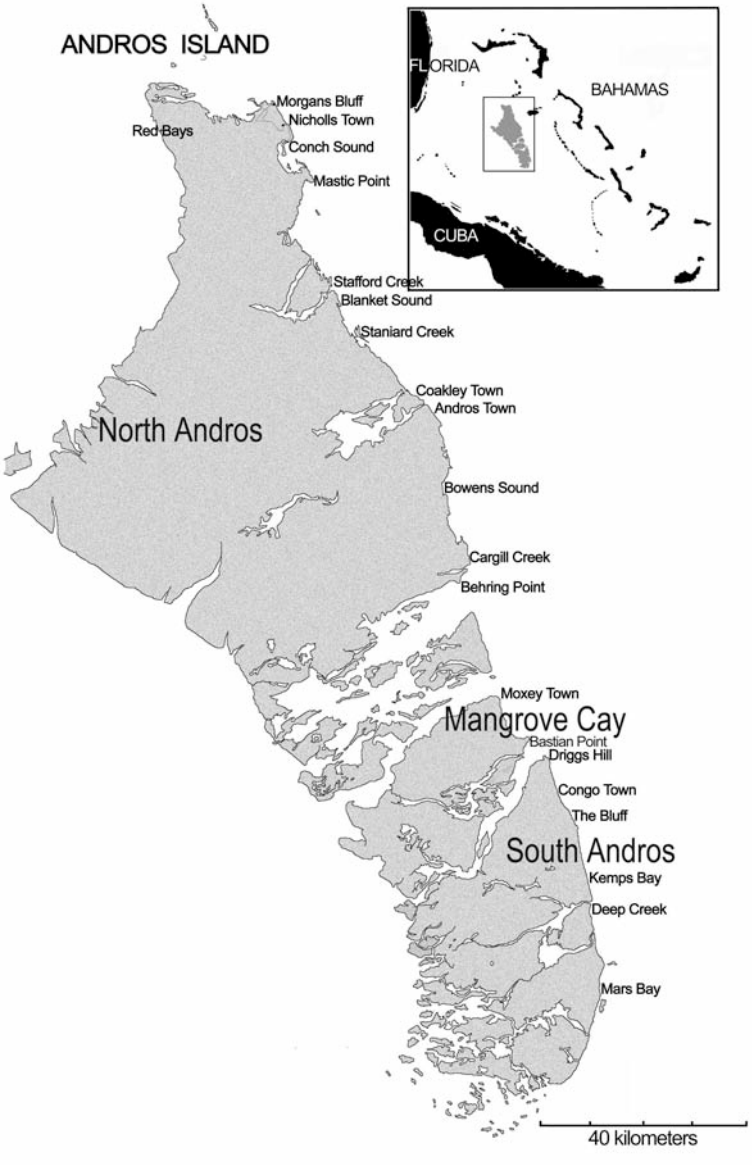
Local community support for conservation measures will be sought and maintained through major public awareness and education campaigns led by the Bahamas National Trust, Ministry of Education, and NGOs. After the management plan is completed with community consultation, the results will be reviewed by key stakeholders and regional decision makers in order to guide management decisions that facilitate the long-term persistence of viable iguana populations on Andros Island.

Funding to implement this plan will be secured from a variety of local and international grants, supplemented with contributions from NGOs. Members of the IUCN/SSC Iguana Specialist Group will assist with implementing the plan, but ultimately the true success of the plan hinges on Bahamian support through the Bahamas National Trust, Department of Agriculture, Bahamas Environmental Science and Technology Commission (BEST), Department of Lands and Surveys, and the Bahamian people.

3 INTRODUCTION *by Charles Knapp, Ph.D.*

The overall goal of this conservation and management plan is **"To ensure the long-term survival of the Andros iguana as a flagship for the biodiversity of South Andros, and perpetuate it as a symbol of pride for the people of Andros and The Bahamas as a whole."** Implementing an effective management plan for the Andros iguana may be a difficult endeavor because the island is a composite of three main islands (North Andros, Mangrove Cay, and South Andros–total estimated human population of 8-9,000) with dozens of associated inland and offshore cays. The physical separation of the human-populated centers can hinder comprehensive awareness and education campaigns because of expense, varied local priorities, and the unique human-related idiosyncrasies of each island. The island geography, however, can facilitate conservation management because negative pressures (e.g., cats, dogs, pigs) can often be contained and protected areas managed more effectively.

Any management program for the Andros iguana must include ecological data garnered through past and future scientific studies. Presently, we understand that adult Andros iguanas have large, dynamic home ranges and rely on a variety of habitat types (Knapp and Owens, 2005), thus underscoring the importance of considering size and placement of potential future protected areas. Further, home range data may be applied to population survey techniques. Iguana movements across the landscape are characterized by temporal and spatial heterogeneity, which ultimately affects detectability. Sampling designs should benefit from this *a priori* knowledge of iguana movement patterns from past studies and be structured accordingly. Habitat selection also has consequences for recently emerged hatchling iguanas since mangroves appear to offer refugia from snake predators (Knapp et al., 2010).



The Andros iguana is unique because it uses termite mounds as incubation chambers for developing eggs (Knapp and Owens, 2008). It is imperative that the use of termitaria by female iguanas for oviposition sites be addressed in conservation management planning.

Although it appears that this behavior may be facultative in specific subpopulations, it is unknown how the general population would adapt to wide-spread environmental change such as the loss of termitaria. Furthermore, there are no ancillary nesting options for many subpopulations because of the lack of suitable areas that can support traditional nest burrow construction in sand or friable soil. Therefore monitoring and protection of termitaria should be incorporated into management initiatives. Knowledge of nest-site characteristics preferred by females and the associated habitats where termitaria are found also will assist managers in demarcating formal protected areas.

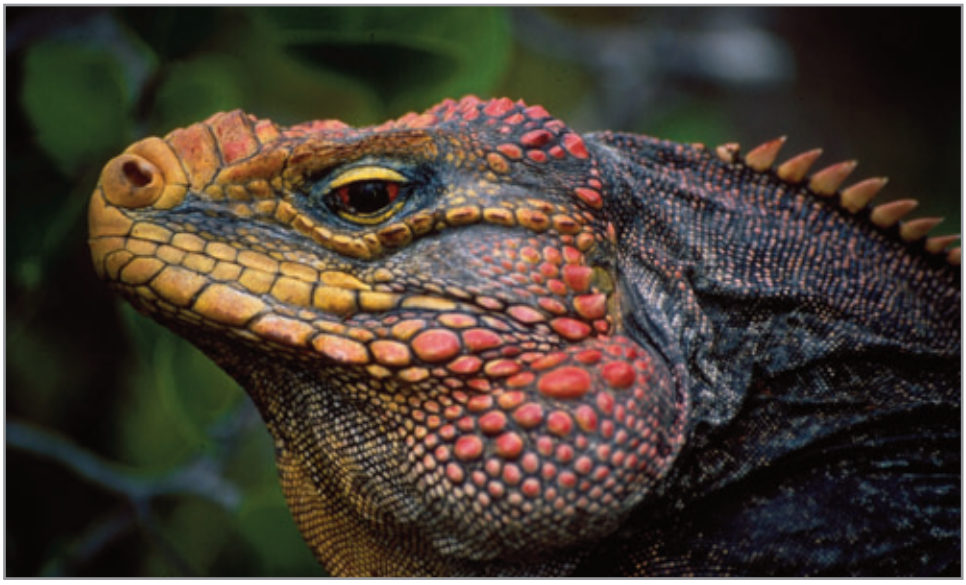
Annual female nesting effort, as indicated by active nests, could be an extremely useful indicator to assess both the number of breeding females and, indirectly, the potential for hatchling recruitment into the population. Moreover, in the absence of labor intensive monitoring programs, the capacity to assess annual activity and variation in nesting populations would provide managers with a simple strategy for identifying high-density populations, and also improve the capacity to assess trends in the Andros iguana population. Iguana nests are conspicuous and attendant females remain with the nest for weeks after oviposition. These factors make nest monitoring a cost-effective rapid survey technique.

A promising management opportunity includes engaging visiting tourists and highlighting the wildlife of Andros Island. Visitors to Andros (estimated at 9-10,000 annually) are attracted to a variety of outdoor activities and are generally interested in paying for guided wildlife tours to see iguanas and other natural features (Knapp, 2007). Because iguanas are large, photogenic, and charismatic, they have the potential to serve as flagship species for ecotourism endeavors and conservation of the tropical dry forest and beach scrub ecosystems they inhabit. Tourists to Andros also are overwhelmingly in favor of paying entrance fees for national parks if the money goes towards conserving wildlife and natural areas (Knapp, 2007). Revenue generated via entrance fees could be circulated back into park facilities, education programs, staff, and equipment.

Education and awareness campaigns have been sporadic yet ongoing on Andros. These campaigns must be strengthened and maintained in order to promote a sustained environmental ethic. Ultimately, all conservation is local and Androsians must become stewards of the Andros iguana and its habitat if future generations are to enjoy this magnificent animal.

Hatchling Andros Iguana (*Cyclura cychlura cychlura*)

4 Species Assessment *The following assessment was completed in February 2010 by Charles Knapp, Ph.D.*



Male Andros Iguana (*Cyclura cychlura cychlura*)
Photograph by Charles Knapp

4.1 Taxonomy

The Andros iguana is classified currently as *Cyclura cychlura cychlura* (Cuvier 1829) and is phylogenetically distinct from the two subspecies in the Exuma Islands (*C. c. inornata*; Barbour and Noble 1916 and *C. c. figginsi* Barbour 1923; Malone et al., 2003). The Andros iguana differs also from the two Exuma subspecies based on modal scale counts, coloration, and nesting behavior (Schwartz and Carey, 1977; Knapp and Owens, 2008).

4.2 Status

With less than 5,000 individuals estimated to remain in the wild, the Andros iguana is considered Endangered according to IUCN Red List criteria. The iguana is listed under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and is formally protected in the Bahamas under the 1968 Wild Animals Protection Act. The entire population of the Andros iguana constitutes three subpopulations occurring on North Andros, Mangrove Cay, and South Andros. Additional satellite populations occur on many cays in the bights of Andros and in the south and southwest areas of the island. The population on North Andros is considered the most severely degraded because of heavy anthropogenic perturbations (see Conservation Issues). The populations south of Mangrove Cay and Lisbon Creek are considered the least degraded and in need of pre-emptive protection.

4.3 Description

The Andros iguana is dark gray to black, with yellow-tinged scales on the legs, dorsal crest, and particularly the head. With maturity the yellow coloration can change to a deep orange or red, especially in large males. On average, the Andros iguana is the largest native terrestrial vertebrate in The Bahamas with a maximum recorded body mass of 9.2 kg (20.2 lb), body length of 57.3 cm (22.6 in), and total length of 132.3 cm (52.3 in).

4.4 Natural History

Andros iguanas are herbivorous—eating fruits, flowers, and leaves of at least 45 different types of plants (Knapp, 2005). The iguanas inhabit interior pine woodlands and isolated pockets of broadleaf scrubland, and mangroves. Males have large home ranges up to 30 ha (74 acres) with little overlap with other males except during the mating season (Knapp and Owens, 2005).

Mating occurs from the second week of April to the first two weeks of May. Female Andros iguanas are the only iguana documented to use termite mounds as incubation chambers for their eggs (Knapp et al., 2006; Knapp and Owens, 2008). Female iguanas predominantly use active *Nasutitermes rippertii* (Termitidae: Isoptera) termite mounds as incubation chambers. Nests are located primarily in open pine, followed by dry evergreen shrubland and closed pine habitats. Nesting females select mounds with > 5 cm surrounding soil depth and initiate excavation and oviposition in early May and cease in mid-June. Tunnels are excavated into lateral sides of mounds and terminate in nest chambers inside the termitarium.

Females lay clutches of 4 to 19 eggs (mean = 10), which are deposited outside the mound and pushed into the chamber using thrusts of the forelimbs. Iguanas back-fill the tunnel and construct a conspicuous buttress of material against the side of the mound using carton from the mound, associated soil, pine needles, twigs, leaf litter, palm fronds, and limestone fragments from the surrounding area. Once deposited, females guard nests from others that might attempt to use the same termite mound. Females normally guard nests for six weeks, but some protect nests for the entire incubation period.

Hatchling iguanas emerge approximately 76 days after eggs are deposited. Hatchling iguanas are on average 9.6 cm (3.8 in) in body length and weigh an average of 42 g (1.5 oz). Young iguanas usually disperse great distances immediately after leaving the nest and can swim between inland cays. The most extensive one-day movement rate confirmed is 1.72 km (1.01 mi) by a hatchling that entered the water in Lisbon Creek. At least seven other hatchling iguanas have been discovered crossing water barriers as wide as 400 m (437 yd). Natural predators of hatchlings are primarily snakes—the Bahamian brown racer (*Cubophis vudii*) and the Bahamian boa (*Epicrates striatus*)—as well as birds and possibly fish.

It is estimated that only between 17 and 28% of hatchlings survive more than two months. Hatchlings often are found on mangrove roots or on branches of shrubs in broadleaf woodland or beach scrub areas. It appears that mangrove habitat may be extremely important for the survival of hatchlings as there is a clear survival advantage for neonates that spend more time in open mangrove habitat than relatively more closed-canopy habitats. This is most likely because there are fewer primary predators in mangroves relative to other habitats (Knapp et al., 2010).

4.5 Conservation Issues

The Andros iguana faces unique anthropogenic pressures relative to other islands in the Bahamian archipelago, such as habitat loss, illegal hunting, and impacts from historic large-scale logging practices for Caribbean pine, which destroyed large tracts of iguana habitat in the 1960s and 70s for saw lumber and pulpwood. These impacts are compounded further with predation by feral animals (e.g. cats, dogs, and hogs). Dogs kill adult iguanas while cats prey on juveniles. Feral cats and kittens, and phalanx-bone elements in cat scat, have been found as far as 20 km (12 miles) from the Lisbon Creek set-

tlement on Mangrove Cay. Feral hogs, found currently only on North Andros, root up nests and eat eggs and may inflict additional unknown harm. Recent surveys of the west side of North Andros revealed the presence of feral pigs at 73% of survey locations. These same surveys found no iguanas in areas with recent hog activity.

Historically, most iguana hunting occurred on North Andros because of the extensive logging roads and larger human settlements. Though people still occasionally observe iguanas on North Andros, surveys suggest that few iguanas remain above North Bight. Juvenile iguanas are seen after hatching season but soon disappear, presumably eaten by cats. Iguana poachers now travel south to catch iguanas because of their scarcity on North Andros. At least two interior camps have been identified on Alcorine Cay and Mangrove Cay where iguanas are routinely taken illegally for food.

4.6 Conservation Actions Implemented

The Andros iguana is formally protected in the Bahamas under the 1968 Wild Animals Protection Act. In 2002, the Central Andros National Parks (total area 115,770 ha) were established to protect inland forest, coral reef, and wetland nursery areas on North Andros Island. Unfortunately, these protected areas are not ideal for iguana conservation because they are located on North Andros Island, which is severely degraded habitat for iguanas because of feral animals, loss of habitat, logging roads that allow access to the island interior, and illegal hunting pressure.

In 2005, the IUCN/SSC Iguana Specialist Group held their meeting on South Andros in order to develop the outline for a conservation and management plan for the Andros iguana. During the meeting, a public forum was held to provide status and life history information about the Andros iguana as well as record feedback from local stakeholders. In October 2006, a public forum was held on Mangrove Cay and South Andros to discuss wildlife issues and expansion of the Andros national park system.

In 2003 and 2004, limited education programs were implemented to raise awareness of the Andros iguana. Various high school presentations with live iguanas were held on Mangrove Cay and South Andros. Educational posters were produced that incorporated local student artwork. Over 300 tee shirts depicting the need to protect the iguana have been distributed on Andros since 1999. In 2005, a soccer team on North Andros took the name "Central Andros Iguanas Football Club" in an attempt to raise awareness for the iguana. In 2007 education consultants from the San Diego Zoo conducted teacher training sessions aimed at including iguana natural history information in the curriculum. Mobile teaching tool kits were distributed to teachers along with Andros iguana tee shirts.

The ecology and distribution of the Andros iguana has been studied extensively from 1999-2004 by Charles Knapp, Ph.D. from the John G. Shedd Aquarium and University of Florida. Annual mark-recapture studies have been conducted from 1999 to the present in order to better understand this long-lived species. Three rapid ecological assessments (REA) have been conducted (June 2006, October 2007, March 2009) to further understand the island-wide distribution of the Andros iguana. Based on Dr. Knapp's detailed five-year study and the three REAs, areas on Andros supporting healthy iguana populations have been identified.

4.7 Research Conducted

Since 1999, research has been conducted on the Andros iguana focusing on 1) adult home range and habitat use using radio telemetry; 2) reproductive ecology; 3) hatchling dispersal and survival using radio telemetry; and 4) tourist surveys. The detailed ecology studies were conducted by Dr. Charles Knapp during his doctoral research. Annual mark-recaptures studies have been ongoing since 1999 in collaboration with the John G. Shedd Aquarium. The detailed ecological studies have been conducted in areas south of Lisbon Creek because no iguana populations sufficiently large enough to study have been found north of Middle Bight. Additional island-wide population range assessments were made in 2006, 2007, and 2009. Based on these studies, Dr. Knapp estimates that fewer than 5,000 iguanas remain in the wild.

Upper left: Sunset over Lisbon Creek, Andros Island
Upper right: Female Andros Iguana depositing eggs
Lower left: Bahamian racer (Cubophis vudii) eating an Andros Iguana hatchling
Lower right: Camp on Alcorine Cay known for illegal iguana hunting activity

Table 1. Research conducted on the Andros iguana since 1999.

Investigator(s)	General location	Time period	Focus
C. Knapp S. Buckner, et al.	Mangrove Cay, Sandy Cay, Alcorine Cay	March 2009	Mark-recapture
C. Knapp E. Freid, et al.	South Andros, Curly Cut Cays, Grassy Creek Cays	March 2009	Population assessment Vegetation assessment
C. Knapp, et al.	South Andros, West Side (S. Andros)	October 2007	Population assessment
C. Knapp S. Buckner E. Freid, et al.	Mangrove Cay, Sandy Cay, Alcorine Cay	April 2007	Mark-recapture Vegetation assessment
C. Knapp E. Freid, et al.	West Side (Andros), North Andros, Middle Bight, Alcorine Cay, Mangrove Cay, South Andros, Water Cays	June 2006	Population assessment Vegetation assessment
C. Knapp A. Owens	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	May-September 2005	Studies detailed in 4.7
C. Knapp S. Buckner, et al.	Mangrove Cay, Sandy Cay	May 2005	Mark-recapture
C. Knapp A. Owens	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	May-September 2004	Studies detailed in 4.7
C. Knapp S. Buckner, et al.	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	May 2004	Mark-recapture
C. Knapp A. Owens	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	May-September 2003	Studies detailed in 4.7
C. Knapp A. Owens, et al.	Mangrove Cay, Sandy Cay, South Andros, South Bight	May 2003	Mark-recapture
C. Knapp	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	April-September 2002	Studies detailed in 4.7
C. Knapp, et al.	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	April 2002	Mark-recapture
C. Knapp	Mangrove Cay, Sandy Cay, Alcorine Cay, South Andros, South Bight	October 2001	Studies detailed in 4.7
C. Knapp S. Buckner, et al.	Mangrove Cay, Alcorine Cay, South Andros, South Bight	May 2001	Mark-recapture
C. Knapp, et al.	North Andros, Mangrove Cay	April 2001	Population assessment
C. Knapp S. Buckner, et al.	Mangrove Cay, South Andros, South Bight	June 2000	Mark-recapture
C. Knapp S. Buckner, et al.	Mangrove Cay, Alcorine Cay, Middle Bight, South Bight	June 1999	Mark-recapture

4.8 Strategic Plan SWOT Analysis

Factors are assessed here for the Andros iguana and the current conservation program as of November 2005.

4.8.1 Strengths

a) Andros is a large island
b) There is an abundance of crown land with no property disputes
c) The iguana population is not critically low so costly conservation measures not needed yet (e.g., head starting, translocation, etc.)
d) Managers possess basic natural history and distribution data for the iguanas
e) Tourists appear to be willing to pay for national park entrance fees and field trips to view wildlife
f) Andros is a tourist destination for people interested in outdoor activities (e.g., diving, fishing, birding, other wildlife-related activities, etc.)
g) Sub-populations of iguanas are present on multiple cays
h) Negative impacts can be contained because of the system of bights

4.8.2 Weakness

a) Culturally embedded apathy and a lack of conservation education
b) Lack of an on-island person willing to spearhead the island-wide conservation campaign
c) Funding
d) Competition to create other protected areas in the Bahamas deemed more critical
e) Current lack of law enforcement
f) Island fragmented geographically making communication difficult and opening cultural divides between North and South Andros, and Mangrove Cay

4.8.3 Opportunities

a) Available Crown land to protect without conflicts of interest
b) Outdoor classroom with some existing outdoor education programs
c) Involvement of local conservation organizations
d) Potential logistical support from AUTEC (The Atlantic Undersea Test and Evaluation Center of the US Navy)
e) Ecotourism with local hotels enhancing their appeal to outdoor enthusiasts

4.8.4 Threats

a) Opportunistic and dedicated iguana hunting
b) Feral, and free-roaming non-native, mammals (dogs, cats, pigs)
c) Habitat loss
d) Uncontrolled human-caused fires (fire is necessary to maintain the pine ecosystem critical for iguanas, but widespread unnatural fires may potentially pose a threat)
e) Potential for resumed logging industry

5 Objectives and Action Steps

Female Andros iguana (Cyclura cychlura cychlura) protecting nest.
Photograph by Charles Knapp

5.1 Overall Goal:

"To ensure the long-term survival of the Andros iguana as a flagship for the biodiversity of South Andros, and perpetuate it as a symbol of pride for the people of Andros and the Bahamas as a whole."

5.2 Objective: Implement a comprehensive education and awareness program at local and national levels for conservation of the Andros iguana and the biodiversity of Andros.

5.2.1 Result: The Andros Island Iguana becomes a flagship for biodiversity conservation on Andros by the end of 2010, stimulating community pride in this unique animal and an understanding of its interrelationships with the local biodiversity.

a) Develop an Androsian soccer league using the iguana as a mascot and use the teams as an avenue for education.
Action: Ricardo Johnson, Central Andros High School
Funding: $5000

b) Develop and produce interactive educational materials promoting iguanas and iguana conservation for festivals.
Action: BNT local office, Joe Burgess, Jeff Lemm, Ricardo Johnson
Funding: $6000

5.2.2 Result: The Andros Island Iguana becomes a flagship for biodiversity conservation throughout the Bahamas by the end of 2011, stimulating community pride in this unique animal and an understanding of its interrelationships with the local biodiversity.

a) Soccer league interfaces with BFA/FIFA.
Action: Ricardo Johnson
Funding: covered in 5.1.1a

b) Community meetings and events supported by BNT, TNC, and Nature's Hope.
Action: BNT local office
Funding: $5,000 - $10, 000 depending on scope

c) Develop interactive educational materials promoting iguanas and iguana conservation for public events.
Action: BNT Director of Education, Joe Wasilewski, Shedd Aquarium
Funding: $4,000

5.2.3 Result: Island-wide support is manifested by the end of 2010 for establishing a large-scale protected area for Andros, through education of local communities and other stakeholders on the benefits, access, and importance of protected areas.

a) Develop and utilize a PowerPoint presentation with recorded narration that establishes the unique qualities of the various iguana habitats.
Action: Chuck Knapp, Sharrah Moss
Funding: none

b) Develop consistent messaging on multiple resource use zones for local communities.
Action: Chuck Knapp, Brian Dean
Funding: none

c) Develop consistent messaging on multiple resource use zones for tourist industry.
Action: Ecotourism groups
Funding: none

d) Develop and distribute posters, fliers, signage, radio ads, newspaper features, postcards, stamps, and relevant information posted on BNT website.
Action: BNT
Funding: $25,000

5.2.4 Result: Iguanas and iguana conservation are incorporated into current coursework in schools throughout Andros.

a) Secure authorization to introduce Andros iguana conservation subjects and materials in schools.
Action: BNT Director of Education
Funding: none

b) Develop activities to be incorporated into classrooms, utilizing similar existing curricula as guides.
Action: BNT, Lee Pagni; Brian Dean, Ricardo Johnson, Shedd Aquarium
Funding: $3,000

c) Training workshop is provided so that teachers are comfortable with the new material.
Action: BNT, Brian Dean, Ricardo Johnson, Lee Pagni
Funding: $1,500

d) Produce and distribute interesting media resources for young audiences.
Action: BNT, Joe Wasilewski
Funding: $2,000

5.2.5 Result: Andros iguanas are no longer hunted, sold or illegally held captive.

a) Create and distribute fliers and posters that state that it is illegal to hunt, keep, or offer for sale iguanas; list the fine; and give the phone number of the appropriate authorities.
Action: Ministry of Environment with BNT
Funding: $5,000

5.3 Objective: Establish protected areas in South Andros sufficient to conserve the island's natural resources as a source of pride and sustainable livelihood for members of the community.

5.3.1 Result: Energize the local community through community outreach to view the unique natural resources of South Andros as a source of pride and sustainable livelihoods, by mid 2010.

a) Conduct thirteen initial local stakeholder meetings and six combined island-wide general meetings to initiate enthusiasm and support for protected areas concept, commencing in early 2008.
Action: Nature's Hope, BNT
Funding: $7,100

5.3.2 Result: Secure sufficient scientific information to enable the demarcation of protected area boundaries, including iguana sanctuaries, by 2010.

a) Survey entire South Andros island biodiversity.
Action: BNT, Shedd Aquarium
Funding: BNT/TNC Kerzner Foundation; Shedd Aquarium

b) Survey the entire island for iguana population distribution by end of 2009 and map core areas of iguana presence. Link to TNC/BNT project to establish time frame.
Action: Nature's Hope, TNC, BNT, Shedd and Bahamas Defense Force
Funding: BNT/TNC Kerzner Foundation; Shedd Aquarium

c) Ground truth by results of vegetation zones by end of 2009.
Action: BNT/TNC

d) Organize, synthesize, and incorporate all previous research results (TNC).
Action: Peter Douglas

5.3.3 Result: Identify priority area(s) for protected area proposal by end of 2009.

a) Use information gathered in 5.2.2 to ascertain priority areas for protection.
Action: Nature's Hope, BNT

b) Hold stakeholder meetings on South Andros by mid-2010 to discuss priorities for protected areas.
Action: Nature's Hope, BNT

5.3.4 RESULT: Protected area proposal approved by the Ministry of the Environment.

a) Protected area proposal prepared.
Action: BNT Parks Division, CK, E. Freid, Nature's Hope, TNC

b) Convene meeting with relevant agencies (lands and surveys, BEST commission, local government, Ministry of the Environment,) to address issues prior to submitting the plan.
Action: BNT

c) Proposal submitted to the Ministry of the Environment.
Action: BNT

5.3.5 RESULT: Establish a management plan for all protected areas on Andros.

a) Organize stakeholder meetings in the South Andros community.
Action: Nature's Hope, BNT

b) Synthesize and disseminate information on conservation and resource use zones and policies.
Action: Nature's Hope, BNT

c) Generate draft Management Plan.
Action: Nature's Hope, BNT

d) Revise and finalize Management Plan based on information from follow-up stakeholder meetings.
Action: Nature's Hope, BNT

e) Management Plan adopted by Nature's Hope, BNT.
Action: Nature's Hope, BNT

5.4 OBJECTIVE: Secure startup and sustainable funding to protect and manage an iguana conservation area, including all associated research and education needs.

5.4.1 RESULT: Implement a comprehensive campaign focusing on unique natural resources that will draw tourists to Andros, with associated revenue directed toward protected area management.

a) Establish an angler fee program with Andros proceeds going toward park management/ iguana conservation.
Action: BNT, Bahamas Sportfishing Conservation Association (BSCA), Nature's Hope
Funding: $1,000

b) Build a visitor center near a blue hole, including an iguana exhibit to ensure that visitors have the opportunity to view and learn about iguanas and other natural attractions. Fees would be cycled back toward park management/iguana conservation.
Action: BNT with funding from outside sources
Funding: $500,000 for building; $50,000 per year for on-site educator; $15,000 per year for maintenance

c) Explore business plan potential of fast power boats, airlines, and other transportation from Nassau and/or Ft. Lauderdale to bring more visitors to Andros; consult with Powerboat Adventures and others.
Action: BNT, Bahamas Ferries, Ministry of Tourism
Funding: $25,000 - $50,000 micro-enterprise grant from Inter-American Development Bank

d) Work with environmental organizations to investigate and promote environmental exit fee (departure tax) to support management of national park system, including protected area management on Andros.
Action: BNT, TNC
Funding: No cost

5.4.2 Result: Secure sufficient international funding to develop and support programs and facilities associated with new protected area for the Andros iguana.

a) Obtain funding ($7,000) through existing TNC Kerzner Marine Foundation grant to support protected areas pre-implementation community outreach activities.
Action: BNT, TNC, Outer Island Promotion

b) Apply for various grants for research/conservation/education and training for Bahamian students.
Action: BNT

c) Consider and potentially seek sponsorship from Kerzner Marine Foundation, Shedd Aquarium, and other local and international corporations/non-profit organizations to meet needs identified below.
Action: BNT

d) Seek major donors in association with ecotourism lodges such as Tiamo Resorts to meet needs identified below.
Action: BNT, Lodge owners

Table 2. Funding requirements for protected area establishment and maintenance (in USD).

Item	Capital Cost	Operational Cost	Total
Building	500,000	0	
Wardens (3) 55k		185,000	
Education (1) 50k	-	50,000	
Boats (2)	120,000	-	
Trailers	20,000		
Vehicles (2)	50,000		
Gasoline/Maintenance	-	20,000	
Building/Maintenance		15,000	
Subtotal	690,000	290,000	
18% Administration	124,200	52,000	
Total	814,200	342,000	$2,524,200

5.4.3 RESULT: Secure sufficient funding to support research needs identified in this plan.

a) Seek research grant funding to support monitoring iguana populations from American Zoo Association Conservation Endowment Fund, Disney Wildlife Conservation Fund, IIF, USFWS Wildlife Without Borders.
Action: Iguana researchers
Funding: 20K per year plus 12K in year 1 for boat

Andros Iguana Action Plan Overview (updated 15 February 2010)

Action	Project Steps	Agency	Notes
5.1	*Comprehensive Education and Awareness Program*		
5.1.1 a	Androsian soccer league	R. Johnson	4/08- league has over 75 participants with two more teams slated to start in 08.
5.1.1 b	Interactive educational materials	Burgess, Lemm, Johnson	10/07- 35 teachers trained in using iguana education kits. Needs follow-up assessment.
5.1.2 a	Soccer League interfaces with BFA/FIFA	R. Johnson	
5.1.2 b	Community meetings	S. Moss, R. Johnson	
5.1.2 c	Interactive educational materials	Wasilewski/Shedd Aquarium	
5.1.3 a	Powerpoint presentation of iguana habitat	C. Knapp, S. Moss	
5.1.3 b	Consistent messaging for local communities	C. Knapp, B. Dean	
5.1.3 c	Consistent messaging for tourism	Ecotourism groups	
5.1.3 d	Posters, fliers, signage, radio ads, newspaper, postcards, etc	BNT Education Office-Parks Dept.	Lee Pagni to check with Bill Hayes on San Salvador education campaign and will advise BNT.
5.1.4 a	Authorization for iguana materials in schools	P. Sweeting/BNT	10/07 Kits in schools. Need assessment of use and/or impact.
5.1.4 b	Develop classroom activities	K. Graham, B. Dean, R. Johnson/ Shedd Aquarium	Curriculum introduced in 10/2007 to 35 educators. Need funding to evaluate training and possibly create more kits.
5.1.4 c	Teacher training workshop	B. Dean	Same as above.
5.1.4 d	Interesting media resources	Wasilewski	
5.1.5 a	Print media against iguana hunting	Ministry of Environment with BNT	
5.2	*Establish Protected Areas in South Andros*		
5.2.1 a	Meetings to generate support for protected areas	Nature's Hope, BNT	Chuck Knapp has had meetings in February 2008 with the BNT and Agriculture. Chuck Knapp also gave a general audience lecture to the BNT members. BNT will slot a meeting on iguana areas specifically for 2009.
5.2.2 a	South Andros Biodiversity Survey	BNT/TNC	BNT to cross reference with work already completed by TNC (Ethan Freid).
5.2.2 b	Island-wide iguana survey	Nature's Hope, TNC, BNT, C. Knapp and Bahamas Defense Force	Chuck Knapp completed the survey in October 2007. Shedd/BNT survey of Grassy Cay was conducted in March 2009.
5.2.2 c	Ground truth vegetation zones	BNT, TNC	Ethan Freid has completed some vegetation surveys (2007) in areas recommended for protection. Need to cross reference and complete.
5.2.2 d	Gather all previous research info	P. Douglas	Ask if BNT/Science Advisory Committee can come up with a list.
5.2.3 a	Use info from 5.2.2 for protected area identification	Nature's Hope, BNT	
5.2.3 b	Stakeholder meetings on South Andros	Nature's Hope, BNT	

5.2.4 a	Protected area proposal prepared	BNT Parks Division, C. Knapp, E. Freid, Nature's Hope, TNC	Chuck Knapp is working with Janeen Bullard in drafting a formal proposal.
5.2.4 b	Convene meeting with relevant agencies (lands and surveys, BEST commission, local government, Min of Env,) to address issues prior to submitting the plan	BNT	
5.2.4 c	Proposal submitted to Ministry of Environment	BNT	Completed 2009. Proposal approved with conditions. Boundaries to be determined.
5.2.5 a	Prepare a draft management plan	Nature's Hope, BNT	
5.2.5 b	Define use zones and policies	Nature's Hope, BNT	
5.2.5 c	Synthesize information for dissemination	Nature's Hope, BNT	
5.2.5 d	Generate draft management plan	Nature's Hope, BNT	
5.2.5 e	Plan review w/ stakeholders	Nature's Hope, BNT	
5.2.5 f	Finalize management plan	Nature's Hope, BNT	
5.2.5 g	Management plan adopted by Nature's Hope and BNT	Nature's Hope, BNT	
5.2.5 h	Implement management plan	Nature's Hope, BNT	
5.3	***Secure Funding for Startup and Management of an Iguana Conservation Area***		
5.3.1 a	Establish angler fee program	BNT, BSCA, Nature's Hope	
5.3.1 b	Build visitor center/ orientation kiosk	BNT	
5.3.1 c	Investigate bringing tourists by ferry or plane to Andros	BNT, Bahamas Ferries, Ministry of Tourism	
5.3.1 d	Investigate Protected Area Support Fee (including possibly a small portion of the departure tax)	BNT- TNC	
5.3.2 a	Obtain funding for community outreach	BNT, TNC, Outer Island Promotion Board	
5.3.2 b	Apply for various grants for research/conservation/ education and training for Bahamian students.	BNT	
5.3.2 c	Seek support from Shedd and other NGOs	BNT	
5.3.2 d	Seek donors from lodges	Lodge owners, BNT	Wrap all this into a sustainable finance plan. This plan already exists for the Bahamas. Make sure iguana research and conservation is integrated into the Bahamas Sustainable Finance Plan (part of the Protected Area Trust Fund).
5.3.3 a	Seek research grants	Iguana researchers	Research projects should be designed to create awareness for and build capacity in Bahamian locals.

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