



## Araripe Manakin Conservation Center, Brazil

CLP project ID 458

### *Final Report*



- September 2013 -

## Araripe Manakin Project Team

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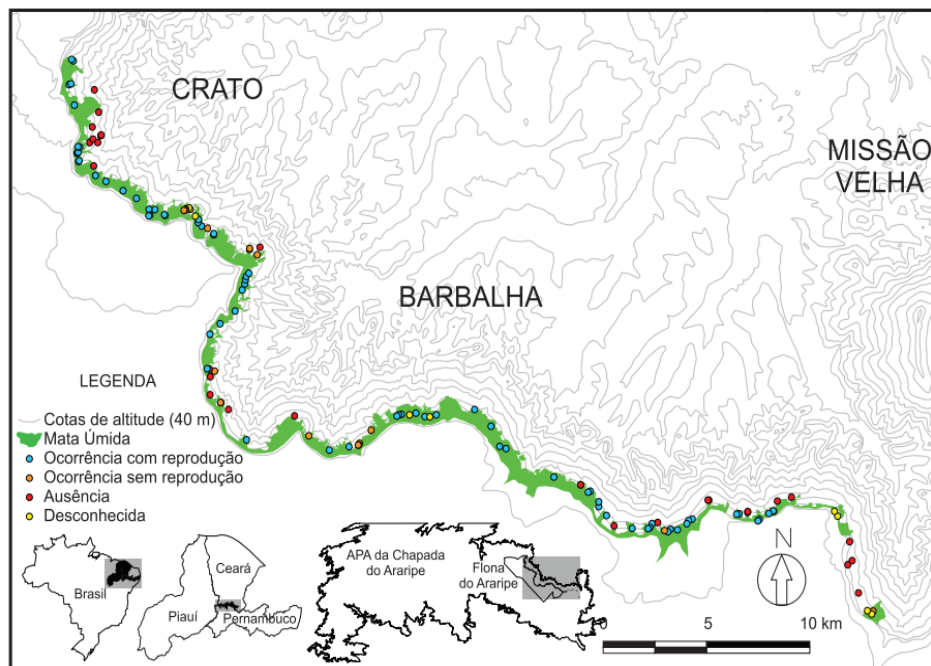
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## Introduction and Map

The Araripe Manakin (*Antilophia bokermanni*) is the most threatened manakin species in the world and is classified as Critically Endangered by the 2010 IUCN Red List. This famously handsome bird is endemic to the humid forest habitats found only on the northeastern facing slopes of the *Chapada do Araripe* (Araripe Plateau) in the extreme southern part of the state of Ceará, in northeastern Brazil. Only recently described in 1998, initial conservation research efforts have focused on determining the most basic aspects of the species biology to estimate its conservation status and produce a formal Conservation Plan.

In 2007, Araripe Manakin Conservation Project team - part of the Brazilian NGO Aquasis - coordinated the production of a proposal to create a fully Protected Area for the species and its habitat, a key objective of the conservation plan, which is still ongoing. In 2008, BirdLife International formally designated Aquasis as Species Guardian and Sir David Attenborough as Species Champion of the Araripe Manakin. The primary goal of our CLP project was to consolidate previous conservation efforts to pursue an awareness campaign, implement a habitat recovery and enrichment initiative, and create a federally protected area: the Araripe Manakin National Wildlife Refuge.





## Fieldwork and Research

**Objective 1. Involve the local society in the conservation of the Critically Endangered Araripe Manakin through the development of birdwatching activities.**

### **Part 1: Interactions with society.**

The Araripe Manakin Conservation Project has developed and matured considerably since the original conception of the current project to the completion of this report. Since 2004, when systematic field activities were initiated, our team members were only able to conduct conservation actions within the area of the focal species' occurrence at an average frequency of just one week per month. This less than ideal situation was due to the constraints of having limited staff, funding shortages, and the practical limitations of the Aquasis headquarters being situated in the city of Fortaleza, some 320 miles from the bird's only area of occurrence on the slopes of the *Chapada do Araripe* in the southern interior of the state of Ceará.

The relocation of two key members of our conservation team to the region of Cariri and the establishment of an office in the city of Crato, greatly facilitated the intensification of our ability to continue implementing conservation actions and increased the degree of interaction and engagement of project team members with the local community. This relocation of staff for practical reasons was not a simple matter or realized without great personal sacrifices, but it was crucial to our team's ability to most efficiently meet the demands the first objective of the current project to contribute to the conservation of the Araripe Manakin by involving local community members.

### **1.1: Contributions to public policy.**

The first example of our team's involvement in making contributions to public policy was in the preparation of the newest National Action Plan for the Araripe Manakin, or “*Plano de Ação Nacional para a Conservação de Antilophia bokermanni*” (aka *PAN soldadinho-do-araripe*), since 2010. The plan is available for download at the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) website: <http://www.icmbio.gov.br/portal/biodiversidade/fauna-brasileira/plano-de-acao/614-plano-de-acao-nacional-para-conservacao-do-soldadinho-do-araripe.html>.

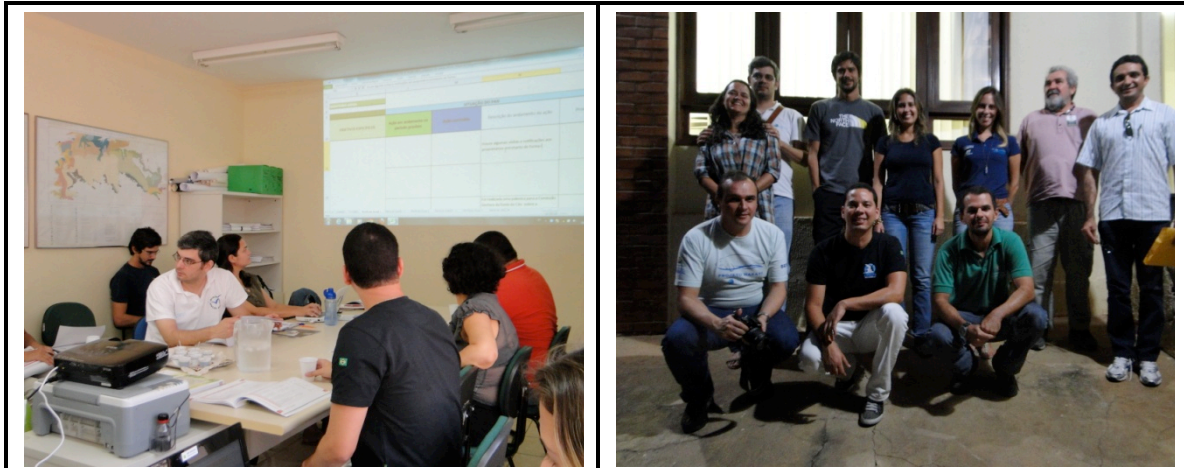
This document outlines 5 conservation goals and proposes 42 actions that representatives of society (municipal, state and federal government, as well as NGOs, universities and schools) have pledged to carry out and/or broker to prevent the extinction of the Araripe Manakin. This important document was published in 2011, along with an Executive Summary, which documents the main aspects of the species biology, in addition to the actions described in the PAN and estimated costs for the execution of each goal (Figure 1).



**Figure 1:** Meeting of specially invited conservation experts to elaborate the National Action Plan for the Araripe Manakin or “*Plano de Ação Nacional para a Conservação de Antilophia bokermanni*” (aka *PAN soldadinho-do-araripe*), coordinated by the Araripe Manakin Conservation Project team, in Crato, Ceará (LEFT). Official public presentation of the *PAN Soldadinho-do-araripe* in the auditorium of the Cariri Cultural Institute (*Instituto Cultural do Cariri - ICC*) in Crato, Ceará. The projected image in this photograph shows the cover of the PAN document on the left side and the cover of the Executive Summary on the right side (RIGHT).

These public policy efforts make the Araripe Manakin the first endangered species in Brazil to have received this type of formal review in five years, according to the recommendations of national legislation. Unlike the previous document, which was a result of the first CLP supported project on the focal species, this most recent effort is supported by three federal government decrees which ensure that the newest version is officially adopted as public policy. This fact is stated in the documentation available at the link to ICMBio website given above.

In addition to overseeing the revision of the first version of the National Action Plan for the Araripe Manakin, ICMBio is obligated to annual monitoring of the proposed actions, with Aquasis serving as a key member of the advisory board and primary coordinator of implementing the plan (Figure 2) .



**Figure 2:** Annual meeting of the National Action Plan for the Araripe Manakin monitoring group at the offices of the Araripe Plateau Environmentally Protected Area (*APA Chapada do Araripe*) in Crato, Ceará.

One of the benefits derived from these efforts in public policy is that, for the first time since it was first established in 1997, representatives of the Araripe Plateau Environmentally Protected Area (*APA - Área de Proteção Ambiental da Chapada do Araripe*) now consider the PAN to be a crucial tool for conservation management of the protected area. This is a critical development because the APA area includes more than 90% of the global population of the Araripe Manakin and still without a Management Plan and zoning rules which among the most basic requirements for management after the nomination and election of an advisory board.

## **1.2: Visitor Center**

The proposed construction of a Visitors Center at the Caianas Site (*Sítio Caianas*), expected to be a principal meeting place for supporting outreach and bird watching activities had to be canceled in October 2010 because of legal disputes and had to be

considered too risky for this investment. In fact, this situation remains unresolved at the time of this report.

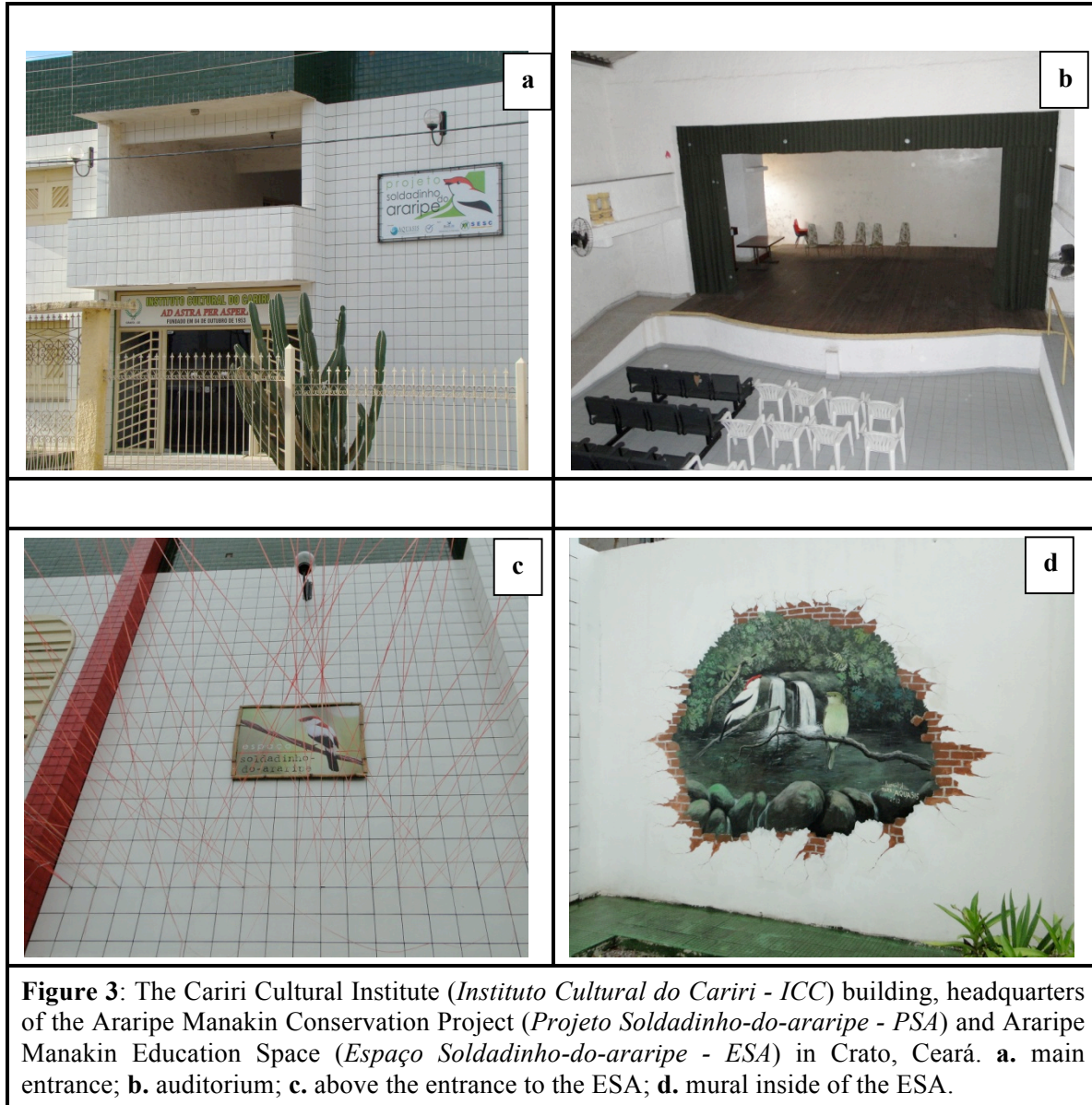
Fortunately, the longterm objectives of our conservation project were not harmed, as we turned our attention to a price survey for purchasing or renting real estate to install a visitor center and project space. Three entities were also evaluated as potential partners for the transfer of physical space to the disposal of the Araripe Conservation Project.

Ultimately it was decided to locate both the offices of the *Projeto Soldadinho-do-araripe* (PSA) and construct a visitor center and plant nursery in a building owned by the Cultural Institute of Cariri (*Instituto Cultural do Cariri* - ICC) in the city of Crato, Ceará. In November, the office space was installed in the new space the PSA coordinator joined the management board of the institution, with encouraging prospects for a long-term partnership that suits the interests of the ICC's support of preserving culture and the environment.

The ICC was first created in 1953 and built this facility in 2006, supported by the resources of its members and private donations. The building is 600 m<sup>2</sup> and has four rooms, six bathrooms, a library collection and an auditorium with the capacity to accommodate as many as 120 people. The PSA currently uses two of the rooms, one designated as an office and the other as laboratory space, plus the garage and outside area behind the building which from here forward be referred to as the Visitor Center ESA, which refers to the *Espaço Soldadinho-do-araripe* or Araripe Manakin Education Space. (Figure 3).

The ICC building is also at a prime location in the city of Crato for our objectives, being located near the city universities, various schools and government offices responsible for the management of natural resources, including ICMBio and COGERH. The building is directly in front of the municipal fire department, a key ally in fighting forest fires in Araripe that are a principle threat to the focal species, and the main city park, where the largest cultural events in the region take place. Amazingly enough, the ICC is located not more than 3.7 miles from the closest area where it is possible to observe an Araripe Manakin. Thus, what initially seemed to be a major setback in

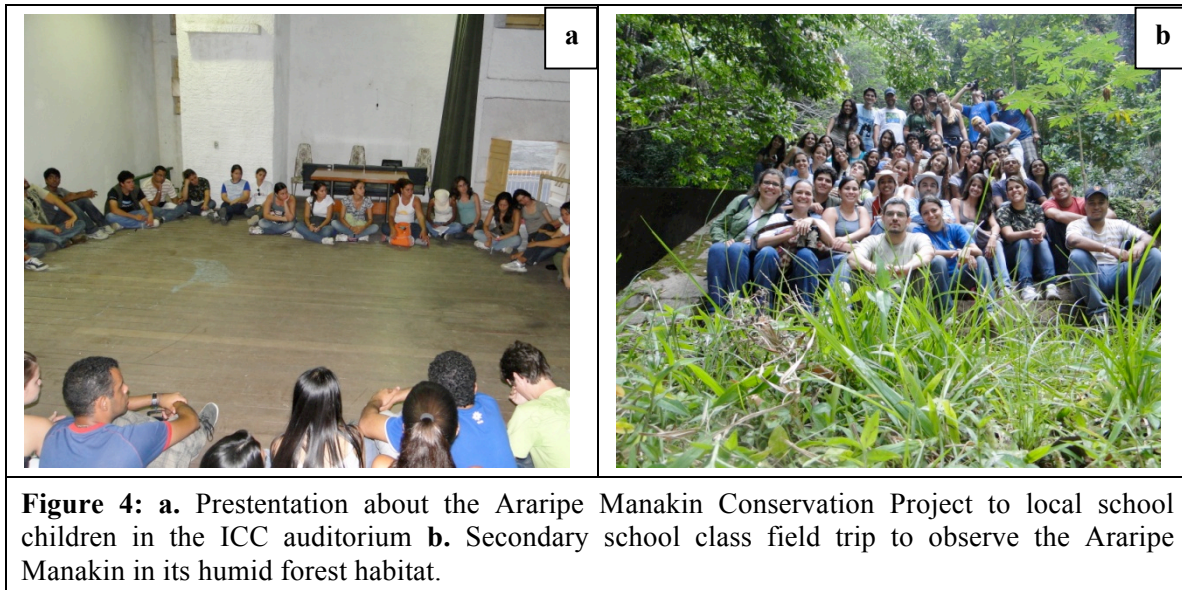
locating the project's headquarters at the Caiana Site, turned out to be rather providential for many of our goals.



To ensure that any funds invested in the new space at ICC would not be lost, we negotiated a lease agreement with a duration of five years and the possibility of renewal. The PSA also contributes to the general maintenance of the ICC building in a mutually agreeable partnership that benefits both parties.



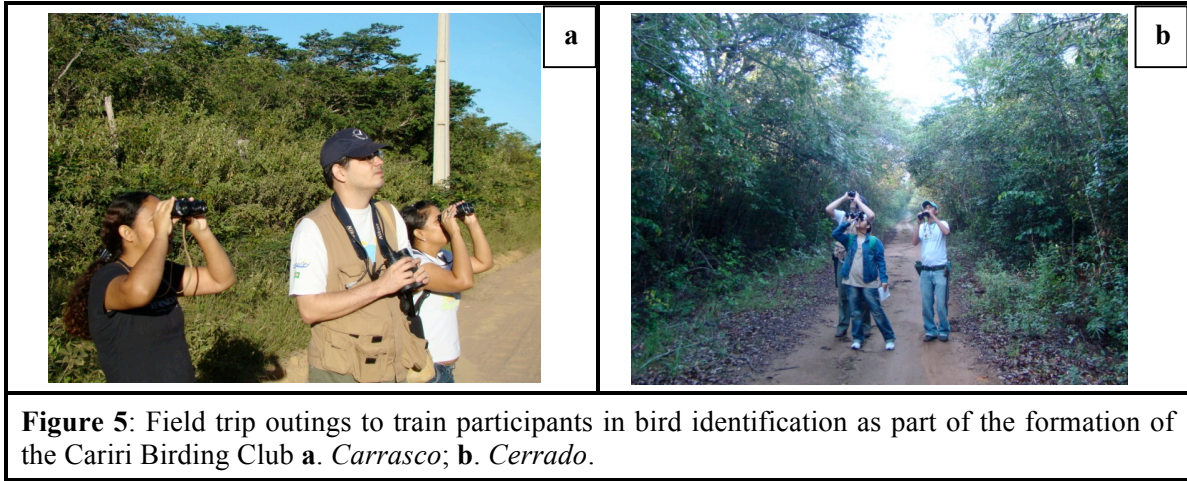
The ESA was finally inaugurated in March 2013, after the auditorium of the ICC served as an Interim Visitors Center since 2011. Dozens of university groups and secondary school students were present at the ICC to celebrate the occasion, before taking their field trip to the forested slopes of the *Chapada do Araripe* to see the bird itself (Figure 4).



**Figure 4:** a. Presentation about the Araripe Manakin Conservation Project to local school children in the ICC auditorium b. Secondary school class field trip to observe the Araripe Manakin in its humid forest habitat.

### 1.3: Birdwatching activities.

In the beginning, a series of 11 field trips visiting different vegetation types of the *Chapada do Araripe* were held in order to encourage participation in creating the Cairiri Birding Club. In evaluating the impact of these trips on our most immediate conservation concerns for the Araripe Manakin, we came to the conclusion that for practical reasons in connecting local people to birds and biodiversity, the groups we could take to the field in the context of a birdwatching club were too small. We realized that along with encouraging development of the club, we must try to support the demands of field trips by various groups of some shared interest, and direct these type of outings towards observing the focal species (Figure 5).



In all, we attended to the demands of specific visits to observe the Araripe Manakin by groups of students from public schools, universities, tourists and farmers, along with ornithology class visits and field trips included as part of the cultural and environmental events supported the city of Crato (Figure 6).





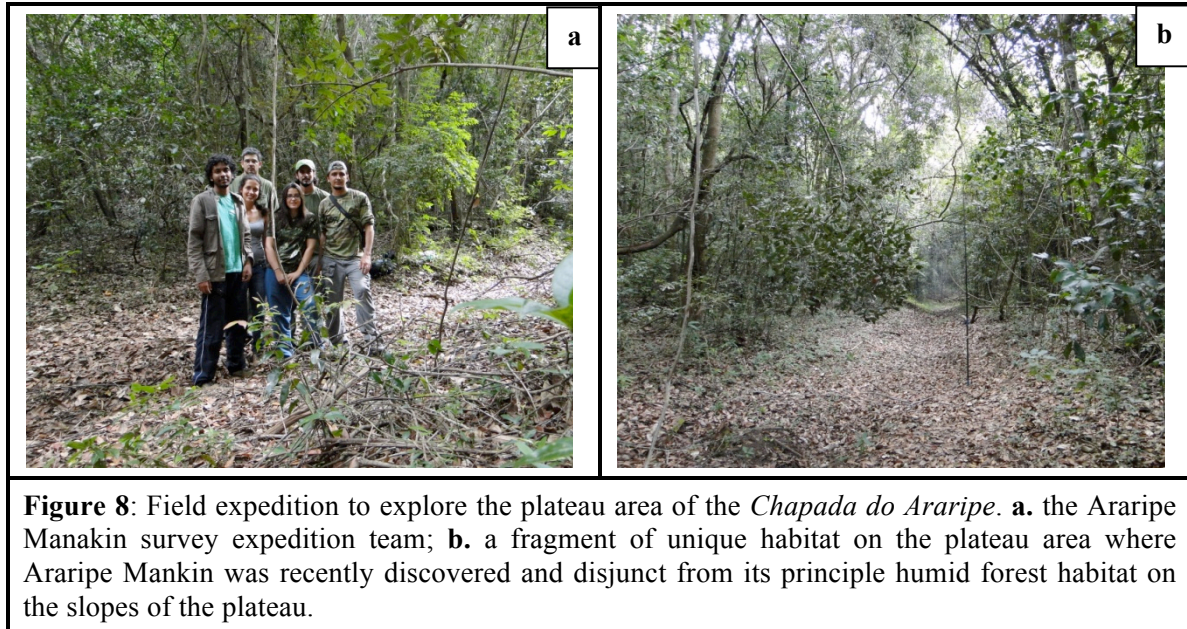
We accomplished other important bird observation activities, but with results oriented towards research that contributes to the theoretical background for the proposed conservation actions. During the 2010- 2011 breeding period, our team realized the third and most extensive population census of the focal species, raising the degree of specific knowledge regarding the locations of breeding territories from 60% to 93% (Figure 7). This activity also analyzed the main threats to each of the freshwater springs and associated Araripe Manakin territories visited during the total field effort to date and was elaborated in the PAN document. The census was deemed crucial to the accuracy and effectiveness of the PAN, as it was projected for publication in 2011.



**Figure 7:** Araripe Manakin population census team: L to R behind: Jason A. Mobley, Karina Linhares, Marcelo Holderbaum, and Alberto Campos; and L to R in front: Weber Girão, Diogo Veríssimo and Fábio Nunes.

Other research actions realized during the reporting period include an expedition to the plateau area of the *Chapada do Araripe*, with the objective of exploring new sites targeted by satellite imagery for having some potential to support the occurrence of the Araripe Manakin. These areas are essentially depressions of various forms that concentrate moisture and have vegetation associated with greater humidity on the top of the sandstone plateau. After 16 years since the discovery of the Araripe Manakin along the humid forest slopes of the *Chapada do Araripe*, its presence was confirmed for the first time in small humid enclaves within the domains of the Araripe National Forest (*Floresta Nacional do Araripe* - FLONA), an important Conservation Unit (*Unidade de*

*Conservação*) that will now have to update and revise its zoning rules to reflect that the area is harboring a Critically Endangered species (Figures 8).



#### 1.4: Araripe Manakin Conservation Project.

The Araripe Manakin Conservation Project (PSA) also sought to meet requests for participation in a variety of special events, including lectures in public schools, universities, environmental forums, private meetings, congresses and fairs in Brazil. These were judged as good opportunities to publicize the highly threatened status of the species and promote the importance of natural resources conservation (Figure 9). Many of these events occur throughout the year or were opportunistic and without any pre-established dates of occurrence.





**Figure 9:** Araripe Manakin Conservation Project team members participating in various events. **a.** environmental forum commemorating the 15 year anniversary of the *Chapada do Araripe* Protected Area (APA); **b.-c.** project coordinator, Weber Girão, giving lectures about the conservation project at universities in NE Brazil; **d.** lecture at the Brazilian Protected Areas congress (VIICBUC); **e.-f.** team leaders Weber and Karina participating in the national Atlantic Forest conservation event, *Viva a Mata!*, in São Paulo.

PSA team members also participate in three established events that are held on an annual basis. These include the SESC Cariri Culture Fair, which as been realized since 2004, the Water and Trees Week (*Semana da Água e da Árvore*), realized since 2010, and



Environmental Week (*Semana do Meio Ambiente*), realized since since 2010 and in its 7th edition. All of these events are now symbolized by a unique image of the Araripe Manakin designed by the PSA coordinator, due to the participation and influence of the PSA in the meetings of various environmental forums (Fig. 9). These activities have helped to consolidate the association of this iconic focal species with the conservation of their habitat and water resources to maintain quality of life in the community.

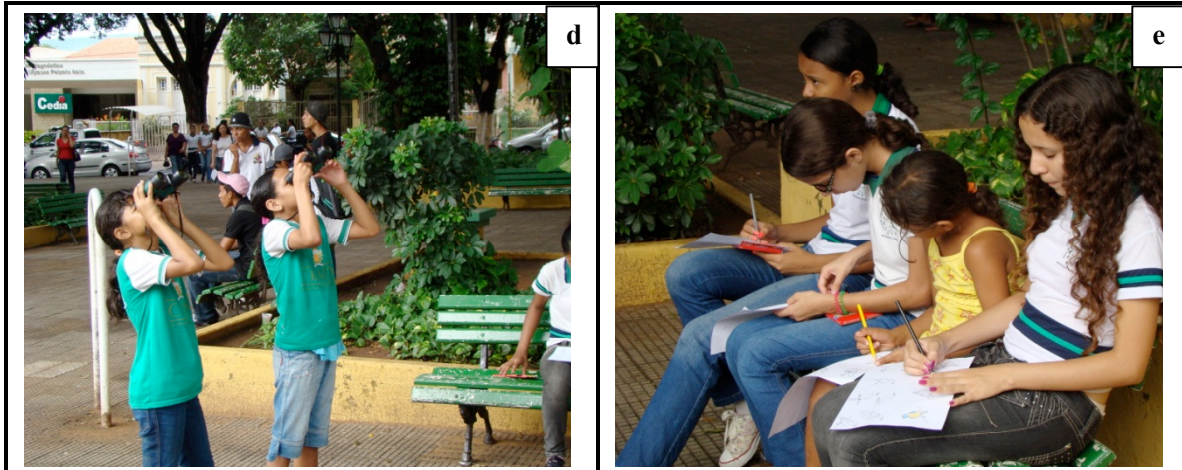


**Figure 10:** Scenes from two of the annual, regional events in which Araripe Manakin Conservation Project team members are regular participants. **a-c.** *Mostra SESC Cariri de Culturas*; **d and e.** *Semana da Água e da Árvore*.

One example of the creativity and community participation in our public outreach efforts was exemplified during Environmental Week 2011 in Crato, when birds handcarved from wood by local craftsman were hidden among trees in the central square of the city and students from the local schools were invited to accept the challenge of finding and identifying them (Figure 10). Once they had located the birds, the children received sheets of line drawings so they could color the birds according to an identification banner located at the display booth. Many participants were also noting and identifying real birds on the scene and had their first encounter with a pair of real binoculars. This experience was judged to be quite successful in promoting our objectives with respect to supporting new interest in bird watching and even inspired two independent entities that also work in the area of environmental education to replicate the activity in their own outreach efforts.



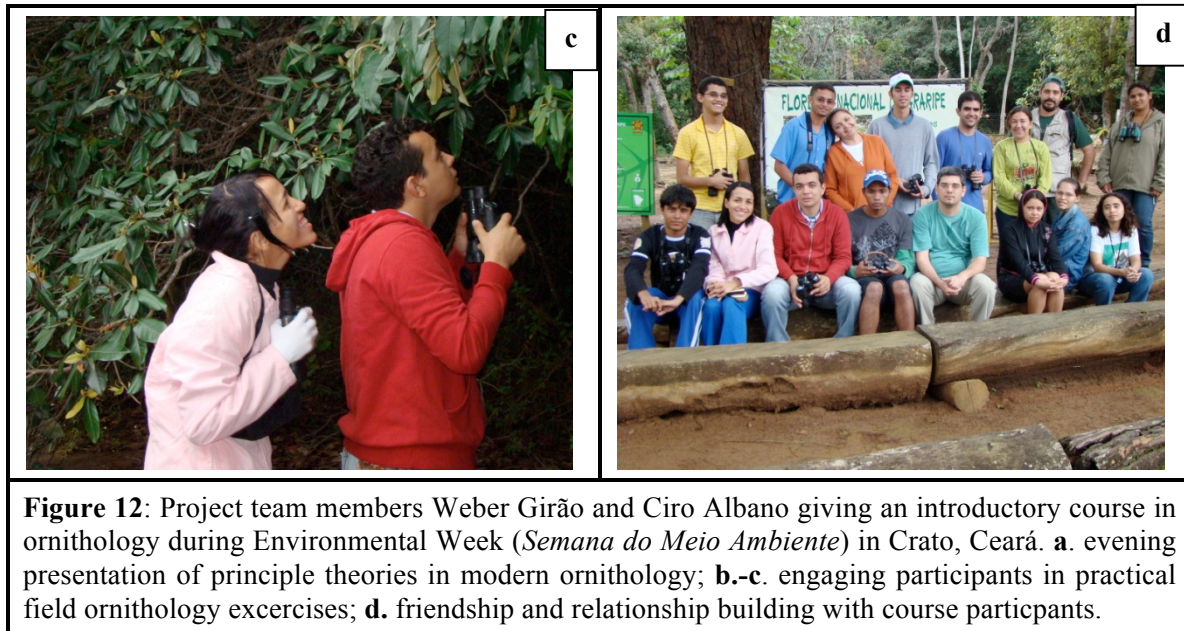




**Figure 11:** Wooden bird observation event held in the main public square of Crato, Ceará during Environmental Week (*Semana do Meio Ambiente*). **a.** installing handcarved wooden bird model of a Troupial in a tree before the event; **b.** Red-cowled Cardinal; **c.** Great Kiskadee; **d.** organizing observation groups before the activity begins; **e.** student participants looking for and trying to identify the models; **f.** coloring line drawings of the models to teach bird identification.

Another activity conducted by the PSA during Environmental Week was offering a workshop in basic ornithology, followed by field trip (Figure 11). The workshop was taught by Weber Girão and Ciro Albano. Participants spent the night at the headquarters of the Araripe National Forest (FLONA), during which time they heard lectures on ornithology, before going into the field to observe birds the following morning at dawn.





**Figure 12:** Project team members Weber Girão and Ciro Albano giving an introductory course in ornithology during Environmental Week (*Semana do Meio Ambiente*) in Crato, Ceará. **a.** evening presentation of principle theories in modern ornithology; **b.-c.** engaging participants in practical field ornithology excercises; **d.** friendship and relationship building with course participants.

Furhtermore, throughout the year of 2012 we conducted a project in partnership with the Crato Department of Education (SEDUC) to train 50 teachers representing 30 different schools in the city (Figure 13). The project was designed to encourage reading and literature appreciation using the Araripe Manakin as a thematic thread among literary genres and was called “*Por uma Política de Formação de leitores: O Soldadinho-do-araripe como fio condutor de temáticas entre os gêneros textuais*”. The training sessions were divided into two parts. In the first session, we divulged information regarding the basic biology of the Araripe Manakin and its environment. In the second part, information from the first session was developed according to various genres (prose, verse, line, etc.), by instructors from SEDUC. Each teacher participant was then expected to work on a similar excercise with their own students during reading room activities throughout the school year. The training concluded with a field trip to observe the Araripe Manakin in its natural setting.





Following the conclusion of our collaborative project with SEDUC, teacher training participants selected some of the final products generated from session conducted with their own students for public display in the ICC auditorium, the PSA headquarters, and other special events (Figure 14).

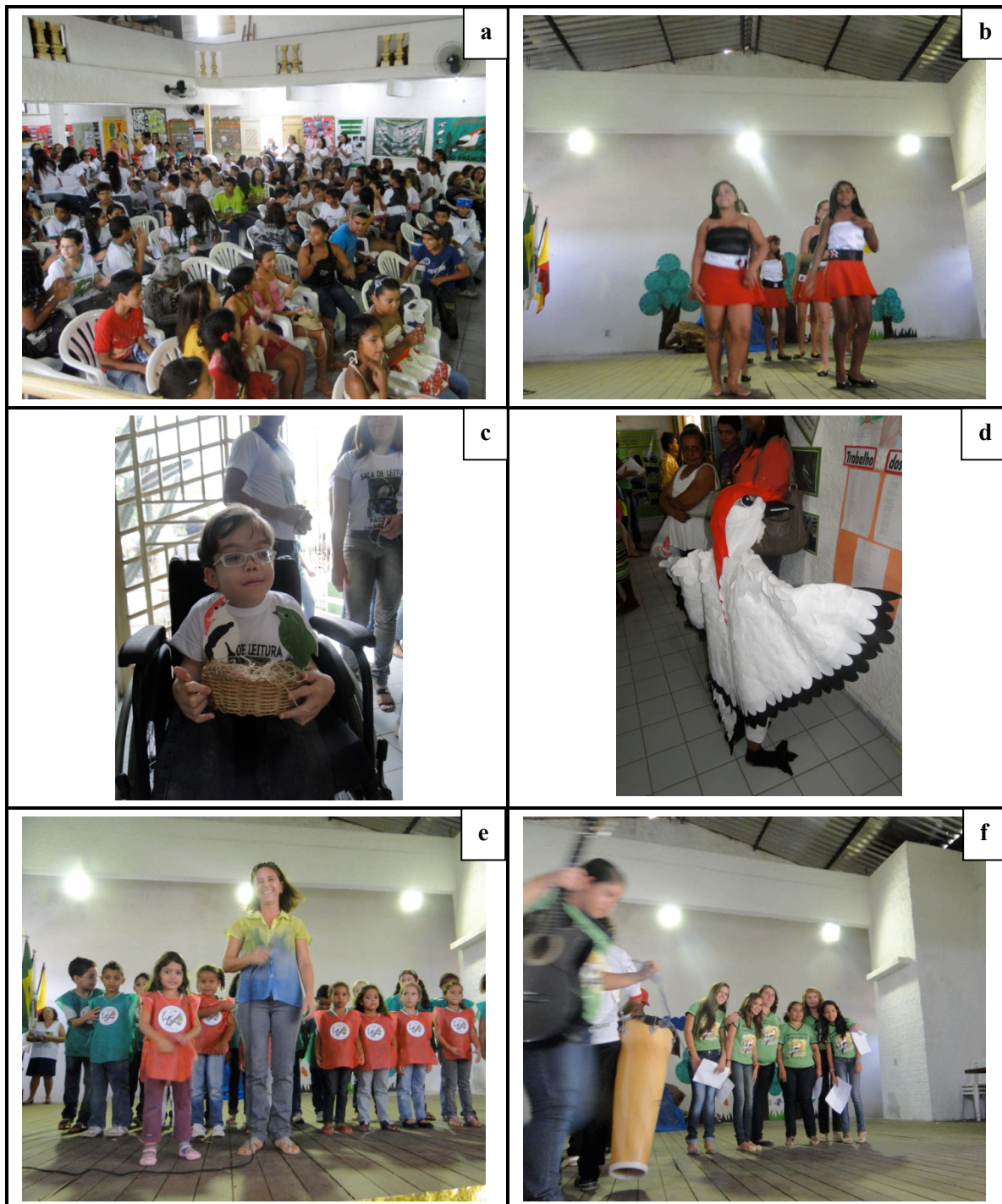






**Figure 14:** Examples of some of the materials produced by school kids that participated in the “*Por uma Política de Formação de leitores: O Soldadinho-do-araripe como fio condutor de temáticas entre os gêneros textuais*” literature projet in Crato, Ceará.

In addition to the many posters and works of art that adorned nearly the entire ICC building, particularly the auditorium space, the project culminated with performances of poetry, dances, music, literature readings, and plays (Figure 15).

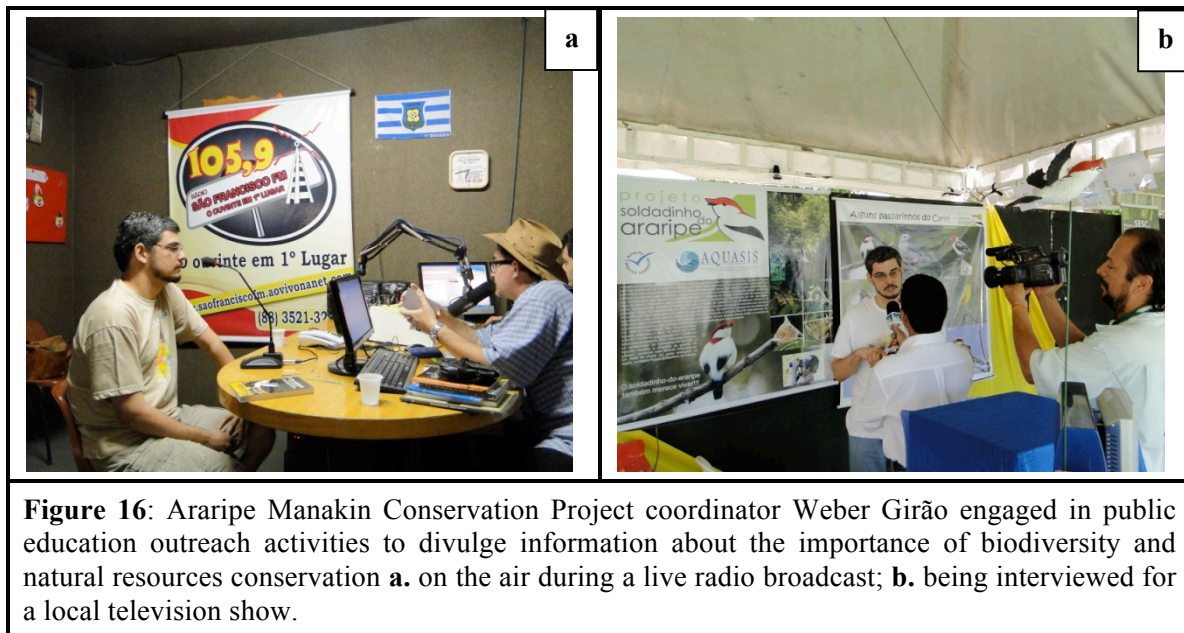


**Figure 15:** Performances in the ICC auditorium during the culmination of the “*Por uma Política de Formação de leitores: “O Soldadinho-do-araripe como fio condutor de temáticas entre os gêneros textuais”*” literature project. **a.** student posters on display; **b.** performing the Araripe Manakin dance; **c.** special needs student showing off his artwork; **d.** Araripe Manakin costume; **e.** school choir presentation; **f.** traditional literature reading presentation.

The PSA also attended to the disclosure of information regarding the importance of conserving the Araripe Manakin through various forms of media including internet,



television, radio and newspaper (Figures 16). We receive a regular stream of media requests for information about the bird and take advantage of these opportunities to send the message that the Araripe Manakin is a symbol for environmental conservation and important bio-indicator of how we are taking care of our natural resources.



**Figure 16:** Araripe Manakin Conservation Project coordinator Weber Girão engaged in public education outreach activities to divulge information about the importance of biodiversity and natural resources conservation **a.** on the air during a live radio broadcast; **b.** being interviewed for a local television show.

### 1.5: Adopting the Araripe Mankin as a symbol for Cariri.

Society in the Cariri region is increasingly appropriating the image of the Araripe Manakin for a variety of uses. We observed several spontaneous demonstrations of its use, such as during parades celebrating Brazil's Independence Day, signage for hotels, in schools, on house number plates, etc (Figure 17). Even the taxis circulating the city of Crato now have the bird's image displayed prominently on their doors. This particular design was requested from the PSA coordinator and designer, but it was an action imagined and realized entirely by the association of taxi drivers without any suggestion from our team.



a



b



c



d



e



f





**Figura 17:** Spontaneous displays of the Araripe Manakin's image consolidating it as a regional symbol Cariri. **a. - c.** school tributes during a parade celebrating Brazil's Independence Day; **d.** Araripe Mankin hand puppets; **e. - f.** dance performance by students wearing Araripe Manakin costumes; **g. - h.** conservation project team members with local school kids wearing Araripe Manakin t-shirts; **i. - j.** more local school kids with Araripe Manakin t-shirts and posters.

A school teacher in the municipality of *Missão Velha* requested assistance from the PSA to produce artwork for a banner featuring the Araripe Manakin to use during the town's main cultural event (Fig. 18), while in Barbalha, an official law was passed to recognize the bird as a symbol of the municipality.





**Figure 18:** Scenes from a parade in *Missão Velha* during the principle cultural event hosted by the city. **a.** - **b.** Araripe Manakin banners; **c.** the parade procession, **d.** local school teachers wearing Araripe Manakin t-shirts.

## Part 2: Checklist and photographic field guide for the "Birds of Araripe".

An official checklist for the bird species known to occur in the general area of the *Chapada do Araripe* was assembled as a guideline to produce a photographic field guide to all of the bird species of the region, in order to facilitate the development of birdwatching activities. With the support and experience of various field ornithologists who collaborate with Aquasis, and a thorough literature review, our team assembled a checklist that includes 290 species (Appendix 1). We also compiled high quality images, submitted voluntarily by the members and collaborators of our conservation team, for all 290 species on the checklist (in many cases for both sexes of dimorphic taxa) to create a photographic field guide to the birds of Araripe.

In addition to the scientific and common names in English, the guide also includes the official common names adopted by the Brazilian Ornithological Society and any regional and/or local common names for each species. Given that the names of many common birds vary even within the state of Ceará, we considered the inclusion of regional and/or local common names in the guide to be an important aspect for the local acceptance and ease of use by our primary target audience. To this end, our team conducted surveys to compile as many of these less known common names as possible for inclusion in the field guide.

This was also an important learning exercise for our team of formally trained ornithologists because many of these regional and local common names for birds were previously unknown to us and will help in our communications and outreach to inspire birdwatching activity in the communities where awareness and participation are most important to realizing our long term conservation goals. The final digital layout for the "Birds of Araripe" is being presented along with this final report, as one of the products of our partnership with the Conservation Leadership Program.

## **Objective 2. Conduct botanical research and outreach activities to promote habitat recovery.**

### **Part 1: Botanical Research.**

The *Chapada do Araripe* covers an area of about one million hectares and is located in the border region between the states of Pernambuco, Piauí and Ceará, Brazil (Figure 19). Due to the unusual topography and presence of numerous water springs, several vegetation and habitat types have been described in this region, which vary in the way that they are classified by different specialists. The system of classification adopted for our purposes here follows the most recent treatment and recognizes six distinct vegetation types: 1) *Matas Secas* (Dry Forests), 2) *Cerradão* (similar to cerrado *sensu stricto*, but denser and with taller vegetation), 3) *Cerrado* (similar to savana, but technically a biome that is unique to Brazil), 4) *Carrasco* (dense, thorny scrub) 5) *Caatinga Arbórea* (a semi-arid habitat, but with some large trees) and 6) *Floresta Úmida* (humid forest) (Figueiredo, 1997).



**Figure 19:** Map of the *Chapada do Araripe*.

The *Floresta Úmida* in Araripe is officially recognized as a special type of *Mata Atlântica*, or Atlantic Forest, (Law No. 11.428/2006) and is almost entirely restricted to the northeast facing slopes of the plateau, all within the territory of Ceará. This unique and highly restricted habitat encompasses nearly all of the known area of occurrence of the Araripe Manakin. The development and maintenance of this fragment of humid forest habitat, nestled deep within the vast *Caatinga* biome that dominates northeastern Brazil, is due mainly to the large number of fresh water springs that surface between 600 and 800 meters along the slopes of the plateau from rain that falls on the flat top of the formation and filters through the sedimentary rock, in addition to the moisture gleaned from passing clouds and direct orographic rainfall that is common at these altitudes (DNPM, 1996).

In order to identify the humid forest plant specimens collected for the current project, approximately 67 botanical experts were consulted and 12 herbarium collections in four different states of Brazil (Pernambuco, Ceará, São Paulo and Rio de Janeiro) were visited (Table 1).

	<b>Herbarium</b>	<b>Host Institution</b>	<b>City</b>	<b>State</b>
<b>1</b>	UFP	Universidade Federal de Pernambuco (UFPE)	Recife	Pernambuco
<b>2</b>	IPA	Instituto de Pesquisas Agronômicas (IPA)	Recife	Pernambuco
<b>3</b>	HVASF	Universidade Federal do Vale do São Francisco (Univasf)	Petrolina	Pernambuco
<b>4</b>	EAC	Universidade Federal do Ceará (UFC)	Fortaleza	Ceará
<b>5</b>	SPF	Universidade de São Paulo (USP)	São Paulo	São Paulo
<b>6</b>	SP	Instituto de Botânica (IBt)	São Paulo	São Paulo
<b>7</b>	SPSF	Instituto Florestal de São Paulo (IF)	São Paulo	São Paulo
<b>8</b>	IAC	Instituto Agrônomo de Campinas (IAC)	Campinas	São Paulo
<b>9</b>	UEC	Unicamp	Campinas	São Paulo
<b>10</b>	HPL	Instituto Plantarum de Estudos da Flora	Nova Odessa	São Paulo
<b>11</b>	ESA	Escola Superior de Agricultura “Luiz de Queiroz” (ESALQ)	Piracicaba	São Paulo
<b>12</b>	RB	Jardim Botânico do Rio de Janeiro	Rio de Janeiro	Rio de Janeiro

**Table 1.** Acronyms for the various herbarium collections visited during the current project, the institution, city and state in Brazil where they are located.

The classification of plant species from the humid forest habitats of the *Chapada do Araripe* used in this survey was based on APG III (2009) and the adopted nomenclature was according to available databases for the List of Species of Flora of Brazil (*Lista de Espécies da Flora do Brasil*, 2012), in the *Tropicos* of the Missouri Botanical Garden (Mobot, 2012) and The International Plant Names Index (IPNI, 2012).

We collected 325 humid forest plant species, representing 83 different families, from the study area (Appendix 2). The five most highly represented families were Fabaceae (9.8%), followed by Malvaceae and Euphorbiaceae (6.12%), Rubiaceae (5.5%) and Lauraceae (4.9%) (Appendix 3). One exemplar collected during this study represents a new species of Myrtaceae (*Eugenia* sp.) and is being described for publication by Dra. Fiorella Mazine.

The results of this floristic collection, together with a thorough literature review and surveys of various herbarium collections, are all contributing to the clarification of a singular definition of this unique plant community and informing our selection of target species to be propagated for our habitat restoration and enhancement initiative.

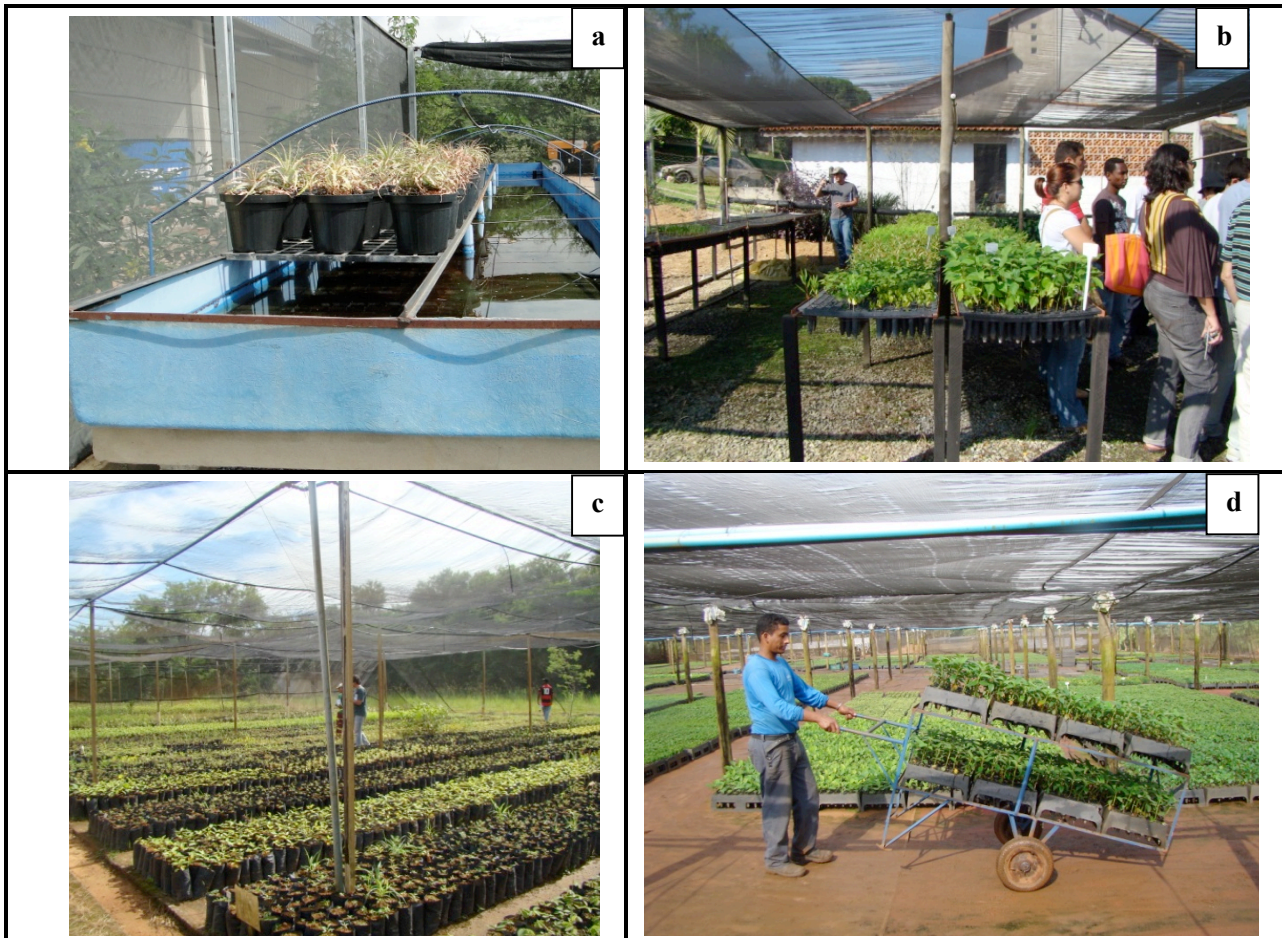
## **Part 2: Preparations to promote habitat restoration and enhancement activities in the area of occurrence of the Araripe Manakin.**

Dates for the activities aimed at identifying botanical materials that required travel in Brazil were scheduled to coincide with other relevant opportunities to acquire new knowledge and learn from experts in the production of seedlings for successful reforestation projects in Brazil. These activities were conducted by PSA botanist and reforestation project manager Karina Vieiralves Linhares as part of the team's preparation of the habitat restoration and enhancement initiatives being developed in the area of occurrence of the Araripe Manakin. Karina learned much from the experiences of visiting four active nurseries, completing two training courses in native species seedling production, visits to five forest restoration areas in various stages of succession, and participate in a training course in degraded areas restoration.

### **2.1: Nursery visits.**

The first nursery visit was to Petrolina, Pernambuco, and the Federal University of Vale do São Francisco (Univasf), where seedlings for projects implemented by the Reference Center for the Recovery of Degraded Environments (*Centro de Referência e Recuperação de Ambientes Degradados* - CRAD) are produced (Figure 20a). Visits were also made to inspect the seedling nurseries of CATI (Figure 20b), SABESP (Figure 20c) and BioFlora (Figure 20d). The visits to CATI and SABESP included training courses in seedling nursery development and management administered by the Institute for Ecological Research (*Instituto de Pesquisas Ecológicas* - IPÊ). The visit to BioFlora's seedling nursery was realized as part of a forest restoration course, sponsored by ESALQ, and included observing the central dynamics of the nursery operation for two full days.





**Figure 20:** Plant nurseries visited during the current project: **a.** CRAD in Pernambuco; **b.** CATI in São Paulo; **c.** SABESP in São Paulo and **d.** BioFlora in São Paulo.

## 2.2: Plant nursery creation and management training.

The first training course in seedling nursery development and operation was conducted at the Institute of Ecological Research (IPÊ) in Nazaré Paulista, São Paulo (Figure 21a). This NGO's mission is to develop and disseminate models of biodiversity conservation that promote socioeconomic benefits through science, education and sustainable business. The second course was in the production of high quality seedling, conducted by *Infobios* in Campinas, São Paulo (Figure 21b).



### 2.3: Visits to reforestation project sites in Brazil.

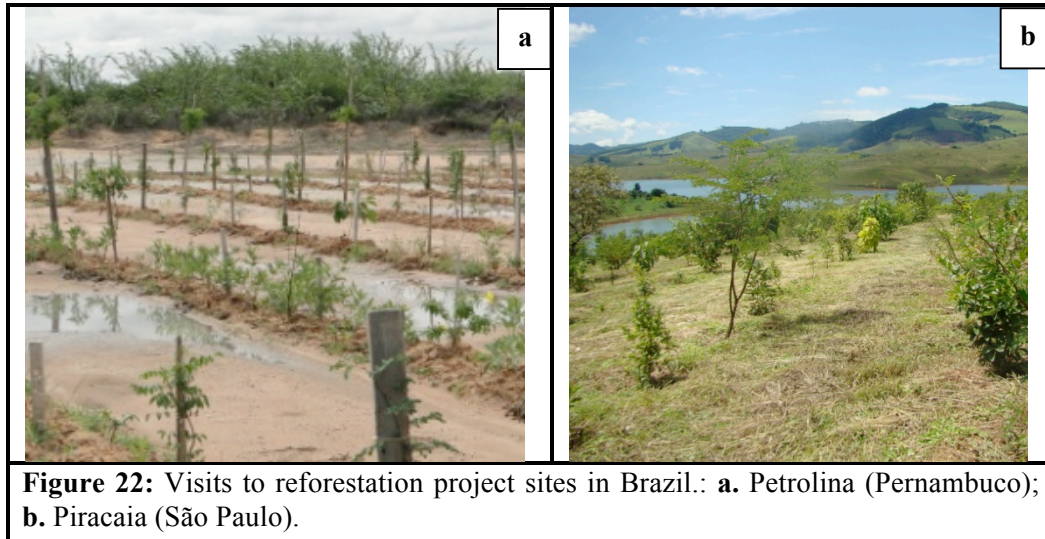
The first forest restoration initiative to be visited was the Reference Center for the Recovery of Degraded *Caatinga* Areas (*Centro de Referência para Recuperação de Áreas Degradadas da Caatinga - CRAD*), a project coordinated by the Federal University of Vale do São Francisco (UNIVASF) and funded by the Ministries of the Environment and National Integration (Figure 22). This project involves the cooperation of various institutions working together in the San Francisco River Basin (*Bacia Hidrográfica do Rio São Francisco - BHSF*) and aims to promote the recovery and conservation of flora in priority areas for conservation of *Caatinga* areas located in the basin.

Reforestation project areas in Petrolina (Pernambuco) and Piracaia (São Paulo) were also visited (Figure 22). The activities in Piracaia are being conducted by three companies contracted by the Secretary of the Environment for the State of São Paulo (*Secretaria do Meio Ambiente do Estado de São Paulo*) and Road Development SA (*Desenvolvimento Rodoviário SA - DERSA*) as part of environmental compensations for the removal of hectares of native forest for construction of a highway that will encircle the city of São Paulo and aims to improve traffic condition in the metropolitan area.

To comment briefly on the basic approach of the two initiatives cited above, the plantings are done in rows, alternating plants with rapid growth that need direct light to



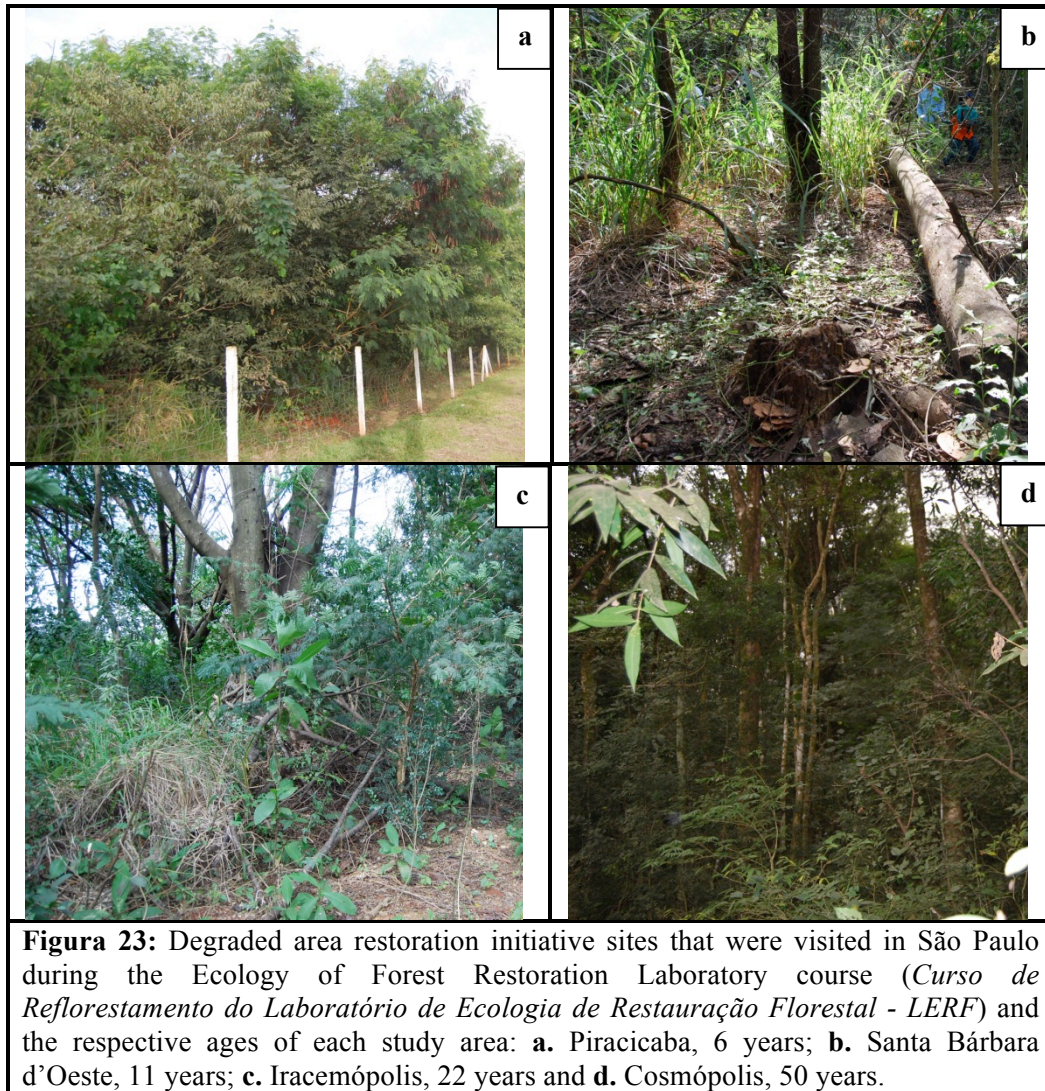
develop (called fill lines), with plants that develop more slowly (diversity lines) and which benefit from the shade from nearby rapidly growing plants of the fill line. The species used in the fill lines also have a shorter life cycle, while those in the diversity lines will characterize the floral community at more advanced successional stages.



**Figure 22:** Visits to reforestation project sites in Brazil.: **a.** Petrolina (Pernambuco); **b.** Piracaia (São Paulo).

#### 2.4: Degraded areas restoration training course.

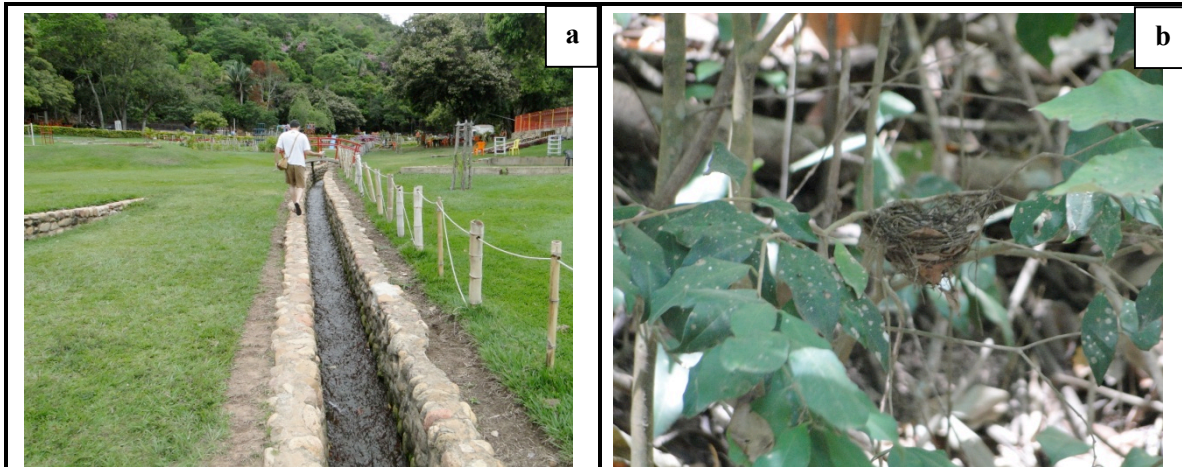
This overall project objective also benefited from our participation in a training course in the recovery of degraded areas, sponsored by the Ecology of Forest Restoration Laboratory (*Laboratório de Ecologia de Restauração Florestal - LERF*) of the College of Agriculture "Luiz de Queiroz" (*Escola Superior de Agricultura "Luiz de Queiroz" - ESALQ*) / University of São Paulo (*Universidade de São Paulo - USP*) in Piracicaba, São Paulo. The professionals who work in this institution are pioneers in the recovery of degraded forests in Brazil. On this occasion four restoration areas were visited, ranging from 3 to 50 years since the initiation of reforestation actions, making it possible to see first hand, the recovery of these environments at various stages of succession and according to several techniques, such as random planting and more targeted models based on our growing knowledge of ecological succession (Figure 23). The training course and site visits were enormously informative to developing our own reforestation and habitat enrichment project in the *Chapada do Araripe*.



### Part 3: Habitat restoration activities.

Following the activities carried out in Part 2 of Objective 2, three *in situ* actions related to the forest restoration initiative, and a fourth action that is in progress, were developed in the *Chapada do Araripe* region. The first action involved the participation of PSA team members in a careful analysis of the *Balneário Termas do Caldas* site in the municipality of Barbalha, Ceará at the bequest of the private landowner in trying to meet environmental compliance requirements for renewal of their operating license. Given that the site is area of known occurrence and breeding site of the Araripe Manakin, the PSA helped draft a proposal to restore riparian vegetation to an existing water course in order to meet the standards of the federal Forest Code or *Código Florestal* (Figure 24).

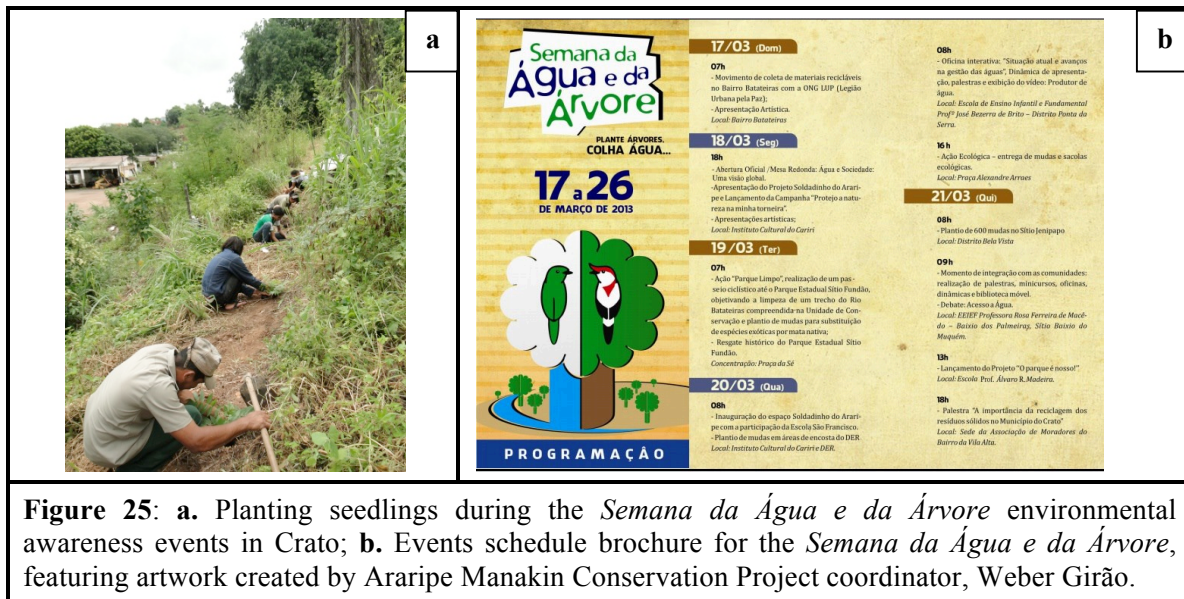




**Figure 24:** The *Balneário Termas do Caldas* site in the municipality of Barbalha, Ceará. **a.** riparian forest area to be restored for renewal of the operating license; **b.** an Araripe Manakin nest discovered at the site.

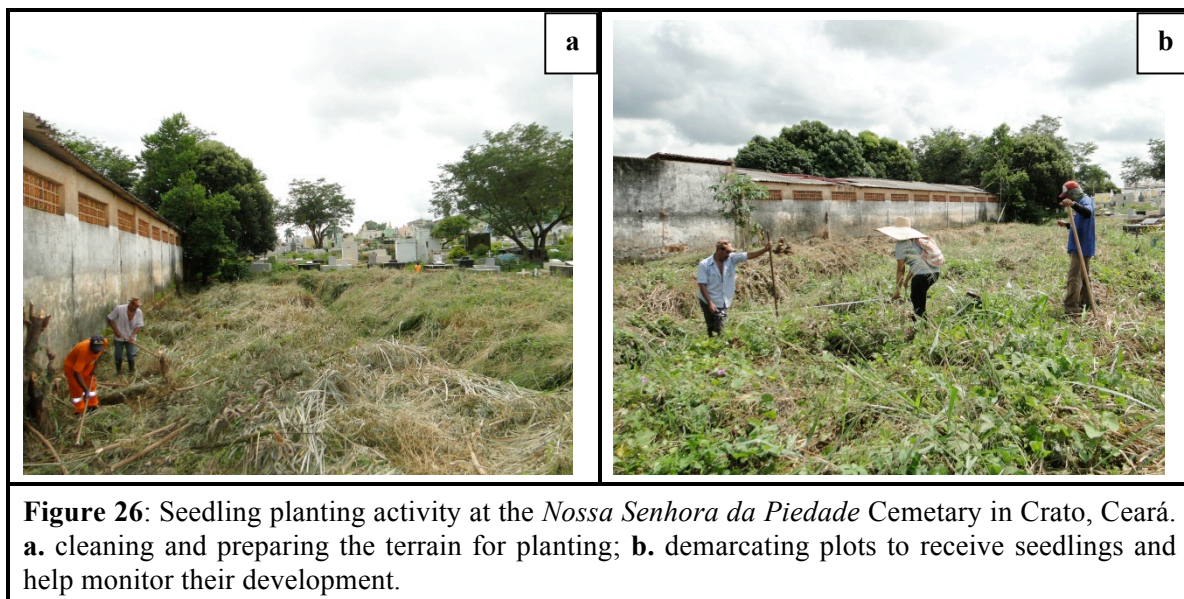
The second habitat restoration activity realized during the project period was an urban seedling planting event. This event was organized by the PSA and involved the participation of a group of secondary school students from the municipality of Crato and various local officials, including the deputy mayor and the president and vice-president of the ICC. The action occurred during Water and Tree Week event (*Semana da Água e da Árvore*), supported by the Crato Department of the Environment and various partners (including the PSA), and used seedlings grown in the PSA nursery located at the ICC (Figure 25). This seedling planting area is adjacent to the ICC building and it is hoped that the recovery of this small area will serve as a source of encouragement and inspiration to people that visit the ESA, help visitors to visualize the process of restoring fauna and flora to degraded areas and allow us to execute other creative actions in to our environmental education initiatives.





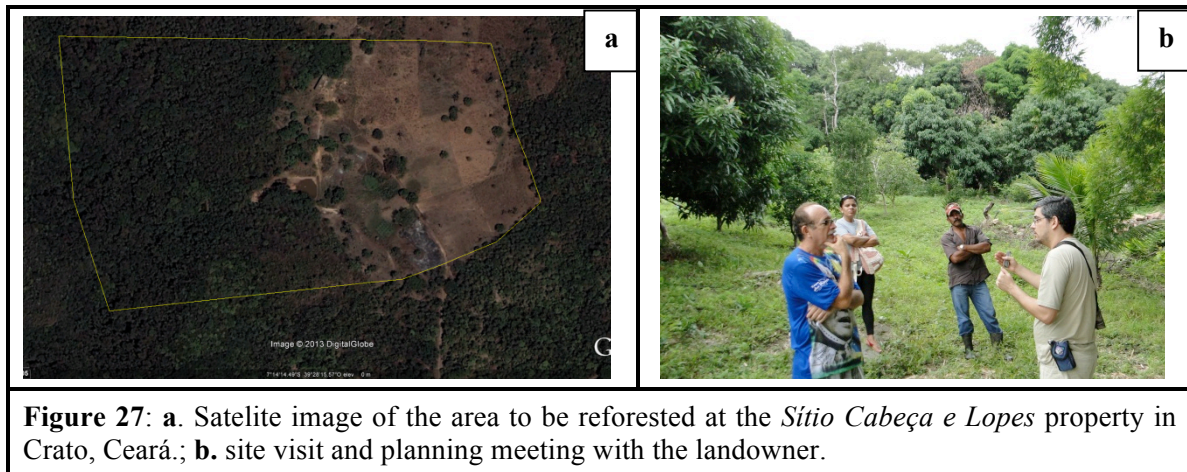
**Figure 25:** a. Planting seedlings during the *Semana da Água e da Árvore* environmental awareness events in Crato; b. Events schedule brochure for the *Semana da Água e da Árvore*, featuring artwork created by Araripe Manakin Conservation Project coordinator, Weber Girão.

The third habitat restoration activity was planting seedlings along a section of the *Riacho da Matinha*, a creek that passes through the main cemetery of Crato (Figures 26). This action will help contribute to the containment of water at this locality, which is highly prone to flooding during periods of prolonged period of rainfall. This activity also helped to solidify a working partnership between the PSA and the Crato Department of the Environment (SEMACE), which both contributed seedlings to the planting effort.



**Figure 26:** Seedling planting activity at the *Nossa Senhora da Piedade* Cemetary in Crato, Ceará. a. cleaning and preparing the terrain for planting; b. demarcating plots to receive seedlings and help monitor their development.

The fourth habitat restoration activity is currently in progress and is being made possible through financial support of the American Bird Conservancy (ABC). This project aspires to reforest approximately five acres of a privately owned area known as the *Sítio Cabeça e Lopes* site, where the Araripe Manakin is known to occur. This initiative will also help to turn the property into a Private Natural Heritage Preserve (*Reserva Particular do Patrimônio Natural - PRPN*), an important class of legally protected areas, the creation of which Aquasis is facilitating in the region and which represents an important tool in our longterm conservation plans for the Araripe Manakin (Figure 27).



**Figure 27:** a. Satellite image of the area to be reforested at the *Sítio Cabeça e Lopes* property in Crato, Ceará.; b. site visit and planning meeting with the landowner.

#### **Part 4: Visitor Center and the Araripe Manakin Education Space (*Espaço Soldadinho-do-araripe - ESA*).**

As described in Objective 1, the site for creating a project visitor center was transferred from the Caianas Site to the Cariri Cultural Institute (ICC). The ICC space was subjected to several structural interventions to recuperate it for the purposes of the PSA, including some basic maintenance work, office refurbishment and even new construction.



#### 4.1: Recuperation, new construction, and maintenance activities.

The PSA visitor center is known as the Araripe Manakin Education Space (*Espaço Soldadinho-do-araripe* - ESA). The ESA has a main parlor and exhibition space, a bathroom and a store restored and constructed with CLP resources (Figures 28). There is also an outdoor area with recycling bins, a replica of a freshwater spring, composting space and vertical garden plot of medicinal plants (Figure 29). We also created a space in the outdoor area for the hardening and drying of seeds (Figure 30), and a small experimental plant nursery (Figure 31). In addition to these specific construction and building recovery efforts, practically the entire structure was treated with new cement to protect bricks exposed by heavy rainfall and helping to prolong the building's lifespan.



**Figure 28.** Various stages of construction and recuperation of the ICC garage area to transform it into parts of the Araripe Manakin Education Space (*Espaço Soldadinho-do-araripe* - ESA). **Top:** the ESA store space before and after; **Bottom:** the main parlor and exhibition space before and after.





**Figure 29.** Various stages of construction and recuperation of the outside area in back of the ICC building to transform it into parts of the ESA. **Left:** recycling bins; **Right:** compost area, vertical garden and artificial water spring to bring a sensation of being in the humid forest.



**Figure 30.** Early onstruction stages of the fruit drying and seed recovery beds.



**Figure 31.** Construction stages of the experimental nursery to produce seedlings for the Araripe Manakin habitat recovery and reforestation initiative.

#### **4.2: Description of the Araripe Manakin Education Space (ESA).**

In creating the ESA we prioritized the use of locally made handicrafts, mainly from bamboo and recycled materials such as tables and ottomans made from old spools of electrical wire, exhibits made from used video cassette tapes, etc. The entire effort involved hands on participation by PSA team members and some contractors for specific work.

The ESA is divided into five parts, with the first four parts corresponding to Water, Earth, Fire and Air. The fifth and final element that will be explained later. The Water area explains the importance of using this limited resource responsibly and sparingly, and shows the location 130 water springs within the area of occurrence of the Araripe Manakin in the municipalities of Crato, Barbalha and Missão Velha. The water

springs are represented by test tubes filled with a volume of water corresponding to its actual estimated flow, along with a label designating the presence or absence of the Araripe Manakin and its reproductive "status" at that particular spring.

More specifically, some of the test tubes have blue caps to designate areas where the bird is present and has a breeding territory, test tubes with orange lids designate springs where, despite the bird being present, there is no evidence of reproductive behavior, test tubes with red lids identify springs where there are no records for the species occurrence and the transparent lids for sites where it has not been possible to do any on site research due to some practical impediment such as bees or difficult access (Figure 32).

The second part of the ESA is the Earth area, which in this context represents biodiversity. This section is designed to familiarize visitors with some of the plant species that occur in the area, particularly those which make up part of the Araripe Manakin's frugivorous diet or used to support the location of nests (Figure 33). This area also talks about the role of the Araripe Manakin as a seed disperser and highlights some of the other wildlife known to occur in the region and which benefit indirectly from protecting the focal species. There are also three 15L water bottles installed here that demonstrate the effects that the presence of natural vegetation has on water quality.

The third part of the ESA is the Fire area, which illustrates one of the main conservation threats to the Araripe Manakin (Figure 34). This section also includes a display of slingshots, mostly used to shoot birds and other small vertebrates for sport, that were voluntarily surrendered by students after an environmental education campaign conducted in their school in a partnership between the PSA and the Crato Department of Education. The Fire area also includes a display of whistles commonly used by hunters to attract birds and a device that plays the actual sounds of the birds.

The fourth part of the ESA is the Air area, which illustrates the network of people (local, regional and international) that support the actions of the PSA and care about preventing the Araripe Manakin from extinction (Figure 35).



The fifth and final element is the area outside of the ESA, designed to encourage the adoption of some specific attitudes and changes in behavior that can help preserve the environment. In addition to an artificial water spring, the area is covered by a live plant arbor whose supporting structure consists of wire cut from 2L plastic bottles. Issues regarding the recycling of waste products and choosing organic food are also addressed here. Finally, this area includes an experimental nursery dedicated exclusively to the production of seedlings to reforest degraded areas where the Araripe Manakin occurs.



**Figure 32.** Water section of the ESA.



**Figure 33.** Earth section of the ESA.



**Figure 34.** Fire section of the ESA



**Figure 35:** Air section of the ESA.

**Objective 3: Continue to closely follow the process of creating a fully protected area.**

One of the key objectives of this CLP project was to coordinate a proposal for the creation of a fully protected area in the *Chapada do Araripe*. This proposal drafted by PSA team members and filed in June of 2008, and in mid-2009, the responsible



government authorities opened a formal process to create this protected area. During this project, we closely followed this process and supplied government authorities with all of the information necessary to facilitate this process. Four monthly meetings with key stakeholders in the Chapada do Araripe and one trip to Brasília was made for discussions with government authorities on the creation of an APA in Araripe. In December 2010, Aquasis and PSA team members participated in a week of activities focused on evaluating the creation of the proposed APA (Figure 36).



**Figure 36.** Meeting with local Protected Area (APA) managers and representatives from the federal agency responsible for APA creation and management (ICMBio) to advance the creation process of a fully protected area (Araripe Manakin Wildlife Refuge) and preserve water resources and the focal species habitat.

This conservation unit will help protect many of the water sources that are considered to be one of the greatest treasure of the region, benefiting the quality of live for local communities and offsetting extinction pressures on a Critically Endangered bird species. Evaluation activities, including site visits by technicians from the Instituto Chico Mendes (ICMBio) in Brasilia and representing the Directory of Integral Protection Conservation Units (*Diretoria de Unidades de Conservação de Proteção Integral - DIREP*), were realized. PSA team members recieved the ICMBio technicians, Gabriela



Leonhardt and Eliana Maria Corbucci, showed them the Araripe Manakng and its threatened habitat, introduced them to key stakeholders, and helped familiarize them with the environmental and political situation in Cariri. This week of activities was supported by the PSA and Aquasis, the APA and Flona of the *Chapada do Araripe*, COGERH and Crato Secretary of the Environment. While this was an important step in the conservation process for the region of Cariri, further efforts must be undertaken to affect the current reality. An additional site visit by ICMBio technicians was realized in October 2011, resulting in the allocation of resources for a land survey (Figure 37).



**Figure 37.** Eliana Corbucci (Brazilin Environmental Ministry) and PSA coordinator Weber Girão during the site visit in October, 2011.

The creation of environmentally protected areas in Brazil can be a very time consuming process, so in addition to following the proceedings filed with the Federal Government in 2007, the PSA adopted a parallel strategy to strengthen the management of existing protected areas. In addition to preparing the Action Plan for the focal species (see Objective 1), project members have joined the Advisory Board of Araripe National Forest (Figure 38), an important area where the species was found only in 2012 (see Objective 1), but which contributes to maintaining of the water resources which the Araripe Manakin depends on.



**Figure 38.** Meeting of the protected area *FLONA Chapada do Araripe* (Araripe National Forest) advisory board in Crato, Ceará. The PSA team holds a chair on the advisory board of the federally protected area.

Participation of the PSA in management of the APA is undergoing a process of formalization, with the inclusion of project team members on the Advisory Board approved by an official vote and awaiting the approval of the ICMBio President. Another PSA action that has been conducted since 2012 is the effort to manage a mosaic of these various units together, of which three are known to harbour Araripe Manakins. The team is also supporting the creation of two private reserves, which are still under negotiation.

## Appendices

### Appendix 1: Checklist for the Birds of Araripe.

<b>Latin names</b>	<b>English Names</b>
<i>Crypturellus noctivagus</i>	Yellow-legged Tinamou
<i>Crypturellus parvirostris</i>	Small-billed Tinamou
<i>Crypturellus tataupa</i>	Tataupa Tinamou
<i>Rhynchotus rufescens</i>	Red-winged Tinamou
<i>Nothura boraquira</i>	White-bellied Nothura
<i>Nothura maculosa</i>	Spotted Nothura
<i>Dendrocygna bicolor</i>	Fulvous Whistling-Duck
<i>Dendrocygna viduata</i>	White-faced Whistling-Duck
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck
<i>Cairina moschata</i>	Muscovy Duck
<i>Sarkidiornis sylvicola</i>	Comb Duck
<i>Amazonetta brasiliensis</i>	Brazilian Teal
<i>Anas bahamensis</i>	White-cheeked Pintail
<i>Netta erythrophthalma</i>	Southern Pochard
<i>Nomonyx dominica</i>	Masked Duck
<i>Penelope superciliaris</i>	Rusty-margined Guan
<i>Penelope jacucaca</i>	White-browed Guan
<i>Tachybaptus dominicus</i>	Least Grebe
<i>Podilymbus podiceps</i>	Pied-billed Grebe
<i>Jabiru mycteria</i>	Jabiru
<i>Mycteria americana</i>	Wood Stork
<i>Phalacrocorax brasilianus</i>	Neotropic Cormorant
<i>Anhinga anhinga</i>	Anhinga
<i>Tigrisoma lineatum</i>	Rufescent Tiger-Heron
<i>Botaurus pinnatus</i>	Pinnated Bittern
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron
<i>Butorides striata</i>	Striated Heron
<i>Bubulcus ibis</i>	Cattle Egret
<i>Ardea cocoi</i>	Cocoi Heron
<i>Ardea alba</i>	Great Egret
<i>Egretta thula</i>	Snowy Egret
<i>Cathartes aura</i>	Turkey Vulture
<i>Cathartes burrovianus</i>	Lesser Yellow-headed Vulture
<i>Coragyps atratus</i>	Black Vulture
<i>Sarcoramphus papa</i>	King Vulture
<i>Chondrohierax uncinatus</i>	Hook-billed Kite
<i>Elanoides forficatus</i>	Swallow-tailed Kite
<i>Gampsonyx swainsonii</i>	Pearl Kite



<i>Elanus leucurus</i>	White-tailed Kite
<i>Accipiter striatus</i>	Sharp-shinned Hawk
<i>Accipiter bicolor</i>	Bicolored Hawk
<i>Rostrhamus sociabilis</i>	Snail Kite
<i>Geranospiza caerulescens</i>	Crane Hawk
<i>Heterospizias meridionalis</i>	Savanna Hawk
<i>Urubitinga urubitinga</i>	Great Black-Hawk
<i>Rupornis magnirostris</i>	Roadside Hawk
<i>Parabuteo unicinctus</i>	Harris's Hawk
<i>Geranoaetus albicaudatus</i>	White-tailed Hawk
<i>Geranoaetus melanoleucus</i>	Black-chested Buzzard-Eagle
<i>Buteo nitidus</i>	Gray Hawk
<i>Buteo brachyurus</i>	Short-tailed Hawk
<i>Buteo albonotatus</i>	Zone-tailed Hawk
<i>Caracara plancus</i>	Southern Caracara
<i>Milvago chimachima</i>	Yellow-headed Caracara
<i>Herpetotheres cachinnans</i>	Laughing Falcon
<i>Micrastur ruficollis</i>	Barred Forest-Falcon
<i>Micrastur semitorquatus</i>	Collared Forest-Falcon
<i>Falco sparverius</i>	American Kestrel
<i>Falco femoralis</i>	Aplomado Falcon
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Aramus guarauna</i>	Limpkin
<i>Aramides mangle</i>	Little Wood-Rail
<i>Aramides cajanea</i>	Gray-necked Wood-Rail
<i>Laterallus melanophaius</i>	Rufous-sided Crake
<i>Laterallus exilis</i>	Gray-breasted Crake
<i>Gallinula galeata</i>	Common Gallinule
<i>Gallinula melanops</i>	Spot-flanked Gallinule
<i>Porphyrio martinica</i>	Purple Gallinule
<i>Cariama cristata</i>	Red-legged Seriema
<i>Vanellus cayanus</i>	Pied Lapwing
<i>Vanellus chilensis</i>	Southern Lapwing
<i>Charadrius collaris</i>	Collared Plover
<i>Himantopus mexicanus</i>	Black-necked Stilt
<i>Gallinago paraguaiiae</i>	South American Snipe
<i>Tringa solitaria</i>	Solitary Sandpiper
<i>Tringa flavipes</i>	Lesser Yellowlegs
<i>Jacana jacana</i>	Wattled Jacana
<i>Columbina minuta</i>	Plain-breasted Ground-Dove
<i>Columbina talpacoti</i>	Ruddy Ground-Dove
<i>Columbina squammata</i>	Scaled Dove
<i>Columbina picui</i>	Picui Ground-Dove
<i>Claravis pretiosa</i>	Blue Ground-Dove
<i>Columba livia</i>	Rock Pigeon
<i>Patagioenas picazuro</i>	Picazuro Pigeon

<i>Zenaida auriculata</i>	Eared Dove
<i>Leptotila verreauxi</i>	White-tipped Dove
<i>Primolius maracana</i>	Blue-winged Macaw
<i>Aratinga cactorum</i>	Cactus Parakeet
<i>Forpus xanthopterygius</i>	Blue-winged Parrotlet
<i>Amazona aestiva</i>	Blue-fronted Parrot
<i>Piaya cayana</i>	Squirrel Cuckoo
<i>Coccyzus melacoryphus</i>	Dark-billed Cuckoo
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo
<i>Crotophaga major</i>	Greater Ani
<i>Crotophaga ani</i>	Smooth-billed Ani
<i>Guira guira</i>	Guira Cuckoo
<i>Tapera naevia</i>	Striped Cuckoo
<i>Tyto alba</i>	Barn Owl
<i>Megascops choliba</i>	Tropical Screech-Owl
<i>Pulsatrix perspicillata</i>	Spectacled Owl
<i>Glaucidium brasilianum</i>	Ferruginous Pygmy-Owl
<i>Athene cunicularia</i>	Burrowing Owl
<i>Aegolius harrisi</i>	Buff-fronted Owl
<i>Asio clamator</i>	Striped Owl
<i>Nyctibius griseus</i>	Common Potoo
<i>Antrostomus rufus</i>	Rufous Nightjar
<i>Lurocalis semitorquatus</i>	Short-tailed Nighthawk
<i>Hydropsalis albicollis</i>	Pauraque
<i>Hydropsalis parvula</i>	Little Nightjar
<i>Hydropsalis hirundinacea</i>	Pygmy Nightjar
<i>Hydropsalis torquata</i>	Scissor-tailed Nightjar
<i>Chordeiles pusillus</i>	Least Nighthawk
<i>Chordeiles minor</i>	Common Nighthawk
<i>Chordeiles acutipennis</i>	Lesser Nighthawk
<i>Streptoprocne biscutata</i>	Biscutate Swift
<i>Chaetura meridionalis</i>	Sick's Swift
<i>Tachornis squamata</i>	Fork-tailed Palm-Swift
<i>Anopetia gounellei</i>	Broad-tipped Hermit
<i>Phaethornis ruber</i>	Reddish Hermit
<i>Phaethornis pretrei</i>	Planalto Hermit
<i>Eupetomena macroura</i>	Swallow-tailed Hummingbird
<i>Anthracothorax nigricollis</i>	Black-throated Mango
<i>Chrysolampis mosquitus</i>	Ruby-topaz Hummingbird
<i>Chlorostilbon lucidus</i>	Glittering-bellied Emerald
<i>Polytmus guainumbi</i>	White-tailed Goldenthrout
<i>Amazilia fimbriata</i>	Glittering-throated Emerald
<i>Heliomaster squamosus</i>	Stripe-breasted Starthroat
<i>Calliphlox amethystina</i>	Amethyst Woodstar
<i>Trogon curucui</i>	Blue-crowned Trogon
<i>Megaceryle torquata</i>	Ringed Kingfisher

<i>Chloroceryle amazona</i>	Amazon Kingfisher
<i>Chloroceryle americana</i>	Green Kingfisher
<i>Galbula ruficauda</i>	Rufous-tailed Jacamar
<i>Nystalus maculatus</i>	Spot-backed Puffbird
<i>Picumnus pygmaeus</i>	Spotted Piculet
<i>Picumnus fulvescens</i>	Tawny Piculet
<i>Melanerpes candidus</i>	White Woodpecker
<i>Veniliornis passerinus</i>	Little Woodpecker
<i>Piculus chrysochloros</i>	Golden-green Woodpecker
<i>Colaptes melanochloros</i>	Green-barred Woodpecker
<i>Colaptes campestris</i>	Campo Flicker
<i>Celeus flavescens</i>	Blond-crested Woodpecker
<i>Campephilus melanoleucos</i>	Crimson-crested Woodpecker
<i>Myrmorchilus strigilatus</i>	Stripe-backed Antbird
<i>Formicivora grisea</i>	White-fringed Antwren
<i>Formicivora melanogaster</i>	Black-bellied Antwren
<i>Herpsilochmus sellowi</i>	Caatinga Antwren
<i>Herpsilochmus atricapillus</i>	Black-capped Antwren
<i>Sakesphorus cristatus</i>	Silvery-cheeked Antshrike
<i>Thamnophilus capistratus</i>	Caatinga Antshrike
<i>Thamnophilus torquatus</i>	Rufous-winged Antshrike
<i>Thamnophilus pelzelni</i>	Planalto Slaty-Antshrike
<i>Taraba major</i>	Great Antshrike
<i>Hyalopezus ochroleucus</i>	White-browed Antpitta
<i>Sclerurus scansor</i>	Rufous-breasted Leaf-tosser
<i>Sittasomus griseicapillus</i>	Olivaceous Woodcreeper
<i>Campylorhamphus trochilirostris</i>	Red-billed Scythebill
<i>Dendroplex picus</i>	Straight-billed Woodcreeper
<i>Lepidocolaptes angustirostris</i>	Narrow-billed Woodcreeper
<i>Dendrocolaptes platyrostris</i>	Planalto Woodcreeper
<i>Xiphocolaptes falcirostris</i>	Moustached Woodcreeper
<i>Xenops rutilans</i>	Streaked Xenops
<i>Furnarius figulus</i>	Wing-banded Hornero
<i>Furnarius leucopus</i>	Pale-legged Hornero
<i>Megaxenops parnaguae</i>	Great Xenops
<i>Pseudoseisura cristata</i>	Caatinga Cacholote
<i>Phacellodomus rufifrons</i>	Rufous-fronted Thornbird
<i>Certhiaxis cinnamomeus</i>	Yellow-chinned Spinetail
<i>Gyalophylax hellmayri</i>	Red-shouldered Spinetail
<i>Synallaxis frontalis</i>	Sooty-fronted Spinetail
<i>Synallaxis albescens</i>	Pale-breasted Spinetail
<i>Synallaxis scutata</i>	Ochre-cheeked Spinetail
<i>Cranioleuca semicinerea</i>	Gray-headed Spinetail
<i>Neopelma pallescens</i>	Pale-bellied Tyrant-Manakin
<i>Antilophia bokermanni</i>	Araripe Manakin
<i>Myiobius atricaudus</i>	Black-tailed Flycatcher



<i>Pachyramphus viridis</i>	Green-backed Becard
<i>Pachyramphus polychopterus</i>	White-winged Becard
<i>Pachyramphus validus</i>	Crested Becard
<i>Xenopsaris albinucha</i>	White-naped Xenopsaris
<i>Procnias averano</i>	Bearded Bellbird
<i>Platyrinchus mystaceus</i>	White-throated Spadebill
<i>Leptopogon amaurocephalus</i>	Sepia-capped Flycatcher
<i>Tolmomyias flaviventris</i>	Yellow-breasted Flycatcher
<i>Todirostrum cinereum</i>	Common Tody-Flycatcher
<i>Hemitriccus striaticollis</i>	Stripe-necked Tody-Tyrant
<i>Hemitriccus margaritaceiventer</i>	Pearly-vented Tody-tyrant
<i>Hirundinea ferruginea</i>	Cliff Flycatcher
<i>Stigmatura napensis</i>	Lesser Wagtail-Tyrant
<i>Stigmatura budytoides</i>	Greater Wagtail-Tyrant
<i>Euscarthmus meloryphus</i>	Tawny-crowned Pygmy-Tyrant
<i>Camptostoma obsoletum</i>	Southern Beardless-Tyrannulet
<i>Elaenia flavogaster</i>	Yellow-bellied Elaenia
<i>Elaenia spectabilis</i>	Large Elaenia
<i>Elaenia chilensis</i>	Chilean Elaenia
<i>Elaenia cristata</i>	Plain-crested Elaenia
<i>Suiriri suiriri</i>	Suiriri Flycatcher
<i>Myiopagis caniceps</i>	Gray Elaenia
<i>Myiopagis viridicata</i>	Greenish Elaenia
<i>Phaeomyias murina</i>	Mouse-colored Tyrannulet
<i>Phyllomyias fasciatus</i>	Planalto Tyrannulet
<i>Serpophaga subcristata</i>	White-crested Tyrannulet
<i>Legatus leucophaeus</i>	Piratic Flycatcher
<i>Myiarchus swainsoni</i>	Swainson's Flycatcher
<i>Myiarchus ferox</i>	Short-crested Flycatcher
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher
<i>Casiornis fuscus</i>	Ash-throated Casiornis
<i>Pitangus sulphuratus</i>	Great Kiskadee
<i>Machetornis rixosa</i>	Cattle Tyrant
<i>Myiodynastes maculatus</i>	Streaked Flycatcher
<i>Megarynchus pitangua</i>	Boat-billed Flycatcher
<i>Myiozetetes similis</i>	Social Flycatcher
<i>Tyrannus melancholicus</i>	Tropical Kingbird
<i>Tyrannus savana</i>	Fork-tailed Flycatcher
<i>Empidonomus varius</i>	Variegated Flycatcher
<i>Myiophobus fasciatus</i>	Bran-colored Flycatcher
<i>Sublegatus modestus</i>	Southern Scrub-Flycatcher
<i>Fluvicola albiventer</i>	Black-backed Water-Tyrant
<i>Fluvicola nengeta</i>	Masked Water-Tyrant
<i>Arundinicola leucocephala</i>	White-headed Marsh Tyrant
<i>Cnemotriccus fuscatus</i>	Fuscous Flycatcher
<i>Lathrotriccus euleri</i>	Euler's Flycatcher

<i>Contopus virens</i>	Eastern Wood-Pewee
<i>Satrapa icterophrys</i>	Yellow-browed Tyrant
<i>Xolmis irupero</i>	White Monjita
<i>Cyclarhis gujanensis</i>	Rufous-browed Peppershrike
<i>Vireo olivaceus</i>	Red-eyed Vireo
<i>Hylophilus amaurocephalus</i>	Gray-eyed Greenlet
<i>Cyanocorax cyanopogon</i>	White-naped Jay
<i>Stelgidopteryx ruficollis</i>	Southern Rough-winged Swallow
<i>Progne tapera</i>	Brown-chested Martin
<i>Progne subis</i>	Purple Martin
<i>Progne chalybea</i>	Gray-breasted Martin
<i>Tachycineta albiventer</i>	White-winged Swallow
<i>Hirundo rustica</i>	Barn Swallow
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow
<i>Troglodytes musculus</i>	Southern House Wren
<i>Pheugopedius genibarbis</i>	Moustached Wren
<i>Cantorchilus longirostris</i>	Long-billed Wren
<i>Polioptila plumbea</i>	Tropical Gnatcatcher
<i>Turdus rufiventris</i>	Rufous-bellied Thrush
<i>Turdus leucomelas</i>	Pale-breasted Thrush
<i>Turdus amaurochalinus</i>	Creamy-bellied Thrush
<i>Mimus saturninus</i>	Chalk-browed Mockingbird
<i>Anthus lutescens</i>	Yellowish Pipit
<i>Coereba flaveola</i>	Bananaquit
<i>Saltator similis</i>	Green-winged Saltator
<i>Compsothraupis loricata</i>	Scarlet-throated Tanager
<i>Nemosia pileata</i>	Hooded Tanager
<i>Thlypopsis sordida</i>	Orange-headed Tanager
<i>Tachyphonus rufus</i>	White-lined Tanager
<i>Lanio pileatus</i>	Pileated Finch
<i>Tangara sayaca</i>	Sayaca Tanager
<i>Tangara palmarum</i>	Palm Tanager
<i>Tangara cayana</i>	Burnished-buff Tanager
<i>Schistochlamys ruficapillus</i>	Cinnamon Tanager
<i>Paroaria dominicana</i>	Red-cowled Cardinal
<i>Dacnis cayana</i>	Blue Dacnis
<i>Hemithraupis guira</i>	Guira Tanager
<i>Conirostrum speciosum</i>	Chestnut-vented Conebill
<i>Zonotrichia capensis</i>	Rufous-collared Sparrow
<i>Ammodramus humeralis</i>	Grassland Sparrow
<i>Sicalis flaveola</i>	Saffron Finch
<i>Sicalis luteola</i>	Grassland Yellow-Finch
<i>Volatinia jacarina</i>	Blue-black Grassquit
<i>Sporophila lineola</i>	Lined Seedeater
<i>Sporophila nigricollis</i>	Yellow-bellied Seedeater
<i>Sporophila albogularis</i>	White-throated Seedeater

<i>Sporophila leucoptera</i>	White-bellied Seedeater
<i>Sporophila bouvreuil</i>	Capped Seedeater
<i>Tiaris fuliginosus</i>	Sooty Grassquit
<i>Arremon taciturnus</i>	Pectoral Sparrow
<i>Piranga flava</i>	Hepatic Tanager
<i>Cyanoloxia brissonii</i>	Ultramarine Grosbeak
<i>Parula pitiayumi</i>	Tropical Parula
<i>Dendroica fusca</i>	Blackburnian Warbler
<i>Basileuterus culicivorus</i>	Golden-crowned Warbler
<i>Basileuterus flaveolus</i>	Flavescent Warbler
<i>Procacicus solitarius</i>	Solitary Black Caci que
<i>Icterus pyrrhopterus</i>	Variable Oriole
<i>Icterus jamacaii</i>	Campo Troupial
<i>Gnorimopsar chopi</i>	Chopi Blackbird
<i>Chrysomus ruficapillus</i>	Chestnut-capped Blackbird
<i>Agelaioides fringillarius</i>	Pale Baywing
<i>Molothrus bonariensis</i>	Shiny Cowbird
<i>Sturnella superciliaris</i>	White-browed Blackbird
<i>Sporagra yarrellii</i>	Yellow-faced Siskin
<i>Euphonia chlorotica</i>	Purple-throated Euphonia
<i>Estrilda astrild</i>	Common Waxbill
<i>Passer domesticus</i>	House Sparrow



**Appendix 2:** List of humid forest plant Families, species, authors of the formal species description, common names (if any), and their current specialists in Brazil (if any) that have been catalogued for the Araripe Plateau thus far.

	<b>FAMILY</b>	<b>SPECIES</b>	<b>REFERENCE</b>	<b>POPULAR NAME</b>	<b>SPECIALIST</b>
1	<b>ACANTHACEAE</b>	<i>Lepidagathis alopecuroidea</i> <i>Ruellia asperula</i> <i>Ruellia inundata</i>	(Vahl) R.Br. ex Griseb. (Mart. & Nees) Lindau Kunth		Cintia Kameyama
2	<b>AMARANTHACEAE</b>	<i>Alternanthera</i> sp. <i>Amaranthus spinosus</i> not identified	L.		
3	<b>ANACARDIACEAE</b>	<i>Astronium graveolens</i>	Jacq.		José Rubens Pirani
4	<b>ANGELONIACEAE</b>	<i>Angelonia</i> sp.1 <i>Angelonia</i> sp.2 <i>Angelonia</i> aff. <i>hooderiana</i>	Gardner		
5	<b>ANNONACEAE</b>	<i>Annona coriacea</i> <i>Annona exsucca</i> <i>Annona paludosa</i> <i>Xylopia frutescens</i>	Mart. DC. ex Dunal Aubl. Aubl.	Araticum-cagão Maria-preta Embiriba; Pindaíba	Renato de Mello-Silva J. C. Lopes
6	<b>APOCYNACEAE</b>	<i>Blepharodon nitidum</i> <i>Mandevilla scabra</i> <i>Tassadia burchellii</i>	(Vell.) J.F. Macbr. (Hoffmanns. ex Roem. & Schult.) K. Schum. E. Fourn.		Alessandro Rapini Diogo Araújo

7	<b>AQUIFOLIACEAE</b>			
		<i>Ilex</i> sp.		
8	<b>ARACEAE</b>			
		not identified		
9	<b>ARALIACEAE</b>			Pedro Fiaschi
		<i>Schefflera morototoni</i>	(Aubl.) Maguire, Steierm. & Frodin	
10	<b>ARECACEAE</b>			
		<i>Mauritia flexuosa</i>	L. f.	Buriti
		<i>Orbignya pharelata</i>	(Mart. ex Spreng.) Barb. Rodr.	Babaçu
		<i>Acrocomia intumescens</i>	Drude	Macaúba
11	<b>ARISTOLOCHIACEAE</b>			Danilo Gissi
		<i>Aristolochia labiata</i>	Willd.	
12	<b>ASTERACEAE</b>			Rita de Cássia A. Pereira
		<i>Ageratum conyzoides</i>	L.	Maria de Fátima Cavalcanti
		<i>Centratherum punctatum</i>	Cass.	M. Monge
		<i>Conocliniopsis prasiifolia</i>	(DC.) R.M. King & H. Rob.	
		<i>Elephantopus mollis</i>	Kunth	
		<i>Mikania cordifolia</i>	(L. f.) Willd.	
		<i>Mikania</i> sp.		
		<i>Porophyllum ruderale</i>	(Jacq.) Cass.	
		<i>Tridax procumbens</i>	L.	
		<i>Vernonia remotiflora</i>	Rich.	
		<i>Vernonia</i> sp.		
		<i>Wedelia villosa</i>	Gardner	
13	<b>BIGNONIACEAE</b>			Anselmo Nogueira
		<i>Amphilophium crucigerum</i>	(L.) L.G. Lohmann	
		<i>Handroanthus serratifolia</i>	(Vahl) G. Nicholson	Pau d'arco amarelo; Ipê amarelo
		<i>Pyrostegia venusta</i>	(Ker Gawl.) Miers	Cipó-de-são-joão

14	<b>BORAGINACEAE</b>	<i>Cordia bicolor</i> <i>Cordia corymbosa</i> <i>Cordia multispicata</i> <i>Cordia</i> sp. 1 <i>Cordia</i> sp. 2 <i>Cordia</i> sp. 3 <i>Cordia</i> sp. 4 <i>Cordia</i> sp. 5	A.DC. Willd. ex Roem. & Schult. Cham.	Garbaúba	
15	<b>BROMELIACEAE</b>	<i>Tillandsia loliacea</i>	Mart. ex Schult. f.	Enxerto	Gustavo Martinelli
16	<b>BURSERACEAE</b>	<i>Protium heptaphyllum</i>	(Aubl.) Marchand	Amescla	
17	<b>CAMPANULACEAE</b>	<i>Centropogon cornutus</i>	(L.) Druce		Silvana A. P. de Godoy
18	<b>CANNABACEAE</b>	<i>Trema micrantha</i>	(L.) Blume		Roseli B. Torres
19	<b>CELASTRACEAE</b>	<i>Maytenus</i> sp.1 <i>Maytenus</i> sp.2 <i>Maytenus</i> sp.3 <i>Maytenus</i> sp.4 <i>Salacia</i> sp.		Balaio-de-velho	
20	<b>CHRYSOBALANACEAE</b>	<i>Hirtella glandulosa</i> <i>Hirtella gracilipes</i> <i>Hirtella racemosa</i>	Spreng. (Hook. f.) Prance Lam.		
21	<b>CLUSIACEAE</b>	<i>Garcinia gardneriana</i>	(Planch. & Triana) Zappi		Volker Bittrich
22	<b>COMMELINACEAE</b>	<i>Commelina obliqua</i>	Vahl		Roxana Barreto Maria do Carmo Amaral



	<i>Dichorisandra thyrsiflora</i>	J.C. Mikan	
	<i>Floscopa glabrata</i>	(Kunth) Hassk.	
23	<b>CONVOLVULACEAE</b>		R. Simão Bianchini
	<i>Ipomoea</i> aff. <i>grandiflora</i>	(L. f.) Lam.	L. V. Vasconcelos
	<i>Jacquemontia saxicola</i>	L.B. Sm.	
	<i>Merremia aegyptia</i>	(L.) Urb.	
24	<b>CONNARACEAE</b>		
	not identified		
25	<b>COSTACEAE</b>		
	<i>Costus</i> cf. <i>spiralis</i>	(Jacq.) Roscoe	
26	<b>CUCURBITACEAE</b>		
	<i>Cayaponia tatyuya</i>	(Vell.) Cogn.	
	<i>Gurania spinulosa</i>	(Poepp. & Endl.) Cogn.	
27	<b>CYATHEACEAE</b>		Augusto Santiago
	<i>Cyathea pungens</i>	(Willd.) Domin	Sérgio Xavier
28	<b>CYPERACEAE</b>		Marcus Alves
	<i>Cyperus eragrostis</i>	Lam.	George Shepherd
	<i>Cyperus</i> cf. <i>haspan</i>	L.	
	<i>Eleocharis</i> cf. <i>plicarhachis</i>	(Griseb.) Svenson	
	<i>Fuirena</i> cf. <i>umbellata</i>	Rottb.	
	<i>Scleria bracteata</i>	Cav.	
	<i>Scleria macrophylla</i>	J. Presl & C. Presl	
	<i>Scleria melaleuca</i>	Rchb. ex Schldl. & Cham.	
	<i>Scleria</i> sp.		
29	<b>DILLENIACEAE</b>		Diogo Araújo
	<i>Doliocarpus dentatus</i>	(Aubl.) Standl.	
30	<b>EBENACEAE</b>		
	<i>Diospyros</i> sp.		
31	<b>ERYTHROXYLACEAE</b>		
	<i>Erythroxyllum</i> sp. 1		
	<i>Erythroxyllum</i> sp. 2		

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*Erytroxyllum* sp. 3

**32 EUPHORBIACEAE**

Maria de Fátima Lucena

<i>Acalypha</i> sp.	
<i>Croton betaceus</i>	Baill.
<i>Croton comosus</i>	Müll.Arg.
<i>Croton fuscescens</i>	Spreng.
<i>Croton lobatus</i>	L.
<i>Croton jacobinensis</i>	Baill.
<i>Croton klotzschianus</i>	(Wight) Thwaites
<i>Croton</i> sp.1	
<i>Croton</i> sp.2	
<i>Croton</i> sp.3	
<i>Mabea</i> sp.1	
<i>Mabea</i> sp.2	
<i>Manihot</i> sp.	
<i>Maprounea guianensis</i>	Aubl.
<i>Microstachys corniculata</i>	(Vahl) Griseb.
<i>Pogonophora</i> sp.	
<i>Sapium glandulosum</i>	(L.) Morong
<i>Sapium</i> sp.	
<i>Sebastiania</i> sp.	
<i>Senefeldera multiflora</i>	Mart.

**33 FABACEAE**

Vidal de Freitas Mansano

<i>Acacia polyphylla</i>	DC.	Haroldo C. de Lima
<i>Acacia</i> sp.		Angela Studart da F. Vaz
<i>Acacia tenuifolia</i>	(L.) Willd.	José Eduardo Meireles
<i>Albizia polycephala</i>	(Benth.) Killip ex Record	Juliana S. Marques
<i>Bauhinia unguolata</i>	L.	Elizabeth Córdula
<i>Cassia ferruginea</i>	(Schrad.) Schrad. ex DC.	Marli Pires
<i>Centrosema arenarium</i>	Benth.	Ana L. Bocage
<i>Chamaecrista diphylla</i>	(L.) Greene	Edson Nunes
<i>Chamaecrista nictitans</i>	(L.) Moench	Juliana S. Silva

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	<i>Chamaecrista repens</i>	(Vogel) H.S.Irwin & Barneby		Ana Paula Fortuna
	<i>Copaifera langsdorffii</i>	Desf.	Podói; Pau-d'óleo	Rita de Cássia A. Pereira
	<i>Cratylia argentea</i>	(Desv.) Kuntze		
	<i>Cratylia</i> sp.			
	<i>Crotalaria incana</i>	L.		
	<i>Desmanthus virgatus</i>	(L.) Willd.		
	<i>Desmodium</i> aff. <i>affine</i>	Schltl.		
	<i>Desmodium distortum</i>	(Aubl.) J.F.Macbr.		
	<i>Dimorphandra gardneriana</i>	Tul.	faveira	
	<i>Hymenaea courbaril</i>	L.	Jatobá	
	<i>Ingaingoides</i>	(Rich.) Willd.		
	<i>Inga laurina</i>	(Sw.) Willd.	Ingá	
	<i>Lonchocarpus araripensis</i>	Benth.	Angelim; Raiz de cobra	
	<i>Luetzerburgia</i> sp.			
	<i>Mimosa arenosa</i>	(Willd.) Poir.		
	<i>Mimosa sensitiva</i>	L.		
	<i>Mimosa xanthocentra</i> subsp. <i>xanthocentra</i>	Mart.		
	<i>Ormosia fastigiata</i>	Tul.		
	<i>Piptadenia stipulacea</i>	(Benth.) Ducke		
	<i>Rhynchosia minima</i>	(L.) DC.	Feijãozinho	
	<i>Senna cana</i>	(Nees & Mart.) H.S.Irwin & Barneby		
	<i>Senna obtusifolia</i>	(L.) H.S.Irwin & Barneby	Canafístula?	
	<i>Vatairea macrocarpa</i>	(Benth.) Ducke	Amargoso	
34	<b>GENTIANACEAE</b>			Harri Lorenzi
	<i>Irbachia</i> sp.			
35	<b>GESNERIACEAE</b>			Harri Lorenzi
	<i>Drymonia serrulata</i>	(Jacq.) Mart.		
36	<b>HELICONIACEAE</b>			



	<i>Heliconia psittacorum</i>	L. f.		
37	<b>HYMENOPHYLLACEAE</b>			Sérgio Xavier
	<i>Trichomanes pinnatum</i>	Hedw.		Augusto Santiago
38	<b>HYPERICACEAE</b>			Volker Bittrich
	<i>Vismia guianensis</i>	(Aubl.) Pers.	Lacre-vermelho	
39	<b>ICACINACEAE</b>			
	<i>Emmotum</i> sp.			
40	<b>LAMIACEAE</b>			
	<i>Amasonia</i> sp.			
	<i>Hyptis</i> cf. <i>martiusii</i>	Benth.		
	<i>Marsypianthes</i> sp.			
	<i>Vitex polygama</i>	Cham.	Mama-cachorro	
41	<b>LAURACEAE</b>			Roxana Barreto
	<i>Aiouea</i> sp.			João Batista Baitello
	<i>Nectandra cuspidata</i>	Nees & Mart.	Louro-urubu	T. I. Barbosa
	<i>Ocotea</i> aff. <i>pallida</i>	Nees		
	<i>Ocotea duartei</i>	Vattimo	Louro	
	<i>Ocotea duckei</i>	Vattimo		
	<i>Ocotea glomerata</i>	(Nees) Mez	Louro-bravo	
	<i>Ocotea limae</i>	Vattimo		
	<i>Ocotea nitida</i>	(Meisn.) Rohwer		
	<i>Ocotea opifera</i>	Mart.		
	<i>Ocotea pallida</i>	Nees	Louro-fedorento	
	<i>Ocotea</i> sp.1			
	<i>Ocotea</i> sp.2			
	<i>Ocotea</i> sp.3			
	<i>Ocotea</i> sp.4			
	<i>Ocotea</i> sp.5			
	<i>Ocotea</i> cf. <i>velloziana</i>	(Meisn.) Mez		
42	<b>LOGANIACEAE</b>			
	<i>Strychnos</i> sp.			
43	<b>LORANTHACEAE</b>			

	<i>Psittacanthus</i> sp.1			
	<i>Psittacanthus</i> sp.2			
	not identified			
44	<b>LYGODIACEAE</b>			
	<i>Lygodium venustum</i>	Sw.		
45	<b>MALPIGHIACEAE</b>			Maria Candida Henrique
	<i>Byrsonima sericea</i>	DC.	Murici-de-folha-fina	
	<i>Diplopterys lutea</i>	(Griseb.) W.R. Anderson & C. Davis		
46	<b>MALVACEAE</b>			Gerleni L. Esteves
	<i>Apeiba tibourbou</i>	Aubl.		Massim G. Bovini
	<i>Corchorus hirtus</i>	L.		Harri Lorenzi
	<i>Corchorus</i> sp.			
	<i>Gaya</i> aff. <i>triflora</i>	Hochr.		V. M. Gonçalves
	<i>Guazuma ulmifolia</i>	Lam.	Mutamba	C. Tacheuchi
	<i>Corchorus</i> sp.			
	<i>Herissantia</i> aff. <i>nemoralis</i>	(A. St.-Hil., Juss. & Cambess.) Brizicky		
	<i>Melochia pyramidata</i>	L.		
	<i>Pavonia malacophylla</i>	(Link & Otto) Garcke		
	<i>Pavonia sidifolia</i>	Kunth		
	<i>Sida cordifolia</i>	L.		
	<i>Sida urens</i>	L.		
	<i>Sida rhombifolia</i>	L.		
	<i>Sidastrum micranthum</i>	(A. St.-Hil.) Fryxell		
	<i>Triumfetta bogotensis</i>	DC.		
	<i>Urena lobata</i>	L.		
	<i>Waltheria indica</i>	L.		
	<i>Waltheria</i> sp.			
	<i>Waltheria viscosissima</i>	A. St.-Hil.		
	not identified			
47	<b>MELASTOMATACEAE</b>			Angela Borges

	<i>Clidemia cf. biserrata</i>	DC.		J. B. S. Oliveira
	<i>Clidemia capitellata</i>	(Bonpl.) D. Don		
	<i>Clidemia hirta</i>	(L.) D. Don		
	<i>Clidemia</i> sp.			
	<i>Henriettea succosa</i>	(Aubl.) DC.		
	<i>Miconia albicans</i>	(Sw.) Steud.	Candeeiro	
	<i>Miconia chamissois</i>	Naudin	João-mole	
	<i>Miconia ciliata</i>	(Rich.) DC.		
	<i>Miconia ibaguensis</i>	(Bonpl.) Triana	Candeeiro-d'água	
	<i>Miconia prasina</i>	(Sw.) DC.		
	<i>Miconia</i> sp.			
	<i>Miconia stenostachya</i>	DC.		
	<i>Tibouchina multiflora</i>	Cogn.		
	<i>Tibouchina stenocarpa</i>	(DC.) Cogn.		
48	<b>MELIACEAE</b>			J. A. Pastore
	<i>Trichilia hirta</i>	L.		
	<i>Guarea guidonia</i>	(L.) Sleumer	Gitó	
49	<b>MENISPERMACEAE</b>			J. M. A. Braga
	<i>Cissampelos tropaeolifolia</i>	DC.		
	<i>Cissampelos</i> sp.			
50	<b>MORACEAE</b>			Sérgio Romaniuc Neto
	<i>Brosimum utile</i>	(Kunth) Oken		A. Santos
	<i>Brosimum</i> aff. <i>rubescens</i>	Taub.		
	<i>Ficus gomelleira</i>	Kunth & C.D. Bouché		
51	<b>MYRTACEAE</b>			Marcos Sobral
	<i>Eugenia florida</i>	DC.		Osny T. de Aguiar
	<i>Eugenia espécie nova</i>			Fiorella Mazine
	<i>Eugenia</i> sp.1			
	<i>Myrcia guianensis</i>	(Aubl.) DC.		
	<i>Myrcia prunifolia</i>	DC.		
	<i>Myrcia multiflora</i>	(Lam.) DC.	cambuí-bravo	
	<i>Myrcia splendens</i>	(Sw.) DC.		



	<i>Myrcia tomentosa</i>	(Aubl.) DC.		
	<i>Psidium guianense</i>	Pers.		
	<i>Psidium rufum</i>	DC.		
	<i>Psidium sp.</i>			
52	<b>NYCTAGINACEAE</b>			Cyl Farney Catarino de Sá
	<i>Guapira opposita</i>	(Vell.) Reitz		
	<i>Guapira sp.</i>			
53	<b>OCHNACEAE</b>			K. Yamamoto
	<i>Ouratea cf. castaneifolia</i>	(DC.) Engl.	Pau-piranha	
	<i>Ouratea parvifolia</i>	Engl.	Louro-amarelo	
54	<b>ONAGRACEAE</b>			Harri Lorenzi
	<i>Ludwigia cf. octovalvis</i>	(Jacq.) P.H. Raven		
	<i>Ludwigia sp.1</i>			
	<i>Ludwigia sp.2</i>			
	<i>Ludwigia sp.3</i>			
55	<b>ORCHIDACEAE</b>			
	<i>Catasetum barbatum</i>	(Lindl.) Lindl.		
	<i>Oeceoclades maculata</i>	(Lindl.) Lindl.		
56	<b>OXALIDACEAE</b>			Pedro Fiaschi
	<i>Oxalis cratensis</i>	Hook.		
57	<b>PASSIFLORACEAE</b>			L. Carlos Benacci
	<i>Passiflora laurifolia</i>	L.	maracujá-peroba-do-mato	Diogo Araújo
	<i>Passiflora rubra</i>	L.		
	<i>Passiflora cf. rubra</i>	L.		
	<i>Passiflora suberosa</i>	L.		
	<i>Passiflora tricuspis</i>	Mast.		
58	<b>PLANTAGINACEAE</b>			
	<i>Achetaria sp.</i>			
	<i>Stemodia cf. foliosa</i>	Benth.		
59	<b>PICRAMNIACEAE</b>			
	<i>Picramnia sellowii</i>	Planch.		

60	<b>PIPERACEAE</b>				Elsie Franklin Guimarães
		<i>Piper aduncum</i>	<i>Piper aduncum</i>	L.	
		<i>Piper arboreum</i> var. <i>arboreum</i>	<i>Piper arboreum</i> var. <i>arboreum</i>	Aubl.	
		<i>Piper arboreum</i> var. <i>hirtellum</i>	<i>Piper arboreum</i> var. <i>hirtellum</i>	Yunck.	
		<i>Piper</i> aff. <i>dilatatum</i>	<i>Piper</i> aff. <i>dilatatum</i>	Rich.	
		<i>Piper hispidum</i>	<i>Piper hispidum</i>	Sw.	
			<i>Piper</i> sp.1		
			<i>Piper</i> sp.2		
61	<b>PHYLLANTHACEAE</b>				Maria de Fátima Lucena
			<i>Hieronyma alchorneoides</i>	Allemão	Pau-caixão; Louro d'água
			<i>Margaritaria nobilis</i>	L.f.	Cabelo-de-cutia- branca
62	<b>POACEAE</b>				Maria Bernadete C. e Silva
			<i>Ichnanthus pallens</i>	(Sw.) Munro ex Benth.	Taquari
			<i>Lasiacis</i> cf. <i>divaricata</i>	(L.) Hitchc.	J. R. Maciel
			<i>Lasiacis ligulata</i>	Hitchc. & Chase	
			<i>Panicum milleflorum</i>	Hitchc. & Chase	
			<i>Panicum pilosum</i>	Sw.	
			not identified 1		
			not identified 2		
63	<b>POLYGONACEAE</b>				
			<i>Coccoloba</i> sp.1		Croaçu
			<i>Coccoloba</i> sp.2		Croaçu
64	<b>PRIMULACEAE</b>				Sigrid L. Jung-Mendaçolli
			<i>Cybianthus detergens</i>	Mart.	
65	<b>RHAMNACEAE</b>				
			<i>Colubrina glandulosa</i>	Perkins	
			<i>Gouania</i> sp.		
66	<b>RUBIACEAE</b>				Elnatan Bezerra de Souza
			<i>Alibertia</i> sp.		Marcela S. Silveira
			<i>Borreria brownii</i>	(Rusby) Standl.	Harri Lorenzi

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<i>Borreria capitata</i>	(Ruiz & Pav.) DC.
<i>Borreria densiflora</i>	DC.
<i>Borreria scabiosoides</i>	Cham. & Schltdl.
<i>Chiococca alba</i>	(L.) Hitchc.
<i>Chomelia obtusa</i>	Cham. & Schltdl.
<i>Coccocypselum lanceolatum</i>	(Ruiz & Pav.) Pers.
<i>Cordia myrciifolia</i>	(K. Schum.) C.H. Perss. & Delprete
<i>Coussarea hydrangaefolia</i>	(Benth.) Benth. & Hook. f. ex Müll. Arg.
<i>Faramea nitida</i>	Benth.
<i>Genipa americana</i>	L.
<i>Guettarda viburnoides</i>	Cham. & Schltdl.
<i>Manettia cordifolia</i>	Mart.
<i>Psychotria colorata</i>	(Willd. ex Roem. & Schult.) Müll. Arg.
<i>Richardia scabra</i>	L.
<i>Sabicea cinerea</i>	Aubl.

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67 **RUTACEAE**

José Rubens Pirani

<i>Zanthoxylum rhoifolium</i>	Lam.	Limãozinho
<i>Zanthoxylum caribaeum</i>	Lam.	

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68 **SAPINDACEAE**

Marcondes Oliveira

<i>Allophylus edulis</i>	(A. St.-Hil., A. Juss. & Cambess.) Hieron. ex Niederl.	
<i>Allophylus</i> sp.1		
<i>Allophylus</i> sp.2		
<i>Allophylus</i> sp.3		
<i>Cardiospermum</i> aff. <i>corindum</i>	L.	cipó-de-vaqueiro; balaõzinho
<i>Cupania</i> sp.		

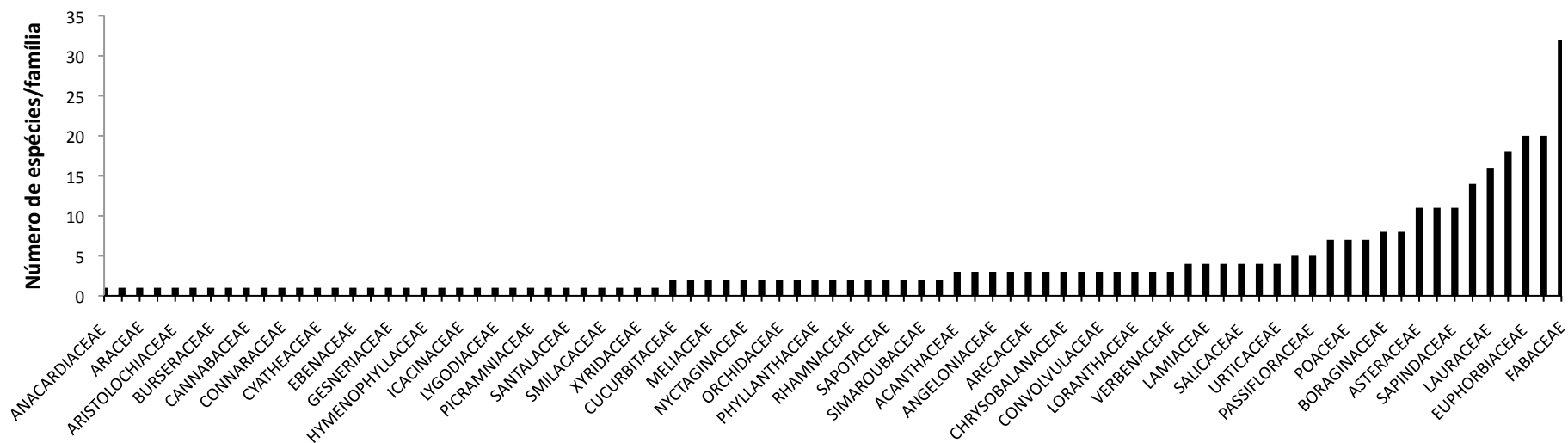
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	<i>Magonia pubescens</i>	A. St.-Hil.	Tingui	
	<i>Paullinia pinnata</i>	L.		
	<i>Serjania cf. lethalis</i>	A. St.-Hil.	Croapé; curaquê	
	<i>Serjania cf. paucidentata</i>	DC.		
	not identified			
<b>69</b>	<b>SALICACEAE</b>			Ronaldo Marquete
	<i>Banara guianensis</i>	Aubl.		
	<i>Casearia grandiflora</i>	Cambess.	Café-bravo	
	<i>Casearia javitensis</i>	Kunth		
	<i>Xylosma ciliatifolia</i>	(Clos) Eichler		
<b>70</b>	<b>SANTALACEAE</b>			
	<i>Phoradendrum</i> sp.		Erva-de-passarinho	
<b>71</b>	<b>SAPOTACEAE</b>			
	<i>Chrysophyllum gonocarpum</i>	(Mart. & Eichler ex Miq.) Engl.		
	not identified			
<b>72</b>	<b>SCHOEPFIACEAE</b>			
	<i>Schoepfia</i> sp.			
	<i>Schoepfia obliquifolia</i>	Turez.		
<b>73</b>	<b>SIMAROUBACEAE</b>			
	<i>Simarouba amara</i>	Aubl.	Craíba	
	<i>Simarouba versicolor</i>	A. St.-Hil.		
<b>74</b>	<b>SIPARUNACEAE</b>			José Rubens Pirani
	<i>Siparuna guianensis</i>	Aubl.	Saboneteira	
<b>75</b>	<b>SMILACACEAE</b>			Ariane Luna Peixoto
	<i>Smilax cf. officinalis</i>	Kunth		
<b>76</b>	<b>SOLANACEAE</b>			
	<i>Acnistus</i> sp.			
	<i>Brunfelsia</i> sp.			
	<i>Cestrum</i> sp. 1			
	<i>Cestrum</i> sp. 2			



	<i>Solanum asperum</i> <i>Solanum</i> sp1. <i>Solanum</i> sp2.	Rich.		
<b>77</b>	<b>STYRACACEAE</b>			
	<i>Styrax camporum</i> <i>Styrax</i> cf. <i>camporum</i>	Pohl Pohl	Corcunda	
<b>78</b>	<b>TURNERACEAE</b>			
	<i>Turnera</i> sp. 1 <i>Turnera</i> sp. 2 <i>Turnera</i> sp. 3 not identified			
<b>79</b>	<b>URTICACEAE</b>			Sérgio Romaniuc Neto
	<i>Cecropia pachystachya</i> <i>Urera caracasana</i>  <i>Urera</i> cf. <i>baccifera</i> <i>Urera</i> sp.	Trécul (Jacq.) Gaudich. ex Griseb. (L.) Gaudich. ex Wedd.	Toré;Torém Urtiga  Urtiga	André Luiz Gaglioti
<b>80</b>	<b>VERBENACEAE</b>			
	<i>Lantana camara</i> <i>Lantana</i> sp. <i>Stachytarpheta</i> sp.	L.	Chumbinho; Camará	
<b>81</b>	<b>VITACEAE</b>			
	<i>Cissus erosa</i>	Rich.		
<b>82</b>	<b>XYRIDACEAE</b>			Maria das G. Wanderley
	<i>Xyris</i> sp.			
<b>83</b>	<b>ZINGIBERACEAE</b>			
	<i>Hedychium coronarium</i>	J.Koenig		

**Appendix 3:** Graph showing the number of humid forest plant species for each taxonomic Family that has been catalogued for the Araripe Plateau thus far (X axis gives each Family designation, Y axis represents the number of species per Family).



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