Earthwatch 2019 Field Report

Mapping Biodiversity in Cuba

Report authors
Natalia Rossi, PhD. Wildlife Conservation Society
Maikel Cañizares. Instituto de Ecología y Sistemática, La Habana. Cuba
Lucia Hechavarria. Instituto de Ecología y Sistemática, La Habana. Cuba
Pedro González. Centro de Investigaciones y Servicios Ambientales. Holguín. Cuba
Tomás Michel Rodríguez. Sociedad Cubana de Zoología
Aslam Castellón Maure. Sociedad Cubana de Zoología
Maydiel Cañizares. Sociedad Cubana de Zoología

Photography
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LETTER TO VOLUNTEERS

Dear Earthwatch volunteers,

As we embark into our 2020 Earthwatch field expeditions, we wanted to take the time to reflect on our collective efforts in 2019 and share some of our highlights.

Thanks to your commitment, motivation, and insatiable curiosity we had an incredible 2019!

Together, we continue to discover and protect the biodiversity of Lomas de Banao Ecological Reserve.

During 2019, we continued to support the conservation of this Reserve's outstanding biodiversity. With your help, we planted over 1000 trees of native species that will enrich the forest for generations to come. We recorded new species in Banao, including a critically endangered and endemic Anolis lizard who will now call Banao home. We deepened our understanding of the seasonal dynamics of birds in Banao looking into the behavioral adjustments of native birds when, all the sudden, have to cope with the influx of numerous winter migrants. We discovered that Cuban parakeets switched their nesting grounds into the northern side of the Reserve, and built and placed artificial nests to support Cuban trogons, pygmy owls and bare-legged owls in the reproduction season. As nature never ceases to amaze us, we even recorded the first record of anurophagy in the Cuban long-legged frog, when we found it predating on the Cuban flathead frog.

Most importantly, we continue to grow as a team between volunteers, scientists, guides and Park staff. We have no words to express our gratitude to your feedback and continued support. As we all shared our passion for experiencing nature and conserving the astounding life it hosts, we thank you for having become part of our family and encourage you to keep connected and come back to Lomas de Banao Ecological Reserve again.

Con todo nuestro cariño,

Maikel, Natalia, Lucy, Pedro, Tomas-Michel, Aslam, Maydiel, Nils, Atila & André

SUMMARY

During the second year of our project, and with the sustained field support of Earthwatch volunteers, we finalized our assessment of vegetation structure and composition in Lomas de Banao Ecological Reserve (LBER). Our assessment included surveys of a total of 90 plots of 400 m^2 each at the sides of each of our faunal transects. In addition, we established six permanent vegetation plots to conduct exhaustive monitoring of forest dynamics. The monitoring protocol for these plots allows to inventory, label and locate each of the plants on an area of 400 m^2 in order to evaluate their development in the short, mid and long-term. Faunal surveys included the identification and estimation of relative abundance for birds, amphibians and reptiles across the year. We recorded two new anole species for LBER, one of them (*Anolis garridoi*) listed as critically endangered in the Red Book of Cuban Vertebrates (2012). Our findings will aid conservation plans for this unique lizard. We conducted two bird surveys during the summer residence season and two during the winter residence period. Similar to 2018, the largest differences in bird community composition occurred between the migratory and non-migratory (breeding) periods, rather than between field sites. Because the activity of native birds is altered by the arrival of migratory birds, which can be numerically dominant during the winter, we initiated a study on bird behavior looking at niche partitioning across groups. Our work has informed managers of LBER and provided important recommendations for the recovery of threatened species. As we move into a new project year, our collective research will contribute to the conservation of unique species and ecosystems with the valuable support of Earthwatch volunteers and locals.

GOALS, OBJECTIVES, AND RESULTS

Our project advanced our proposal objectives as follows:

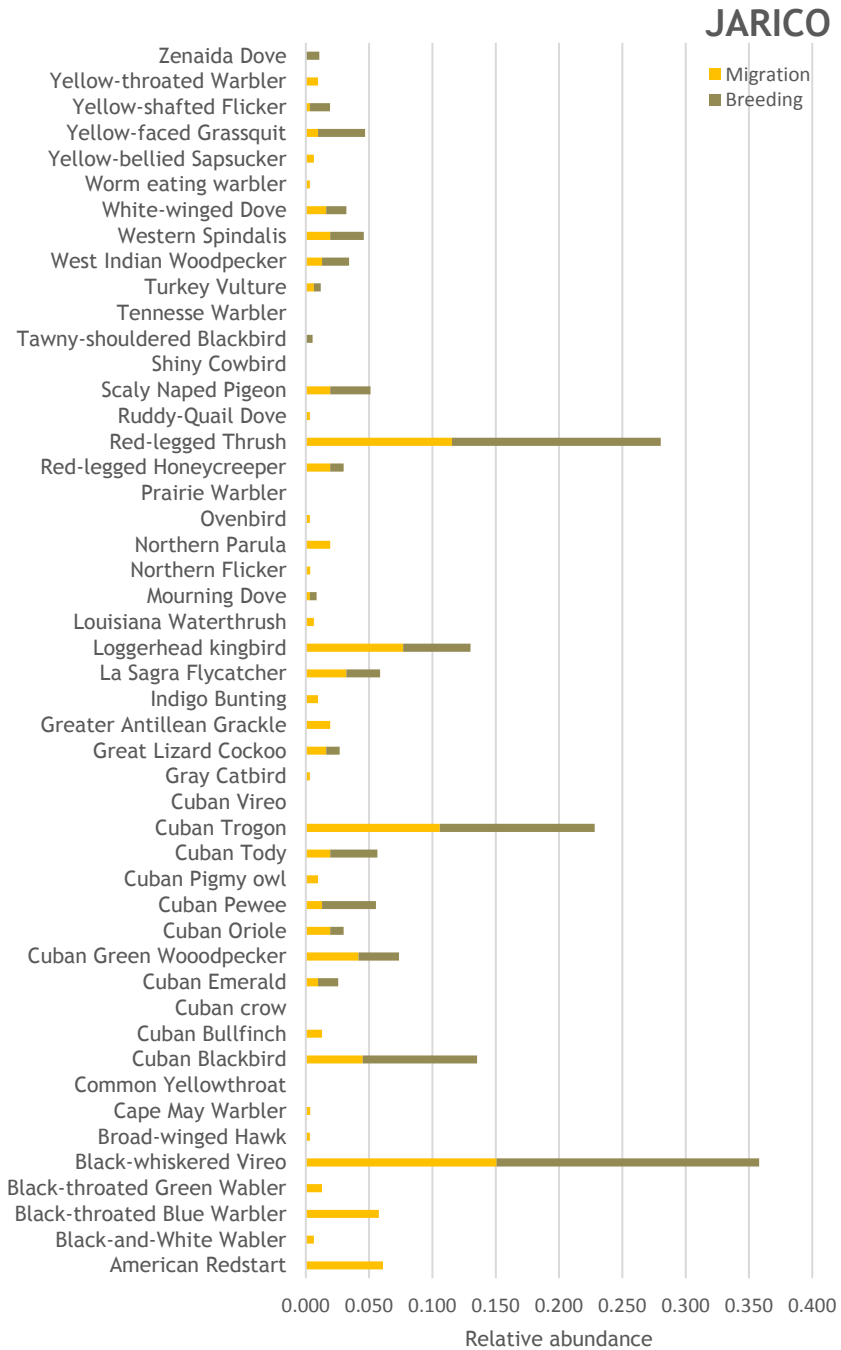
1) Investigate the effect of altitude and temperature on the density of birds, reptiles, and amphibians of LBER

Birds. We recorded 55 species of forest birds during our four expeditions of 2019. Bird species diversity was higher in Jarico field site (51 species) than La Sabina field site (40 species). Although La Sabina constitutes the core conservation area of LBER, Jarico's more complex and diverse vegetation offering more habitat types for birds could explain its greater diversity. We have continued our research to quantify the ratio of species diversity vs vegetation complexity and will be completing this analysis during our third project year. Similarly to 2018, the largest differences in bird community composition occurred between the migratory (from end of September to end of March), and non-migratory periods / breeding (from end of March to end of September), rather than between field sites. We recorded the greatest diversity of species during the wintering period. Among wintering bird species, Jarico showed a larger number than La Sabina. The largest number of species was recorded during the winter residence with 44 species while in summer we only recorded 31 species (Figure 2 and 3). A few species dominated the summer residence, including the black-whiskered vireo and red-legged thrush, and to a lesser extent, the Cuban trogon, scaly-napped pigeon and Loggerhead Kingbird. Of these, only the red-legged thrush also appears among the most abundant species with the arrival of winter migrants.

We conducted a total of 24 hours of observation to record the most frequent behaviors of forest birds in a comparative study between the summer residence season that coincides with the reproductive period and the onset of the migratory period in the winter, when new species are incorporated into the forest.

Figure 1. Lomas de Banao Ecological Reserve demarcated by green line. Location of field stations are indicated with green circles, including our primary field sites of Jarico and La Sabina.

Figure 2. Bird relative abundances for Jarico and La Sabina in migratory (winter) vs breeding season (summer).



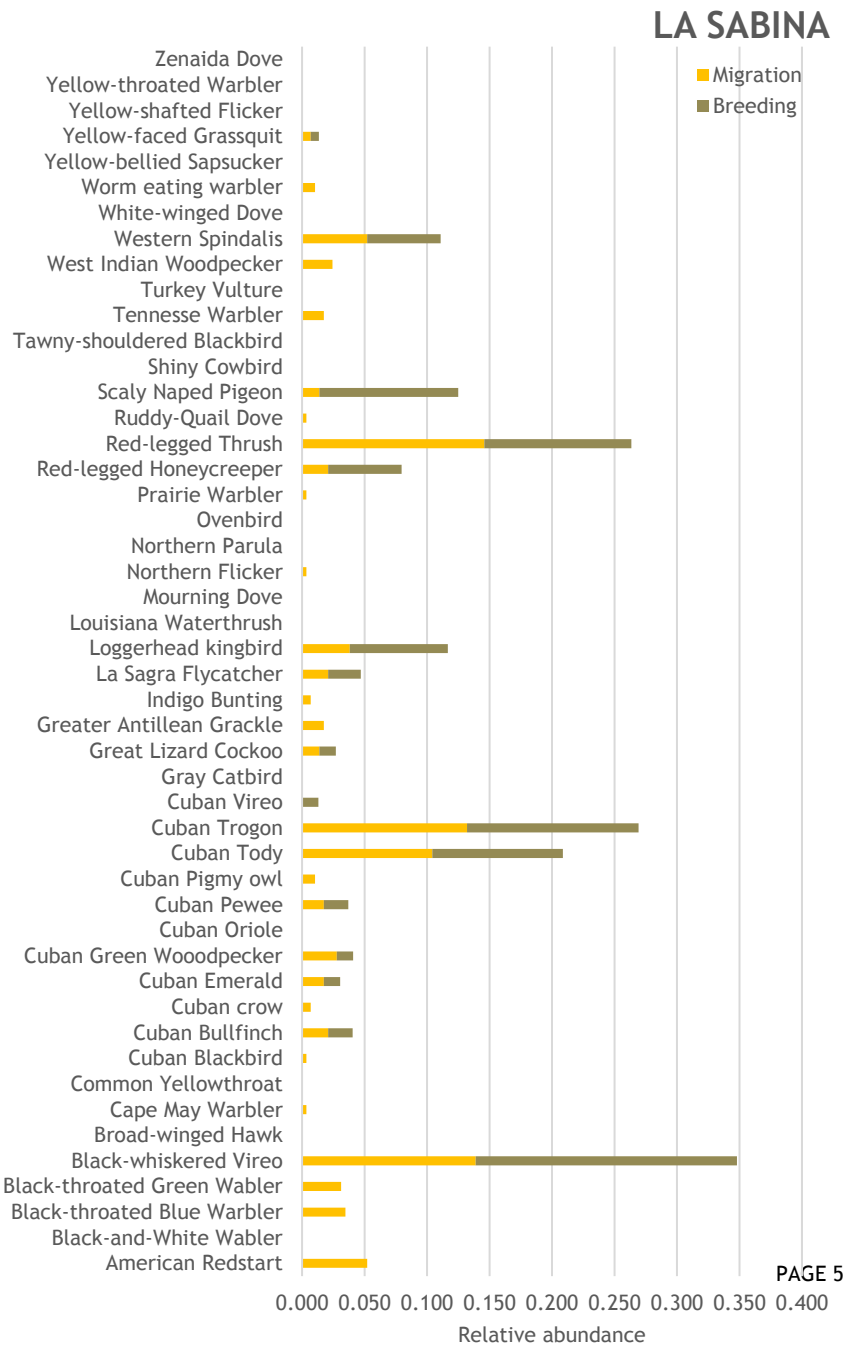
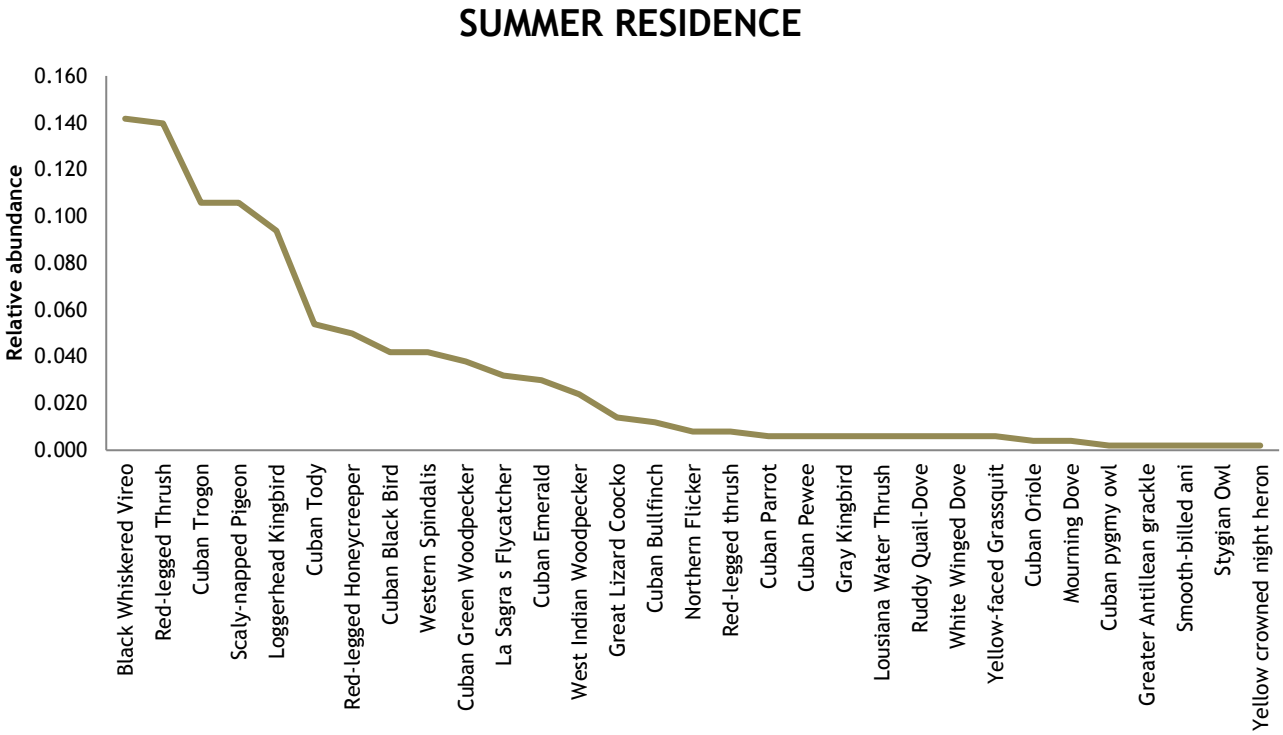
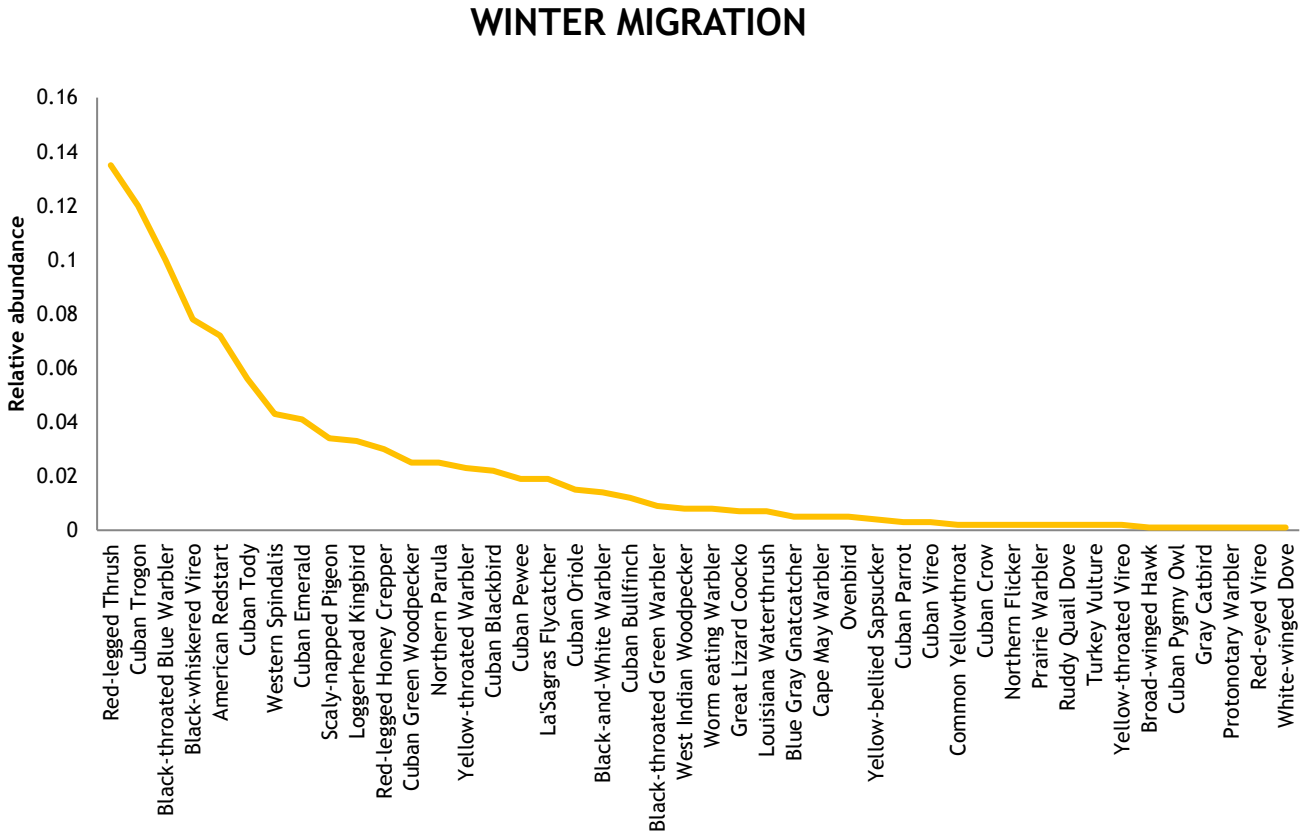


Figure 3. Bird relative abundances in migratory (winter) vs breeding season (summer) for all sites combined.





Amphibians. Seventeen amphibian species occur at LBER, 82% of these are endemic to Cuba, one is endemic to the central region and three are endemic to the Guamuhaya mountain range. All amphibian species of LBER are of conservation significance. During four expeditions in 2019, we surveyed three kilometers of evergreen forest in separate transects of 500 meters each, three between 200-250 m above sea level and three between 600-650 meters above sea level, with different levels of human impact.

In 2019, we observed similar patterns in amphibian species composition and abundance than that recorded in 2018 (Figure 3). The surveys around Jarico field station (low mountain <250 m a.s.l.) revealed a lower amphibian diversity, particularly of the direct-developing frogs (*Eleutherodactylu*s), whereas toads were more frequent in this area, particularly *Peltophryne peltocephala* and *P. taladai*, both Cuban endemics. Contrarily, frogs were very abundant in the high mountain transects at La Sabina field site (high mountain :> 600 m a.s.l.), especially during the rainy season when most species were vocalizing engaged in reproductive activities. Frogs were scarcer at the onset of the dry season (November). We observed *Eleutherodactylus casparii*, one of the rarest species, during one survey at La Sabina field site. We recorded the first record of anurophagy in *E. dimidiatus*, in this case preying on *E. planirostris*. This is the first event ever recorded on the feeding habits of *E. dimidiatus*. Both species are very common in the area, particularly in the high mountain, therefore, interactions like this might be more frequent than previously thought. This information is currently being prepared for publication in a peer-reviewed journal as a short communication.

Reptiles. Twenty-six reptile species inhabit the LBER, 69% of these are endemic to Cuba and four are exclusive to the Guamuhaya mountain range. All reptile species of LBER are of conservation significance. During four expeditions in 2019, we surveyed three kilometers of evergreen forest in separate transects of 500 meters each, three between 200-250 m above sea level and three between 600-650 meters above sea level, with different levels of human impact.

Similar to amphibians, we found similar patterns of species composition and abundance than that of 2018 (Figure 3). Anoles were by far the most abundant reptile group in all surveys, both in the low and high mountain. *Anolis sagrei* was the dominant species in the low mountain transects, and *A. homolechis* was the second dominant species. This proportion shifted dramatically in the high mountain transects, where *A. homolechis* was by far the dominant species and *A. sagrei* very scarce and restricted to human buildings and surroundings. These differences in relative population density might be due to two main factors: 1) the level of human disturbance, as *A. sagrei* seems to be a more tolerant species and 2) differences in climatic conditions, as it is colder and more humid in the high mountain. Other anole species were observed more sporadically, such as the Cuban Giant Anole (*Anolis equestris*), the Escambray Blue-eyed Anole (*Anolis ahli*), the Slender Cliff Anole (*Anolis lucius*), and the Blue-eyed Twig Anole (*Anolis alutaceus*).

We recorded for the first time at LBER two anole species: the Dwarf Green Anole (*Anolis isolepis*) and the Escambray Twig Anole (*Anolis garridoi*). Both are new records to LBER. *Anolis garridoi* is listed as Critically Endangered in the Red Book of Cuban Vertebrates (2012), and had been previously known only at Topes de Collantes and surrounding areas. Our findings will be critical for the reevaluation of the species conservation plan, and will add a critically endangered species to LBER. With these two species, the total number of reptiles for Lomas de Banao increased to 26.

Seven individuals of the endangered snake *Tropidophis spiritus* were observed, measured, and ecological and morphometric data recorded. Among the individuals was a neonate (still bearing umbilical scar), observed in November 2018, the core of the birth period for live-bearing snakes in Cuba. In addition, we found one individual of the endangered Escambray White-necked Trope (*Tropidophis galacelidus*), which

later regurgitated a Grey's Frog (*Eleutherodactylus greyi*) partially digested. This dietary finding represents the first information ever recorded on the feeding habits of this threatened snake. This information is currently being prepared for publication in a peer-reviewed journal as a short communication.

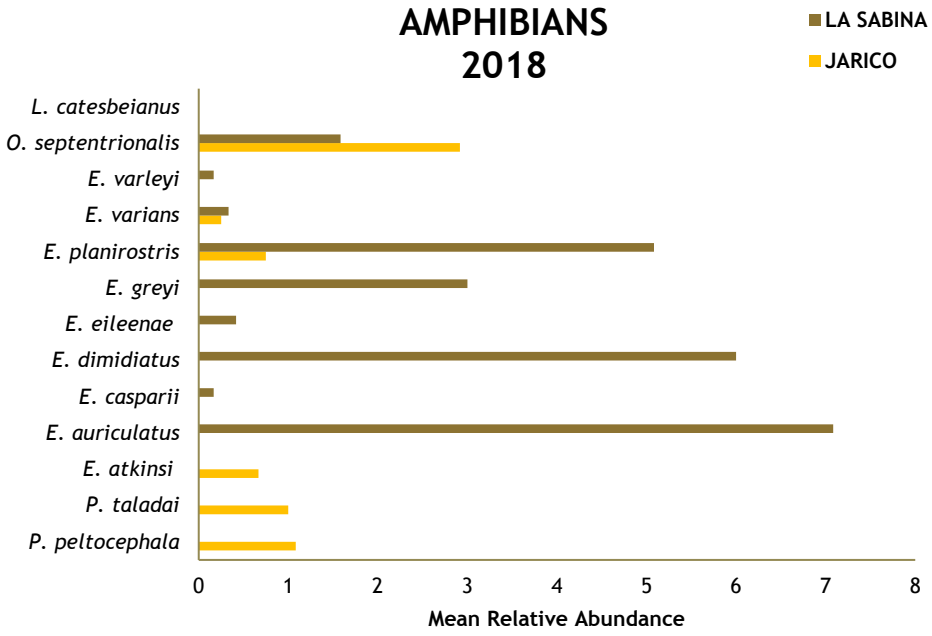
2) Evaluate the use of artificial nest boxes in the breeding density of Cuban parrots

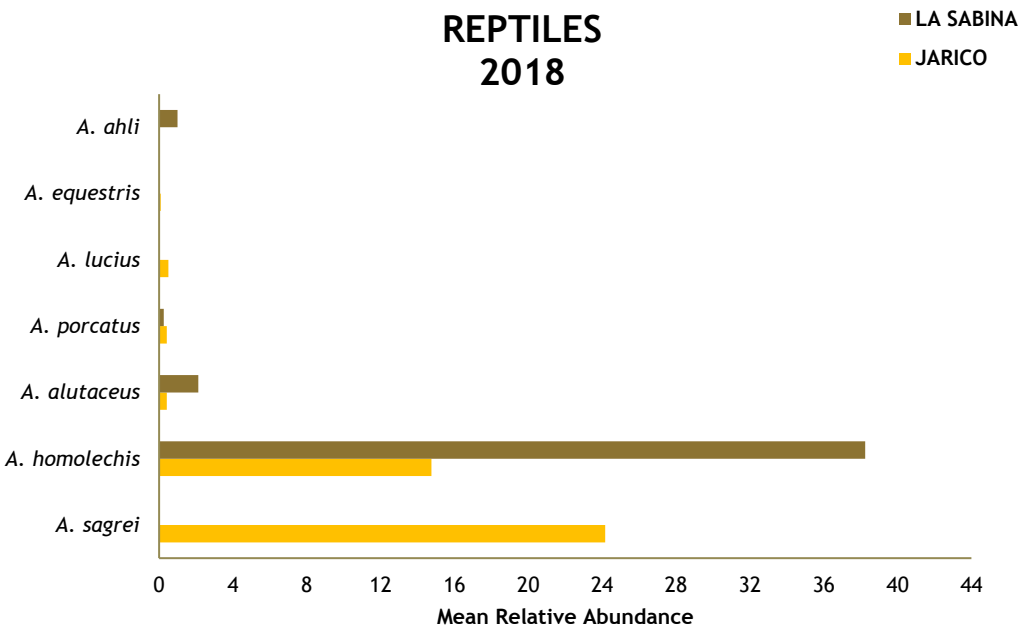
We assessed Cuban parakeet's nests in Jarico and found that changes in the structure of the surrounding vegetation likely caused the Cuban parakeets to abandon Jarico's nesting area. Usually Cuban Parakeets nest in isolated dead palms (or artificial nests in live palms), located above the forest canopy and with the front of open vegetation, allowing them a direct flight from and to the nest and great visibility. Because of forest management at LBER after its creation, Jarico's pastures were restored into native, dense forest. Cuban parakeets lots the optimal conditions for nesting in Jarico and left this area moving their nesting grounds to the north end of the reserve, into Hoyo del Naranjal field site.

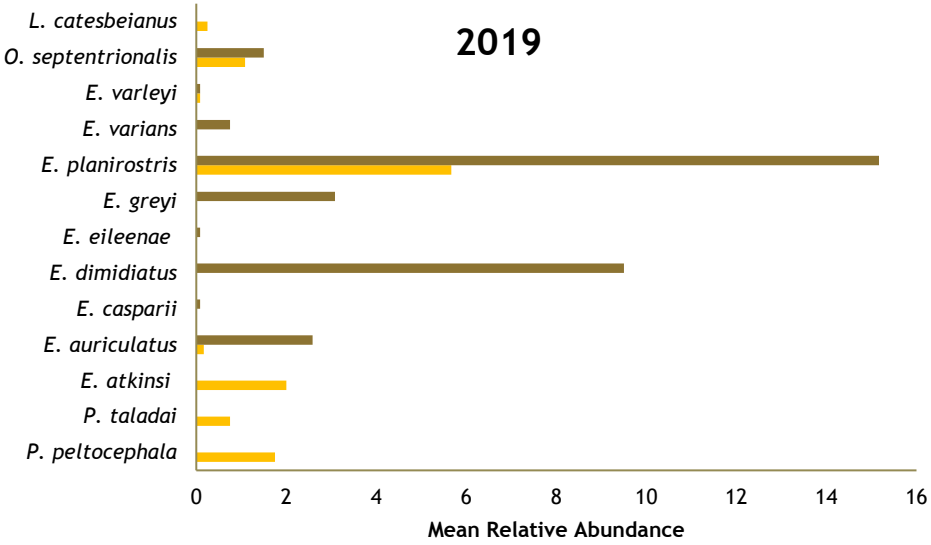
In addition to investigating and aiding pstitacid's nesting, we built and set 20 artificial nests to increase the availability of cavities for the endemics Cuban trogon, Cuban pygmy owl and bare-legged owl. The nests were prepared and set before the start of the 2019 breeding season.

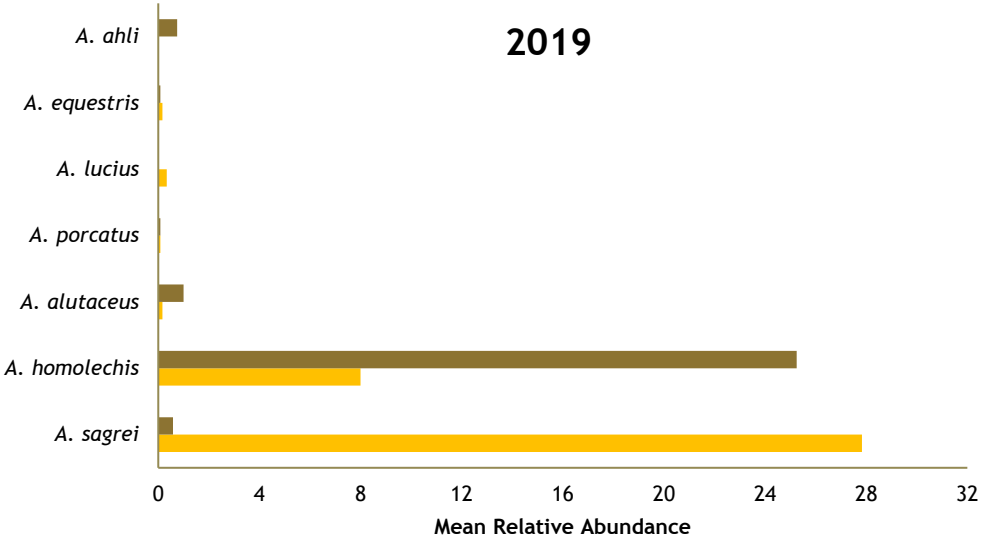
3) Develop a community outreach program to implement with the rural communities of Banao LBER, where targeted species survive

Throughout 2019, our community outreach program engaged LBER staff and local schools and focused on two main objectives, including 1) training in bird identification and monitoring in the field, and 2) engaging locals and volunteers in seed collection and planting of important trees for wildlife. Birds are not only critical for the ecosystem functioning of the evergreen forest, but constitute charismatic and attractive tourism attractions as well as a symbol of pride for the local communities. Engaging people in learning about their birds of LBER proved a successful tool to raise awareness about their conservation and provided an important link to understanding the importance of keeping a healthy forest. Our support to the LBER Reforestation Program constitute another powerful awareness and community-engagement tool. We planted over 1000 seedlings of key native forest species, including *Cordia gerscanthus* (500), *Tabernaemontana apoda* (250) and *Podocarpus angustifolius* (300). In addition, we provided support for the maintenance of the trees planted in former project year.


AMPHIBIANS
2018
LA SABINA
JARICO
L. catesbeianus
O. septentrionalis
E. varleyi
E. varians
E. planirostris
E. greyi
E. eileenae
E. dimidiatus
E. casparii
E. auriculatus
E. atkinsi
P. taladai
P. peltocephala
0 1 2 3 4 5 6 7 8
Mean Relative Abundance


REPTILES
2018
LA SABINA
JARICO
A. ahli
A. equestris
A. lucius
A. porcatus
A. alutaceus
A. homolechis
A. sagrei
0 4 8 12 16 20 24 28 32 36 40 44
Mean Relative Abundance


2019
L. catesbeianus
O. septentrionalis
E. varleyi
E. varians
E. planirostris
E. greyi
E. eileenae
E. dimidiatus
E. casparii
E. auriculatus
E. atkinsi
P. taladai
P. peltocephala
0 2 4 6 8 10 12 14 16
Mean Relative Abundance


2019
A. ahli
A. equestris
A. lucius
A. porcatus
A. alutaceus
A. homolechis
A. sagrei
0 4 8 12 16 20 24 28 32
Mean Relative Abundance

SURVEY METRICS
(2018-2019)

60 BIRD SURVEYED TRANSECTS COVERING **60 KM**

60 AMPHIBIAN SURVEYED TRANSECTS COVERING **30 KM**

60 REPTILE SURVEYED TRANSECTS COVERING **30 KM**

90 VEGETATION PLOTS SURVEYED COVERING **36,000 M²**

122 TOTAL BIRD SPECIES RECORDED

15 TOTAL AMPHIBIAN SPECIES RECORDED

21 TOTAL REPTILE SPECIES RECORDED

90 TOTAL PLANT SPECIES RECORDED

3153 TREES SURVEYED

24 NEW FAUNAL RECORDS FOR LOMAS DE BANAO ECOLOGICAL RESERVE

Photo: © Rosario Domínguez

EARTHWATCH® INSTITUTE

PROJECT IMPACTS

1. Increasing Scientific Knowledge

a) Total citizen science research hours

Research hours	Time (hours) each group
Training	8 hours
Data collection in the field (bird and vegetation surveys: 24 hours, amphibian surveys: 18 hours, reptile surveys:18 hours)	60 hours
Data entry	14 hours
Other activities (seedling collection, planting saplings, fixing artificial nesting boxes)	18 hours
Total	**100 hours (10 hours/day) X 37 volunteers = 3,700 total hours**

b) Peer-reviewed publications

Our lead herpetologist Tomás Michel Rodriguez Cabrera submitted a manuscript for publication to ICRF's Reptiles and Amphibians Journal titled "New localities and distribution models inform on the conservation status of the endangered lizard *Anolis guamuhaya* (Squamata: Dactyloidae) from central Cuba. Phyllomedusa." reporting new localities in Cuba were the endemic Escambray Bearded Anole was found during 2019 Earthwatch Expeditions.

c) Non-peer reviewed publications

Social media publication by lead herpetologist Tomás Michel Rodriguez Cabrera:

"Here's the story of a snake and a frog.

The Cuban Treefrog (Osteopilus septentrionalis) spends most of the time on top of the trees, but frequently goes down to the soil to forage at night. On the other hand, over 70% of the diet of the Giant Trope (Tropidophis melanurus) is composed of Cuban Treefrogs. This snake has mainly a sit-and-wait (ambush) hunting strategy, stays at the base of the trees to increase the likelihood of encountering a frog when climbing up back to the trees after the foraging periods. This is the typical scenario in most natural areas of Cuba during non-rainy periods: over 90% of Giant Tropes are found at the base of tree trunks.

However, during the rainy season, when most of the frogs are engaged in reproductive activities associated to rainwater pools and ponds, over 90% of Giant Tropes also move to these places because the prey is easily obtained since the frogs are more concerned about the next generation than their own safety.

This close predator-prey relationship can be observed in LBER, where both the Giant Trope and the Cuban Treefrog are very common."

d) Presentations

Maikel Cañizares (July 3, 2019). *Psittacid Conservation at Lomas de Banao Ecological Reserve*. XII International Convention on the Environment; La Havana, Cuba.

Maikel Cañizares (2019). *Cavity Management for Birds of Central Cuba*. XXIII Congress of the Mesoamerican Society for Biology and Conservation, Antigua, Guatemala.

Maikel Cañizares (2019). *Feeding ecology of Cuban Psittacids in Lomas de Banao Ecological reserve*. IV Caribaea Iniciative Conference, Santo Domingo, Dominican Republic.

Maikel Cañizares (2019). *Conservation of Cuban Psittacids*. BirdsCaribbean Meeting, Guadalupe.

2. Mentoring

a) Graduate students

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
Sofía González Labrador	Bachelor's degree thesis	*Bird community dynamics in two localities of Lomas de Banao Ecological Reserve*	June 2022
Jorge Manuel Alberdi Rodríguez	Bachelor's degree thesis	*Amphibian's composition and abundance in Lomas de Banao Ecological Reserve*	June 2022

b) Community outreach

Name of school, organization, or group	Education level	Participants local or non-local	Details on contributions/ activities
School *Comunidad de Banao*	Primary school	Local participants	Training on bird identification and monitoring in the field Presentation of school theater play about biodiversity conservation in protected areas
School *Comunidad de Banao*	Primary school	Local participants	Seed collection and planting of important trees for wildlife
Lomas de Banao Ecological Reserve Staff	Rangers	Local participants	Training on bird identification and monitoring in the field

3. Partnerships

Partner	Support Type(s)	Years of Association
Wildlife Conservation Society	Collaboration, Funding, Logistics	2018-present
Instituto de Ecología y Sistemática (IES)	Academic Support, Permits, Collaboration	2018-present
Sociedad Cubana de Zoología (SCZ)	Technical Support, Collaboration	2018-present
Centro de Investigaciones y Servicios Ambientales (CISAT)	Academic Support, Permits	2018-present
San Cristóbal Travel Agency	Logistics, cultural support	2018-present
Lomas de Banao Ecological Reserve. National Enterprise for the Protection of Flora and Fauna	Logistics, cultural support	2018-present
Facultad de Biología Universidad de la Habana	Academic support, scientific collaboration	2019-present

4. Contributions to management plans or policies

Plan/Policy Name	Type[2]	Level of Impact[3]	New or Existing?	Primary goal of plan/policy[4]	Stage of plan/policy[5]	Description of Contribution
Updating of conservation targets	Management Plan of LBER	Local	Existing	Species conservation	Proposed	Inclusion of *Huertea cubensis* (a very rare native tree) and the CITES-protected species *Cedrela odorata* (a precious wood tree) as new conservation targets to be monitored at LBER; Inclusion of Escambray Twig Anole (*Anolis garridoi*) in the management plan of LBER
Assessment of conservation status	Cuban Red List of Flora IUCN Plant Specialist Group	National	Existing	Species conservation	Proposed	Assessment of conservation status of endemic and rare trees at LBER
Biological Diversity National Program	Management Plan of LBER	National	Existing	Species conservation	In-progress	Monitoring of bird, amphibian, reptile and tree populations at LBER contributing to the National Program for the conservation of threatened mountainous ecosystems
Conservation of Cuban psitacids	Management Plan of LBER	National	Existing	Species Conservation	In-Progress	Monitoring and updating of the status of Cuban Amazon and Cuban parakeet

5. Conserving natural and sociocultural capital

a) Conservation of taxa

Focal study species that not listed in most recent proposal

Species	Common name	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source
Tabernaemontana apoda C. Wright (Apocynaceae)	Huevo de Gallo	Critically Endangered	Local endemic, Critically Endangered	González Torres, L.R. *et al.* (2016)
Pera oppositifolia Griseb. (Peraceae)		Critically Endangered	Endemic	González Torres, L.R. *et al.* (2016)
Podocarpus angustifolius Griseb. (Podocarpaceae)	Sabina	Critically Endangered	Local endemic, Critically Endangered	González Torres, L.R. *et al.* (2016)
Huertea cubensis Griseb. (Tapisciaceae)		Data Deficient.	Native, relocated in Central Cuba after ca. 80 years / DD	González Torres, L.R. *et al.* (2016)
Tapura cubensis (Poepp.) Griseb. Subsp. *Cubensis* (Dichapetalaceae)	Aura, Lechuza, Vigueta de aura, Vigueta de lechuza	Not evaluated due to lack of information	Endemic / DD	González Torres, L.R. *et al.* (2016)
Tropidophis spiritus, Hedges & Garrido, 1999 (Tropidophiidae)	Sancti Spiritus Trope	Critically Endangered	Regional endemic (central Cuba)/ Critically Endangered	Moreno García, L.V. & L. Rodríguez Schettino (2012)
Tropidophis galacelidus, Schwartz & Garrido, 1975 (Tropidophiidae)	Escambray White-necked Trope	Critically Endangered	Regional endemic (central Cuba) / Critically Endangered	Rodríguez Schettino, L. (2012)
Peltophryne longinasa dunni (Barbour, 1926) (Bufonidae)	Long-nosed Toad	Endangered	Regional endemic (Guamuhaya range)/ Endangered	Rivalta González, V. (2012)
Eleutherodactylus casparii, Dunn, 1926 (Eleutherodactylidae)	Trinidad Flathead Frog	Endangered	Regional endemic (Guamuhaya range) / Endangered	Hedges, S.B. & L.M. Díaz (2004)
Accipiter gundlachii, Lawrence, 1860 Accipitridae	Gavilán Colilargo Gundlach's hawk	Endangered	Cuban endemic / Endangered	González *et al.* (2012)
Anolis garridoi Díaz, Estrada & Moreno, 1996 (Dactyloidae)	Escambray Twig Anole	Critically Endangered	Regional endemic (Guamuhaya range) / Endangered	Rivalta González, V. (2012)

Populations of species of conservation significance our project helped conserve in the past year.

Species	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source	Description of contribution	Resulting effect[6]
Tabernaemontana apoda C. Wright (Apocynaceae)	Huevo de Gallo	Critically Endangered	Local endemic, Critically Endangered	Planted 500 saplings as part of the reforestation program of LBER	Population increase, improved habitat for the species
Podocarpus angustifolius Griseb. (Podocarpaceae)	Sabina	Critically Endangered	Local endemic, Critically Endangered	Planted 400 seedlings as part of the Threatened Plants Conservation Program at LBER	65 % of survival of seedlings, some of the samplings were also shared with the National Park Topes de Collantes where the species was locally extirpated. Range increased, population increased, enhanced genetic diversity
Tropidophis galacelidus Schwartz & Garrido, 1975 (Tropidophiidae)	Escambray White-necked Trope	Critically Endangered	Regional endemic (central Cuba) / Critically Endangered	Recorded the first record of the feeding habits of the species	This information helps to understand the role of this species in its habitat
Tropidophis spiritus Hedges & Garrido, 1999 (Tropidophiidae)	Sancti Spiritus Trope	Critically Endangered	Regional endemic (central Cuba)/ Critically Endangered	Recorded ecological and morphometric data on seven individuals	Their individual-specific spot pattern was photographed to allow identification and monitoring
Anolis garridoi Díaz, Estrada & Moreno, 1996 (Dactyloidae)	Escambray Twig Anole	Critically Endangered	Regional endemic (Guamuhaya range) / Endangered	New record of the species in the country. Expanded distribution range of the species for about 40 km	This data will be used in a study applying ecological niche modeling to reassess the conservation status of the species. Moreover, the species can be included now in the action plan of the LBER
Psittacara euops Wagler, 1832	Cuban parakeet	Endangered	Endemic to Cuba. Endangered	Planted tree species important for species diet	Improved habitat for species
Amazona leucocephala Linneo, 1758	Cuban Amazon	Vulnerable	Endemic to Cuba, Vulnerable	Planted tree species important for species diet	Improved habitat for species, range increased

b) Conservation of ecosystems

Habitats our project helped conserve/restore in the past year.

Habitat type	Habitat significance[7]	Description of contribution	Resulting effect[8]
Evergreen forest	Cover more than 60% of LBER corridor, migration path, critical habitat for endemic species, winter range, summer range, spring range, fall range breeding ground, and feeding sites for local fauna	Floral and faunal characterization and monitoring; enriched forest with typical native species of diverse functionalities. Species included *Cordia gerascanthus*, *Cedrela odorata*, *Calycophyllum candidissimum*, *Tabernaemontana apoda* (endemic), *Podocarpus angustifolius*, *Juglans jamaicensis subsp. Insularis* and *Pera oppositifolia*. Contribution to the recovery of endangered endemic trees by planting ~.1000 seedlings for nursery: *Cordia gerscanthus* (~ 500), *Tabernaemontana apoda* (~250) and *Podocarpus angustifolius* (~300). Follow up and provide maintenance to trees planted in the previous project year (2018). Carried out forest structure and composition survey in 3.36 hectares of evergreen forest (90 plots of 400 m^2, in six transects) Established permanent plots of evergreen forest and surveyed the vegetation structure and composition (six permanent plots of 400 m2, in six transects).	Extent maintained, Improved connectivity and resilience. Produced critical information for the conservation and management of the forest 8 hectares of forest enriched with native species. Maintenance of 2 hectares of planted trees (2018).

c) Ecosystem services

Ecosystem service categories we are directly studying in your Earthwatch research

☐Food and water

☐Flood and disease control

X Spiritual, recreational, and cultural benefits

X Nutrient cycling

Details:

Our project documents the richness and abundance of species, as well as the timing of activity peaks and detectability of charismatic taxonomic groups, including bird, amphibians, and reptiles. We also document the structure and composition of the vegetation that supports this wildlife at LBER. This information is key not only because it contributed to the effective management of LBER but also because it can promote responsible local and international ecotourism into the Reserve, providing recreational benefits. The conservation of endemic species as symbols of national pride is also part of the project's contribution to cultural benefits. By protecting the forests and key animal species of LBER (seed dispersers, insectivorous species, etc.) our project is contributing to the maintenance of the overall ecosystem health of this Reserve, including the cycling of nutrients and food chain dynamics.

RESEARCH PLAN UPDATES

Report any changes in your research since your last proposal/annual report. For any 'yes' answers, provide details on the change in the 'Details' box.

1) Have you added a new research site or has your research site location changed? ☐Yes X No
2) Has the protected area status of your research site changed? ☐Yes **X** No
3) Has the conservation status of a species you study changed? ☐Yes **X** No
4) Have there been any changes in project scientists or field crew? ☐Yes X No

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ANYTHING ELSE

We had several new records and findings in our expeditions (Table 1) including a new record of birds (Giant Kingbird), two new records of Anolis lizards (one critically endangered), and the potential discovery of new species of cricket (Table 1). In addition, we made important progress with our vegetation surveys. We carried out forest structure and composition surveys in 3.36 hectares of evergreen forest (90 plots of 400 m2, in six transects) and established six permanent plots of evergreen forest. We recorded 17,291 individuals of 133 species, belonging to 118 genera and 71 plant families, and measured the diameter of all the stems at 1.3 m height (DBH) and counted saplings in 400 m^2 plots.

In Jarico (low mountain <250 m a.s.l) we surveyed 932 trees and 11208 saplings. *Guarea Guidonia* is the dominant species, followed by *Picramnia pentandra* and the invasive *Sizygium jambos*. The relative abundance of the only endemic species and critical endangered *Pera oppositifolia* in 1200m^2 is very low, with only 0.0033 individuals per square meter. In La Sabina (high mountain :> 600 m a.s.l.) we surveyed 1285 trees and 5121 saplings. The dominant species is also the native *Guarea guidonia*, followed by *Eugenia axillaris*. No endemic species was recorded. There were no invasive species in the surveyed plots. Taking into account the relative abundance of species and DBH we will conduct estimations of Carbon Net Balance of evergreen natural forest at LBER.

Table 1. Additional findings from 2019 Earthwatch expeditions in Cuba

Species (scientific name)	Type	Remarks
Anolis garridoi	Lizard	First record to the LBER; Critically endangered
Anolis isolepis	Lizard	First record to the LBER
Tropidophis galacelidus	Snake	First record of predation on the Grey's Frog (*Eleutherodactylus greyi*); first data gathered on the feeding habits of this critically endangered snake
Eleutherodactylus dimidiatus	Frog	First record of anurophagy (predation on the Cuban Flathead Frog, *Eleutherodactylus planirostris*); first data gathered on the feeding habits of this frog
Cyrtophora citricola	Spider	First record to the LBER. Exotic invasive species
Abelona sp. (Gryllacrididae)	Cricket	First record of the genus to LBER (possible new species)
Epilobocera cubensis poliorcetes	River crab	Two instances of females carrying their offspring on land about 200 m from the nearest river; first data recorded on the reproductive biology of this species
Pholidoscelis auberi	Lizard	First record to the LBER.
Tyrannus cubensis (Aves: Tyrannidae)	Bird	First record of this species to the LBER; Endangered

APPENDICES

APPENDIX 1: Annotated list of species – Lomas de Banao Ecological Reserve.

APPENDIX 2: Most recent CVs for PI and co-PI(s) (attached).

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APPENDIX 1: Annotated list of species – Lomas de Banao Ecological Reserve

BIRDS

Species (common name)	Species (scientific name)
Gundlach's Hawk	*Accipiter gundlachi*
Sharp-shinned Hawk	*Accipiter striatus*
Tawny-shouldered Blackbird	*Agelaius humeralis*
Wood Duck	*Aix sponsa*
Cuban Amazon	*Amazona leucocephala*
Cuban Nightjar	*Antrostomus cubanensis*
Limpkin	*Aramus guarauna*
Stygian Owl	*Asio stygius*
Cattle Egret	*Bubulcus ibis*
Red-tailed Hawk	*Buteo jamaicensis*
Broad-winged Hawk	*Buteo platypterus*
Green-backed Heron	*Butorides virescens*
Turkey Vulture	*Cathartes aura*
Killdeer	*Charadrius vociferus*
Cuban Emerald	*Chlorostilbon ricordii*
Antillean Nighthawk	*Chordeiles gundlachii*
Great Lizard-Cuckoo	*Coccyzus merlini*
Yellow-shafted Flicker	*Colaptes auratus*
Northern Bobwhite	*Colinus virginianus*
Common Ground-Dove	*Columbina passerina*
Cuban Pewee	*Contopus caribaeus*
Eastern Wood Pewee *	*Contopus virens*
Cuban Crow	*Corvus nasicus*
Smooth-billed Ani	*Crotophaga ani*
Red-legged Honeycreeper	*Cyanerpes cyaneus*
Gray Catbird	*Dumetella carolinensis*
Little blue Heron *	*Egretta caerulea*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
American Kestrel	*Falco sparverius*
Common Yellowthroat	*Geothlypis trichas*
Gray-fronted Quail-Dove	*Geotrygon caniceps*
Key West Quail-Dove	*Geotrygon chrysia*
Ruddy Quail-Dove	*Geotrygon montana*
Cuban Pygmy-Owl	*Glaucidium siju*
Worm-eating Warbler	*Helmitheros vermivorum*
Cuban Oriole	*Icterus melanopsis*
Tennessee Warbler	*Leiothlypis peregrina*
Swainson's Warbler	*Limnothlypis swainsonii*
Bare-legged Owl	*Margarobyas lawrencii*

Species (common name)	Species (scientific name)
Belted Kingfisher	*Megaceryle alcyon*
West Indian Woodpecker	*Melanerpes superciliaris*
Northern Mockingbird	*Mimus polyglottos*
Black-and-White Wabler	*Mniotilta varia*
Shiny Cowbird	*Molothrus bonariensis*
La Sagra's Flycatcher	*Myiarchus sagrae*
Yellow-crowned Night-Heron	*Nyctanassa violacea*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Louisiana Waterthrush	*Parkesia motacilla*
House Sparrow	*Passer domesticus*
Painted Bunting	*Passerina ciris*
Indigo Bunting	*Passerina cyanea*
White-crowned pigeon*	*Patagioenas leucocephala*
Scaly-naped Pigeon	*Patagioenas squamosa*
Cave Swallow	*Petrochelidon fulva*
Rose-breasted Grosbeak *	*Pheucticus ludovicianus*
Cuban Grassquit	*Phonipara canora*
Summer Tanager	*Piranga rubra*
Pied-billed Grebe*	*Podilymbus podiceps*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Cuban Trogon	*Priotelus temnurus*
Cuban Martin*	*Progne cryptoleuca*
Cuban Parakeet	*Psittacara euops*
Cuban Blackbird	*Ptiloxena atroviolacea*
Cuban Bullfinch	*Pyrrhulagra nigra*
Greater Antillean Grackle	*Quiscalus niger*
Ovenbird	*Seiurus aurocapilla*
Northern Parula	*Setophaga americana*
Black-throated Blue Warbler	*Setophaga caerulescens*
Yellow-rumped Warbler	*Setophaga coronata*
Prairie Warbler	*Setophaga discolor*
Yellow-throated Warbler	*Setophaga dominica*
Magnolia Warbler	*Setophaga magnolia*
Palm Warbler	*Setophaga palmarum*
American Redstart	*Setophaga ruticilla*
Cape May Warbler	*Setophaga tigrina*
Black-throated Green Warbler	*Setophaga virens*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Western Spindalis	*Spindalis zena*
White-collared Swift	*Streptoprocne zonaris*
Eastern Meadowlark	*Sturnella magna*
Antillean Palm-Swift	*Tachornis phoenicobia*
Yellow-faced Grassquit	*Tiaris olivaceus*

Species (common name)	Species (scientific name)
Cuban Tody	*Todus multicolor*
Red-legged Thrush	*Turdus rubripes*
Loggerhead Kingbird	*Tyrannus caudifasciatus*
Giant Kingbird*	*Tyrannus cubensis*
Gray Kingbird	*Tyrannus dominicensis*
Barn Owl	*Tyto alba*
Black-whiskered Vireo	*Vireo altiloquus*
White-eyed Vireo*	*Vireo griseus*
Cuban Vireo	*Vireo gundlachii*
Red-eyed Vireo*	*Vireo olivaceus*
Cuban Green Woodpecker	*Xiphidiopicus percussus*
White-winged Dove	*Zenaida asiatica*
Zenaida Dove	*Zenaida aurita*
Mourning Dove	*Zenaida macroura*

* New records for Lomas de Banao Ecological Reserve

AMPHIBIANS

Species (common name)	Species (scientific name)
Cuban Groin-spot Frog	*Eleutherodactylus atkinsi*
Cuban Telegraph Frog	*Eleutherodactylus auriculatus*
Trinidad Flathead Frog	*Eleutherodactylus casparii*
Cuban Long-legged Frog	*Eleutherodactylus dimidiatus*
Cuban Colin Frog	*Eleutherodactylus eileenae*
Cuban Grey's Frog	*Eleutherodactylus greyi*
Yellow-striped Dwarf Frog	*Eleutherodactylus limbatus*
Cuban Flathead Frog	*Eleutherodactylus planirostris*
Cuban Stream Frog	*Eleutherodactylus riparius*
Cuban Bromeliad Frog	*Eleutherodactylus varians*
Cuban Grass Frog	*Eleutherodactylus varleyi*
American Bullfrog	*Lithobates catesbeianus*
Cuban Treefrog	*Osteopilus septentrionalis*
Eastern Giant Toad	*Peltophryne peltocephala*
Cuban Spotted Toad	*Peltophryne taladai*

* New records for Lomas de Banao Ecological Reserve

REPTILES

Species (common name)	Species (scientific name)
Escambray Blue-eyed Anole	*Anolis ahli*
Blue-eyed Twig Anole	*Anolis alutaceus*
Short-bearded Anole	*Anolis chamaeleonides*
Cuban Giant/Knight Anole	*Anolis equestris*
Escambray Twig Anole	*Anolis garridoi**
Cuban White-fanned Anole	*Anolis homolechis*
Dwarf Green Anole	*Anolis isolepis**
Slender Cliff Anole	*Anolis lucius*
Cuban Green Anole	*Anolis porcatus*
Cuban Brow Anole	*Anolis sagrei*
Cuban Lesser Racer	*Caraiba andreae*
Cuban Boa	*Chilabothrus angulifer*
Cuban Racer	*Cubophis cantherigerus*
Cuban Brown Curlytail	*Leiocephalus cubensis*
Cuban Whiptail	*Pholidoscelis auberi**
Ashy Sphaero	*Sphaerodactylus elegans*
Cuban Slider	*Trachemys decussata*
Cuban Water Snake	*Tretanorhinus variabilis*
Escambray White-necked Trope	*Tropidophis galacelidus*
Giant Trope	*Tropidophis melanurus*
Sancti Spiritus Trope	*Tropidophis spiritus*

* New records for Lomas de Banao Ecological Reserve

PLANTS

We follow the criteria of Greuter & Rankin for species nomenclature (2017 http://portal.cybertaxonomy.org/flora-cuba/node/211?language=es). We follow the criteria of González *et al.* (2016) to assign conservation status, where:(CR) Critically Endangered, (E) Endangered, (DD) Data Deficient, (LC) Lower Concern, (NE) Not Evaluated, (NT) Neat Threatened. We follow the criteria of Oviedo & González-Oliva (2015) to assign categories for invasive alien species. We follow Roig (1965) for species common names.

Family	Species (scientific name)	Species (common name)	Conservation Status	Invasive Species Category
Sapindaceae	*Allophylus cominia*	Palo de caja	NE	
Fabaceae	*Andira cubensis*	Yaba	NE	
Fabaceae	*Andira inermis*	Yaba		
Fabaceae	*Andira* sp.	Yaba		
Annonaceae	*Annona muricata*	Guanábana		
Polygalaceae	*Badiera virgata* subsp. *virgata*		LC	
Lauraceae	*Beilschmiedia pendula*		E	
Combretaceae	*Buchenavia tetraphylla Howard*	Espuela de	NE	
Combretaceae	*Bucida buceras*	Júcaro	NE	

Family	Species (scientific name)	Species (common name)	Conservation Status	Invasive Species Category
Burseraceae	*Bursera simaruba*	Almácigo	NE	
Calophyllaceae	*Calophyllum antillanum*	Ocuje	LC	
Rubiaceae	*Calycophyllum candidissimum*	Dagame	NT	
Arecaceae	*Calyptronoma occidentalis*	Palma Manaca	NE	
Samydaceae	*Casearia aculeata*	Raspalengua	LC	
Samydaceae	*Casearia mollis*	Raspalengua	NE	
Samydaceae	*Casearia sylvestris*	Raspalengua	LC	
Samydaceae	*Casearia sylvestris* subsp. *myricoides*	Raspalengua	VU	
Cecropiaceae	*Cecropia peltata*	Yagruma	NE	
Bombacaceae	*Ceiba pentandra*	Ceiba	NT	
Cannabaceae	*Celtis trinervi*	Aguedita	NE	
Sapotaceae	*Chrysophyllum oliviforme* subsp.	Caimitillo	LC	
Lauraceae	*Cinnamomum montanum* (Sw.) J. Presl	Boniato	E	
Verbenaceae	*Citharexylum spinosum*	Guayo blanco	NE	
Rutaceae	*Citrus ×aurantium*	Naranja agria		Potentially
Rutaceae	*Citrus ×limon*	Limón		Potentially
Fabaceae	*Cojoba arborea*	Moruro rojo	LC	
Rhamnaceae	*Colubrina arborescens*	Bijáguara	NE	
Boraginaceae	*Cordia collococca*	Ateje	LC	
Araliaceae	*Dendropanax arboreus Planch.*		NE	
Fabaceae	*Dichrostachys cinerea*	Marabú		Invasive - modifier
Putranjivaceae	*Drypetes alba*	Hueso	NE	
Erythroxylaceae	*Erythroxylum cf. havanensis*	Jibá	NE	
Myrtaceae	*Eugenia axillaris*	Guairaje	LC	
Myrtaceae	*Eugenia* sp.			
Rubiaceae	*Exostema ellipticum*	Plateado	LC	
Sapindaceae	*Exothea paniculat*	Yaicuaje	NE	
Rubiaceae	*Faramea occidentalis*	Café cimarrón	LC	
Moraceae	*Ficus americana*	Jagüey	LC	
Moraceae	*Ficus cf. wrightii*	Jagüey		
Fabaceae	*Gliricidia sepium*	Piñón florido		
Meliaceae	*Guarea guidonia*	Yamagua	LC	
Byttneriaceae	*Guazuma ulmifolia*	Guásima	LC	
Chrysobalanacea	*Hirtella americana*	Hicaco de aura	NE	
Tapisciaceae	*Huertea cubensis*		DD	
Aquifoliaceae	*Ilex nitida var. repanda González*		NE	
Fabaceae	*Leucaena leucocephala*	Ipil-ipil		Invasive - modifier
Lauraceae	*Licaria triandra*	Leviza	NE	
Fabaceae	*Lonchocarpus heptaphyllus*	Guamá	NT	
Sparmanniaceae	*Luehea speciosa*	Guásima varía	NE	
Anacardiaceae	*Mangifera indica*	Mango		Potentially

Family	Species (scientific name)	Species (common name)	Conservation Status	Invasive Species Category
Sapindaceae	*Matayba domingensis* (DC.) Radlk.	Macurije	NE	
Melastomataceae	*Miconia* sp.			
Myrsinaceae	*Myrsine coriacea Schult.*		LC	
Lauraceae	*Nectandra hihua*		LC	
Lauraceae	*Ocotea cuneata*	Canelón	NE	
Lauraceae	*Ocotea leucoxylon*	Aguacatillo	LC	
Annonaceae	*Oxandra lanceolata*	Yaya	NE	
Annonaceae	*Oxandra laurifolia*	Yaya	NE	
Bignoniaceae	*Parmentiera aculeata*			Potentially
Peraceae	*Pera oppositifolia*	Huevo de gallo	CR	
Pinaceae	*Pinus caribaea*	Pino macho	LC	
Piperaceae	*Piper aduncum*	Platanillo de	NE	
Nyctaginaceae	*Pisonia aculeata*	Zarza	NE	
Fabaceae	*Poeppigia procera*	Tengue	NE	
Sapotaceae	*Pouteria sapota Stearn*	Mamey		
Rosaceae	*Prunus occidentalis*	Cuajaní	NE	
Rubiaceae	*Psychotria* cf. *horizontalis*			
Arecaceae	*Roystonea regia*	Palma real	LC	
Fabaceae	*Samanea saman*	Algarrobo del		Potentially
Euphorbiaceae	*Sapium laurifolium*	Piñí	LC	
Araliaceae	*Schefflera morototoni*	Yagruma	NE	
Fabaceae	*Senna spectabilis Barneby*	Algarrobillo		Invasive - modifier
Sapotaceae	*Sideroxylon foetidissimum*	Jocuma	LC	
Sapotaceae	*Sideroxylon foetidissimum subsp.*	Jocuma	LC	
Sapotaceae	*Sideroxylon* sp.			
Bignoniceae	*Spathodea campanulata*	Tulipán		Invasive - modifier
Anacardiaceae	*Spondias mombin*	Ciruela	LC	
Meliaceae	*Swietenia mahagoni*	Caoba	LC	
Myrtaceae	*Syzygium jambos*	Pomarrosa		Invasive - modifier
Bignoniaceae	*Tabebuia* sp.	Roble blanco		
Apocynaceae	*Tabernaemontana citrifolia*	Pegojo	NE	
Malvaceae	*Taliparitti elatum*	Majagua	LC	
Dichapetalaceae	*Tapura cubensis cubensis*	Vigueta de	NE	
Cannabaceae	*Trema micranthum*	Almez de	NE	
Meliaceae	*Trichilia havanensis*	Siguaraya	LC	
Meliaceae	*Trichilia hirta*	Cabo de hacha	LC	
Moraceae	*Trophis racemosa*			
Urticaceae	*Urera baccifera*	Chichicate	LC	
Myrsinaceae	*Wallenia laurifolia*	Casmagua	NE	
Rutaceae	*Zanthoxylum coriaceum*	Bayúa		