INTRODUCTION

SECTION 1 – INTRODUCTION (Pages 1-5)

- What is Operation Wallacea?
- Global Research and Conservation Management Strategy
- How Can I Become Part of the Programme?
- Health, Safety and Fitness
- How are the Data Used?

SECTION 2 – ACADEMICS (Pages 6-8)

- Participating Academics
- Visiting Academic Grants
- PhD Studentships
- Academics – Class Groups

SECTION 3 – RESEARCH OBJECTIVES AND FACILITIES & RESEARCH ASSISTANT OPTIONS (Pages 9-31)

- Joining as a Research Assistant
- Gaining Course Credit as a Research Assistant
- Indonesia
- Honduras
- Peru
- South Africa
- Madagascar
- Mexico
- Guyana
- Cuba
- Transylvania

SECTION 4 – UNDERGRADUATE DISSERTATION / THESIS TOPICS (Pages 32-63)

- How to Select and Complete a Dissertation/Thesis
- Botanical Research Topics
- Herpetology Research Topics
- Bird Ecology Research Topics
- Mammal Ecology Research Topics
- Primates Ecology and Behaviour Research Topics
- Marine Ecology Research Topics
- Intertidal Research Topics
- Environmental Science Research Topics

SECTION 5 – ADVANCED FIELD PLACEMENTS (Pages 64-65)

- Medical Electives
- Masters by Research

SECTION 6 – ORGANISING AN EXPEDITION (Pages 66-73)

- How to Get More Information
- Prices and Organising Your Expedition
- Fundraising
- Dates for Research Assistants
- Feedback Quotes from 2013 Research Assistants and Dissertation Students

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WHAT IS OPERATION WALLACEA?

Operation Wallacea is an organisation funded by tuition fees, that runs a series of biological and conservation management research programmes in remote locations across the world. These expeditions are designed with specific wildlife conservation aims in mind - from identifying areas needing protection, through to implementing and assessing conservation management programmes. What is different about Operation Wallacea is that large teams of university academics who are specialists in various aspects of biodiversity or social and economic studies are concentrated at the target study sites giving volunteers the opportunity to work on a range of projects. The surveys result in a large number of publications in peer-reviewed journals each year, have resulted in 30 vertebrate species new to science being discovered, 4 ‘extinct’ species being re-discovered and $2 million levered from funding agencies to set up best practice management examples at the study sites. These survey teams of academics and volunteers that are funded independently of normal academic sources have enabled large temporal and spatial biodiversity and socio-economic data sets to be produced and provide information to help with organising effective conservation management programmes.

In 2014, the expeditions are operating in 9 countries: Indonesia, Romania, South Africa, Madagascar, Peru, Guyana, Cuba, Honduras and Mexico. In each country, a long-term agreement is signed with a partner organisation (e.g. Fund Amazonia in Peru, Wildlife Ecological Investments in South Africa) and over the course of this agreement, it is hoped to achieve a survey and management development programme at each of the sites. Occasionally, a competent local partner organisation is not available. In these cases, Operation Wallacea mentors the formation of a new Non-Government Organisation (NGO) formed from local staff who have provided successful input to the expedition surveys (e.g. Lawane Ecotone for the Indonesian forest and Expediciones y Servicios Ambientales de Cusuco for the Honduran cloud forests).

GLOBAL RESEARCH AND CONSERVATION MANAGEMENT STRATEGY

The vast majority of science programmes that deliver key research outcomes are characterised by short-term funding with restricted aims and bio-geographical ranges. Long-term projects covering large bio-geographical scales that incorporate more than one ecosystem are rare. The Operation Wallacea programme provides the opportunity to consider science and conservation of key ecosystems from a global perspective. Opwall is able to draw upon researchers from a wide range of different disciplines and academic institutions to address major issues related to the sustainable management and conservation of some of the world’s most diverse but threatened environments.

A global research and conservation strategy has been developed and is applied in 4 stages at each of the sites. This includes an initial assessment of the biological value of the site (stage 1). If the site is accepted into the Opwall programme, an ecosystem monitoring programme is established to determine the direction of change (stage 2). If this reveals a continuing decline, a programme for monitoring socio-economic change in adjacent communities is established to determine how these communities interact with the study site (stage 3). Once data from stage 2 and stage 3 are obtained, funding applications are submitted to establish a best practice example of conservation management and the success of these programmes are then monitored (stage 4). There is obviously considerable overlap between these stages and stage 1 projects can be running at the same time as a stage 4 programme in order to add data to understanding the ecosystem requirements of target species or adding to the overall species lists for previously un-worked taxa.

BIODIVERSITY SCIENCE

Opwall is the publisher of Biodiversity Science (www.biodiversityscience.org) that is a quarterly online journal that describes advances in biodiversity monitoring, new species discoveries and advances on conservation management. Articles are peer reviewed by a team of editors from Harvard, Oxford, Cambridge, McMaster and Essex Universities, Scottish Wildlife Trust and the Royal Geographical Society. If you are not receiving the quarterly journal then please log onto the Biodiversity Science website and sign up for the free quarterly issues.
HOW CAN I BECOME PART OF THE PROGRAMME?

The Operation Wallacea surveys require contributions from a large range of people with different levels of academic expertise and training and this brochure describes how the different groups are able to contribute to the programme. Note groups of Sixth Form or High School (16+) students with their teachers in attendance are allowed to participate in some of the programmes but have a much more restricted range of options available to them. The school programme is not included in this brochure and has a separate brochure.

Section 1: Describes how the Operation Wallacea programmes are constructed, the health and safety approach used and how the data generated by the programmes in each country are used for conservation management purposes.

Section 2: Describes the opportunities for academics to become involved in the programme.

Section 3: Describes the opportunities for those in university education or who have recently completed degrees, to join the programme as research assistants to gain field experience or for course credit.

Section 4: Describes how you can join to complete an undergraduate dissertation or independent research project in the field with a high level of academic support. There are more than 100 research topics available to develop into dissertations or independent research topics.

Section 5: Describes opportunities for completing a Masters by Research involving a 6-month field-based project or to gain expedition medicine experience on a Medical Elective placement.

Section 6: Describes how to organise involvement in one of these expeditions, the prices and the dates.
HEALTH, SAFETY AND FITNESS

HEALTH AND SAFETY
Risk is inherent in everything that we do in life. Without accepting and understanding these risks, we would not be able to do anything at all. The first concern of all activities undertaken as part of Operation Wallacea expeditions is to gain an understanding of the environments we will be working in, and from this to reduce risk to health and safety as far as is possible. All the expeditions provided by Operation Wallacea meet the requirements of British Standard Specification for the provision of visits, fieldwork, expeditions and adventures outside the UK. Detailed documents explaining how each of the expeditions comply with the clauses of BS8846 are published on the Operation Wallacea website before the start of the research programmes. In addition Opwall has been audited and awarded a Learning Outside the Classroom badge for taking students on overseas expeditions. Safety auditing is also performed at each of the sites during the research programmes. Reports on the accidents and illnesses that occurred during the expeditions each year are published on the website.

Operation Wallacea has a seven point health & safety policy which is reproduced below together with short notes on how each of these policy points are implemented in the various countries.

PROVISION OF RELEVANT HEALTH AND SAFETY INFORMATION TO ALL VOLUNTEERS BEFORE THEY ARRIVE ON SITE
The website contains information on the immunisations and prophylactic medications required for volunteers going to different countries, as well as information on necessary equipment for activities such as trekking, staying in the forest, diving etc. In addition pre-expedition webinars are organised to brief the students.

ENSURING THAT APPROPRIATE QUALIFIED AND EXPERIENCED STAFF ARE EMPLOYED ON THE PROJECT AND THAT ALL FIELD STAFF AND GROUP LEADERS ARE TRAINED IN THE SAFE OPERATING PROCEDURES
Operational procedures have been prepared for each site and staff have to go through an on site induction course which includes training in the relevant procedures. Implementation of the procedures is audited on a regular basis by Health & Safety or medical staff on site and non-conformances reported to the relevant staff for corrective actions to be implemented. On the dive training side of the expeditions all the staff are PADI Dive Instructors or higher, whilst all dive support in the water is given by PADI Divemasters. Unlike the PADI scheme, which is clearly relevant for the marine side of the project, on the terrestrial sides of the project there are often no directly applicable qualification schemes. This is approached by ensuring the senior staff at each site have extensive experience in relevant skills (e.g. field camp management, jungle training, canopy access etc). Bush training and field surveys in South Africa do however, have relevant qualification schemes for guides (FGASA) and for carrying firearms in the field, and senior staff on this project have these qualifications.

IDENTIFICATION OF THE RISKS ASSOCIATED WITH ACTIVITIES AND LOCATIONS, AS WELL AS THE DEVELOPMENT OF MEASURES TO MINIMISE THESE RISKS
Risk assessments have been produced for each location visited (dive site, forest, bush or trek location) activity undertaken (e.g. diving, trekking, etc) as well as specific research project associated risks. These risk assessments are on the Operation Wallacea website and can be downloaded to help with planning your expedition. Volunteers, when they first arrive, are required to complete an exercise where they are asked to identify the risks likely to be encountered at the site and on the various activities and projects they will be doing. This process is designed to get all volunteers thinking about risks and how to reduce them for themselves before they are told of the agreed risk reduction measures.

DEVELOPMENT AND IMPLEMENTATION OF SAFE OPERATING PROCEDURES FOR EACH OF THE ACTIVITIES UNDERTAKEN
Procedures to ensure trekking teams remain in contact with all the members of the group are practised. Sign out/in procedures for all groups leaving terrestrial camps have been put into position and search and recovery procedures prepared for teams missing return and contact deadlines. Additional procedures cover aspects such as safe driving, hygiene, snorkelling and swimming and many other aspects. All diving is carried out in accordance with procedures in accordance with PADI and include limiting diving to two dives a day, maximum depth for survey and training dives of 18m, a maximum 50 minute dive (unless the dive is to 5m or less), a minimum 3 hour surface interval between dives and each diver must return to the surface with at least 50 bar remaining in the tank. All boats have a sign out/sign in procedure and have to carry oxygen and First Aid kits.

ENSURING THERE ARE ADEQUATE COMMUNICATION, MEDICAL AND EVACUATION PROCEDURES IN POSITION
At all sites and on all transport routes there are multiple methods of communications comprising VHF radios, satellite phones, cell phones and email. It is possible to contact the teams in the field directly from the UK co-ordinating office. A Medical Officer (doctor, accident and emergency nurse or emergency paramedic) is at each main camp. Where the camps are close to US standard hospitals then Emergency First Aid trained staff are used as the Medical Officers whereas in the sites where access to high standard hospitals is more distant then doctors with well equipped medical kits are on site. Evacuation plans for Emergency Priority evacuations (normally by air but in some cases in conjunction with overland routes), High Priority (fastest overland route to a hospital) and Medium Priority (most convenient and comfortable overland route) have been developed for each site and are published on the Operation Wallacea website before the start of each expedition. £1 million medical and evacuation insurance cover has been purchased for all participants by Operation Wallacea so that the evacuation co-ordinating company appointed by the insurer can, with the help of the Medical and Evacuation plans, establish contracts and agree prices in advance with all the hospitals, air ambulances etc likely to be used in an emergency. This is done so there are no delays if an incident were to occur.

BRIEFING OF ALL VOLUNTEERS ON ARRIVAL IN THE SAFE OPERATING PROCEDURES, AND ACQUainting THEM WITH THE MEDICAL FACILITIES AVAILABLE.
All volunteers on arrival are given a general health and safety briefing, and additional briefings are given by leaders as the volunteers join new projects or visit new areas.

RECORDING ALL ILLNESSES, ACCIDENTS, NEAR-Misses OR INCIDENTS WHICH MAY HAVE A BEARING ON HEALTH AND SAFETY AND USING THIS INFORMATION AS PART OF AN ONGOING REFINEMENT OF THE OPERATING PROCEDURES.
The Medical Officers and First Aiders keep detailed confidential medical records and summary reports on all staff and volunteers, which are used in combination with accident and ‘near miss’ data reported, in compiling accident and illness reports. These reports are published for each country on the Operation Wallacea website at the end of each season’s expeditions. These analyses have been performed on all the expeditions run by Operation Wallacea since 2004 and show that joining an expedition is as safe as going on a sports tour (e.g. football, rugby) or taking part in activities such as skiing.

FITNESS LEVELS REQUIRED
The forest projects, particularly Honduras and to a lesser extent Indonesia, Guyana, Mexico and Madagascar, as well as the Transylvania expeditions require reasonable levels of fitness. The survey work can be physically demanding, and on top of that the working conditions may be hot, humid and/or tiring. A useful guide to fitness levels is given below and for some of the more physically demanding projects you will need to assess your fitness prior to the expedition starting against the criteria below so we can help advise you on the best choice of sites:

<table>
<thead>
<tr>
<th>GRADE LEVEL</th>
<th>DEFINITION OF FITNESS AND HEALTH RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capable of trekking up mountains over rough ground for 5 hours with a 15kg rucksack and no health problems that would require medical assistance in remote camps</td>
</tr>
<tr>
<td>2</td>
<td>Capable of trekking up mountains over rough ground for 3 hours with a 15kg rucksack and no health problems that would require medical assistance in remote camps</td>
</tr>
<tr>
<td>3</td>
<td>Capable of trekking for up to 2 hours on well defined footpaths with a 15kg rucksack and no health problems that would likely require medical assistance.</td>
</tr>
<tr>
<td>4</td>
<td>Lower fitness levels than any of the above definitions or with a medical condition that could reduce ability in the field or require emergency evacuation.</td>
</tr>
</tbody>
</table>

Research Assistants generally have to complete week-long jungle training or bush training courses before joining the main research programmes. Their fitness is assessed during these courses, and advice is offered on appropriate camps or projects. Marine projects are generally possible with lower levels of fitness (the marine teams may not agree!), although there are various swim tests required for diving and snorkel based projects. For example, to undertake Open Water Dive Training you need to be able to swim 200m unaided.
HOW ARE THE DATA USED?

The Opwall Trust, full name Operation Wallacea Trust (Charity number 1078362) was established in 2000 in the UK in order to support activities that could directly contribute towards the conservation of biodiversity in the areas in which Operation Wallacea is working. The Opwall surveys produce data that can be used by conservation managers to more effectively manage the studied areas. However, despite in many cases having demonstrated an urgent biodiversity need to protect an area, the data were often not being fully utilised because of the lack of conservation management funds. Hence the Opwall Trust was created to provide the focus for funding follow-on conservation management interventions at the Opwall study sites. The Opwall Trust is a UK registered charity which is entirely independent of Operation Wallacea, with no shared Directors.

This collaboration between a business funded model (Opwall) and a charity (Opwall Trust) has proved to be a strong symbiotic relationship. The costs of identifying potential projects to fund and the mechanisms most likely to be successful are all part of the Opwall funded research programmes so the Opwall Trust does not need to spend hard won funds on initial project development. Moreover, the Opwall annual biodiversity monitoring programmes produce, free of charge, the data needed to monitor the success of any conservation management interventions funded by the Opwall Trust. From the Opwall viewpoint there is little point in collecting biodiversity data if there is no conservation benefit. Conservation management interventions cannot be funded just from the tuition fees paid by the participating students so the follow on funding from the Opwall Trust is essential.

With these advantages one of the main successes of the Opwall Trust has been in demonstrating how funds can be used cost effectively in developing countries to ensure wildlife conservation. A distinctive feature of Opwall Trust funded projects is that they are trying to empower communities and individuals to develop businesses linked to forest or reef protection. Funding for wildlife conservation projects often includes provision of alternative income streams but in many cases these alternatives are not then linked to enhanced protection of the wildlife and habitats. In some cases this spending results in ‘additional’ rather than ‘alternative’ incomes with the damage continuing unabated. Where the work of the Opwall Trust is unique is that it has pioneered the concept of tying business development investment in communities that agree conservation contracts (Wildlife Conservation Products scheme) or to fishing licence replacement income (Kaledupa reef fisheries project). Once individuals or communities have a financial benefit in protecting their wildlife then the effects can be spectacular.

Rt. Hon. Kenneth Clarke QC MP is Patron of the Trust which is chaired by Professor Ian Swingland with a group of Trustees drawn from academia and business.

The Opwall projects are identifying a number of priorities for funding of conservation management which cannot all be supported at the same time. For 2013/14 the priorities are:

PACKAGING FORESTS FOR FUNDING UNDER THE REDD+ SCHEME

The United Nations REDD+ scheme aims to fund governments in developing countries to ensure they slow or eliminate forest destruction and hence conserve carbon. This scheme has enormous funding from western government, but has been criticised because of corruption and proper compensation to local forest-based communities. Large non-governmental organisations (NGO’s), with funding from the corporate sector, have therefore developed a parallel scheme but based on a bottom up approach (funding local communities rather than governments). For this, forests are evaluated according to set guidelines. The scheme has many advantages, but is too expensive and too reliant on technical expertise for most local communities or small NGO’s to engage. The Opwall Trust has been funding the Oxford University Biodiversity Institute to develop an internet-based portal that overcomes these problems. For no charge, users simply define their area (by uploading a shape file), and a report is automatically produced, which contains the information needed on the forest structure, relative biodiversity value and carbon to be saved against the ‘do nothing’ scenario. The title holders to the land then design and cost a management plan for the forest that sets targets for forest and biodiversity protection and ensures that some of the funding benefits the local communities. The Opwall Trust are negotiating with various organisations to then use this information to create a market for funding forests based on the costs of these management plans rather than just the carbon value of the forest. For many forests the opportunity cost of leaving the forests untouched are too great to be just funded by carbon values alone – hence the need for this scheme which will enable the value of protecting various forests to be compared based on carbon saved, their relative biodiversity value, rigorousness of the monitoring

INTRODUCTION
programme and biodiversity targets, number of people in the lowest quartile of income
who will get a 5% or greater uplift as a result of implementing the management
scheme and the likelihood of the management plan succeeding in achieving its
objectives as assessed from an independent review of the scheme.

RESTORING AND MANAGING OVERFISHED CORAL REEF FISHERIES
The Opwall Trust has pioneered a scheme in conjunction for sustainably managing
severely overfished coral reefs. This involves registration of all those in the local
community who fish, each of whom obtains a fishing licence on registration.
Opportunities for other livelihoods are developed at the same time, people can then
opt to surrender their fishing licences in return for assistance in establishing a new
income stream. No new fishing licences are conferred, meaning both a gradual
reduction in fishing pressure and a gradual increase in value of the remaining licences.
Working with the Indonesian Government and part-funded by the UK’s Darwin
Initiative, the Trust has brought this theory to life on the island of Kaledupa in the
Wakatobi Marine National Park which lies in the centre of the Coral Triangle – the
areas of reefs that are the most biologically diverse in the World. In that region the
most promising income-generation method is the extraction of carrageenan (a food
thickening agent) from seaweed, for sale to the global wholesale markets. The Opwall
Trust has funded the development of an extraction process that can be done locally,
allowing the key value-adding step to benefit the people local to the reefs. Over the last
year, progress has been made with a major commercial buyer over guaranteeing
purchase of carrageenan produced by this scheme, which helps provide the confidence
needed for commercial investors to develop this scheme in Kaledupa and implement
the reef fish licence ‘buy outs’ in exchange for minority shareholdings in the small scale
carrageenan factory.

LANDSCAPE LEVEL CERTIFICATION OF PRODUCTS
Providing enhanced prices for products produced by communities who have agreed to
protect their local environment is a potentially powerful way to ensure protection of
forests. However, current ethical pricing schemes for products (e.g. Fair Trade,
Rainforest Alliance etc.) certify only the environmental impact on the farms on which
products are grown. Within a community there can be farmers who are gaining
enhanced prices for their products under one of these ethical pricing schemes yet the
other parts of the community can be heavily involved in destruction of the
surrounding forests. There is a move to develop community level certification schemes
for products from some of the big certification schemes to overcome this issue and the
Opwall Trust has been funding research at Nottingham University on how such
landscape level certifications schemes could be implemented for coffee.

INSPIRING STUDENTS ABOUT TROPICAL WILDLIFE CONSERVATION
School students are the future of both conservation and business, yet the school
curriculum evolves slowly and tends to lack inspiring examples of tropical biodiversity
and conservation. Students typically have little knowledge of tropical wildlife and of
how conservation can be linked to sustainable development in the tropics (and
beyond). The Opwall Trust has part funded the development of example data sets from
real biodiversity research projects around the world that can be used as case study
exercises in classes. These data sets, known as the Wallace Resource Library, are proving
very popular with over 700 schools worldwide now using them in lessons – motivating
more young people to get involved with wildlife conservation. Additional data sets are
being added in 2014 so that there are multiple case studies on Ecosystems – Coral
Reefs, Ecosystems – Rainforests, Ecological Survey Techniques, Animal Behaviour and
Natural Resource Use & Sustainability.
**PARTICIPATING ACADEMICS**

Operation Wallacea works with academic specialists in numerous fields from a range of universities and academic institutions around the world. There are more than 200 academics in total involved in the research programme. A sample of the academics are listed below that have been involved in recent years in the field research programmes, contributing to publications, supervising PhD students who form part of the programme or are involved in data analysis or conservation management outputs from the research.

**Conservation Management Scientists**
- Dr Julian Clifton - University of Western Australia
- Dr Angela Benson - University of Brighton
- Dr Richard Bodmer - University of Kent
- Dr Keri Brondo - Memphis University
- Dr Jiri Fox - University of New England
- Chris Maiors - Wallacea Biodiversity Institute
- Dr Ruth Malleson - Social and Economic Consultant
- Dr Aubrey Manning - University of Edinburgh
- Dr Wanda McCormick - Moulton College
- Dr Bob Payne - Lakehead University
- Dr Richard Phillips - University of Liverpool
- Dr Sarah Pilgrim - University of Essex
- Dr Selma Stead - University of Newcastle
- Professor Ian Swingland - Operation Wallacea Trust

**Genetics, Oceanography and Geology Scientists**
- Dr Kim Hunter - Salisbury University
- Dr Ben Horton - SUNY ESF
- Dr John Milsom - University College London
- Dr Mark Tittler - University of South Wales
- Dr Cathy Walton - University of Manchester
- Dr Moya Wilson - Curtin University, Australia
- Dr Gerd Winterleitner - Royal Holloway, University of London

**Invertebrate (terrestrial and freshwater) specialists**
- Dr Martin Speight - University of Oxford
- Dr Sarah Beynon - University of Oxford
- Dr Patricia Chow-Fraser - McMaster University
- Professor James Cook - University of Reading
- Dr Sammy de Grave - Oxford Natural History Museum
- Dr Francis Gilbert - University of Nottingham
- Andy Godfrey - Consultant Entomologist
- Dr Merlijn Jocque - University of Leuven
- Dr Mary Kelly-Quinn - University College Dublin
- Dr Stuart Longhorn - NUI Maynooth
- Dr Kenneth McCravy - Western Illinois University
- Dr José Nuñez-Mino - TRAFFIC International
- Dr Paul O’Callaghan - University College Dublin
- Dr Karen Rothery - National Museum of Scotland
- Dr Simon Segar - University of Reading
- Dr Roy Wiles - University of Glamorgan
- Dr Keith Willmore - Florida Museum of Natural History

**Ornithologists**
- Dr Tom Martin - University of Lancaster
- Dr Jake Bicknell - DICE, University of Kent
- Dr Alan Dykes - Kingston University
- Dr Barry Ferguson - University of East Anglia
- Dr Leanne Hepburn - University of Essex
- Dr Tom Horton - SUNY ESF
- Dr Ben Horton - UConn
- Dr Richard Hunter - Salisbury University
- Dr John Milsom - University College London
- Dr Mark Tittler - University of South Wales
- Dr Kathy Walton - University of Manchester
- Dr Moya Wilson - Curtin University, Australia
- Dr Gerd Winterleitner - Royal Holloway, University of London

**Herpetologists**
- Dr Steve Green - Operation Wallacea
- Dr Graeme Gillespie - University of Melbourne
- Dr Mark Miller - BirdLife International
- Dr Paul Leafe - Montgomeryshire County Recorder
- Dr Ben Horton - SUNY ESF
- Dr Jon Kolby - James Cook University
- Dr Scotty Kyle - KZN Ezemvelo
- Dr Byron Lardner - USGS
- Dr Randall Morrison - McDaniell University
- Dr Eridani Mulder - Central Queensland University
- Dr Silviu Petrovan - University of Hull
- Dr Bob Reed - USGS
- Mariano Suarez - Centro de Ecologico de Akumal (CEA)

**Botany, Plant Sciences and Forestry Specialists**
- Dr Bruce Carlisle - Northumbria University
- Dr Steven Durance - Glaramorgan University
- Dr Jon Cocking - JCA Ltd
- Dr Anke Dietzsche - University College Dublin
- Dr Daniel Kelly - Trinity College Dublin
- Dr Grace O’Donovan - Independent ecology consultant
- Dr Pascale Pousaris - Princeton University
- Dr Andrew Poulton - University of Portsmouth
- Dr Andrew Smith - University of Oxford
- Dr Peter Thomas - University of Keele
- Dr Clay Trauterricht - University of Hawaii
- Caroline Whitefoot - Natural History Museum
Dr Samy Zalat - Nature and Science Foundation for Egypt

**Marine Scientists**

Professor Dave Smith - University of Essex
Dr Gabby Ahmidia - World Wildlife Fund (WWF)
Professor Jorge Angulo Valdes - University of Havana
Dr Arthur Anker - Museum National d'Histoire Naturelle, Paris
Dr Richard Barnes - University of Cambridge
Professor James Bell - Victoria University of Wellington
Dr Wayne Bennett - University of West Florida
Dr Paul Bologna - Montclair State University
Dr Isabelle Cote - Simon Fraser University
Professor James Crabbe - University of Bedfordshire
Dr Simon Cragg - Portsmouth University
Dr Leanne Cullen - Cardiff University
Dr Sarah Curran - Department for Planning and Infrastructure, Fremantle
Dr Jocelyn Curtis-Quick - Cape Eleuthera Marine Institute, Bahamas
Dr John Eme - University of North Texas
Dr Caine Delacy - University of Western Australia
Dr Teresa Fernandes - Heriot Watt University
Dr Andy Gill - Cranfield Institute
Dr Ben Green - Environment Agency
Dr Emma Hayhurst - University of Glamorgan
Dr Sebastian Hennige - Heriot Watt University
Dr Jess Jaxon Harm - University of Vienna
Dr Magnus Johnson - University of Hull
Dr Tim Johnson - University of Glamorgan
Dr James McDonald - Rutgers University
Dr Steve Mc-Meall - University of Essex
Dr Ed Morgan - University of Glamorgan
Dr Clare Peddie - University of St Andrews
Dr Alan Pinder - Dalhousie University
Dr Johanna Polenberg - US House of Representatives
Dr Dai Roberts - Queens University Belfast
Professor Alex Rogers - University of Oxford
Dr Pelayo Salinas de Leon - Victoria University Wellington
Dr James Sastry - University of Wallacia
Dr Patric Scaps - University of Perpignan
Dr Jon Shivers - Jersey State Fisheries Department
Dr Tim Smith - WEI, South Africa
Dr Edd Stockdale - University of Western Australia
Dr Dave Suggett - University of Essex
Professor Chris Todd - University of St Andrews
Dr Richard Unsworth - Swansea University
Dr Nerida Wilson - Australia Museum
Dr Kyle Oung - Universidad de los Lagos, Chile

**Mammal Specialists**

Dr Kathy Slater - Operation Wallacea
Dr Kirsten Bohn - Florida International University
Dr Mark Bowler - University of St Andrews
Professor Mike Bruford - University of Cardiff
Jill Carpenter - Independent bat consultant
Dr Ruth Cox - Liverpool John Moores University
Dr Christian Dietz - University of Tuebingen
Dr Nigel Dunstone - Natural History New Zealand
Dr Sharon Gursky-Doyen - SUNY Stony Brook
Abdul Harris Mustari - IPP, Bogor
Dr Justin Hines - Operation Wallacea
Andrew Jennings - IUCN/SSC Small Carnivore Specialist Group
Jim Jones - Surrey Wildlife Trust
Dr Tiggia Kingston - Texas Tech University
Juliet Leadbeater - University of Chester
Dr Burton Lim - Royal Ontario Museum
Professor Aubrey Manning - University of Edinburgh
Niall McCann - University of Cardiff
Professor Mike Perrin - University of Kwazulu Natal
Dr Rob Peck - Institute of Zoology London
Dr Abigail Phillips - University of Birmingham
Dr Nancy Priston - Oxford Brookes University
Professor Ute Radeckl - Hannover University
Dr Neil Reid - Queens University Belfast
Dario Rivera - University of Queensland
Dr Steve Rossiter - Queen Mary University of London
Dr Adrian Seymour - Independent wildlife film maker
Dr Myron Shekelle - National University of Singapore
Dr Andrew Smith - Anglia Ruskin University
Dr Kym Snare - University of Toronto
Dr Peter Taylor - University of Kwazulu Natal

Professor Stewart Thompson - Oxford Brookes University
Dr David Tosh - Queen's University Jerusalem
Jeremy Truscott - Sheffield Biodiversity Steering Group
Dr Phil Wheeler - University of Hull
Dr C.B Wood - Providence College
Dr Anne Zeller - University of Waterloo

**Fisheries Scientists**

Dr Dan Exton - Operation Wallacea
Dr Dave Bird - University of Western England
Dr Emmanuel Frimpong - Virginia Polytechnic
Professor Tim Gray - University of Newcastle
Dr Peter Henderson - University of Oxford
Piotr Kalinowski - Fisheries consultant
Dr Duncan May - Fisheries consultant
Dr Joel Rice - Fisheries consultant
Dr Rodney Rountree - University of Connecticut
Professor Michael Stewart - Troy University
Dr Jason Vokoun - University of Connecticut
Paul Simmon - Cornell University

**GIS and Statistical Analysis**

Dr Peter Lang - University of Oxford
Dr Craig Beech - Peace Parks Foundation
Jesse Blirs - University of Amsterdam
Dr Natalie Cooper - Havard University
Dr Bella Davies - Oxford Brookes University
Dr Richard Field - University of Nottingham
Dr Fiona Hemley Flint - University of Edinburgh
Dr Alan Jones - University of Sheffield
Dr Marco Lusquinos - Imperial College London
Cristi Malos - Babes-Bolyai University, Cluj
Dr Lisa Manne - CUNY
Dr Peter Randerson - University of Cardiff
Dr Allister Smith - Oxford Brookes University
Dr Emily Woollen - University of Edinburgh
Professor Kathy Willis - University of Oxford
**VISITING ACADEMIC GRANTS**

**FUNDED RESEARCH VISITING ACADEMICS**

Operation Wallacea operates a Visiting Academic programme for academics interested in using our sites to conduct their own research. The Visiting Academic programme runs from the start of the survey season to 31 July each summer and is available at all of the sites. Academics participating in this programme will be designing a long term research programme which can be carried out by the academic themselves, postdoc students or eventually turned into a part funded PhD. The programme is intended to let the academic come to the research site or sites for a short period to observe the area and facilities available, with the other participating scientists and design a research project for future years. If the submitted project is accepted as part of an Operation Wallacea research programme for future years then the costs of the research including full or part funding of travel costs are paid.

All data collected are the joint property of Operation Wallacea and the academic. It is expected that the academic will be producing peer reviewed publications from their research and Operation Wallacea will be acknowledged and the senior scientist included as a co-author. Operation Wallacea can also use the data in grant applications towards establishing sustainable conservation initiatives in the area, although this will not compromise the ability for the data to be used in peer reviewed publications.

The visiting academic program costs $500 a week, with flights not included. This cost covers all food, accommodation and transport from the start point of each expedition within the country, use of equipment, vehicles, boats etc and medical and evacuation insurance. This cost is for the first summer only with the majority of future costs subsequently covered by Operation Wallacea. Occasionally, an academic proposes a highly desirable and unique research idea and in such cases the cost of the visiting academic program is waived.

To apply for a funded research or class group visiting academic programme or if you have any questions about the sites or potential research projects, please email academics@opwall.com. Allocation of visiting academic positions is done throughout the year, but for logistical reasons they are rarely accepted for a summer after the end of February of that year.

**PhD STUDENTSHP**

Operation Wallacea has already supported or is currently supporting by provision of part studentships a total of 40 PhD students.

**PhD STUDENT FIELD RESEARCH GRANTS**

Operation Wallacea runs a yearly grant programme for PhD students. The grants are available to PhD students registered at an academic institution. It is intended to allow that student to come to our sites and conduct their own research projects for 4 to 8 weeks each summer for multiple years if required. The research project must fit within the themed research programme for the site and be between June and August each year.

The deadlines for applications are February 19th and September 10th with decisions made within 3 weeks after these dates. If you wish to submit a grant, discuss potential grant applications or require more information on any of the sites and potential research areas please email academics@opwall.com.

**CO-FUNDED PhD POSITIONS**

Operation Wallacea is willing, if the PhD is of major research interest to the site, to co-fund PhD grant applications to large funding bodies such as Research Councils, in particular acting as the industrial partner in a CASE grant. The academic applying for the grant will be the Principal Supervisor for the PhD position and Operation Wallacea will provide a co-supervisor with experience of the subject and working at the site. If you wish to discuss potential grant applications or require more information on any of the sites and potential research areas please contact academics@opwall.com.

**ACADEMICS – CLASS VISITS**

**INDEPENDENT CLASS TRIPS**

Operation Wallacea has developed research centres and facilities at 22 sites around the world. These research centres are used for our expeditions in the summer months, but a few of them are open throughout the rest of the year for independent academic class trips. The set up of the trips is intended to offer as much flexibility as possible, allowing them to be designed around the requirements of the class. For example, trips can be based at just one site within a country or move around sampling different habitats, including time in both forest and marine systems if required. The trips can be run for any length of time with a simple price structure based on flexibility.

All trips to all of the sites are set at a cost of $600 a week per student, with 10 students covering the cost of a single academic. This price can be divided to fit needs, so the price can be calculated to match a 10 day trip for example. Equally part costs of academics will be covered with, for example, 15 students covering the costs of 1.5 academics. Each country has an agreed start and finish point and the costs include all the transfers from this point, food, accommodation, use of facilities, equipment, boats, vehicles etc, diving if required and safety systems including medical cover.

Operation Wallacea has developed a number of written courses with exam material which are used for training of volunteers joining the main research programmes. These may be utilised as part of the course being developed by the academics but the responsibility for developing the academic course and delivery of the course will be that of the organising academic.
If you are in, or have completed, university level education and have a good level of English, you can join the expeditions as a research assistant. Relatively few people have field experience working alongside real research projects and the Operation Wallacea research programme offers the opportunity to work with a range of academic teams to strengthen your CV/Résumé or to help you decide whether tropical field work is of interest for your career. Research assistants are involved in a wide range of tasks on each research topic and help to gather primary data.

JOINING AS A RESEARCH ASSISTANT

For students interested in gaining course credit for their time on expedition, there are two ways of organising this: signing up for an external course or gaining internal course credit.

EXTERNAL COURSE CREDIT

If you are from a North American university and are going on expedition for a minimum of 4 weeks, all options can be used for credit (except dive training) by signing up for the distance learning module BL3400 Tropical Research and Field Study at University of St Andrews in Scotland (cost £600 – approx. $1000). St Andrews will award 20 course credits for the 4 weeks (equivalent of 3-4 credits at US universities) and you will receive a graded transcript that can be used towards your GPA. The credit system works by completion of an approved training course, followed by three weeks of research assistant projects or additional training and submission of a research proposal.

To enrol for credit for BL3400 Tropical Research and Field Study Module with St Andrews, you would book onto the Opwall expeditions in the normal way and pay your 10% deposit. You then need to arrange a meeting with your Study Abroad Office to discuss what you would like to do and how to organize the transfer of credits to your university. If your academic advisors or Study Abroad departments have questions about the program or about how the St Andrews course credit applies, please have them email biodot@standrews.ac.uk. Once you have received approval from your university, please send an email to coursecredit@opwall.com so we are aware that you are gaining credit. In January 2014, you will be invoiced for your second 10% deposit by Operation Wallacea. Once this is paid, we pass your contact details through to St Andrews who will email you a student code for their enrolment website. You then enrol on the St Andrews website and pay the £600 registration fee, which will give you access to the St Andrews electronic library and reading lists, as well as the lectures and notes, to help you prepare for the module.

INTERNAL COURSE CREDIT

It is sometimes possible to use an Operation Wallacea expedition to gain credits from your own university. This is often done through an Independent Study or Internship program. The amount of credit available will vary depending on which university you are at and the duration of your expedition. Your university will often require a piece of work based on your experience to go towards your Independent Studies or Internship, again these vary between institutions but may be in the form of a presentation or written report.

To organise gaining credit in this way, you will have to speak to your academic advisors and often your Study Abroad departments to find out what they can offer. They will usually have forms for you to complete before coming out with us, which will need certain details about the expeditions before you can gain the credit. This might be details of time allocation or academic supervision during the expedition, all of which we can happily supply to you, if needed.

If you have any questions about gaining credit from your university, please email coursecredit@opwall.com. If your academic advisors or Study Abroad departments have questions about the program, they can also contact us at this address. It is very important that if you are gaining credit in this way for an expedition, you email us in advance so we know you are gaining credits, even if you have no special on site requirements. This will make the awarding of credits much easier and ensure that any provisions you need on site are made in advance. If you fail to tell us about any credit you are gaining before an expedition we cannot take any responsibility for problems that may occur on site or when you return to your university.
INDONESIA RESEARCH OBJECTIVES

FOREST RESEARCH OBJECTIVES

Indonesia was the first site established by Operation Wallacea and was selected for two main reasons. Firstly, the forests of the Wallacea region of Indonesia, comprising the islands of the central part of the archipelago and which are separated from the islands to the east and west by deep ocean channels, are the most endemic-rich forests in the world. The deep trenches prevented these islands from being joined to the main continental land masses during the lowered sea levels of the Ice Ages. As a result of the long period of isolation, a large number of unique species have evolved. Moreover, the forests of central Indonesia are one of the least studied areas biologically and one of the most likely places to discover vertebrate species new to science. Secondly, there is a triangle of reefs in Eastern Indonesia, part of which lies within the Wallacea region, that have the highest diversity of coral genera, the proxy commonly used to assess overall diversity of coral reefs.

The results of the Opwall forest surveys in central Buton Island, from where 21 vertebrate species new to science have been described, resulted in a $1 million World Bank/GEF grant being obtained to establish an example of best practice conservation management for a lowland forest. This project finished in 2008 and an assessment of the various quantifiable conservation targets showed that 90%+ of the targets had been achieved and in many cases, significantly exceeded. Since the World Bank/GEF project was completed, Opwall has continued with monitoring the abundance and diversity of key taxa.

The Lambusango forests in the central part of Buton form the southern end of a continuous tract of forest that continues north through the remainder of the island and at the northern end is protected as the North Buton Nature Reserve. Despite this designation, virtually no data are available on the forests north of Lambusango and Opwall is establishing a series of field camps to survey these new forest areas which almost certainly will record new species records for the island, as well as potentially discovering new species to science. These data together with those from Lambusango can then be compiled into a Climate, Community and Biodiversity Alliance report that will make the Buton forests eligible for corporate sector funding under the REDD (Reduction in Emissions of greenhouse gases from Deforestation in Developing countries) initiative. Corporate investors benefit by receiving Voluntary Carbon Scheme (VCS) credits and quantifiable benefits to biodiversity and poverty alleviation to surrounding communities from the annual REDD payments, which are based on performance in protecting the forests.

MARINE RESEARCH OBJECTIVES

Located in the heart of the Wakatobi National Park is the Hoga Island Marine Research Station, the most active research facility within this unique bioregion. The Coral Reef Research Unit (CRRU), based at Essex University and comprising marine biologists from both UK and US universities, is developing the Hoga Island Marine Research Station as an internationally recognised centre for marine research. The CRRU has developed a thematic research programme with such research areas as coral reef dynamics, coral reef diversity, fisheries ecology and reef based economics, within which a series of research tasks are completed each year. To date, it has published over 90 scientific research papers within top-ranked, peer-reviewed journals and continues to attract international funding to support this research.
INDONESIA FACILITIES

LAMBUSANGO
The main base for the university students doing the jungle training course or for dissertations/independent research projects is the village of Labundo which is where the senior scientist is based. Accommodation is in picturesque local village houses with a mandi (bathroom) in or near the house and each room having a mattress with mosquito net. Staying in Labundo is an ideal way to get to know local people and experience how they live. Meals, evening lectures and briefings take place in the village hall. There is a specially-built clinic with a medic permanently on site. Training courses and projects based in Labundo are denoted IL.

NODE CAMPS
Node camps are being constructed at various points in the Lambusango to North Buton forests to incorporate different forest types and disturbance levels. The node camps are set up with hammocks, tents and communal eating areas. Field toilets are built at each of the camps and shower systems are built into waterfalls on the rivers next to each of the camps. The experience of living and working at these remote forest camps is one that few people forget, and the skills that you will develop, both in terms of fieldwork and forest living, will be invaluable. All node camp projects are denoted IN.

HOGA
Students based at the Hoga Island Marine Research Station will be living on an idyllic tropical island surrounded by white sandy beaches and pristine coral reefs. Traditionally-built wooden houses serve as accommodation on the island and are complete with their own bathroom and private balcony. The station’s main building contains a large, open-air study area, a computer laboratory, email and extensive library facilities. It also contains a restaurant area and bar downstairs. There are also extensive wet and dry lab facilities on site that have been constructed by the Wakatobi government to assist in the development of the Hoga Research Centre as the principal centre for marine research in the Coral Triangle in eastern Indonesia. In addition, there is a lecture theatre where the Coral Reef Ecology course and regular scientific talks are presented. There is a fully operational dive centre where visitors to the research base can rent dive equipment. The base also supports a medical clinic stocked with a full range of medical supplies and equipment. All Hoga projects are coded IH.
INDONESIA RESEARCH ASSISTANT OPTIONS

FOREST TRAINING COURSES

IL001 Jungle Training and Wallacea Forest Ecology (Weeks 1 - 7)
This training course is designed to allow you to acclimatise to the forest environment and give you the field skills to work competently alongside field scientists in the forest. You will be taught practical survival skills, how to live, walk and work safely in the forest including how to establish a field camp and what potentially dangerous organisms to look out for. The course also contains a series of lectures with practicals to train you in the field survey techniques being used for different taxa and identification of the more common species. You will also learn about the ecology of tropical forests and what is so special about the Wallacea forests. You will be spending 3 nights in forest camps with the remaining time based at Labundo. This prerequisite course is a highlight of the expedition for many volunteers and where lasting friendships between volunteers, course leaders and local people are built.

Canopy Access Experience (Weeks 1 - 8; half-day additional course on top of your normal schedule)
There is the option to do a half-day course that gives students the opportunity to learn how to safely ascend into the canopy. The ascent is done using ascenders (pulley system) with safety ropes and is a unique opportunity to experience wildlife in the canopy. This experience costs $145. You do not need to choose the Canopy Access Experience as one of your options when booking with Opwall – you can do this as an optional extra as part of time on site. However, you do need to pre-book with Canopy Access Limited by emailing opwall@canopyaccess.co.uk

MARINE TRAINING COURSES

IH005 PADI Open Water Dive Training (Weeks 1 - 9)
This one-week course is a prerequisite to any diving project. Open Water dive training is free to Operation Wallacea volunteers except for the costs of the PADI registration card and the Open Water Crew Pack, which you need to buy and bring with you. Completion of this course will give you an internationally-recognised diving qualification and enable you to join general diving projects accompanied by a Divemaster.

IH006 Divemaster Training (Weeks 1 - 8)
Divemaster training is available free to Operation Wallacea volunteers, with only PADI membership fees and liability insurance costs to pay. Participants will have to set aside four weeks for this course. Before booking this course you need to be a qualified rescue diver with up to date Emergency First Responder (EFR) training, have a minimum of 60 logged dives, and should contact Operation Wallacea for a detailed list of kit you will need to bring on expedition. Note: Divemasters trained with Opwall are offered the opportunity to be employed as a member of the dive staff team in future years.

Unfortunately, it is not possible to offer work placements in the same year you qualify because of the time required to pass the course and obtain your full PADI Divemaster registration and insurance needed.

IH007 Indo-Pacific Coral Reef Ecology with practicals by diving (Weeks 1 - 9)
IH008 Indo-Pacific Coral Reef Ecology with practicals by snorkelling (Weeks 1 - 9)
The Hoga Marine Research Station is ideally situated in the centre of the coral triangle, the area with the most biologically diverse coral reefs on the planet. This intensive course involves a series of lectures and in-water practical sessions suited to both divers and snorkellers. The course aims to introduce the key topics of coral reef biology and ecology, and includes a large component that will introduce key species and taxonomic groups. The importance of coral reef ecosystems will also be discussed, along with threats to their continuing survival and management strategies as tools for conservation. Coral reefs cannot be considered in isolation and a healthy reef system is largely dependent on other connected systems. The course will therefore also introduce you to seagrass and mangrove systems. The Indo-Pacific Coral Reef Ecology course will provide you with the knowledge you need to participate in further Operation Wallacea research activities whilst on Hoga, as well as being a fascinating insight into the functional ecology of coral reefs. Apart from the formal training component, a series of research seminars, lectures of general interest and classes and workshops on other ecological tools will be delivered to you throughout your stay to increase and widen your knowledge base.
IH009 Wakatobi Culture, Community and Environment (Week 3)
This course gives a unique insight into rural Indonesian life on remote islands and the opportunity to experience what it is like to work on a local farm, how to fish in a dugout canoe, and how to prepare Indonesian food. Along with these activities, there will be lectures covering topics that range from Indonesian language (you should be able to speak some Indonesian by the end of the course), Indonesian culture and history of the area, as well as introducing you to the marine conservation, development, resource management and eco-tourism issues that are considered significant to the Wakatobi. The course comprises lectures at the Hoga research base and day trips around the island of Kaladupa.

FOREST OPTIONS
IN101 Node Camp Biodiversity Monitoring Team (Weeks 2 - 8; need to have completed IL001)
Volunteers working on this project will be based in one of the forest node camps working with a range of scientists. One team is gathering data on the mammals and reptiles. This involves emplacing pitlines for small reptiles and invertebrates, standard search times for herpetofauna, spotlighting for amphibians, setting and emplacing small mammal and civet traps, checking camera traps and completing long transects for patch occupancy analysis of two key endemic mammals, the Buntn Macaque and Anoa (an endemic dwarf buffalo species on the edge of extinction), and the Wild Pigs. A second team is monitoring bird communities from point counts and from opportunistic observations and mist netting. An invertebrate survey team is describing butterfly communities from pollard walks and trapping, moth communities from light tapping and dung beetle communities from pitfall trap surveys. Another team is assessing human levels of extraction in different parts of the forest including rattan, timber and distribution of bees nests exploited for the honey.

MARINE OPTIONS
IH110 Coral Reef Monitoring (Weeks 2 - 9; need to have completed IH007 and be dive trained or have completed IH005)
The Operation Wallacea Coral Reef Monitoring Programme underpins many of the specific research projects and the results of the repeated annual surveys of 108 transects are fed back to the Government of the Wakatobi to assess annual changes in the reefs. The monitoring programme will continue during 2014 to complete the 13th annual survey of these reefs. The surveys are completed along 50m transects with fish community structure assessed from visual surveys using experienced fish biologists. The benthic surveys are completed by underwater video surveys which are then analysed back in the laboratory. These videos will be used to assess coral cover, mortality, algal cover and will be compared to data obtained by the team in previous years so that rates of change can be calculated. Benthic surveys also include invertebrate transects within which ecologically and economically important reef invertebrates are assessed. In 2014 the team will focus on determining the abundance and size distribution of the Crown-of-thorns starfish, a ferocious predator of reef building corals. Coral recruitment is key to a healthy and resilient environment and therefore in 2014 the monitoring team will deploy coral recruitment panels at each of the sites and start to evaluate monthly rates as well as initiating investigations into annual rates of coral recruitment. In 2014, the stereo video survey approach (that was developed by the University of Western Australia and is being used at the other Opwall marine research sites in Cuba, Honduras and Madagascar), will also be used in Indonesia to compare with the results from the visual surveys completed by the skilled surveyors. Note these same data sets from reefs in the Indo-Pacific, Indian Ocean and Caribbean will provide valuable comparative data sets. Research assistants joining this project will be involved in filming of the transects, and will then be expected to work long hours back in the lab completing analysis of the footage.

IH111 Research Assistant Pool (Weeks 2 - 9; need to have completed IH007 or IH008; surveys can be done by snorkelling but if you wish to participate in the dive elements, you will need to be dive trained or have completed IH005)
There are many different marine research and conservation projects running at the Hoga Island Research Centre including dive-based projects, snorkelling projects, shallow sub-tidal projects, inter-tidal projects and research projects focused within the mangrove forests. Research assistants are always needed to help various scientists collect essential data both in the field and at the field centre following field excursions. Research assistants have the opportunity to gain experience in several different research areas. On arrival at the field base, you will be introduced to the range of research projects that are underway and allocated to a scientist whose specific responsibility is to line you up with scientists who need assistance and whose projects match your specific or general interest. Joining the research assistant pool maximises your opportunities to widen your knowledge of marine biology whilst also allowing you to increase your specialist knowledge in specific areas of research. There is also the opportunity for students to do short overnight projects based on the live-aboard research vessel, the Bintang Sedang.
HONDURAS RESEARCH OBJECTIVES

FOREST RESEARCH OBJECTIVES

In Honduras the terrestrial research programme is run in conjunction with a Honduran NGO called ESAC (Expediciones y Servicios Ambientales de Cusuco). There are few forests in Honduras which have as high a level of biodiversity as that in Cusuco National Park, and even fewer (if any) that have the same level of biodiversity data available. However the Park is critically endangered from small scale land clearance to make way for coffee plantations or to graze cattle, and therefore the research programme is focussed on providing data on socio-economics, forest structure and biodiversity (using indicator groups and population levels of key or threatened species) to assess the performance of the protected-area management. With the advent of funding mechanisms such as REDD (Reduction in Emissions of greenhouse gases from Deforestation in Developing countries), these annual biodiversity surveys have taken on an even more important role. The purpose of the REDD funding is to provide a marginal cost advantage for governments and communities to protect their forests rather than allow deforestation, thereby protecting their carbon sequestration value. The REDD funding is intended not just to protect the carbon value of the forests but also to protect its biodiversity and provide funds for poverty alleviation for communities surrounding or within the funded forest areas. Data sets, such as those compiled by Opwall on the Cusuco National Park where changes in the diversity of key taxa or population levels of key species can be tracked, can be used to set additional biodiversity-related criteria for receiving REDD payments. The data collected to date on Cusuco have demonstrated that the Park contains 6 species of amphibian found only within the Park boundaries and a further 10 species of amphibian in the IUCN threatened category. In addition, a new genus of tree (Honduradorhodendron) has recently been described from the Park. These data are being compiled into a Climate, Community and Biodiversity Alliance report to make the Cusuco forests potentially eligible for REDD payments.

MARINE RESEARCH OBJECTIVES

The marine research programme is run in conjunction with the Coral View Research Centre on Utila and Tela Marine Research Centre in Tela Bay, which Opwall is currently involved in establishing as a new marine protected area. Surveys are being completed on the reefs and coastal mangroves around the Bay of Tela Marine Reserve and the reefs and mangroves around Utila and the main research objective is to complete annual reef fish and coral community surveys using stereo video for the reef fish and video transects for the benthic communities. This annual monitoring effort provides valuable data to local and regional conservation organisations to advise their management strategies and subsequently monitor their success. In addition to this broad ecosystem monitoring programme, however, our specialist research team is focusing on a set of key objectives to address some of the highest priority concerns for coral reefs and linked habitats in Honduras and throughout the Caribbean. The first of these is to investigate barriers to the recovery of the keystone species Diadema antillarum. This sea urchin is naturally the most important herbivore on Caribbean coral reefs, but has been unable to recover throughout much of the region after a mass mortality event led to the death of around 98% of individuals in the 1980s. A second priority is to improve our understanding of the impacts of the lionfish invasion, to work with our collaborative partners to explore the most efficient management approach and to investigate whether there are any signs of an ecosystem fight back. Additional projects include studying the impacts of human activities on mangrove structure and function, the increasing role of soft corals and sponges to overall reef biodiversity and productivity in the face of hard coral decline, and the provision of herbivory to halt the pattern of phase shifts seen throughout the Caribbean.

HONDURAS FACILITIES

CUSUCO

A number of camps have been established across the Cusuco National Park, where survey teams are based. From each of these camps, four sampling lines (transects) radiate out and sampling points are located along them to ensure that most of the Park is surveyed each year. On the eastern side of the park, 4-wheel drive vehicles can access the main Base Camp by a 3-hour drive from the town of Cofradia. Accommodation at Base Camp is in tents and there are toilets and showers. Terrain around this site is not as steep as some of the other sites. There is a wireless networked computer system with an internet link at Base Camp and this is where all the data from the various survey teams are collated. In

HONDURAS
addition, there are DNA extraction, amplification and visualisation facilities. From Base Camp, teams can access three core zone fly camps across the Park. These are for people who want to experience living deep in the forest, sleeping in hammocks or tents (depending on availability) and with the river as your shower facility. About 1 hour below Base Camp, along the 4-wheel drive track, lies the buffer zone village of Buenos Aires. Accommodation is in local houses at this site, which gives you the chance to experience living in a Honduran mountain community. Projects run in the Cusuco Park are labelled HM.

**UTILA**

The Utila Marine Research Centre is based at Coral View in the southwestern corner of the island. Accommodation is in shared rooms with fans in the Coral View Hotel, away from the main tourism centre and situated between some of the best reefs and the largest mangrove-lined lagoon system on the island. The hotel is run by a local Utilan family who have built, in conjunction with Operation Wallacea, a well equipped dive and environmental monitoring field lab. The Coral View home reef is one of the best on the island and can be accessed from the jetty at Coral View. The research centre has a number of dive boats that can be used to access the remaining reefs, which range from being designated as a Marine Protected Area, to those having no protection and with substantial fishing pressure. All projects based on Utila are coded HU.

**TELA**

The Bay of Tela is situated between the national parks of Punta Sal and Punto Isopo. Honduras Shores Plantation is located on the beach in the Bay of Tela just outside a small Garifuna community called San Juan. The plantation is located between the sea and a small lagoon which connects to some of the larger lagoons in the area. There is no swimming in the larger lagoons however because there are regular sightings of crocodiles! Accommodation is in dormitory style rooms set back from the beach and there is a small dive centre, swimming pool and lecture facilities in the adjacent hotel. Projects based at Tela are coded HT.

**FOREST TRAINING COURSES**

**HM001 Neo-tropical Forest Ecology and Jungle Training (Weeks 1 - 7)**

This one week course is a requirement for all research assistant and dissertation students who will be working in any of the forest sites. The course takes one week and comprises of two sections of three days each. The first section involves a series of seven lectures and associated practical exercises to provide an introduction to tropical forest ecology, conservation biology and biodiversity monitoring techniques for flora and fauna. The lecture series will deliver up-to-date research results from the various scientific teams that have been working in Cusuco National Park and covers topics including species distributional modelling using commonly used techniques such as MAXENT, population genetics, using stable isotopes to determine trophic ecology of species and estimating species richness by using genetic bar coding to describe new species. The second section of the course involves trekking to and camping in a number of different forest locations. The course teaches participants basic jungle survival skills, such as how to select a suitable camp site with minimum impact on the environment, where to find food and water in the forest, how to build natural shelters and orientation skills. By the end of the week-long course, students will understand the research aims of the expedition, the ecology of the key taxa we are monitoring, be trained in the data collection methods they will use while assisting scientists with data collection and will know how to operate safely and healthily in remote forest areas.

**Canopy Access Experience (Weeks 1 - 7; half-day additional course within your normal schedule)**

The tropical forest canopy is the richest, least explored and most threatened habitat on the surface of the planet, providing a home to 40% of all life on earth. Due to its inaccessibility, remains almost completely unexplored. Canopy Access Limited, the team that helped David Attenborough ascend into the canopy for Life of Mammals, Life in the Undergrowth and Planet Earth series, will be on site to provide access to the canopy for the science teams two days a week. For the rest of the time, the team will be running a half-day course on safe ascent into the canopy. This course carries an additional cost of $145, you do not need to choose the Canopy Access Experience as one of your options when booking with Opwall – you can do this as an optional extra as part of your weeks on site. You will need to pre-book with Canopy Access Limited by emailing opwall@canopyaccess.co.uk.
MARINE TRAINING COURSES

HU004 Utila PADI Open Water Dive Training (Weeks 1 – 9)
HT005 Tela PADI Open Water Dive Training (Weeks 2 – 9)
This one-week course is a prerequisite to any diving project. Open Water dive training is free to Operation Wallacea volunteers except for the costs of the PADI registration card and the Open Water Crew Pack, both of which you need to bring with you. Completion of this course will give you an internationally recognised diving qualification and enable you to join general diving projects accompanied by a Divemaster. The course can be done on Utila (HU004), or at Tela (HT005).

Additional Dive Training (Weeks 1 – 9)
Additional dive training beyond Open Water level is available on Utila and can be fitted around your work on other projects so you do not need to specify the additional courses on your options list. Courses include Advanced Open Water Diver ($220), Emergency First Response ($150) or Rescue Diver ($400 - includes Emergency First Response). This price includes the cost of the manual and PIC card. These extra courses may not be available at all times and enrolment may depend on the number of people wanting the training.

HU006 Utila Divemaster Training (Weeks 1 – 4)
Divemaster training is available free to Operation Wallacea volunteers, you have to set aside 4 weeks, and will complete your internship during that time. If you complete your DM training with Opwall then in future years you will be given the first option on available DM slots available at Opwall marine sites. Before booking this course you need to be a Rescue Diver, have at least 60 logged dives and contact the Opwall office for a list of equipment that you will need.

HU007 Utila Caribbean Reef Ecology with practicals by diving (Weeks 1 – 9; need to be dive trained or have completed HU004 or HT005)
HU008 Utila Caribbean Reef Ecology with practicals by snorkeling (Weeks 1 – 9)
HT009 Tela Coastal Ecology with practicals by diving (Weeks 2 – 9; need to be dive trained or have completed HU004 or HT005)
HT010 Tela Coastal Ecology with practicals by snorkeling (Weeks 2 – 9)
This one-week course is a prerequisite for joining many of the marine research projects and is free for Operation Wallacea volunteers. The course teaches identification of common genera and species of coral and other macro-invertebrates, identification of the major reef-associated fish families and common species and introduces a variety of methods and practices used for scientific research in the marine and coastal environment. Snorkelling on Utila will focus more on coral reef practicals and will therefore follow the diving option, whereas snorkelling in Tela will focus more on mangrove surveying with more limited access to the reefs.

HM015 Expedition Medicine Experiential Course for Pre-Meds (Weeks 1 – 8)
This 4-week option in Honduras is aimed at giving Pre-Med students the opportunity to experience how to provide medical support to teams working on expeditions in remote areas. The first 3 weeks of the course are run in the Cusuco National Park cloud forest with the last week at the marine research centre on Utila Island. The Expedition Medicine experiential course provides formal teaching in the form of interactive lectures (core knowledge) coupled with mentorship by doctors working out in the field in various sites to gain experience in clinical diagnosis and treatment. The mentors will provide individual assessments for each of the students at the end of the placement. Note the course does not provide training in expedition medicine that can then be used as a qualification to practice expedition medicine. During week 1, the group complete the Jungle Survival and Neotropical Forest Ecology course so that they are accustomed to the forest conditions and the type of research being conducted. In week 2 the group will complete a training course in expedition medicine which will cover pre-expedition planning (e.g. how to identify risks, developing emergency evacuation plans), medical emergencies and trauma in the field (anaphylaxis, asthma, diabetic emergencies, heat & dehydration, gastroenteritis and hygiene), tropical infections (e.g. malaria, rabies, dengue fever and DHF), and snake bite and envenomation procedures. In week 3, the experiential medical students will be spread amongst the various core and buffer zone research camps in Cusuco Park in pairs to work alongside the medic at each of the sites. Generally, from a medical viewpoint there is not too much to do at these camps, so most of the time will be spent helping on the biodiversity surveys including emptying dung beetle pitfall traps, helping with point counts for birds, standard search times and spotlighting for reptiles and amphibians, tapir transects, etc. In week 4, the group will move to Utila Island where they will be completing a PADI Open Water dive training course or doing the Caribbean reef ecology course if already qualified. During this week, they will have the chance to visit a hyperbaric chamber.
**FOREST OPTIONS**

HM101 Monitoring Biodiversity Change (Weeks 2 – 8; need to have completed HM001)

This option is usually based in one of the remote field camps where you will be living in hammocks or tents and involves a lot of trekking over the steep terrain of Cusuco. Operation Wallacea has established an annual monitoring programme for the Cusuco National Park that includes standardised monitoring of a number of taxa from 145 sites across the Park to assess changes in the structure of the forest and how these changes are impacting the target taxa (dung beetles, Spilopogon and Saturniidae moths, amphibians, reptiles, birds, and large mammals). These monitoring data are combined with analysis of satellite imagery to produce an annual State of the Cusuco National Park report. Volunteers can do multiple weeks of this option, which gives the opportunity to visit camps at different altitudes where the fauna are very different. Activities include helping to set up and empty invertebrate pitfall traps, light traps, performing timed searches for herpetofauna (reptiles and amphibians), and point counts and mist netting for birds. In addition in any one of the field camps there will be some of the specialist scientists studies ongoing each week. These studies include projects such as the role of altitude and rainfall on leaf formation, species trees working on the trophic ecology of small mammals, running camera traps for large carnivores, and completing inventories of dung beetle species, examining invertebrate communities in bromeliads and collecting data on the total diversity of invertebrates using DNA bar coding of samples from flight intercept traps set at different points around the Park and in the canopy. Other teams are looking at infection rates of chytrid fungus – a disease that has decimated amphibian populations elsewhere – in these tiny mountain top amphibian communities to determine the best strategy for their conservation. There are additional teams working on the trophic ecology of small mammals, running camera traps for large carnivores, and mist netting bats to describe community structure, so there are always plenty of projects needing help. Note if you are only doing one week of this option then you would be based in one of the closer camps but if you are doing 3 or more weeks of this option then you would be helping with the teams trekking right across the whole Park.

HM102 Canopy Monitoring (Weeks 3 – 8; need to have completed HM001)

This project will investigate the reasons behind Tela’s extraordinary coral reef benthic community, including the completion of benthic transects and an assessment of populations of the sea urchin Diadema antillarum. These data sets will be collected by SCUBA diving. A second project will be investigating the structure and function of mangrove forests around a series of lagoons, focusing on forest structure measurements, carbon storage calculations and the extent of associated biodiversity. This research component will be completed by kayaking. The third research area is to assess the fishery of Tela Bay to begin a long term catch monitoring programme, including a census of fishermen and gear types, and catch assessments to explore patterns in catch per unit effort and catch composition. This project will take place in local communities. Research assistants on this option will have the opportunity to develop a wide range of research skills and experience many aspects of coastal ecological assessment and their implications for management.

**MARINE OPTIONS**

HU105 Reef fish and benthic communities of Utila reefs (Weeks 2 – 7; need to have completed the reef ecology course HU007 and be dive trained)

Operation Wallacea has been conducting an annual monitoring program of the reefs around Utila for the last few years using the standardised Underwater Visual Census technique. This technique involves trained surveyors counting fish within an imaginary box 2.5m above the transect tape and 2.5m either side. However, this technique has a number of drawbacks: it relies on the surveyor’s ability to accurately identify fish encountered which varies annually, there is no record of the counts other than the documented numbers and the size estimates of all fish encountered are estimated and is very approximate with errors as high as 50%. In 2011, Operation Wallacea introduced surveys using a stereo video system developed by the University of Western Australia on Utila. This system allows surveyors to swim along the transects and video the fish encountered. Then in the lab, by playing back the two video images on a single computer screen using specialist software, not only can the images be freeze-framed to accurately identify all fish encountered, but also size estimation can be done to below 4% error. Benthic communities are surveyed by laying 50m tapes along depth contours and a surveyor swims along the tape holding it in his left hand and filming the tape and adjacent corals with an underwater video camera. Coral cover and community structure of hard and soft corals, macroalgae and sponges are then assessed from lab based analysis of the video footage using the continuous method. In addition, invertebrate belt transects are used to monitor the populations of key species including sea urchins. Volunteers on this project will be helping with laying transects, collecting data in the water, and completing the video surveys, but will also be heavily involved in the analysis of the images in the on-site laboratory.

HU106 An assessment of the ecology of coastal systems and the anthropogenic impacts affecting them in Tela Bay (Weeks 3 – 9; need to have completed the coastal ecology course HT009, HT010)

There are three main focuses of the overall research programme in Tela Bay; and research assistants will rotate between these projects to help with all aspects of the research. One project will investigate the reasons behind Tela’s extraordinary coral reef benthic community, including the completion of benthic transects and an assessment of populations of the sea urchin Diadema antillarum. These data sets will be collected by SCUBA diving. A second project will be investigating the structure and function of mangrove forests around a series of lagoons, focusing on forest structure measurements, carbon storage calculations and the extent of associated biodiversity. This research component will be completed by kayaking. The third research area is to assess the fishery of Tela Bay to begin a long term catch monitoring programme, including a census of fishermen and gear types, and catch assessments to explore patterns in catch per unit effort and catch composition. This project will take place in local communities. Research assistants on this option will have the opportunity to develop a wide range of research skills and experience many aspects of coastal ecological assessment and their implications for management.

HU107 Utila Research Assistant Pool (Weeks 2 – 9; need to have completed the reef ecology course HU007, HU008)

There are several different research projects on Utila, including many at dissertation and thesis level. These projects involve studying a specific element of the marine environment in extensive detail, either through diving, snorkelling or kayaking. Projects include highly detailed coral reef benthic surveys focusing on interspecific interactions, sea urchin size frequency and ecology studies, seagrass and mangrove system ecology and several others. All these projects require extensive data collection and research assistants are always needed to assist with this. Research assistants joining this project can volunteer their time to help with projects they are interested in and will gain valuable insights into the specific research topic they cover.
The Pacaya Samiria National Reserve is the largest protected area in Peru spanning over 20,000 km² of tropical rainforest and is a truly exceptional wilderness area. Situated deep in the rainforests of the western Amazon basin, at the point where the Amazon River begins its long journey to the Atlantic Ocean, the reserve teems with aquatic and terrestrial wildlife. The two major rivers that bind the reserve are the Ucayali and Marañon, they join to form the Amazon proper right at the point where the reserve begins. The huge floodplains of these majestic rivers have produced the low-lying flooded forests (Varzea) of the reserve, much of which is accessible on foot during the dry season surveys. The core areas of the reserve with no exploitation permitted are at the most upstream end. At the downstream end, there are communities of Cocama Indians who are involved in reserve management and managing resources in non-core zone areas sustainably. The Samiria River that runs through the heart of the Pacaya Samiria National Reserve has a particularly large population of river dolphins and is the last remaining refuge for the Amazon manatee. Giant river otters are also returning and every year more are sighted in the rivers, lakes and channels. There are 12 species of primates in the Reserve, many of which are commonly sighted on the terrestrial and aquatic transects.

The flooded forests (Varzea) of the Reserve are particularly susceptible to global climate change which appears to be increasing the frequency of extreme flooding events and low water periods. During the height of the annual floods, 92-94% of the Reserve is flooded but this can be as high as 98% in extreme flooding events, confining land based mammals (agouti, deer, peccaries, armadillos) to small areas of land and thereby significantly impacting their population levels. In times of extreme low water, fish populations and their associated predators (dolphins, river birds) are under stress. The data set managed by Fund Amazonia for this Reserve, which is based on the annual surveys completed by the Opwall teams and others, is the most extensive in any of the Peruvian reserves and is enabling decisions on whether subsistence hunting levels are sustainable to be made as well as identifying the impact of global climate change on a range of taxa.

The entire research expedition, including accommodation and travel to the field site, will be based on board either the Rio Amazonas or the Pithecia ships which are restored boats from the rubber boom era. The boats have fan cooled cabins (which can accommodate 2-8 participants in bunk-beds), dining areas, a small research library, and plenty of open deck space. There is limited generator power during the evenings providing an opportunity for participants to recharge laptops or camera batteries. This makes travel and working in even the most remote part of the Amazon a reasonably comfortable experience. In addition to the research boat on which you will be living, there are many auxiliary boats (e.g. wooden and aluminium canoes) used to access the various data collection points. Volunteers are taken by bus from Iquitos to Nauta. At that point, you join one of the research boats or are taken by speedboat up to the survey site. The Rio Amazonas takes approximately 48 hours (depending on river conditions) to reach the research site and the speed boat around 12 hours.
PERU RESEARCH ASSISTANT OPTIONS

TRAINING COURSES

PP001 Amazonian Wildlife Ecology and Conservation Course (Weeks 1, 3, 5 & 7)
This course which is run whilst you are travelling to site and during your first week on site with the research teams, is designed to give you an introduction to Amazonian wildlife. The course consists of a series of lectures and field based practicals and aims to teach you the survey techniques and main species likely to be encountered in groups such as freshwater fish, amphibians and reptiles, birds, freshwater mammals, exploitation rates of large mammals and birds and primate population and behaviour studies. In addition the course covers a series of examples of best practice sustainable management in Amazonia.

PP101 Biodiversity monitoring in the Pacaya Samiria National Reserve (Weeks 2 – 8; need to have completed PP001)
Research Assistants on this project will be based on the Rio Amazonas or Pithecia research ships. There is a large team of mainly Peruvian researchers based on the research ship with nine different research programmes running. Research Assistants signing up for the various projects will help on all the projects over the course of their stay. There is a strong research atmosphere on the boat with teams coming and going at all times of day and night on various research tasks.

Research tasks which require volunteer manpower include:, spotlight surveys for caimans and diet studies of this species (which necessitates capture of the caimans through noosing), transect surveys for the abundant Pink and Grey River Dolphins, mist netting surveys of the bird communities utilising the forest understorey, transect counts of wading birds, point counts of macaws as indicators of forest fruiting, gill net surveys of fish communities to compare catch per unit effort between years, standardised searching surveys to characterise the amphibian communities, land based transect counts of primates, large mammals and game birds as indicators of levels of exploitation and checking 20 camera traps run at a variety of habitats. In addition to these surveys there are dissertation studies where assistance may also be required - for example assisting with behavioural data observations on the primate species.
There are a number of different approaches addressing the problem. The first issue is how the carrying capacity of a reserve for elephants is calculated. This is not a question of how many elephants an area of land can hold before the populations starts to decline, because by the time this stage is reached, the habitat would have been almost completely destroyed by elephants. Rather, the term “carrying capacity” relates more to what the acceptable levels of damage are to a particular habitat type. In addition, it is important to consider the fact that elephants don’t spread out evenly over the fenced areas but rather have preferred areas of feeding based on access to water or preferred trees, such as Marula. Thus the definition of acceptable levels of damage needs to be expressed in terms of percentage of total reserve area that has certain defined levels of serious damage. The Walker scale of elephant browsing pressure is used by the Opwall teams to assess the levels of damage to trees and shrubs in different reserves at differing levels of elephant feeding pressure so that contours of similar levels of habitat damage can be defined for each of the reserves. Data are being gathered at a range of elephant grazing pressures so that estimates of levels of damage for a reserve with differing levels of elephant populations can be predicted.

Redefining what are acceptable levels of elephant numbers are, in a reserve, is only one approach being used by reserve managers. Another approach is to expand the areas accessible to elephants. In KwaZulu Natal, a project called Space for Elephants is trying to persuade private game reserves to drop their fences to create contiguous areas. Private reserves constitute over 60% of the protected areas in South Africa; so projects such as this, which encourage cooperation between the reserves through mutually beneficial practices, can be hugely important for conservation management within southern Africa. In Pongola Reserve, where parts of the reserve are subjected to huge grazing pressure, there is a move to open up an adjacent area of 1500ha to relieve the pressure on the reserve. Dropping fences does not only allow elephants to expand their ranges, but also affects the distribution of other herbivores and predators. Long term data sets on the distribution of large mammal species in most of the study reserves are also being gathered and are revealing some interesting patterns.

Yet another approach to managing elephant populations is to control their increase in numbers by using contraception. In Pongola, the bulls have been vasectomised and there is a long term study looking at the impact that this has on elephant social structure and behaviour. Other reserves are using injections of PZP, an immunosuppressant, to provide contraception. Changes in elephant numbers do not only have an impact on the habitat but also, by changing the habitat, influence the diversity of other taxa. To examine this, studies on winter bird communities associated with differing levels of elephant habitat damage are being completed at 4 of the 5 reserves.

There are two reserves in KwaZulu Natal where studies are being conducted: Pongola and Thanda Reserves. Both are up market game reserves with high end tourist lodges. Thanda is a Big Five reserve (lion, leopard, rhino, elephant and buffalo) and accommodation is situated in a community-owned camp just outside the Reserve. Students sleep in single-sex rooms or tents and there is a communal lecture and dining area. The camp has its own boma and fire area where groups can socialise in the evenings after a hard day’s field work. In Pongola, which does not have lions, a research camp with a separate research centre has been built to accommodate a research camp with a separate research centre has been built with twin bedded accommodation and communal shower and toilet facilities. Volunteers based at Pongola and Thanda prepare their own meals. Projects based at Pongola are coded SP and those at Thanda are coded ST.
SODWANA BAY MARINE TRAINING CENTRE

The Sodwana Bay Training Facilities have been developed within an existing dive centre along the north-eastern coast of South Africa, close to the Mozambique border and in a picturesque area with a fully equipped kitchen with gas stove, oven, fridge and freezer. At Sodwana Bay, volunteers prepare their own meals. Projects based in the Waterberg are coded SW.

LOWVELD SITES

Conservation in the Lowveld stretches far wider than the renowned Kruger National Park. Adjoining Kruger are a number of key reserves, the more established of which have dropped their fences with the park. Opwall have two sites in this area, one in the Balule Game Reserve and the other in the newly proclaimed Marakapula Game Reserve. Both camps are situated next to major rivers where groups can hear the resident rafts of hippo. Students will be accommodated in dorm-style rooms with single sex ablutions. There are central units with kitchens and open dining areas which will also be used for the lectures.

SOUTH AFRICA RESEARCH ASSISTANT OPTIONS

ST101 Bush Training & Elephant Impact Surveys in Thanda and Diving in the Indian Ocean (Expeditions 1 - 3)

These expeditions are each four weeks long and for the first three weeks are run in the Thanda reserve. They start with a week-long bush training and savannah ecology course. The objective of the course is to orientate new volunteers in the African bush and to develop the skills and confidence necessary to participate in surveys. Important rules and etiquette concerning safety procedures on how to conduct yourself in a dangerous game area on foot and what to do if the group walks into dangerous animals such as buffalo, elephant and lion are covered. Training is also given in animal behaviour, how to track and identify animals, identifying safe and danger zones around large game species when encountered. Navigation using GPS and other techniques. Identification training is given for large mammals from sightings, spoor (tracks) and scat (droppings), common birds and their calls, major vegetation types and trees. An additional objective of this course though is to gain an understanding of savannah ecology and management. A qualified and experienced Trails Guide and Armed Ranger lead each group of participants in the field. The course includes daily field visits together with in-camp lectures and practicals. For the next two weeks you will be helping with assessing the impact of elephants on vegetation. Volunteers working on this project will spend half their time in the field and the field will be accompanied by experienced armed guards with a stand-by vehicle at all times. The survey provides a unique opportunity for volunteers to join small survey teams completing surveys on foot with armed rangers in big game areas and have wildlife encounter experiences not normally available to visitors. Detailed measurements of grass volume, tree and shrub size, percentage encroachment of bushes and levels of elephant browsing on trees and bushes using the Walker scale will be completed on study plots across the whole reserve. In addition, perpendicular 1km transects will be completed across the whole reserve to assess the percentage of trees and shrubs in the most damaged categories on the Walker scale so that contours enclosing areas of equal damage can be plotted for the reserve. In addition early morning bird point counts will be completed. Students will spend the other half of their time completing an African Wildlife Conservation course which goes into much more detail about how wildlife resources are managed and the major conservation issues faced in the region. The fourth week will be at Sodwana Bay completing a PADI Open Water dive training course or, if already dive trained or you want only to snorkel, to complete an Indian Ocean reef ecology course with two lectures and two in-water activities each day.

SK102 Assessing the effects of water distribution, fire management and tourism infrastructure on habitat and biodiversity (Expedition 4)

This is a four week terrestrial expedition. Volunteers working on this project will spend the first few days completing the bush training course (as in expeditions 1-3) and then will move on to a series of surveys in one of the lowveld Opwall sites in the Greater Kruger area (Balule or Marakapula) for the remainder of the four week period. Volunteers will spend half their time in the field with the other half back in camp completing an African Wildlife Conservation course. In the field volunteers will be accompanied by experienced armed guards with a stand-by vehicle at all times. The survey provides a unique opportunity for volunteers to join small survey teams completing surveys on foot with armed rangers in big game areas and have wildlife encounter experiences not normally available to visitors. Unlike in many other African countries all big game areas in South Africa are all enclosed by fences. Although this measure is reasonably effective in reducing human-wildlife conflict, natural migration routes have been interrupted and animals can no longer follow season water availability. This has forced managers into creating artificial waterholes throughout the park. As these waterholes also offer the best game viewing to tourists, many private lodges started to follow suit, which has now created a surplus of water in the park. As water-dependant herbivores, like elephant, are driven into areas in unnaturally high numbers, their impact upon soils, vegetation structure and plant species composition is greatly increased. Students will be involved in surveying habitat at varying distances from waterholes to monitor the extent of pisospheres (rate of decreasing impact away from waterholes) in the lowveld. Students will also record the damage that fire is having on woody vegetation and provide data on grass biomass and vegetation structure. The effect of this habitat impact on biodiversity will also be assessed using early morning bird point counts. Mammal transects around lodges and management infrastructure will also be completed to determine how the increasing safari industry is impacting distribution patterns and group compositions.

SK103 Bush training and elephant impact surveys (Expeditions 5 & 6)

These are two week terrestrial expeditions which take place in the lowveld regions around the Greater Kruger area. Volunteers will follow the same itinerary as the first two weeks of expedition 4.

WATERBERG SITES

In the Waterberg Biosphere Reserve, the Opwall teams are working at the Welgevonden Game Reserve. Welgevonden is a leading reserve in sustainable ecotourism and is home to over 50 different mammals, including all of the Big Five. Volunteers will be accommodated at the new research centre within the Reserve. Accommodation is in large canvas safari tents with shared ablution (toilet) facilities in a private fenced area. The camp has a central dining and recreation area with a fully equipped kitchen with gas stove, oven, fridge and freezer. At Welgevonden, volunteers prepare their own meals. Projects based in the Waterberg are coded SW.
MADAGASCAR RESEARCH OBJECTIVES

Madagascar boasts some of the most spectacular biodiversity in the world (lemurs, tenrecs, boababs, and over half of all known chameleon species), much of which is endemic. The Operation Wallacea surveys are completing research on the dry forests and associated wetlands of Mahamavo in the North and the reefs around Nosy Be Island.

MAHAMAVO FORESTS

The Mahamavo dry forest ecosystem and adjacent wetlands have exceptional biodiversity, but much remains to be discovered. Diurnal lemurs include Coquerel’s Sifaka Propithecus coquereli, and Common Brown Lemur Eulemur fulvus with another 2 - 3 species of nocturnal lemurs. Madagascar is the global centre of diversity for chameleons. Several species can be found in Mahamavo including two spectacular large species, Furcifer oustaleti and Furcifer angeli. The wetlands support the critically endangered Madagascar fish eagle Haliaeetus vociferoides, a flagship species for the area, and Humboldt’s heron Ardea humbloti, an endangered species.

The Mariarano forest forest provides livelihoods for several neighbouring communities in terms of agricultural land, fuel and construction wood as well as some wild food, hunting and medicinal plants. The wetlands in the coastal area support fisheries, which constitute the main resources for coastal communities. However, within this complex, areas of dry forest are managed for sustainable wood production in a way which is compatible with biodiversity conservation. In 2014 the Operation Wallacea teams will be completing a series of sample routes, covering the main protected forest areas and adjacent habitats. Data will be gathered on forest structure and communities of key taxonomic groups including birds, herpetofauna (reptiles and amphibians) small mammals such as tenrecs, rodents and bats, and lemurs. The output from this work will be a report submitted to the Madagascar government to support an application under the REDD scheme to provide long term funding for this area.

MADAGASCAR FACILITIES

MAHAMAVO

Expeditions run from a base camp in Mariarano village, which is permanently occupied during the field season. Accommodation is in tents next to a building converted for use as a field laboratory with a library, computers running the biodiversity database and office, GIS, and statistics software. There are jungle showers and toilets in the camp. The village is very friendly and living amongst this remote local community is a special experience. In addition to the camp at Mariarano, other tented forest camps are also used as bases for the surveys in the more remote parts of the forest.

Nosy Be

Opwall has established a permanent research base in a walled villa on the edge of Maradoka village. Accommodation is in tents next to the beach within the walled area in an idyllic location.
MADAGASCAR RESEARCH ASSISTANT OPTIONS

TRAINING COURSES

MM001 Madagascar Wildlife and Culture Course (Weeks 1, 3, 5 & 7)
This course consists of a series of lectures and practicals in the field to demonstrate the different ecological survey techniques being used and how data from the surveys can be analysed. In addition, the course will teach identification of some of the more common species and help gain an understanding of their ecology. The course will also give participants an overview of the conservation issues affecting Madagascar and an understanding of the diverse Malagasy cultures.

MN002 PADI Open Water Dive Training Course (Weeks 2 – 7)
This one-week course is a prerequisite to any diving project. Open Water dive training is free to Operation Wallacea volunteers except for the costs of the PADI registration card and the Open Water Crew Pack, both of which you need to bring with you. Completion of this course will give you an internationally recognised diving qualification and enable you to join general diving projects accompanied by a Divemaster.

Additional Dive Training (Weeks 2 – 8)
Additional dive training beyond Open Water level is available and can be fitted around your work on other projects so you do not need to specify the additional courses on your options list. Courses include Advanced Open Water Diver ($220), Emergency First Response ($150) or Rescue Diver ($400 - includes Emergency First Response). The price includes the manual and PIC card. These extra courses may not be available at all times and enrolment may depend on the number of people wanting the training.

MN003 Indian Ocean Reef Ecology Course (Weeks 2 – 8; need to have completed MN002 or be dive trained if doing the practicals by diving)
This one-week course is a prerequisite for joining the reef research programme and is free for Operation Wallacea volunteers. The course teaches identification of common genera and species of coral and other macro-invertebrates, identification of the major reef-associated fish families and common species and introduces a variety of methods and practices used for scientific research in the marine environment. Note the practicals can also be done by snorkelling if there are volunteers who do not want to dive.

FOREST OPTIONS

MM101 Dry Forest and Wetlands Biodiversity Assessment (Weeks 2 – 8; must have completed MM001, Madagascar Wildlife and Culture Course)
This option will be based either at the main camp in Mariarano or in one of the satellite camps. By doing this option for multiple weeks it will give you the option of seeing a wide range of wildlife and see you gaining a more in depth knowledge of the ecosystems and species of this remote part of Madagascar. The research projects running include herpetofauna standard search transects as well as spotlight surveys in the evening for chameleons and frogs. Boat based spotlight surveys for crocodiles are also being completed and there are specialist scientists working on colour change in chameleons. Lemur survey transects are being completed both during the day and also at night using spotlights. In addition there are other teams studying the behaviour of Coquerel’s Sifaka and live trapping the nocturnal lemurs to look at niche separation in the various species. Bird point count surveys and mist net surveys are also being undertaken as well as boat based transects for the water birds. There are also small mammal surveys using live traps and mist netting at night to characterise the bat communities. One of the main objectives of the survey is to present the forest areas for potential funding under the REDD+ scheme. In addition, this activity monitors trends in some indicators of forest physical parameters (canopy cover, sapling density). Volunteers can rotate between these survey groups throughout their stay.

MARINE OPTIONS

MN102 Reef Fish and Coral Monitoring (Weeks 3 – 8; must have completed MN003 and be dive trained)
2014 should be the first of a series of annual monitoring program of the reefs around the island using a stereo video system developed by the University of Western Australia. This system allows a surveyor to swim along transects and video the fish encountered. Then in the lab, by playing back the two video images on a single computer screen using specialist software, not only can the images be freeze-framed to accurately identify all fish encountered but also size estimation can be done to below 4% error. Benthic communities on the island reefs will be surveyed by laying 50m tapes along depth contours. A surveyor swims along the tape holding it in their left hand and using a video under their other shoulder, filming the tape and adjacent corals. Coral cover and community structure of hard and soft corals are then assessed from lab based analysis of the video footage using the continuous method. In addition, invertebrate belt transects will be used to monitor the populations of key species including sea urchins. Volunteers on this project will be helping with laying transects, collecting data in the water, and completing the video surveys, but will also be heavily involved in the analysis of the images in the on-site laboratory.
MARINE RESEARCH OBJECTIVES

Forest

The Calakmul Biosphere Reserve in Mexico is a huge expanse of tropical forest that is continuous with the Maya Biosphere Reserve in the Peten Province of Northern Guatemala. Collectively, this forest spans over 7.5 million hectares and is the largest section of tropical forest north of the Amazon. This stretch of forest was also home to the two largest ancient Mayan cities of Tikal in Guatemala and Calakmul in Mexico during the classic period in ancient Mayan history (400AD-900AD), plus one of the oldest ancient Mayan cities El Mirador which dates back to the pre classic period (600BC-300BC). Today, the extensive pyramids and ruined cities lie sprawled through the dense jungle, with some of the taller pyramids towering above the canopy at 65m in height. It is these pyramids that give Calakmul its name. Wildlife in Calakmul includes jaguar, puma, ocelot, jaguarundi, tapir, brocket deer, peccary, howler and spider monkeys in addition to over 50 species of reptile and amphibian and 350 species of resident and migratory birds, including abundant parrots, toucans and the endemic ocellated turkey.

The Calakmul Biosphere Reserve covers an area of 723,000 hectares but is attached to two state reserves Balam-kim and Balam-ku, which run the entire length of the western side of the biosphere. The total area covered by these connected reserves is 1.2 million hectares. Unlike the majority of forest in the Yucatan, the forest in Calakmul has not been used for timber production nor has it been burned for farming and ranching and, as such, it is one of the last remaining stands of virgin forest in Mexico. The northern part of Calakmul contains tropical deciduous forest, where trees typically have a canopy 8-20m high and lose their leaves in the dry season (December to May), but the majority of the reserve contains tropical semi-deciduous forests. Tropical semi-deciduous forests have a canopy ranging between 15-40m in height, although the majority of these trees are from 25-30m. The canopy can be closed or partially open and in the dry season, 20% to 40% of the trees lose their leaves. Calakmul also contains numerous temporary lakes known as aguadas, which form during the rainy season and may last well into the dry season.

The Calakmul Biosphere Reserve forms one part of the proposed Mesoamerican Biological Corridor spanning Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Creating such forest corridors are extremely important for ensuring gene flow between animal populations and for ensuring that populations can withstand natural disasters such as droughts, forest fires, hurricanes and floods. Seeing as Mexico and Central America experience all four of these extreme weather conditions, forest connectivity is extremely important. Forest connectivity is also crucial for animals with extensive ranging patterns such as jaguar. The primary objective of the Operation Wallacea project is to quantify the carbon storage value of the forests and to produce annual data on the biodiversity of key taxa. These data are being used to draft a report using the Climate, Community and Biodiversity Alliance standards so the forests can be submitted for funding under the Redaction in Emissions from Deforestation and forest Degradation scheme (REDD+). Another focus of the project relates specifically to the large mammals. Calakmul and the connected Mayan Biosphere Reserve in Guatemala is the largest remaining stronghold for jaguar and tapir. However, with rapidly growing buffer zone communities, hunting of forest mammals is a major concern for the reserve. Pronatura have been working with local communities to educate them about sustainable hunting of fast producing mammals that live in relatively high densities such as paca and deer rather than slow-reproducing mammals that live in low densities such as tapir. The Opwall surveys in Calakmul are also producing annual data on population density of the large mammal species in order to calculate sustainable hunting quotas for buffer zone communities.

MEXICO RESEARCH OBJECTIVES
MEXICO RESEARCH ASSISTANT OPTIONS

TRAINING COURSES

YC001 Introduction to the Ancient Maya and Mayan Jungle Ecology Course (Weeks 1, 3, 5 & 7)
The agro-forestry methods of the Ancient Maya and their close relationship with wildlife played a major role in shaping the forest within the Calakmul Biosphere Reserve. This week-long course will provide background information about the Ancient Maya in the form of a guided tour of the museum at the research camp followed by a trip to the breathtaking Calakmul ruins. The information gained during these activities will then be complemented by a series of lectures and field-based practical sessions relating to the key flora and fauna of the Mayan forest. Lectures will cover topics such as the Mayan influence on tree diversity and its resultant affect on frugivore abundance, mammal ecology and sustainable hunting practices, bird and herpetofauna diversity, ecological census techniques, and carbon trading as a means to conserve tropical forest. The practical sessions that accompany these lectures will teach you the skills necessary for biodiversity surveys including animal identification, animal capture using mist netting and pitfall traps, transect surveys, and carbon biomass estimates.

YA002 PADI Open Water Dive Training (Weeks 1 - 9)
This one-week course is a prerequisite to any diving project. Open Water dive training is free to Operation Wallacea volunteers except for the costs of the PADI registration card and the Open Water Crew Pack, both of which you need to bring with you. Completion of this course will give you an internationally recognised diving qualification and enable you to join general diving projects accompanied by a Divemaster.

YA003 Caribbean Reef Ecology Course Ecology with practicals by diving (Weeks 1 - 9; need to be dive trained or have completed YA002)

YA004 Caribbean Reef Ecology Course Ecology with practicals by snorkeling (Weeks 1 - 9)
The coral reef system on the east coast of the Yucatan Peninsula or Mexico is the northern tip of the Meso-American Barrier Reef, which is the second largest stretch of coral reef in the world. The coral reef system in the Yucatan is, however, rather unusual due to the presence of underground rivers and sink holes (called cenotes) throughout the peninsula with outlets along the coast and further out to sea. The complex hydrology of this area means that pollution events inland can have an immediate and disastrous effect on coral reefs because polluted water can travel untreated through the underground rivers directly onto the reefs as not all water will pass through the natural filtration system of mangrove lagoons. The Mexican coastal and reef ecology course aims to provide students with an understanding of the unusual coastal environment in the Yucatan Peninsula with specific reference to the role of cenotes and underground rivers, seagrasses and mangrove lagoons in shaping the coral reef system. The course will also introduce key topics of coral reef biology and ecology and identification of key species and taxonomic groups found within the reef system. This intensive course consists of a series of lectures and in-water practicals suitable for divers (YA003) and snorkelers (YA004).

FOREST OPTION

YC101 Mayan Jungle Megafauna and Biodiversity Surveys (Weeks 2 - 8; need to have completed YC001)
The primary objective of the Operation Wallacea project is to assess the biodiversity and carbon biomass of the Calakmul Biosphere Reserve in order to obtain funding from the UN REDD+ scheme. This funding will be used to protect the forest by increasing forest patrols and providing sustainable economic development for buffer zone communities so they are less reliant on forest resources. Surveys will be conducted at the main base camp and remote forest camps throughout the reserve, which gives the opportunity to see how the forest and wildlife change from the dryer northern sections of the reserve to the more humid forest in the south. Carbon biomass estimates will be produced by taking a range of tree measurements in survey plots throughout the reserve. Biodiversity assessment will focus on six key groups: Lepidoptera (butterflies and moths), reptiles, amphibians, birds, bats, and large mammals. Moths will be monitored from light traps and butterflies from pollard counts. Reptiles and amphibians will be monitored using pitfall traps in survey plots, and diurnal active searches and nocturnal spotlight surveys along forest transects. Birds will be assessed using point counts and mist netting and bats will be monitored using mist nets. As large mammals occur at high densities in Calakmul, mammal surveys will be a major component of the project. Mammal monitoring data will provide valuable information relating to the ranging patterns of primates, jaguar, puma and tapir and may be used to calculate sustainable hunting quotas for deer and peccary. Large mammal surveys will involve recording mammal sightings and mammal tracks encountered along forest transects and data obtained from camera trapping throughout the forest. Note that if you want to specialise in bats and learn how to handle the animals then you will need a full course of rabies vaccinations before joining the expedition.

MARINE OPTION

YA102 Marine Ecosystem Monitoring (Weeks 1 – 9; need to have completed YA003 or YA004 and be dive trained if participating in dive based elements of this project)
The coral reefs in Akumal are one of the few areas of reefs in the Yucatan that have not been notably damaged by hurricanes or pollution from hotel developments. In addition, the beaches and sea grasses are a safe haven for nesting sea turtles. Centro Ecologico Akumal (CEA) is gathering the data necessary to award Protected Area status to the beaches, lagoons and reefs of Akumal. Protected area status is needed for the sustainable management of fisheries and tourism, which in their current form, are a major threat to the marine ecosystem. The marine ecosystem monitoring programme focuses on an integrated coastal system using video surveys for monitoring coral cover, levels of bleaching and disease and benthic communities, turtle monitoring and monitoring of fisheries and tourism in the bays, lagoons and reefs. The data collected will be used to determine the biodiversity value of the reefs, to assess the impact of commercial and sport fishing on reef fish populations, to assess the relative importance of Akumal beaches and sea grasses for sea turtle populations, and to calculate the tourism carrying capacity for the area. Students participating in this monitoring programme will have an active schedule that involves dive or snorkel based reef surveys, dive based surveys for reef fish communities and benthic communities, snorkel surveys of turtle use of sea grasses, nocturnal turtle nesting surveys, fisheries monitoring and daytime beach and lagoon patrols. Students will also contribute to daily data entry and assist with the creation of field reports on tourism.
GUYANA RESEARCH OBJECTIVES

The Guiana Shield in South America is a massive granite dome that formed 2 billion years ago and forms what is now Guyana, Surinam, French Guiana and parts of Venezuela, Colombia and Brazil. Throughout most of this area there is a low human population density and as a result 2.5 million km2 of tropical rainforests still remain largely untouched along with extensive savannas and wetlands. The Operation Wallacea expeditions are working in Guyana – an English speaking country with some of the most pristine remaining forests, savannahs and wetlands and where sightings of jaguar, tapirs, giant otters, harpy eagles and many other charismatic South American species are common. The expeditions to the interior of Guyana, which involve trekking through undisturbed forests and lengthy river travel in small boats with temporary field camps on the river banks, are not for the faint hearted – this is true South American forest and a real expedition experience.

Operation Wallacea has formed a partnership with the Iwokrama International Centre for Rainforest Conservation and Development (IIC), and the Amerindian community of Surama. The IIC manages one million acres (371,000ha) of undisturbed forests in the centre of the country. The IIC represents an international partnership between Guyana and the Commonwealth to demonstrate how tropical forests can be sustainably used in the interest of global scale climate change, local communities, and biodiversity conservation. IIC also has a key partnership with the 16 North Rupununi communities, via an established body known as the North Rupununi District Development Board (NRDDB) and this is cemented in agreement known as the Collaborative Management Agreement. The Iwokrama Forest is divided into roughly half Sustainable Utilization Area (SUA), where sustainable use of forest resources are permitted and tested, and half Wilderness Preserve (WP), where there is no commercial extraction of forest resources.

Surama Village, one of the NRDDB communities, in the North Rupununi, Region 9, is a primarily Makushi Amerindian community that is part of the villages encompassed under the administration of Anai Village. Suram’s vision is to develop, own and manage a community-based eco-tourism business by constructively using the natural resources and their traditional culture in a socially appropriate manner.

A monitoring programme providing equal coverage of the SUA and WP parts of the Iwokrama Forest as well as the forests surrounding Surama Village has been initiated, and is being completed annually by the Opwall survey teams. The purpose of this monitoring is to provide long-term data sets on the abundance and diversity of key biodiversity taxa so that the impacts of sustainable use within Iwokrama and the forest surrounding Surama can be identified in comparison with the non-utilised wilderness areas. The species locality data are also being used to model species distributions, in order to identify areas of high diversity, and other areas of conservation importance. Over time, the effects of climate change and climate fluctuations (in particular El Niño Southern Oscillation patterns) should also be identifiable from these data sets. Additionally, these surveys provide survey coverage of parts of the Iwokrama Reserve and adjacent areas where there has been little previous survey work and may therefore provide additions to the species list for the area. There are now several derivatives of the Reducing Emissions from Deforestation and forest Degradation (REDD+) mechanism where biodiversity criteria are included in payments derived from REDD+ funding and these data may therefore be used for similar initiatives in Guyana.

For more information:
- www.iwokrama.org
- www.iwokramacanopywalkway.com
- www.nrddb.org
- www.suramaecolodge.com

GUYANA FACILITIES

Expeditions begin at the beautiful Iwokrama River Lodge and Research Centre (IRL), set on the banks of the Essequibo river. Here accommodation is in dormitories with normal washing facilities. There is a well equipped research centre with a lecture room and restaurant overlooking the river. After a few days of induction and training though volunteers will head out to the more remote field camps to begin surveying. Five field camps are used for the surveys with two in Sustainable Use Areas within Iwokrama, two in the Wilderness Preserve areas within Iwokrama and one camp outside the reserve in the Surama forests. At each camp, two 2-3km transects will be used to survey large mammals, large birds and herpetiles and will radiate out in different directions. The first 200m of one of the transects will also be used for the bird and bat mist net array. In these camps, accommodation will be in hammocks with bashas and integral mosquito nets. There are temporary field toilets and washing will be done in the rivers. Emergency communications will be by satellite phone and VHF radio at each of the camps.
Howler Monkey, Wedge-capped Capuchin, White-faced Saki, deer, peccaries, macaws, parrots, parakeets, toucans, tinamous, trumpeters, curassows, guans). Distance sampling analysis will be used to identify changes in relative abundance of the commoner species. The bird mist net and the bat mist net data will be quantified per unit of netting effort. These data over a period of years combined with forest structure and satellite data will then be able to track biodiversity changes in the Iwokrama and Surama forests and are being written up as a part of several PhD studies.

Starting from the savannah village of Surama, during one of the four weeks the team will travel down the Burro-Burro River through the heart of the Iwokrama rainforest. The purpose of this trip is to gather standardised data on the Giant River Otters, Caiman, Anaconda and water birds (e.g. kingfishers, herons, egrets, ducks, cormorant, terns etc) as well as conducting the other surveys outlined above. This is a deep forest experience and the teams will be helping the boat drivers and guides porter the boats around rapids and to navigate around fallen trees.

GI101 Iwokrama and Surama Forest Biodiversity Survey (Expeditions 1&2)
Research Assistants will be joining an expedition with a fixed 4-week itinerary that contains training course elements as well as working on the various research projects that will be running. Working on this expedition will give volunteers the opportunity to contribute to an annual biodiversity monitoring programme of key forest taxa, as well as see a wide range of Guiana Shield wildlife.

For three of the four weeks the group will be based in one of the field camps. In the first week the group will be completing a Jungle Training and Guiana Shield Forest Ecology course. The course is designed to prepare the group for living and working in the forest and to be of practical use in the surveys. Skills in learning how to live safely and healthily in the tropical forest in hammock based camps will be gained. The other part of the course will be a series of lectures on the wildlife and ecology of the fauna and flora likely to be encountered as well as learning how to identify some of the commoner species.

The teams will move at the end of each week and will be helping with the surveys at each camp and along their radiating transects. At each site the transects radiating out from the camp in different directions will be used for the surveys. Mist nets will be set for understoody birds during the day and bats at night. Herpetofauna surveys will be completed from day and night time searches along each transect and streams. Large mammal and bird surveys will be completed from separate standardised searches along the transects. Key invertebrate groups will be also be surveyed along the transects and around the camps. The transects will be surveyed daily to provide sufficient sample sizes to statistically analyse the faunal community dynamics of the forest.

The data collected will be used to monitor annual changes in abundance of key indicator species, to understand the effects of climatic variation, human induced impacts, and species distributions using modelling techniques. The herpetofauna data gathered from standardised searches will identify encounter rates for the commonest species as well as adding to the overall species lists for the Park. The invertebrate data will contribute to the understanding of indicator taxa, and add significant contributions to the species list of the area. The large mammal and large bird data gathered from standardised searches will be expressed as encounter rates (direct observations or signs) for each of the main species (e.g. Black Spider Monkey, Red Howler Monkey, Wedge-capped Capuchin, White-faced Saki, deer, peccaries, macaws, parrots, parakeets, toucans, tinamous, trumpeters, curassows, guans). Distance sampling analysis will be used to identify changes in relative abundance of the commoner species. The bird mist net and the bat mist net data will be quantified per unit of netting effort. These data over a period of years combined with forest structure and satellite data will then be able to track biodiversity changes in the Iwokrama and Surama forests and are being written up as a part of several PhD studies.

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CUBA RESEARCH OBJECTIVES

The southern part of the Isle of Youth (Isla de la Juventud), the largest island off the coast of Cuba, is an area of significant biodiversity importance and is now being proposed as a Sustainable Use and Protected Area (APRM) whilst the western end has been designated as the Punta Frances National Park. The Punta Frances National Park contains mangroves, lagoons, semi-deciduous forests and coral reefs, and forms an excellent example of relatively undisturbed and linked Caribbean habitats. Operation Wallacea and the Centre for Marine Research at the University of Havana (CIM-UH) have agreed a long-term research collaboration to develop and implement a biodiversity monitoring programme that will provide the data needed to inform conservation management practices across the whole of the southern island APRM.

The survey work is based on research ships and from land based teams in the Punta Frances Reserve. In 2014, the research objective is to complete fish and benthic surveys using video surveys of all the reefs of the southern Isla de la Juventud APRM and assess the manatee populations by direct observation and side scan sonar in the mangrove channels.

CUBA FACILITIES

COLONY HOTEL AND MARINA

All volunteers will be staying in the 3 star Colony Hotel for the first week. The Colony Hotel has air conditioned rooms, a swimming pool, showers and all the luxuries you would not expect on an Operation Wallacea research expedition! Breakfast and dinner are taken at the hotel with packed lunches provided for the field team. In the second week the students are based for three nights in the hotel.

FELIPE POEY RESEARCH SHIP

In the second week 3 nights will be spent on the Felipe Poey research ship and for those staying for 4 weeks the whole of the last 2 weeks will be spent on this ship. The University of Havana research ship, the Felipe Poey (named after a famous ichthyologist) has berths both above and below decks, though most people choose to sleep under the stars on the top deck. The Felipe Poey was converted from a fishing boat and has excellent facilities aboard including a flush toilet and a basic fresh water shower (to be used sparingly to conserve fresh water). There is a fresh water tank which can hold up to 8 tonnes of fresh water at one time. There are also solar panels on board the boat to charge the batteries for radio communication. There is a projector and screen and sitting area on the bottom deck for lectures. The captain’s wheel house has state of the art real time navigation systems, GPS systems, echosounder and satellite images all linked to a main computer.
CUBA RESEARCH ASSISTANT OPTIONS

CP101 Reef Fish, Benthic Communities, Sharks and Manatees in the Southern Isla de la Juventud APRM (Weeks 1 - 4)

Volunteers on this project will spend their first week in the Colony Hotel with day trips out in boats. Those who are not already dive trained will be spending the first week completing a PADI Open Water dive training course. Those already dive trained will be completing a Caribbean reef ecology course based at the Colony Hotel but with day trips on one of the research ships with in-water practicals to help training in the identification of the reef fish and coral species likely to be encountered. For the second week the students will split into two groups one of which will be based in the Colony Hotel and will help with the manatee observational transects and side scan sonar surveys, manatee capture and marking, analysis of the reef fish and benthic video data collected. The second group will be based on the Felipe Poey research ship and will be completing stereo video reef fish surveys, video line transect surveys, helping with shark capture and tagging and with processing Lionfish samples (an invasive Caribbean species). Those staying 4 weeks will be based on the Felipe Poey for weeks 3 and 4 and will be completing surveys on the reefs and small islands in the remote parts of the Southern Isla de la Juventud APRM. The students on this extended boat survey will finish at Batabano.
TRANSYLVANIA RESEARCH OBJECTIVES

The Tarnava Mare Natura 2000 Region in Transylvania is one of the last medieval landscapes in Europe. Sitting at the foothills of the Carpathians this stunning 85,000 ha area not only boasts picturesque remote Saxon Villages surrounded by some of, if not the most, extensive flower-rich grasslands remaining in lowland Europe but it also houses a spectacular array of fauna including one of the largest populations of European Brown Bears found anywhere in the world.

The landscape still presents a medieval land-use pattern: forested ridges and gullies, pasture and hay meadows on gentler slopes and terraces, and arable land and smaller meadows on the flat valley bottoms near villages.

Inclusion of the area in the EU Natura 2000 network enables funding to be obtained to maintain the low input traditional based farming that has created such a high biodiversity. The Opwall teams are completing an annual biodiversity survey of the region in order to assess the effectiveness of maintaining the traditional farming practices in protecting this outstanding area. The work is being completed with ADEPT, a Romanian based NGO, with the Opwall teams providing annual data on a series of biodiversity performance and farming criteria.

TRANSYLVANIA RESEARCH FACILITIES

This Opwall expedition gives students the chance to join a small team which will move from remote village to village across the region. Each village is nestled in one of many valleys running North to South, and so after completing surveys for between five and seven days in each village the team will trek up the side of the adjacent valley and down into the next one. Luggage can be transported on oxcart or on a 4x4 vehicle, which is a relief given the strength of the Transylvanian sun during this time of year!

When in the villages teams will usually be staying in basic campsites where they can pitch their tents under the fruit trees, and where the water in the showers is heated by the sun each day. Meals are locally prepared and the majority of the food on the expedition is baked, grown, or farmed in the same village in which it is consumed. In some villages volunteers will be able to stay in local guesthouses which gives a fantastic insight into the Saxon culture and traditions.

It should be noted that on this expedition almost all surveys are conducted on foot. Volunteers can be out in the sun surveying the remote forests, meadows and grasslands for long periods of time each day, in addition to collecting more data during the evenings where possible, so it is helpful to have a reasonable level of fitness.

SAXON VILLAGES

This Opwall expedition gives students the chance to join a small team which will move from remote village to village across the region. Each village is nestled in one of many valleys running North to South, and so after completing surveys for between five and seven days in each village the team will trek up the side of the adjacent valley and down into the next one. Luggage can be transported on oxcart or on a 4x4 vehicle, which is a relief given the strength of the Transylvanian sun during this time of year!

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RT101 Transylvania Biodiversity Survey (Weeks 5 - 8)
Research assistants will be joining a project which includes a training course element as well as working on the different surveys that will be running during the survey season. During the first week the teams will be completing a Transylvanian ecology course which is designed to give volunteers an understanding of the cultural and ecological history of the region, of the overall research and survey objectives, and of the specific surveys and taxonomic groups that the teams will be focussing on. Lectures and discussion groups will be interspersed with practical survey sessions and students will have the opportunity to get involved in the surveys that they are going to be completing during the following weeks.

Volunteers will split into groups and will form a key part of the teams collecting data from the extensive woodlands, meadows and grasslands around a series of Saxon settlements across the Tarnava Mare.

LARGE MAMMALS
This team will position camera traps in key locations in the forests and on the valley transects in order to capture sightings of large mammals such as bears, wolves, wild boar and deer. The team will also visit likely vantage points at dawn or dusk to see large mammals and will record any prints or scat encountered.

SMALL MAMMALS AND HERPETOFAUNA
This team will set small mammal traps late at night which will be checked and emptied each morning. They will also complete standard searches around the edge of river and wetland areas for amphibians, and will walk the longer sample routes around the valleys either side of the village, recording mammal and herpetofauna sightings and signs.

During the evenings bat surveys will be completed.

BIRDS
The bird team will be leaving at dawn and walking the long transect sample routes that traverse the valleys either side of the village. They will complete point count surveys at 500m intervals en route, looking for sightings and listening for calls of the wide range of birds found in the area. The bird assemblage includes an abundance of woodpeckers, shrikes, larks, warblers and many birds of prey (such as eagles and hawks). In the evening call-back surveys are also completed for corn crake and owls.

PLANTS
The plant team will be focussing on target species which are good indicators of grassland types or have medicinal use. Transects will be completed in low, medium and high nature value grasslands along the different sample routes where the presence of different key species will be noted. This area contains some of the most diverse grasslands in Europe this project will be a chance to work in a rarely seen and spectacular habitat.

BUTTERFLIES
The butterfly team will be covering the same 50m transects as the plant team, recording the butterflies encountered and using sweep nets to catch and identify the rarer species. Light trapping will also be completed for moths in the evenings, with early mornings then spent identifying those species caught.

FARMS
The traditional farming methods used in this region play a crucial role in the maintenance of high biodiversity. Part of the monitoring effort therefore includes visiting a number of farms in each village and recording the numbers of livestock, dates of grassland cutting, type of arable crops etc. They will also be gathering data on bear and wolf attacks on the livestock, and will have a unique opportunity to experience methods of farming which were lost many years ago in most of the world.
HOW TO SELECT AND COMPLETE A DISSERTATION/THESIS OR INDEPENDENT RESEARCH PROJECT

This section describes the undergraduate dissertation or independent research project topics where there is academic support on site and that can be developed into research questions for dissertations or senior theses. About 25% of students use their time on site to also gather data for their undergraduate or Masters level dissertations or theses. Doing it this way means that you still have the benefit of working in some of these remote environments but can also use your time over the summer to collect data for your degree dissertation or senior thesis. Over the last couple of years 95% of the students doing dissertations with Opwall have gained the top two grades for their dissertations and some have even won the best dissertation for their year! Katherine Elsom from Cambridge University won the 2011 RGS-IBG Biogeography Prize for the best national undergraduate dissertation and students from universities such as Oxford, Princeton, Toronto, Manchester, Birmingham, Essex and many other Universities have won the best dissertation in their department for an Opwall based study.

The 100+ topics have been separated into subject areas (e.g. mammal ecology topics, genetics topics etc) and the topics within each subject area are often drawn from a range of countries. Each of the topics describe an area of study from which students can develop their own research questions. Some of the topic areas involve data collected as part of the general monitoring effort. In such cases, the data-collection sites and methods are fixed, and the range of possible research questions is therefore limited. However, it also means that the likely sample size of the data collected is large, allowing a variety of research questions to be addressed using the data. Other subject areas, which are not part of the general monitoring effort, allow a much larger range of possible research questions and flexibility in the planning of the work. The main constraints for these projects are logistical (vehicles, safety guard cover, dive launches etc).

HOW DO I SELECT A SUITABLE DISSERTATION TOPIC?

The first stage is to decide which topic area(s) is of most interest and then go to the relevant subject area in the brochure. There are brief descriptions of each of the topic for that subject area in the brochure. If you then go to the relevant section on the Opwall website (www.opwall.com) you can download a short video describing each of the topics and also more detailed project descriptions and initial reading lists for each topic. After reading through these you should be able to narrow your selection to one or two topics. Then please contact your local Opwall office and they will arrange for one of the lead academics on the topic areas of most interest to speak with you to help narrow down your choices. Once you have some initial ideas of your proposed research question you need to consult with your academic tutor/advisor to check that you are able to complete an off site dissertation/senior thesis as part of your degree and that you have had their input on your initial ideas.

HOW DO I PREPARE WELL BEFORE COMING OUT TO THE SITE?

Once you have selected your preferred topic and booked onto the expedition, you need to start preparing a draft research proposal that needs to be submitted by 28th February 2014 to our Senior Dissertation Advisor (dissertations@opwall.com). The research plan should contain the following sections:

- a project title
- review of current literature relevant to your project, rationale for your project and the specific aims and hypotheses of your research
- proposed data collection methods
- how the data will be analysed
- equipment requirements
- reference list

At this stage you also need to talk to your university tutor/advisor to identify who your internal University supervisor for the research project will be. You will then be sent a dissertation assessment form that will need to be signed by your university supervisor. Once we have received this form and the draft research proposal, the Senior Dissertation Advisor and the academic who will be providing your specialist supervision in the field will contact...
you with comments on the draft and the practicalities of completing the proposed research. Once you have these comments you can then submit the final research proposal to the Opwall Senior Dissertation Advisor, your Opwall field supervisor and your internal University supervisor. The final proposal has to be completed before 1 April 2014 otherwise Operation Wallacea has the right to refuse you the opportunity to complete a dissertation or thesis on site. Having agreed your project plan you will then need to complete a risk assessment for the project. Risk assessments for all generic activities carried out by Operation Wallacea can be obtained from the Opwall web site (www.opwall.com) so that you can complete this task for your specific project. Note that this risk assessment should also be submitted to your University before departing for the project.

HOW WILL I BE SUPERVISED IN THE FIELD?

Once you are on site, an experienced Senior Scientist will be introduced to you. You will meet with your specialist field supervisor as well as the Senior Scientist to discuss your proposed project plan in detail. You will then be asked to draft a timetable for the implementation of the project plan which ensures that data are gathered, any necessary interviews scheduled, background information collected and spare time built into the timetable to allow for problems. During your field work you will be supervised on a daily basis by your specialist project supervisor, but will also have to report on progress regularly to the Senior Scientist.

WHAT WILL I BE EXPECTED TO DO ON SITE?

Ensure that you give completion of your dissertation or thesis the highest priority. You will be staying in some of the most beautiful reefs and/or forests in the world and it is important that you don’t get distracted. It is best to work hard early on in your stay, complete your research and then if there is spare time at the end, relax. As a minimum you will need to spend 4 weeks working on your dissertation/independent research topic if it is for an Honours project or 6 weeks if it is for a Masters. Since skills and safety training inevitably takes 1–2 weeks, you will need to stay for 6 weeks for an undergraduate dissertation or thesis, although 8 weeks would be better and is essential for a Masters project. You should enter data, analyse results and start drafting sections of your dissertation or independent research report during your stay. Usually when you start writing you realise that there is additional information that you need to collect and it is typically not possible to gather this information once you have left site. You will be asked to give a short oral seminar to other students and staff about your research at the end of your stay, and to write a short report. These are very useful parts of the experience, because of both the scientific feedback obtained and the experience of doing them.

WHAT WILL I BE EXPECTED TO DO WHEN I RETURN TO UNIVERSITY?

We strongly recommend that you finish writing up your dissertation or independent research report as soon as you can, while it is still fresh in your mind. If you leave it for a few months, it is often very difficult to get back into the detail of the project. You must send a digital copy of your dissertation or independent research project to Operation Wallacea as soon as it is completed. This copy is forwarded to various in-country organisations who are interested in the results of the work and to publish your report on the Operation Wallacea website. Remember that you are part of a wider project and your results are needed! Please also let the Senior Dissertation Advisor know the grade you get for your dissertation.
BOTANICAL RESEARCH TOPICS

IN200 Do roads and paths increase the level of disturbance within tropical forests? Indonesia (Weeks 2 – 8; need to have completed IL001)
The Lambusango Forest Reserve (LFR) is a 76,000 hectare wildlife reserve of lowland tropical rainforest located on the island of Buton in South-east Sulawesi. Over 20 villages are located around the periphery of the LFR whose inhabitants use timber and non-timber products (NTPs) from within and outside of the reserve. Pressure on the LFR is increasing as the population grows around its boundaries. This project will investigate the effect, if any, the presence of roads and paths have on the level of disturbance found within the LFR. Variables including; canopy cover, number of trees, tree circumference, number of saplings will be measured within multiple 50 x 50 m plots at varying distances within the forest. We hypothesise that a gradient will exist with more disturbed areas occurring closer to roads adjacent to the forest and paths leading into the forest. The results of this work has implications for the management of forest reserves within the tropics as it will inform what size buffers around protected areas should be.

HM201 The effect of altitude, rainfall and temperature on leaf structure, Honduras (Weeks 2 – 8; need to have completed HM001)
This project is designed to investigate the factors that affect leaf size, thickness and shape in trees. It is known that these leaf variables change with altitude but the main environmental driving force behind this change has long puzzled ecologists. The forest here allows samples to be taken in areas of quite different rainfall and temperature and so provide a unique opportunity of teasing apart this puzzle. Samples will be collected at a number of different camps using standard techniques to measure leaf area, thickness, shape, dry weight and dry weight per unit area of the samples. It will also possible to look at stomatal density, the presence of drip-tips, degree of herbivory and a number of other factors which link into the overall question. There are also data available from previous projects that can be used to help gain a bigger picture.

IL202 The effects of forest disturbance on butterfly communities in lowland Indonesian forests (Weeks 2 – 8; need to have completed IL001)
Butterflies are often used as biodiversity indicators – community composition is affected by levels of forest disturbance and openness of the canopy. Operation Wallacea teams are completing annual forest butterfly surveys from pollard walks, sweep netting and fruit baited traps at each of the studied field camps. This survey could be utilised to ask a series of dissertation or thesis questions. For example one project could study the effects that environmental variables associated with forest disturbance have on butterfly abundance and diversity. Collection of data on habitat structure at these sites would then allow the impact on butterfly communities that forest structure factors have, such as degree of canopy openness, amount of understory vegetation etc. Alternatively, the effect of height on butterfly community composition could be studied from fruit baited traps set at different heights in the canopy. The effectiveness of the various survey techniques could be examined to determine the effect of time on the effectiveness of pollard walks, how sweep net catches compare with pollard walks and fruit baited traps, how bait type affects catches of butterflies, etc. A platform has been built in the canopy at Labundo so that point count surveys could be completed from the canopy and compared with the results from ground level surveys.

HM203 Estimating tropical invertebrate diversity (Weeks 2 – 8; need to have completed HM001)
This is a unique opportunity to participate in a global DNA barcoding initiative, the International Barcode of Life (iBOL, http://ibol.org/). Conceptualized, and supported, by the University of Guelph Canada, DNA barcoding provides an accurate, rapid and inexpensive species identification method for thousands of specimens within Cusuco National Park. Initial studies within the park where malaise traps were deployed for an 8 week period in two separate camps resulted in 2000 species being identified from a total of 6000 specimens caught. Despite the two camps being only 2km apart and a 200m difference in altitude, the overlap in species was only 5% giving an indication of just how spectacular the diversity of this cloud forest park may be. This topic is designed to gain an overall estimate of the total invertebrate diversity of Cusuco National Park from the work of several dissertation students who will each concentrate on different Orders.

DISSERTATION/THESIS TOPICS
(e.g. Hymenoptera, Coleoptera, Diptera). Projects could include: (i) **a biodiversity investigation within a vertical forest structure** where Malaise traps are set in the canopy, mid tree, and on the ground to compare overlap in species; (ii) **The spatial variation and overall invertebrate diversity with varying tree species, altitude, or rainfall level** found within the park; (iii) **The proportion of overall invertebrate biodiversity being sampled by Malaise traps**, a comparison of diversity and overlap in specimens from leaf litter traps, light traps, pitfall traps and active searching samples. Students doing these projects collect specimens on a weekly basis, allowing species accumulation curve plots, and sort their specimens into Order. Larger specimens will be pinned and a leg will be removed from each specimen for subsequent DNA extraction. Smaller specimens will be placed directly into 96-well plates. Great care has to be taken to minimize contamination and ensure the accurate labelling of specimens. Sorted plates and pinned specimens are sent to the University of Guelph for DNA sequence generation (2-3 weeks). The student registers and manages their project on the online BOLD database (http://www.barcodinglife.com/) ensuring all specimens data has been uploaded with the appropriate label. Each of the sequences will be assigned a Barcode Index Number (BIN), which closely approximates species, enabling analysis of overlaps between sites and percentage contribution by each Order and identification and distribution analysis from known species within the database. A large percentage of the sequences will be for unknown species and in these cases the database can be used to produce a phylogeny showing the nearest known species. The students will manage their own data on the BOLD database and have access to this resource so they can compare their results with similar studies within the region giving an amazing opportunity for dissertation studies. The sequencing for this project is being completed at a heavily subsidised rate by the University of Guelph and from additional funds provided by Opwall, but additional lab cost funds will be required from students to complete the work. Note many dissertation students have access to a lab costs budget which can be used for this work and if working on the same Order the costs for the samples can be shared between a number of students.

**HM204 Factors affecting dung beetle, jewel scarabs and moth communities in Honduran cloud forests (Weeks 2 – 8; need to have completed HM001)**

This topic can take advantage of the existing, fixed-method sampling program of baited pitfall traps for dung beetles at all 150 sites and of light trapping for moths and jewel scarab beetles at each of the 28 local sites, as well as the taxonomic expertise on site to help with identifications. Students on this project will participate in the main data collection effort, and may also be able to adapt the sampling program to their own project or set up plots for experimental studies. There may also be the opportunity to investigate aspects of ecological genetics, or to utilise GIS in analysing the local biogeography of these three groups.

The dung beetle community may play an important role as an indicator for the quality of the local rainforest habitat or for the occurrence of other taxa. Dung beetle projects could involve analysing community data from the sampling program in relation to the habitat structure measurements, for example investigating changes in species composition with altitude. Dung beetles also play a vital role in decomposition in the forest and in seed dispersal and the impact and effectiveness of these roles could be tested using various experimental designs. Alternatively, a project could use live trapping of dung beetles to assess how far they travel to their food source, via mark-recapture methods, or to study aspects of dung beetle ecology such as diet activity or feeding preferences.

Similarly, community data of the jewel scarab beetles or moths could be analysed with respect to habitat characteristics. Given that jewel scarab beetles are extremely attractive and highly valued by collectors, a project using mark-recapture analysis of trapped jewel scarab beetles to estimate population size and other parameters to inform sustainable exploitation of the beetles would also be useful. The moth species in the park are relatively understudied, so projects involving these species could involve investigations into their population sizes and distribution through the park.

**HM205 Comparison of community structure and abundance of moths on the Honduran Cloud forest floor compared to the canopy (Weeks 2 – 8; need to have completed HM001)**

Many species have specific ecological niches which extend to the height above to ground at which to reside. The majority of the biomass and biodiversity in rain- and cloud-forests is in the canopy which can be >30m above the ground level. Moths are one of the most diverse taxonomic groups but often poorly described. Using plastic heath traps and actinic bulbs running from portable batteries, we plan to position one on the forest floor and another directly above in the canopy using a catapault and rope rigging system. The height of the second trap above the ground will be estimated using a clinometer and simple trigonometry. Each trap will be run for one night before the captures will be processed. Morphospecies will be described and listed and specimens will be taken as a reference collection. The system will be deployed at multiple camps. Specimens will be used for DNA Barcoding provided by the University of Guelph, Canada to enable new species to science to be identified. However, the main focus of the project will be to compare the paired traps to determine the dissimilarity in moth community structure and abundance between the forest floor and canopy. We hypothesize that there will be remarkably little overlap and that the majority of new species will be found in the canopy.

**HM206 Metacommunity dynamics of aquatic invertebrates in bromeliads (Weeks 2 – 8; need to have completed HM001)**

This project is a step up from the classic biodiversity surveys and aims at gaining insight in some deep ecological mechanisms driving diversity patterns. Building on a detailed study of the aquatic invertebrates in bromeliads in the last seven years, a series of experimental set ups will be used to look into metacommunity dynamics and how dispersal affects alpha, beta and gamma diversity. Surveys in bromeliads resulted in over 50 species of aquatic invertebrates recorded. Most are larval stages of insects, so invertebrates with an active dispersal. Additionally, and quite surprisingly, also several passive dispersers are regularly found in bromeliads in Casasco National Park (CNP). CNP has the highest recorded diversity of passive dispersers in bromeliads so far. Passive dispersers need vectors to move between bromeliads and the presence of two dispersal strategies are an added value to how dispersal strategies affect community assembly and diversity patterns. The passive dispersers found in bromeliads include two species of Ostracoda (Ephippum meridionales and a Ceridona sp.) and two species of Anomopoda (Geisaldfenius laticaudata and Abona bromeleia). In this project the student will use small plastic cups strategically placed in the forest as artificial bromeliads to experimentally test hypotheses concerning metacommunity characteristics such as for instance metacommunity size (number of bromeliads), patch size (bromeliad size) and interpatch distance (distance between bromeliads) on the alfalfa, beta and gamma diversity. The small and well delineated communities are easy to sample, provide a large flexibility in terms of set up and allow for a large number of replicates with relatively small effort.

**HM207 How do dragonfly communities change over an elevation gradient? (Weeks 2 – 8; need to have completed HM001)**

Protected as a national park for the freshwater resource used as drinking water, CNP is home to a high diversity of aquatic invertebrates. A particularly charismatic and prominently visible part are the dragonflies. Preliminary surveys indicate the presence of at least 40 species, but little is known on the ecology of these species. This project aims at performing the first community assembly study of dragonfly communities in CNP. The student will look into distributional patterns of individual species and how dragonfly communities change with river types and on an elevation gradient. Particular attention will be devoted to how the dispersal capacity of the individual species affects the distribution patterns. Expected is that damselflies with limited flight abilities have a smaller distribution in comparison with the more mobile dragonflies. Also within each group, size differences within species are expected to affect mobility and distribution patterns.

**RT208 Butterflies as indicators of grassland management (Weeks 3 – 8)**

The grasslands in the study area are used for livestock grazing and hay production. Changes to farming practices include hay cutting by hand scythe being replaced by mechanised mowing, changing frequency of cutting, and changing numbers of livestock and hence stocking intensity. Butterflies have been found to be good indicators of various environmental conditions. This project will investigate the potential of butterfly census data to indicate the impact of changing farming practices on the nature value of Transylvanian grasslands. Butterfly surveys will be undertaken in a variety of grassland types, experiencing a range of grassland management practices, to assess the abundance and species composition. Vegetation surveys will provide evidence of the type of management.
HERPETOLOGY RESEARCH TOPICS

IL210 Influence of habitat structure on herpetofaunal assemblage composition in Sulawesi, Indonesia (Weeks 2 – 8; need to have completed IL001)
The general aim of this project will be to examine relationships between forest habitat structure and herpetofauna assemblage composition. As part of the above overall research and monitoring project, you will assist the herpetology teams in the collection of herpetofauna data at approximately 60 sampling sites stratified into areas with differing levels of forest disturbance at various research camps on Buton Island. The surveys at each site will be completed using five buckets buried in the ground with a fence running over and connecting each bucket. These pitfalls traps will be checked daily. Time constrained diurnal and nocturnal censuses will also be undertaken at each site to complement the trapping programme. These data could be supplemented by taking habitat structural measurements at each site, using standard measurements previously developed and the spatial patterns of assemblage composition and individual species with respect to habitat characteristics determined. This project could focus upon the overall herpetofauna community or specific guilds, such as snakes or litter-dwelling species.

IH211 Physiological adaptations of the unique salt-water frog (Weeks 1 – 8)
The crab-eating frog, Fejervaracancrivora, is the only truly marine amphibian on the planet. The Hoga Island crab-eating frog population is unique in that they only have access to freshwater during the rainy season. Currently, it is unclear how their ecology differs from crab-eating frog populations that have freshwater access throughout the year. It is known that the frogs retain urea in their blood thereby enabling them to tolerate sea water by eliminating the osmotic gap between sea water and body fluids. It is unclear, however, what if any mitigating osmolytes are used to buffer urea’s toxic effects. Projected studies include: examination of the frog’s thermal ecology; quantifying metabolic costs associated with living in fresh and saltwater; water balance physiology and molecular osmolyte determination. These studies will add to understanding the physiology of a novel species. Regardless of the results obtained data will be unique and inform science of how this species has adapted to life in the extremes.

HM212 Abundance and distribution of threatened amphibian populations in the Cusuco cloud forest, Honduras (Weeks 2 – 8; Training – need to have completed HM001)
The amphibians of Cusuco National Park, Honduras are threatened by rapid, recent expansion of coffee farms and pastures for cattle ranching within the buffer zone as well as alarming encroachment into the core zone of the park. Efforts are being made to halt the illegal encroachment of farms into the core zone but this will take time and political will. If the amphibian populations continue to decline then decisions must be made regarding the value of ex-situ conservation of key species for subsequent release once the threats to the population have been resolved. However, in order to make such decisions, it is imperative that we have reliable estimates of amphibian population dynamics. Thus, data are urgently required on the population sizes and distributions of each of the cloud forest amphibian species and the catchments in which each occur. Data collection for this project involves trekking along sample routes through the forest (to monitor terrestrial species) and river based surveys (to monitor stream-dwelling species), recording all encounters with amphibians, noting the species, number of individuals, GPS location, length and weight of the individual, and taking numerous photographs of each individual as a non-invasive method of capture-mark-recapture monitoring. These data may then be used to calculate reliable estimates of species abundance and may also be added to existing GIS maps of the park to investigate species distribution patterns.

HM213 Prevalence of Chytrid in amphibian populations within the Cusuco National Park, Honduras (Weeks 2 – 8; need to have completed HM001)
The single most important reason for the need for effective conservation of the Cusuco National Park is the importance of this cloud forest for amphibians. The spread of chytrid fungus has caused severe declines in many amphibian populations and is a major concern for global amphibian conservation. Chytrid is known to have been present within the amphibian populations of Cusuco for at least 15 years, but its prevalence within specific areas of the forest and the extent to which different species are affected are not well known. Amphibian species will be encountered during diurnal and nocturnal transects and swabbed for chytrid. Swabs will be taken back to the lab at base camp and tested for the presence of chytrid using polymerase chain reaction (PCR) and visualised using agarose gel electrophoresis. Individuals will also be assessed for visual signs of infection. Prevalence of chytrid will be mapped in the park using multiple years data to assess whether the disease is continuing to spread to previously unaffected areas.

HM214 Trophic ecology of (palm vipers) snakes in Honduran cloud forest (Weeks 2 – 8; need to have completed HM001)
Cusuco National Park is home to a large diversity of snake species. Their distribution is often patchy and little is known about the features influencing their ecology. Indeed, the
pp15 The role of floating vegetation mats in the Pacaya-Samiria Reserve, Peru in providing breeding habitat for amphibians (Weeks 2 – 8; need to have completed PP001)
The Pacaya-Samiria Reserve contains a large diversity of amphibians and some of the tree frog species (e.g. Hyphophis punctatus, Dendropsophus triangulum, Scinax garbei and Sphaenorhynchus lacteus and others) are specialised on using the floating vegetation along the edge of the river, cut off channels and oxbow lakes for breeding. One project could examine the effectiveness of different techniques for surveying the communities on this floating vegetation. The current survey technique consists of driving a boat into the vegetation along transects. Research projects could investigate differences in herpetofaunal species distribution and niche partitioning in Calakmul Biosphere Reserve, Mexico (Weeks 2 – 8; need to have completed YC001)
The herpetofauna of the Mayan jungle is one of the richest assemblages in the Americas, primarily because of considerable variation in habitat within these forests. Despite this, the herpetofauna of the Calakmul Biosphere Reserve is poorly studied. There is a notable rainfall gradient from the north to the south of the reserve, which significantly affects tree diversity and forest structure. On a smaller scale, proximity to temporary lakes known as aguadas also affects habitat composition. This variation in habitat is likely to affect the abundance of distribution of herpetofauna within Calakmul. Herpetofauna surveys will be conducted at 5 different research locations within the reserve that have notable differences in habitat type. Students will also assist with habitat surveys in which tree diversity, DBH, canopy height and sapling density are recorded in a selection of 20m x 20m forest plots at each survey location. Rainfall data can also be collected at each site. Within each location, herpetofauna will be surveyed using pitfall traps and diurnal and nocturnal active searching along transects. Research projects could investigate differences in herpetofaunal species.
assemblages between different sites and in relation to distance from aguadas. These projects could incorporate a wide range of species or could focus on specific groups (e.g., anurans, lizards, snakes). A more specific project could focus on niche partitioning in Anolis lizards. The Anolis species assemblage in Calakmul is extremely diverse for continental lizard species assemblages and no less than 6 species are co-distributed in the reserve. This topic could examine the habitat usage and potentially feeding ecology of the co-distributed species to identify how they separate their niches.

**YA218 Sea turtle behaviour and nesting site preferences in Mexico (Weeks 2 – 9)**

There are seven species of sea turtle in the world, all of which are either threatened or endangered. The beaches of Akumal (meaning “home of the turtles”) are nesting ground for two of these species: the loggerhead turtle (*Caretta caretta*) and the green turtle (*Chelonia mydas*). Year-round you can find juvenile green turtles feeding on the sea grasses in Akumal Bay and hawksbill turtles (*Eretmochelys imbricata*) can be found around the reefs. One of the major aims of the ongoing turtle conservation project is to ensure that the turtles have access to suitable nesting sites on the beaches. In order to do so, it is necessary to understand the nesting site preferences of the green and loggerhead turtles and to ascertain the nest characteristics associated with successful incubation. Investigation of turtle nesting will record the number and location of green and loggerhead turtle nests, noting their distance from the shore, habitat characteristics, their size, temperature inside the nest, number of eggs laid and number of successful hatchlings. The juvenile green turtles in Akumal Bay have become a popular tourist attraction but it is not clear if the presence of tourists is affecting their behaviour. There is also some evidence to suggest that the turtle are over grazing the sea grasses. Research into green turtle behaviour will involve snorkelling with the turtles throughout the day to record their activity budgets and foraging patterns. The daily habitat usage patterns of each individual. All data collected will be used to create a monitoring system for future studies whereby the species composition at each water body can be monitored.

**MN220 Ecology of amphibians in Mahamavo (Weeks 1 – 6)**

Amphibians play a vital role in the ecosystems where they are found. Nine species of amphibians are currently known from Mahamavo, some of which occur in relatively high abundances, even during the long dry season. Data for this project will be obtained by surveying rice paddies, ephemeral and permanent ponds and lakes, recording all encounters, noting the species, the number of individuals and the specific details of the immediate habitat where the animals are found. All data collected will be used to create a monitoring system for individual animals.

**MN221 Thermal ecology and UV-B requirements of chameleons, skinks and geckos (Weeks 1 – 6)***

Ultraviolet light (UVB) is an essential requirement for vitamin D synthesis in the skin of lizards, allowing the uptake of dietary calcium which is necessary for proper bone growth and neurological function. There are also thermal demands upon these animals in order for successful Vitamin D production. This project aims to investigate i) the thermal and UVB preferences of some of the lizard species at Mahamavo and ii) how these species utilise their habitat to optimise their exposure to the sun, and hence UVB irradiation, while thermoregulating. Data will be collected by surveying routes for lizard species during daylight hours. Once found, UVB intensity, measured using a solarmeter, temperature and other habitat characteristics will be collected along with morphometric measurements of the individual animals.

**MN222 Colour and colour change in the chameleons, Uroplatus geckos or Phelsuma geckos of Mahamavo (Weeks 1 – 6)**

This topic focuses on quantifying the colours and colour change abilities of the Oustalet’s chameleon and Angel’s chameleon in the Mahamavo western dry forests. Oustalet’s chameleon is one of the largest known chameleon, Angel’s chameleon is restricted to the dry western forests of Madagascar. Colour and colour change of chameleons is well known worldwide and is yet surprisingly poorly studied. Chameleons can be brightly coloured and still be very cryptic. They often exhibit rapid colour change but it is almost exclusively used for communicating social status to nearby males and females and not for background matching. They often show tremendous geographical variation in colour both within and between populations and genders as well. Recent work has established the kinds of pigment
cells and their arrangement in the skin of several colour morphs of the Panther chameleon found in different localities in northern Madagascar. There are at least five classes of pigment cells that have a stereotypical arrangement in the skin. The same general array of pigment cells can be used to generate a wide range of colours ranging from blue, green, yellow, orange or red. Organelles within cells are apparently rearranged in a very specific way to accomplish colour change and only certain changes seem possible. Very little is known about the colours and colour variation of natural populations of chameleons in spite of a large captive breeding program for the different colour morphs of Panther chameleons in the USA. A field spectrometer applied to the skin, photographs and video will be used to quantify colour and colour change by measuring the wavelengths of light that are actually reflected from the skin. There are a wide variety of different topics relating to chameleon colour that can be addressed at Mahamavo. One is to use data from colour and colour change from both species to test a model that has been proposed for colour change based on the arrangement and reorganization of pigment cells in the skin of Panther chameleons. A second topic is to assess the range of variability in colouration both within males and females in natural populations to compare colour heterogeneity between the two species of chameleons. A third would be to assess the ability of both adult males and adult females to undergo rapid colour change. A fourth would be to study how colours are used in intraspecific interactions in these two species. Males tend to display to other males/females under rapid colour change. A fifth topic would be to study how colours are used in interspecific interactions in these two species. Males tend to display to other males/females and gravid females tend to display to males. A fifth topic would be to compare the reflectances from the chameleons to the reflectances of elements of their surroundings, both physical and biotic, other aspects of the patterns on the lizards and even behaviours to examine the concept of crypticity of chameleons in their natural environment.

**MN223 Population ecology of Nile crocodiles in Madagascar (Weeks 1 – 6)**

In Madagascar, Nile crocodiles *Crocodylus niloticus* have a stronghold in isolated areas of the west coast including the Mahamavo wetlands. However crocodiles are threatened by egg collection for crocodile farms and by local people killing large crocodiles perceived to be a threat. For these reasons, crocodiles are currently listed on CITES Appendix II in Madagascar and international trade in crocodile products from Madagascar is banned. Since there is very limited information about the crocodile population in Mahamavo, it would be very valuable to make a robust baseline estimate of population size and to begin a monitoring programme. Students selecting this project will be able to use a speedboat to undertake surveys in the wetlands by day and at night using distance sampling and taking photographs of basking crocodiles. The photos can be used to uniquely identify crocodiles by the scale patterns on the left and right sides of the base of the tail. This permits ‘capture’-‘mark’-‘recapture’ analysis of the crocodile population without the danger associated with handling these animals. It would be possible to compare population size estimates derived from distance sampling and the detection histories of the ‘marked’ animals. Additionally it will be possible to explore ranging behaviour, territoriality and estimate densities.

**MN224 Population ecology of colubrid snakes or chameleons in Madagascar (Weeks 1 – 6)**

Three of the species of colubrid snake in Mahamavo, *Mimophis mahafalensis*, *Leioheterodon madagascariensis*, and *Madagascarophis colubrinus*, are abundant and can be safely handled and uniquely marked by clipping ventral scales. There are also two very abundant chameleon species, *Furcifer outaele* and *F. angeli* which can be uniquely marked with UV paint. This system would allow a student to go out with the herpetology team to walk routes on lots of occasions and capture snakes or chameleons, record the locations with a GPS and note individual identification numbers. This would allow estimates to be made of population sizes and densities using mark-recapture analysis. The data could also be used to map home ranges for each individual using minimum convex polygons or kernels and hence test whether these species are territorial.

**MN225 Microhabitats and niche partitioning in chameleons, skinks, geckos or snakes in Madagascar (Weeks 1 – 6)**

The dry forests in Mahamavo support a very diverse reptile assemblage which shares the same habitat. Competitive exclusion theory suggests that sympatric species must partition their niches for them to persist and the reptiles in this forest provide a great system to investigate how this occurs. In Mahamavo there are two abundant chameleon species, *Furcifer outaele* and *Furcifer angeli*. It is thought that Oustalet’s chameleon prefers more degraded forest to Angel’s chameleon but additionally these species may be selecting different microhabitat niches, in terms of height above the ground selected for feeding, branch thickness, ambient temperatures or structural complexity of vegetation. A similar situation exists with a pair of closely related skink species *Trachylepis elegans* and *T. gravenhorstii* which are both very abundant in the forest. It appears that *T. elegans* is more abundant in drier habitats than *T. gravenhorstii*, but the picture is probably more complicated at the microhabitat scale. There are also three species of leaf-tailed Uroplatus geckos: *U. ebbenii*, *U. benelli* and *U. guntheri* which share the same cryptic adaptations and feeding strategies yet differ markedly in size. With field data collected from a large number of individuals, it would be possible to compare niches and identify factors which separate species’ niches using principal component analysis, linear discriminant models or regression trees.
BIRD RESEARCH TOPICS

IN230 Comparison of the effectiveness of different methods for surveying the birds of the Lambusango Forest (Weeks 2 - 8; need to have completed IL001)

Birds are one of the most widely-studied taxonomical groups in the tropics and over the last 40 years a wide range of different methodologies have been developed to survey bird communities in a variety of habitats. However, although birds are generally well-known compared to other taxa, large research gaps still remain, and avian communities in some parts of the world remain virtually unexplored. This is especially true of bird communities in isolated island forest habitats, such as those found throughout Wallacea. The first step to understanding and researching these poorly-known bird communities is to develop methods to survey and record them effectively. However, there has been a tendency in the past for researchers to simply apply methods that have been tried and tested in well-studied regions to all other tropical forest habitats, with the assumption that these methods will be equally effective everywhere. This is problematic, however, as forest habitats spatially vary greatly and support extremely different bird communities, thus different methods may not be equally effective everywhere. This project aims to examine how effective two of the most commonly utilized methods – point counts and mist-nets – are in surveying birds in the Lambusango Forest Reserve. Point counting involves surveying all birds seen and heard while conducting a series of timed counts at a set of pre-determined plots, and mist-netting involves catching birds in fine-mesh nets and recording species detected and capture-release abundance data. Both are subject to well-known limitations, but are generally considered to be effective techniques in most forest types. However, the unusual composition of the bird community in the Lambusango (low species richness and abundance, high ratio of canopy-level frugivores, highly-distinctive vocalizations etc) may mean that these methods may have differential levels of effectiveness compared to those reported in other studies. Students taking this project will conduct both mist-netting and point counts at the same study sites in various parts of the Lambusango, compare how effective each are in describing the richness and abundance of the Forest’s known bird species (around 80 species), as well as for birds in different body-size groups, feeding guilds and habitat strata affinities. Students will then compare these results with secondary sources to determine and explain how and why these methodological approaches differ from those reported in more well-known parts of the tropics. Students will ultimately be able to produce a recommendation as to which methods should be used for surveying the birds of the Lambusango Forest in the future.

IN231 Conservation value of different habitat types for bird species in the Lambusango Forest Reserve (Weeks 2 - 8; need to have completed IL001)

The Lambusango Forest supports around 80 species of birds, ranging from large hornbills to tiny sunbirds. Around 50% of these birds are unique to the Wallacean region – one of the highest rates of endemism in the world. However, as with elsewhere in the tropics the forest habitats of Wallacea are being degraded and destroyed at an unprecedented rate, very little research has been conducted examining how well the regions avifauna – particularly its endemic species – can adapt to rapidly changing habitat types. Students completing this project will conduct a large number of point count surveys across a range of pre-determined study sites located across the Lambusango Forest Reserve. These will encompass a range of forest types, from near-primary forest in the reserve’s interior to well-vegetated and recently disturbed forest habitats near the forest boundary. Students will examine how total avian richness and abundance – along with endemic richness and abundance as an important sub-set – varies along this disturbance gradient. Variations in other avian sub-groups such as feeding guilds and body-size categories can also be assessed. By analyzing the extensive datasets produced by this survey work students will be able to assess the conservation value of the different forest habitats found in the Lambusango Forest Reserve. Findings can then be compared to results reported from similar studies in continental South-East Asia and other parts of the tropics, and any important differential results discussed with relation to the unusual bird community assemblages and biogeography of the Wallacea region.

HM232 Factors affecting bird communities in cloud forest, Honduras (Weeks 2 - 8; need to have completed HM001))

Birds are excellent indicators of forest ecosystem health as their abundance and diversity is closely related to habitat disturbance. This topic takes advantage of the existing, fixed-method point count survey work being undertaken for birds at over 150 survey sites across Cusuco National Park, as well as the recently started mark-recapture mist-netting survey data. Aspects of these data sets can then be analyzed to study a whole range of impacts on bird communities. For example, presence-absence data for each species can be used to investigate the main environmental variables affecting species distribution patterns. Species distribution maps can then be collared to bird species richness maps of the park to identify diversity hotspots or to make comparisons of species richness between the different study sites. Examples of such projects could include: An intensive study of the bird communities in the varied agro-ecosystems or other human-modified habitats, taking into consideration the spatial and time scale of disturbance, a comparison between bird communities between the different administrative divisions in the park (e.g. between park buffer/core zone) or a comparison of the bird community composition in different habitats identified by vegetation type, (e.g. pine dominated vs. broadleaf forest). The mist netting protocols have been...
re-established to understand different aspects of bird biology and ecology in the park. Another study could involve the recent bird banding monitoring, focusing on the most captured and potential indicator species this season which will be a starting point to study how the species condition is being affected by its habitat.

HM233 Assessing detectability of under-represented species in Cusuco National Park (Weeks 2 – 8; need to have completed HM001)

Traditional biodiversity monitoring techniques used in Cusuco, such as point counts and mist netting have biases that have the potential to result in some species being under recorded. A good example being species that vocalise rarely, for example, several members of the Furnariidae family. Something that could be investigated in Cusuco is the potential for audio playback to assist in the detection of these species, you could examine the detectability of these species using audio playback compared with traditional point count methodology. There has never been an in depth study of the nocturnal birds of the park and as a result very little is known about their densities, distributions or ecology. As in depth nocturnal survey would use audio callback of various nocturnal species that have either been recorded or could potentially be present to attempt to gain an understanding of how these species are distributed throughout the park. The study of these species is extremely important since, they could be good indicators of the state of the environment because of their particular habitat requirements.

SW234 The effects of habitat, elephant damage and fire management on winter bird communities in Welgevonden, South Africa (Weeks 3 – 8)

Each summer and winter for four years prior to the 2014 season, 40 sites across Welgevonden Game Reserve have been surveyed for bird diversity through point counts. At each of these sites detailed habitat assessment are also conducted each winter to assess spatial heterogeneity, dominant tree and shrub species, levels of elephant impact, and evidence of fire damage. Students on this project will also have access to habitat and vegetation maps for the reserve as well as high resolution aerial photography and extensive spatial data highlighting the areas of all management and natural burns over the last three years. All of this data can be used to assess the key factors affecting bird guild diversity across the reserve. Additionally satellite data for the region and derived environmental data could then be used to determine ranges of the commoner species and estimate population sizes. Students working at Welgevonden will spend half of their time in the field while the other half will be spent in camp doing data entry, completing a lecture course on African Conservation and independent work on dissertations. Note for the first few days after arrival in Welgevonden the incoming students need to complete a working on foot in game reserves safety course.

PP235 Assessing changes in bird communities in the Pacaya-Samiria Reserve, Peru (Weeks 2 – 8; need to have completed PP001)

In 2014 replicate bird point counts are being completed by an experienced ornithologist at a series of sites in riverine forest, levee, open understory forest and liana forest to provide data on the community structure in each habitat. Mist nets are also being used in some of these same habitats so the data sets can be used to compare the techniques and one dissertation could compare the bird communities in these different habitats. In addition transects along the river edge are being completed by an experienced ornithologist to record all river associated birds (herons, egrets, cormorants, screamers, waders, ducks, kingfishers, raptores and waders). The river based surveys will be repeated over the 8 week season as water levels fall so one project could examine how this affects the river associated bird communities. Note as river levels fall the research boat will be moved to the mouth of the Samiria river where huge concentrations of egrets and cormorants occur to feed on the migrating juvenile fish who are coming off the huge flooded forest areas as the water levels drop and are funnelling through the mouth of the Samiria river into the Maranon river. There are data sets from previous years on the water bird abundances and one project could examine the total weight of fish being consumed by this enormous concentration of birds and also look at how numbers of fish feeding birds have changed in relation to changes in extreme flooding and low water events. River based early morning and late afternoon point counts of macaws will also be completed and these data can be compared with data from similar counts in previous years to assess changes in these species.

MN236 Niche separation and the impacts of disturbance on avian communities in dry forest, Madagascar (Weeks 1 – 6)

Birds are often used as indicator species for overall ecosystem condition, with species from different ecological niches being impacted to varying degrees by habitat disturbance. The avifauna of the Mahamavo forests contains a number of restricted range species, and other species being restricted to particular habitats. Students choosing this subject will undertake timed species counts and mist net surveys to make comparisons between avian communities in different habitat types and between differing levels of human habitat disturbance. Species distribution models using the spatial records for a given species can then be constructed and the percentage of the variability that can be explained by various environmental covariates (e.g., elevation, climate, land cover) determined in order to construct and validate a statistical model of the probability that a given species will be found in a particular landscape unit. These models can then be expressed as a habitat suitability map and the overlap between these species used to determine the level of niche separation. These dissertation subjects will contribute to our understanding of the avian communities of Mahamavo, and in particular to determining the habitat preferences and relative impacts of habitat disturbance on the bird species from different ecological niches and of different levels of conservation priority.
MAMMAL ECOLOGY RESEARCH TOPICS

II.241 Factors affecting bat assemblage composition in lowland forests of Indonesia (Weeks 2 – 8; need to have completed IL001)
The bat research programme has been capturing bats around Labundo village and at three forest sites since 2000, with most efforts concentrated in the Kakenauwe Reserve. Forest interior bat species are adapted to life in dense vegetation and are therefore expected to be especially vulnerable to the effects of logging, rattan extraction and other types of forest disturbance. Therefore, bat projects will look at the effects of disturbance on bat communities across a disturbance gradient via a combination of trapping (harp traps) and acoustic sampling (static and hand held bat detectors). Sampling methods will be used to determine whether there is a relationship between bat activity levels, community composition and forest disturbance.

II.242 Ecology of the top mammalian predator in the forests of Sulawesi, Indonesia (Weeks 2 – 8; need to have completed IL001)
The Malay civet is the principal (possibly the only) mammalian carnivore in the Lambusango Forest. Very little is known about the population dynamics of civets or indeed any other rainforest carnivore. This project provides an excellent study system to investigate population processes in this ecologically important group. The project builds on a 7-year data set working on a marked population of civets occupying a 4 km2 area of forest. So far more than 110 civets have been tagged, and the project is beginning to build up a unique picture of civet ecology. Dissertation projects can add to this long-term study by repeating annual surveys which involves a 7 – 8 week capture-mark-recapture (CMR) study to estimate population density and to identify which animals are still remaining in the population from previous surveys. Projects could focus on comparing observed population metrics (e.g. density, age structure, average body mass) of Malay civets in the Lambusango forests with those published in studies from elsewhere in their range under different ecological conditions, or even with other similar-sized mammalian carnivores living in contrasting habitats. Project students can also examine elements of civet survival (e.g. what attributes of a civet make it more likely to be found in the population in the following year?) using data from the previous survey season (data includes physical attributes such as age, sex, and sex and behavioral attributes such as the number of times it was captured within a season). This project provides experience in how to carry out a CMR study for a small carnivore and how to estimate population density from CMR data using CMR models (e.g. CAPTURE, Jolly-Seber). These are standard tools in wildlife ecology and a must for any budding wildlife biologist.

IN243 Density and distribution of Sulawesi mega fauna, Indonesia (Weeks 2 – 8; need to have completed IL001)
Four of the largest and most charismatic vertebrates that are present in the forests of Buton are endemic species of conservation concern: the anoa, a highly endangered dwarf buffalo, Sulawesi wild pig, an endemic pig species that can be a crop pest, the Buton macaque, a poorly studied endemic primate and the knobbed hornbill which is often captured for the pet trade. A survey team will assess the abundance of anoa, macaques and hornbills on 3km transect lines at the forest node camps. Various projects could be completed as part of this topic. Anoa and pig distribution could be assessed using patch occupancy analysis and hornbills and macaques through distance sampling. Forest structure could be assessed through standardized sampling at points along the transects and the distribution of the target species related to forest structure and levels of human activity.

HM244 Habitat associations and trophic partitioning within cloud forest small mammals, Honduras (Weeks 2 – 8; need to have completed HM001)
Small mammals demonstrate a variety of feeding guilds from granivores and frugivores consuming seeds, nuts and fruit (many mice and rats) to obligate insectivores (shrews). A total of 19 small mammal species have been recorded in Cusuco National Park comprising a complex community. How these species share the forest and the individual specialism of each species remains largely unknown. Transects consisting of paired cage traps will be placed on the forest floor (terrestrial environment) and also along river corridors (riparian environment). Each pair will be alternately baited with small mammal mix (peanut butter, oats and syrup) to attract granivores or tuna to attract insectivores. Two sizes of trap will be used: one capable of being triggered by small species (shrews and mice <50g) and another capable of being triggered by larger species (mice and rats >50g). Differential trapping success in the different habitats will describe species-habitat associations whilst tissue samples (1cm of tail) will be used for Stable Isotope Analysis (SIA). The ratios of Nitrogen (15N) and Carbon (13C) will be used to determine the trophic position at which small mammals have been feeding and geographic origin of their food items (aquatic or terrestrial). Thus, differences between-species and within-species (for example, differences in the feeding strategies of the sexes) will be elucidated. A tutorial will be held during which students will be responsible for processing tissues samples in preparation of stable isotope analysis. Samples will be oven dried, ground to a powder and carefully weighed into small
HM245 The use of camera trapping arrays in inventorying large mammal species and the deployment of the Random Encounter Model (REM) for estimating their abundances (Weeks 2 – 8; need to have completed HM001)

A total of 23 large mammal species have been recorded in Cusuco National Park using indirect survey techniques including field signs such as footprints (spoor) or droppings (dung). These include the endangered Baird’s tapir, near threatened mangay cat as well as other large cats including the puma, jaguarondi and ocelot as well as their prey such as pecaries and deer. As useful as traditional survey techniques have been, we aim to deploy a camera trapping array throughout the park. One camera trap will be deployed on each transect of which there are four at each of seven camps (28 camera traps in total). These will be deployed for 3 nights before being moved to a second position on each transect; totaling 2 per transect (i.e. 56 trapping locations and 168 trap nights). Due to human disturbance and levels of hunting, some large mammals are wary of humans and may avoid our network of established transects. Thus, points will be selected on traditional transects for ease of travel but camera will actually be deployed at least 200m perpendicular to our transects mounted on traps in open areas or along river banks. Occurrence data will be gathered for all species caught on video footage. Species Distribution Models using MAXENT will be constructed for common species to extrapolate their likely distribution throughout the rest of the park. For key target species, the Random Encounter Model (REM) will be employed to estimate probable abundance. Thus assumes that traps are located randomly with respect to the target animal population and that the speed of movement of the target species can be estimated (either derived from the length of time it takes for the animal to traverse the cameras detection field or from published radiotelemetry data). A simply formula describing Brownian motion can then be used to estimate species abundance within the park. In addition, a frequency distribution of records over the 24 hour period can be used to examine species activity patterns whilst co-occurrence in space and levels of hunting, some large mammals are wary of humans and may avoid our network of established transects. Thus, points will be selected on traditional transects for ease of travel but camera will actually be deployed at least 200m perpendicular to our transects mounted on traps in open areas or along river banks. Occurrence data will be gathered for all species caught on video footage. Species Distribution Models using MAXENT will be constructed for common species to extrapolate their likely distribution throughout the rest of the park. For key target species, the Random Encounter Model (REM) will be employed to estimate probable abundance. Thus assumes that traps are located randomly with respect to the target animal population and that the speed of movement of the target species can be estimated (either derived from the length of time it takes for the animal to traverse the cameras detection field or from published radiotelemetry data). A simply formula describing Brownian motion can then be used to estimate species abundance within the park. In addition, a frequency distribution of records over the 24 hour period can be used to examine species activity patterns whilst co-occurrence in space can be used to examine likely species-species associations or avoidance behaviour.

HM246 Ecology and behaviour of bats in tropical cloud forests, Honduras (Weeks 2 – 8; need to have completed HM001)

Cusuco National Park is an incredibly complex landscape with huge variation in elevation, temperature and rainfall resulting in a wide range of habitats. Bats at Cusuco National Park have been monitored between June and August each year since 2006 using mist net surveys. Over 50 species of bats have been captured at Cusuco including insectivores, nectarivores, frugivores, carnivores and sanguivores. In addition to abiotic data like lunar phase, precipitation and temperature, habitat measurements are also available. Some potential ecology projects include examining the effects of abiotic variables, prey abundance and/or habitat type on bat abundance or demography. Studies could also examine how ecological variables contribute to annual variation in bat abundance or diversity using Opwall’s historical data. The abundance and diversity of bats in Cusuco permits comparisons within or across species or guilds. In addition to mist netting, acoustic surveys using ultrasonic recording equipment are now being implemented that permit projects on vocal behaviour such as examining echolocation or social vocalizations in individual species, developing species identification using echolocation signals, or comparing mist net and acoustic survey data for species presence and abundance.

HM247 Variation in microchiropteran bat activity in response to spatial and temporal variation in insect activity (Weeks 2 – 8; need to have completed HM001)

Most microchiropteran bat species are insectivorous although some prey on flying insects (e.g. mosquitoes) and others glean arboreal invertebrates from leaves (e.g. spiders). Invertebrate activity can vary markedly over relatively short distances (e.g. in proximity to water), over large distances (in response to altitude) and over time (i.e. at the same site but on different nights of different temperature). Bat activity will be recorded using a combination of bat detectors to record ultrasonic bat activity (numbers of bat passes) and mist netting (to capture individuals to determine body condition). Fly traps (strips of sticky fly paper) will be erected at each site being surveyed for the duration of the night and the number of flying insects caught enumerated to a high taxonomic level (e.g. family). Sweep netting could also be conducted to enumerate foliage dwelling invertebrates such as spiders. Nightly temperatures will be recorded and bat activity will be correlated with invertebrate activity in response to temperature (which is also elevation dependent).

SP248 The use of behavioural studies to assist with management decisions for a large elephant population in a small private game reserve, South Africa (Start date 28 June 2014)

Between 1979 and 2001 over 800 elephants were reintroduced to over 58 reserves in South Africa, Pongola Game Reserve being one of them. The elephant carrying capacity for Pongola has been estimated at 37 animals but the numbers are at over 75 individuals. In 2008, the Disney Corporation provided funding for vasectomies of the bull elephants in an attempt to cap the population. Unfortunately, one of the males was deemed too old for a vasectomy so it was decided to give this male GnRH in an attempt to suppress musth and
behind the recent boom in land conversion from farmland to conservation in the region, it eco-tourist visitors to reserves, particularly if reserves want to maintain sufficient numbers of these species. Consequently, it is difficult to support the population densities demanded by the elephants to an alternative site. However, removing part of an existing elephant population can cause disruption to herd dynamics and result in problematic elephants, particularly if there are not enough older individuals remaining in the herd to regulate younger elephant behaviour. If elephants are to be removed from Pongola then it is important to identify which individuals to remove that will result in minimal disruption to herd dynamics and reduce the likelihood of ‘delinquant’ elephants in the remaining herds at Pongola. Data relating to this decision will be twofold: firstly, ranging patterns and association indices of the herds and bull elephants will provide insight into cohesive units that could be removed in their entirety; and rates of habitat exhibited by the elephants and their interactions with other herd members will determine which of the bulls have developed the full suite of social behaviour required for the ‘policing’ of adolescents and maintaining herd cohesion (meaning that they could take control of the population should other bulls be removed). If the more sociable adolescent bulls are starting to show signs of sexual maturity and are likely to start breeding in the near future then plans must be made for their removal or subsequent vasectomies. The third aim of this current research project is therefore to monitor the behaviour of the younger bulls to identify a time-line for this management decision. Data relating to this issue will be produced by investigating rates of adolescent bull behaviour and their interactions with other herd members.

SP249 Calculating the carrying capacity of the Pongola reserve for elephant, South Africa (Start date 28 June 2014) One of the most pressing issue on the Pongola reserve is the size of the elephant population. The adult bulls have all been vasectomised (see SP201) but the bull given GNRH seems to be still being entered into musth is assumed to have fathered the 15+ elephants born since 2010. Therefore, the population is still growing and is already at approximately double the estimated carrying capacity of the reserve. However, how is the carrying capacity for a reserve calculated – it is clearly not based on the maximum numbers of elephants that the land can support before they start losing condition because the elephants continue to thrive at double their estimated carrying capacity. Rather, carrying capacity for elephants relates more to the levels of habitat damage that are acceptable. If that is the definition then what level of habitat damage are acceptable and what density of elephants would result in habitat damage only up to this level? Pongola offers an excellent opportunity to collect quantifiable data on levels of habitat damage relating to density of elephant usage of the area. The position of the elephant herds has been noted virtually daily since 2008 and their usage of the reserve varies from areas with very high levels of elephant week usage to areas with very low levels of elephant week usage. The positional data could be plotted on GIS programmes to calculate areas of differential elephant usage and these areas sampled to quantify levels of damage to shrubs and trees using the standardised Walker scale. Note these data could then be used to help set elephant carrying capacity levels in terms of how many would be sustainable to keep levels of habitat damage below pre-determined levels (e.g. less than 20% of the area must have 40% or more trees and shrubs in the top 5 categories of the Walker damage scale).

SW250 Factors affecting the population size and distribution of large mammals in the Waterberg Biosphere Reserve, South Africa (Start date 28 June 2014) The Waterberg Biosphere area contains nutritionally poor grass species which hold a minimal grazing value for herbivores, which results in relatively low carrying capacities of these species. Consequently, it is difficult to support the population densities demanded by eco-tourist visitors to reserves, particularly if reserves want to maintain sufficient numbers of large carnivores such as lion that prey upon these herbivores. As tourism is a massive driver behind the recent boom in land conversion from farmland to conservation in the region, it is important to understand what factors are affecting the population dynamics and distribution patterns of herbivores so that populations can be effectively managed in the future. Welgevonden contains a wide range of herbivore species including elephant, rhino, zebra, wildebeest, blesbok, kudu, impala and other antelope. The herbivore population is monitored each month using vehicle based surveys throughout the reserve road system and annual helicopter census. Between June and August each year, additional vehicle based surveys are conducted each day along seven 10km long transect lines across the reserve. During this period daily and monthly counts of herbivores are recorded and is used to help set elephant carrying capacity levels in terms of how many would be acceptable to keep levels of habitat damage below pre-determined levels (e.g. less than 20% of the area must have 40% or more trees and shrubs in the top 5 categories of the Walker damage scale).
The pink dolphin (*Inia geoffrensis*) and grey dolphin (*Sotalia fluviatilis*) are endemic to the Amazon Rivers and function as indicator species for the general health of aquatic habitats. Dolphins make an excellent indicator species, because they rapidly move out of polluted or degraded habitats and in turn quickly indicate changes in the condition of aquatic systems. The dolphins are easy to count and observe, since they frequently surface and are large-bodied and very distinctive. The river dolphin population in Pacaya Samiria has been monitored for several years using fixed-width transects along rivers, and lakes and channels using small boats. During these surveys, all dolphin encounters are recorded noting the species, number of individuals, habitat in which the dolphins were seen and the dolphin behaviour. Dissertation topics could examine the health of the aquatic systems in the Peruvian species, number of individuals, habitat in which the dolphins were seen and the dolphin behaviour. Dissertation topics could examine the health of the aquatic systems in the Peruvian Amazon by evaluating population trends of the two species of river dolphin overtime, or could focus on habitat, behaviour and group size differences between the two species.

### PP253 Population trends and habitat preferences of Pink and Grey River Dolphins in the Peruvian Amazon (Weeks 2 – 8; need to have completed PP001)

 Transect count data on the levees (non flooded forest areas) and areas of forest that are flooded during high water periods have been completed in two main areas of the Reserve since 2006. Each time a large mammal (large game birds such as chachalacas, guans and curassows are also counted) is encountered along the transect line, the species and number of individuals, the habitat type, the distance travelled along the transect line, and the perpendicular distance of the mammal from the transect line are recorded. These data are used to calculate population density estimates for each species in habitat type using the DISTANCE software programme. These surveys provide good data on arboreal species and some smaller ground mammals (e.g. agouti) but tend to underestimate the larger species (e.g. jaguars and other cats, tapis, deer etc). A network of 30 camera traps is being run each season to also gather data and the images of all animals captured (assuming a single record for each species is separated by at least 1 hour) can be used to estimate densities by estimating the area in which the camera ‘traps’ animals. Note both these calculations are estimates and error around these estimates has to be considered. Comparing these estimates from the two methods though may indicate much higher densities for the large ground mammals from camera traps and much higher densities of arboreal species from the transect data. However, calculations on previous data sets from this Reserve have found similar density estimates of the smaller ground based species (e.g. agouti). Once the density of one species is known then the density of the other more difficult to estimate species can be calculated from their ratio to other species from say camera traps for ground dwelling mammals and arboreal species from transects. With the density estimates it is then possible, combined with previously available data, to determine safe levels of hunting using models such as Stock Recruitment or Unified Harvest Model and whether existing hunting levels for the various species are sustainable. The historical data from the transects can be used to assess the effects of the extreme flooding events.

### MN255 Occupancy modelling for nocturnal lemurs, carnivores and bush pigs with camera traps in Madagascar (Weeks 1 – 6)

In the Mahamavo dry forest most diurnal and nocturnal lemur species are easily seen by teams walking sample routes by day and at night. However two nocturnal species, the fork-marked lemur *Phaner palliatus* and fat-tailed dwarf lemur *Cheirogaleus medius*, are seldom seen by the field teams. Additionally, the forest is within the range of ay-aye *Daubentonia madagascariensis*, so it could occur in Mahamavo, although it has not yet been detected. Every year there are a small number of sightings of carnivores including the Fossa *Cryptoprocta ferox*, Fat-tailed dwarf lemur *Cheirogaleus medius*, Ring-tailed mongoose *Galidia elegans*, but not enough observations to infer their distributions or population sizes. The dry forests are also home to bush pigs *Potamochoreus larvatus*. For cryptic species such as these, a network of camera traps is the best way to gain reliable data on distributions, densities and trends through time, without needing to trap animals. Students choosing this project would help design the spatial and temporal sampling strategy for the cameras, select ‘best’ sites at the local scale to install them on the ground or in trees, visit the cameras to change SD cards and look at the photos and then undertake analysis of the detection histories of each species recorded by the cameras at each site using occupancy models. This powerful approach allows occupancy of sampling units (camera locations) over the course of the season to be estimated taking account of the detectability of each species.

### MN256 Development of indicators for monitoring bat populations in Madagascar using bat detectors and automatic analysis of sonograms (Weeks 1 – 6)

The dry forests in Mahamavo support a wide range of microchiropteran bats which use echolocation. These species can be monitored by constant effort mist-netting, but this requires a huge amount of sampling effort to be able to reliably detect trends in bat populations. An alternative approach is to walk sample routes and along the edges of the forest and wetlands at dusk with a time-expansion bat detector connected to a digital sound recorder and GPS. The sound recording can then be viewed as a sonogram and automatically compared with recordings of known species to identify how many individuals of each species were present on a sampling occasion and their location. It would also be possible to validate results from sound analysis with capture data from mist nets and contrast the two approaches.
**PRIMATE ECOLOGY AND BEHAVIOUR RESEARCH TOPICS**

**IL.260 Effects of forest disturbance on Buton Macaque behaviour, Indonesia** (Weeks 2 – 8; need to have completed IL001)

The Buton Macaque is endemic to SE Sulawesi. Of all the known macaque species it is one of the least studied with the only published papers on the behavior of this species coming from Operation Wallacea field research. There are three semi-habituated troops of macaques used for behavioral research - one in a forest/farm matrix, one in disturbed forest and one in relatively undisturbed forest. Group sizes of these troops vary from under 20 individuals to over 50 and they live in multi-male, multi-female groups. This variation in group size is particularly interesting and it both impacted upon by forest fragmentation and in turn impacts on home range and foraging behaviour. Macaques are particularly interesting as they are semi-terrestrial, generalised frugivores and extremely adaptable to habitat change. There are a variety of projects that can be conducted on these three troops including investigations into the behavioral responses to disturbance in terms of overall activity budget, or a specific focus on feeding behaviour between the troops. The impact of habitat differences on levels of aggression or the types and frequency of social behaviour could also be investigated. Home range data can also be collected and related to habitat factors. Data could be collected through scan sampling and comparisons made between age and sex classes of monkeys as well as between the troops.

**IL.261 A comparative approach for assessing the population density of the Buton Tarsier, Sulawesi, Indonesia** (Weeks 2 – 8; need to have completed IL001)

Reliable estimates of species density are important for the conservation of all animals. Tarsiers are endemic to SE Asia and most are endangered or data deficient. It’s plausible that species may be going extinct without us even knowing they existed. The Buton tarsier is listed as vulnerable by the IUCN, but without accurate and up to date values these species could be in decline. Population density of the tarsiers living on Buton had never before been calculated. This project will focus on a number of established methods, such as point counts, carrying capacity and the traditional method of triangulation. Tarsiers are nocturnal primates so these studies will be carried out at dawn and dusk when they emit shrill vocalisations. A comparative analysis can be made between not only the methods used but also the densities found across a disturbance gradient.

**DISSEPTION/THESIS TOPICS**

**YC.262 Spider Monkey grouping patterns and sex differences in behaviour** (Weeks 2 – 8; need to have completed YC001)

Spider monkeys are frugivorous primates that live in complex societies characterised by high degree fusion-fusion dynamics whereby members of the same community are rarely all together and spend their time in fluid subgroups that constantly change in size and composition. Subgroup composition (specifically same-sex versus mixed-sex subgroups) can have a notable affect on activity budgets as mixed-sex subgroups generally spend more time socializing and less time feeding than same-sex subgroups. Unlike other primates, spider monkeys rarely engage in social grooming and have a unique suite of friendly behaviour consisting of embraces, kisses and pectoral sniffs. Rates of friendly behaviour and aggression vary considerably between male-male, male-female and female-female dyads and can provide insight into the strength of social bonds. There are also considerable sex differences in the context in which aggression and friendly behaviour arise (e.g. fusion events, or aggression in the context of feeding). As spider monkeys live in the upper canopy of the forest, they are generally difficult to study and documentation of their social interactions is limited to a small number of field sites. The low and partially open canopy of the Calakmul forest means that spider monkeys can be viewed very easily, thus providing an excellent research location. Activity data will be collected using instantaneous scan sampling and all occurrences of aggression and friendly behaviour will be recorded, noting the sex of the individuals involved and the context in which the behaviour occurred. Subgroup composition will be recorded throughout the day.

**PP.263 Niche separation in Tamarins, Howler Monkeys, Squirrel Monkeys and other primates in the Peruvian Amazon** (Weeks 2 – 8; need to have completed PP001)

Multiple primate species can be found in rainforest habitats such as the Peruvian Amazon. In order to combat competition associated with several similar species living in close proximity, each species has evolved to occupy a specific niche within the habitat. These adaptations include differences in dietary requirements (frugivorous, folivorous and insectivorous primates), preference for different habitat types within the forest (e.g. seasonally flooded forest, upland forest and palm swamps) and variation in habitat use within the same forest type (e.g. occupying different heights within the forest canopy or variation in activity budgets). Twelve species of primates have been recorded in the Pacaya Samiria Reserve, but three species (red howler monkeys, saddleback tamarin and common squirrel monkeys) are frequently encountered along the survey transects and are therefore best suited for dissertation projects. Upon locating a troop of one of these target species, the monkeys will...
be followed for as long as possible and behavioural data can be collected using instantaneous scan sampling, recording troop size, position in the canopy, behaviour and food preferences. Fruit samples may also be collected to investigate species preference for colour and hardness.

MN264 Ecology and behaviour of nocturnal lemurs in the dry deciduous forests of northwestern Madagascar (Weeks 1 – 6)

Lemurs are endemic to Madagascar, are a highly diverse taxonomic group (>100 species) and the most threatened group of mammals with about 46% of all species being categorized as either vulnerable, endangered, or critically endangered. Many factors contribute to the prominent conservation crisis on the island. Among the most important factors contributing to this conservation crisis are the constant loss of forest habitats that coincides with an increasing degree of forest fragmentation. In addition, remaining forests are often altered by selective logging or wood extraction. This topic is aimed at helping to understand the ecological plasticity and responses of each lemur species towards these anthropogenic threats since not all lemur species respond equally to forest fragmentation. Extant Malagasy lemurs have very diverse ecological requirements (microhabitats, sleeping sites etc.), activity patterns (nocturnal, diurnal, cathemeral), feeding habits (folivores, frugivores, omnivores), body sizes (40g - 9.5kg) and social grouping patterns, and the interactions between these parameters, local abundance and spatial distribution of lemur populations in fragments is still largely underexplored. A total of six nocturnal lemur species are known from the Mariarano area, (Microcebus murinus, M. ravelobensis, Cheirogaleus medius, Phaner pallescens, Lepilemur edwardsi, Avahi occidentalis). Nocturnal lemurs are generally much less studied than their diurnal cousins but face the same anthropogenic threats. The aim of this study is to explore the ecology, abundance, spatial distribution and behaviour of three different nocturnal lemur genera (Microcebus spp., Lepilemur edwardsi, Avahi occidentalis) in forest fragments. Mouse lemurs (Microcebus spp.) live in a dispersed neighbourhood system with animals forming sleeping groups during day and foraging solitarily at night (Radespiel 2000). Lepilemur and Avahi are pair-living cat-sized lemurs, in which pair partners can be either far (Lepilemur) or close to each other (Avahi) during nighttime. Dissertation topics may be grouped into two major project groups, termed (a) Niche ecology of mouse lemurs (Microcebus spp.), and (b) Ecology and edge-related behaviours of Lepilemur edwardsi and Avahi occidentalis. Data on the spatial distribution of nocturnal lemur species are collected by means of nocturnal survey walks complemented with capture-mark-release sessions in the case of mouse lemurs (Microcebus spp.), since the two sympatric congener species cannot be easily distinguished during nocturnal surveys. Data are simultaneously collected on the used microhabitats (e.g. substrate use, height above ground), group size, and behaviour (e.g. locomotion, feeding, flight response, vocalization) that allow the testing of specific hypotheses. Survey walks can also be combined with the method of focal animal sampling in order to obtain more extended behavioural datasets for particular lemur species. There a wide range of dissertation questions that could be developed from these studies such as niche separation of mouse lemurs or their sleeping site ecology, or on the ecology, acoustic and edge-related behaviours of Lepilemur edwardsi and Avahi occidentalis.

MN265 Feeding ecology, habitat preferences and activity budgets of Coquerel's Sifaka, Madagascar (Weeks 1 – 6)

There are semi-habituated groups of Coquerel's sifaka Propithecus coquereli which can be reliably observed every day close to Mariarano base camp. Local people never persecute this species in Mariarano as it is taboo to harm them, so they can be approached closely and observed for long periods. Although globally endangered due to habitat loss within their small range, the sifakas are the commonest of the diurnal lemurs in Mahamavo. Coquerel's sifakas live in loose extended family groups of 5-10 individuals. They favour large fruiting trees such as Ficus and gallery forest but can be found in a range of habitats including degraded forests and small forest fragments. This species is most active in the morning and late afternoon and exhibit a range of behaviour including feeding on fruits, leaves and flowers, often in a suspensory posture, locomotion by climbing and spectacular leaps and interactions with other individuals. Students studying the behavioural ecology of this species should develop an ethogram and devise a behaviour recording protocol such as using instantaneous scan sampling. It will be possible to construct activity budgets, use selection indices to test for habitat or food preferences.
MARINE ECOLOGY RESEARCH TOPICS

IH270 Sponge ecology and coral reef phase shifts in Indonesia (Weeks 2 - 8; need to have completed IH007 and be dive trained)
The high abundance of sponges on many coral reefs, along with their diverse functional roles mean changes in their distribution and abundance patterns have the potential to affect overall reef ecosystem functioning, particularly through their trophic relationships with other organisms. Of particular importance is the potential for declines in coral and fish to result in the increased abundance of other organisms, and for reef systems to undergo phase shifts in response to such degradation. Although the best described phase shifts are from coral- to algal-dominated systems, there also appears to be the potential for coral-dominated systems to become dominated by other organisms, including sponges. Understanding the causes and consequences of such phase shifts is critically important for coral reef management, as these changes can have profound effects on reef ecosystem function. This project will specifically document the spatial variation in the abundance and diversity (using a morphological surrogate) across sites in the Wakatobi and assess the variation in total sponge abundance, and that of key sponge species across environmental gradients in the Wakatobi. Given the expected declines in coral abundance in response to climate change and ocean acidification effects, there is every possibility that sponge-dominated reefs might become more abundant in the future, and this project will begin to assess how such reefs might function and if they can support similar levels of fish biomass and productivity as coral-dominated systems.

IH271 Competitive interactions between sponges and other reef organisms in Indonesia (Weeks 2 - 8; need to have completed IH007 and be dive trained)
Sponges are an important component of coral reefs across the world with a range of important functional roles. Given that sponges are one of the dominant components of reef fauna in many places and because space is generally limiting in healthy coral reef systems, sponges are likely to interact in a variety of ways with a range of organisms as they grow. Although limited space might be expected to result in intra and inter-specific spatial competition between sponges, many earlier studies have highlighted how sponge survival can be facilitated by positive interactions with other organisms. Despite these positive interactions, other studies have clearly shown that sponges are effective spatial competitors with the ability to overgrow other reef organisms and cause the necrosis of tissue that has been overgrown. This project will investigate the spatial associations and potential competitive interactions between sponges and other organisms in order to assess how coral reef function may change as a result of future declines in corals.

IH272 The diversity, distribution and abundance of Nudibranchs in Indonesia (Weeks 2 - 8; need to have completed IH007 or IH008 and be dive trained)
Molluscs are the most abundant group of animals on coral reefs, comprising up to 60% of all marine invertebrate species. Nudibranchs are one of the most diverse groups within the phylum but ecological knowledge of these charismatic species and specifically data concerning their true diversity, abundance and distribution is very limited. Studies into the extremely phylomorphetic Nudibranchs are extremely important to the Wakatobi which is increasingly becoming recognised as one of the best coral reef dive sites in the world particularly for underwater photographers. Unfortunately, before Operation Wallacea established their research facility on Hoga Island, an expedition team removed many specimens for museum collections and since that point numbers have been low. Anecdotal evidence however suggests that populations are recovering and now represents the perfect opportunity to gain a much greater understanding of the ecological needs of Nudibranch species, their habitat preference, feeding ecology and those factors that drive their distribution as well as abundance. Due to their life history traits such as low fecundity and low dispersion, Nudibranchs are not very resilient and thus detailed knowledge of their ecology are needed so group specific conservation strategies can be produced and recommendations made to marine park authorities.

IH273 The role of territorial Damselfish in sculpturing coral reef biodiversity in Indonesia (Weeks 2 - 8; need to have completed IH007 or be dive trained if incorporating a diving element)
One of the most conspicuous groups of fish and certainly one of the most successful across reef systems are the Damselfish. Several species of Damselfish set up closely guarded territories and defend their resources through numerous aggressive behaviours. The degree of aggression varies between species and also with species, most probably as a direct consequence of the surrounding fish community. Those individuals living in species rich and highly competitive environments may defend their territories with great vigour than individuals of the same species living on reefs with lower fish abundance. Regardless such Damselfish species are likely to influence fish assemblages in their immediate vicinity. The obvious influence would be a negative one with Damselfish actively excluding other species, however research has demonstrated that some Damselfish may facilitate species richness through their active farming and managing of the benthic environment. This study will help understand how the complex fish communities of coral reefs are structured.

DISSERTATION/THESIS TOPICS
**IH274 Resource utilisation of reef fish across environmental gradients in Indonesia**
(Weeks 2 - 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element)

As reef habitats become more degraded, resident fish species will have to constantly adapt to the changing environment. Arguably, it is the species that are most plastic in their behaviour that will fare best but the numbers of studies that examine the variety of species behaviours across reefs of different quality are rare. We therefore have little idea on how specialised species are able to alter their behaviour and ecological niche to be able to exist across reefs of different quality. Studies could examine the variation in the behavioural ecology and therefore the degree of plasticity that exists between two coral dependent butterflyfish namely *Chaetodon baronessa* and *Chaetodon lunulatus* across reef sites of varying qualities through the use of scuba, snorkelling or a combination of both. Specifically researchers could examine whether the species’ preferred prey (coral species) changes across reefs and whether the selectivity of species alters depending on the availability of coral species. Such research will greatly increase our understanding of how adaptable reef fish species are and how specialised species with an apparent restricted ecological niche, may fare under conditions of reduced habitat quality.

**IH275 The ecology of Anemonefish in Indonesia**
(Weeks 2 - 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element)

One of the more conspicuous groups of fish on tropical reefs is the anemone fish. Anemonefish are heavily collected for the aquarium trade and have a mutualistic relationship with their host anemones. However, preliminary investigations have shown that this relationship is much more plastic than first thought and may be dependent on the availability of different anemone species across different reef sites with more dominant anemone fish species being more selective than less aggressive species. Further investigations have also shown that some species co-inhabit single host anemones; but what dictates this dual association? Surprisingly little research has been carried out that adequately details the association between fish and anemones and at present, it is not possible to identify the key ecological drivers of the partnership. Research could also include detailed investigations in to the behavioural ecology of different Anemonefish and the degree to which they defend their resource. The question then arises as to whether or not the presence of Anemonefish on a reef exclude others. There is much to learn about the Anemonefish and insights in to their ecology will enhance our understanding of the key drivers of reef biodiversity.

**IH276 The ecological impact of smothering sponge and ascidians on coral reefs in Indonesia**
(Weeks 2 - 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element)

In recent years, an aggressive colonial ascidian (tunicate) and a smothering sheet like sponge has increased in abundance on reefs surrounding Hoga Island, particularly reefs that are impacted by high sedimentation. This ascidian is unique in that it is able to colonize live coral resulting in colony death whereas it is uncertain whther the sponge species colonies live or dead coral colonies. To date, no research has been undertaken on this ascidian or the sponge species despite the fact that they are causing significant mortality on reefs of the Indo-Pacific and have the potential to dramatically alter the ecology of the system by degrading biological and physical complexity. Research is urgently required to assess the ecology of these two species and in particular to examine their abundance, distribution, environmentally regulated growth, and also to determine the coral species that are most affected and under water set of environmental conditions. This research is only suitable for scuba divers and will involve extensive field surveys coupled with repeated measures of colonies affected across environmental gradients so that site-specific progression rates can be calculated.

**IH277 The behaviour and functional role of reef fish cleaners in Indonesia**
(Weeks 2 - 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element)

The Wakatobi Marine National Park is unusual in that three species of cleaner wrasse are present on its reefs and a number of cleaner shrimps. The Bluestreak Cleaner Wrasse (*Labroides dimidiatus*) has been well studied but few studies have focused on the behaviour and ecology of the other two cleaner wrasse species: the Blackspot (*Labroides pectinatus*) and Bicolour (*Labroides bicolor*) and the numerous cleaner shrimps. This study could be divided into a number of different research projects that aim to fully characterise the ecology of the different cleaner species and the relative role they play on reefs of different quality. In particular researchers may which to compare and contrast the clients of the different species and whether or not one species is more important than another in terms of the functional roles they play. To achieve this research could examine variation in time spent cleaning, differences in the clientele, the relative worth of different clients to the various cleaner species and whether this value alters across environmental gradients.
The growth of a coral reef is dependent on the balance between processes of accretion and erosion. In a healthy system, there is generally net growth as those organisms contributing to the physical structure of a reef (e.g. hard corals, coralline algae) are more dominant than abiotic physical erosive forces (e.g. wave energy), anthropogenic destruction (mining, blast finishing and anchor damage) and bio-eroding. This balance can be changed by prevailing environmental conditions, in particular light and temperature by reducing reef accretion rates but reef growth can also be reduced by variations in the abundance of those organisms that can actively remove material, i.e. bio-eroders. Many species are capable of bio-eroding corals, either during predation activities (e.g. Parrotfish) or during burrowing activities (e.g. several species of molluscs). It would seem likely that the abundance of these organisms may also be regulated by prevailing environmental conditions and therefore if the processes that reduce coral growth are the same that stimulate greater bio-erosions, reefs could be severely threatened. Therefore research is required to determine the relative abundance and selectivity of bio-eroding species and how environmental conditions regulate this activity.

How stable are reef communities over time? What changes are occurring and over what time scales? What are the responses of fish communities to changes in benthic cover? Coral reefs are dynamic ecosystems and may actually exist in multiple stable states. Permanent transects have been used to successfully document changes in benthic cover but assessing changes in mobile organisms are more difficult. However, smaller patch reefs sometimes referred to as bommies provide an ideal template to evaluate changes in mobile organisms, as they tend to house a greater number of resident species. Coral patch reefs situated in lagoonal areas, backward of the main reefs, may also facilitate the daily migration of reef fish to other coastal habitats such as seagrass and mangrove forests. Consequently and apart from being an ideal model system to investigate the drivers of reef biodiversity, these patch reefs are of major ecological importance. Several research projects could be developed in this field to assess the ecological and functional roles of such patch reefs and also to identify the key environmental and biological drivers of reef biodiversity. This research is increasingly becoming more important as such patch reefs are often targeted for coral mining activities and are therefore at real threat from human induced degradation.

Methods of reef assessment and the effect different survey techniques have on estimations of reef fish abundance and functional biomass in Indonesia

This research project, which is fundamental to conservation research, aims to compare techniques and protocols most commonly used within reef monitoring programmes, and will assess the variability between techniques, the relative cost of each technique, and how all of these vary across sites of different quality and habitat structure. The ultimate goal of the study is to produce an output in the form of a standardised and validated set of protocols which will be recommended for all agencies to use. For example, obtaining true estimates of fish abundance and biomass is key to reef management, conservation and monitoring programmes. Several techniques are widely used although we have little appreciation of how the techniques used influence the data obtained and whether or not it is possible to directly compare data collected by different techniques. It is most likely that the different techniques return different data and evaluating the levels of variation between methods is extremely important particularly when scientists and managers need to compare data obtained between sites or within a site over successive years when different protocols have been used. We also need to identify best practises and identify those techniques and protocols that return the most reliable and robust data. Furthermore, it would be most desirable to identify the techniques which are most cost effective, in terms of time, to use when undertaking reef assessment. The best practises will therefore be those methods that return the most scientifically robust data for minimum effort.

Conservation of herbivore biomass and functional biology of reef systems

Of key concern to conservation biologists are those species that play important functional roles and the potential loss of those species from the system as a result of over exploitation. The removal of algae from coral reefs is an extremely important functional role and influences successful coral recruitment and coral growth. Herbivores are a key functional group whose characteristics (e.g. species and abundance) influence the structure and biodiversity of coral reefs and therefore help sculpture the environment. In reefs of the Caribbean, removal of grazing fish (Parrotfish) following the demise of grazing Diadema populations, has resulted in a phase shift from a once coral dominated system to an algal dominated system with major consequences for biodiversity. Within the Indo-Pacific region, there are many more grazing species and consequently a higher degree of functional redundancy. However, limited information exists on the relative importance of different herbivores. Research is thus needed that evaluates the relative importance of different
herbivore groups by examining their feeding behaviour, abundance, biomass and distribution across sites of different habitat quality. Biomass can be very accurately estimated through the use of stereo videography and through the construction of length to biomass relationships from fish caught in local fisheries markets.

HT282 Uncovering the unique coral reef ecosystems of Tela Bay (Weeks 3 – 9; need to be dive trained and have completed HT009)

The coral reefs of Tela Bay are truly unique and pose a number of ecological questions with important implications for coral reef conservation throughout Honduras and the rest of the Caribbean. The main reef in the bay, known as Banco Capito, boasts a coral cover of approximately 70%, which is higher than almost anywhere else in the entire Caribbean and even higher than many reefs in the Indo-Pacific. Nearby patch reef systems, however, are more representative of Caribbean reefs, being dominated by macroalgae after the occurrence of phase shifts, although even these sites are showing early signs of recovery. Another distinct difference between the reefs of Tela Bay and elsewhere is the increased turbidity, which reduces visibility but importantly reduces the quantity and quality of light reaching the benthic community. This phenomenon is believed to protect sensitive corals from the dangers of high light stress, an idea known as the refuge hypothesis. In short, the reefs of Tela Bay are ecologically mysterious, this project will attempt to better our understanding of the biological and ecological processes taking place. In order to better inform conservation managers of how the corals are able to thrive to such an extent. Data will include a benthic assessment of a number of reef sites to investigate patterns in benthic cover, coral species diversity, and variation in environmental conditions. A more detailed assessment of the physiology of corals in Tela Bay could also be carried out using fluorometry techniques to assess patterns in photosynthetic efficiency.

HU283 Depth distributions and bathymetric connectivity of coral reef fish (Weeks 2 – 9; need to be dive trained and have completed HU007)

Most coral reef research focuses on shallow water habitats and their ecological processes. A good example of this is the habitat connectivity exhibited by fish migrations between coral reef, seagrass and mangrove ecosystems. However, coral reefs extend beyond the limits of recreational diving, with mesophotic coral reef ecosystems (MCES), extending in some areas to over 100m depth. These reefs are beyond the logistical abilities of most researchers, therefore very little is known of the community structure at these depths and what level of habitat connectivity exists between MCES and their shallow counterparts. By working alongside a small team of technical divers able to sample MCES, students on this project will collect the shallow data component through a range of fish and benthic monitoring techniques and ultimately have access to both data sets for use in their dissertations. Specific questions could include an assessment of total biomass at varying depths, or a more detailed analysis of fish community structure between a range of habitats. The ultimate aim of this project is to investigate the importance of deeper coral reef habitats for conservation management, and data collected will be used to inform the conservation framework on Utila.

HR284 The ecological restoration offered by keystone species: Sea urchins in Tela Bay (Utila: Weeks 2 – 4; Tela: Weeks 5 – 9; need to be dive trained and have completed HU007 or HT009)

Under natural conditions, sea urchins (specifically Diadema antillarum) are the most important herbivores on Caribbean coral reefs, and are therefore considered a keystone species. However, a disease in the 1980s caused the death of an estimated 98% of individuals throughout the region. This mass mortality event had a devastating effect on reef health, driving subsequent phase shifts to algal dominated benthic communities. Recovery has been limited throughout the Caribbean, with populations on most reefs still severely depleted, and Utila is a classic example of this. Remarkably, a reef system in Tela Bay known as Banco Capito has a population density of D. antillarum at astonishingly high levels. It also boasts extremely high benthic reef health, despite historical overfishing leading to a complete collapse of the fishery. In 2013, a significant colonisation of D. antillarum was observed on a heavily degraded reef system in Tela Bay, known as La Ensanada, which seems to support the theory that Banco Capito can act as a seeder population for future reef recovery along the Honduran coast. This project will assess the populations of D. antillarum and other urchins on Honduran coral reefs, and investigate their ecological impact on degraded reefs after re-colonisation. In addition, students could investigate why the population of urchins in Tela Bay has been so successful compared to nearby Utila.

HU285 Herbivore ecology and feeding behaviour on algal dominated reefs around Utila (Weeks 2 – 8; need to be dive trained and have completed HU007)

Many coral reefs are currently under threat from phase shifts which lead to a move from a coral-dominated to an algal-dominated system. The consequences of these changes in stable state can be enormous, both ecologically and economically, including a large reduction in carrying capacity for the associated fishery. Traditionally, macroalgal density is kept low through a lack of nutrients in the water combined with consumption by herbivores. However many reefs are now polluted, which leads to an increase in nutrients required for algal growth, whilst overfishing has greatly reduced the biomass of herbivorous fish. In the Caribbean an important grazing organism is the urchin Diadema antillarum, which naturally occurs on reefs in high numbers. In the 1980s a disease decimated the population throughout the Caribbean, and numbers around Utila have still shown no signs of significant recovery. This combination of factors has left Caribbean reefs like those around Utila even more vulnerable to phase shifts, and this dissertation will study herbivore activity around the island. Data could include bite rates of herbivorous fish normalised to biomass, focusing on differences in herbivory rates between species and in response to changes in habitat quality.

HB286 Influences on reef fish populations on contrasting reef systems in Honduras (Utila: Weeks 2 – 6; Tela: Weeks 7 – 9; need to be dive trained and have completed HU007)

The reefs around Utila and Tela Bay offer a unique opportunity to study various aspects of fish community structure and population dynamics on Caribbean coral reefs. Reef fish populations are subjected to a huge variety of different pressures and variables, both natural and human, that dictates their abundance and diversity and many of these variables are little understood. Specific influences that are particularly important in Honduras are those of fishing, coral/algal coverage on reefs and the role of mangrove systems as nursery grounds for juvenile reef fish species. On Utila, overfishing has long been a problem, whilst degraded reef habitats have limited the carrying capacity for fishery recovery. However, the island boast a gradient of reef habitats to explore the drivers of fish population density and community structure. The reefs of Tela Bay have been subjected to extreme overfishing in the past, which has led to a complete collapse of the fishery. This ultimately led to fishing pressure significantly decreasing as fishers sought alternative livelihoods which, along with the extensive mangrove systems in the bay, has provided Tela with the potential for rapid fish biomass recovery. Dissertation projects will use cutting edge stereo-video technology, which allows accurate biomass assessments of reef fish communities. These data will be combined with additional data on benthic habitat quality and abiotic factors to investigate the main drivers of variation in reef fish community structure, and to identify temporal trends in overall fish biomass at both sites.

HU287 Interactions between benthic organisms on coral reefs around Utila (Weeks 2 – 9; need to be dive trained and have completed HU007)

Scleractinian corals are the ecosystem architects of highly biodiverse and productive coral reef biomes. However, on many reefs around the Caribbean, numerous factors have negatively impacted the ability of corals to thrive as they once did, which has severely altered the way competition for space takes place on these reefs. In particular this has commonly led to an overgrowth of macroalgae and the threat of an ultimate phase shift to an alternative stable state lacking the structural complexity to support the high diversity of fish and invertebrates which a healthy coral reef is famous for. This dissertation will therefore study the interactions between key groups of benthic organisms such as Scleractinian corals, macroalgae, sponges and soft corals to assess how these interactions are varying between reefs with different levels of impact. It could also focus specifically on the coral community, and study how competition between coral colonies varies with increasing impacts to try and gauge which corals are most likely to dominate the system in future years.

MM288 Reef fish and coral communities in Nosy Be, Madagascar (Weeks 2 – 8)

For this topic students need to be dive trained and also to have completed an identification course on reef fish and coral species likely to be encountered. These courses will be running in weeks 2 and 3 and from weeks 4 – 8 students will be able to work on their dissertation topic which utilises the stereo video and benthic video data being collected on all the reefs around the Lokobe Reserve and adjacent areas. Repeat stereo video surveys will be completed at different depths and the images analysed back at the research centre. The software available in camp allows the length of each fish within the study area to be measured accurately so precise biomass estimates can be made as well as details on the species communities. The benthic video data is collected by laying a 50m tape along a depth contour and then the benthic communities are filmed by swimming along with a video under your right shoulder and holding the tape in your left hand. The video data is then analysed back at the research centre to calculate total coral cover, hard and soft coral community composition and levels of bleaching and disease. The data from this topic could be a analysed to assess the relative effectiveness of utilizing different length transects or how coral cover, coral communities or fish communities and size groups change with depth. For those students at universities where completion of their dissertation/thesis outside of term time is not allowed, this topic provides an opportunity to gain experience in conducting fieldwork and a guaranteed data set for later analysis.
IH290 Niche partitioning of fiddler crabs in biodiverse and highly competitive environments in Indonesia (Weeks 2 – 8; need to have completed IH007 or IH008)
The fiddler crabs are perhaps the best known of the tropical intertidal organisms and are characterized by having an enlarged claw. These charismatic species are highly abundant in the intertidal zone of the Wakatobi and play important functional roles. The Wakatobi has the highest biodiversity of fiddler crabs on record and is the perfect location to study the biology and ecology of these important species. Incredibly up to 9 species of fiddler crab can seemingly co-exist in a single location but their specific distributional patterns need to be carefully mapped to determine the extent to which the different species overlap. The locations and feeding habitats of those species that have similar distributions need to be fully characterized to determine how different species are able to co-exist and specifically how these species partition their resources to avoid competition which would otherwise lead to exclusion. This study will include intertidal profiling, habitat mapping, environmental assessments and behavioural ecology and will enhance our knowledge of niche partitioning in biodiversity hotspots.

IH291 Mangrove habitats of the Wakatobi, Indonesia (Weeks 2 – 8; need to have completed IH007 or IH008)
Mangrove forests are extremely important systems and intricately connected to other coastal habitats. They act as nursery and refuge environments for reef fish, provide and entrap nutrients, facilitate the deposition of sediments and thereby protect neighbouring reef systems and they offer a natural coastal defence from storm surges. Mangrove forests are very productive systems and sequester carbon through sediment deposition and accretion and also through locked-up biomass. Consequently mangroves are described as systems that provide many ecosystem services and their health and protection is extremely important. However mangrove forests are heavily exploited for the fish and invertebrates they contain and for the wood they produce. This study will examine the major properties of mangroves in the Wakatobi, will characterise the forest, will examine standing biomass, associated diversity and signs of exploitation including tree felling and wood removal.

IH292 Seagrass habitats of the Wakatobi (Weeks 2 – 8; need to have completed IH007 or IH008)
Seagrass beds of the Wakatobi are amongst the most diverse on the planet and provide many important ecosystem services. A healthy and productivity seagrass bed is extremely important for connected reef systems as they provide refuge and nursery grounds for reef fish; they also entrap sediments which may otherwise smother reef organisms. The majority of tropical coastal research however is focused on reef systems and there is great need to bring the importance of seagrass beds to the attention of management authorities. This study should therefore fully describe the community structure of seagrass beds across several sites within the Wakatobi and specifically examine the distribution of seagrass species, their standing biomass and associated biodiversity and fish biomass. Researchers should carry out their investigations at sites with different distances from local communities as a proxy to anthropogenic pressure. Importantly and to ensure the importance of seagrass beds are fully understood by local authorities, researchers may wish to determine the amount of produce extracted from seagrass beds by local communities and thereby evaluate the importance of seagrass beds for local food and economic security as well as ecosystem biodiversity.

IH293 Ecology and behaviour of fiddler and sentinel crab populations (Weeks 2 – 8; need to have completed IH007 or IH008)
Mixed populations of fiddler crab occur in some intertidal areas of the Wakatobi, but the same species also occur in single-species populations, e.g. Uca vocans on the Ambuean mudflat, or U. tetragonon at the western end of Pantai Pogo (near the village of Furake) and U. mjoebergi at the eastern end of the same bay. There are a number of comparative studies that need be done to investigate how intra and inter-specific competition is affecting the feeding time, feeding areas and activity budgets of each of the species, and thus resource partitioning and niche differentiation of the different species. Both mixed and single-species populations of two species of sentinel crab, Macrophthalmus convexus and M. serenei, occur in some numbers at the top of the low tide sand flat on Pantai Kampoa. How do these species partition the resources and are there interactions between the species? Knowledge concerning the apparent co-existence of these species and fine scale resource partitioning will help us understand how species are able to occupy the same habitat in highly biodiverse environments.
HU294 Assessing the impact of mangrove degradation on their structure and functionality (Weeks 2 – 8; need to have completed HU007 or HU008)
The island of Utila is dominated by mangrove and wetland systems. These are highly important to the functioning of the entire marine ecosystem on the island through their role in coastal protection and as fish nurseries. However they are being placed under increasing threat from development on the island, either through direct removal to clear space for construction, or more commonly through partial disturbance and pollution. Many previous studies on mangroves have compared the functioning of healthy systems to areas where mangroves have been completely removed, but little has been done on the impacts of degradation on mangrove systems and its effect on their functioning. This topic allows research to be done on mangroves in four contrasting lagoons. Of these lagoons one is subjected to high levels of organic pollution, while a second is subjected to physical disturbance from dredging and boat traffic, a third contrasting lagoon is relatively untouched and a fourth is part of a marine reserve. These contrasting systems provide an excellent opportunity to study the effects of differing levels of mangrove disturbance on factors including sediment dynamics, forest structure, carbon storage and associated biodiversity. On this topic students will be kayaking around the remote mangrove lagoons, exploring and surveying areas of Utila that are rarely seen by other visitors.

HT295 Structure and function of mangroves in Tela Bay (Weeks 3 – 9; need to have completed HT009 or HT010)
Tela Bay boasts an extensive mangrove system, which are centred around a network of five lagoons, each of varying sizes and anthropogenic impacts. These lagoons are an important source of food and income for local communities, while the mangroves themselves are important for overall biodiversity and carbon storage throughout Tela Bay. In addition, mangroves are known to be important nursery grounds for nearby fisheries, forming an integral component of the reef-seagrass-mangrove continuum in existence along tropical coastlines. Extreme overfishing in the area has led to a complete collapse in reef associated fisheries and the importance of maintaining healthy mangrove ecosystems in the bay is more important than ever. This project will investigate the structure and functioning of mangrove forests in Tela Bay for the first time, and will provide valuable information for future conservation efforts in the area. An important focus will be forest structure measurements to characterise the state of a number of mangrove sites, but additional data could include sediment dynamics, carbon storage, and associated invertebrate and vertebrate fauna. By combining this range of data sets, dissertation projects could focus on a detailed ecological assessment of the structure and functioning of Tela mangroves, their role in local carbon storage, or their importance to overall coastal ecology. Data collection will take place by kayaking within the lagoons.
ENVIRONMENTAL SCIENCE RESEARCH TOPICS

IH300 Environmental impact and feeding habits of the Crown of thorns starfish *Acanthaster planci* in a low density population in the Wakatobi, Indonesia (Weeks 2 – 8; need to have completed IH007 and be dive trained)

*Acanthaster planci* are coralivores and voracious predators of coral reef ecosystems, spending approximately half their lifetime feeding. An individual adult is able to feed continuously for up to 9 hours at a time by extruding its stomach inside-out over coral polyps. Despite this insatiable feeding technique a healthy coral reef with around 50% coral cover can sustain between 20-30 individuals ha⁻¹, however outbreak densities of up to 1000 ha⁻¹, can destroy a reef system in months. Due to the potentially destructive nature of *A. planci* it is very important to establish the extent to which the starfish is affecting reefs within the Wakatobi. This can be achieved by assessing current population densities and through monitoring their feeding habits and destructive potential. This study will involve diving or snorkelling based population surveys combined with behavioural investigations aimed at identifying the most favoured coral prey and therefore the species of coral that are most at threatened by the starfish within the Wakatobi.

IH301 The importance of different coral growth forms for reef biodiversity in Indonesia (Weeks 2 – 8; need to have completed IH007 and be dive trained)

Hermatypic coral species, otherwise known as reef-building corals, are often the dominant component of tropical reef systems. The various colony morphologies, which are genetically determined but also environmentally regulated, provide the physical complexity that characterises coral reefs. The complexity provided by reef building corals is a key driver of the high biodiversity associated with tropical reef systems. It is because of this feature that reef building corals are often termed system architects. We now know from field studies and experimental biology that the vulnerability of coral to climate change and environmental anomalies such as those that occur during El Niño and La Niña events, is linked to their growth morphology and that branching species tend to be less tolerant than other species. We therefore predict that the physically complex branching species are likely to be the first components of a reef system that are lost as climate change increases its impact on tropical reef systems. We also know that branching coral species are most affected by pollution and reduced water quality, both of which are becoming increasingly common throughout the tropics. It is important that we therefore know the biodiversity associated with different coral growth forms and that we are able to predict the biodiversity that is most likely to be lost from the system if the abundance of branching species is significantly decreased. This important project will help reef managers to predict the likely near future of reef systems impacted by short and long term stresses.

IH302 The physical and biological structure of a light-limited coral reef (Weeks 2 – 8; need to have completed IH007 and be dive trained)

The Wakatobi contains some of the most biodiverse reef systems in the world and are also amongst the most productive. This productivity supports many coastal communities which has led to further coastal development often to the detriment of neighbouring marine environments. Coastal development including removal of mangrove forests and seagrass beds has reduced the water quality of adjacent coral reefs and in cases has led to sediment smothering reef organisms. This study aims to increase our understanding of the impact reduced water quality and increased sedimentation has on the biological and physical structure of coral reefs. In the case of the Wakatobi managers need to know whether or not such systems are deteriorating or whether a new state of equilibrium has been reached and to enable this, researchers will have access to the long-term monitoring programme.

Researchers will also need to fully describe environmental conditions as well as the physical structure of the light-limited reefs making this study ideal for those with an environmental science background. Understanding the likely future fate of such systems is extremely important for managers of the Wakatobi in order to conserve biodiversity and ecosystem service provision.

IH303 Environmental driven variations in reef architecture (Weeks 2 – 8; need to have completed IH007 and be dive trained)

Calcification by reef building corals is a light enhanced process. Light quantity and quality will influence rates of calcification and also the morphology of coral colonies. In turn, the morphology of colonies influences the architecture of a reef, a factor that directly affects associated biodiversity and productivity. The effects of light can be considered at different
IH304 Environmentally driven changes to the primary causes of coral mortality (Weeks 2 – 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element)

There are numerous factors that cause coral mortality ranging from environmental anomalies (e.g. elevated sea temperatures) through to disease and direct anthropogenic disturbance (e.g. anchoring). Knowledge of mortality rates is key for environmental scientists and conservationists that manage reef systems. This topic is aimed at increasing our understanding of the mortality rates across different reef environments. Specifically, research could include detailed investigation of thermal induced bleaching as compared to seasonal sub-lethal bleaching, examine the incidence rates of coral diseases and also examine coralivore activity across several sites of the Wakatobi and importantly across different reef environments. One project could identify the degree of threat, how this varies across species and whether or not threat levels are environmentally regulated. The research can be undertaken by scuba and/or snorkelling activities and will require detailed ecological surveys, underwater photography and repeated assessment of impacted coral colonies to determine mortality progression rates.

HU305 An assessment of coral health on Utila’s coral reefs (Weeks 2 – 9; need to be dive trained and have completed HU007)

Global climate change is having a serious impact on coral reefs, with the health of both hard and soft corals under threat from a range of factors. These include coral bleaching and disease, both of which reduce the health of a colony and can ultimately lead to the death of the coral. Modern pollution levels are believed to be responsible for an increased frequency of disease, whilst a number of factors are known to cause coral bleaching, most famously increased water temperature. Both coral disease and bleaching are evident on reefs around Utila and are adding to the suite of factors negatively impacting the health and viability of important coral communities. This dissertation will explore the extent of various coral diseases and bleaching on reefs around Utila, focusing on trying to identify patterns in their occurrence and severity. It could also look for variations in susceptibility between different taxonomic groups down to species level, and predict which species are most likely to survive under current conditions.

YA306 Hydrography and water quality of coastal lagoons around Akumal, Mexico, and impacts on adjacent reef systems (Weeks 3 – 6; need to have completed YA003 or YA004 and be dive trained if including data collection by diving)

Akumal Bay and the adjacent Half Moon Bay are areas of key economic and marine biodiversity interest because the coral reefs and wildlife that these areas protect. The attractive lagoons that feed into them draw a large number of visitors to the Akumal area every year. Understanding the circulation and water quality of the lagoons, which have different fresh water inputs and how these impact the coastal ecosystem, is of considerable importance. Research in this area would include sampling and analysing waters from the lagoons and their underground riverine inputs, assessing water structure and circulation, and determining the export of fresh water and nutrients. In addition, the effects of the contrasting lagoons on adjacent reefs will be assessed through reef surveys and through chemical analysis of seafloor plants. Most of the data will be collected via kayaks that you will use to access various parts of the lagoons, but there will also be an opportunity to scuba dive in order to participate in reef monitoring data collection.
IH310 The adapted physiology of cephalopods (Weeks 1 – 8)
Cephalopods are an important fishery throughout the Wakatobi Marine National Park. Intertidal habitats near and around Hoga Island are home to several of these commercially viable species including dwarf cuttlefish, pigmy squid and several octopuses. These animals live in tide pools and very shallow areas which experience more extreme fluctuations in temperature, salinity and oxygen concentration than anywhere else on the planet. Observational studies incorporate habitat utilization, environmental characterization, and cephalopod behavior measurements from the field. Other studies that can be done in the laboratory include: metabolic sensitivity, critical thermal limits and hypoxia tolerance. These studies provide important insights into the physiology and behavioral adaptations cephalopods have to survive in capricious environments as well as aid in conservation management of the fishery.

IH311 Adaptations of fish living in two worlds (Weeks 1 – 8)
Mangroves on Kaledupa and Hoga Island are home to almost a dozen species of amphibious air-breathing fishes. These fish are able to emerge from their pool environments for extended periods of time, and some species living almost exclusively on land. Air-breathing fish have many unique physiological and behavioral adaptations which allow them to live the amphibious life. The fishes are also keystone species, and thus excellent indicators of Global Climate Change impacts on critical mangal habitats. Study projects include: capacity tolerance determinations on water loss, critical thermal limits, temperature acclimation and evaporative water loss. These studies aim to examine upper environmental tolerance limits to predict how air-breathing fish populations will change as climate shifts become more extreme and mangal habitats become dryer and hotter.

IH312 The eco-physiology of juvenile reef fish: preparing for future climate change (Weeks 1 – 8)
The spectacular reefs surrounding Hoga Island are some of the most beautiful in the world, and are home to hundreds of species of reef fish. While many studies focus on species interactions with the reef, far fewer studies look at the physiology of reef fishes. Many reef fish spend the first part of their lives in the seagrass beds or in mangrove habitats where conditions are very different from the reef. Physiology of juvenile fishes can differ greatly from the physiology of the adult fish and make for interesting comparisons. Studies include: critical thermal limits, temperature preference, hypoxia tolerance, and metabolic sensitivity. All studies aim to improve our understanding of juvenile reef fish physiology and the changes that occur as these fish recruit to the reef environment. As global climates change a better understanding on this underrepresented and often overlooked group of juvenile reef fishes will be needed if we wish to effectively manage shallow nursery areas.

IH313 Are animals living in extreme environments best equipped to deal with climate change? (Weeks 1 – 8)
The global climate is changing and researchers predict an increase of 2 to 3°C in ocean surface temperatures over the next 50 years. The animals most likely to be affected by increasing ocean temperatures are those already living in extreme thermal habitats, such as tidally influenced seagrasses or mangrove habitats, where animals may experience a 10°C shift in temperature throughout the day. Temperature is the “Abiotic Master Factor” and influences all physiological functions and little is known about how these animals are adapted to deal with temperature change. thermal tolerance of amphibiuous fish, thermal niche of juvenile reef fish, thermal ecology of intertidal cephalopods, and thermal sensitivity of gastropods will be investigated. Learning how animals respond to temperature will help us to predict how animals will adapt to the changing climate and will provide insight into how these animals are adapted to deal with temperature changes.

IH314 Thermal induced rapid coral mortality in Indonesia (Weeks 2 – 8; need to have completed IH007 or IH008 and be dive trained if incorporating a diving element in the study)
The demise of coral reefs is one of the greatest environmental disasters mankind is facing with some scientists predicting that 33% of all coral species will be lost within the near future. It has been suggested that corals with a higher skeletal density are able to tolerate thermal stress through numerous mechanisms of acclimation thereby enabling the species to track environmental conditions (a sub-lethal response). However, many other, often functionally important, species have limited acclimatory potential and rapidly die off during relatively small changes in temperature (just a few degrees above the long-term monthly average). Research is required that assess such rapid thermal mortality and compare the...
responses of a range of species collected from a range of sites to determine possible implications of environmental anomalies (e.g. elevated temperature common during El Niño events) on the biological and physical structure of reef systems. Data will also be used to determine whether or not environmental growth conditions can regulate a species thermal response and information obtained will be invaluable to conservationists trying to devise the best way to manage reefs from such global threats. The experimental component of the research will need to be laboratory based but researchers may need to undertake diving and snorkelling surveys.

HU315 Thermal ecology, tolerance, and temperature preference of coral reef and mangrove species in Utila, Honduras (Weeks 2 – 9; need to have completed HU007 or HU008)

Ectotherms, those animals in which the internal body temperature mirrors that of the external environment, have adapted mechanisms for dealing with changes in environmental temperatures. Ideally, these organisms inhabit areas in which the environmental temperature is at an optimal range for the organism’s peak biological performance. In the face of changing environmental conditions, the first line of defence against thermal changes are behavioural responses, such as avoidance of extreme temperatures. However, many ectotherms also use various physiological tactics such as the use of heat stress enzymes, which allow tolerance to higher than normal temperatures for brief periods of time. Identification of the thermal tolerance range and thermal preference for various organisms provides important information for conservation and management efforts in the face of global climate change. Researchers will have the opportunity to conduct thermal laboratory experiments with a variety of coral reef and mangrove species, identifying thermal tolerance ranges and temperature preferences, to try and understand the interspecific variation in environmental tolerances seen in tropical coastal organisms.
Coral reefs are amongst the most productive marine ecosystems on the planet and this productivity supports a very active fisheries sector. Overexploitation of reef-based fisheries is one of the major threats to reefs around the world with as much as 60% of coral reefs being threatened by overextraction of natural resources. The population of the Wakatobi are highly dependent on local fisheries and thus there is a great need to understand the characteristics of fisheries activities. A number of different techniques are used and one of the best approaches to identify the extent of a given activity is to visit local fisheries markets and examine species caught, their length and biomass, and their relative value. To validate such information, it is also important that studies incorporate direct observations of fisheries landing and therefore researchers engaged with this activity should work alongside local fishermen to determine catch per unit effort and total landings per fishermen for the specific technologies used. Fish of reef systems are a finite natural resource and unless effectively managed overexploitation can and will have irreversible devastating impact on the regions reef systems. Authorities need data which can be examined and compared over-time and between regions, to determine the sustainability of fisheries activities within the park. Data collected by researchers will directly inform conservation plans that are aimed at preserving biodiversity, functionality, productivity, and traditional fisheries activity.

Fish fences are located within shallow subtidal environments and entrap fish within reef flat areas, seagrass beds as well as species that migrate from the mangrove onto reef systems. Due to their positioning and construction a large percentage of their catch are juveniles and they are completely unsselective in terms of their target species. Furthermore and unlike many other fisheries activities, the economic output for fish fences is at the time of construction and once built there are no economic barriers to prevent the activity from being used. Consequently fish fences have the very real potential to fish reefs to complete ecological rather than just economic collapse. The Wakatobi has a long history of fish fence use with the numbers of fish fences have the very real potential to fish reefs to complete ecological rather than just economic collapse. The Wakatobi has a long history of fish fence use with the numbers of fish fences being increased over the years along with the size of individual fish fences. This study will examine fish catch by the fences, will evaluate the full characteristics of the catch and will compare this data to previous collected more than 5 years ago. This temporal comparison will provide ‘time zero’ for a long-term assessment of fish recovery. It is also a unique opportunity to study a post-collapse reef associated fishery, where the removal of fishing effort so highly prioritised by conservation managers has already occurred without intervention. Data could include assessments of gear types, overall fishing effort, targeted species, catch per unit effort and catch composition. Data collection will take place in local communities throughout Tela Bay.

HT322 Fisheries assessment of Tela Bay (Weeks 3 – 9; need to have completed HT009 or HT010)

Overfishing is one of the greatest threats to tropical coastal ecosystems and because of this fishing pressure is a priority for conservation organisations throughout the tropics. One of the greatest barriers to success has been the provision of suitable alternative livelihoods for fishers, which are essential to reduce overall fishing effort. In Tela Bay, the extent of historical fishing pressure combined with a lack of management efforts in the area has led to a total collapse of the fishery. Anecdotal evidence suggests that the majority of local fishers have subsequently been forced to seek alternative sources of income, meaning that current fishing pressure is believed to be low. High reef health and extensive nursery grounds in the form of mangroves means that fish populations in Tela Bay have the potential to recover swiftly, providing fishing levels are kept low. This dissertation will explore fishing activity in Tela Bay for the first time, and will provide ‘time zero’ for a long-term assessment of fish recovery. It is also a unique opportunity to study a post-collapse reef associated fishery, where the removal of fishing effort so highly prioritised by conservation managers has already occurred without intervention. Data could include assessments of gear types, overall fishing effort, targeted species, catch per unit effort and catch composition. Data collection will take place in local communities throughout Tela Bay.
AGRICULTURAL RESEARCH TOPICS

RT330 Influence of farm features on dairy cow milk yield (Weeks 3 – 8)
The traditional methods used in dairy farming in Romania are the primary reason for the landscape to have resulted in such high levels of biodiversity. However, economic pressures are high on farmers and so it is essential to understand the landscape features that will improve dairy productivity so that local farmers can manage their livestock in a way that benefits the environment as well as the animals. Project students can evaluate a range of landscape features between farms whilst monitoring the milk yields produced by cattle. These can include distances walked by cattle to suitable pasture, availability of shade and usage of this by cattle, and location of water sources. This project will enable students to gain hands on experience of working alongside livestock as well as developing their knowledge of behaviour sampling techniques.

RT331 Comparison of native and imported livestock breeds for health and production in a traditional farming system (Weeks 3 – 8)
Traditional Romanian livestock breeds were developed over time to suit both the farming landscape and local climate within the region, as well as the uses to which they were put. More recently with the advent of new reproductive technologies, farmers in the Tarnava Mare region have begun to import commercially developed breeds from other European countries and further afield. These newly imported breeds perform well in the commercial settings that they have been developed for but it is unknown how successfully they will adjust to the climate, diet and management of the traditional systems. Student projects in this area can compare traditional to imported breeds, as well as cross breeds, in dairy cattle with regards to a wide range of indicators such as milk yield, health factors (such as mastitis and lameness levels) and behaviour when on, or travelling to, pasture. This project will enable students to develop a wide range of research techniques in animal science including on-site mastitis testing, behaviour sampling and body condition scoring, as well as gaining practical experience working with livestock.

RT332 Selection of feedstuffs by dairy cattle at grazing (Weeks 3 – 8)
The traditional grazing system used in Romania allows livestock to consume a wide range of plant species that would not normally be made available to them in a commercial farm setting. This includes the consumption of several herb species with potential health benefits, such as parasite protection, which raises the possibility that the animals are knowingly selecting these. Student projects in this area would involve the tracking of cattle whilst grazing at pasture in order to record feeding patterns and plant species selected to determine if they are preferentially choosing those with possible beneficial properties. This project will enable students to both gain a deeper understanding of animal behaviour and experience of recording this in the field, as well as developing their plant identification skills.

RT333 Livestock usage in different villages across Tarnava Mare (Weeks 3 – 8)
As farming methods have changed from traditional to modern influenced, a range of systems have developed in villages in Transylvania. In particular, there appear to be differences in the types of livestock held in different villages across Tarnava Mare and this project will attempt to quantify those differences. The project will estimate the livestock breeds (cattle, sheep, goats, pigs, poultry) owned by a series of farms across the Tarnava Mare region and will attempt to identify why such differences may be occurring such as traditional usage, availability of land or economic benefits. Completing this study will almost certainly identify examples of best practice or breeds that are more successful economically and this information could be used to feedback to the farmers.
SPATIAL ECOLOGY AND GIS TOPICS

MN341 Species distribution modelling in Madagascar (Weeks 1 – 6)
Distribution models allow a set of spatial records for a given species (from our database) to be integrated with maps of environmental covariates (e.g., elevation, climate, land cover) in order to construct and validate a statistical model of the probability that a given species will be found in a particular landscape unit. These models can then be expressed as a habitat suitability map. It will be possible for students in 2014 to join one of the science teams and contribute to collecting field data for lemurs, forest birds, wetland birds, or reptiles and amphibians and then use our entire dataset to make models for a set of species using either GLM or Maxent. Outputs from these studies would be very helpful as the maps produced can feed directly into our systematic conservation planning process and inform the management of the Mahamavo region. High quality maps are also excellent communication tools for explaining the significance of the site to decision makers.

MN343 Community ecology in Madagascar (Weeks 1 – 6)
By conducting biodiversity surveys, we build up a knowledge base concerning patterns in the environment. However, in order to make resilient conservation plans for a dynamic future characterised by land cover change, climate change, human population growth and infrastructure development, we need to be able to understand the processes which are affecting the distribution and density of species within the landscape. It would be possible to join the teams conducting field surveys of lemurs, forest birds or reptiles to contribute to data collection, then return to base camp and use our full database linked to our spatial data to infer population processes from patterns of biodiversity. In particular, it would be very useful to test to what extent various species in a particular guild are affected by patch size, edge effects, isolation and compactness and therefore predict the likely consequences for biodiversity of habitat fragmentation in future environmental scenarios.

MN344 Remote sensing and environmental modelling in Madagascar (Weeks 1 – 6)
Freely available satellite images can enable frequent synoptic observations of whole landscapes. However, it is critical to develop and implement methods that convert this stream of raw data into useful knowledge about the state of the environment. It would be possible for dissertation students to undertake projects on classification methods, change detection, multi-sensor fusion, field evaluation of MODIS products, inversion of the satellite signal to biophysical parameters and hyperspectral remote sensing. Students choosing projects in this area will benefit from considerable on-site technical expertise in processing satellite data, will gain a broad experience of remote sensing methods, and become proficient in some advanced techniques. One possible project could involve collecting a field reference dataset using GPS and then making and validating a classifier for temporally coincident moderate resolution multispectral data from Landsat 5, Landsat 7, ALI and ASTER probably using a maximum likelihood approach, but it would be possible to investigate tree-based, Bayesian or object oriented classifiers too. Another project would be to use our existing collections of processed images to evaluate the strengths and weaknesses of a range of change detection methods, including univariate differencing, delta classification and change indices such as the TC disturbance index. In this project it would also be possible to investigate the effects of scale by contrasting results from Landsat-like sensors with coarser-resolution sensors such as MODIS. This project could make recommendations about the best way to operationally monitor the forest using satellite data in the long term. A third project could take the latest fusion algorithms and use them to develop an effective tool (such as a macro or script) which would allow environmental managers in developing countries to be able to combine the latest MODIS reflectance composite with recent Landsat-like data to frequently produced high-resolution images for monitoring purposes. A lot of derived data products are routinely produced from MODIS data for environmental monitoring purposes, in particular...
MOD13 vegetation indices, MOD14 fire products and MOD12 change products. However, before these datasets can be routinely used for monitoring in a particular site, it is important to check that the automatic products accurately capture local scale processes. Mahamavo is an ideal test system to investigate the accuracy of these products in relation to field survey data and higher resolution images since local people frequently burn the forest and savannah and the forest extent is highly dynamic, exhibiting complex patterns of forest loss and regeneration.

MN345 Developing monitoring protocols for REDD in Madagascar (Weeks 1 – 6)
Climate change mitigation initiatives such as REDD have focused attention on the need to be able to monitor carbon stocks and flows in tropical forests in order to administer schemes which compensate local people for avoided deforestation. Field surveys of forest structure, as conducted by Opwall, are an effective means of gathering this data for small areas. However mapping forest biomass over large areas requires the development of methods for inversion satellite signals to estimate biophysical parameters, such as canopy height or basal area. There are a variety of ways doing this from extremely complex physical models of light scattering to artificial neural networks to very simple regression methods. A possible project would integrate satellite data (either Landsat, MODIS or MISR) with field data from forest plots and also measurements taken from interpretation of high-resolution commercial imagery (e.g. Quickbird) to develop, refine and validate a statistical model (or a neural network) to take satellite data and generate maps of forest properties such as above-ground woody biomass.

MN346 Evaluation of biodiversity monitoring methods in Madagascar (Weeks 1 – 6)
It is only worthwhile to commit resources to a biodiversity monitoring programme if the methods being used would permit a significant trend of a certain magnitude in an indicator (say, 10% decline) over a specified period (say, over 3 years) to be detected with a desired level of confidence (e.g. 95%). Whether a particular method (e.g. forest bird point counts) will satisfy these criteria depends on the number of sample units, their spatial distribution, the number of sampling occasions on each unit each year, the prevalence in the landscape and detectability of the species of interest, the underlying variance in the state parameter estimated (i.e. density, occupancy, relative abundance), and the level of disaggregation of the indicator. Students with strong statistics skills could use our monitoring data from 2009, 2010, 2011, 2012 and undertake a power analysis focused on a particular group e.g. birds, lemurs, reptiles and amphibians and contrasting the indicators derived from GLMM, distance sampling and occupancy models. It would be extremely useful to confirm by power analysis or simulation that our monitoring and data assimilation methods are effective in meeting the aims of the monitoring programme, or to identify ways in which the allocation of effort to occasions or sampling units could be refined to make our monitoring more powerful.

HM347 Determining the likely impact of climate change on altitudinally sensitive species in isolated Honduran Cloud forests (Weeks 2 – 6; need to have completed HM001)
Cloud forests are often described as ‘sky islands’ were species adapted to their conditions are often isolated on mountain tops surrounded by a sea of human disturbance in the lowlands. Cusuco National Park is home to six species of endemic amphibians and numerous endemic invertebrates (for example, two species of Jewel scrab beetles). These species exhibit a strong altitudinal cline with either higher or lower abundances at the lower or high altitudes within Cusuco National Park. Dissertations students or Research Assistants can join either the Herptile or Invertebrate Survey Teams to survey either the endemic amphibians or invertebrates. Species occurrence records generated throughout the season will be added to an existing database of records from 2006. These will be used for Species Distribution Modeling using the software programme MAXENT. Using Geographic Information System (GIS) layers for mean annual temperature, precipitation and topographical variables such as slope or distance from water the bioclimatic envelope of each species will be determined accounting for topography and habitat. Established models for projected climate change will be downscaled to a 30m resolution and the bioclimatic envelopes will be projected into the future to determine the likely impact of climate change and future climatic space available for the park endemics. We hypothesize that the climatic space will be reduced as alitudinally sensitive species are pushed to higher elevations due to increasing temperatures in the surrounding lowlands.

RT347 Distribution of abandoned land in the Tarnava Mare Reserve (Weeks 1 – 6)
Land abandonment is one type of agricultural change driven by membership of the EU and associated policy and socio-economic changes. This project seeks to better understand the process of abandonment and the factors behind such land use change. Fieldwork will involve mapping the location and extent of abandoned farmland for each village. GIS-based spatial analyses can then be used to investigate distribution patterns: the degree to which abandoned land is clustered or randomly dispersed across the landscape, and whether there are characteristic field shapes and sizes. Further analysis will investigate the influence of various factors on the likelihood of abandonment, such as topography (steepness of slope and altitude), distance to the village and soil characteristics.
CONSERVATION MANAGEMENT RESEARCH TOPICS

IH350 Assessing the impacts of tourism in the Wakatobi Marine Park, Indonesia (Weeks 4 – 8; need to have completed IH009)
In recent years, the Wakatobi has gone from a little known remote park in Indonesia to one of the most widely publicised dive tourism destinations in the country. The marine park has witnessed dramatic changes in terms of tourism facilities, with two commercial airstrips, more accommodation options and regular flights which have effectively opened up the park for tourism. As tourism becomes ever more important to the local economy, it is important to understand what policies are in place to promote tourism and the extent to which these impact upon environmental, economic and social conditions within the park. This project can take a number of directions, depending on the specific interests of the student.

One project could focus upon the economic benefits associated with tourism activity, considering how the primary and secondary financial inputs associated with Operation Wallacea are distributed amongst individuals and local communities. This would be suited to students with interests in human geography, tourism management or economics. A second option could examine the notion of carrying capacity in the context of the Wakatobi. There are many ways in which tourism carrying capacity is defined and measured and this project could evaluate alternative measures to identify an appropriate version of carrying capacity for island tourism in developing countries. This would be suited to students with a background in tourism, environmental management or sustainability. A third option within this programme could focus on the socio-cultural impacts of tourism in the Wakatobi. There are a number of different forms of tourism taking place in the park, involving different types of tourists and different ranges of activities. The extent to which these impact upon local communities’ structures, individual attitudes and daily routines would be of direct importance to understanding how appropriate forms of tourism can be promoted. This project would be suited to students with a background in human geography, sociology, anthropology or tourism management.

IH351 Exploring the potential for REDD+ in Wakatobi communities (Weeks 4 – 8; need to have completed IH009)
REDD is the acronym for Reducing Emissions from Deforestation and Forest Degradation in Developing Countries and is one of the most important initiatives intended to mitigate the impacts of anthropogenic climate change worldwide. REDD-type policies involve payments to local resource owners and users in return for agreed actions relating to emissions reduction.

REDD+ is a related set of programmes that move beyond forest conservation to include activities designed to conserve and enhance carbon stores. This includes both terrestrial and marine environments as reefs, mangroves, seagrasses and salt marshes as well as forests are important stores of carbon. REDD+ policies have yet to be systematically implemented on a large-scale but countries such as Indonesia, with its remaining forest cover and areas of high quality marine habitats, are prime potential locations for such activities. This project is designed to scope out the potential for REDD-type projects in the Wakatobi and the extent to which these could realise economic benefits for local communities. This will involve identifying the barriers, which could be economic, political or cultural, to designing such policies in the context of the Wakatobi National Park and evaluating these in light of the theoretical context associated with REDD+.

The project could also examine the likelihood of equitable distribution of any economic benefits associated with REDD+ and the extent to which these may provide sufficient incentive for participation within local communities.

IH352 Supporting fisheries management policies in the Wakatobi (Weeks 4 – 8; need to have completed IH009)
The Wakatobi marine park authorities implemented a revised zonation plan in 2007 which is intended to conserve and manage fish stocks whilst enabling local communities to meet their needs. As part of this process, policies designed to facilitate greater control over total fishing effort are being explored and implemented by Operation Wallacea in the fishing communities around Hoga. These include vessel registration and the design of local byelaws to restrict the use of certain types of fishing gear, both of which have been crucial in managing the impacts of fishing activity. However, a longer term objective is to reduce the number of participants in the fishery through the ‘buy-out’ of 30% of the licenses issued. This policy, which is widespread elsewhere in fisheries management, requires a considerable sum of money to support the buyout process. This project will examine the viability of the options which have been identified to generate the money required, which include a processing plant for seaweed which is widely cultivated in the region. As the seaweed is exported unprocessed, the value of the product is minimal and this could be remedied through the construction of a processing plant servicing local seaweed cultivators. This would require a close degree of cooperation between local seaweed farmers, the building of a strong business model and the voluntary participation of many local individuals. The project can examine these and other issues which will determine the viability of this programme and identify options and mechanisms which could facilitate its success and serve as a model for other similar programmes.

DISSESSATION/THESIS TOPICS
the last decade has occurred alongside the emergence of schemes such as biodiversity offsets,Forested land in Madagascar both within and outside protected areas has been officially
(Weeks 1 – 6)
All the information collected will ultimately inform the application to the REDD+ scheme.
to determine the wealth status of villagers and how this is related to deforestation in Buton.
Anoa; cash and non-cash incomes and a variety of other indicators. The results will be used
extraction; the level of non-timber forest product (NTFPs) collection; illegal hunting of
Surrounding LFR and NBFR. Information collected will include; data on illegal timber
socio-economic information of villages surrounding the area is also required.
This project will focus on collecting socio-economic information from the villages that
community of Mariarano benefits in various ways from the tourism, with the provision of
direct payments, and forest related emissions reductions/mitigation schemes under the Clean
Development Mechanism (CDM) and Reduced Emissions from Deforestation and Forest
Degradation (REDD). These new innovative models of conservation within inhabited
multiple use protected areas combined where local communities have significant natural
resource dependency and often live in poverty has brought into sharp focus the importance
for the promoters of conservation to better understand and recognise the customary systems.
Students choosing this option will work in partnership with a Malagasy student and carry
out spatial and social surveys to map and document the customary rights and land tenure
systems in different parts of the Mahamavo forest. The studies will contribute to a broader
effort in Madagascar to inform the forest tenure policy processes, to ensure that protected
areas better recognise the customary system, and the rights of Malagasy forest people to legally
(and sustainably) use the natural resources in their ancestral forests.

MN357 Economic impacts of tourism and conservation in the Mahamavo forests, northern Madagascar (Weeks 1 – 6)
Community Based Tourism and Ecotourism are frequently adopted as strategies to provide
alternative livelihoods for communities living in and adjacent to protected areas in
Madagascar. The community of Mariarano benefits in various ways from the tourism, with the provision of
direct employment in tourism and through opportunities for local entrepreneurs to provide
services to visiting tourists and groups. Conservation activities in the Mahamavo area
implemented by international and local NGOs has also provided some employment and
livelihood activities. Students choosing this topic will work in partnership with a Malagasy
student to assess the economic impacts for local people in Mariarano from tourism and
conservation. Using quantitative surveys, and participatory rural appraisal tools, the
dissertations will examine the relative benefits accrued from the different revenue streams
from tourism and conservation.

MN358 Assessment and valuation of ecosystem service provision in Madagascar (Weeks 1 – 6)
Local people in poor rural villages such as Mariarano depend on the natural environment for
almost all their daily needs. In the Mahamavo region the main economic activities are rice
agriculture, fishing, charcoal production and zebu pastoralism. There is considerable scope to
work with local people and our social scientists to elicit this traditional ecological knowledge
and develop a conceptual model of which provisioning ecosystem services are considered
important (e.g. the fisheries, fresh water, pasture for zebu, wood from the forest), who uses
the services, how far they travel to obtain services, what kind of forest/lake/mangrove etc is
most suitable for a particular resource use and whether it is possible to place monetary value
on any services (e.g. with market prices or substitution costs). The next step might then be to
cross-walk this information into parameters of GIS models for the probability that landscape
units will provide particular services. In this way it should be possible to build a robust map
of ecosystem service provision across the landscape. Such outputs would be extremely useful
in conservation planning, especially if they can be compared with maps of biodiversity value.

III.533 Quantifying the resilience of marine dependent communities to climate change
and resource depletion in Indonesia (Weeks 4 – 8; need to have completed III009)
The traditional Bajo fishing community living on Sampela, a still island located 500 metres
from the land, has been settled for over 70 years. Before the settlement period families were
nomadic, moving between fishing grounds and trade points. Population levels are increasing
year on year, with high levels of in and out migration and in recent years there has been an
increase in social infrastructure including a new school and medical centre. The community
traditionally lived a subsistence existence but due to the arrival of modern fishing techniques,
extended access to markets and increasing aspirations, the Bajo fishing effort has increased
dramatically. With a decline in fisheries and an increase in living costs the community has
developed a number of livelihood strategies, which include a series of strategic livelihood
diversifications. The Bajo have had to develop a flexible annual livelihood strategy not only
to accommodate seasonal weather patterns, which significantly affect fishing outputs, but
also to account for environmental resource use regulations, a marginal location and
fluctuations in the market. Projects could be developed to investigate the growth of
alternative incomes, including seaweed (agar) farming and its potential to contribute towards
household incomes. Bajo communities are also characterised by strong ties across large
maritime spaces, based on family ties, trading networks and history. These offer
opportunities for research into the drivers of migration, both temporary and permanent,
within Bajo in Indonesia, at this has significant implications both for marine resource
management and conservation along with Bajo adaptation and resilience to environmental stress.
Another project area could examine changes in Bajo society through comparison with
Butonese communities on the island of Kaledupa, looking at issues of natural resource
ownership and participation in infrastructure development activities.

III.534 Examining the roles of NGOs and government in improving natural resource
management in Indonesia (Weeks 4 – 8; need to have completed III009)
Moves towards greater democracy and accountability within government in Indonesia have
led to the rapid devolution of decision-making power away from the capital of Jakarta
towards local and regional government. This process, which occurred in reaction to the
Corruption of the Suharto period, is one of the most important issues determining the future
of natural resource management and conservation within Indonesia. This project is therefore
designed to explore how village-level government and non-governmental organisations
operate. It will focus on their capacity to take on some of these decision-making roles,
particularly those relating to marine resource management, tourism, fishing and other
marine-based activities. By law, every village in Indonesia has a large number of local
voluntary ‘groups’, all of which can be included in this work. At the same time, the
increasing openness of Indonesian society has allowed local NGOs to flourish and they play a
vital role in the devolution process. The project will therefore also examine how local NGOs
operate, which areas they choose to become involved with and why, the level of
independence and freedom they enjoy and the factors which may constrain or limit their
activities. The role of the Wakatobi district level government will also be examined, as district
government is highly influential in determining the amount of national funding allocated for
development projects received by the Wakatobi. This project will therefore examine some of
the key processes determining how marine natural resources are managed within the
Wakatobi and offer prospects for improving this in the future.

II.355 Relation between income levels in communities surrounding the Buton forests,
Indonesia and deforestation rates (Weeks 2 – 8; need to have completed IN001)
This project will focus on collecting socio-economic information from the villages that
surround Lambasungo Forest Reserve (LFR) and the North Buton Forest Reserve (NBFR) to
inform an application for REDD+ funding. The REDD+ scheme provides developed
countries with an opportunity to offset carbon production by purchasing carbon credits from
developing countries with large natural forest resources. If an area is to qualify for this
scheme then socio-economic information of villages surrounding the area is also required.
Socio-economic information will be collected via face-to-face interviews within villages
surrounding LFR and NBFR. Information collected will include; data on illegal timber
extraction; the level of non-timber forest produce (NTFPs) collection; illegal hunting of
Anoa; cash and non-cash incomes and a variety of other indicators. The results will be used
to determine the wealth status of villagers and how this is related to deforestation in Buton.
All the information collected will ultimately inform the application to the REDD+ scheme.

MN356 Forest land tenure and conservation revenue sharing in protected areas of
northern Madagascar (Weeks 1 – 6)
Forested land in Madagascar both within and outside protected areas has been officially
considered as being owned by the state since the colonial era, while complex and nuanced
customary rights and tenure systems exist as a parallel but largely unrecognised de facto
traditional system. The rapid expansion of the coverage of protected areas on the island in
the last decade has occurred alongside the emergence of schemes such as biodiversity offsets,

ADVANCED FIELD PLACEMENTS

These placements are for medical students who have completed their degrees and are moving into the clinical phase and are designed to give field experience of expedition medicine. There is an expedition medicine experiential medicine course (HM010) but that is for pre-med students whereas these placements are for 8 weeks starting on 11 June 2014 in Honduras and give students the opportunity to work alongside a wide range of doctors at different research camps to learn about issues ranging from tropical diseases to hyperbaric medicine. On this placement you sign up for the Jungle training and Neotropical Forest Ecology course (HM001) for your first week and then spend a week at Base Camp working with the medical staff supporting the cloud forest ecological research team (HM101). At this camp you can also complete a short course on how to extract DNA under field conditions. Teams at this camp are working on electrofishing surveys of the headwater stream fish communities, epiphyte distribution in the canopy, completing a botanical inventory of the Park, identifying levels of chytrid infection of amphibians and many other projects which you would have the chance to join in your spare time.

For the next 2 weeks you would be on placement supporting the medical staff at two different field camps in the Casuco National Park (HM102). These camps are much more remote and you are living in hammocks or tents deep in the forest. Here medical emergencies are hopefully fairly infrequent and you get the chance to join the research teams who are working on dung beetle, moth, amphibian, reptiles, bird and large mammal standard monitoring programmes.

For the next 2 weeks you would move to Utila and learn to dive (HU004) followed by completing a Caribbean reef ecology course (HU007). On Utila our partners run the hyperbaric chamber and we have medics who are experienced in dive medicine so you would gain some experience of hyperbaric medicine and issues likely to arise on dive based expeditions. You would then go to the coastal reefs around Tela and join the research teams there completing stereo video surveys of the reef fish communities and the video transect surveys of the benthic communities (HT106). There are medical staff at this base as well and you would be working with them and gaining experience of how to provide support to dive based expeditions.

At the end of this 8 week period you would have had a range of expedition medicine experience as well as gaining skills in jungle survival and diving and having had a range of biodiversity monitoring experiences. Each of the different medical staff (6-7) who would have been mentoring you at the various camps would sign you off as having received relevant experience in different aspects of expedition medicine. The costs for the 8 week medical elective experience are £3,800 or $5,500.
Masters by Research

A number of students, after having completed their undergraduate research projects with Opwall working in remote and beautiful locations, would like to spend much more time doing an in-depth study for a Masters based in the field rather than doing a more traditional taught Masters course at a university. The costs of doing a traditional Masters course include the not insubstantial living costs of being based often in a large city (room rent, food, accommodation, heating etc) whilst studying at the university. For £1200 a month, which is not much more than the European or North American monthly living costs you can be based in one of the Opwall Wallaces and have all your food, accommodation, transport, guides, diving costs etc covered and complete your Masters based out in the field. In addition at each of the sites we run a Teaching Fellowship Award scheme for the best students where the monthly living costs are waived in exchange for helping with the main Opwall research programmes from mid June to mid August. Doing a field based Masters has a massive advantage that your CV/Reumid is considerably strengthened by having completed a research project based in an overseas location as well as having made valuable friendships and contacts in the wildlife conservation world in those countries that will hopefully stand you in good stead for your career. Note in addition you would need to pay your flight costs to site.

From September 2014 there are 4 universities which are offering a Masters by Research option where the majority of the time is spent in the field. The Masters research projects are based on the Peruvian Amazon, two game reserves in South Africa, a research centre in the Ecuador cloud forests and at a marine research site in the centre of the Coral Triangle (the triangle of most diverse reefs in the world) in Indonesia. Each of these sites has a portfolio of background papers, data sets and research questions that have been developed by the Opwall academic teams and the reserve managers as research topics available for those completing a Masters by Research.

In order to qualify for one of these placements the student has to apply first to Operation Wallacea (email to masters@opwall.co.uk) and for the 2014/15 intake of Masters by Research students the deadline for applications is 15 March 2014 although applications can be processed at any time up to this deadline. In approving applications for acceptance of one of these placements, preference will be given to those students who have completed their usual taught Masters dissertation or have worked as wallaces in the field previously. The reason for this is that if you are doing one of these projects you will be living in the bush, on a remote desert island or on a research ship/station in the Amazon so we need to be sure that you are suited to this sort of independent living and research.

Once you have been accepted onto the Opwall Masters volunteer pool which will require payment of a deposit, you then need to apply to one of the universities listed below for their Masters by Research option. If you are not accepted onto a Masters by the university then the deposit paid to Opwall is refunded in full.

Durrell Institute of Conservation Ecology, University of Kent – Amazon Projects

(see: http://www.kent.ac.uk/courses/postgrad/application/index.html for application forms)

Those students wanting to work in the Peruvian Amazon would apply to the Durrell Institute of Conservation and Ecology (DICE) at the University of Kent and if accepted you would pay the tuition fees (£3900 tuition fees + £1000 bench fees for European students or £13,180 tuition fees + £16,200 tuition fees for overseas students) and start in September. The first 4 months would be spent at Oxford Brookes University completing various modules and meeting with your dissertation supervisor to complete your research plan. Then from January, you would be based in either the Pongola or Welgevonden reserves in South Africa completing your research with safety vehicles and specialist guides assisting. Academic supervision would be by email with on site supervision during the write up phase in mid June to mid August. The theses would then be examined in Oxford Brookes during October. The field costs payable to Opwall cover food, accommodation, visa costs, use of the research boats and equipment, field assistance with experienced guides and academic supervision. Those students wanting to work on the elephant behaviour and ecological impact projects or on various aspects of big game ecology in South Africa would apply to Oxford Brookes University. If accepted you would pay the tuition fees (£3900 tuition fees + £1000 bench fees for EU students and £13,180 tuition fees + £16,200 bench fees for overseas students) and start in September. The first 4 months would be spent at Oxford Brookes University completing various modules and meeting with your dissertation supervisor to complete your research plan. Then from January, you would be based in either the Pongola or Welgevonden reserves in South Africa completing your research with safety vehicles and specialist guides assisting. Academic supervision would be by email with on site supervision during the write up phase in mid June to mid August. The theses would then be examined in Oxford Brookes during October. The field costs payable to Opwall cover food, accommodation, visa costs, use of the equipment and field assistance with experienced guides.

Oxford Brookes University – South Africa Projects

Those students wanting to work on cloud forest projects in Ecuador would apply to Sussex University. If accepted you would pay the tuition fees (£5000 tuition fees + £1000 bench fees for European students or £13,950 tuition plus £1000 bench fees for overseas students) and start in October. From October to February you would complete taught modules at Sussex University in Tropical Marine Resources, Tropical Marine Systems, Tropical Marine Practical Skills and Professional Skills in Tropical Marine Biology. Then from March to August you would be based at the Hoga Island marine research centre in the heart of the Coral Triangle. There would be an introductory 3 week field course on site and you would then complete research for your thesis until August with submission of the final thesis in September.

The Hoga Island marine research station is well set up with boats, a dive centre, computer network, dry and wet labs etc. Accommodation is in stilted cabins with individual bathrooms. This research centre has produced more than 90 peer reviewed publications over the last 7 years and publications are currently at around 20 per year. There are projects here on various aspects of reef ecology, mangroves and intertidal communities and it gives you the chance to spend a few months living on a remote desert island and diving on the most biologically diverse reefs in the World. The Opwall costs cover your food, accommodation, diving and safety cover at the research centre.

Sussex University – Ecuador Cloud Forest Projects

(see: http://www.sussex.ac.uk/study/pg/applying2014entry/onlineapplicationforapplicationforms)

Those students wanting to work on cloud forest projects in Ecuador would apply to Sussex University. If accepted you would pay the tuition fees (£3900 tuition fees for EU students and £16,200 tuition fees for overseas students) and start in September. The first 4 months would be spent at Sussex University completing various modules and meeting with your dissertation supervisor to complete your research plan. Then from January, you would be based in Ecuador completing your research with specialist guides assisting. Academic supervision would be by email with on site supervision during the write up phase in mid June to mid August. The theses would then be examined in Sussex during October. The field costs payable to Opwall cover food, accommodation, visa costs, use of the equipment and field assistance with experienced guides.
Whilst the brochure is designed to give basic information about the research and facilities, there is much more information on the Opwall website (www.opwall.com), including 2-3 page detailed descriptions with suggested reading lists for each of the dissertation topics. Information on the travel, facilities at each site, kit lists and health and safety information. In addition, there is a library of reports and papers published from the research sites and short videos from each of the sites or groups of dissertation or independent research project topics so you can get a better idea of what is involved.

One of the best ways to learn about what it is like on one of the expeditions is to attend one of the presentations or project selection meetings at universities in the UK, Ireland, USA and Canada (details on Facebook for each of the presentations). In addition, a series of webinars is being run in the autumn where you have the opportunity to talk directly to some of the key staff in each of the countries. Of course, the fastest way to find out about a project is just to pick up the phone and talk to one of the Expedition Advisers in the Opwall offices who have direct experience of the country or research topic of most interest to you.
PRICES AND ORGANISING YOUR EXPEDITION

PRICES FOR RESEARCH ASSISTANTS AND DISSERTATION OR INDEPENDENT RESEARCH PROJECT STUDENTS

The costs of the expeditions are the same for each country as listed below. These costs include all the food, accommodation, £1 million medical and evacuation insurance cover, participation in the survey programme, training courses such as jungle training and forest ecology and dive training to PADI Open Water, medical and safety cover and transfers around the projects from the start point to end point of each expedition.

<table>
<thead>
<tr>
<th>EXPEDITION LENGTH</th>
<th>PRICE IN UK £</th>
<th>PRICE IN US $</th>
<th>PRICE IN CAN$</th>
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<tr>
<td>2 WEEKS</td>
<td>1,150</td>
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<td>8 WEEKS</td>
<td>3,800</td>
<td>5,500</td>
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</table>

Note you need to pay in the currency of your resident country if that is £ sterling, US$ or Can$. If it is none of these currencies then you need to contact the UK finance office.

WHAT IS NOT INCLUDED?

The main additional cost is that involved in getting to site and this depends from which country you are starting and which expedition you wish to join (see Flights section below). On-site virtually everything is included in the expedition price except for: any insurance cover needed beyond medical and evacuation cover provided by Opwall (see insurance below), costs of additional elective training (e.g. canopy access course, dive training to higher levels than Open Water - PADI Open Water dive training is free on Opwall expeditions), dive equipment rental, PIC cards and PADI training books, local taxes and Park entry fees. The detailed guidance notes on the Opwall website for each country quantify any additional costs but these are not substantial in any of the countries.

INTERNATIONAL FLIGHTS

Once you have booked on then we have a Bookings Team based in Opwall who will liaise with travel agents and obtain the best quotes for your international flights. We will be using Round the World Experts RTWE (www.roundtheworldexperts.co.uk) as the preferred travel agency for most countries except where we have specialist travel agencies (e.g. Victor Travel for Canadian departures and Special Delivery Travel for Maltese departures) or there are low cost airlines (e.g. Wizz Air for UK departures to Transylvania). RTWE have numerous offices around the world and can provide competitive prices for departures from most European countries, US, China and Australia. Once you are satisfied the best international flight quote has been obtained then they can make the booking directly with the travel agency in their country.

ROUND THE WORLD EXPERTS CONTACT DETAILS:

email: opwall@rtwexperts.co.uk
Tel: 08444 535956
International contact: ++44(0)203 056 1130

If you are booking international flights departing from a country other than the UK then please email RTWE and they will direct you to their counterpart agency. For those booking flights from the US please email usa@opwall.com and they will forward your requirements to a couple of competing flight providers. The advantage of using this system for booking your own international flights is that you can use the markets to get the best price on flights.

IN-COUNTRY TRAVEL

The in-country travel arrangements can be handled through the Opwall office making it much simpler for you to arrange your travel to and from the start and finish points of the expedition. Once you have your international flights booked, the Bookings Team will organise the transfers to and from the start and finish points of the expedition using the in-country travel agents and NGOs that have organised these transfers for the last few years for Opwall expeditions. Payments for these internal transfer packages can be made directly to your local Opwall office so there is no need to make international bank transfers.

ATOL

All the flights and flight-inclusive packages prepared by the Operation Wallacea Bookings Team are financially protected by the ATOL scheme. When you pay you will be supplied with an ATOL certificate. Please ask for it and check to ensure that everything you booked (flights, hotels and other services) is listed on it. Please see our booking conditions for further information or for more information about our financial protection and the ATOL certificate go to: www.atol.org.uk/atolcertificate

INSURANCE

Opwall has insurance in place to provide medical and repatriation cover up to £1 million for all participants in the expedition. We do this through Cover-More who are a global insurance company covering in excess of a million travellers every year. Detailed medical and evacuation plans are sent to Cover-More’s medical emergency team in advance of the expeditions. If there are any medical issues on the expeditions all plans have been agreed in advance so there are no delays in providing any medical support that might be needed. The medical and repatriation cover provided by Opwall also covers travel to and from the site. In addition to this medical and repatriation cover provided by Opwall, it is strongly recommended that you have top-up insurance (which can be arranged by Flight Centre Group) to cover the following items:

- If you have an existing medical condition that may be exacerbated by the expedition and require additional medical treatment in hospital other than that provided by the Opwall medical staff in the field at each site, or may even require repatriation in severe cases, then the Opwall medical and evacuation cover will not cover the costs of this additional medical treatment and evacuation. For pre-existing medical conditions then specialist insurance cover can be obtained from the Flight Centre Group.

- Need to cancel the expedition and flights because of illness to you or a close family member, call for jury duty or other insured conditions making it impossible to reach the departure point for the trip.

- costs of re-booking connecting flights, boat or overland transfers to the start and from the finish points of the expedition in the event of delays caused in connecting flights or overland transfers due to delayed flights, ferries or buses because of mechanical breakdown of transport or adverse weather conditions, strikes, industrial action, riot or civil commotion, bomb scares, criminal or terrorist acts, etc.

- loss of personal baggage, clothing or items such as cameras or electronic items or the costs of having to buy replacement items if baggage is delayed.

For UK residents, a special policy which dovetails into the medical and repatriation cover provided by Opwall can be obtained from the Flight Centre Group, and when you book your international flights they will let you know about this. Alternatively you can contact them at opwall@rtwexperts.co.uk (or call 08444 535956). For residents of countries outside of the UK and Ireland, please contact your Flight Centre Group consultant for details of insurance that will be appropriate for your trip. Note for Canadian volunteers joining the expeditions all the travel insurance elements described above are included in the package provided by Victor Travel.
When faced with the opportunity of a lifetime there tends to be only one major factor that holds people back... expense! Most students who join the expeditions do not have the money needed and therefore have to obtain a percentage from fundraising. Remember you are fundraising to join projects that are successfully conserving important habitats and species as well as increasing income for local communities and this type of activity generally has widespread support amongst people and organisations.

When you confirm your expedition, in your confirmation email we will send you a link to a password protected webpage which gives details of grants and other information. Experienced fundraisers are employed at the various offices to help students raise the funds needed and they will be happy to have a chat on the phone or by Skype with you to help develop your fundraising plan. In universities where there are groups of students joining the expeditions, a professional fundraiser will meet with the group and help them plan their fundraising programme.

There are many ways of raising funds but they generally fall into the categories:

- **University Grants** – most universities have a number of grants available (US universities in particular if you are obtaining course credits) from their department or student services.

- **External grants and commercial sponsorship** – in the UK, there are hundreds of Trusts and conservation charities that can be approached for support to participate in a real scientific survey programme. If you have worked at a large company during your holidays, it is worth approaching them also for support. Charitable organisations (e.g. Rotary or Round Table) are also often keen to support this type of activity.

- **Wallace Biodiversity Awards** - these are grants available by applying to Opwall that are available to a few of the best UK and US based research assistants or dissertation/independent research students. There is a competitive application process (see www.opwall.com/wallacebiodiversityawards) and the winners are announced on 15 April each year.

- **Raffles** – in the UK, Operation Wallacea has organised a major national raffle with a car as the first prize. Tickets are sold by students at 65p profit per ticket and the proceeds of the raffle are donated to the Operation Wallacea Trust (charity no. 1078362). Selling these tickets at major events (e.g. sports events, social events, etc.) can result in a substantial income.

- **Fundraising events** – e.g. bag packing, seasonal events, band nights, theme parties, conservation dinners, car boot sales, tag sales, etc.

- **Sponsored activities** – e.g. sponsored hikes, abseils, swims, etc.

- **Working for it!**

**PREPARING FOR YOUR EXPEDITION**

The Opwall website (www.opwall.com) has detailed information about how to prepare for your expedition as well as risk assessments and health and safety information for each of the sites. Country specific webinars are run by staff with direct field experience in that country, a few months before the expedition starts to describe the conditions, what to take and to answer the numerous questions that arise when going to such remote locations.

**FUNDRAISING**

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</tr>
</tbody>
</table>

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**ORGANISING AN EXPEDITION**

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68
The start point of the expeditions is Labundo on Thursday at 0800hrs and if your last week on one of the forest projects then the finish point is in Labundo on Wednesday at 0800hrs. If your projects start on the marine side then the start point is week is Hoga Island in the Wakatobi Marine National Park on Thursday at 1200hrs and the finish point is Hoga Island on Wednesday at 0800hrs. You need to be in Makassar (known as Ujung Pandang on airline schedules) by the Tuesday before your expedition starts and can organise your international flights from Makassar back home from the Wednesday after 1600hrs after your expedition finishes.

Note you can only change between the Buton forests and Hoga Island after spending a minimum of 2 weeks at one of those sites. Thus if you are going to the forests you need to spend at least two weeks there before moving to the marine sites.

### INDONESIA DATES

<table>
<thead>
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<th>2014 WEEK NUMBER</th>
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<th>FINISH DATE</th>
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<td>2</td>
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### HONDURAS DATES

For those starting in the forest, expeditions start in San Pedro Sula on Wednesday at 0700hrs. For those starting on one of the marine sites, the expeditions start in the town of La Ceiba on Wednesday at 1400hrs. The end point for volunteers leaving from the forest sites is San Pedro Sula on Tuesday at 1200hrs. The end point for volunteers leaving from the marine sites is La Ceiba at 0800hrs on Tuesday for those leaving from Utila, and Tela at 0800hrs on Tuesday for those leaving from Tela. You will need to book your flight into San Pedro Sula on the Tuesday before the expedition and you can book your flight leaving San Pedro Sula anytime after 1400hrs on the Tuesday at the end of the expedition.

Note you can only change between Cusuco, and either of the marine sites after spending a minimum of 2 weeks in the forest. Thus if you are going to Cusuco you need to spend at least two weeks there before moving to one of the marine sites.

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SOUTH AFRICA DATES

2014 EXPEDITION START DATE FINISH DATE
NUMBER
Expedition 1 Saturday 14 June 2014 Friday 11 July 2014
Expedition 2 Saturday 5 July 2014 Friday 1 August 2014
Expedition 3 Saturday 26 July 2014 Friday 22 August 2014
Expedition 4 Saturday 14 June 2014 Friday 11 July 2014
Expedition 5 Saturday 12 July 2014 Friday 25 July 2014
Expedition 6 Saturday 26 July 2014 Friday 8 August 2014

PERU DATES

2014 WEEK NUMBER START DATE FINISH DATE
1 Sunday 15 June 2014 Friday 20 June 2014
2 Sunday 22 June 2014 Friday 27 June 2014
3 Sunday 29 June 2014 Friday 04 July 2014
4 Sunday 06 July 2014 Friday 11 July 2014
5 Sunday 13 July 2014 Friday 18 July 2014
6 Sunday 20 July 2014 Friday 25 July 2014
7 Sunday 27 July 2014 Friday 01 August 2014
8 Sunday 03 August 2014 Friday 08 August 2014

All expeditions start at Iquitos airport on a Sunday at 1200hrs and finish at Iquitos airport on a Friday at 2000hrs. Research Assistants can only start in weeks 1, 3, 5 or 7 whilst dissertation students because of time constraints can only start in weeks 1 and 3. You need to arrive in Iquitos on the Saturday before your expedition start date and to book your return flights from the Saturday after their expedition.

The Research Assistant expeditions start on a Saturday at 0800hrs at Thanda Reserve or in the Lowveld and finish on a Friday at 0800hrs in the Lowveld for the terrestrial only programmes, or on a Friday at 0800hrs at Sodwana Bay for the terrestrial/marine combination programmes. Note Research Assistants must sign onto a specific expedition, some of which are solely based at a terrestrial site, whilst others have the final week based at our Indian Ocean marine site in Sodwana Bay.

If you are doing a dissertation in Welgevonden then the expedition starts on a Saturday at 0800hrs and finish on a Friday at 0800hrs at the Welgevonden Reserve. If you are doing a dissertation in Pongola then the expedition starts on a Saturday at 0800hrs and finish on a Friday at 0800hrs at the Pongola Reserve. All dissertation projects start in Week 3 last for six weeks.

Volunteers will need to arrive in Johannesburg on the Thursday afternoon so they stay overnight, or arrive before 08:30 on the Friday and are in plenty of time to join the in-country transfers leaving on the Friday morning to the start of the expeditions. Flights back from Johannesburg can be arranged from 2000hrs on the Friday of the expedition finish date.

ORGANISING AN EXPEDITION

2014 EXPEDITION NUMBER START DATE FINISH DATE
Expedition 1 Saturday 14 June 2014 Friday 11 July 2014
Expedition 2 Saturday 5 July 2014 Friday 1 August 2014
Expedition 3 Saturday 26 July 2014 Friday 22 August 2014
Expedition 4 Saturday 14 June 2014 Friday 11 July 2014
Expedition 5 Saturday 12 July 2014 Friday 25 July 2014
Expedition 6 Saturday 26 July 2014 Friday 8 August 2014

2014 EXPEDITION NUMBER START DATE FINISH DATE
Dissertation Saturday 28 June 2014 Friday 8 August 2014
Expedition 1 Saturday 14 June 2014 Friday 11 July 2014
Expedition 2 Saturday 5 July 2014 Friday 1 August 2014
Expedition 3 Saturday 26 July 2014 Friday 22 August 2014
Expedition 4 Saturday 14 June 2014 Friday 11 July 2014
Expedition 5 Saturday 12 July 2014 Friday 25 July 2014
Expedition 6 Saturday 26 July 2014 Friday 8 August 2014

Saturday 28 June 2014 Friday 8 August 2014
**MADAGASCAR DATES**

The Mahamavo projects in northern Madagascar start on a **Sunday** at 1300hrs and finish on a **Saturday** at 0800hrs at Mariarano village. The Nosy Be projects start on a **Sunday** at 1200hrs and finish on a **Saturday** at Nosy Be airport. Research Assistants can only join the expeditions in week 3 for Mahamavo sites and weeks 3, 5 or 7 for Nosy Be whilst dissertation students can only join in week 1. Volunteers moving between the forest and the marine sites can only do so at the end of weeks 4 and 6. Note the costs for this transfer are not included in the expedition costs and these will be charged as part of the internal transfer package needed to get to the start and back from the finish of the expedition if you are including a marine element in your expedition.

Volunteers joining the forest project need to arrive in Antananarivo by the Friday before their project starts. Note: Air Madagascar, which has exclusive use of the internal Madagascar routes has a habit of switching schedules at the last minute so plenty of time is required to allow for the possibility of going overland if need be. If you are returning from Mahamavo at the end of your expedition then you should be able to schedule your internal flights leaving Antananarivo for the Monday morning.

For those starting their expedition in Nosy Be you should be able to book your flights all the way through to the island so you arrive on the Sunday morning or the Saturday evening before and leave from Nosy Be on the Saturday after 1000hrs on the end date of your expedition.

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**MAYAN FORESTS, YUCATAN (MEXICO) DATES**

The expeditions start on a **Monday** at 1300hrs at Calakmul Biosphere Reserve or Akumal in the Yucatan Peninsular of Mexico and finish on a **Sunday** at 1200hrs. Research Assistants can only join the expeditions in weeks 1, 3, 5 and 7 whilst dissertation students can only join in weeks 1 and 3. Volunteers moving between the forest and the marine sites can only do so at the start of weeks 3, 5 and 7).

Volunteers need to arrive in Cancun by 1400hrs on the Sunday before their expedition starts and to organise flights leaving Cancun after 1800hrs on the Sunday of the last day of their expedition.

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GUYANA DATES

The expeditions start on a **Tuesday** at **1500hrs** at the Iwokrama Research Centre and finish on a **Monday** at **0800hrs** at Surama Village. You need to arrive in Georgetown by the Monday evening before your expedition starts and to arrange homeward flights from Georgetown on the Tuesday after the expedition finishes.

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CUBA DATES

The expeditions start on a **Friday** at **0800hrs** at the Colony Hotel, Isla de la Juventud, and finish on a **Thursday** at **0800hrs** at the same location for those finishing at the end of week 2 or at Barabano on the mainland of Cuba if you are finishing at the end of week 4. You need to arrive in Havana on the Wednesday before your expedition starts and to arrange flights from Havana for Friday after their expedition ends. Research assistants can only join in week 1 and can stay for 2 or 4 weeks.

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TRANSYLVANIA (ROMANIA) DATES

The expeditions start on a **Wednesday** at **1600hrs** at the Fundatia ADEPT offices in the village of Saschiz. They finish on the **Tuesday afternoon** in the same location. You should arrange flights into and from Transylvania Airport (Tirgu Mures) to arrive no later than **1330hrs** on the Wednesday of your expedition start, and to leave on the day after your expedition ends. Note: Research assistants can only join in week 5 for a 4-week expedition, whilst dissertation students can only join in week 3.

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I’ve gained almost too much experience, because now I can’t see myself doing anything else other than conservation. I’ll be leaving with such close friends, such great memories, and a comprehensive knowledge of the African bush and the conservation of it.

Dylan Taylor, Dublin City University, Ireland; Research Assistant, South Africa Expedition

Amazing experience, amazing people; a trip of a lifetime.

Meghan Nickerson, Memorial University of Newfoundland, Canada; Research Assistant, Indonesia Expedition

Amazing experience that I would certainly like to repeat many more times. Learned a lot of theory as well as field work skills.

Frederico Barroso, Glasgow University, Scotland; Research Assistant, Peru Expedition

Best experience of my life (so far :)). This expedition really, really, really, REALLY just opens your eyes and makes you fall in love with South Africa and the bush.

Tanya Qiu, McGill University, Canada; Research Assistant, South Africa Expedition

Honduras is a beautiful country with fascinating flora and fauna. Working here in Cusuco truly gives you a sense of the difference conservation work can make both to wildlife and people from across the globe.

Abigail Metley, Oxford University, UK; Research Assistant, Honduras Expedition

Wonderful experience to see animals in their natural habitats. We actually got to see 2 Jaguars!

Vanessa Benic, University of Guelph, Canada; Research Assistant, Mexico Expedition

Opwall has given me the greatest experiences of my life, with people I’ll never forget, in places I’ll never truly leave (South Africa and Peru).

Amanda Stornebrink, University of Guelph, Canada; Research Assistant, South Africa Expedition

There is nothing better than the feeling of a hands on education with people as genuinely dedicated and interested in conservation as you – Guyana gives that experience to the maximum.

Madison Ball, Grand Valley State University, USA; Research Assistant, Guyana Expedition

A fantastic insight into the world of marine and forest research, once in a lifetime experience.

Shanell Patel, University of Cambridge, UK; Pre-Med student, Honduras Expedition

I have gained friends and memories that will last a lifetime, best staff I could’ve wished for... coming back for more next year.

Christopher Lovell, University of Nottingham, UK; Research Assistant, Mexico Expedition

This trip was on of the best 2 weeks of my life! Great peers and staff, wonderful locals and an overall incredible experience.

Rebecca Swift, Bangor University, UK; Research Assistant, Cuba Expedition

Thank you so much to all the field staff for their incredible support & enthusiasm. I had a fantastic time and would gladly come back.

Yani Smith, Edinburgh University, UK; Dissertation Student, Mexico Expedition

A really great experience with a lot more support with analysis than I would have received at university.

Beth Rutterford, University of South Wales – Glamorgan, UK; Dissertation Student, Madagascar Expedition

The fisheries programme facilitates a wonderful learning experience both academically and culturally. It’s meaningful research with a meaningful outcome. Personal development and growth is completely unquestionable.

Tom Gammage, University of Plymouth, UK; Dissertation Student, Indonesia Expedition

I’m very happy I chose to do my project with Opwall. I had so much fun and gained a lot of insight into what field work can involve. Cheers!

Harriet Downey, Oxford Brookes University, UK; Dissertation Student, Honduras Expedition

One of the best times of my life, truly feel like it is the start of a career and a passion.

Hannah Bryan, Bangor University, UK; Dissertation Student, Mexico Expedition

Mist netting has been incredible. Working hands on with different tropical birds made my dissertation research interactive and exciting everyday.

Rachel Molloy, UCD, Ireland; Dissertation Student, Peru Expedition

An utterly amazing experience with exceptional staff that made my dissertation thoroughly enjoyable.

Hannah Scott, University of Portsmouth, UK; Dissertation Student, Indonesia Expedition

A challenging but worthwhile experience. I wouldn’t have wanted to do my dissertation on anything else.

Emily Coop, University of Birmingham, UK; Dissertation Student, Madagascar Expedition

Definitely a programme to get involved with, loads of perks and thrills for every kind of adventurer.

Kenroy Milwood, Keele University, UK; Dissertation student, Honduras Expedition

The most incredible 8 weeks, so much more enjoyable than being stuck in a lab!

Natalie Swain-Díaz, University of Southampton, UK; Dissertation student, Honduras Expedition
IMPORTANT NOTE: The details of the expedition programmes described in this brochure are correct at the time of going to print. However, note that you will be joining a real scientific expedition and that on occasions the work carried out on individual projects will differ from that described in order to respond to scientific priorities. Please keep checking our website www.opwall.com for the most up-to-date information about the expeditions.