Placing out a camera trap at a forest salt lick in Cambodia’s largest protected area brought more than a few surprises for the Cambodia Frontier team.

Frontier, a non-government conservation organisation, has been working within the Kulen-Promtep Wildlife Sanctuary since January 2011 surveying the local wildlife and documenting the effects of deforestation on key species within the sanctuary. With Cambodia having the third highest rate of deforestation in the world, and a decline of 70% of primary rainforest since the 1970s, the work is vitally important for conservation research. Frontier had already documented many species of conservation concern living within the protected area such as Malayan sun bears, Asiatic golden cats, pileated gibbons and the gaur, a species of large wild forest cattle.

However the recent images of wildlife captured on camera trap, an automated camera tripped by animals breaking an infrared beam, are by far the most interesting yet. “When we opened the photos and saw a group of five civets, no one could believe it” said Sarah Edwards, Principal Investigator for Frontier Cambodia. “The local rangers had been working in the area for five years and had never seen anything like it”.

The common palm civet, a small omnivore found across Southeast Asia, had been captured on camera trap by the team previously, but only one at a time. Common palm civets are believed to be solitary, only coming together for breeding. We don’t really know why we had five individuals at once. Maybe it was a mother with nearly adult cubs or maybe conditions in the forest may cause these animals to be social. What is more surprising is that we had the same group show up three times. It almost looked like they were having a disco!” The same camera trap at the salt lick also revealed groups of East Asian porcupines, tiny mouse deer and a range of bird species, including owls and woodpeckers.

Animals visit salt licks to gain essential nutrients such as sodium which are missing from their diets. We are pleased that the camera trap should have revealed such a high diversity of species using the salt lick.
About Frontier

The Society for Environmental Exploration was established in 1989 as a non-profit conservation and development non-governmental organisation which operates under the banner name of Frontier. Frontier began with just one volunteer-based project set up by Eibleis Fanning, the founder and managing director of the company. Over the past 20 years Frontier has expanded greatly and we now have both marine and terrestrial projects in five different countries, Cambodia, Costa Rica, Tanzania, Madagascar and Fiji, all with the same goal of conserving the local environment and creating sustainable livelihoods for the local communities who rely on it. We additionally run partner projects in over forty countries, where volunteers can gain experience in other disciplines, such as teaching English and working in an orphanage.

FRONTIER BIODIVERSITY RESEARCH

Madagascar Forest
Located on Nosy Be, Frontier is carrying out vital exploratory research, seeking out important forest fragments which may harbour populations of endangered lemurs, birds and chameleons, and instigating community forest programmes

Madagascar Marine
In beautiful Nosy Be, Madagascar Marine are surveying to assess the health of the local marine environment. Particularly important to our research are the relationships between coral reefs, mangroves and seagrass.

Tanzania Savannah
It has been twenty years since Frontier first started carrying out terrestrial research in Tanzania. Now located in the Kilombero Valley, an internationally important wetland, we monitor large mammal movements between the valley and nearby Selous National Park.

Tanzania Marine
Having moved back to Mafia Island, which became a protected marine park in 1995 thanks to Frontier’s pioneering work, we are monitoring the effectiveness of the reserve, and have been asked by the government to carry out more survey work on currently unprotected coral reefs with the aim of extending the park.

Cambodia Forest
Frontier is rightly proud of being the first organisation of our kind to be invited into Cambodia to carry out conservation research. Our studies in the dense forests of the Kulen-Promtep Wildlife Sanctuary are finding new species and formulating vital management strategies.

RECENT PUBLICATIONS


• Labanowski, R.J. & Lowin, A.J. (2011) A reptile survey in a dry deciduous forest fragment in northern Madagascar showing new records for the little-known snake Pararhadinaea melanogaster and a range extension for the skink Amphiglossus tanysoma. Herpetology Notes 4: 113-121


Costa Rican and international conservationists have been devising effective methods to remedy the many environmental problems caused by Costa Rica’s turbulent history of unsustainable land use and the toll taken by industry. Unfortunately, climate change is a new peril which conservationists now need to address. Frontier’s project is currently focused on an investigation of the effects of climate change on terrestrial communities in a reserve on the Osa peninsula. Encompassing lush lowland forests and coral reefs, the unique geographical isolation of the reserve has promoted speciation and is home to six of the world’s sea turtles and a variety of endangered species, including the harpy eagle, the resplendent quetzal and five species of wild cat.

The Osa Peninsula may only cover 3% of Costa Rica’s land mass, but it is home to over 50% of its species. After only 18 months of surveys the research team has already seen some exciting and positive results. Out of the four primate species present in Costa Rica, the Geoffrey’s Spider monkey and Central American Squirrel monkey have proved to be the most abundant. These results are incredibly promising as according to the IUCN red list both species are at risk of extinction.

Our work in Costa Rica is vital and the team will continue to monitor and collect long term data on the flora and fauna of the Osa Peninsula, which will serve the additional purpose of providing a better understanding of the impacts of climate change.

The Madagascar forest project is located on Nosy Be, the largest island off the coast of Madagascar. It is one of the most exciting and attractive research sites, due to the endemic species and the rich biodiversity that can be found there.

Data is being collected on the south west corner of the island, within the Lokobe National Park. Much of the habitat outside the reserve has been the subject of deforestation, having been turned into pasture and crop areas. The data being collected in the Lokobe reserve encompasses information on reptiles, birds and small mammals, and over the past phase some exciting discoveries have been found.

A significant difference was found between the number of reptiles within and outside the reserve, with those inside being significantly higher in their numbers. Specifically snake and chameleon species were found in a higher abundance within the forested areas. Interestingly however, two species (Hemidactylus mercantorius and Heterixalus tricolour) were found only in the areas inhabited by humans.

Bird surveys produced insignificant results and it was found that the bird populations are comparatively low when compared with the mainland. Three species of small mammals were found, although all were introduced species. These included Ratus ratus, Suncus marinus and Mus musculus. Mouse lemurs were also seen on all the surveyed sites.

The next phase of the project will extend to research into the mangrove habitats in the area. Surveys of the plant and invertebrate species within the mangroves will be conducted and satellite images will be used to assess the changes in the cover of habitat. This information will continue to show the advantages of maintaining a protected area and provide valuable scientific data for future conservation initiatives.
makes the work of Frontier’s Madagascar marine project all the more important.

Much of the area around Nosy Be is yet to be explored and mapped, providing Frontier Madagascar with the opportunity and challenge of delving into uncharted waters and collecting baseline data on the local marine ecosystems. The aim is to assess and compare the impacts of fishing and tourism by surveying sites inside and outside two locally managed marine protected areas.

The need for baseline data on coral reef health increases in proportion with the pressures on it from anthropogenic impacts (see article below). The decline in coral reefs over the last 50 years, which is expected to continue at around 1% per year, makes the work of Frontier’s Madagascar marine project all the more important.

Although Frontier Madagascar has been in Nosy Be for a relatively short period of time, the results have already shown that biodiversity is high, with the good news that the reefs are largely healthy. Seeing humpback whales and hearing dolphins communicate, recent researchers have had a memorable time experiencing at first hand the richness and diversity of the marine fauna around Nosy Be.

Further research needs to be carried out in order to get a more complete picture of the condition of the marine ecosystems surrounding Nosy Be.

THE EFFECT OF DIVERS AND SNORKELERS ON CORAL REEFS

BY WINNIE COUNRTENE-JONES

It has been well documented that anthropogenic disturbances from diving and snorkelling activities cause detrimental effects to coral reef communities.

Hard corals which have slow growth rates, existing in complex and brittle structures are particularly susceptible to damage. A large proportion, between 70-90% of divers, come into contact with coral during their dive, the main cause of damage occurring through physical contact from fins, the body or SCUBA gear. Sediment is also stirred up which can affect sessile organisms.

This disturbance can prevent the settlement of polyps and increase pathogen attack. Boat damage also occurs through anchoring, grounding and waste discharge while increased tourism brings other problems such as sewage, pollution and non-degradable materials, all of which impact upon fragile systems such as coral reefs.

The impact of recreational divers and snorkellers has been investigated in a number of areas. The Northern Red sea has been found to have increased rates of tissue loss, algal overgrowth and coral breakages in frequently visited SCUBA and snorkelling areas.

A study in 2000 showed that snorkelling in the central area of the Great Barrier Reef Marine Park caused significant changes in the number of damaged and broken coral colonies, revealing that snorkellers were directly accountable for over 95% of the damage. Due to these breakages, the composition of coral can be altered; for example an 8.2% increase in a relatively fast growing branching coral species occurred in heavily dived areas at Bonaire in the Netherlands.

There is a need to design and implement management strategies which ensure sustainable use of underwater resources. Co-operation with diving centres and the Marine Park Authority would enable the regulation of tourist numbers entering the park. Scientific studies of the area to observe the extent to which and the manner in which increased tourism was putting pressures on the coral reefs would enable strategies to be developed to secure the long term management of the area.

Winnie Courtene-Jones is an Assistant Research Officer on the Frontier Tanzania Marine project located on Mafia Island.
Between the gargantuan Selous game reserve and the mighty Udzungwa mountains nestles the Kilombero valley. This rich tapestry of wetlands and forests once linked these two game reserves, allowing elephants, buffalo and other great beasts to pass between them. Today however the area is greatly degraded. The steady drip of deforestation has turned to a raging torrent as large numbers of immigrants have moved to the area and cleared land for great herds of cattle.

There remains one dwindling hope that the two reserves can remain connected, a strip of forest called the Ruipa Corridor. This potential link is currently all but vanished with a well used road blocking the way and farms encroaching on it from all directions. It would be a blow to conservation if these two reserves were to be cut off from each other, limiting genetic flow between their animal inhabitants.

In a project funded by DEFRA, Frontier has made progress in halting the destruction of this crucial natural highway, bringing together four villages in the most vulnerable area to form land management plans. These plans would crystallize an agreement between the villagers to conserve the remaining fragments, preventing them from being illegally sold or destroyed. The project has already managed to ignite the enthusiasm of the local people; at one recent meeting two hundred people turned up, many cycling four hours each way just to hear about the project. A key requirement is for the area to be mapped so that the land management plans can be made based on accurate land use information.

Local people rely on the resources that forests supply, from medicines to timber. They collectively own the resources and no conservation project in this area will succeed unless it carries the local inhabitants with it. Frontier is working to identify the most crucial fragments of the corridor for large mammals, with the strongest conservation effort being concentrated where it is most needed.

It is unsure at this stage whether this once pulsing natural artery will flow again in the future. If lucky, it will be possible to bring this corridor back from the brink of destruction. If this is not immediately successful, then the aim of the project will be modified to one of seeking to safeguard enough significant fragments of the corridor to allow future generations to regenerate the corridor and re-link the two reserves.
Piranha’s Bark Worse Than Its Bite

Anthony Kubale, Biodiversity and Conservation Intern

Scientists have recently discovered that the widely feared piranha fish use sounds to communicate with one another in an attempt to intimidate rivals as an alternative to attacking them.

Dr. Eric Parmentier, from the University of Liege, Belgium, previously studied sound production and communication in a variety of fish species including piranhas. This research discovered that piranhas made sounds, but was inconclusive as to why. Studies in this area suggest that a wide variety of fish use noises to attract potential mates, so that the sounds made by piranhas could simply have fallen into that category.

Through the use of underwater microphones, known as hydrophones, Dr. Parmentier and his colleagues undertook a laboratory experiment that recorded the sounds piranhas made when they confronted each other, while also filming their interactions.

The recordings picked up three distinct sounds from the piranhas. The first was a bark that the fish produced when they "displayed" or confronted one another without engaging in fighting behaviour. The other two were a drum-like beat which they used when chasing one another and a softer croak made when biting other individuals. These physical confrontations tended to be made over food.

For much of the study the fish made no noise and did not engage in any passive or physical confrontations. It was only after hours of observations that researchers managed to capture this illusive behaviour. The production of sound in piranhas is made by vibrating their swim bladders, a gas-filled chamber that helps regulate their buoyancy. The vibration of the swim bladder is driven by high-speed muscles that contract and relax 150 times every second.

Dr. Parmentier suggests piranhas use noises to communicate as it uses less energy than physical conflicts. As a result, energy expenditure can be directed into other important biological activities such as reproduction and feeding.

Dr. Parmentier and his team are aiming to conduct further studies on piranhas in the Amazon to find out more about the acoustic repertoire of this fascinating creature.

Frontier - Fiji Marine Research Programme

Anthony Kubale, Biodiversity and Conservation Intern

The sea around Gau, Fiji, represents an essential resource particularly to those engaged in commercial and artisanal fishing. However, the ineffectiveness of established no take zones and a lack of knowledge in local stakeholders is severely impacting ecosystems around Gau.

The research team at Frontier Fiji are conducting surveys and community work around Gau in an attempt to ascertain the health of the fringing reef and educate local stakeholders in protecting their local environment. The aim is to create a desire in the local inhabitants to fish in a sustainable way and therefore improve the health of the marine environment.

Five years on, Frontier Fiji is busier than ever! Surveys around the island of Gau in collaboration with WWF South Pacific have revealed a degree of biodiversity that is seldom seen elsewhere in the world. Sightings of humpback whales breaching, 15ft manta rays not to mention white tip reef sharks, grey reef sharks and the very illusive sicklefin lemon sharks have provided an excellent indication that coral reef ecosystem around Gau are in a healthy condition.

Although this indication of increased biodiversity is very positive news, the job is by no means complete. Further surveying on Gau’s fringing reefs and community work is planned in the hope that continued increases in biodiversity will be observed.
DISSEMinATION TOPICS

Frontier works in many locations on many research topics, from fish surveys on Tanzanian reefs to tracking sun bears in Cambodia. As a result of this diversity of work, we are able to offer an almost endless list of dissertation projects. This variety means that although our principal dissertation topics are listed below, we are more than happy to discuss new ideas. We also feel that it is important to discuss and develop the project to suit the individual carrying out the research.

The data requirements of a dissertation are such that the majority of projects will require a minimum ten week participation. Dissertation students are also eligible for the following discounts (subject to conditions):
- BSc 10%
- MSc 20%
- PhD 50%

Cambodia Forest

What is the potential for resin trees to produce sustainable incomes for local communities?
Determine the economic value of timber in the forests and examine the potential conservation implications.
To what degree are non-timber forest products used to supplement income by local people?
How does human disturbance relate to large mammal abundance?
Using faecal samples describe the diet of large mammals of the area and investigate whether seeds that have been ingested remain capable of germination.

Costa Rica Forest

Leaf cutter ant ecology – determine foraging distance, tree selection/leaf preference, overall biomass and scent marking efficiency (which would include some lab work)
Behavioural study of army ants including troop dynamics, relationship with weather and food competition
Turtles – the variation of temperature at different sand depths. What are the factors that determine sand temperature and what effect will that have upon the sex of turtle eggs laid in different locations?
Using turtle nests that are relocated due to bad placement identify the variation in the weight and size of eggs and explore the implications.

Madagascar Forest and Marine

Lemurs: studies in abundance, habitat preference, diet, social structure.
Small mammals, amphibians and reptiles: seasonality, abundance and diversity in relation to habitat type and reaction to human disturbance.
Examine the interplay between local attitudes to natural resource use and conservation goals.
Examine fishing methods and compare catch for subsistence, artisanal and commercial fisheries.
Using the example of local fisheries discuss the interplay between local attitude and conservation goals.
Fish food webs, what is the makeup of the community with respect to diet?
What fish species use the mangroves as nurseries and in what densities?

Tanzania Savannah and Marine

The value of marine protected versus unprotected areas to the ecotourism and fishing industry.
Study the effect of varying soil characteristics such as pH, nutrition level and salinity on plant species.
Investigate the diet of large mammals, the presence of viable seeds in dung (and thus their potential role in seed dispersal), and estimations of their abundance and species makeup.
Investigate the importance and role of natural resources – what economic value to natural resources represent?

Fiji Marine

Assess locally managed marine reserves and the spill over effect in maintaining local fisheries.
Assess the population ecology of commercially important holothurians.
What are the effects of anthropogenic activity and surface run-off on the ecology of coral reefs?
Compare the abundance of damaged or bleached coral to living coral.
Identify abundance of coral eating fish in relation to coral – what is their overall feeding rate?

If you are interested in conducting research alongside our field scientists then the first step is to contact our research department at research@frontier.ac.uk or phone our London office on +44 (0) 207 613 2422. We can then discuss your interests, what is applicable to your course and what will best contribute to your future career. Armed with this information you can then work with both us and your university supervisor to develop your project. Once you have a clear project idea then it is time to fill out a project proposal form and send it in. All that is left after that is to go and do the research!
Have you ever wondered what noise a koala makes? A roar? A squeak? Or a g’day? Well researchers and many other people that live in, or have visited the wonderful land of Oz, know that they make a low grumbling noise. Intriguingly, how they create this sound has not been understood until now.

The low, grumbling tones normally occur during mating season, perhaps recreating some Barry White magic for female koalas?

Dr. Benjamin Charlton and his team from the University of Queensland, Australia have discovered how koalas produce an astonishingly loud noise at a very low frequency for such a small marsupial. The loud noise has probably evolved during the process of sexual selection. As might be expected, the louder the noise generated by a male, the larger and fitter the male is and therefore the more attractive.

The instrument from which koalas make this noise has been deciphered using MRI scans and post mortem studies on the larynx (which houses the vocal chords). It was found that the larynx, which is normally located near the throat, has descended all the way to the 3rd and 4th cervical vertebrae.

In addition to this, the muscle anchoring the larynx to the sternum was found to reach much deeper in the chest cavity than previously thought. This allows the larynx to be pulled down even further in the chest when making mating calls.

This anatomy, which is not known to figure in other marsupials, causes a loud, rumbling sound to enter the voice box, which, acting like a large empty room, amplifies the call further. The noise made by a koala is so deafening that it is even louder than a bison!
Fiji Marine Conservation & Diving
- The Fijian archipelago lies scattered lazily in the achingly blue waters of the Pacific Ocean, bathed in the radiant South Pacific sunlight. Join our team of volunteer divers and marine scientists and dive alongside dolphins, sharks, manta rays and turtles, scuba dive training to PADI AOW level FREE.

Madagascar Marine Conservation & Diving
- Visit the home of some of the world’s most spectacular and least explored dive sites. FREE dive training to PADI AOW level.

Madagascar Wildlife Conservation Adventure
- Explore some of the world’s most spectacular and least explored wildlife and wilderness as you camp and trek on the extraordinary island of Madagascar.

Cambodia Tropical Forest Conservation & Adventure Project
- Explore Cambodia’s uncharted and pristine tropical rainforests and discover a host of exciting wildlife while living as an intrepid explorer in the jungles of Cambodia.

Tanzania Marine Conservation & Diving
- Dive with your fellow volunteers and conserve pristine coral reefs in the turquoise waters of the Indian Ocean surrounded by turtles, rays and whale sharks. Dive train to PADI Advanced Open Water FREE.

Tanzania African Wildlife Conservation Adventure
- Track and monitor threatened wildlife communities in the open savannas and wooded wildlife corridors in the heart of Tanzania.

Costa Rica Big Cats, Primates and Turtle Conservation
- Help save endangered sea turtles, patrol beaches, and release turtle hatchlings. Trek volcanoes and explore tropical forests.

OVERSEAS:
- TANZANIA: Assistant Research Officer (terrestrial and marine)
- MADAGASCAR: Assistant Research Officer (terrestrial and marine)
- COSTA RICA: Assistant Research Officer (terrestrial)
- FIJI: Assistant Research Officer (marine)
- CAMBODIA: Assistant Research Officer (terrestrial)

IN LONDON HQ:
- INTERNSHIPS: Available in the London HQ throughout the year in various departments:
  - Overseas Operations
  - UK Operations
  - Marketing & Events
  - Biodiversity and Conservation

If you would like the opportunity to join the Frontier team and apply for one of these positions, please email your CV with covering letter explaining your suitability for the role: staff@frontier.ac.uk

Further details on Frontier and all the available positions can be found on www.frontier.ac.uk

SPECIAL OFFERS

GROUP DISCOUNTS
Why not save up to 20% by travelling with friends by taking advantage of Frontier’s group discounts? Here’s what you could be saving:
- Groups of 2 people - save 10% each
- Groups of 3 people - save 15% each
- Groups of 4 or more people - save 20% each
Available on the below projects for 10 weeks +

CALLING ALL STUDENTS!
If you’re studying towards a BSc, MSc or PhD, Frontier can not only help you with your dissertation but are offering some fantastic discounts off your Frontier Group project. BSc students will receive a 10% discount, MSc students receive a 20% discount and PhD will receive 50%!
Available for all projects listed below

- Fiji Marine Conservation & Diving - The Fijian archipelago lies scattered lazily in the achingly blue waters of the Pacific Ocean, bathed in the radiant South Pacific sunlight. Join our team of volunteer divers and marine scientists and dive alongside dolphins, sharks, manta rays and turtles, scuba dive training to PADI AOW level FREE.
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- Madagascar Wildlife Conservation Adventure - Explore some of the world’s most spectacular and least explored wildlife and wilderness as you camp and trek on the extraordinary island of Madagascar.
- Cambodia Tropical Forest Conservation & Adventure Project - Explore Cambodia’s uncharted and pristine tropical rainforests and discover a host of exciting wildlife while living as an intrepid explorer in the jungles of Cambodia.
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