# STUDENTS' RESEARCH PROJECTS

INDONESIA AND ITS NEIGHBOURS ARE CONSIDERED some of the most biodiversity rich areas in the World. The sustainable use of the region's natural resources and the conservation of the rich biodiversity relies primarily on the current research and conservation effort taking place and, perhaps more importantly, on encouraging and facilitating committed and passionate students to maintain interest in these enormously important topics. This section is made available entirely to highlight MSc and PhD students' projects in the region that contribute enormously to building the foundation for future conservation interventions and initiatives.

## Orangutans as Seed Dispersers

Esther Tarszisz (Australia)
OuTROP / University of Wollongong Australia. PhD candidate.

Animal-mediated seed dispersal is crucial for maintaining natural forest ecosystems. Orangutans (*Pongo pygmaeus*) are thought to play a significant role in animal-mediated seed dispersal due to their large body size and home ranges, however this information is critically lacking throughout all their habitat. I will undertake the first comprehensive analysis of seed dispersal by orangutans, by monitoring an orangutan population within the Sabangau River catchment, Central Kalimantan, Indonesia. This subject is vital, as seed dispersal and germination are crucial for maintaining natural forest ecosystems; orangutan populations are decreasing rapidly in many areas owing to human activities, yet the impacts of these losses on forest processes such as seed dispersal, and thus how these might be mitigated, are very poorly known; and this research serves as a potential model for understanding the importance of other forest fauna in, and effects of losses of these populations on, seed dispersal. Orangutan handling, ingestion and elimination of seeds will be investigated, and germination and plant establishment trials will be conducted. Data on orangutan behavior, movement and physiology; as well as floral composition of the study site will be utilized in order to gain a comprehensive picture of seed fate and develop a mechanistic model of the orangutan's role in it. This will determine the orangutan's importance role in this important component of forest ecology and provide the ability to predict effects of population declines on forest structure, over a range of scenarios.

## The Conservation and Ecology of the Red Langur (*Presbytis rubicunda*) in Sabangau Tropical Peat-Swamp Forest

David A. Ehlers Smith (United Kingdom)
OuTROP / Oxford University, MSc candidate.

Sabangau tropical peat-swamp forest in Central Kalimantan constitutes one of the largest remaining contiguous lowland forest-block on Borneo. In October, 2009, I began to investigate the ecological requirements of the red langur (*Presbytis rubicunda*), an Asian colobine monkey endemic to Borneo. I sought to establish the ecological parameters vital to informing conservation strategies for the species, as relatively few published articles were available on the red langur. Between October 2009 and March 2010, I conducted transect surveys to calculate population density in the mixed-swamp forest, one of Sabangau's three main habitat types. Using the sampling principles of Distance, I discovered that the population in this habitat type occurred at relatively very high densities, an unexpected result given that peat swamps is often considered one of low biodiversity and densities due to the nutrient-poor environment. I began habituating four groups in the core study area, and subsequently recorded the behavioural, feeding and ranging habits through focal-animal sampling of three adult females in a mixed-sex group over one complete year (January – December 2011). In between I conducted additional population density

surveys in the tall-interior forest and low-pole forest, the other of Sabangau's major habitat types.

## Satellite Tracking, Social Behaviour and Management of the Bornean Elephant in Sabah, Malaysia

Nurzhafarina Othman (Malaysia)
Danau Girang Field Centre / Cardiff University - Sabah Wildlife Department.

In this study, I look at the social behavior, social organization and movement of the Bornean elephant (*Elephas maximus borneensis*) in Lower Kinabatangan Wildlife Sanctuary (LKWS). I will follow several family groups for two weeks every month. I will be tracking the elephants using GPS/satellite telemetry to establish knowledge about the dispersal range and social organization. I started my work in 2010 and plan to complete it within seven years as I am registered as a part-time PhD student at Cardiff University, UK. I hope that the results of this study will provide valuable information to the Sabah Wildlife Department for the future management of the species.

## Human-crocodile Conflict: Increasing Understanding through use of Satellite Tracking, Education and Management

Luke Evans (United Kingdom)
Danau Girang Field Centre / Cardiff University - Sabah Wildlife Department.

The encroachment of humans into areas that were previously considered as wild has brought crocodiles and humans into constant contact. My study deals with the problem of human-crocodile conflict. The project focuses on the estuarine crocodile (*Crocodylus porosus*) across the state of Sabah. The aim is to discover adult crocodile ranges and long-term movements to assess when people are at the greatest risk of attack. Satellite tracking allows for unprecedented levels of information about this secretive and notoriously illusive species. As part of my study I will also examine how nesting behaviour has been affected by increasing human settlement. Smaller individuals are caught and tissue samples removed to develop an understanding of the genetic health of the species throughout the state of Sabah. The culmination of the project will result in the distribution of information to local people as well as a more detailed understanding of the standing of a species, which just 30 years ago was considered endangered. This work began in January 2012 and should be concluded by 2015.

## Fragment Size, Edge effects, and Anthropogenic Factors influences on the Movement, Distribution and Parasite load of Proboscis Monkeys (*Nasalis larvatus*) in the Kinabatangan Floodplain, Sabah

Danica Stark (Canada)
Danau Girang Field Centre / Cardiff University - Sabah Wildlife Department.

Proboscis monkeys live in riparian, mangrove and swamp forest, which are amongst the most threatened habitats in Borneo. Due to the conversion of land along the Kinabatangan River, mainly for agricultural purposes, there are sites along the river where remaining forest may be insufficient for the requirements of proboscis monkeys. The impact of the size and shape of forest patches, as well as the types of forest edges may have an important impact on the intensity of use, and the distribution and movement of groups throughout the Kinabatangan region. By fitting proboscis monkeys with satellite collars throughout the course of my PhD, I will be able to quantify their daily and seasonal movement patterns for the first time, and examine which factors determine their movement and distribution. The intensity in which proboscis monkeys use their range will be examined through gastro-intestinal parasites found in faeces. The outputs of this project include a model to report on the effective conservation development of the Wildlife Sanctuary, and to identify useful corridor options.

This will be taken to national government officials as support in the restoration of wildlife corridors along large rivers in Sabah during an international workshop on the conservation of the proboscis monkey that we will organize at the end of the project in Kota Kinabalu, Sabah. This part-time PhD began with Cardiff University in 2012 and is expected to be completed in 2017.

## Conservation Genetics of the Proboscis Monkey (*Nasalis larvatus*) in Sabah

Dr Senthilvel Nathan (Malaysia)
Danau Girang Field Centre / Cardiff University - Sabah Wildlife Department.

The proboscis monkey is an endemic species of the island of Borneo. Although movement and dispersal of proboscis monkeys are not restricted by water, populations become isolated due to the increasing loss of habitat by logging and agriculture (palm oil plantations). In 2005, an extensive survey in Sabah was conducted to establish the population status and to assess the threats to the survival of the species in the state. We estimated the population size to a minimum of 5,907 individuals found along major coastal river systems in Sabah. The distribution of the proboscis monkeys appeared highly fragmented, with only five major centres of continuous distribution and numerous small isolated populations. Only 15.3% of the population estimated was found within protected forest reserves, with much of the species' diminishing range habitats exposed to further conversion, extraction and disturbance leading to increased isolation of proboscis monkey groups. I propose to investigate how landscape and environmental factors can influence gene flow within and between populations in order to design adequate conservation measures for a highly endangered species of mammal. To address this, I will use two types of genetic markers, mitochondrial DNA and microsatellites.

## Population ecology, demography and home range size of *Bos javanicus lowi* using an integrative approach of satellite telemetry, remote camera trapping and molecular analysis

Penny Gardner (United Kingdom)
Danau Girang Field Centre / Cardiff University - Sabah Wildlife Department.

I am studying the rare and endangered *Bos javanicus lowi* (common name: Banteng or Tembadau); a wild bovid on the island of Borneo. I started my PhD in 2010 (collaboration between Danau Girang Field Centre, Cardiff University (Wales) and the Sabah Wildlife Department) studying the population ecology, demography and home range of Sabah's banteng using a multidisciplinary approach, incorporating remote camera traps, noninvasive molecular genetics and GPS-satellite telemetry. In 2011 and 2012 I was able to collect the first baseline data of banteng in Sabah using camera traps, and have successfully located herds, created profiles for recognizable individuals, identified breeding status and activity patterns. By having a familiarity of banteng locations I was able to collect fresh dung samples for molecular analysis; I will use mitochondrial and micro satellite DNA to estimate sex-bias dispersal and kinship, and identify if sex-bias dispersal corresponds with spatial distribution. I am due to complete my PhD (2014) and hope to catch a subset of individuals and collar them with GPS-satellite tracking devices to identify their movements and estimate home range size. I also hope to identify environmental factors influencing habitat use such as vegetation structure, temperature and the effect of human presence. In the long term, I hope to raise the conservation profile, awareness and understanding of banteng, and contribute to the creation of a conservation management plan. And encourage young scientists to develop their own research ideas and undertake more challenging projects on species that are poorly understood.

## Feedbacks between fire, vegetation, and landscape configuration: Peat swamp forest dynamics in the changing tropical landscape

Megan Cattau (USA)

Department of Ecology, Evolution, and Environmental Biology, Columbia University, USA.

In their natural condition, peat lands buffer saltwater intrusion, prevent flooding problems downstream, and have a large capacity for below ground carbon storage and, thus, a high potential to mitigate global climate change. Tropical peat fires can cause elevated human mortality, massive carbon emissions, and the loss of forest cover that is habitat for a rich array of flora and fauna. Fire can also cause dramatic changes to landscapes affecting both the composition and structure of the vegetative community and the landscape configuration of land cover types. Positive (amplifying) feedbacks can develop between land cover and fire.

In my research, I use remotely sensed data, field-based measurements, and modeling to evaluate the cause of fire events and the consequences for the forest community in a peat swamp forest. The study site is a former agricultural project in Central Kalimantan called the Mega Rice Project (MRP), the goal of which was to convert over a million hectares of intact peat swamp forest into rice paddies. The project was abandoned, but the remaining irrigation canals continue to causing peat soil drainage and subsidence, leaving the area susceptible to fire, a novel disturbance regime. With my research, I propose three specific aims. First, I will disentangle the relative effects of human access, vegetation and fuel load, fire history, and climate on fire risk by developing a Bayesian model of fire probability. Second, because fire alters the landscape configuration of forest fragments, I will assess the role of landscape configuration in structuring tree composition within forest fragments and the capacity for tree species traits to modify that relationship. Third, because in the absence of forest reestablishment, degraded peat lands will continue to become aerated, resulting in increased susceptibility to ignition and $CO_2$ emission, I will evaluate what factors alter the trajectory of vegetative regrowth in the post-burn barren area: establishment limitation from environmental filtering or seed limitation from altered landscape configuration. Understanding the underlying mechanisms of how disturbance affects ecological communities is a central goal of disturbance and community ecology, and my research will contribute to the body of work exploring the dynamics between vegetation and fire in the peat swamp forest. My work can also inform restoration efforts and land management planning on this complex landscape. The fieldwork for this project will be conducted during a 2013-2014 field campaign sponsored by the Fulbright Program, and the anticipated completion date for my dissertation is 2015.