BIOME

VOL 01

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You cannot get through a single day without having an impact on the world around you.

What you do makes a difference, and you have to decide what kind of difference you want to make.

- Jane Goodall

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From the Editor.

Welcome to Biome, a new publication that unfolds the art of photography and nature into a combined collage of science, facts and new discoveries; for the lovers of nature, the curious and of course, the adventurers. This quarterly journal is home to a complex biotic community, characterised by a variety of plant and animal species. Each edition will focus on a different biome situated somewhere on our Earth. These biomes, dominated and defined by unique flora and fauna, influenced by climatic variations, help to form a vast array of biomes including, tundra, tropical rainforest, desserts and even aquatic biomes, such as freshwater and marine.

The spark of inspiration behind the ignition for the creation of biome, was formed from the overwhelming desire I have to share and explore the world through my camera. From under the sea in the eastern pacific to the peaks of the Madagascan jungle, each journal will form a collection of my expeditions and adventures straight from a naturalist's heart.

This volume – Just a Forest, focuses on one of my most challenging adventures yet. Our team of six, travelled to Loholoka forest situated of the south-east coast of Madagascar, in August 2017. It's here that lies a patch of rare littoral forest, which has extremely high levels of biodiversity and this was our home for 5 weeks. This journal delves deep into the conservation issues of Madagascar and its inhabitance, alongside a detailed report on our research, findings and the experiences we had, camping in such an incredible place.

Frances Eyre
Editor

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Just a Rainforest

Volume One

Madagascar.

Approximately 135 million years ago Madagascar split from Africa, then subsequently 55 Million years later, it also split from the Indian block, these movements were due to continental drift. This gave Madagascar its geographical isolation and has helped to protect its native species and in turn given evolution, effectively millions of years to 'play around' and experiment with its inhabitants. The resulting creatures that we know today, have become rulers of their terrain, perfectly adapted to suit their current environment.

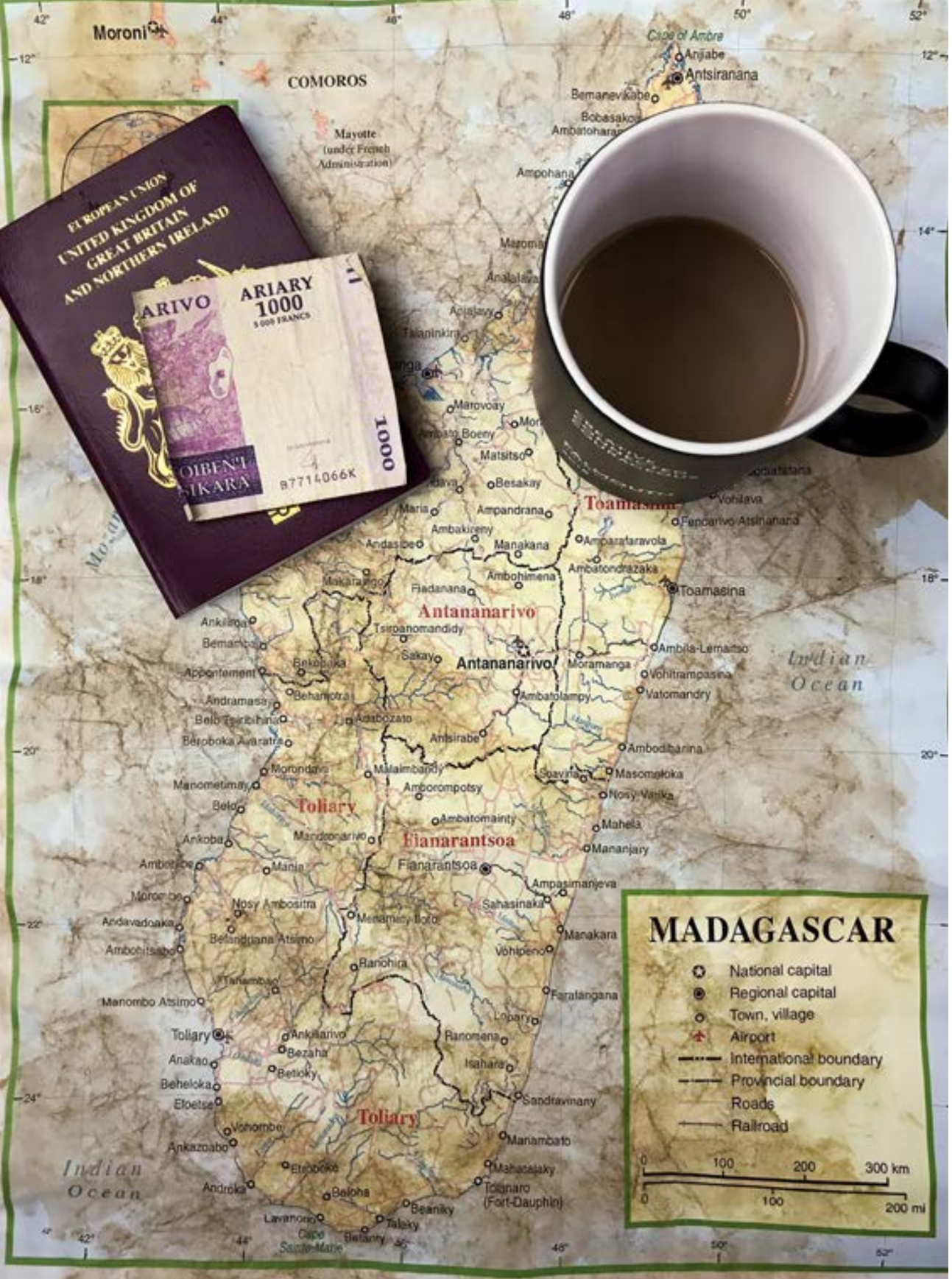
However, because of these unique adaptations, that has made these species, everything from frogs to lemurs and even snakes, the 'best', could now be the cause of their demise. These species having been left to evolve over millions of years and have become complacent in their current environment, with only gradual natural changes taking place. However, the 21st Century has continued to inflict rapid changes upon this island, everything from the era of globalisation to the continued growth of mankind.

In 2012, the World Bank estimated that 78% of Malagasies (roughly 22million) lived in poverty, lacking the basic necessities that makes living in such a variable climate, almost impossible. Madagascar's financial issues, means it is regarded as one of the poorest nations on earth today, and this is mainly due to its financial and political instability. Much needed improvements and basic requirements have been denied to many Malagasy people as a direct result of this instability, which means, despite being a biological hotspot, Madagascar's diversity is in rapid decline, thanks to globalisation and exploitation, but more importantly the dependence of more than half of the Madagascan population. Because these people lack the basic necessities to survive, with a reduction in agricultural farming opportunities and limited paying jobs, many Malagasy people have no choice but to rely heavily on natural resources; resources that are often derived from illegal forms of exportation, mainly of native plants for their medicinal values and animals for the pet trade.

Another additional major concern alongside Madagascar's financial problems and governmental instability, is that the Malagasy population has continued to increase at a staggering rate, creating an upsurge in the need for natural resources and land cultivation. As well as putting pressures on an already dwindling forest, this need, has led to the exacerbation of the land regeneration cycle, which for decades has insured that the land would be passed down to future generations in perfect working order. Furthermore, there are other demands coming from external markets, for the export and trade of goods to satisfy the desire of exotics and culinary delicacies around the world.

This lack of sustainably means that over the past 20 years, Madagascar has lost more than 1 million hectares of forestry. Even today the rainforests are still pillaged for hardwoods such as rosewood, further destroying tens of thousands of hectares of some of the island's most biologically diverse habitats and national parks. These processes along with other significant demands coming from agriculture and energy logging for the production of fuelwood and charcoal, doesn't just mean temporary losses. They cause permeant damage and contribute to the depletion of Madagascar's limited natural habitats.
There are many conservation projects trying to rectify these issues before they become irreversible, although there are many hurdles to overcome before we can see visible and viable changes taking place. With the lack of law enforcement, manmade actions and unsustainable living, Madagascar's diversity is decreasing, and this is leading to the demise of many flora and fauna species, some which still have not been discovered and recorded. A wise man once said, "In the struggle for survival, the fittest win out at the expense of their rivals because they succeed in adapting themselves best to their environment", Charles Darwin. However, I wonder if he would say the same today, if he could see the rate at which mankind is now the main cause of forced environmental changes. Mankind as a species cannot keep up with the pace of destruction and change. So how do we expect other species that inhabit this earth to cope?

Climate change, deforestation, globalisation, all threaten to change the world as we know it and in doing so, will challenge these species unique capabilities and their abilities to adapt in a forever changing environment.



Project Loholoka.

The island of Madagascar is considered to be a living laboratory of evolution, a biodiversity hotspot, with extremely high levels of endemism. On the south-east coast of this island, is situated the Loholoka forest; one of the few remaining littoral habitats of its kind. A littoral habitat, is a stretch of humid forest that is located next to a constant source of water, and it is this feature that makes this type of environment very rare, even in Madagascar. Today, there are still many ecosystems within this type of forest environment that remain unsurveyed and have very little research gathered on their ecological structures and functions. Meaning, that even in the 21st century there are still areas and habitats like Loholoka forest we know very little about, even knowing there are still undiscovered species we continue to destroy, devastate and tear down these environments for financial gain. It is this threatened and remarkable habitat that our team travelled to in August 2017.

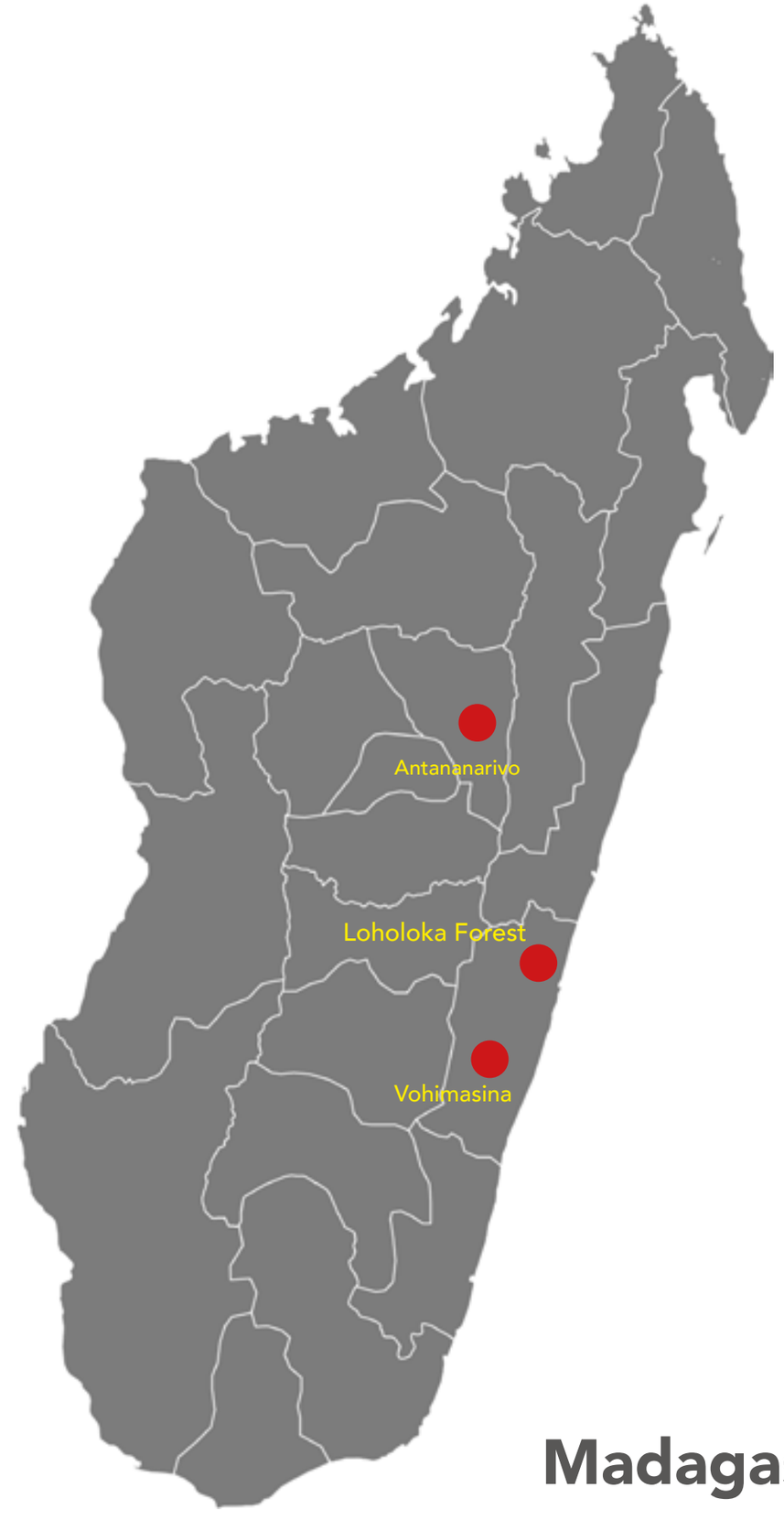
Expedition Loholoka which took place in 2017, was not the first of its kind. This expedition was first founded in 2014, with the aims of their project being to conduct terrestrial surveys over a five-week period. During that time, the 2014 team created a species list for the Loholoka forest, which focused primarily on 4 groups, mammals, birds, reptiles and amphibians, this helped to address the previous gap in biodiversity knowledge.

The findings of this expedition revealed, geographically important range extensions of various mammal species; this means that various mammals had expanded the area in which they were previously thought to inhabit. Along with those findings they potentially discovered new species and subspecies that were previously unrecorded. Their biodiversity count, showed 94 different species, 8 of which are listed as Vulnerable' or 'Endangered' by the IUCN, and a preliminary study that had been carried out by DBCAM (Development and Biodiversity Conservation Action for Madagascar).

The success of the 2014 team enabled us to travel back to Loholoka for five weeks in 2017. Our team of 6, included five zoology students from the University of Exeter and one marine and wildlife photographer from Falmouth University (yes, that's me). The hard work and research undertaken during our five weeks, consisted of repeating the terrestrial surveys first conducted by the 2014 team, into the same four groups, along with a few other projects of our own. Our personal objectives included widening our understanding of local life and the threats many Malagasy people and their homes are currently facing.

Our expedition commenced on the 8th of August 2017 and we returned home safely on September the 12th 2017 and it's within this journal I'll endeavour to share what we learnt along the way, our finding and the overall outcomes of our expedition.

Africa....



Madagascar.

On the Road ....

London > Istanbul > Antananarivo > Loholoka Forest.
2hrs > 13hrs > 48hrs

Meet the Team.

Thomas Marceau
Team Leader

A 3rd year Evolutionary Biologist whose main interests lie in the fields of evolution, genetics and conservation but extends to much of biology as a whole.
His previous experiences in roles of leadership has helped him to develop skills in co-operation, teamwork and time management. This, along with his fluency in French, meant that he was a valuable asset to the team when it came to logistics and communication. And throughout the expedition he proved to be a very competent and successful leader.

Ellie Coleman
Fundraising

Ellie was our second year Conservation Biologist; whose interests lay within working with local communities to aid conservation efforts abroad. Over the past 2 years Ellie has been volunteering and working closely with many different projects. This has given her valuable experience when it comes to fundraising, but also due to her extensive travels and knowledge gained, she has learned valuable cooperation and teamwork skills which has given her an understanding of many different cultures.

Graham Birch
Grants Officer

A 3rd year zoology student with extensive experience working in and researching in the field around the world. For two months in the summer of 2016 he worked with the Society for the Protection of Turtles (SPOT), helping to research the loggerhead and green turtle population of North Cyprus. This included tagging and biopsying adults and hatchlings whilst also carrying out a wide variety of survey methods and techniques. His competency with field work proved to be invaluable in carrying out our surveys in Madagascar. Without Graham's prior knowledge and expertise in applying for grants the 2017 team would have most probably not achieved the required funding to support this project.

Artwork: Nicholas Tucker

Frances Eyre
Photographer and Videographer

Wildlife enthusiast and 2nd year Marine and Natural History photography student, Frances specialises in studio and documentary photography. Throughout her time at university, she has developed a fascination with evolution and has tried to incorporate this interest within her photographic work. In March 2017 she travelled to the Galapagos Islands to work closely with the researchers and scientists and was a member of a film team creating a documentary and supplying photographs for the Charles Darwin archives. These various experiences helped to improve her field photography skills and enabled her to develop fundamental team building abilities, both of which aided her in the expedition to Madagascar.

Meriel Anderson
First Aider and Health and Safety Advisor.

Meri is also a 3rd year Evolutionary Biologist with a keen specialist interest in wildlife disease, conservation and genetics. Her interest and knowledge in diseases was advantageous to the group as we studied chytrid fungus and her scientific understanding proved hugely beneficial within our group. Meri also has considerable experience in the field not only as a scientist but as a first aider which proved to be very valuable during or expedition.

Nicholas Tucker
Science Coordinator

First attracted to biosciences by Palaeontology, Nicholas Tucker was a third year Zoology student whose specialist topics include evolution and herpetology. In 2011, he went on a self-funded four week expedition to Sabah, Borneo. Then in January 2017, he returned for a University field trip in North Kalimantan. This meant he gained valuable jungle experience that proved useful in Madagascar. Furthermore, in 2015 he spent 2 months at the Society for the Protection of Turtles and as a returnee, he was given extra responsibilities as a team leader which helped develop his practical team leadership and organisation skills.

Artwork: Nicholas Tucker

Project Aims.

As previously mentioned, our goals were focused upon building up the pre-existing datasets, collected by the team in 2014. We hoped that the information and findings we collected, would be used to safeguard this locations biodiversity for future generations. By discovering and documenting new species and pre-existing species, especially on the IUCN protected list, we would be helping towards justifying the significance and importance of Madagascar's rainforests and in turn the forests and their inhabitants would be placed under protection.
However, in the process of this data collection, we wanted to remain as undestructive as possible. Therefore, we used various methods of data collection which varied from live trapping (un-harmful) to manual gathering of information, using techniques such as detecting eye shine and physically spotting and capturing, with our own hands, reptiles and amphibians. All of these methods will be explained later and were conducted on our excursions through the littoral forest we grew to call home.

Our second objective during this expedition was to undertake and conduct a scientific experiment into chytrid fungus (this had not been carried out by the previous 2014 team). We did this by sampling the locations amphibian population, in order to test for the presence of chytrid fungus. Despite a few problems we had to overcome, which I will be explaining later on, we managed to find and test 50 frogs, 10 from each of the 5 transects we walked daily. The final part of this process, was to then send back these samples to the UK and have the field results confirmed. This information would then indicate whether the Loholoka region was in fact infected with a fungus that is currently wiping out many amphibian species around the world.

Finally, alongside our preliminary goals we set time aside in order to identify and document any threats that we found, to the regions biodiversity. In an attempt to further aid in the conservation efforts for this region, we communicated with a few local communities to create an effective working relationship, which would help us to fully understand, from their point of view, the challenges of living within a threatened forest environment. They explained to us that due to government restrictions and new laws that had been imposed upon them without consultation and were now making their lives even harder. We discussed ways to achieve sustainable solutions, reduction of deforestation and the overconsumption of natural resources. In many ways we were surprised as to how fundamentally aware many of the locals were for the need of conservation, but it seemed that without being given alternative options, they had no other choice but to keep living such an unsustainable lifestyle.


Home Sweet Home
For 5 Weeks....

Our Arrival.

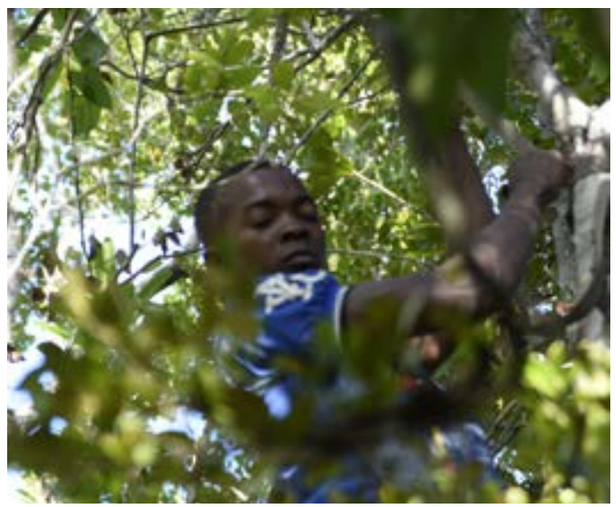
After 3 days traveling, including 17 hours spent in a run-down 4x4 and a few very early mornings, plus an unexpected sleep over in a welcoming Malagasy's back garden, we arrived at the last road accessible village before Loholoka forest, all that was left now was a 3 hour walk to our camp. Our luggage had it easy and was transported downstream in canoes!

When we finally arrived at our base camp, home for the next 5 weeks; to our surprise the entire camp apart from the tents! had been hand built from materials sourced from the forest. It has to be said that we felt slightly guilty, with the country suffering from deforestation issues, we did not expect everything, from wooden benches to tables and even a laboratory area, to be made from forestry materials. However, we had no part to play in the prior decision making of our camps construction, even the toilet and showers (which I'll refrain from going into too much detail), were wooden and, safe to say, rather basic and open to the elements!

Furthermore, upon our arrival at our new home, we were informed our luggage hadn't arrived yet. Slightly alarmed, it was explained to us that this particular region had been going through a dry phase and the water levels were very low, making it problematic to send down our heavy equipment.
We did not let that stop us! We decided not to wait for our kit to arrive and proceeded to undertake our first jungle walk. As you can imagine we were all very tired but excited that we had finally arrived.

Small mammals form a vital component of our terrestrial ecosystems, both by contributing to overall biodiversity and establishing a predator and prey hierarchy. For the purposes of research, one of the most common ways of monitoring small mammals is through the use of live traps. This allows for a range of species to be monitored simultaneously, and it also permits scientists to collect biometric data, such as weight and sex. In addition, they can also estimate the population size and structure. Live trapping is an effective method for the collection of data that is much better than the alternatives, and instead of killing, injuring or causing unnecessary stress, the specimens can be captured, marked and released quickly, this technique is called CMR. It is a very effective process where the marking of the specimens helps to produce more effective results. Not to mention if the same subject is caught again it can be released instantly, thus saving it unnecessary stress and wasting time.

Our research plan for the next 5 weeks, was to split into teams of two and then, accompanied by a specialist and a guide, we explored one of the five designated transect paths. Each path had its own challenges that we had to overcome, whether it required us precariously walking along a semi floating log using a staff for balance or navigating our way through sharp tropical fauna. Although it grew even more challenging towards the end of the expedition as we were rather tired and slightly worse for wear, we managed to continue on and complete our research. Anyway, back to our first trek. We



had been given various tools, including a GPS, an open frame tape measure, buckets, string, tarpaulin and a shovel, and whilst it sounds like we were going to bury someone! We were in fact using these items to set up Pitfall traps. Although it was a simple system, this process was a fairly labour intensive exercise that required, measuring the same distance between locations and then digging a hole to place the buckets in. This container then allows for small mammals and reptiles to be caught without harming them. In our case, we also used an additional drift fence which runs over the top and through the middle of the buckets, this created an additional barrier which prevented various species from being able to pass over the bucket, we hoped this would help to maximise our captures. The benefits of using these traps is that they are low maintenance once setup. However, we did have to check them daily in order to prevent water logging in damp areas and also to make sure any species that we caught were recorded, tagged and released as quickly as possible.
Although it may appear that methods like these are harsh, they are a vital way of gathering and providing scientific evidence of a particular locations inhabitants, especially when they are in need of protection. In today's society where conservation funding is restricted, every fact and figure is needed, to enable successful grants and funding applications must be backed up with hard substantiated evidence. Therefore, by collecting these datasets and surveys in threated areas like Loholoka, it means that a window of opportunity is being provided to argue for that locations protection. It is proven that by using these methods of live capture, amongst others, the end statistical results are considered to be accurate enough that their usage further reinforces the importance and encourages the development of a more substantial conservation framework worldwide.

Local Life.

Madagascar is listed by the United Nations, as one of the world's 49 least developed nations, also according to the US Department of State, in 2003 "approximately 70 percent of the population was living well below the government's own poverty level of approximately 45 cents a day in income." Also, health care in many places is non-existent, which has led to an increased mortality rate, especially of infants, where almost 1 in 10 infants are expected to die from mainly treatable diseases. Shortly after we departed from Antananarivo (the capital city of Madagascar) to return home there was a confirmed plague outbreak from the 1st August 2017 to the 22nd November 2017, a total of 2348 confirmed, probable and suspected cases of plague, including 202 deaths, were reported by the Ministry of Health of Madagascar to WHO (World health organisation). However, it is likely that these numbers were higher due to poor methods of social care. This would have led to under reporting, and increased risk of disease transference meaning that if there had been more basic medical assistance available these numbers could have been substantially reduced.

This high mortality rate is one of the few reasons for the population increase. We discovered as we visited the local villages, that each family averaged between 6-10 children, this is because mortalities are so common they almost compensate for the expected losses by having a larger family, therefore ensuring the survival of the family's legacy. This rise has now led to a two-child limit per family in major cities like Antananarivo, in order to try and manage the population numbers.

Unfortunately, this population increase, especially in villages that rely on natural resources and the forest for survival, are now putting an additional strain on the already dwindling forest resources. This population rise increases the need for housing developments, as well as the need for suitable agricultural land.

All of these factors then produce expected consequences such as, low life expectancy, periodic famine, unsustainable exploitation, just to name a few. In 2015, the Guardian published an article "Madagascar: the country that's poor but not poor enough for aid" and it publicised the harsh realities of living in Madagascar and how the suffering of many Malagasy children, goes unrecognised. It would appear that from the following statement "with no terrorism or geo-strategic importance, the islands nation slips off lists of global causes despite widespread hunger and harsh impact of climate change" what is being said is that because they pose no threat to any other nation, and because of their lack of ability to ask for help, they are trapped in a downward spiral.

Thankfully for some villages (of which the numbers are growing), help is coming. Due to the various publications raising awareness of the need for conservation, in the form of, newspapers, journals and online platforms. Conservationists have helped to highlight the problem this country is facing and mainly as a result of this increased publicity, it has meant that many non-governmental organizations - NGO'S have intervened and commenced several small projects that are making a noticeable difference to local communities.

Help is Coming.

Throughout our travels and visits to these communities, witnessing some of the benefits these NGO's have created, our team was able to experience how the other half truly live.
To and from Tana (Antananarivo) we saw significant visual changes in the work methods and living conditions of many people, and we paid particular attention to this as we left Madagascar. On the drive to the airport we saw a steady increase in the quality of living as if traveling through time. From barely standing wooden shacks to stone buildings, I personally, never would have thought how the quality of life could vary so much within one island. We passed small children begging for money at the side of the roads, some of which, had created obstacles in a desperate attempt to make passers-by slow down.

Despite all of this, there were still many communities that thrived even when living on a 'knife edge'. Our team was fortunate enough to witness some of the benefits these NGO's had brought to these villages. When we visited Vohimasina on our way to Loholoka, we spoke to the local women and they showed us the rugs they were weaving, they also offered to make the lads new hats, as they ones they owned looked a little worse for wear. The second village we visited towards the end of our expedition was Andosty, here we sat down with the local people, swarms of children fascinated by us, poked their heads around the doors and through windows, but I couldn't help but notice a small boy sitting in the front row with a bottle cap tied to a piece of string; even with all the technology our generation has, never have I seen a child so happy. Andosy was also the village where a women travelled, with all of her children, once a week to our camp bringing much needed biscuits and beer to sell to us.

The Andrew Lees Trust, this NGO is working towards improving social and environmental education programmes, by creating projects that empower the younger future generations to become more sustainable and self- sufficient.
SEED Madagascar (Sustainable Environment, Education & Development), is another organisation, currently working with the future generations of Malagasy people. Providing locally developed initiatives based on the needs of the communities. The work from this organisation leads to lasting change, in attempting to alleviate poverty and supporting environmental conservation for some of the world's most vulnerable people in threatened and irreplaceable environments.

LuminAID, is also a non-profit organisation, currently working with local communities to provide positive changes. People living within rural areas rely heavily on subsistence farming for survival. Without infrastructures, such as roads, water, and electricity, many financially productive activities are virtually impossible. One of the most notable changes, our team saw during our expedition was within a village we visited, called Vohimasina. Here many of the women are highly-skilled weavers, with their produce being highly sought after in the capital, Tana. However, these women, despite having the ability to bring in much needed finances into their villages through their weaving skills, they also have responsibilities and are required to carry out manual labour in the fields, to help provide food for their families. This situation means that throughout the day they must tend to their crops, leaving only a few hours of light in the evenings, were they can utilise their weaving abilities. These women are restricted by their village's lack of electricity, after the sun goes down they rely on candle light to work by in order to produce their woven goods. These candles pollute their houses and provide a minuscule amount of light. The result of this is that many women simply choose not to weave in the evenings, which further limits their productivity. However, thanks to LuminAID this has begun to change with the donation of solar powered, portable lighting.


SHA
NEW YOR

A Forest.

The sheer density of the Madagascan rainforest allows for a false sense of security. Every moment, is met with a brush of a leaf or the touch of a branch, along with this cozied feeling of closeness, you cannot help but feel disorientated, it mimics the feeling of being dropped into the ocean, far away from civilisation, except we are not surrounded by blue but a thousand shades of green and brown.

The ethereal distant calls of the indigenous bird's ring throughout the forest, putting our senses on high alert, heightened to every subtle movement and sound. Each transect travelled had specific challenges, each step placed with a feeling of uncertainty, yet we continued on nevertheless, tripping, tumbling and scratching our way through this enigmatic environment, motivation was high as we had a sense of purpose. Just to be here, to see and feel all of this we had travelled across oceans and lands to fulfil our roles as scientists, photographers and explorers.

by Frances Eyre

Sherman Traps

Further into our expedition, about half way through we decided to set up Sherman traps. At this point the pitfall traps were still active but unfortunately, we had very little success. Similarly, to the pitfall traps, Sherman traps are a form of live trapping; meaning they also do not kill or harm the animals captured. They were simple to use, as the trap is triggered by a weight sensitive platform located on the base of the box and unlike the pit fall traps, they required very little manual labour to set up (no more digging holes!). However, Sherman traps are not as inconspicuous as a bucket buried in the ground, so these traps require a little enticement in the form of bait, a mixed nut spread, resembling peanut butter. At this point, I am not going to deny that after 3 weeks of living on a diet of mainly rice and beans, the idea of peanut butter was pretty enticing, even to us, so we felt very confident that any hungry creatures wouldn't be able to pass up the opportunity.

During the set-up, we decided to locate these traps close to our camp, although they were easy enough to transport as they collapsed into flat panels, they required constant maintenance as they were very susceptible to the slightest of movements, including rain and winds, of which we had plenty. Even with this trapping process we still applied our CMR technique (capture, mark and release).

Life as a Lemur.

Native only to the island of Madagascar and the neighbouring Comoro Islands, lemurs resemble the oldest ancestors of primates which existed tens of millions of years ago, they are small primates known as "prosimians," which, roughly translates to "pre-primates" or "before monkeys." As part of our expedition, our goals were to record as much biodiversity as we could, which meant that we had to find and record as many lemurs as possible. So, aside from setting up the Sherman and Pitfall traps, in the hope of a lemur wandering into one, on our transect walks our lemur teams would venture out each evening and using GPS devices, mark each lemur's location and the species identification (if possible). But how did we spot them? After a few days, our eyes adapted to picking up particular indicators, for the lemurs that was spotting eye shine. In order to detect this, we had to use our most valuable piece of equipment, our head torches. Shining our torches into the trees whilst on our treks, meant that we were able to detect the reflection of our lights in the lemurs eyes.

Eye shine (tapetum lucidum) is an effect created by a layer of tissue that sits immediately behind the retina, in the eye of many vertebrates. This layer of tissue is basically a retroreflector, this means it acts as a light reflective surface, it reflects visible light (such as our head torches) back through the retina, which in turn, increases the light available to the photoreceptors (although slightly blurring the image), thus making the pupils appear to be glowing and making lemurs easier to spot.
The whole purpose of this reflective layer is to provide superior night vision to many nocturnal animals, it helps them to be able roam freely under the cover of darkness and in many cases this adaptation allows them to see so well that its can help them in the capture of prey or evasion from predators

The Pet Trade

The illegal trading of wildlife, poses a major threat to the conservation of many species, worldwide. In 2011, it was reported that wildlife trade was responsible for the movement of tens of thousands of live primates and millions of dead primates (including lemurs) per year, as reported by CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). A documented increase of this type of trade was made between 1996 and 2011 and is expected to have increased substantially within the past 7 years. Especially within Madagascar, many primate species, such as lemurs, are commonly traded for meat, used in traditional medicines as well as being sold as pets. Since there has been a vast increase in these trades, these activities are now considered to be a 'leading threat' to wildlife, on the same level as hunting and habitat destruction.

Between 2010 and 2013 it's estimated over 28,000 lemurs were removed from the wild and sold into the pet trade, meaning roughly 100 of those species were native to and residing in Madagascar, 90 of which were classified by the IUCN as threatened, with fewer than 1,000 individuals remaining. These figures are unfortunately not 100% representative of the true number of specimens that have been traded, this is due to under-reporting and the illegal wildlife trading for commercial profit. However, any exportation of animals from a welfare point of view is devastating, the removal of so many species not only decreases numbers, but results in much smaller populations which means there's less genetic diversity, causing further issues down the line.

What can you do?

Surely you all remember the sapphire rush? which last yeae,2017, resulted in more than 45,000 miners digging up habitats in protected areas for financial gain, or maybe the organised poaching of Madagascar's sea-turtle population? Or the illegal exportation of rosewood? It is time that the government enforced its existing laws to ensure the survival of Madagascar's unique habitat and place this valuable asset above short-term financial gain.

However, there is something you can do. Publicity is the key to making changes happen, but often the outcome depends on what message is being shared. We have all seen those "super cute" videos of tourists stroking captured and tamed wild animals on Facebook, or those videos on YouTube of people showing off their "adorable" new primates pets. Well instead of encouraging these fads by sharing or commenting just ignore or delete them, the less publicity, actions like these receive it will help to reduce the trends and trading of these species illegally. It is us, the travellers and the tourists that encourage these behaviours, many hotels and restaurants who draw profits from tourism, keep pet lemurs and other exotic animals due to the photo opportunities it presents for visitors.

So instead of supporting this exploitation, stop it!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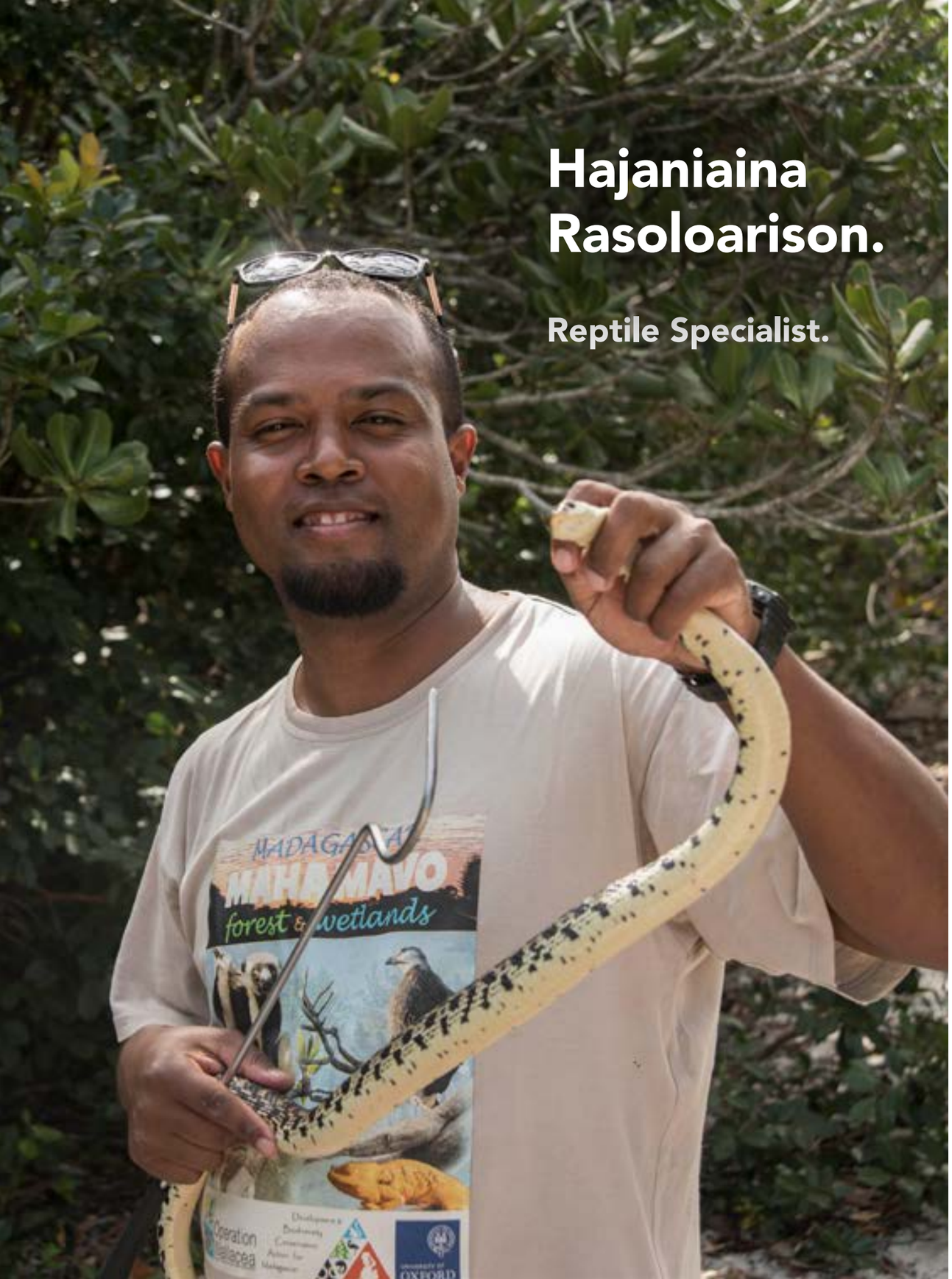

Hajaniaina Rasoloarison.

Reptile Specialist.

The Interview

Introduce yourself?

My name is Hajaniaina Rasoloarison, I am 29 years old, and I am a Conservation biologist, field Herpetologist, and PhD candidate.
I am currently working with both amphibians and reptiles, researching their vulnerability to the climate change in 3 different highlands, in northern Madagascar.

What do you do?

I am currently a consultant and field herpetologist and curator at the museum of natural history at the University of Mahajanga (department of Zoology).

What threats face Madagascar's rainforests?

Direct threats: These take various forms such as, selective logging, or partial forest removal which is the practice of cutting down one or two species of trees while leaving the rest intact. Slash and burn agriculture, which is carried out by locals, this is one of the most devastating activities as it results in mass deforestation and major habitat loss.
Other direct threats consist of climate change and hunting,
Indirect threats: Consistence of corruption, and lack of regulation enforcement by authorities and government policies.

Why is the protection of the Madagascan rainforest so important?

Madagascar's rainforest are the largest forest remnants in the Indian Ocean region compared to other habitat types. Indeed, this forest is a special refuge for a range of exceptional biodiversity variability, of which more than a quarter are waiting for a formal description. This is why the protection of this area it crucial, in order to allow for discovery and research of variable species.

How important is scientific research in the Loholoka rainforest?

Loholoka is a remnant of a littoral forest, one of the most endangered habitat types in Madagascar. So far, no long-term research has been carried out in this site, and moreover, no scientific literature has been published to bring out the perennial solutions of the management of this site.

Do you think there's a future for the world's rainforests?

Indeed, because most people are now knowingly aware of the importance of rainforests, which themselves are a special reservoir of ecological goods. As a result, most people are aware of the importance of wet forests and therefore more engaged in their protection.

How important is the use of social media in raising awareness of the threats facing our rainforests?

The use of the media is a paramount as it is a source of knowledge and awareness for local people about the importance of natural resources, and the benefits these resources bring to us.

Chytrid Fungus.

Alongside collecting biodiversity data on the transects, our other task included testing of amphibians for chytrid fungus. A "chytrid" is a type of fungus, of which there are around 1,000 different chytrid species that live exclusively in water or moist environments, such as a littoral forest. Most species of chytrid are saprobes, meaning that they feed on dead and rotting organic matter, whilst others are parasites that live on plants or invertebrate animals. However, in 1999 a new species of chytrid was discovered that infects amphibians, this was known as Batrachochytrium dendrobatidis; a mouthful I know, but luckily, it's known as Bd for short!
Bd, is the only known chytrid that is a parasite of vertebrate animals (amphibians specifically). This one fungus seems to know no bounds and is capable of infecting amphibians worldwide, once infected this fungus spreads rapidly and contributes to a devastating decrease in populations and can even lead to extinctions.

The way in which Bd affects amphibians is by causing an infection inside the cells of the outer skin layers. It then causes a defect in the protein called "keratin". Keratin is the material that toughens up your skin and helps you to be resistant against injuries, it's also present in your hair and with animals, its present in their feathers and claws! But this fungus causes microscopic changes in the skin, effectively changing the keratin levels.

Although this change in keratin levels, may not seem like an issue large enough to cause species extinction, in amphibians it is. Amphibians "drink" water and absorb important electrolytes though their skin, however, the change in keratin, means the skin becomes too think to absorb water and electrolytes, which eventually results in an imbalance, causing their heart to stop beating. Once infected it becomes an enormous challenge to prevent Bd from spreading. Some amphibian populations have experienced devastating mass mortality events due to this fungus. Although there is some hope, through continued research, it has been discovered that a few species such as the South African clawed frog, has managed to overcome this infection. Once infected the population rapidly develops a mild infection and then after approximately 40 days the infected population stabilises and recovers.

Testing for Chytrid Fungus.

When it came to testing for chytrid fungus, like most experiments, the samples had to remain uncontaminated, this was where our first major issue occurred. Within the testing kit given to us by Exeter university, the kit had remained sealed, this was to reduce any risk of contamination and so it could pass through airport security, however, this meant that the kit wasn't checked before departure by our team. When we came to test our first frog, we opened the packet and realised it lacked sterile swabs; which are a crucial component to conducting these experiments. However, this situation was soon rectified when one of the guides was able to supply sterile swaps from a first aid kit.

After that, our tests could begin. On all of transect walks the Herpetology team was on the lookout for reptiles and amphibians, once found, the reptiles were placed in cotton bags and the frogs in plastic bags which contained water and foliage. There was no special technique for their capture, it just required us searching and then lunging to the ground in the hopes of catching one. We started our testing back at camp by carefully removing the frog from the bag and gripping it gently with our thumb and forefinger, this test was a two man job, so whilst one held the frog and prevented it from escaping the other colleague would take a pipette full of water and cover the frog, this was to prevent it from drying out and to insure that the sample taken was sufficient. When we had thoroughly swabbed the frog, the sample was placed in a small vile containing a liquid called PBS, this liquid enabled the sample to be stored, and the DNA would stay intact until we returned to the UK. When the swab had been in the solution for a minute, 2 drops of the sample were placed into a small pallet which would indicate whether or not chytrid was present. The rest of the sample was then labelled, sealed and stored for returning to the UK, for conformation of our findings. For the 50 frogs we tested, they all came up negative for chytrid which was a relief.

Is it a Bird, is it a Plane...

The flying fox is endemic to Madagascar and is one of the largest species of bat in the world with a wingspan of 1.5 –1.7m and weighing 0.7–1.2 kg. As mentioned our expedition was taking place in a littoral forest, and it's this forests close proximity to the ocean that made this environment a prime location for the flying foxes to roost. The majority of roosts are often found in relatively small areas of degraded land with a few very large situated trees, but the importance of locations being situated next to water, is that the bats use this water source for navigation and orientation. They have been known to fly up to 34 kilometres to find food and instead of using the standard technique of echolocation (used to navigate by most bat species because of their poor sight) these flying foxes use land marks because they have impeccable vision.

As for their conservation, there was no technique we could use during our expedition to test, research or document this species, but they were present on two of our set transect paths and with them being disturbed so easily, each time we ventured past their roosting locations it was a truly spectacular sight to watch them take flight. The abilities these bats have in a landscape and forest that is depleting quickly, is that they are able to adapt in heavily modified environments, even though their diet is primarily fruit based they are able to feed on a mixture of native plants and fortunately they can adapt their diet to consume non-native, introduced plants.

Despite seeing numerous bats regularly on our treks, these species are actually vulnerable and in decline, and it's been estimated that there has been a population reduction of 30% in the last three generations. This vulnerability is due to a Malagasy law, that allows this particular species of bat to be legally hunted between May and August of each year, furthermore, this activity has grown in popularity especially with the introduction of shotguns, and the increased importance of subsistent food for both locals and of course commercial benefits.

Living within the Forest.

Living of the Land.

Until the early twentieth century, local Malagasy communities lived off the land treating it with respect and living in harmony with the flora and fauna, leaving a land legacy for future generations, by insuring lands were not over used and were left in the same conditions in which they had received it from their ancestors. However, with a population increase and reduced viable agricultural land, living off the land in Madagascar has become unsustainable. That doesn't mean it lacks the potential to sustain its own development, it's still rich in natural resources, however, local subsistence faces strong outside pressures such as "land grabbing" by local and foreign investors, unfortunately at the expense of the less financially fortunate locals.

Since 2008 the term "land grabbing" has gained a reputation world-wide. It means that private, public and foreign investors work within legal grey areas of government policies, enabling them to purchase large pieces of land, usually farmland, which is taken away from local communities and sold on for development. In 2009, the Daewoo project was supported by the Madagascan Government which involved granting a large area of Malagasy land to investors; despite the strong cultural bond many Malagasy people have to their ancestral lands. There are many examples of land grabbing which demonstrates the multitude of problems caused by this ruthless policy, such as a decline in employment and food production and the destruction of social and economic systems, that have been proven to work for decades. Through this unethical and unfair process, locals lose their ancestral land and in order to stop this, a transformation is needed that will respond to the requirements necessary to meet the growing demand of the Malagasy people.

Their Way of Living...

21° 05′ 00″ S 47° 45′ 00″ E

Deforestation.

Deforestation, is now a global issue and the negative effects are becoming increasingly hard to reverse. The deforestation process in Madagascar started a long time ago and has accelerated since the 19th century with the French colonization and conversion of agricultural land to coffee fields. Since then, the country has lost 80% of its original forests and the primary forest now covers approximately only 12% of the country. As previously mentioned, the significant loss of many hectares of land is a horrendous result of rainforests being desecrated for valuable woods such a rosewood and mahogany, this illegal logging of hardwoods, is one of the most damaging occurrences that is still happening today.

After everything we've spoken about, it is in some ways understandable why the local communities carry out these illegal activities, as the vast majority of people in Madagascar unfortunately still have to use wood for heating, cooking and building as there are no alternatives, such as gas or electricity. This huge usage of these natural resources, that are so easily obtained and are "free", just to sustain an everyday life style, is continuing to place enormous pressures on forest habitats. Many Malagasy people desperately need the finances gained from these actions, just to be able to live and survive. However, this process is in many ways just as unfair as the land grabbing, as the Malagasy people do not receive a fair price for the wood and materials they trade, and instead, the process is usually benefited financially by larger organisations who obtain these valuable commodities for exporting.

Not only does deforestation have a visual impact on the beautiful Madagascan landscapes and the lives of Malagasy people but it also has an impact on varying factors of an ecosystem. There's abiotic factors such as soil degradation, and biotic factors which affects the abundance and variation of biodiversity. The integrity of Madagascar's biodiversity is crucial. It is what makes the ecosystem more resilient and therefore more "elastic" when it comes to environmental strains and changes, consequently allowing for a more durable ecosystem. A prime example is the biodiversity level of 'Makira-system', which is a connection between Masoala National Park and Anjanaharibe-Sud Special Reserve, it is amongst the highest in the world. The forests of Makira provide an important "genetic corridor" between these two areas which ensures the integrity of one of the most important ecosystems in Madagascar.

Deforestation is another threat to Madagascar's biodiversity as 90% of Madagascar's endemic species live or heavily rely on the forest just to survive, and with the growing pressures of land grabbing, competition for agricultural areas, all placing further strains on an already dwindling forests. There's also a threat from a process called slash and burn agriculture; which turns tropical forests into rice fields. All of these processes permanently damage the soils nutritional value, which cannot be regained, and the combination of these manmade actions are destroying this biological paradise.

However, thanks to continued scientific research, we are obtaining new information which is starting to change the future outlook for Madagascar's forests. With many non-profit organisations trying to work with the Madagascan Governments, they are aiming to improve the protection of the rainforests and their inhabitants. In doing so, in 2013 it was announced that 6 million hectors (triple its original range of protected areas) was now protected, in the sole aim of improving the longevity of the remaining forests.

It’s Just a Rainforest.

The thick emerald patch sewn to the tropics tied
the land
Stretched north to south met the compass hand

The Old World thriving walls,
Canopied watch towers, held life; all but all

In the New, the same was found
Millions of lives sky to ground.

Over a century a kingdom’s lost,
The once rich land left with only ghosts

The same story through everyone,
Will we cease before all is gone?

She stands tall and proud,
Feet planted in what’s now battleground

Her leaf blades droop under salt-less tear
As the mechanical beast’s teeth spin bared

The dull set sink into her rippled age
A ring for every year she stood this stage.

She falls; with many more
In its self a tragedy but the wound carries forth

Within her roots resides, the last golden toad
At one time common, far spread it roamed

What of those which aren’t known?
This rate suggests they will stay unknown.

Stumps stand in smoke and smoulder
Tomb stones, for a thousand lives are over.

by Joshua Mica-Hawkyard

Progress.

Like many countries around the world Madagascar has its problems. However, despite all of the 'doom and gloom' factors surrounding the various issues that I have included in this journal, there is hope to be had as improvement are beginning to emerge, slowly but surely. There are many NGO's that are now focusing on ensuring a future for all the inhabitants of Madagascar. However, for these conservation projects to succeed, continued awareness is vital. Our team did play a small part in helping to contribute towards the protection of at least one forest by conducting research but I hope that by creating this photographic journal I may have hopefully helped further by informing and inspiring a few of you, to become more active and spread the awareness of these issues, even if it's just to stop sharing "cute" captive videos.

Furthermore, to prove that change is happening, since 1990 Madagascar has received more than $700 million in international funding for conservation, which has helped more than 500 different projects seeking to protect the country's singular biodiversity. Most of Madagascar's conservation funding has been channelled through the National Environmental Action Plan, usually called NEAP. The World Bank, NEAP's leading financial provider, has called it "the most ambitious and comprehensive environmental programme in Africa." During this time, the country has rewritten and produced key environmental legislation and also trained hundreds of additional civil servants, which in turn has dramatically expanded its protection schemes, ranging from national parks to research stations, and even community-managed forests.
Many ecosystems would undoubtedly be in a far worse situation today had it not been for their support. However, there are also many examples of costly conservation projects that never actually got off the ground, or whose benefits have been eroded in a few short years. Persistence is key and there is still a long way to go in order to achieve full sustainability of agriculture and tourism within this incredible location.

Our team was warmly welcomed by the Malagasy people that we met during our expedition. The amazing team of local guides and specialists that helped to guide us through the forest and educated us with lessons in Malagasy history, culture and its language, their friendship and assistance was invaluable and the main reason for our expeditions success.
The research we conducted and the findings we obtained were archived and used by DBCAM to help reduce the knowledge gap in Madagascar's biodiversity, a detailed report of our findings was written and sent to our sponsors including the Royal Geographical society. As for the chytrid tests and potential new species identification they were sent off to await confirmation.

Overall, despite the challenges we faced, the expedition was a great a success and a once in a life time opportunity that we are so grateful to have been a part of. It was worth all the late nights and early mornings and even the parts where we waded through mud and cold rivers. We gained valuable first hand experiences and developed our understanding and knowledge of different conservation issues. We met fabulous people, danced around campfires and saw incredible sights such as baby whales learning to breach. We hope that our research and findings have helped to contribute to the conservation of this incredible place and we extend our thanks to all the people that helped make it possible.

> Earth does not belong to us; we belong to Earth. Take only memories, leave nothing but footprints.
>
> - Chief Seattle

Depth

Volume Two

Biome is a journal for the curious and the lovers of adventure. It provides an in-depth look into specific environments that get overlooked and lost in general locations for conservation. As it develops and evolves as a journal it will continue to explore and connect with the natural world through various means. In the second edition, we shall plunge into deep water, discovering the spectacular ecosystems Egypt's watery depths have to offer. We shall uncover underwater gems and explore the threats facing this biome.

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