



Conception Bank Silver Boa 5-year Species Conservation Action Plan

*Final Report of the workshop held
22–23 July 2019
Nassau, Bahamas*



The world's most endangered boa species: Conception Bank Silver Boa, *Chilabothrus argentum*



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A collaboration among Bahamas Environment, Science & Technology Commission, Bahamas National Trust, North Carolina Zoo, Silver Boa Trust, University of North Carolina, Asheville and IUCN SSC Conservation Planning Specialist Group.

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Participants from the workshop consisted of an international group of individuals representing numerous stakeholders involved in Silver Boa conservation.

List of Acronyms:

BEST	Bahamas Environment, Science & Technology Commission
BNT	Bahamas National Trust
CINP	Conception Island National Park
CPSG	Conservation Planning Specialist Group
IUCN SSC	International Union for the Conservation of Nature Species Survival Commission
RBDF	Royal Bahamas Defence Force

I. Executive Summary

Though it was just discovered in 2015, the Conception Bank Silver Boa (*Chilabothrus argentum*) is already considered the most endangered boa in the world (Reynolds et al. 2016). The only known population consists of fewer than 200 individuals and exists within a total area of half of a square kilometer in The Bahamas. The species is listed as Critically Endangered on the IUCN Red List (Reynolds 2017), indicating a high likelihood that the species might go extinct in the next decade. The Bahamas National Trust, the organization responsible for managing its only known habitat, recognized the urgent need to develop an action plan to guide the species recovery.

On July 22–23, 2019, the Bahamas National Trust - in collaboration with the North Carolina Zoo and the University of North Carolina Asheville and with facilitation by the IUCN Species Survival Commission’s Conservation Planning Specialist Group - convened a workshop to take the first steps in the drafting of a Species Conservation Action Plan for the Conception Bank Silver Boa.

The workshop brought stakeholders together to: 1) share critical information on the species and its current status; 2) develop consensus around the priority threats to the species; and 3) identify the most promising solutions as well as an implementation plan to achieve them.

Participants were engaged and informed throughout the workshop and worked intensively with a clear dedication to the survival of the species. Together they envisioned a future where “sustainable populations of the Conception Bank Silver Boa are secure in the face of existing and future threats and recognized as a species of cultural and biological importance to The Bahamas and the World”.

Participants identified the following goals to bring about this future: 1) increasing boa habitat patch size and number of habitat patches; 2) improving protection of Conception Island National Park through enforcement of existing legislation to conserve the Silver Boa; 3) eliminating unwanted human impacts to habitat (including fire, pets, illegal collection of plants, animals and marine resources, tourism, etc); and 4) establishing *ex situ* population for assurance, increasing population size, retention of genetic diversity, eventual reintroduction, and research into reproduction, life history, and stress response. Specific action steps were outlined, and responsible parties identified to achieve these ambitious goals.

The Bahamas National Trust and partners will take the lead on implementation of the plan, in collaboration with Dr. Graham Reynolds of the University of North Carolina Asheville, who co-discovered the boas and has conducted the only surveys of the species, and Dustin Smith of North Carolina Zoo who is now a key project partner.

II. The Conception Bank Silver Boa

The Commonwealth of The Bahamas is a small archipelagic nation south east of Florida and north of Cuba. With over 3000 islands, cays, and rocks and more than 650,000 square kilometres of ocean, many parts of the country are very isolated and relatively unexplored.

The Silver Boa, *Chilabothrus argentum*, was discovered on the Conception Island Bank in 2015 by a group of scientists from Harvard University led by Dr. Graham Reynolds. Since that time Dr. Reynolds has returned to the remote Conception Island Bank to conduct population-level studies of the species, obtain genetic data, and record the threats to the species. The team officially described the new species as *Chilabothrus argentum*, after both the Silver Palm (*Coccothrinax argentata*) in which they found the first specimen and the silvery colouration of the snake itself. Phylogenetic studies based on DNA sequence data (Reynolds et al. 2016) determined that the Silver Boa is a unique lineage endemic to the Conception Island Bank and sister to other species of Bahamian Boas, such as *Chilabothrus schwartzi* (Reynolds et al. 2018).

Conception Island National Park, Bahamas

The Silver Boa exists entirely within the boundaries of the Conception Island National Park (CINP). The Conception Island Bank is a partially submerged platform occupying about 102 square kilometres and supporting one main island along with some rocky satellite islands. Conception Island is approximately 8 km² with a maximum elevation of 24 m (Lands and Surveys Department, Bahamas

Government, 1972) and is currently afforded protection from development by its status with the Bahamas National Trust system of National Parks. Established in 1978 and expanded in 2009, CINP protects Conception Island, Booby Cay, and the South Rocks as well as the oceanic platform surrounding these islands. The park protects important seabird nesting areas, mangrove habitats which serve as nurseries for Green Turtles (*Chelonia mydas*) as well as economically important species, and one of the most beautiful and healthy reef systems in The Bahamas. The reefs surrounding Conception Island have always been a popular sailing, diving, and snorkeling destination. Most of the habitat on Conception Island is coastal scrub or low-mangrove habitat with few trees taller than two meters high (Figure 1). The central portion of the island is covered by a shallow lagoon ringed by Red Mangrove (*Rhizophora mangle*). Scrub habitat occurs on the surrounding dunes and hills, though some mature closed-canopy forest exists at the leeward base of a tall hill that acts as a windscreen.

Population Status

Reynolds' teams have spent a total of 18 days on-island studying the species over a series of four expeditions to the island since 2015. Every boa encountered to-date has received a full suite of measurements, has been individually tagged with an electronic microchip, and has been sampled for genetic analysis. During these studies the acute conservation concerns for



Figure 1. Typical coastal-scrub habitat on Conception Island.

the species have become apparent, and it appears that there is a high likelihood that the species will not survive in the wild without intervention.

Silver Boas only occur in a patch of remnant forested habitat. This forest is characterized by a closed-canopy dominated by old-growth Gumbo Limbo/Gum-elemi (*Bursera simaruba*) trees and understory Silver Palms (*Coccothrinax argentata*). This forest type occurs in only one place on the Conception Island Bank and is less than 1.0 km² in area. Silver Boas are arboreal and require relatively mature forest, where they hunt migratory songbirds at night (Reynolds et al. 2016). The species requires tree holes, large branches, rotten logs, rocks, and solution holes as refugia. Reynolds' capture-mark-recapture estimates for the entire population of Silver Boas have demonstrated that 137 (\pm 40) adult individuals remain. Thus, the entirety of the species likely consists of < 200 individuals occupying a single habitat patch < 1 km² in area. No information is yet available on fecundity or mortality.

Genetic Diversity

Reynolds has analyzed genetic data for a mitochondrial locus (1,100 base pairs of cytochrome B) and found zero genetic variation. This suggests that the population might be on the verge of suffering the deleterious effects of consanguineous breeding (inbreeding).

Conservation Threats

Silver boas face numerous threats that limit our expectations for their survival in the wild without conservation intervention. The main threats to the species identified in 2016 (Reynolds et al. 2016; Reynolds 2017) are 1) range contraction, 2) potential exploitation, and 3) natural disaster:



Figure 2. Aftermath of Hurricane Joaquin, a category 3 storm that struck Conception Island in October 2015 and caused the loss of a 2,500 m³ piece of the closed-canopy forest where at least three boas lived.

restricted to the only remaining patch of forest on the Conception Bank. This is likely owing to anthropogenic habitat modification, as the island has a history of use for agriculture (sisal plantations, goat grazing, burning and cutting of forest) throughout the 18th–20th centuries. 2) The recent discovery of this attractive species might lead to exploitation for the pet trade, as has happened with other members of the genus (Dodd 1986). 3) Remaining habitat for this species is threatened by

loss owing to hurricanes, fire, and eventual complete destruction from rising sea levels. Hurricane Joaquin struck the island in 2015, causing an approximately 50 m x 10 m x 5 m section of forest to wash into the sea (Figure 2). The land that was lost was found to be quality boa habitat during the initial survey in July 2015. Conception Island has a maximum height of 24 m, with much of the forest habitat occurring near present-day sea level. Thus, natural catastrophes, which



Figure 3. Spent signal flares on Conception Island, 2017.

might be exacerbated in intensity or frequency owing to climate change, should be considered a significant threat to the persistence of this species. Further, during surveys in 2017, Reynolds found a recent campfire and dozens of spent signal flare canisters near the forest (Figure 3). These flares and campfires are signals typically used by narco-traffickers. A single wayward flare or ember from a campfire could trigger a fire that would quickly consume the remaining forest. Finally, rising sea levels will likely render the island uninhabitable by the species in the coming century (Williams 2013).

The Silver Boa was classified as Critically Endangered in 2017 (Reynolds 2017) due to its extremely small habitat range (effectively less than 1 km²), its small and isolated population size (less than 200 individuals estimated), and threats to the species (climate change, erosion, hurricanes, fire risk, habitat destruction, potential for human exploitation and interference; Dodd 1986; Williams 2013).

Currently, other than being protected from development by being a national park, there are very few other protections for Conception Island National Park. Its isolation and distance from civilization (>34 km to Port Nelson, Rum Cay– the nearest settlement by boat) allows for visitation without BNT monitoring. This includes tourists and sailors as well as the possibility of illegal activities such as drug, human, and animal trafficking. There is currently work being done towards better management of the park, and the existence of the Silver Boa within the park will surely be important in this work.

III. The Workshop Process

On July 22–23, 2019, 24 people from five governmental and conservation organizations gathered in Nassau, Bahamas to share information about the status and threats to the Conception Island Silver Boa and to begin crafting a Species Conservation Action Plan for the species. The event was hosted by the Bahamas National Trust and the North Carolina Zoo, with support from the University of North Carolina Asheville.

The IUCN SSC Conservation Planning Specialist Group was invited to design and facilitate the workshop process using their participatory, science-based, One Plan Approach for integrated species planning.

The workshop began with overview presentations on the biology and conservation status of the Conception Bank Silver Boa; *ex situ* management for Caribbean Boas; Conception Island National Park governance, management and conservation priorities; and the IUCN's *ex situ* guidelines decision process and CPSG's One Plan Approach.

This was followed by an interactive visioning exercise to describe the ideal future for the Conception Bank Silver Boa. The vision is a short statement that outlines the desired future state for the species. It is intended to be both long term and ambitious. Participants were asked: "If you were to leave The Bahamas today, and come back in 25–50 years, what is the situation you would like to find for the Conception Bank Silver Boa?" Everyone offered the elements of that future that were most important to them and a small group was tasked with synthesizing all the material and presenting a composite statement to the group. After discussion and revision, consensus was reached on a vision statement.

The next step in the process was a threat analysis with identification of direct and indirect drivers of population decline. The threats were themed and three groups emerged: 1) threats to habitat, 2) threats to the population, and 3) socioeconomic threats. Participants were then distributed, based on their areas of expertise, into one of the three threat-based groups in order to develop goals to help mitigate those identified threats. Each group reported back to the plenary so that the resulting goals were discussed, revised, and ultimately adopted by all participants. The rough, informal notes from each working group can be found in Appendix 3.

Again, working in small groups, participants were tasked with identification of specific actions to be taken in order to achieve the goals. Before the close of the meeting, each group reported back on their work, proposed actions were discussed, and an implementation plan was outlined.

IV. Silver Boa Species Conservation Action Plan

A. Vision

Sustainable populations of the Conception Bank Silver Boa are secure in the face of existing and future threats and recognized as a species of cultural and biological importance to The Bahamas and the World.

B. Goals

Population Goals

Goal 1: Establish *ex situ* colonies for assurance, increase in population size, retention of genetic diversity, eventual reintroduction, and research into reproduction, life history, and stress response.

Goal 2: Establish biosecurity by implementing prevention, monitoring, and eradication exercises of invasive species.

Habitat Goals

Goal 3: Increase boa habitat size and number of habitat patches.

Goal 4: Eliminate unwanted human impacts to habitat (e.g. fire).

Goal 5: Ensure Conception Island is free of invasive species.

Goal 6: Conduct research to understand, and address to the best of our abilities, the impacts of climate change on the Silver Boa population.

Socioeconomic Goals

Goal 7: Improve protection of Conception Island National Park through enforcement of existing legislation.

Goal 8: Create and implement management plan.

Goal 9: Improve capacity in resource management agencies.

Goal 10: Improve the awareness and support for the Silver Boa through advocacy and education.

C. Action Table. List of potential strategies, actions, responsible parties, timelines, and progress for action items identified in the workshop. All activities will undergo separate detailed evaluation if they require permits. Bahamas National Trust will evaluate action items in the context of progress and outcomes.

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
Goal 1: Establish <i>ex situ</i> colonies for assurance, increase in population size, retention of genetic diversity, eventual reintroduction, and research into reproduction, life history, and stress response.				
Establish ex situ colony	Establish a reproducing ex situ assurance colony at the North Carolina Zoo	Dustin Smith	2020	See Appendix C
	Conduct research on reproduction, life history, and stress response	Dustin Smith	2020-2026	
Repatriation	Assess feasibility of repatriating animals to Conception Island	Dustin Smith	2021-2026	
Develop a draft Emergency Rescue Plan	Draft a plan	Dustin Smith		See Appendix A
	Subject draft to expert review process, and revise draft plan accordingly; finalize and distribute plan	Dustin Smith		
	Train staff in plan implementation	Dustin Smith		
Goal 2: Establish biosecurity by implementing prevention, monitoring, and eradication exercises of invasive species.				

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
Biosecurity	Conduct invasive plant and animal surveys	Graham Reynolds, Alberto Puente-Rolon, Dustin Smith	2020–2026	Begins in May 2020
Goal 3: Increase boa habitat size and number of habitat patches.				
Complete a Habitat Use Analysis	Habitat surveys, mark recapture, radio tracking	Graham Reynolds	2020–2026	Begins in May 2020
Habitat use analysis of prey	Prey surveys, identification of critical plant species, abiotic resources	Graham Reynolds, Scott Johnson	2020–2026	Begins in May 2020
Detailed analysis of diet of snake	Determine if seabirds are prey–isotope analysis during seabird nesting	Alberto Puente	2020–2025	Begins in May 2020
	Scat analysis, feathers and bones, DNA extraction from scat	Alberto Puente, Graham Reynolds	2020–2026	
	Seabird nesting analysis	Scott Johnson, Will Mackin	tbd	
Complete vegetation mapping	GIS (try to get as many digital maps as possible, send copies to Graham Reynolds)	Kirk Cunningham	2020–2023	
	Rapid assessment	Ethan Freid	2020	

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
Complete elevation mapping	Already exists, send to Graham	Sandra Buckner	2019	Sent Conception I Scale 1 in 25000 extract BLS Series 320 July 2019 To Graham and Kirk in– shows trigpoint heights and contours.
Promote native vegetation	Remove invasive species	Anwar Rolle and Ethan Freid	2020	
Surveys of other potential habitat patches or cays	Comprehensive surveys of Conception Bank	Alberto Puente, Graham Reynolds	2020–2026	Begins in May 2020
Goal 4: Eliminate unwanted human impacts to habitat (e.g. fire).				
Reduce fire risk	Campfires signage	Graham Reynolds, Lakeisha Anderson, Falon Cartwright, Anwar Rolle	2020–2021	Begins in May 2020
	Assessment of fire risk to the forest (fuel load)	Ethan Freid and Kirk Cunningham	2020–2022	

Strategy	Action	Responsible Parties	Timeline	Progress
Develop web-based resources with information for people visiting Conception Island	BNT page regulations	Shelley Cant-Woodside, Sandra Buckner, Dominique Martin (BNT)	end of 2019	
	Ministry of Tourism webpage	Sandra Buckner and BNT staff	end of 2019	
	Yacht clubs and marinas have informational signage about regulations	BNT	2020	
Establish a Signage Task Force	Determine critical audiences and messages; Identify where signs are placed	Graham Reynolds and Sandra Buckner	2019	Completed
	Draft and proof signage text	Graham Reynolds and Sandra Buckner	2019	Completed
	Order, check for errors, pay for signs	Anwar Rolle	2020	Immediately - Graham Reynolds and Dustin Smith (completion in May 2020)
	Organize all supplies required for installation	Anwar Rolle	2020	Immediately - Graham Reynolds and Dustin Smith (completion in May 2020)

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
	Install signs	Graham Reynolds	2020	Completion in May 2020
	Ensure signs are well maintained	BNT	Quarterly	Maintenance is ongoing and will continue as long as park is managed
Safety of Researchers	Alert Royal Bahamas Police and Defense Forces to drug trafficking on Conception Island	Scott Johnson	2019	
	Ask BTC about cell tower	Anwar Rolle	2019	
	Gather information about Wildlife Conservation and Trade Advisory Committee	Sandra Buckner and Dr. Isaacs		
Cruising Guides	Add regulatory information to cruising guides	Sandra Buckner	2020	
Link with Marine Turtle Group	Steve Connett (Sandra will write, copy Graham, Shelley and Lakeisha)	Sandra Buckner	2019	Done - Replies received and circulated; suggestions to be incorporated with the above comments
Goal 5: Ensure Conception Island is free of invasive species.				
Baseline information on invasive species for CINP	Get invasive species report from Island Conservation	Shelley Cant–Woodside	2020	

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
	Conduct trapping exercises when on-island	Graham Reynolds	2020-2022	
	Evaluate CIMP for non-direct invasive species (i.e. <i>Casuarina</i> and longhorn boring beetles)	Graham Reynolds	2020	
Invasive species monitoring	Continue trapping exercises during visits	BNT	2020–2026	Begins May 2020
	Deploy wildlife cameras for remote monitoring of possible invasive mammal species and illegal human activities	Graham Reynolds	Deploy in 2020 and continue through 2026	
Goal 6: Conduct research to understand, and address to the best of our abilities, the impacts of climate change on the Silver Boa population.				
Climate change risk	Evaluate likelihood of hurricanes impacting CIMP			
	Evaluate coastal erosion and sea level rise impacts on CIMP			
	Temperatures affecting Silver Boa behavior?			
	Loss of food sources due to climate change?			
Goal 7: Improve protection of Conception Island National Park through management and enforcement.				
Create and implement a management plan.	Draft a park management plan	BNT		

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
	Finalize and publish park management plan	BNT		
Improve capacity in resource management agencies	Increased funding and training of enforcement officers			
	Gazette Park–Specific Bylaws for Conception Island National Park			
Goal 8: Create and implement species management plan.				
Prepare report from this workshop	Draft workshop report	Giselle Dean, Onnie Byers, Graham Reynolds, Dustin Smith	Spring 2020	Complete
	Review and revise draft report; distribute final report	Giselle Dean, Onnie Byers, Graham Reynolds, Dustin Smith	Spring 2020	In progress
Develop list of indicators to be used to assess and monitor action implementation		BNT		
Implement actions		All responsible parties	2020-2030	In progress
Monitor, and evaluate effectiveness of, implementation		BNT, Graham Reynolds, Dustin Smith	2020-2030	
Goal 9: Improve capacity in resource management agencies.				

<i>Strategy</i>	<i>Action</i>	<i>Responsible Parties</i>	<i>Timeline</i>	<i>Progress</i>
SMART Training	Have a training workshop for SMART (Spatial Monitoring and Reporting Tool) for trainers	BNT	Feb/Mar 2020	
	Train technical and enforcement staff on SMART techniques			
Workshop/Meeting on CINP/Silver Boa	Educate/train enforcement officers (RBDF and Customs) on the Silver Boa?			
Goal 10: Improve the awareness of and support for the Silver Boa through advocacy and education.				
Develop an advocacy campaign for the Silver Boa (Consider a generalized snake campaign)	Identify audiences (eg. schools, general public, politicians)	BNT		
	Conduct pre and post campaign surveys	BNT		
	Identify Funding for the Campaign	BNT		
	Identify Partnerships	BNT		
National Park	Tenure– change from the 99-year lease to permanent	BNT		
	Make changes in National Park priorities to strengthen protection	BNT		

V. Literature Cited

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VI. Appendices

Appendix A: Emergency Rescue Plan

***Ex Situ* Management of the Conception Bank Silver Boa Emergency Rescue Plan**

This emergency rescue plan has multiple components to ensure the conservation of the Conception Bank Silver Boa in the case of a catastrophic event threatening severe population loss. This plan will be activated in response to a variety of significant threats, including a severe weather event (Category 5 Hurricane), fire, introduction of invasive species (cats or other substantial predators), disease, poaching, or any other serious concern of those involved with the recovery program.

When a significant threat has been determined (as listed above), BNT will call an emergency meeting (via conference call) with the following parties (and others as needed for immediate implementation of plan including assisting with logistics, identifying funds, etc.):

- BNT Staff
 - Shelly Cant-Woodside
 - Eric Carey
- BEST Staff
 - Sydnei Cartwright
- Dr. Graham Reynolds
- Dustin Smith

This group will begin pre-planning, determine a timeline for action items, and identify additional partners needed for the response.

Here, we outline the actions involved in the emergency rescue plan and partners responsible for such actions.

Pre-Planning

These items should be finalized before proceeding with the rest of the plan

- Permitting or an emergency variance to the existing permit: BEST, Department of Agriculture, and the BNT.
- Notify short-term and long-term holding facilities, within The Bahamas based on structure of facility, ease of access, resources.
- Determine how many animals should be rescued, in the event of an emergency or should this be based on the type of emergency and response time available.
- Identify resources available to assist in an emergency
 - Funding for rescue operation (~\$5000)
 - Vessel large enough to transport rescue staff (3-5 individuals) and safely transport snakes.
 - Boat driver familiar with Conception Bank and/or familiar with region

- Commercial or charter flight to transport snakes to Ardastra (or other approved facility).
- Snake transport and holding resources:
 - Pillow cases (transport)
 - Coolers/buckets (transport)
 - Secure plastic containers or snake enclosures (holding)
 - Medical supplies (holding)

Action items:

- Does BEST/BNT allow for special permission/permitting for an emergency, temporary rescue operation?
- Would this be allowed for 20 or more individuals?

Coordination of Response

- BNT will be the responsible party when enacting the emergency rescue plan. This will include coordinating a response with partners/contractors involved.

Action items:

- Identification of available boat and driver
- Budget source for associated rescue costs (including boat, fuel, driver)

Facilities

- Ardastra Gardens will serve as a short-term rescue facility. This could include keeping snakes in pillowcases or secure tubs/enclosures for a few days, if the threat is short-term. Should be isolated from other snakes.
 - This will depend on space available and staff resources, although these needs are minimal because it is short-term (less than 7 days).
 - Staff should conduct a basic health assessment of individuals upon arrival to Ardastra (or other approved facility).
 - Emphasis should be on general health and short-term holding.
 - Ensure animals are hydrated and they are kept clean with appropriate temperature (75-80° no direct sunlight), humidity (50-80%), and adequate ventilation.

Action items:

- Are there any other facilities that can assist?
 - Requirements:
 - Secure, concrete building and associated holding space with climate control (appropriate temperature/humidity/ventilation)
 - Reliable, permitted/approved source
 - Access to vet/medical care

- Experience/Expertise and time
- Proximity

1. Temporary Rescue (**ACTION ITEM – Draft Emergency rescue plan – Bradley BNT/Dustin – SEPTEMBER 2019)
 - a. Understanding/simplification of permits:
 - i. Similar to the regulations in the US (USFWS)
 - ii. Do similar regulations exist
 1. Giselle check with Shelley/BEST
 - b. Rescuing 20 or more individuals
 - c. Destination
 - i. Ardastra? Anywhere else?
 - ii. Proximity is valuable
 - iii. Do they have the capacity for the short-term holding?
 1. Likely yes – pillow cases, concrete building
 2. Climate control is important – not necessarily HVAC, but not allowed to overheat.
 - d. Mechanics –
 - i. Who drives the boat (literally and figuratively)?

Appendix B: Visioning Statement Working Group

Kirk Cunningham, Graham Reynolds, Dr. Deandra Delancey-Milfort, Sydnei Cartwright, Lynn Gape, Shelley Cant–Woodside

Management and research

- Effective management
- Increase research (x5)
- Threat management
- Protection
- Enforcement

Education

Population

Increase and encourage *in situ* and *ex situ* continuous research, management, and education for the Silver Boa promoting specifically its cultural and biological importance to The Bahamas and the world

Ensuring the survivability of the Silver Boa throughout The Bahamas through research education and habitat management

Ensure long term and viable populations of the Silver Boa in the face of climate change through management, research, and education

Long term viability of the population through habitat threats and education

Cultural value and perspective

Fostering respect

Round 1 Vision Statement

....Ensure long term and viable populations of the Silver Boa in the face of climate change through *in situ* and *ex situ* management, research, and education promoting its cultural and biological importance to The Bahamas and the World.....

Comments Period:

Dr. Maurice Isaacs: Expand to other threats? “including climate change”

Falon Cartwright: word-smithing

Dr. Onnie Byers: define “viable” and “long-term”

Dr. Maurice Isaacs: other methods not included? “sustainable development” incorporates cultural and economic concerns

Dr. Ethan Freid: “cultural” importance

Bradley Watson: Economic?

Round 2 Vision Statement

....Sustainable populations of the Conception Bank Silver Boa are secure in the face of existing and future threats and recognized as a species of cultural and biological importance to The Bahamas and the World.....

Appendix C: Working Group Notes

Socioeconomic Working Group

Participants: Scott Johnson, Janezka Johnson, Lesley Meadows, Portia Sweeting, Dr. Deandra Delancey-Milfort, Candice Webb, Falon Cartwright, Agnessa Lundy, Lynn Gape

Time Keeper: Lesley Meadows – DMR

Team Leader: Shelley Cant

Recorder: Lynn Gape

Presenter: Scott Johnson

Capture the key points

Conclusions drawn on the group conversation

Read aloud the cards – ask the questions

Categorize them – Prioritize them

First Priority Step – write a goal statement

Goal or objective statements provide direction for planning, for evaluating plans and for guiding projects and actions. A "good" goal statement is SMART: Specific. Measurable.

Action oriented

Goal 1: Improved Protection of Conception Island National Park through enforcement to conserve the Silver Boa

Strategy:

- Create and implement a management plan.
- Improve capacity in resource management agencies
 - o by increased funding and training of enforcement officers.
- Gazette Park Specific By Laws for Conception Island National Park

- 1) Lack of Capacity in Resource Management Agencies
- 2) Training of Enforcement Officers
- 3) Lack of Funding
- 4) Illegal Immigration – changing the migrant landing pattern
- 5) Enforcement – changing in patrol times of RBDF Patrols
- 6) Inadequate legislation
- 7) Wildlife tracking – due to lack of enforcement / RBDF Patrols
 - a. Tourism – increased visitation creates awareness of species among collectors
 - b. Increased damage to habitat
 - c. Depressed economy: would create people who will enter the illegal pet trade and sell the Boa
 - d. Small Population – more rare and endangered species creates a market

- e. Policy – regional / international involvement in management –
Multilateral agreements

Goal 2: Improve the awareness and support for the Silver Boa through advocacy and education

Strategy:

- 1) Development of advocacy campaign for the Silver Boa
 - Audience: Schools, general public
 - Pre and Post Surveys
 - Pre survey – help in developing
 - Consider a generalized snake campaign
 - Identify Funding for the Campaign
 - Identify Partnerships
1. National Park Tenure-ship – change from the 99 year lease to permanent protection
2. Changes in National Park Priorities
3. Lack of political will to Protect the Species – Politicians Stakeholder
4. Lack public appreciation of the Silver Boa as a natural resource
5. Indiscriminate killing and removal and persecution

Political Will

- AL – making politicians aware is a part of the concern but politicians should be aware that the general public is aware and want this protected in addition to general public want this as well.
- Not sure how to educate the public – change their will – create pressure on the politician – important to the Bahamian People (International)
- Something to hold their feet to the fire – still do what they want to do – aware of the importance – why do we have to fight you – economic species – throw money at the problem
- More of a strategy – not measurable
- Lot of work to do – lots of good legislation
- Already in a park and already on the Red List – so illegal to move them – already has the legislation
- BNT as the NP manager – how to manage the space appropriately, create bylaws and manage the habitat properly

Two separate things that overlap are educating the lay person, kids and families, and Action – Have a workshop to train people

Goal 3: Build national and international collaboration to protect the Silver Boa

Then national and international level strategy building and capacity building, how to identify who should be involved and then determine the different roles of the agencies and organizations

–Strengthen the national and international policy and legislation to increase protection for the Silver Boa.

Lobby for the elevation of the Silver Boa from Appendix II – Appendix Steward Politicians focusing on Ministries and Departments responsible for species legislation and enforcement.

Coordinating Body to foster interagency collaboration.

Who do we need to engage internationally?

Comments on Goal 1 – OK
Park Management Plan
Agencies capacity is improved

Habitat Working Group

Threat analysis – HABITAT

Time Keeper – Andrew

Manager – Falon

Computer – Dustin

Presenter – Kirk

Dustin, Falon, Ethan, Candice, Hendrew, Kirk, Sandra

Notes:

Hurricanes

Fire – increased visits – campfires, smoking, flares

Loss of habitat from storms

Increase in hurricane intensity/frequency leading to habitat destruction

Only found in one small location

Invasive Species

Categories:

1. Climate Change/Weather Events
 - Increase in frequency/intensity of weather events
 - Sea level rise will change/reduce habitat/quality
 - Increased temperatures affecting behavior(?)

Goal: Developed *ex situ* management plan based on assessment of climate change threats

2. Small isolated habitat

- Reduced amount of genetic diversity
- Small population size vulnerable to stochastic events
- Small population size Vulnerable to habitat change
- Small population size Vulnerable to invasive species
- Small population size Vulnerable to sea level rise/hurricanes
- Small population size Vulnerable to rainfall pattern shifts
- Small population size Vulnerable to fire
- Limits population growth
- Simple for poacher to collect large portion of population

Goal: Increased boa population size and range

3. Direct Human Impact

- Habitat/population negatively impacted by fire
- Introduction of invasive species
- Intentional or inadvertent impact to habitat
- Capturing/stressing snakes
- Development of property

Goal: Eliminated unwanted human impacts to habitat.

4. Invasive Species

- Further reduce suitable habitat
- Reduces biodiversity

Goal: Conception Island is free of invasive species

Participants: Graham and Heidi

Remove Mice
Survey and map
Survey invasive

Increase Boa habitat size
Complete vegetation mapping
Complete Habitat use
Complete research on diet of the snake
Survey of other cays for appropriate habitat
Eliminate harmful human impact
No fisherman huts
Controlled tourism

Working to understand the effects of climate change on the Silver Boa Population

Goal 1: Improved Protection of Conception Island National Park through enforcement to conserve the Silver Boa.

Strategy:

- Create and implement a management plan for Conception Island National Park. – BNT/Falon Cartwright / Shelley Cant
 - Gazette Park Specific By Laws for Conception Island National Park – L. Gape
 - Identify funding to support management planning process – BNT
 - Create Stakeholder Matrix – for management planning process
 - Schedule and host Management Planning Meetings
 - Meet with Silver Boa Researchers to develop a Species Management Plan – as an appendix to the overall park management plan
 - Write the Plan and circulate for comment to stakeholders
 - Present final plan to stakeholder groups for final comment
 - Implement the Management Plan

- Improve capacity in resource management agencies
 - Increased funding
Assessment of funding needs to support species management and protection
Identify funding sources: grants etc.
Write and apply for identified grants

 - Training of enforcement officers
BNT coordinates a multiagency collaboration for training and enforcement.
Assessment of funding and capacity needs to support training
Identify funding sources: grants etc.
Write and apply for identified grants
Develop a training programme focused on endangered species management and protection.
Identify participatory agencies for the training

Timeline:

Management Planning Process usually takes 1 year

Management Plan completed 2022

Goal 2: Develop and Implement Advocacy Campaign for the Silver Boa – BNT

- Identify Funding for the Campaign
- Identify Partnerships for the development and implementation

- Develop the Silver Boa Advocacy Campaign to address concerns/ issues identified in the Pre– Survey
 - Define Audience: Schools, general public
 - Pre and Post Surveys
 - Pre survey – help in developing
 - Incorporate a generalized snake campaign

Time Line: Implementation of the campaign will be informed by the *ex situ* emergency strategy timeline.

Goal 3: Build a national and international collaboration to achieve support for the Silver Boa

- Strengthening international policy
 - Elevate the Silver Boa from CITES Appendix II to Appendix I – Dr. Deandra Delancey
- Steward Politicians responsible for the implementation of existing legislation – BNT Science and Policy Department

Population/*Ex Situ* Working Group

Ex situ Management

Bradley, Hendrew, Dustin, Phil, Giselle

1. Primary Threats
 - a. Small Site Vulnerability – Natural disasters/climate change
 - b. Small Population–Vulnerable
 - c. Invasive Species
 - d. Lack of Awareness/Appreciation of species
2. Potential *ex situ* management options:
 1. Insurance Populations – Prevent Extinction
 - a. Population can be created with the goal of maintaining assurance population and also as a source for release.
 2. Temporary Rescue – Threat of catastrophe
 - a. This is something the group should consider as an option in the event of storms – short term mitigation strategy
 3. Long–term *ex situ* – Keeping the species in existence after extinction in the wild with potential for long–term release
 - a. Not extinct in the wild
 4. Head–start Population
 - a. Not necessary at this point because of threats
 5. Source for release – short–term holding/breeding for release

- a. Insurance population is also a source for release
- 6. Research
 - a. Necessary to understand biology and natural history of the species
- 7. Education/Awareness
 - a. Necessary to raise awareness for the species – especially a Bahamian endemic.

Bradley:

How are zoos in the US going to help the species and how are they going to raise awareness?

What role(s) will we play and how will we contribute?

With them living longer and reproducing longer, does that mean you need a smaller population size?

- 3. Characteristics of *Ex Situ* Roles
 - a. Insurance population/source for release
 - i. What is the genetic goal for the *ex situ* population in order to achieve population viability?

**ACTION ITEM – Complete analysis portion of report – Phil Miller – 1 month

Test numbers using PMx

Population Variables:

Generation length – 12.4 years

Maximum potential lambda (pop growth rate) – 10%

N – 20

Ne/N – 40%

GD – 97.5

Allowable N – 100

Would allow 86% GD after 100 years and 90% for 51 years

Founder related variables (Using information above)

New founders per addition event – 2 (individuals)

Year to start adding founders – 5 years from collection date

Years between events – 2 years

Year to stop – stop at 9 years

FGE per founder – .40

Can maintain 86.8% GD after 100 years and 90% for 64 years

Founder related variables (Using information above)

New founders per addition event – 4 (individuals)

Year to start adding founders – 5 years from collection date

Years between events – 2 years

Year to stop – stop at 25 years

FGE per founder – .40

Can maintain 90% GD for 101 years

Generation length – 12.4 years
Maximum potential lambda (pop growth rate) – 10%
N – 10
Ne/N – 40%
GD – 97.5
Allowable N – 100
Would allow 90% GD after 6 years and 79.3% for 100 years

Founder related variables (Using information above)
New founders per addition event – 4 (individuals)
Year to start adding founders – 5 years from collection date
Years between events – 2 years
Year to stop – stop at 29 years
FGE per founder – .40
Would allow 89.8% GD after 100 years and 90% for 97 years

Founder related variables (Using information above)
New founders per addition event – 6 (individuals)
Year to start adding founders – 5 years from collection date
Years between events – 5 years
Year to stop – stop at 30 years
FGE per founder – .40
Would allow 89.7% GD after 100 years and 90% for 96 years

Follow-up comments:

Phil – adjusting certain numbers can help with the GD. This could be as simple as adding space available to increase population size.

Scott – Do these numbers allow for removing animals from the population numbers for release – (Yes).

Scott – Can assessments help with determining whether an animal would have any reproductive issues?

Dr Isaacs – would it be better to collect and breed in pairs or in groups with one male and multiple females. Phil – this is a concern when focusing on genetics.

Sandy – what does this group recommend – 20 individuals or 10 and which option?

No one in the group was opposed to pursuing *ex situ* management (pending risk/threat analysis).

4. Feasibility/Risks (risk to population)
 - a. Risks of no action:
 - i. High probability of population decline or extinction in the face of threats
 - ii. Suggests high value of *ex situ* program
 - b. Risk of initiating *ex situ*:

- i. Increased risk of extinction by removal of animals from population
 - 1. Mitigate by reducing number of founders at beginning and supplement population with additional founders periodically.
 - c. Feasibility – ***ACTION ITEM – DUSTIN SMITH
 - i. 10 founders less risky than 20
 - ii. For a population size of 100, we would need ~10 institutions or more (many variables).
 - 1. 10 institutions
 - a. Need to consider feasibility of in-country facilities
 - i. Ardastra – assess capacity to maintain/breed species (HENDREW)
 - 1. Is there enough space for 10 individuals – if not, how many?
 - 2. Does staff currently have boa husbandry/breeding expertise? If not, what training is necessary?
 - 3. Has kept/bred Bahamian Boas
 - b. Identify willing/able interested institutions
 - i. NCZOO – assess capacity to maintain/breed species
 - ii. Other AZA facilities
 - iii. Use workshop report as proposal and create terms
 - d. Awareness Role
 - i. Requires display – evaluate capacity for appropriate space
 - ii. Work with “sociological group” to generate information for educational materials
 - iii.
5. Temporary Rescue (**ACTION ITEM – Draft Emergency rescue plan – Bradley BNT/Dustin – SEPTEMBER 2019)
 - a. Understanding/simplification of permits:
 - i. Similar to the regulations in the US (USFWS)
 - ii. Do similar regulations exist
 - 1. Giselle check with Shelley/BEST
 - b. Rescuing 20 or more individuals
 - c. Destination
 - i. Ardastra? Anywhere else?
 - ii. Proximity is valuable
 - iii. Do they have the capacity for the short-term holding?
 - 1. Likely yes – pillow cases, concrete building
 - 2. Climate control is important – not necessarily HVAC, but not allowed to overheat.
 - d. Mechanics –
 - i. Who drives the boat (literally and figuratively)?

Appendix D: Participant List

1. Lakeisha Anderson	Bahamas National Trust
2. Sandra Buckner	
3. Onnie Byers	CPSG
4. Shelley Cant-Woodside	Bahamas National Trust
5. Eric Carey	Bahamas National Trust
6. Falon Cartwright	Bahamas National Trust
7. Sydnei Cartwright	Bahamas Environment, Science & Technology (BEST) Commission
8. Kirk Cunningham	Forestry Unit
9. Chantal Curtis	Bahamas National Trust
10. Gisell Deane	Bahamas National Trust
11. Deandra Delancey-Milfort	Department of Agriculture
12. Ethan Freid	Bahamas National Trust-Levy Preserve
13. Lynn Gape	Bahamas National Trust
14. Hendrew Haley	Ardastra Zoo
15. Wavell Hanna	Forestry Unit
16. Maurice Isaacs	BAHFSA
17. Janeczka Johnson	Bahamas National Trust
18. Heidi Johnson	Bahamas National Trust-Levy Preserve
19. Scott Johnson	Bahamas National Trust
20. Agnessa Lundy	Bahamas National Trust
21. Dominique Martin	Bahamas National Trust
22. Lesley Meadows	Department of Marine Resources
23. Phil Miller	CPSG
24. Graham Reynolds	University of North Carolina- Asheville
25. Anwar Rolle	Bahamas National Trust
26. Elijah Sands	Bahamas National Trust
27. Dustin Smith	North Carolina Zoo
28. Portia Sweeting	Bahamas National Trust
29. Bradley Watson	Bahamas National Trust
30. Candice Webb	Department of Marine Resources

Appendix E: Photographs

