

ACHIEVEMENTS & OPPORTUNITIES

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FOREWORD

RESEARCH AND DEVELOPMENT MANAGER NISHA OWEN



LEADING THE WAY FOR ECOSYSTEM CONSERVATION IN 2008

In today's world, there have been dramatic developments in our collective social consciences, increased enthusiasm for contributory action towards positive causes through volunteering, and growing awareness of our impacts in energy consumption and carbon footprints. All this has brought the concept of climate change and biodiversity loss from a remote global crisis to an immediate and personal problem. Never before has the idea that one person can make a difference been so prominent.

Frontier continues to go from strength to strength in offering a diversity of opportunities to volunteers, which helps them achieve both personal development and career progression through actively participating in conservation and development projects that are truly making a difference. In parallel, we continue to raise international scientific standards with our funded research and consultancy programmes.

In particular, Frontier sustains projects that have both intellectual outputs and concrete outcomes, a recent debate at the heart of the scientific community. Not only are our results published in both peer-review and our in-house report series, but projects also achieve tangible outcomes. Notably, this ranges from grassroots local community education and awareness initiatives that reduce reliance on natural resources and generate alternative livelihoods, to national government recommendations for upgrading conservation protection, enabling us to accomplish practical conservation and sustainable development on the ground.

The recent change in the economic climate means that cost-effectiveness must be incorporated into conservation and research now more than ever before, and Frontier continues to lead the way in the ability to provide manpower and funding for projects that otherwise would never be realised through the inspiring assistance of all our volunteers.

We hope you enjoy the latest news on our projects, and we hope that we can motivate you to contribute your share to global conservation.



SIAMESE CROCODILES AND ASIAN DRAGONFISH

The last six months have seen exciting developments in Frontier-Cambodia's Tropical Forest Research Programme: in addition to continued biodiversity work in Botum Sakor National Park, Frontier-Cambodia has also begun to partake in collaborations with other environmental NGOs working in Cambodia. The provision of enthusiastic Research Assistants (RAs) to provide manpower on specific biological survey assignments is a useful niche which Frontier alone is capable of filling and which other environmental NGOs are happy to utilise.

During October 2007 a team from Frontier-Cambodia conducted socio-economic surveys on the use of freshwater resources in three villages in Koh Kong province in the far southwest of Cambodia. The study formed part of a larger Conservation International (CI) project evaluating the potential impacts of a proposed hydroelectric dam on the communities and biodiversity of the Cardamom Mountains region. The Frontier survey report entitled 'A Rapid Assessment of the Role of Flooded Forests, and the Impact of Their Loss on Local Communities and Fish Populations' concluded that the building of the dam would have a highly negative effect on fish stocks, and thus on the surrounding villages who rely on them; and on the continued existence of two IUCN Red Listed fish species found in the flooded forests. If government policy-makers decide to proceed with the dam development, we recommend that alternative sources of income and food would have to be found for local people; and that the level of flow output is an important factor in maintaining the present ecosystem in the face of a dam.

The main focus of the current phase located on the banks of the Upper Areng river in the southern Cardamoms, has been surveying for the endangered Asian Arowana or Dragon Fish, *Scleropages formosus*, which is found nowhere else in Cambodia and is a highly prized and sought-after species in the global aquarium fish trade. Frontier's work is to gauge the success of a CI project initiated in 2006 which offered local people a financial incentive not to collect this species.

Frontier is also collaborating this phase with Fauna & Flora International (FFI) on their Cambodian Crocodile Conservation Programme. Frontier has been involved with surveying for the nests of the Siamese crocodile, *Crocodylus siamensis*, a few hours upstream of the Dragon fish pools. The Siamese crocodile is Critically Endangered, there being only an estimated 200-250 left in the wild in Cambodia, having been hunted to the brink of extinction because its skin is one of the most valuable reptile hides in the



Koh Kong is home to the endangered Asian arowana which is currently under threat from the global aquarium fish trade

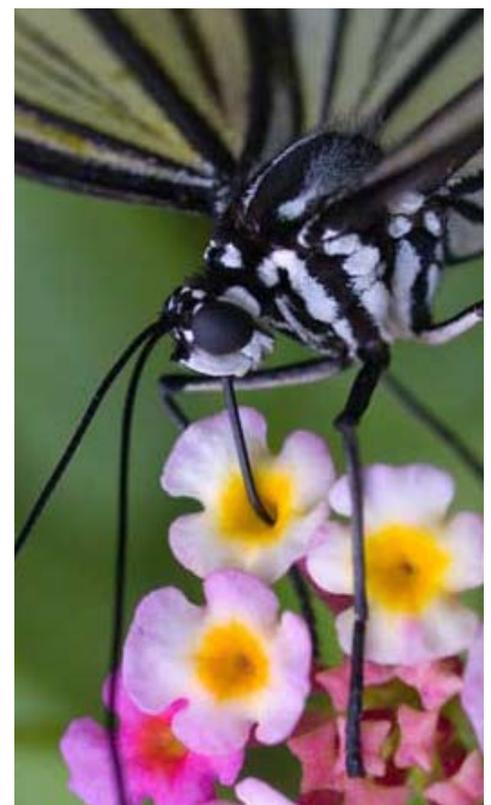
leather industry. In fact until 2001 it was believed to be extinct in the wild and still very little is known about it; hence we are also surveying the crocodiles' habitat and behavioral characteristics. Featured in BBC's Saving Planet Earth series screened in June 2007, when celebrities were sent in search of rare and endangered species, the Siamese crocodile was the only species not actually seen in the wild by the visiting celebrity, the Radio 1 DJ Edith Bowman. A group of RAs however have been luckier; whilst failing to locate any crocodile nests, they did get to see a Siamese crocodile!

All three of the above projects are connected through a common threat: a proposed hydroelectric dam development and the impact this could have on local livelihoods and the unique biodiversity of the area. That Frontier should be involved with such projects is perhaps a sign of the times in Cambodia, where environmental NGOs are increasingly finding themselves trouble-shooting as the development juggernaut gathers a head of steam.

The intention is that Frontier-Cambodia will continue with such collaborative work in the Koh Kong region as and when other environmental NGOs require the manpower, particularly as the work complements the ongoing research Frontier has been involved with in Botum Sakor National Park. This Park forms the southernmost mainland section of the same contiguous forest region, the Cardamoms Mountains Rain Forests ecoregion, one of the largest intact primary rainforests left in Southeast Asia.

Whilst this ecoregion is still relatively intact, it is threatened from all sides by development; including new roads, hydroelectric dams and

mining. In addition local population pressure is leading to agricultural encroachment into the forest and enhanced and unsustainable levels of illegal logging and hunting. Botum Sakor National Park is no exception: the Park contains a unique area of coastal mangrove and freshwater swamp forest habitat, one of the most pristine and untouched in the South East Asia, and is now potentially threatened by a huge Chinese tourist development along the coast, already in the planning stages. The work Frontier has been involved with is therefore doubly important if parts of this unique habitat are not to be lost forever.





Miraflor is home to 236 species of birds of which an amazing 156 species have been identified in the last few months alone

SCARLET MACAWS AND ENVIRONMENTAL EDUCATION

Nicaragua is the largest of the Central American countries, located in the middle of the Central American isthmus to the south of Honduras and the north of Costa Rica. Frontier-Nicaragua's Forest Research Programme operates in the north and north-west part of the country, predominantly in tropical dry forest, with regions of cloud forest, savannahs and mangroves. The dry forests are some of the only remaining fragments of such habitats in the country, and have all been given protected status.

At present we are running two projects, at the Miraflor and Cosiguina Nature Reserves. Reserva Natural Miraflor is an area of 206 km² located 32 km from Esteli, and became a protected area in 1990. Miraflor covers three microclimate zones: semi-arid savannah, semi-humid forest and montane cloud forest, and so far we have conducted surveys in both montane cloud forest and semi-humid forest. During these biodiversity studies, we fully integrate into the local community, camping in tents or staying in community buildings, and eating meals with local families.

Miraflor is home to 236 species of birds of which 156 species have been identified in the last few months alone. One interesting sighting has been a magpie jay *Calocitta formosa*, observed in the cloud forests of Oro Verde at 1300m above sea level. This species is rarely found at this high an altitude nor in this habitat, and its presence could be a result of the abnormally hot temperatures and drought that Miraflor has been experiencing in recent months. It will be interesting to see if this abnormal climate becomes part of a trend over

the coming years. This area also holds mantled howler monkeys *Alouatta palliata*, Central American spider monkeys *Ateles geoffroyi*, ocelots *Leopardus pardalis*, jaguars *Panthera onca*, white-tailed deer *Odocoileus virginianus* and many small mammals. It is also home to 300 species of orchids and a variety of bromeliads and epiphytes. The diversity of bat species recorded has also been encouraging, with 21 different species being identified so far. Some of the rarer species that have been caught include: Davy's naked-backed bat *Pteronotus davyi*, lesser mustached bat *Pteronotus personatus* and Heller's broad-nosed bat *Platyrrhinus helleri*. We trekked on horse-back to La Esperanza, to track the Critically Endangered quetzal *Pharomachrus mocinno*, which is only found in the Miraflor region in Nicaragua. We were lucky to hear calls indicating their presence, and next time we hope to glimpse this stunning bird. Reserva Natural Miraflor species suffer greatly as a result of habitat fragmentation, to which quetzals are particularly vulnerable, so these preliminary investigations will be important in establishing population numbers.

El Rosario is a small community located on the Cosiguina Peninsula in Chinandega. Our study site lies within the Pacific lowlands, and focuses on a nature reserve surrounding the Cosiguina volcano. New survey projects in the region have recently been set up to search for the Critically Endangered scarlet macaw *Ara macao*, which have started promisingly. The expertise of enthusiastic local people has been adopted, who have helped to find potential nesting sites in the area of La Salvia. These nesting sites have been visited on two preliminary treks where nests were seen and macaws were heard. We will continue to monitor the nest sites and observe behaviours at dawn and dusk, improving our knowledge of these charismatic birds.

Finally, we have also begun an investigation into waste management in rural and urban areas within Nicaragua with the objective of starting an environmental education programme for Nicaraguans. Meetings with members of the local community in Oro Verde have brought up some interesting discussion points and the locals have responded with some lively and enthusiastic debates. It has become clear that little is known by local people about major global environmental issues such as climate change and biodiversity loss, but several members of the community have expressed a desire to learn more. There is a lot of potential here for the successful continuation and extension of our environmental education programs in Miraflor, and we look forward to developing a productive relationship with the local communities.



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LARGE MAMMAL MIGRATION AND TRADITIONAL
MEDICINE

Frontier-Tanzania's Savanna Research Programme started the new year with a major move to a new location. After a year researching endangered red colobus and large mammal movement through the Ruipa Corridor, and studying species assemblages as indicators of habitat quality, it seemed that it was time to move on from Shamba Camp. Furthermore, as the year progressed, more and more miombo woodland was being converted to farmland; large mammal transects that we had sited deep in the forest in January 2007 were in the middle of farmland by December 2007. Habitat mapping conducted in November confirmed that well over half of the western part of the corridor was now farmland. Without legislation, there is nothing to prevent this encroachment. Sadly, there was little potential for continuing research at Shamba Camp and a new location for study was identified.

The move to Sayari Camp was accomplished incredibly quickly, with a brand new base camp on the south side of the river, taking the research program to an area yet to be properly explored by Frontier. Previously, this area had been briefly assessed in July 2007, when we conducted preliminary biodiversity surveys for KVTC, a teak company interested in acquiring this land. These surveys were conducted at several sites between the Selous Game Reserve and the main road to Mahenge, including our new camp, and the information gathered was used to develop ideas for new research at Sayari Camp.

In keeping with past projects we are continuing to monitor the large mammal population. Historically, animals have moved from the Selous down to the Kilombero River floodplain and up to the Udzungwa Mountains. While movement is still taking place there is some debate about the actual migration patterns. Through village surveys conducted during the end of 2007 we ascertained that most villagers no longer believe animals, especially elephants *Loxodonta africana*, are moving across the river between the Selous and Udzungwas. Also, because of development in the region it is possible that animals are no longer moving between the protected areas and the flood plain within the Kilombero Valley. Thus our new camp is ideally located to study the effects of development on migratory movements between the Selous and the Kilombero floodplain. The end of the last phase of research revealed that elephant, buffalo *Syncerus caffer*, bush pig *Potamochoerus larvatus*, hartebeest *Sigmoceros*



Most villagers no longer believe animals, especially elephants *Loxodonta africana*, are able to migrate between the Selous Game Reserve and Udzungwa Mountains through the Kilombero Valley, because of human developments in the region

lichensteinii, duiker *Cephalophus spp.* and waterbuck *Kobus ellipsiprymnus* were the most abundant large mammals found in the area.

Butterfly surveys are also continuing, and while past work has focused on using butterflies as indicators of habitat quality, this phase we are focusing on habitat use by different species as our new site is located in a relatively pristine area.

Studies conducted in Kenya have established an intricate relationship between small and large mammals: in areas inaccessible to large mammals the small mammal population doubles and this difference is maintained across years and seasons. This work has important implications for conservation as large mammals are often the first group to be lost when a habitat is disturbed. The resulting increase in small mammals can have a detrimental effect on the surrounding landscape as some species are known agricultural pests and carriers of disease. Work conducted in areas of varying degradation around Shamba Camp in 2007 supported this, while recent surveys in more pristine areas at Sayari Camp have revealed higher populations of large mammals and lower numbers of small mammals.

We have continued to emphasise the socio-economic aspects of conservation, and undertake surveys in the surrounding villages. A broad survey on a variety of topics was carried out in 2007 throughout the Kilombero Valley, and in 2008 we narrowed our focus into two questionnaires aimed at villages in Ulanga District (the south side of the river). The first questionnaire sought to better understand the use and perception of traditional medicine. Trees and plants in miombo woodlands have long been used in traditional healing but with the advent of easy access to western medicine there has been a decline in the practice. This survey focused on the passage of knowledge between generations and results indicate traditional medicine is quickly becoming

a thing of the past. However, our team also visited three local healers and two responded that their business has been increasing. Work in the coming months will attempt to tease apart these opposing responses. The second survey sought to understand the local villagers' perception of conservation and the environment as a whole. Initial findings suggest local villagers understand the importance of wildlife and do wish to preserve them, but conflict arises when animals and people try to occupy the same portion of land. The answers collected will be directly used to update our community and environmental education programs.

Lastly, an exciting new frog project is underway. When driving through the rice paddies adjacent to villages after dark there is always a deafening roar of frog calls, yet in more pristine areas these calls are not nearly as noticeable. Fertilisers, pesticides and herbicides are thought to have negative effects on sensitive frog populations, therefore we investigated species assemblages in rice paddies versus seasonal wetlands in pristine miombo. Soil samples were collected at every site, and in rice paddy sites the local farmer was interviewed about pesticide and fertiliser use. Reed frogs (Hyperoliidae) have been found to be the most abundant in both habitat sites. Preliminary results indicate that rice paddies are ideal habitats for many frog species and to date none have been superficially adversely affected by fertiliser use, which could be promising for promoting sustainable development.

Meanwhile we are enjoying life at Sayari Camp, where there is never a dull moment between the raucous calls of birds in the early morning and visits from hyenas and leopards after dark!

FIELD GUIDE TO THE MOIST FOREST TREES OF TANZANIA

In 2006 we co-published Jon Lovett's 'Field Guide to the Moist Forest Trees of Tanzania' in collaboration with the Centre for Ecology, Law, & Policy, York University and the Critical Ecosystem Partnership Fund. This is the first field guide dedicated to the large tree species of the Eastern Arc and Coastal Forest biodiversity hotspots. It is available for purchase from Frontier's London Headquarters, our Dar es Salaam (DES) Field office, the English Book Shop, DES, and the Natural History Book Store (www.nhbs.com).



FACT: Frontier is the only organisation of our type able to offer internationally accredited qualifications, equivalent to A or AS-levels.

SHARKS AND WADING BIRDS

Frontier Tanzania's Marine Research Programme has moved to a new site on Mafia Island and with that comes an exciting array of new research opportunities. After having worked within the Mafia Island Marine Park (MIMP) for almost two years, Frontier TZM has relocated to the west coast of Mafia, well outside of the Marine Park boundaries. Here, the mangroves and sand flats are home to a diverse selection of species, and the study site has provided field teams with the opportunity to observe two marine environments with differing levels of protection. The Mafia Island Marine Park was gazetted in 1995, based on seven years of research data from Frontier, and has thus enjoyed over 10 years of relative environmental protection which has allowed reef ecosystems to flourish. On the other hand, the west coast of Mafia Island is under no formal protection and has as a result, suffered to some extent from this lack of protection, hence our conservation efforts are vital.

There is thus a clear need to begin research on the western parts of the island, as very few studies on the reefs, their health and fish stocks have been undertaken in this area. On first impressions, the reefs between Kilindoni, Ras Mbisi and the smaller islands offshore (Shungu Mbili, Barakuni and Niororo) are subject to a high level of fishing effort. Numerous boats are seen on the reefs daily, with drive net fishing the predominant method used. With closer observation, the reefs have varying levels of health. On many reefs, remnants of past dynamite blasts scar the reef crest although there is very little data to establish exactly when these incidences occurred, thus making it difficult to judge whether dynamite fishing on Mafia is a thing of the past.

Currently, reef transects are being undertaken to ascertain the health of these reefs, by concentrating on reef fish, invertebrates and benthic components. The methodology for this is proving successful in terms of using non-specialist volunteers for data collection. With a team of science staff, transects are also being undertaken to assess how quickly non-specialist volunteers (separated into two groups of certified divers and non-certified divers) learn their species up to the level of producing viable and true data, in order to validate our research techniques.

The three fringing coral reefs around the islands are currently under plans to be established as protected areas. Shungu Mbili and Barakuni, although only briefly surveyed as yet, show a high level of diversity with sightings of numerous juvenile black tip reef sharks *Carcharhinus melanopterus* on Shungu Mbili. Considering sharks (with the exception of whale sharks *Rhincodon typus*) have never previously been



The west coast of Mafia Island is under no formal protection, but is an important natural resource for the local communities, such as these intertidal harvesters.

sighted on any of the reefs here, this information is exciting evidence of the ecological importance of these islands. We are in the initial stages of commercial fish surveying in areas outside of the islands' peripheries in order to provide data to support gazettement of these islands as extensions to the Marine Park.

We are also compiling a comprehensive species list of all fauna found in the intertidal zone of the bay, as we are situated in an extensive bay with a tidal range of roughly 2km at spring low. So far, the variety and numbers of coastal birds that the bay attracts is worthy of recognition and regular bird surveys on the sand flats are producing data that may reveal exceptionally high numbers of crab plovers *Dromas ardeola* and dimorphic egrets *Egretta dimorpha*. These two species congregating in high numbers are potentially the vital evidence needed to designate the bay as an Important Bird Area. The bay is completely bordered by mangroves which also host many other species of bird as well as fruit bats. The results of mangrove mapping reveal that the mangroves are highly intricate and cover a very large area, many man-hours of mapping exercises have been undertaken but the bay still has yet to be completely mapped. On a positive note, human clearing of the mangroves in areas surveyed is at a minimal level with no apparent damage to the integrity of the mangrove ecosystem. Reef fish species such as damselfish, butterflyfish, longfin bannerfish *Heniochus acuminatus* as well as commercial species (barracuda *Sphyaena spp.*, snappers, emperors, groupers) appear to be using the sheltered creeks and waterways within the mangroves as a nursery ground. Numerous juveniles have been sighted recently, opening up areas of research regarding whether these juvenile fishes are staying within the mangroves or eventually moving out into the open ocean.

We thus have an exciting and busy research schedule ahead of us. With the coming and going of Research Assistants, the constant supply of enthusiastic helping hands will make the task of

surveying such a large area with such diverse areas of research much easier. These surveys and inventories are some of the first of their kind for this area, and produce valuable data that can be used for the future, especially in support of the bay being recognized as an ecological sanctuary for the many species found within it.

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Frontier-Madagascar has endeavoured to pioneer mangrove conservation and prevent further degradation of this precious habitat

REEF BIODIVERSITY AND MANGROVES

The Frontier-Madagascar Research Programme has been conducting research in the Bay of Diego-Suarez for more than three years, working alongside the Marine Institute from the University of Toliara (IHSM), the University of Antsirana, local Malagasy NGOs and governmental bodies. The Bay of Diego-Suarez is the second largest natural inlet in the world with a long and chequered maritime history. The bay's location in the southwest Indian Ocean allows for the revolving ocean currents to bring a wealth of fish, coral and mammal species into the bay, producing some excellent diving opportunities. Additional environmental interest in the bay has arisen as a result of its proximity to surrounding terrestrial protected areas such as Montagne d'Ambre and the newly managed Ramena complex, incorporating Orangea and Montagne des Français.

Originally identifying regions of the Bay with healthy reef systems leading to the proposal of a Marine Management Strategy in 2006, the Marine Research Programme is now developing long-term datasets to monitor changes in physical conditions and reef system biodiversity across the bay, particularly in relation to anthropogenic pressures. The marine ecological data collected includes benthic community composition, fish species abundance and population structure, and algae and invertebrate indicator species frequencies, as well as physical environmental parameters. On top of this, our staff are involved in a variety of specialised research projects, currently looking into coastal fishery practices, soft coral speciation and abundance, and fish feeding guilds.

An investigation into the hard coral community structure around the bay has shown that coral cover and diversity is greatest opposite the mouth of the bay, an area which is most exposed to the oceanic water currents running into the bay from the Indian Ocean, thus likely receiving outside nutrients and coral larvae to restock their resident coral reefs. The currents may also remove suspended sediment from the water column, therefore increasing light penetration, which corals require for growth. In the southern portion of the bay, on the other hand, hard coral cover and diversity were generally lower, particularly in the immediate proximity to the towns of Diego-Suarez and Ramena, which shows the detrimental effects of human pollution and industrial development, and the destructive fishing practices used around Ramena. Macroalgal cover also reached a maximum around the town of Diego, which indicates a coral-algal phase shift. The balance between coral and algal cover can be influenced by a number of things, among them changes in levels of herbivore fish populations and changes in physical characteristics of the water due to anthropogenic activities.

For the past year, we have been integrating the complex, interdependent relationship between coral reef, mangrove and seagrass bed ecosystems into our research by participating in PADI, seagrass watch and mapping mangrove stands. Mangroves and seagrass habitats act as important sediment and nutrient traps, protecting the reef from being overwhelmed by runoff from the land as well as protecting the land from erosion, and recycling essential nutrients such as nitrogen and phosphorus. Their crucial role became evident when surveying reefs of different quality and health, providing the volunteers with an important insight into the way human activity,

both marine and terrestrial, can significantly impact coral reefs and their associated fauna.

Due to the protection they provide, attention is gradually being given to the conservation of mangroves around the world, and Frontier has endeavoured to pioneer such efforts in Madagascar. A joint project with Frontier-Madagascar's Forest Research Programme on mangrove habitats was implemented in 2007, which we have since continued. This project aims to identify the species of mangroves present and to estimate the mangrove biomass in a number of stands. So far, we have found the mangroves in this area to be relatively diverse with many floral and faunal species; however it was apparent that the mangroves around the bay have been degraded by human activity at a faster rate than they can regenerate, which has resulted in a lack of floral species zonation. A mangrove nursery project was also initiated in the latter part of 2007 in the hope of establishing a replanting project.

The mangrove project was complemented by a workshop in the local village Antsisikala as part of our aim to involve and build links with local communities. The workshop consisted of a presentation, a question and answer session and a questionnaire for the adults, whilst our volunteers performed an educational play on the importance of mangroves for the children and followed it with a colouring session and marine-related games. The residents use the mangroves on a subsistence basis, mainly once a year for construction purposes and more regularly on a smaller scale for charcoal, firewood, fishing poles and traditional medicines. The workshop was attended by 50 people and was very well received by all that attended, with the president expressing gratitude that the village had been involved in our work and anticipating future collaboration with a replanting day. In light of this success, we hope to carry out similar workshops in other villages in Diego Suarez in the near future.

Ongoing socio-economic work in Antsisikala includes weekly visits teaching English, and since the beginning of 2008, a newly designed Marine Workshop in which the staff and volunteers give information about marine species and sustainable practices, but as importantly, gain knowledge about local marine habitats, local fishing practices and Malagasy culture, which is essential in the community-based approach to conservation adopted by Frontier.





A friendly visitor to our camp, a Sanford's lemur, *Eulemur fulvus sanfordi*

UNEXPLORED FORESTS IN CLIMATIC TRANSITION

Frontier-Madagascar's Forest Programme has visited a variety of unique Madagascan habitats over the last year. The latter part of 2007 was spent completing work in the Bobaomby region, next to the small village of Ampombofofo. This area has some of the last primary dry deciduous forest in the region and is home to a diversity of endemic wildlife and vegetation. The main objectives were to assess the condition of the wildlife and habitats and the impact of human activity on the area, as little was previously known of the fauna here. These surveys are key to strengthening the case for future protection of this rich but rapidly disappearing ecosystem.

Interesting encounters included the beautiful but critically endangered *Mantella viridis* frog, abundant in one of the few remaining strongholds for this species, and the rare, unique and extremely well-camouflaged leaf-tailed gecko, *Uroplatus sp.* Madagascar is also home to half of the world's chameleon species, and around camp we discovered both the biggest (*Furcifer oustaleti*) and smallest (*Brookesia minima*). Within Lepidoptera, we recorded a significant range extension of the butterfly *Pharmacophagus antenor*, previously found only in the east coast rainforests of Madagascar; its presence in these dry deciduous forests influences our previous knowledge of the ecology and natural history of this species. Along with the science research, socio-economic work was an essential part of our study. We have produced a GIS map of the area for the local village, which has proved extremely useful for the locals as it shows farmland, field and forest boundaries. In terms of our research it has revealed the distribution of human land use and impacts on the surrounding forest, and it will allow us to study changes in habitat and damage to the local environment in the future.

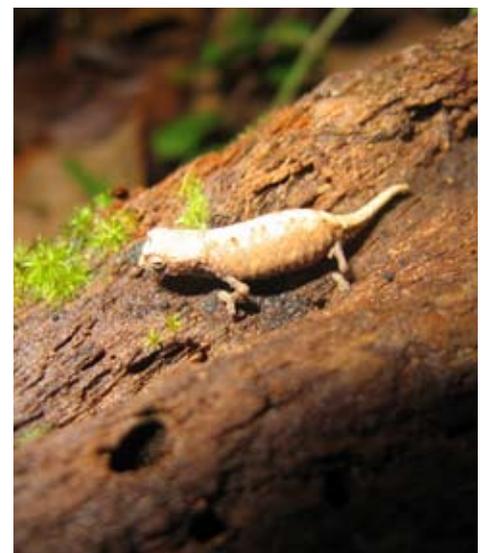
It is obvious from our research around the Ampombofofo area that there is a rich wildlife and a diversity of habitats; the sizable pockets of relatively rare primary forest give the area real potential to have its conservation status upgraded to improve conservation efforts.

After completion of this research, the Forest Programme relocated at the start of this year to a site just south of Montagne d'Ambre near the village of Tsarakibany. The area is situated in the remaining fragmented forest patches that form a corridor between two climatically different National Parks: Montagne d'Ambre to the north with semi-evergreen montane forest, and Ankarana just a few kilometres to the south with dry deciduous forest in a limestone karst region. This unique ecosystem transition is an ideal opportunity to study floral and faunal changes, and the use and conservation value of remaining forest patches as potential refuges or wildlife corridors between two protected areas.

This being a new site, our species inventories are the first of their kind in the area, making it an exciting area to study. Three species of lemur are present: the black lemur *Eulemur macaco*, Sanford's lemur *Eulemur fulvus sanford* which occasionally visits us on camp, and the brown lemur *Eulemur fulvus*. Other species included the beautiful endemic bird species, Chaberts vanga, with brightly coloured blue skin around the eyes. We also came across the Endangered *Acrantophis madagascariensis*, which is the largest species of snake in Madagascar at 2.5-3.5m and is only found in the north of the country. Also found only in the far north and recorded only in a small pocket of forest near camp was the Vulnerable frog species *Boophis blommersia*. This shows the importance of protecting the remaining forests in the area, home to these endangered endemics.

We took advantage of the proximity of Tsarakibany for our volunteers to teach basic English and environmental education to the pupils of the local school. Socio-economic questionnaires were also carried out with the help of an interpreter, to collect information on family, education, occupation, uses of and threats to the surrounding forests, and finally their opinion of Frontier's research. We visited different families in the village, including the village President, which provided an excellent opportunity to talk to and mix with the locals, who were always keen to invite us into their homes, answer questions and offer us plenty of food! After asking our questions we continued to get to know the family, as they were often just as interested in us as we were in them. Many villagers wanted to know more about Frontier-Madagascar, which gave us the opportunity to explain in further detail exactly why we were there, a great way to strengthen our relationship with the local community. One of the villagers generously offered us a goat, which in Madagascar is only eaten on special occasions, providing a great excuse to invite the whole village to have a celebration! From our socio-economic surveys, we have been able to identify the main threats to the forests and the extent of these threats, such as the destructive practice of deforestation for farming. We can now link these findings with our biodiversity data to provide recommendations for successful preservation of these forests.

This recent move has proved to be extremely successful. Although much of the forests in the area are becoming degraded secondary forest, many more species were found than expected, with a particularly large variety of endemic frogs and mammals, highlighting the importance of these forests as a corridor between the two major protected areas. On the socio-economic side, the teaching and questionnaires proved very popular with both the locals and volunteers, and showed how the Malagasy people rely on their local resources.



SHARK NURSERIES AND COMMUNITY CONSERVATION

Following the successes of our Marine Research Programmes in Tanzania and Madagascar, Frontier was invited to Fiji in 2006 by the International Oceanography Institute – Pacific Islands (IOI-PI) and the University of the South Pacific (USP) to help the communities on Gau assess, monitor and manage their marine resources.

Considering its diminutive size, Gau is biogeographically diverse, encompassing a wide spectrum of tropical environments including dense rainforests, highlands, grasslands, mangroves and extensive fringing coral reefs. Frontier-Fiji is currently based in Naviavia on the western coast. This long coast is dominated by a barrier reef running parallel to the island, a deep lagoon and a network of fringing reefs.

In contrast to the main Fijian Islands of Viti Levu and Vanua Levu there is little urbanisation or tourism here, therefore the islanders rely on subsistence agriculture and artisanal fisheries for their livelihoods. The systems of marine resource governance in Gau are unique; as opposed to the state owning the coastal resources, each community is responsible for managing its own traditional marine protected areas, or 'qoliqoli'.

Survey efforts are revealing interesting patterns of reef development and degradation around Gau. Somosomo and Nukuyaweni on the north-western coast revealed to harbour the highest levels of coral and fish diversity in the areas surveyed to date. Extensive mangrove stands and seagrass meadows ensure crystal clear water, verified by a very low algal cover, predominantly coralline. Due to the barrier reef, these fringing reefs are sheltered from prevailing south-westerly currents and subsequent storm damage, with low levels of disturbance evidenced by rubble making up only a small percentage of benthic substrate. These favourable conditions have allowed for the growth of delicate branching and tabular forms of coral, primarily *Acropora*, *Porites* and *Pocillopora* species. Further north, the reefs are more exposed to brisk oceanic currents. There is evidence of high levels of coral recruitment as there is still high coral diversity, but the colonies are much smaller. Encrusting forms dominate the benthos as these forms are more resilient to wave action and stronger currents. The oceanic currents also draw in many pelagic fish species which also contribute to high biodiversity in this region. The rich marine fauna and high visibility has made surveying these sites a pleasurable experience for the staff and volunteers.

Despite the limited commercial fisheries and lack of heavy coastal development on Gau there is still evidence of serious degradation in reefs



Frontier-Fiji provides the scientific expertise and manpower, but the communities are at the heart of decision-making

which are situated close to some settlements. One of the least diverse areas surveyed on the Western coast was Nawaikama Bay, where a combination of natural and anthropogenic factors has resulted in the degradation of this reef system. In the past few years Gau has been provisioned with new systems such as flush toilets which have unfortunately had an ecologically detrimental effect as the nutrients from the untreated sewage are encouraging algal growth at the expense of the slow growing coral. Due to the geographical nature of the inlet, with prevailing south-westerly currents, sediment and nutrients which make their way here are trapped. Ecological evidence of this has been a phase shift from coral dominance to algal dominance in this area, as algae thrive in high sediment and nutrient conditions, out-competing the coral, particularly at depths of 10-12m. Coral species more resilient to sedimentation such as massive forms of *Porites* genus coral were more common here.

Regular dives to Nigali (a passage where there is a break in the barrier reef which surrounds the majority of the western coastline of Gau) have given us numerous sightings of sharks, predominantly the grey reef shark, *Carcharhinus amblyrhynchos*. We have observed in excess of 20 individuals at this site at any one time. Return visits and photographs have enabled us to identify numerous individuals who appear to be resident at this site and are exclusively female showing numerous scars along their flank. This, combined with the fact that many individuals appear to be heavily pregnant suggests that this site may represent a locally important maternity area for this species. As there is limited published research on the maternity behaviour of sharks this represents an interesting new avenue and we intend to conduct more detailed research in this area over the coming months.

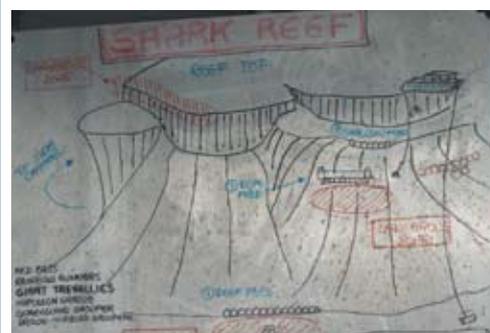
In the past, clashes between the interests of external conservation organisations and local people have frequently led to conflict. As a result, particularly in the last decade, conservation practice has experienced a paradigm shift away from a traditional top-down approach, towards initiatives which integrate the voices of local

Sea Turtle Conservation and Awareness Project



Funded by PADI Project AWARE, Frontier-Fiji initiated this community-based venture in mid-2007. Over the past few phases we have been busy collaborating with experts on sea turtle biology to train local community wardens in ecology, identification and tagging. The wardens have then been able to disseminate information in their villages. In addition, we went to local schools and held workshops on turtle lifecycles and habitats, and played educational games to reiterate these new concepts. The program was received with enthusiasm and gave our volunteers a chance to meet and interact with local communities. The goal of this project has been to encourage community stewardship of marine turtles and their habitats and we are well underway.

communities. Frontier-Fiji's work is riding this new wave of conservation, with communities at the heart of decision-making, drawing on the expertise of external organisations and the enthusiasm of volunteers. Ultimately by supporting this approach, adaptable and sustainable solutions for the management of our natural resources will be attained.



Frontier new website launched in Sept 2007 - check out www.frontier.ac.uk to see our new look and easier to use site.

University research seminars a success - a new seminar on Participatory Eco-tourism has been presented as part of Exeter Uni's MSc in Conservation and Biodiversity and Imperial College's MSc in Conservation Science

Frontier scientists in the papers - the publication of Frontier's findings on positive effects of elephant disturbance on butterflies in the African Journal of Ecology was taken up by newspapers around the country

Carbon Offset - new collaborations with carbon offsetting projects mean that Frontier volunteers can now directly offset their flight's carbon emissions through contributing to a variety of grass-roots projects, including reforestation and energy-efficient stoves.

FRONTIER HOSTS LOCAL STUDENTS IN MADAGASCAR AUDE CARMEL, RESEARCH AND DEVELOPMENT OFFICER

Two Malagasy students from the University of Antsiranana joined the Frontier Madagascar Forest programme to undertake their dissertations for degrees in Natural Science and Environment, and to learn biodiversity survey and monitoring techniques for their future careers.

Dahlia, 25, is in her third year and her research title is 'A comparison of butterfly diversity in open and forested areas'. Butterflies use different habitats

and can be restricted to certain environments, so knowing butterfly activity patterns can aid in National Park management and protection of vulnerable species. Butterflies are also commonly used as indicators of ecosystem disturbance, so Dahlia's study will help future researchers looking into the effects of human presence on the forest.

Patric, 24, is in his fourth year and will be investigating 'Amphibian diversity along riparian corridors' for his dissertation. Riparian zones are a unique and distinctive transition landscape between the terrestrial and stream ecosystems, with structurally complex and diverse habitats resulting from a gradient in soil moisture conditions, encouraging diversity. Riparian areas are critical corridors for wildlife movement, and amphibians are particularly sensitive to the health of these corridors as they have very limited dispersal capabilities and may be unable to navigate even moderately sized areas of unsuitable habitat.

The two students are working alongside international Frontier volunteers, helping them to survey the ecologically important forest fragments in Tsarakibany. More importantly, they are teaching the international volunteers the right way to cook rice and beans and the menu has improved dramatically on camp since their arrival! Their presence on camp has also made the mutual Malagasy and English lessons far more interesting and language skills are improving rapidly. The opportunity for greater cultural exchange will make this experience a memorable one for all involved, and Frontier is proud to continue a long-standing tradition of scholarship places for local students.



The PADI Environmental Achievement Award recognises Frontier's "commitment to conserving underwater environments through education, advocacy and action", and was granted as a result of Frontier's continuing successful marine research and development projects. Dr Drew Richardson, Chairman of Project AWARE Foundation, stated that "The Environmental Achievement Award is about rewarding vision, excellence and pursuit of conservation. More importantly, this award ensures the enjoyment of underwater environments for future generations". This award recognises our exceptional commitment to the marine environment, through both the environmental education of local peoples and ongoing research and conservation of marine ecosystems. Globally, the marine world is facing unprecedented threats as degradation and exploitation occurs on an unsustainable scale; but we are proud that Frontier's activities are recognised as a tangible conservation solution.



DISPATCHES FROM THE FIELD

VOLUNTEER UPDATE

After months of anticipation, it was such a relief to have finally arrived in Diego. The group seems as though it is going to get on really well and I very much look forward to getting to know all of them over the next 3 months. We were whisked away from the airport and set up camp in a nice hotel whilst we got used to our surroundings and the idea that we were actually in Madagascar. We made the most of the luxury that a real bed and real food provides before we departed for camp.

One of the days in town was spent at the local University where we were told stories of the horrors of tropical ulcers - I think I speak for all

of us when I say that we will always wear our booties when we are in the sea and look after all those little cuts! We were all very pleased to pass our health and medical tests.

We had some free time the following day to buy supplies and 'goodies' to supplement our diet of rice and beans for the coming months. I think we bought up the entire town's supply of peanut butter!

Monday came and deployment at last. We had made it on to camp. Wow! It's such a beautiful location and I'm looking forward to making it

my home for the next ten weeks. The last few days have involved getting to know each other, collecting wood for cooking fires and attending science lectures. We have been taught all about fish and are looking forward to seeing some of them in the flesh during our snorkel point out lecture. We have also been getting to grips with camp duty, learning to make fire and digging a new long drop. So far, everything is amazing and camp life is going great. Roll on the next ten weeks!

SPECIAL OFFERS

50% off expeditions for MSc Dissertation Students!

Now's the time to be thinking about your MSc dissertation, and Frontier is pleased to announce that all MSc dissertation students receive a 50% discount on the cost of their expedition! That's 10 weeks starting from £995 on any of our major projects!

Free expedition place for temporary Uni Reps!

Frontier are recruiting temporary University Representatives to help promote Frontier's research activities and university talks. If you are a successful University Representative, you will receive a free expedition place! You will only need to participate in promotional activities around your university and in your own time, for a short period of time - a maximum of one month, and the conditions for

obtaining your free place are easily achievable.

If you'd like to be considered, send your CV (with details of your course, which year you are in, and include any previous experience you have of promotional activities - whether paid or unpaid) to marketing@frontier.ac.uk to find out more.

Save up to £1000 (25%) on your expedition!

Get huge savings on your Frontier project, with up to £1000 off if you want to go on two or more 10 week Frontier conservation expeditions!

Contact the Expedition Recruitment Coordinator on info@frontier.ac.uk for more details, or book your projects online to automatically receive your discount!

Discounts apply to individuals participating on two or more projects.

Experience some of the most spectacular global events while on a Frontier project!

Joining a Frontier project is a great way to experience a cultural event first-hand with the local communities. Don't be a tourist, live some of the greatest traditions in the world! This is a rare opportunity to see these events without paying top prices for accommodation as a tourist.

- Celebrate Chinese New Year 2008 while participating on one of our Frontier-China projects
- Live the African Cup on a Frontier-Ghana project
- Experience the Rio Carnival on a Frontier-Brazil project

