



**ZSL**

**LET'S WORK  
FOR WILDLIFE**



# Conserving the Pygmy Sloth

## Project Summary 2017





# Overview

The Critically Endangered pygmy sloth *Bradypus pygmaeus* is only found on the tiny island of Escudo de Veraguas in Panama. Although Escudo is protected, its natural resources are utilized by local communities and threatened by overexploitation of fisheries, increasing tourism pressure, extraction of timber and increasing amounts of litter.

This project is conducting detailed ecological surveys of pygmy sloths, combined with socio-economic surveys in dependent fishing communities, to better understand the nature and impact of known threats to the pygmy sloth. Targeted outreach and educational programmes are increasing local awareness, enhancing public support for conservation, establishing sustainable resource management, and supporting local authorities in enforcing legal regulations to protect the pygmy sloth and its mangrove habitats.



# Introduction

The pygmy three-toed sloth *Bradypus pygmaeus* is endemic to Isla Escudo de Veraguas, a 4.3 km<sup>2</sup> island 17km off mainland Panama. It is listed as Critically Endangered due to its small population size and restricted range. Described in 2001, it is considered to be Evolutionarily Distinct and Globally Endangered, ranked at #16 on ZSL's EDGE mammal list ([www.edgeofexistence.org](http://www.edgeofexistence.org)), and hence a global conservation priority.

Escudo is the only land mass in the 41,596ha Escudo de Veraguas-Dego Protected Sanctuary, part of the Ngobe-Bugle Indigenous Lands, designated in 2009 (Resolucion 0095-2009) by the National Environmental Authority (Mi Ambiente). Although uninhabited, there are seasonal visitors. Fishermen and lobster divers from the local indigenous communities are allowed to harvest fish and lobster and temporarily live on Escudo during the fishing season. However, illegal fishing of turtles and sharks remains a problem, as does small scale removal of wood for timber and charcoal. Numbers of local and international tourists are increasing and there is no management of litter on the island, posing further threats to the ecology of the island.

Historically there has been little conservation attention or support for the pygmy three toed sloth and the International Union for the Conservation of Nature (IUCN) Xenarthan (Anteater, Sloth and Armadillo) Specialist Group has identified a need to improve enforcement and raise awareness of the island's protected status. As Escudo is part of the Ngobe-Bugle heritage, the indigenous people wish to achieve a balance between their customs and culture and protection of the island. Our aims are therefore to integrate monitoring of the pygmy sloth with a comprehensive community engagement programme to raise awareness and promote sustainable resource use.

ZSL's EDGE of Existence Programme highlights the pygmy sloth as one of its flagship species and is committed to building capacity for its conservation through supporting Panamanian conservationist, Dr. Diorene Smith. Diorene is an alumna of the EDGE of Existence Fellowship; a programme of training and support for early career conservationists. As a direct result of our support, Diorene is now recognised as a champion for the pygmy sloth and received the Disney Conservation Hero award in 2016. She has joined the IUCN Xenarthan Specialist Group and has helped to establish a collaborative 'Committee for the Protection of the Pygmy Sloth' overseeing conservation and research activities.

We are working collaboratively with local communities, NGOs, local and national authorities with the goal of conserving the pygmy sloth and achieving effective sustainable management of Escudo. Conservation of Escudo benefits not only the pygmy sloth, but other endemic species and subspecies including: the fruit bat *Artibeus incommutatus*, the Escudo rufous-tailed hummingbird *Amazilia tzacatl handleyi*, Escudo manakin *Manacus vitellus amitinus*, Escudo bay wren *Thryothorus nigricapillus oedipus*, Escudo blue-gray tanager *Thraupis episcopus caesitia*, and maritime worm salamander *Oedipina maritima*.







# Personnel

**Dr. Nisha Owen**, EDGE of Existence Programme Manager, Zoological Society of London. Responsible for general oversight of the project, mentoring of, training and technical support for the co-PI, Dr Diorene Smith.

**Dr. Diorene Smith**, Summit Zoo, Panama City. Responsible for co-ordinating ecological and socio-economic surveys, outreach and educational activities, stakeholder workshops and community engagement. As a qualified veterinarian, Diorene ensures animal welfare is paramount in all ecological surveys.

**Dr. Claudia Gray**, EDGE of Existence Conservation Biologist, Zoological Society of London. Responsible for technical support and capacity building, data management and analysis and assisting with fundraising.

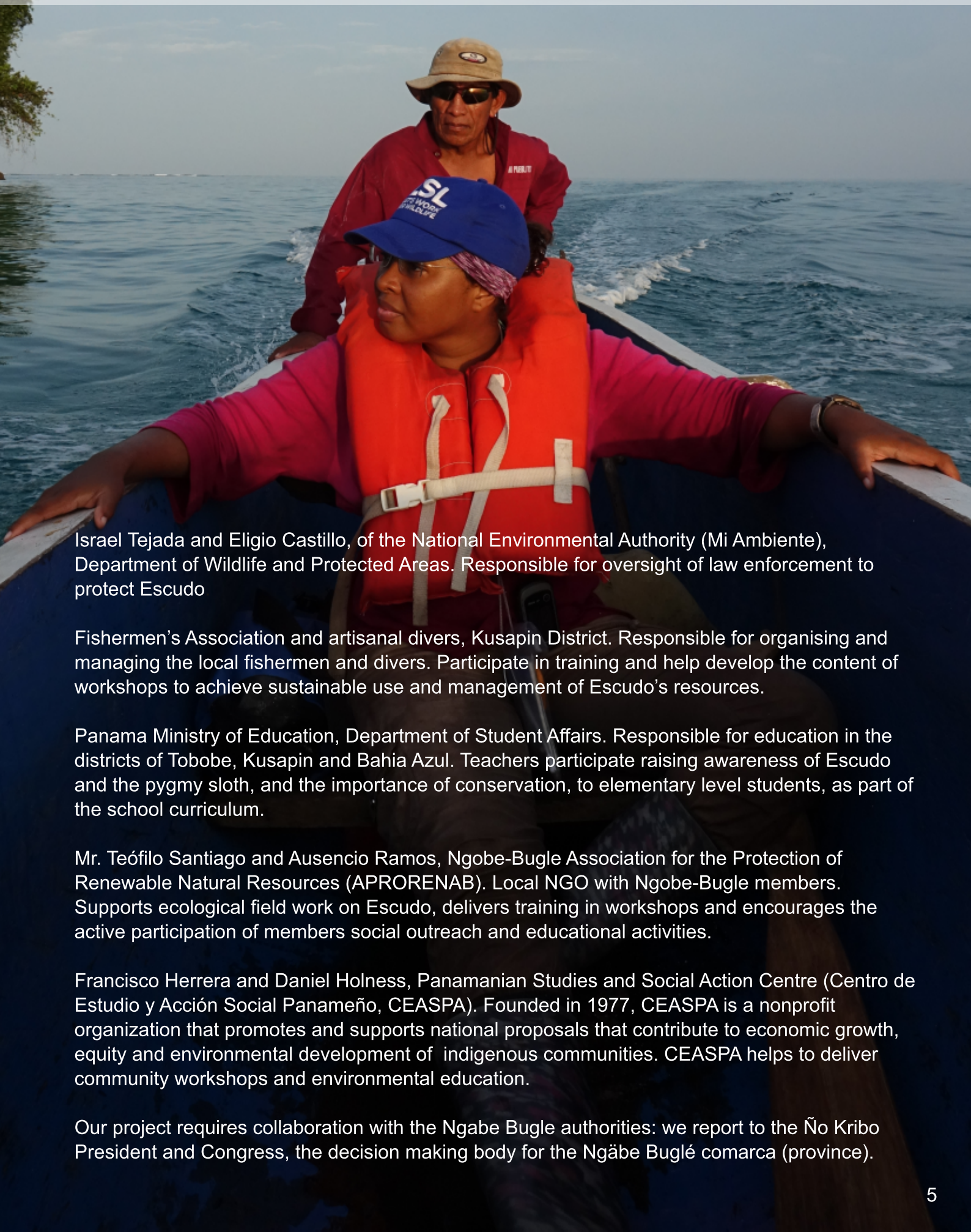
**Ms Cassandra Murray**, Discovery & Learning Evaluation Officer, Zoological Society of London. Provides support for the communication, education and public awareness aspects of the project.

**Hidalgo Taylor, assistant to the Mayor of Kusapin District.** Responsible for assisting with long term monitoring of the pygmy sloth and liaising with local communities.

**Local staff.** Provide boat transport to and from Escudo and for travel around the local communities, for cooking and logistics on Escudo.



# Project Partners and Local Collaborators



Israel Tejada and Eligio Castillo, of the National Environmental Authority (Mi Ambiente), Department of Wildlife and Protected Areas. Responsible for oversight of law enforcement to protect Escudo

Fishermen's Association and artisanal divers, Kusapin District. Responsible for organising and managing the local fishermen and divers. Participate in training and help develop the content of workshops to achieve sustainable use and management of Escudo's resources.

Panama Ministry of Education, Department of Student Affairs. Responsible for education in the districts of Tobobe, Kusapin and Bahia Azul. Teachers participate raising awareness of Escudo and the pygmy sloth, and the importance of conservation, to elementary level students, as part of the school curriculum.

Mr. Teófilo Santiago and Ausencio Ramos, Ngobe-Bugle Association for the Protection of Renewable Natural Resources (APRORENAB). Local NGO with Ngobe-Bugle members. Supports ecological field work on Escudo, delivers training in workshops and encourages the active participation of members social outreach and educational activities.

Francisco Herrera and Daniel Holness, Panamanian Studies and Social Action Centre (Centro de Estudio y Acción Social Panameño, CEASPA). Founded in 1977, CEASPA is a nonprofit organization that promotes and supports national proposals that contribute to economic growth, equity and environmental development of indigenous communities. CEASPA helps to deliver community workshops and environmental education.

Our project requires collaboration with the Ngabe Bugle authorities: we report to the Ño Kribo President and Congress, the decision making body for the Ngäbe Buglé comarca (province).



# Project Goals and Objectives

**Overall project goal:** Effective long-term conservation of the pygmy sloth on Escudo through the development of a participatory management plan supported by all stakeholders and based on sound science.

*Research Goal: Instigate a long-term monitoring programme assessing the pygmy sloth population, ecology and threats.*

Objective 1: Implement standardized monitoring protocols to enable long-term monitoring of the pygmy sloth population and facilitate rapid detection of any population declines, within the coastal mangroves, interior tropical forests, and swamps.

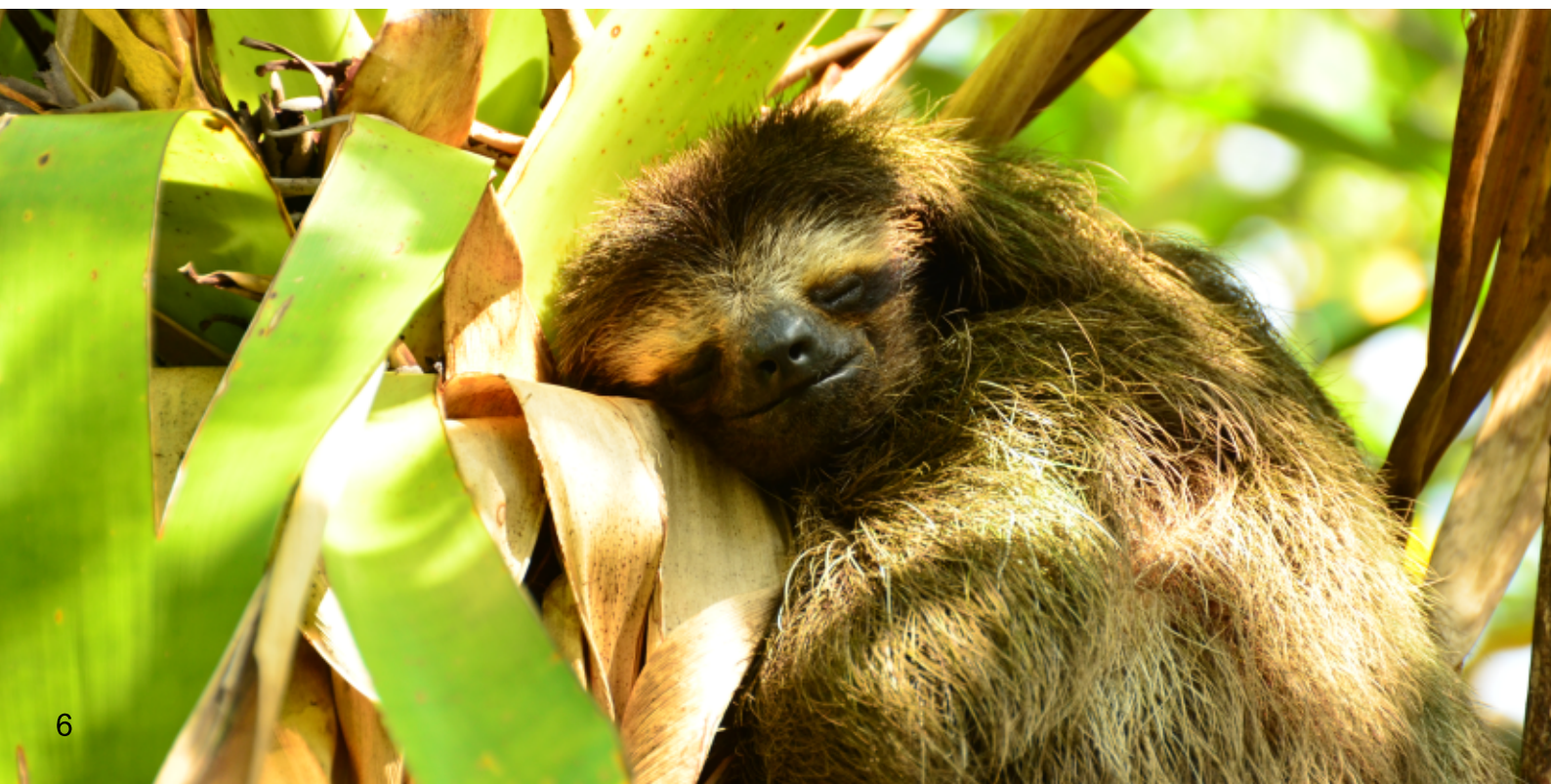
Objective 2: Assess habitat use of the pygmy sloth throughout the island to determine particular strongholds and areas of concern for the continued survival of the pygmy sloth.

Objective 3: Understand the main threats to the pygmy sloth from human activities on the island, and any natural or environmental changes.

*Community Education Goal: Raise awareness of the importance of protecting Escudo and sustainable resource use, using the pygmy sloth as a flagship species among local communities in the region.*

Objective 4: Implement comprehensive outreach activities and environmental education aimed at the children and families of the Ngabe Bugle communities that use Escudo's resources.

Objective 5: Educate Fishermen and artisanal divers on the sustainable use of the resources of Escudo and the importance of conservation, through training workshops developed and held in partnership with Mi Ambiente.







*Conservation Goal: Successful development of a participatory management plan for the pygmy sloth and island of Escudo, achieved through local support of conservation and the building of in-country capacity.*

Objective 6: Strengthen the membership base and involvement of the local NGO APRORENAB Ngobe-Bugle Association with ANAM, to involve members in outreach, training and educational activities, and to inspire support for conservation.

Objective 7: Facilitate and develop a network of stakeholders with interests in Escudo and the pygmy sloth, to ensure inclusion and participation in all related activities, to promote conservation and sustainable practices on and around Escudo.

Objective 8: Develop a network between communities and authorities to assist in the enforcement of environmental laws, and to facilitate reporting of illegal activities, such as logging for export, collection of animals or plants, pollution.

Objective 9: Produce a comprehensive participatory management plan for Escudo focusing on the pygmy sloth and its habitats as the flagship species.

Objective 10: In-country capacity built through mentoring and supporting Dr. Diorene Smith, training local field assistants and APRORENAB members in continuing monitoring; and empowering local communities to be capable of contributing towards conservation management of Escudo.





# Achievements to date

ZSL scientists, including Diorene, have undertaken ecological assessments of the sloth population in Escudo's mangroves. Permanent transects were established in 2014 and are surveyed twice a year as part of a long term monitoring scheme that would detect changes in abundance. To date we have completed a total of 245 transects covering over 25 km and recording 259 sloths. Diorene has officially confirmed the presence of the pygmy sloth in the forests, outside their previously believed mangrove habitat. 5 adult pygmy sloths have been radio collared, confirming that individual sloths have a very restricted home range that includes both mangrove and forest habitats. GPS trackers and backpacks have been trialed on the sloths and methods to investigate whether the sloths show seasonal changes in habitat use continue to be developed. Field surveys have recorded increasing human disturbances on the island, in the form of intensifying pressures from tourism, mangrove cutting and logging, and unsustainable marine exploitation such as shark-finning and turtle netting.

Outreach and engagement events highlight the work on Escudo with pygmy sloths to indigenous communities throughout Kusapin District. Four stakeholder workshops were held between 2014 and 2016, engaging a total of 260 participants across four communities with information on the ecology of Escudo, the pygmy sloth and the management of the Ngabe Bugle natural heritage. In response to feedback and discussion at these workshops, we ran the first tailor-made workshop on sustainable livelihoods in 2017. 79 attendees received presentations on working with researchers, engaging with tourism and setting up a community bank, with speakers strongly emphasizing the positive role that women are able to play in sustainable livelihoods. Attendees expressed their interest in embracing new sources of income and were pleased with the opportunity to discuss their thoughts and concerns with representatives from Mi Ambiente. These workshops have also been attended by district authorities, regional and general Congress representatives and the Mayor of Kusapin.

More than 1160 children in 7 schools between the ages of 5 and 12 have now enjoyed watching an innovative puppet theatre highlighting the pygmy sloth and the island of Escudo. This storytelling drama was a new style of activity for these rural schools and was very well received. In communities where the play was delivered in an open courtyard and announced by a loud speaker, many other members of the community also came to watch. Alongside each play, the schools received 50 interactive activity books and a poster highlighting the unique natural heritage of Escudo.

Additional support will enable this project to continue to develop relationships with stakeholders and improve ecological knowledge on the species, working towards the ultimate goal of a participatory management plan for Escudo. Specifically, 2018 activities will involve:

- Rolling out a conservation project planning contest at three high schools, to engage older children in conservation of their natural heritage
- Repeating the sustainable livelihood workshop at 2 more communities
- Continued monitoring of the sloth population using transect surveys, radio-collars, and suitable satellite tags to better understand their ecology and the impacts of human activities on Escudo.



# Ecological Research

## Methodology

Diorene Smith and this project have led on the majority of research on the pygmy sloth to date. The pygmy sloth was only recognised and described in 2001 (Anderson & Handley 2001), and is IUCN red-listed as Critically Endangered (Anderson et al. 2011) due to a small population size and restricted range. This species is of particular importance due to its Evolutionary Distinctiveness and Global Endangerment (Collen et al. 2011), resulting from its unique dwarfism evolved in an insular environment (Anderson & Handley 2002).

Population surveys in 2012 and 2013 focused only on the coastal mangrove habitats and estimated ~100 individuals in approximately ~1.5km<sup>2</sup> of mangroves (Kaviar et al. 2012). However, local knowledge indicated the presence of sloths in the tropical forests around the island, despite scientists previously believing that sloths were restricted to the mangroves. The presence of sloths in the forest habitat has been confirmed for the first time by this project. This project has established a long-term monitoring scheme to enable the detection of any population declines.

All mangrove patches on the island have now been identified and mapped (see Fig. 1) and surveys of 31 permanent transects (see Fig. 2) continue to be conducted twice per year. The surveys take place in March and October; stormy weather prevents travel to the island between May and October. Transects are surveyed on foot and when a pygmy sloth is sighted, data recorded includes distance from observer, height above ground, compass bearing from observer and to transect, habitat type, age and sex, behavioural notes, and GPS locations for every sloth. Encounter rates calculated from the surveyed transects produce estimates of relative abundance, which are used to identify core areas of habitat with greater numbers of sloths and to detect any changes in abundance over time.

Given the limited information currently known about the pygmy sloth and its use of the habitats on Escudo, we have used radiocollars and started exploring the use of GPS tags to track the sloths movement. In March/April 2015, we collared 5 adult pygmy sloths (3 males and 2 females, greater than 3kgs and not pregnant) using radio collars (ATS Tracking, M1940). This was combined with tracking devices called 'Mataki' tags (mataki.org) which were glued onto the sloths fur. These tags enable downloading of information to handheld devices, so the sloths do not need to be recaptured, and are lighter and more economical than satellite collars. To refine the tracking methodology, in April 2017, we deployed another tracking device (IgotU gt120), which does not have remote download facility but has more robust data storage and battery life. We tried this tracker in a backpack design which has previously been used on the larger mainland three-toed sloth *Bradypus variegatus*.



Pygmy sloth wearing radio collar



## Anthropogenic threats

Data is also collected on anthropogenic disturbance throughout Escudo, both in standardised formats on transects and presence / absence surveys, and anecdotally, when encountered. Anthropogenic use is primarily deforestation and mangrove cutting, and data was recorded on the extent, age, and location of such incidents. Ongoing data collection through socio-economic surveys assesses resource use, attitudes, knowledge, and behaviours around and on Escudo.

## Research permissions

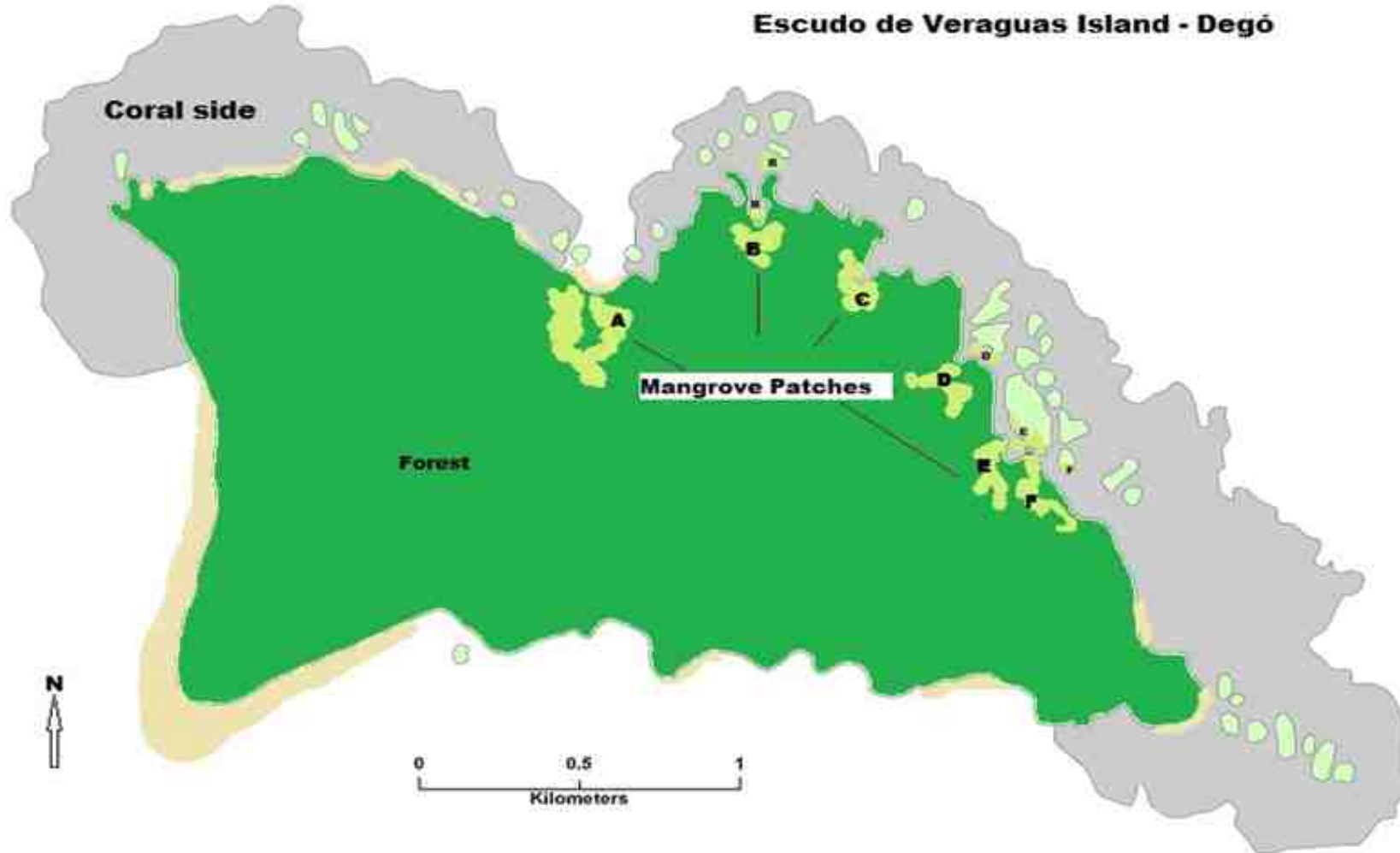
This project has obtained a scientific research permit granted by the National Environmental Authority (ANAM) for all proposed activities. The Ngobe-Bugle authorities govern through local 'caciques', and a national and regional Congress. As Escudo is part of the Indigenous lands, all research requires the approval of local chiefs, which we renew each year.

## Welfare & ethics

The pygmy sloth *Bradypus pygmaeus*, like its closest relative *Bradypus variegatus*, is a quiet species that allow simple and brief handling for placement of the collars and trackers. They do not require the use of anaesthetics or sedatives. The combined weight of the collar and tracker is below the 3% maximum bodyweight standard in movement ecology research. The placing of collars and trackers takes a maximum of 20 minutes, minimising the level of stress experienced by the sloths. The backpack was tailored to lie comfortably under the fur and prevent any snagging on branches. If it is not retrieved in 12 months the straps of the backpack will rot and the backpack will fall off, preventing any harm to the sloth. No other methods are invasive or require any handling or interference with animals.

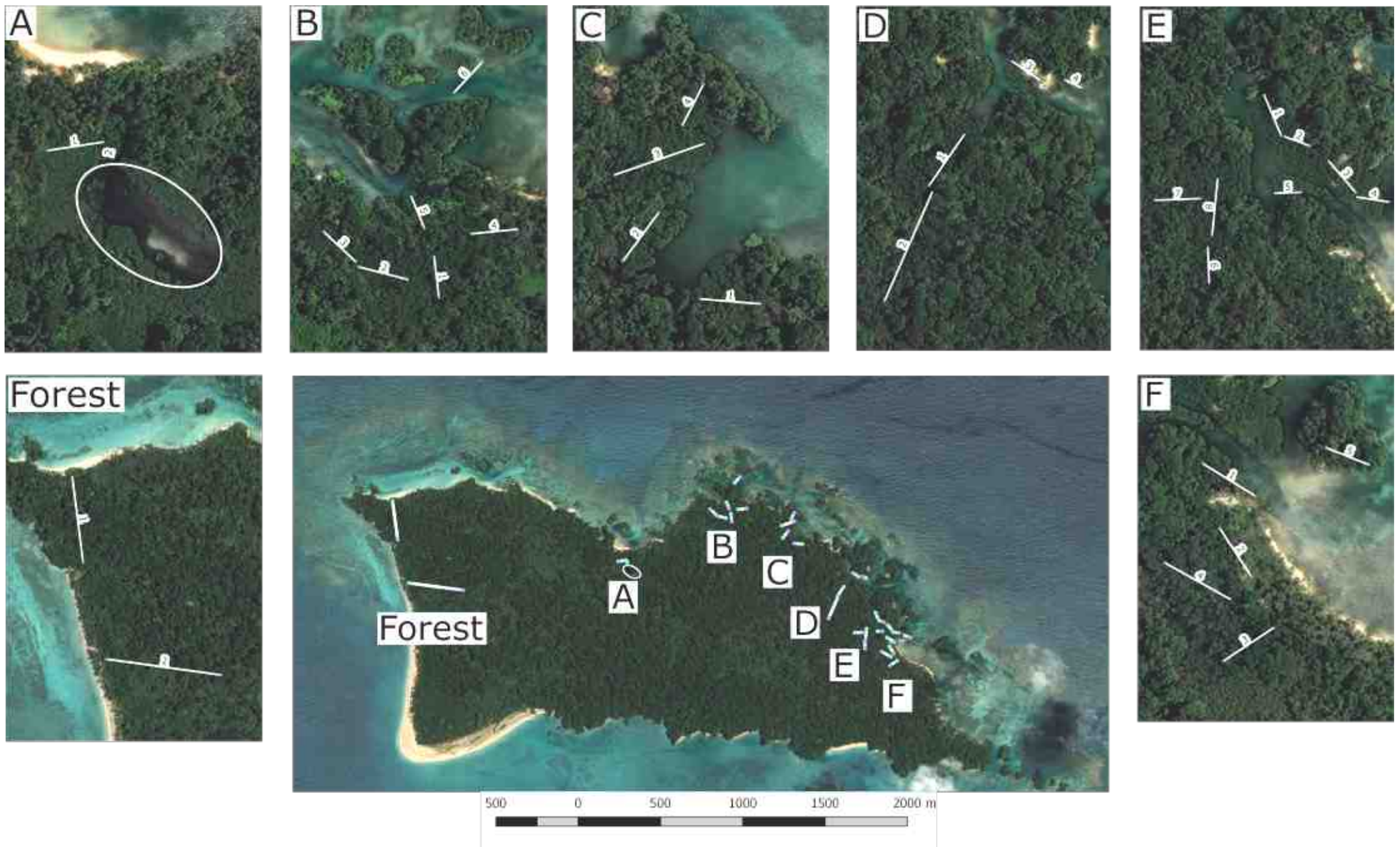






**Fig 1.** All mangrove patches on Escudo have now been mapped.





**Fig 2.** Locations of the 31 permanent transects that have been established in the six mangrove patches and in the forest on Escudo



# Ecological Research

## Results

Between 2014 and 2017 a total of 8 field visits to Escudo have been completed. We have surveyed 245 transects covering over 25 km. To date 259 pygmy sloths have been recorded. We have established a baseline that will allow us to detect changes in pygmy sloth abundance; no declines have been seen since 2014 (Fig. 3).

In October 2014, the presence of the pygmy sloth was officially confirmed for the first time ever deep in the forests, when a female pygmy sloth was observed on a tree on one of the forest transects. Since then, 3 more sloths have been observed on the forest transects. However, the height of the canopy makes surveys in the forest much more difficult than those in the mangroves.

The 5 individuals fitted with radiocollars in April 2015 have been relocated each field season. Two females have been seen to breed successfully wearing radiocollars. Whenever possible, all individuals have been weighed and they have maintained a healthy weight while wearing the collars. Although the individuals have not always been directly visible, by mapping the approximate location of the sloths on each field survey we have confirmed that each individual uses both forest and mangrove habitat. Also, we have seen that at least in the spring and autumn seasons the individuals can be found within 200 – 300m of where they were first collared.

Of the tags deployed in 2015, unfortunately none were recovered; most likely they had detached due to the humidity and salt-water corrosion present within the mangroves. Of the five, 3 relocated individuals were confirmed to no longer have tags. The 2 other collared individuals were located within the forest habitat, but could not be accessed. Unfortunately, we were not able to pick up any data signal from these two individuals despite setting out multiple base-stations over the field trip. The tag deployed in April 2017 could not be retrieved in oct 2017 as the sloth wearing it was also inaccessible in the forest, so a further attempt to retrieve this tag will be made in 2018.

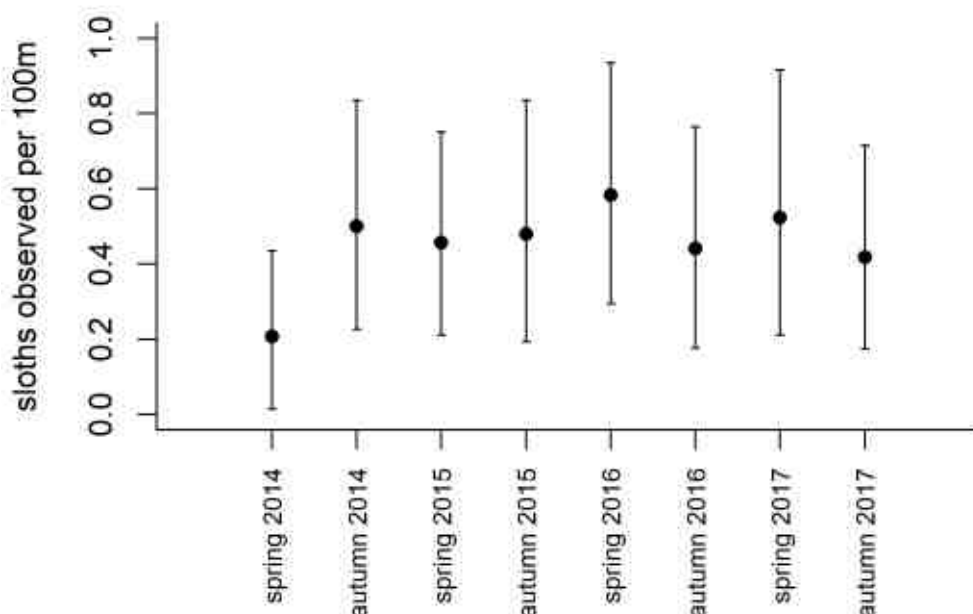
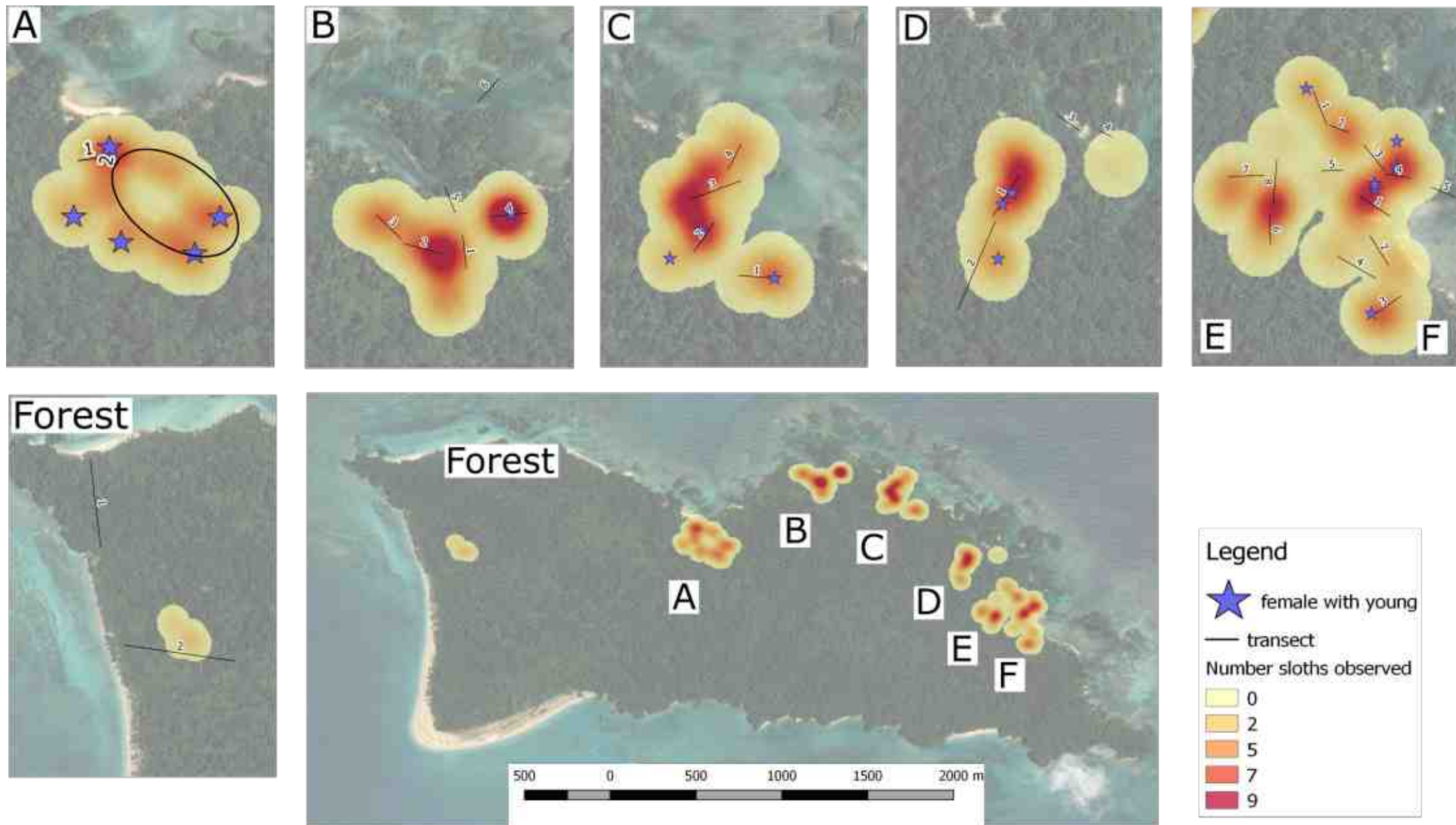


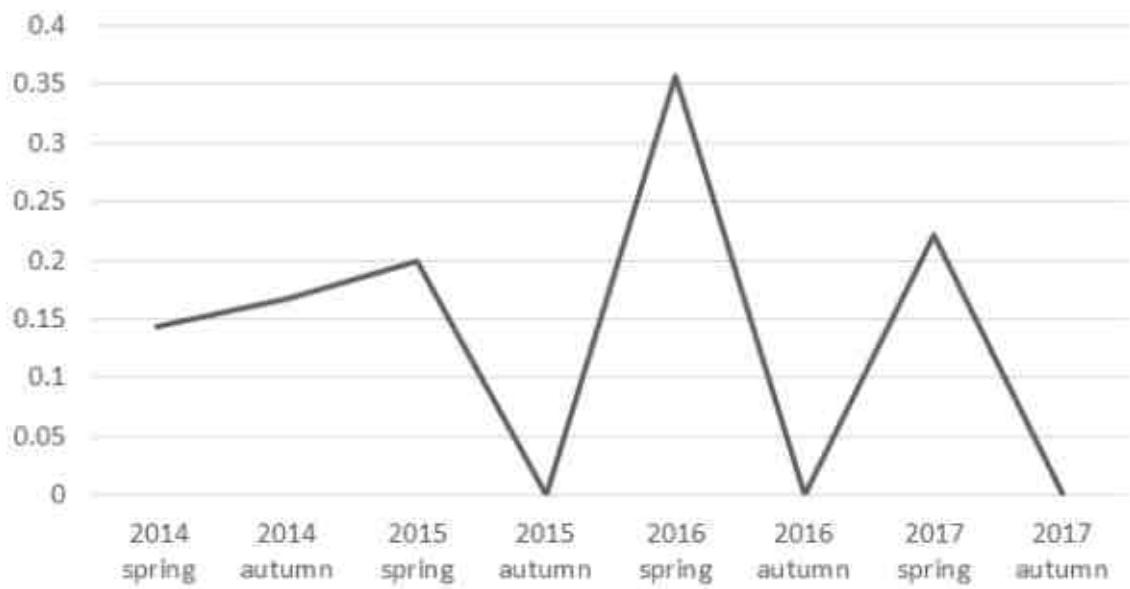
Fig. 3 Mean and 95% confidence interval for pygmy sloth encounter rates





**Fig 4.** Heatmap showing locations of all sloths observed on Escudo during 8 field seasons between 2014 and 2017. No sloths have ever been observed on the isolated outcrop of mangroves in patch B, suggesting that sloths do not swim long distances and/or require proximity to forest. Patches A and E have had the highest numbers of breeding females.





**Fig 5.** The proportion of females carrying young has been low but consistent across all sampling seasons.

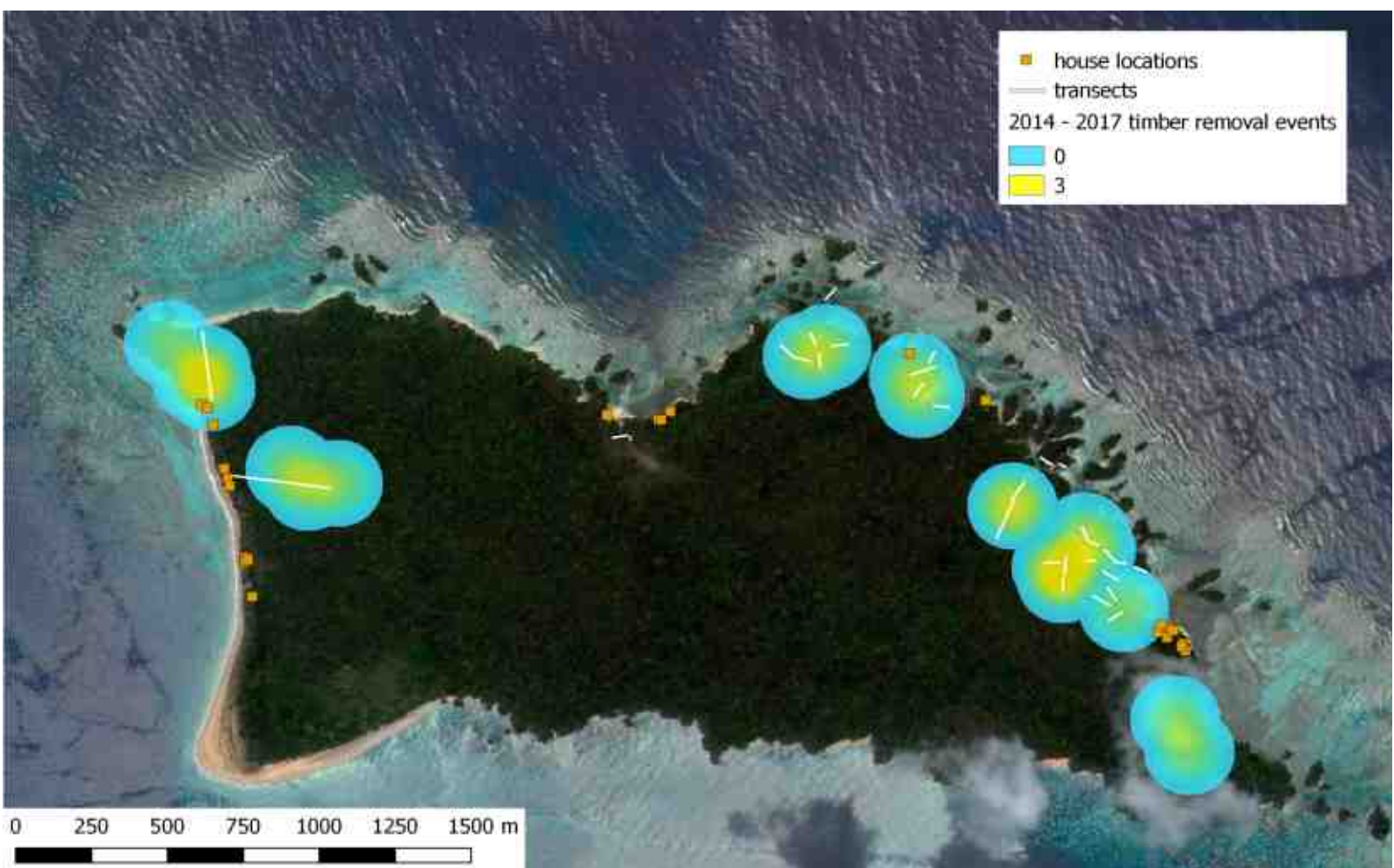


The tiny claws of a baby sloth can be seen as it clings onto its mother



## Anthropogenic threats

We have documented low but consistent levels of timber removal. Logging mangrove and forest trees for local use is relatively small-scale, primarily for building temporary huts and cooking areas. Species targeted include *Ferruginea Vochysia*, *Manilkara spp.* and *Rhizophora mangle*. Wood may also be being removed illegally from the island, as stacks of planks have been photographed on the beach, ready for loading into a boat. Sacks of coconuts for removing from the island were also photographed, which is another illegal collection activity.



**Fig 6.** Timber removal events across Escudo 2014 - 2017. Patch A has particularly low levels of disturbance considering its proximity to houses. Patch E and the Forest transects have the highest levels of timber removal.





Diorene explains to an illegal tourist boat that permits are required

There is little control over the presence of tourists. Most visitors come from Bocas del Toros or Chiriqui Grande, and although permits are required to visit the island, few tour groups are obtaining these. Numbers of visitors, especially international tourists, is increasing. Without systems for organic and inorganic waste on Escudo this causes a risk for contamination of the few fresh water sources and is a concern for human health as well as the endemic biodiversity. Field visits have also discovered the activities of unlicensed 'researchers' and collectors who visit Escudo to take specimens. Although this occurs on a much smaller scale than tourism, it is still a serious concern.

Hunting and fishing of protected species also continues to be a problem. In 2015 and 2017 we found evidence of turtle hunting and convinced local people to release live turtles they had hauled onto the beach. In March 2015 we also recorded shark fin collection and drying, counting over 30 fins. The fine meshed nets used by fishermen also catch a great deal of by-catch, and are frequently discarded on the island or in the waters. Some of the indigenous Ngäbe also bring their pets (dogs and cats) and farm animals (chickens, pigs) to the island, posing a further risk to the local flora and fauna.



Large old male hawksbill released by fishermen in 2017



Pollution is a major issue because of the scale of litter left by visitors to the island and washed up onto the beach. There is very little in the way of waste disposal in the region so the build up of inorganic waste on Escudo is an urgent problem that needs to be resolved.

To combat these threats, we are now accompanied each season by a ranger from Mi Ambiente, who is able to take action whenever we encounter illegal activities. Unfortunately, the cost of visiting Escudo is so high that the Ministry currently does not have funds for regular patrols. The longer term solution is therefore to develop a system where the Ngabe monitor their own



Shark fins left out to dry



Litter on Escudo greatly increases in the fishing season



A green lizard with yellow stripes on its back and head, perched on a tree branch in a mangrove forest. The background is dark and filled with tree roots and leaves.

# Community Outreach and Engagement

Multiple outreach activities each year have been integral to the development of our project, creating trust within the local communities, inspiring community participation, enabling acceptance of the study by the district authorities, and incorporating feedback to improve future activities.

The communities in the district of Kusapin primarily rely on artisanal fishing and diving. Many families are poor and there are few other employment opportunities. Families are commonly comprised of a father who obtains food and an income, and a mother who cares for children and housework. The number of children per family is usually three or more, and they usually attend the single community school.



# Sustainable Livelihoods for Fishermen and Divers

For generations, local communities have told myths about Escudo, sharing stories about spirits and the ancient indigenous inhabitants who protect important parts of the island. However, these stories are dying out and unsustainable resource use is growing. Highlighting the cultural importance of Escudo and emphasising local ownership will encourage the Ngabe Bugle people to recognize their irreplaceable natural resources and maintain key sources of income for future generations. We aim to raise awareness of the protected status of Escudo and what activities are permitted. We are also working to develop alternative livelihoods to take the pressure off fishing, achieve sustainable local tourism, and manage the inorganic waste that arrives on Escudo.

There are some considerable challenges to this work. Individuals in the community can be reluctant to give information in interviews or to fill in participant details in workshops as they believe this information can be misused. Communications between different groups of divers and fishermen is also undermined by internal conflicts between communities. To help overcome these challenges, we established a collaboration with a non-profit organization, the Panamanian Studies and Social Action Centre (CEASPA), which started to work in the area in 2014. CEASPA has a solid track record in environmental education in the Ngabe Bugle indigenous communities, and enhanced the trust and credibility of our project within the communities that utilize Escudo's resources. This, along with our already established relationships with the Association for the Protection of Renewable Resources (APRORENAB), and the Ngäbe Bugle Regional Congress, has facilitated our community engagement and the participatory process. We have slowly established trust and are now reliably collecting feedback and data from surveys and workshops.







In 2013 we identified key community outreach activities by talking to fisherman and divers from the communities of Paterson island, Kusapin, Bucori and Punta Escondida. Discussions were conducted both in groups and individually (figure 11). They were asked about the pygmy sloth, management of natural resources, knowledge of Escudo, local perceptions on changes in the ecosystem, and organizational capacity to sustainably manage their natural resources. Photographs, posters, and maps were used to facilitate understanding, and discussions were conducted in the local language (Ngobere) and translated by Hidalgo Taylor, an indigenous Ngäbe and research assistant.

Key information obtained was:

- The association of artisanal fishermen and divers of Kusapin stressed the need to organize as an association (legal entity) and encourage active participation and union of fishermen and divers to join the association.
- They expressed their concern as divers and fishermen in Isla Escudo de Veraguas, that the research on the pygmy sloth could disrupt or limit the use of the island.
- They presented their needs as fishermen and divers and the risks of their work and what it costs them to get resources when they go to the island.
- The need for more effective communication with the Ministry of Environment and Aquatic Resources Authority of Panama on the regulations for the seasonal closure of the lobster fishery, and fishing and diving techniques.
- They expressed their concern about the future of the Escudo de Veraguas Island and ignorance of the importance of protecting the island and its ecosystem.

We were able to identify the primary communities that depend on the resources of Escudo de Veraguas: Tobobe, Cayo Paloma, Paterson Island, Bucori, Ensenada, Red Beach, Punta Sirain Green Beach, Pueblo Nuevo, Punta Escondida, and Blue Bay. The community of Rio Caña does not engage in artisanal fishing and diving, but as it is only 45 minutes from the island it is the headquarters of the Ngäbe Bugle NGO, APRORENAB.



Based on the information gathered, educational workshops were developed. Each workshop used simple language and visual aids to deliver an overview of the pygmy sloth and Escudo de Veraguas island, an explanation of the study and preliminary results, and a discussion of the possible threats to the conservation of the island (including waste management, timber/mangrove cutting and collection, and the presence of pets) and potential solutions.

The workshops were held in 2015 and 2016 in conjunction with the NGO APRORENAB Ngäbe-Bugle, CEASPA, the National Environmental Authority, the Aquatic Resources Authority and the Ministry of Environment of the Comarca. In 2015 four workshops were delivered in Kusapin district in the communities of Punta Siraín, Tobobe, Playa Roja and Bucori, a fifth workshop was run in 2016 in Playa Verde. Each workshop included 40-60 people, mostly fisherman and divers, some women, seniors and children and teachers. They were attended by district authorities, representatives of the Ño Kribo Regional Congress and general Congress, as well as the Mayor of the District of Kusapin. The Ministry of the Environment used the workshops as an opportunity to discuss regulations and laws concerning the hunting of turtles, diving and fishing prohibited species, and indiscriminate felling. Afterwards, participants completed a simple questionnaire to analyse changes in perceptions. Most attendees found the information interesting and valuable, expressed interest in learning how to identify more plants and species that they did not previously know the importance of. They also requested that the workshops be expanded to other communities.

Historically, it has not been easy for fishermen and divers to find alternative livelihoods. Following feedback from the earlier sessions, we designed a new workshop focusing on sustainable alternatives to intensive fishing and diving. This was run for the first time in 2017. The local NGO APRORENAB covered the possibilities of working with researchers, the organisation Timorogo introduced ideas for creating handicrafts and local tours to engage with tourism, and Cooperativa Solaris discussed the benefits of setting up a community bank. These workshops emphasized the importance of identifying the unique traditional crafts and attractions of each village area and showed participants that other communities have been able to organize and practice alternative livelihoods. The workshop also conveyed examples of how women can contribute to sustainable incomes, encouraging both men and women to take up these practices. The workshop was very successful and many attendees expressed an interest in pursuing more sustainable livelihoods as fish and lobster stocks have been declining. We plan to role these workshops out at more communities during 2018.

These activities have laid strong foundations for developing a participatory management plan for Escudo, to safeguard its unique species and the livelihoods of the Ngabe Bugle people.





# Schools Education Programme

The aim of the educational programme is to raise awareness of the pygmy sloth and Escudo both in terms of ecosystem services, such as the provision and maintenance of natural resources, and as a part of the Ngobe-Bugle heritage.

The majority of our educational activities between 2014 and 2017 have targeted school children at elementary level, from 3rd – 6th grade between the ages of 5-12 years. Diorene's social surveys indicated that children in this age group are often taken to Escudo at an early age by their parents, to learn the craft of artisanal fishing and diving. Hence these children are the next generation who will need to sustainably manage Escudo's resources, and also able to influence current practices by their parents and families.

In April 2014 we visited four schools to meet with and discuss an environmental education curriculum with directors and teachers, and to establish numbers and ages of students attending. These schools were Kusapin School C.E.B.G., Buena Vista School (Paterson Island), Telebásica School of Bucori and the School and Basic Education Center of Bahía Azul. There were some problems with the administration of the existing educational system, in that one school had not yet named a new director after the previous one departed, and at another school the director could not be located. Despite this, we established a point of contact at each school and conducted some introductory sessions with the children (figure 13). We discussed which age groups to target and the materials and visual aids that would be most useful. Working with the teachers in this area can be challenging as it is difficult to access and the Ministry of Education do not maintain permanent staff there. Hence there is constant staff turnover, limited communication, and a lack of internet and telephone lines.



Diorene talking to children at Rio Cana school





In 2015 we developed an activity book that can be used by teachers to guide classroom activities, as a supplement to courses in natural resources and/or extracurricular activities. The workbook is presented as a journey lead by a Pygmy sloth called Dego, and is filled with fun facts, questions and games. The books have been very popular, and in at least 3 of the communities, copies of the books have also been shared more widely among the community. The content of the book covers the following topics:

**Module A: Living things and their functions**

Plants, invertebrates, fish, reptiles, amphibians, mammals,  
Living things important in Escudo de Veraguas

**Module B: Ecosystems**

Water, land, and ecosystem services  
Care and protection of ecosystems  
Escudo de Veraguas, a treasure to be protected

**Module C: Practicing Conservation**

What are sloths  
What is the pygmy sloth on Escudo and why is it important  
How I can help protect the pygmy sloth?

This book is now supplemented by a poster per school, as requested in initial consultation with the community and teachers. The posters display the natural heritage of Escudo and emphasise key actions to protect the islands' habitats; disposing of litter appropriately, not trapping animals illegally and avoiding timber removal. The posters are displayed in communal spaces such as corridors, and since the buildings are shared with the high schools in the afternoons, the information is accessible to a wide range of ages.



In 2016 a group of teachers and students of the community of Rio Caña, a community that is about 45 minutes from Escudo, were taken to visit the Island on a local tour. This took advantage of our presence on the Island in October during the monitoring and we were able to speak with them directly about the research and answer their questions.

Most recently, an innovative puppet theatre show has been designed and delivered to the schools. The puppet theatre was called "conservation of the pygmy sloth" and was directed by Bruno Paredes of "Titeres SinSuan"; a director that has specialized in the creation of children's puppet theatre with simple language and continuous interaction. This is the first time this kind of activity has been brought to these remote communities, ensuring the conservation message is conveyed in a fun and interactive way. It was not only enjoyed by the children but by adults too. Many of the children were still able to enthusiastically answer questions about the pygmy sloth and Escudo a year after they saw the play.

In 2016 and 2017 the puppet play, books and posters were delivered to 1160 children in 7 schools (171 children in Bucori, 340 in Kusapin, 122 in Paterson Island, 180 in Bahia Azul, 40 in Playa Lorenzo, 98 in Rio caña, 210 in Tobobe).

Additionally, in 2017 Diorene designed a conservation contest for high school students. This is targeted at the fifth year of secondary school, as this is the year with highest attendance and student numbers, and where social work is a mandatory educational component. The contest will fit into the mandatory hours for social work within the project planning classes, and therefore aligns with the existing curriculum. Groups of 3 students will submit a proposal for raising awareness of the pygmy sloth in their community, and conduct this as part of their social work school activities. The most impactful group will win the opportunity to visit Escudo and see the pygmy sloth, among other prizes, directly learning about their natural heritage and fostering their continued interest in the natural world and conservation. So far three schools have been approached to engage in the contest, but there has been limited response so further work is needed to engage the teachers and students. School directors have not shared the information with their staff, so we plan to give more talks in the high schools to engage the students and highlight to the directors the benefits to be gained from the children's participation.



Diorene with the Director of the puppet theatre at Bucori school





# Capacity Building

We have facilitated stronger links between APRORENAB and the fishermen and divers, and this has inspired a sustainable mindset within the Fisherman's Association, and empowered the Ngobe-Bugle community to more independently manage their own natural resources. Ongoing workshops and outreach activities will encourage the Fisherman's Association to become affiliated with APRORENAB as a recognised non-profit organisation to inspire support for conservation.

Conservation can be best achieved through empowering and developing in-country conservationists. This project has developed Diorene's capacity through the EDGE Fellowship Programme: a two-year programme of mentorship and support, providing £10,000 of funds plus a broad range of training. Diorene successfully completed her EDGE Fellowship in 2015. She received extensive training in implementation of ecological and social activities on the Conservation Tools training course (Nov 2012), three field-visits (March 2013, March 2014, March 2015) and attended a 2-week Conservation Leadership training course at ZSL (Sept 2014). We continued this with remote mentorship, inclusion in training and networking opportunities and a further project visit in April 2017.

A Scientific Committee has been set up, which includes Dr Diorene Smith, to review all scientific activities happening on the island, in conjunction with the Comarca. Training has also been undertaken with local field assistants to continue data collection and monitoring. Hildalgo Taylor and Teofilo Santiago (from APRORENAB) are both native to the Ngabe Bugle communities and have become central members of the field team. We are also involving more and more community members in conducting monitoring activities on Escudo. The workshops continue to develop the network of stakeholders with interests in Escudo and the pygmy sloth. Our ultimate aim is to empower the local communities to be capable of managing the conservation of Escudo with support from the National Environmental Authority and to benefit from sustainable use of the islands resources and potential for tourism.



# Looking to the Future

A strong network of motivated stakeholders is vital to achieve an inclusive, participatory, sustainable management plan for Escudo and to safeguard the livelihoods of the Ngabe Bugle. Our work will continue to build this network by bringing together the scientific community, local communities around Escudo including fishermen and divers, the Ngobe-Bugle chiefs and Congress, the National Environmental Authority and the Aquatic Resources Authority.

Over the coming years we will be extending the educational activities to more communities and developing new material, to engage older children in conservation of their natural heritage. We will be repeating the new sustainable livelihood workshop at more communities and developing follow up strategies to assist the communities wishing to embark on new income streams. We will be continuing the long term monitoring of the sloth population and extending this into the forest. Our understanding of how the sloths use the forest will be improved by deploying new radio-collars with tracking devices, and this information will enable us to refine the population estimate of sloths on Escudo. The combination of engaging outreach activities, educational events and improved ecological knowledge will enable us to work with the Ngabe Bugle people to develop a shared vision for the future of the island.

There has been a growing interest in developing a conservation management plan for the Pygmy Sloth and Escudo, with interest from the Committee for the Protection of the Pygmy Sloth, various NGOs, the National Environmental Authority, members of the Ngobe-Bugle indigenous community, and scientific researchers. As this project grows, we continue to seek new funding and collaborations that will support our workshops, educational activity and field research. A key step in the near future will be to move from educational workshops to participatory mapping and planning exercises, working with stakeholders to disseminate the conservation needs of the pygmy sloth, and identify shared requirements for the sustainable use and continued protection of Escudo. Ultimately, this participatory initiative will be the first of its kind in the region, and our team has already made significant progress towards achieving this goal.





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