Operation Wallacea

university brochure 2020

Operation Wallacea (Opwall) 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 ecologists, scientists and academics, who are specialists in various aspects of biodiversity or social and economic studies, are concentrated at the target study sites. This gives volunteers the opportunity to work on a range of projects. The surveys result in a large number of publications in peer-reviewed journals (over 465 published to date), have described 56 species new to science, and levered $2 million from funding agencies to set up best practice management examples at the study sites. These large survey teams of scientists and volunteers, funded independently of normal academic sources, provide a unique way of collecting large temporal and spatial biodiversity and socioeconomic datasets to help with organising effective conservation management programmes.

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Global research and conservation - making a difference

If we are concerned (as we should be) about the very high rate of species extinctions around the world, what can we do to help? A review of the main drivers behind the 8,688 threatened or near threatened species on the IUCN Red List published in *Nature* by Maxwell et al. (2016) showed that over-exploitation (e.g. logging and non-sustainable hunting) was the dominant causal factor in 72% of the cases. As a minimum first step in preventing species extinctions, at least 10% of each of the habitats within a country need to be properly protected. Whilst governments in developing countries have identified protected areas (often well below the minimum 10% target), in many cases the level of management within those areas is so little that the protected area declaration has little impact on rates of deforestation and hunting levels. As such these areas are often very much 'paper parks' which may be visible on a map, but offer very little in terms of practical protection. The most effective way of ensuring protection of these areas is for surrounding local communities to see a clear financial benefit so they have an incentive to protect their local wildlife. The Opwall programmes are mobilising enthusiastic young people from developed countries to get involved in community-based wildlife tourism in these remote areas. This provides a significant conservation incentive for local communities and also increases knowledge about their wildlife. Just having visitors from overseas in the various Opwall sites is making a clear difference on the ground, with hunting and deforestation significantly curtailed and and growing enthusiasm for wildlife conservation being observed, often from the same people who were most involved in deforestation and hunting previously.

A second although lesser problem, being the principal driver for declines in <20% of threatened species, is climate change. Many countries and multinational companies are attempting to become carbon neutral over the next few decades. One way this is being achieved is by buying carbon credits, which are used for reforestation projects as well as prevention of deforestation within tropical rainforests. Several Opwall projects are working on packaging data from the studied forests to apply for funding from carbon offset platforms (such as REDD+) to prevent deforestation that would lead to greenhouse gas emissions. Our carbon project in Indonesia, for example, aims to stop deforestation on Buton Island, SE Sulawesi and the total carbon impacts of flying the survey teams there are less than 0.1% of the carbon that can be saved each year from this scheme.

Expedition Fees

Expedition Length	Price in the UK £	Price in US$	Price in Can$
2 Weeks	1,275	1,900	2,150
4 Weeks	2,350	3,375	4,100
6 Weeks	3,150	4,500	5,400
8 Weeks	4,100	5,925	7,100

Printed on environmentaly friendly recyclable paper.

Getting more information

You will find much more detailed information on our website. This includes full project descriptions, details of accommodation, costs, kit lists, reading lists and our publication library, along with full details on how and where to book international flights, internal travel arrangements and costs. If you have trouble finding any information you are looking for please contact your local office.

How to find out more

Opwall's YouTube channel has a large number of short videos. Attending a presentation is also a fast and easy way of finding out which expedition is right for you. We visit multiple universities in the UK, Ireland, US and Canada each year. Please contact your nearest office to find out when we will be visiting your university.

Ready to book?

You can book your expedition in a number of ways; in person at one of our presentations, over the phone or by submitting an online booking form.

Insurance

Opwall expeditions costs include a comprehensive travel insurance policy that provides cover for overseas medical and travel expenses, cancellation, travel disruption, and personal property for all participants. For more details of the policy please see **www.opwall.com**

Fundraising support

All students pay to join the expeditions; this is how the entire unique programme is funded and makes our research possible. Most of our students are not able to pay for the expedition fully. We do recommend a mixture of looking to personal finance and savings, working in your holiday time and fundraising effort. With planning and assistance from Opwall's fundraising team you should be able to raise a large portion of funds needed to join. Please contact our office to find out details of a fundraising meeting at your university or how to catch up if you have missed one. We are able to give you full support and advice for many fundraising events, activities and projects.

Key

1 — Set expedition number, start and end dates

Green = terrestrial

Blue = marine

Sand = bush

(D) Forest dissertation start date

(D) Marine dissertation start date

(D) Bush dissertation start date

	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9
Croatia 8-11	11 June 17 June	18 June 24 June	25 June (D) 1 July	2 July 8 July	9 July 15 July	16 July 22 July	23 July 29 July	30 July 5 August	6 August 12 August
Dominica 12-13	13 July 18 July	20 July 25 July							
Guyana 14-17	9 June 15 June	16 June 22 June	23 June 29 June	30 June 6 July	7 July 13 July	14 July 20 July	21 July 27 July	28 July 3 August	
Honduras 18-31	10 June (D) 16 June	17 June (D) 23 June (D)	24 June (D) 30 June	1 July 7 July	8 July 14 July	15 July 21 July	22 July 28 July	29 July 4 August	
Indonesia 32-41	7 June 13 June	14 June (D) 20 June	21 June 27 June	28 June (D) 4 July	5 July 11 July	12 July 18 July	19 July 25 July	26 July 1 August	2 August 8 August
Madagascar 42-51	14 June (D) 19 June	21 June 26 June	28 June 3 July	5 July 10 July	12 July 17 July	19 July 24 July	26 July 31 July		
Malawi 52-53	30 June 6 July	7 July 13 July							
Mexico 54-63	15 June (D) 21 June (D)	22 June 28 June	29 June (D) 5 July (D)	6 July 12 July	13 July 19 July	20 July 26/27 July	27 July 2 August	3 August 9/10 August	
Peru 64-69	7 June (D) 12 June	14 June 19 June	21 June (D) 26 June	28 June 3 July	5 July 10 July	12 July 17 July	19 July 24 July	26 July 31 July	
South Africa 70-75	20 June (D) 26 June	27 June (D) 3 July	4 July 10 July	11 July 17 July	18 July 24 July	25 July 31 July	1 August 7 August	8 August 14 August	
Transylvania 76-79	17 June (D) 23 June	24 June 30 June	1 July 7 July	8 July 14 July	15 July 21 July	22 July 28 July	29 July 4 August	5 August 11 August	

Joining for Research Experience

An Operation Wallacea expedition gives you the chance to participate in active field research. By working with a range of academic teams and scientists you are afforded the opportunity to enhance your career potential, to see if field work is something you wish to pursue and to try something completely different, all while being part of a legacy-leaving project.

Choose from a combination or any of the following

marine weeks	terrestrial weeks	bush weeks
2 4 6 8	2 4 6 8	2 4

How to choose your expedition

1. Look through the brochure
2. Review table of options on pages 80-83
3. Visit the Opwall website
4. Watch the videos
5. Speak to Opwall staff
6. Check for spaces
7. Pay a 10% deposit
8. Submit a booking form
9. Start fundraising

US & Canadian students wanting to gain course credits

Internal course credit

By visiting your Study Abroad office and/or college academics you will be able to determine if an Opwall expedition could be classed as independent study or an internship program. The amount of credit offered depends on your own university.

External course credit

University of West Florida - the course credit is based on exam results, a field diary, a research project essay, and an assessment of student performance in the field.

Shasta College, California - run a long distance learning course, with both pre and post expedition coursework completed online.

For more information about gaining credit please email coursecredit@opwall.ac.uk

Joining to Complete a Dissertation / Final Year Project / Master's Thesis

You can join an expedition to collect data for your own project, using this towards your degree and in some cases Master's thesis. Operation Wallacea provides an extensive range of reading materials to help you plan and prepare for your field experience. The information below should give you a clear idea of what is expected of you before, during and after your expedition. Choose from any of the research topics listed in the country pages and from the summary table on pages 84 and 85. Projects must be a minimum of six weeks.

How to choose your project

1. Look through the brochure
2. Review summary table on pages 84-85
3. Decide your ideal topics - selecting at least 2-3
4. View videos on the website
5. Contact us to speak to dissertation support staff
6. Book your chosen topic space*
7. Start fundraising
8. Consult your university tutor

Before Expedition	During Expedition	After Expedition
Prepare a project title and broad research area within the topic	Initial meeting with field supervisor and senior scientist	Primary supervision taken over by university
Review current literature and draft a project rationale and methods	Finalise research questions and methods and agree itinerary	Finish writing up early to focus on coursework and exams
Submit a draft research proposal to your Opwall supervisor	Collect data, analyse results, draft introduction and methods sections	Send Opwall a digital copy of your completed project
Incorporate Opwall's feedback into a final research proposal	Regular progress meeting with on-site supervisors	Let us know your awarded grade
	Presentation of initial findings to group	

*If your university does not allow you to complete a dissertation with Opwall, a full refund of your deposit is given, upon receipt of confirmation from your tutor.

Participating Academics

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

Conservation Management Scientists
Dr Julian Clifton - University of Western Australia, Australia
Tom Avent - Wetlands and Wildfowl Trust, UK
Dr Angela Benson - University of Brighton, UK
Dr Richard Bodmer - University of Kent, UK
Dr Keri Brondo - University of Memphis, USA
Dr Alice Eldridge - University of Sussex, UK
Barry Ferguson - University of East Anglia, UK
Dr Jeri Fox - University of New England, USA
Chris Majors - Operation Wallacea, Indonesia
Dr Ruth Malleson - Social and Economic Consultant, UK
Dr Wanda McCormick - Moulton College, UK
Dr Mika Peck - University of Sussex, UK
Dr Richard Phillips - University of Liverpool, UK
Dr Sarah Pilgrim - University of Essex, UK
Dr Edi Purwanto - Tropenbos, Indonesia
Dr Ali Reza - Delta State University, USA
Dr Selina Stead - Newcastle University, UK
Prof Ian Swingland - Operation Wallacea Trust, UK
Dr Chui Ling Tam - Calgary University, Canada
Dr Raquel Thomas - Iwokrama Rainforest Research Centre, Guyana
Helen Tedds - Moulton College, UK
Dr Katharine Vincent - University of the Witwatersrand, South Africa
Roger Wardle - Consultant on agri-environmental schemes, UK
Dr Atiek Widayati - Northumbria University, UK
Dr Tony Whitten - Flora and Fauna International, UK
Dr Olivia Norfolk - Anglia Ruskin University, UK
Dr Kathy Velander - Napier University, UK

Genetics, Oceanography and Geology Scientists
Dr Danielle Gilroy - University of Manchester
Sylvie Bardin - University of Ontario institute of Technology, Canada
Dr Stephen Burrows - Clark University, USA
Dr Giulia Casasole - University of Antwerp, Belgium
Dr Greg Cowie - University of Edinburgh, UK
Dr Alan Dykes - Kingston University, UK
Dr Antonia Ford - Bangor University, UK
Dr Leanne Hepburn - University of Essex, UK
Dr Tom Horton - SUNY ESF, USA
Dr Ben Horton - Upenn, USA
Dr Richard Hunter - Salisbury University, USA
Dr Greg Kerr - South Australia Govt, Australia
Dr John Milsom - University College London, UK
Christopher Phipps - Canterbury Christchurch University, UK
Dr Claire Raisin - University of Kent, UK
Ben Titus - The Ohio State University, USA
Professor George Turner - Bangor University, UK
Dr Alexandra Tyers - Bangor University, UK
Dr Cathy Walton - University of Manchester, UK
Dr Moyra Wilson - Curtin University, Australia

Entomologists
Professor Martin Speight - University of Oxford, UK
Dr Jan-Robert Barr - University College Dublin, Ireland
Dr George Beccaloni - Natural History Museum London, UK
Dr Sarah Beynon - University of Oxford, UK
Professor Mark Brown - Royal Holloway, UK
Dr Moya Burns - University of Leicester, UK
Dr Greg Chamberlain - BSG Ecology, UK
Dr Patricia Chow-Fraser - McMaster University, Canada
Professor James Cook - University of Reading, UK
Dr Thomas Creedy - Natural History Museum/Imperial College London, UK
Dr Will Earle - INVAS Biosecurity, University College Dublin, Ireland
Michael Geiser - Natural History Museum London, UK
Professor Francis Gilbert - University of Nottingham, UK
Andy Godfrey - Consultant Entomologist, UK
Dr Sammy de Grave - Oxford Natural History Museum, UK
Dr Neal Haddaway - Royal Swedish Academy of Sciences, Sweden
Dr Ian Hardy - University of Nottingham, UK
Dr Merlijn Jocque - University of Leuven, Belgium
Dr Mary Kelly-Quinn - University College Dublin, Ireland
Dr Stuart Longhorn - NUI Maynooth, Ireland
Dr Erica McAlister - Natural History Museum, UK
Dr Kenneth McCravy - Western Illinois University, USA
Dr José Nuñez-Mino - Bat Conservation Trust, UK
Dr Paul O'Callaghan - University College Dublin, Ireland
Dr Graham Rotheray - National Museum of Scotland, UK
Dr Simon Segar - University of Reading, UK
Dr Jo-Anne Sewlal - University of the West Indies, Jamaica
Dr Sergiu Torok - Babes-Bolyai University, Romania
Dr Roy Wiles - University of Glamorgan, UK

Ornithologists
Dr Tom Martin -Operation Wallacea, UK
Dr Jake Bicknell - DICE, University of Kent, UK
Dr Alan Blackburn - University of Lancaster, UK
Dr Robin Brace - University of Nottingham, UK
Dr Simon Butler - University of Reading, UK
Dr Bruce Byers - Umass Amherst, USA
Dr Hannah Clarke - University of Dundee, UK
Dr Nicola Goodship - Wetlands and Wildfowl Trust, UK
Dr Martin Jones - Manchester Metropolitan University, UK
Dr Dave Kelly - Trinity College Dublin, Ireland
Dr Sean Kelly - Trinity College Dublin, Ireland
Paul Leafe - Montgomeryshire County Recorder, UK
Professor Nicola Marples - Trinity College Dublin, Ireland
Martin Meads - Sparsholt College, UK
Dr Mark Miller - James Cook University, Australia
Dr Brian OiShea - North Carolina Natural History Museum, USA
Dr Joel Prashant Jack - Environmental Protection Institute, India
Sam Jones - University College London, UK
Fabiola Rodriguez - Universidad Nacional Autonoma de Honduras
Dr Eimear Rooney - Queens University Belfast, UK
Cindy Stacier - Dalhousie University, Canada
Matthew White - RSPB, UK
Dr Nurul Winarni - World Conservation Society, Indonesia
Dr Rueven Yosef - Arava Institute for Environmental Studies, Israel

Herpetologists
Dr Steve Green - Cornwall College, UK
Dr Scott Boback - Dickinson College, USA
Dr Jeff Burkhart - University of La Verne, USA
Dr Tim Colston - University of Mississippi, USA
Dr Jacqualyn Eales - University of Bangor, UK
Julius Frazier - California Polytechnic State University, USA
Dr Graeme Gillespie - University of Melbourne, Australia
Rob Gandola - University College Dublin, Ireland
Dr Jon Kolby - James Cook University, Australia
Dr Mike Logan - Harvard, USA
Dr Chad Montgomery - Truman State University, USA
Professor Randall Morrison - McDaniel University, USA
Dr Eridani Mulder - Central Queensland University, Australia
Jose Nobrega - University of Salford, UK
Dr Silviu Petrovan - University of Hull, UK
Dr Bob Reed - USGS, Guam
Stephen Roussos - Texas Tech University, USA
Mariano Suarez - Centro Ecologico Akumal, Mexico
Dr Katy Upton - Chester Zoo, UK
Dr Charles Watson - Midwestern State University, USA

Botany, Plant Sciences and Forestry Specialists
Dr Bruce Carlisle - Northumbria University, UK
Dr Harison Andriambelo - Antananarivo University, Madagascar
Richard Barker - Queens University Belfast, UK
Dr Sven Batke - Trinity College Dublin, Ireland
Dr Gareth Bruce - Glamorgan University, UK
Dr Jon Cocking - JCA Ltd, UK
Dr Anke Dietzsche - Trinity College Dublin, Ireland
Dr Daniel Kelly - Trinity College Dublin, Ireland
Dr Melinda Laidlaw - Queensland Herbarium, Australia
Dr Grace O'Donovan - Independent ecology consultant, UK
Dr Pascale Poussart - Princeton University, USA
Dr Andrew Powling - University of Portsmouth, UK
Dr Andrew Smith - University of Oxford, UK
Dr Sarah Taylor - University of Keele, UK
Dr Peter Thomas - University of Keele, UK
Caroline Whitefoord - Natural History Museum, UK
Dr Samy Zalat - Nature and Science Foundation for Egypt, Egypt

Marine Scientists
Professor Dave Smith - University of Essex, UK
Dr Dan Exton - Operation Wallacea, UK
Dr Gabby Ahmadia - World Wildlife Fund, USA
Dr Dominic Andradi-Brown - World Wildlife Fund, UK
Prof Jorge Angulo Valdes - University of Havana, Cuba
Dr Arthur Anker - Muséum National, Paris, France
Dr Anastazia Banaszak - Universidad Nacionál Autónoma de Mexico, Mexico
Dr Richard Barnes - University of Cambridge, UK
Professor James Bell - Victoria University of Wellington, New Zealand
Dr Wayne Bennett - University of West Florida, USA
Dr Max Bodmer - Open University, UK
Dr Paul Bologna - Montclair State University, USA
Dr Heidi Burdett - Heriot Watt University, UK
Dr Isabelle Cote - Simon Fraser University, Canada
Professor James Crabbe - University of Bedfordshire, UK
Dr Simon Cragg - Portsmouth University, UK
Dr Leanne Cullen - Cardiff University, UK
Dr Jocelyn Curtis - Quick - University of Exeter, UK
Dr Caine Delacy - University of Western Australia, Australia
Dr John Eme - University of North Texas, USA
Dr Teresa Fernandes - Heriot Watt University, UK
Dr Andy Gill - Cranfield Institute, UK
Dr Helen Graham - Institute of Marine Research, Bergen, Norway
Dr Ben Green - Environment Agency, UK
Dr Emma Hayhurst - University of Glamorgan, UK
Dr Ian Hendy - University of Portsmouth, UK
Dr Sebastian Hennige - University of Edinburgh, UK
Dr Jess Jaxion Harm - University of Vienna, Austria
Dr Magnus Johnson - University of Hull, UK
Dr Tim Johnson - University of Glamorgan, UK
Dr Jamal Jompa - COREMAP, Indonesia
Dr Nick Kamenos - University of Glasgow, UK
Dr Tina Kutti - Institute of Marine Research, Bergen, Norway
Dr Vanessa Lovenburg - University of Oxford, UK
Jenny Mallon - University of Glasgow, UK
Dr James McDonald - Rutgers University, USA
Dr Steve McMellor - University of Essex, UK
Dr Ed Morgan - University of Glamorgan, UK
Dr Owen O'Shea - Cape Eleuthera Institute, Bahamas
Dr Clare Peddie - University of St Andrews, UK
Dr Alan Pinder - Dalhousie University, Canada
Dr Johanna Polsenberg - US House of Representatives, USA
Dr Niamh Quinn - University of Galway, Ireland
Dr Sam Rastrick - Institute of Marine Research, Bergen, Norway
Dr Dai Roberts - Queens University Belfast, UK
Professor Alex Rogers - University of Oxford, UK
Dr Pelayo Salinas de Leon - Charles Darwin Foundation, Galapagos, Ecuador
Dr James Saunders - St Andrews University, UK
Dr Patric Scaps - University of Perpignon, France
Dr Jon Shrives - Jersey State Fisheries Department, UK
Dr Edd Stockdale - University of Western Australia, Australia
Dr Dave Suggett - University of Technology, Sydney, Australia
Prof Chris Todd - University of St Andrews, UK
Dr Richard Unsworth - Swansea University, UK
Dr Brigitta Van Tussembroek - Universidad Nacionál Autónoma de Mexico, Mexico
Dr Nerida Wilson - Western Australia Museum, Australia
Dr Kyle Young - Aberystwyth University, UK

Mammal Specialists
Dr Kathy Slater - Operation Wallacea, Mexico
Dr Heather Gilbert - Operation Wallacea, UK
Victoria Boult - University of Reading, UK
Dr Mark Bowler - St Andrews University, USA
Dr Jedediah Brodie - University of British Columbia, Canada
Professor Mike Bruford - University of Cardiff, USA
Dr Anthony Caravaggi - Queens University Belfast, UK
Dr Ruth Cox - University of Prince Edward Island, Canada
Dr Christian Dietz - University of Tuebingen, Germany
Dr Nigel Dunstone - Natural History New Zealand
Dr Jonathan Flanders - University of Bristol, UK
Dr Ivar Fleur - Universidad Nacional Autónoma de México, Mexico
Professor Laura Graham - University of Guelph, Canada
Matthew Hallett - University of Florida, USA
Dr Abdul Haris Mustari - IPB, Bogor, Indonesia
Dr Justin Hines - Operation Wallacea, Canada
Hannah Hoskins - Queens University Belfast, UK
Dr Marine Joly - University of Portsmouth, UK
Frederick Kiene - Hanover University, Germany
Juliet Leadbeater - University of Chester, UK
Dr Burton Lim - Royal Ontario Museum, Canada
Professor Aubrey Manning - University of Edinburgh, UK
Professor Suzanne MacDonald - York University, Canada
Dr Niall McCann - University of Cardiff, UK
Dr Nkabeng Mzileni - WEI, South Africa
Dr Sarah Papworth - Royal Holloway, UK
Huma Pearce - Independent Bat Consultant, UK
Dr Abigail Phillips - University of Birmingham, UK
Dr Rob Pickles - Panthera, USA
Rob Pitman - Panthera, South Africa
Dr Nancy Priston - Oxford Brookes University, UK
Professor Ute Radespiel - Hannover Unversity, Germany
Dr Felix Rakotondraparany - Antananarivo University, Madagascar
Dr Osvaldo Eric Ramires-Bravo - Universidad de America, Puebla, Mexico
Malcolm Ramsay - Hanover University, Germany
Dr Neil Reid - Queens University Belfast, UK
Dario Rivera - University of Queensland, Australia
Dr Steve Rossiter - Queen Mary University of London, UK
Dr Adrian Seymour - Independent Wildlife Film Maker, UK
Dr Myron Shekelle - National University of Singapore, Singapore
Dr Andrew Smith - Anglia Ruskin University, UK
Dr Kym Snarr - University of Toronto, Canada
Dr Emma Stone - University of West England
Dr Peter Taylor - University of KwaZulu Natal, South Africa
Dr Pamela Thompson - UCLA, USA
Professor Stewart Thompson - Oxford Brookes University, UK
Ivar Vleut - UNAM, Mexico
Dr Kevina Vulinec - Delaware State University, USA
Dr Phil Wheeler - Open University, UK
Dr Anne Zeller - University of Waterloo, Canada
Heike Zitzer - Pongola Elephant Reserve, South Africa

Fisheries Scientists
Dr Tim Coles OBE - Operation Wallacea, UK
Dr Dave Bird - University of Western England, UK
Irven Forbes - Environment Agency, UK
Dr Emmanuel Frimpong - Virginia Polytechnic, USA
Professor Tim Gray - Newcastle University, UK
Dr Peter Henderson - University of Oxford, UK
Piotr Kalinowski - Fisheries consultant, UK
Stephen Long - University College London, UK
Dr Duncan May - Fisheries Consultant, UK
Joel Rice - Fisheries consultant, USA
Dr Rodney Rountree - University of Connecticut, USA
Paul Simonin - Cornell University, USA
Professor Michael Stewart - Troy University, USA
Dr Mike Walkey - University of Kent, UK

GIS and Statistical Analysis
Dr Peter Long - University of Oxford, UK
Dr Joe Bailey - University of Nottingham, UK
Jesse Blits - University of Amsterdam, Netherlands
Oliver Burdekin - BurdGIS, London, UK
Dr Natalie Cooper - Harvard University, USA
Dr Bella Davies - Oxford Brookes University, UK
Dr Richard Field - University of Nottingham, UK
Dr Fiona Hemsley Flint - University of Edinburgh, UK
Dr Alan Jones - University of Sheffield, UK
Dr Marco Lusquinos - Imperial College London, UK
Cristi Malos - Babes-Bolyai University, Cluj, Romania
Dr Gareth Mann - Rhodes University, South Africa
Dr Lisa Manne - CUNY, USA
Dr Peter Randerson - Cardiff University, UK
Dr Allister Smith - Oxford Brookes University, UK
Dr Emily Woollen - University of Edinburgh, UK
Professor Kathy Willis - University of Oxford, UK

Getting involved & benefits to academics

Please email academics@opwall.com to discuss:

- Research Opportunities
- PhD Studentships
- PhD Student Field Research Grants
- Co-funded PhD Placements
- Class Visits & Field Courses

Academic journals in which Opwall teams have published

General Science
Nature
Nature Communications
PLoS ONE
Royal Society Open Science
Scientific Reports
PeerJ
Ambio
Caribbean Journal of Science
Cuadernos de Investigación UNED
PNAS

General Conservation Biology
Biological Conservation
Conservation Biology
Biodiversity and Conservation
Animal Conservation
Oryx
Global Ecology and Conservation
Conservation Genetics Resources
Environmental Conservation
Aquatic Conservation:
Marine and Freshwater Ecosystems
Tropical Conservation Science
Conservation and Society
Journal of Nature Conservation

General Ecology and Zoology
Ecology
Proceedings of the Royal Society B: Biological Sciences
Ecological Applications
Ecology and Evolution
Current Biology
Global Change Biology
Ecography
Functional Ecology
Journal of Natural History
Journal of Zoology
Biodiversity and Ecology
Animal Behaviour
Integrative and Comparative Biology
Diseases of Aquatic Organisms
Ecological Indicators
Biological Invasions
Integrative Zoology
Bioscience Horizons
Behavioural Ecology
Journal of Comparative Psychology
Journal of Tropical Ecology
Biotropica
Tropical Ecology
Acta Oecologica
Aerobiologia
Hydrobiologia
Zoological Journal of the Linnean Society
Biological Journal of the Linnean Society
Aquatic Biology
Aquatic Ecology
ISRN Zoology
Australian Journal of Zoology
African Journal of Wildlife Research
Raffles Bulletin of Zoology
The Southwestern Naturalist
Egyptian Journal of Biology
Proceedings of the Biological Society of Washington
Micronesica
Physiological and Biochemical Zoology
Entomology Ornithology and Herpetology
Zoology in the Middle East
Bothalia
Ecological Questions
Immediate Science Ecology

Applied and Theoretical Biology
Journal of Biogeography
Environmental Evidence
Molecular Phylogenetics and Evolution
Molecular Ecology
Molecular Ecology Resources
Applied Environmental Microbiology
Environmental Microbiology
Environmental Evidence
Journal of Thermal Biology
Environmental Science and Technology
Computational Biology and Chemistry
Journal of the Acoustical Society of America
Environmental Modelling and Software

Faunistics and Taxonomy
The Raffles Bulletin of Zoology
European Journal of Taxonomy
Zootaxa
Zookeys
Zoologica Scripta
Checklist
Annalen des Naturhistorischen Museums in Wien
Acta Society Zoological Bohemia
Comptes Rendus Biologies
Spixiana

General Marine and Freshwater Biology
Marine Biology
Marine Biodiversity
Marine Biodiversity Records
Marine Ecology
Marine Ecology Progress Series
Coral Reefs
Reef Encounter
Frontiers in Marine Science
Journal of Marine Biological Association of the United Kingdom
Journal of Experimental Marine Biology and Ecology
Galaxea, Journal of Coral Reef Studies
Journal of Indonesian Coral Reefs
Regional studies in Marine Science
Bulletin of Marine Science
The Open Marine Biology Journal
Marine and Freshwater Research
Canadian Journal of Fisheries and Aquatic Sciences
Fisheries research
Gulf and Caribbean Research
Ocean Challenge
Atoll Research Bulletin
Revista Investigaciones Marinas
Diving Hyperbaric Medicine
Freshwater Biology

Icthyology
Journal of Fish Biology
Neotropical Icthyology
Copeia

Mammalogy
American Journal of Primatology
Mammalian Biology (Zeitschrift für Säugetierkunde)
International Journal of Primatology
Australian Mammalogy
Small Carnivore Conservation
Acta Chiropterologica
Anthropologie

Herpetology
Journal of Herpetology
Herpetological Review
IRCF Reptiles and Amphibians
The Herpetological Bulletin
British Herpetological Society Bulletin
Herpetology Notes
Herpetological Conservation and Biology
Herpetologica
Salamandra
Herpetozoa
South American Journal of Herpetology
Mesoamerican Herpetology
Iguana
Alytes
Captive and Field Herpetology

Ornithology
Bird Conservation International
Ostrich
Emu
Cotinga
Sandgrouse
Forktail
Ornitologia neotropical
BirdingASIA
The Ring
El Esmeralda
Ibis
Bulletin of the British Ornithologists Club

Botany and Habitat Structure
Journal of Phycology
Forest Ecosystems
PhytoKeys
American Fern Journal
Palms
New Phytologist
International Journal of Plant Physiology and Biochemistry
Reinwardtia
Journal of the Botanical Research Institute of Texas
Annals of the Missouri Botanical Garden
Assiut University Journal of Botany

Entomology and other Invertebrates
Journal of Insect Science
Journal of Insect Conservation
The Florida Entomologist
Ecological Entomology
Journal of Crustacean Biology
Journal of Molluscan Studies
Molluscan Research
Journal of Foraminiferal Research
Crustacean Research
Crustaceana
Nematology
Journal of Arachnology
The Coleopterists Bulletin
Nachrichten des Entomologischen Vereins Apollo

Social Science, Policy and Environmental Management
Forest Ecology and Management
International Journal of Pest Management
Sustainability
Marine Policy
Human Ecology
Sustainability: Science, Practice and Policy
Marine Pollution Bulletin
Ecological and Environmental Anthropology
Practicing Anthropology
Coastal Management
Society and Natural Resources
Ocean and Coastal Management
Fishery Management
The International Journal of Interdisciplinary Social Sciences
Indian Journal of Traditional Knowledge
SPC Traditional Marine Resource Management and Knowledge Information Bulletin
Madagascar Conservation and Development
Livestock Management

Education and Tourism
Journal of Biological Education
Journal of Ecotourism
Journal of Sustainable Tourism

Physical Geography and Geology
Geography
Journal of Quaternary Sciences
Limnology and Oceanography
Journal of Limnology
Marine Geology
Proceedings of the American Society of Limnology and Oceanography
Estuarine, Coastal and Shelf Science
Cave and Karst Science
AAPG Bulletin

Operation Wallacea
Conservation research through academic partnerships
www.opwall.ac.uk

Croatia overview

Key facts
- Opportunity to work within the spectacular Krka river valley; an endemic-rich site located within the Mediterranean Biodiversity Hotspot.
- Only European expedition that provides the opportunity to combine marine and terrestrial research work
- Includes boat trip through the Adriatic Islands and the chance to work at a research centre on the beautiful car-free Silba Island

> "I came to learn something and learnt a lot. Could've stayed all season and would've still had more to see and do."
> **Paul Thrift,** *Sussex University*

Expedition Details

Research assistant places for 2 & 4 weeks

Research topics for dissertation students for 6 weeks

RESEARCH OBJECTIVES

The Krka Valley runs from the Dinaric mountains bordering Bosnia to the Adriatic and is only 77km in length. However, since the river runs through limestone there are some spectacular gorges and this is one of the most scenic river valleys in Europe. It is also important from a biodiversity viewpoint containing nine Croatian and three Krka endemic fish species and spectacular cave systems containing a number of potentially new species to science. Opwall together with Biota (a Croatian biodiversity research organisation) has built a research centre in the central part of the Krka valley with easy access to the whole park. The centre is based in a restored house and grounds within 100m of the park boundary and has access to all the habitats throughout the park and surrounding countryside. The National Park Authority have requested we perform baseline surveys to increase the known inventory for the Park, as well as collect long-term monitoring data to answer a series of their management questions.

Tourist visits to Krka National Park are heavily concentrated towards the lower stretches of the river and and very few people visit the central and northern parts of the valley. The Biota/Opwall research centre is in the central part of the valley within a rural community that has suffered from significant depopulation and land abandonment in recent years. The centre is designed to give benefits to the local community from the visits (e.g. provision of employment etc). Whilst the main research effort each year from this centre comes through the opwall programme, the centre will remain open year-round in an attempt to attract some of the many visitors to the Croatian coast further inland, increasing revenue for the Park and local communities..

Silba Island is in the northern Dalmatian archipelago and is a car and hotel free island. The island markets itself as a haven of tranquillity and much of the island is still covered by Mediterranean black oak and maquis. The objective for our partners on this island is to develop the first marine research centre for northern Dalmatia and they have a series of research projects on seagrass, sea urchins, protected species and fisheries, as well as marine plastics.

Costs to consider £$

International Flights return to arrival and departure airports listed below ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Visa – not required for most countries but see visit-croatia.co.uk/information-on-croatia/visa-requirements-for-croatia/ ✓

Park Entrance Fees ✓

Spending Money (local currency is **Kuna**) ✓

If diving: Equipment Hire and 3mm full length wetsuit. ✓

If dive training: PADI Manual & PIC ✓

For full costing details please visit the money section on the Opwall website **www.opwall.com**

Travel information

Expeditions 1-3 start on a Thursday at 1600hrs at the Puljane Mediterranean Ecology Research Centre and finish at 1000hrs on a Wednesday on Silba Island. Expedition 4 and the dissertations start on a Thursday at 1600hrs at the Puljane Mediterranean Ecology Research Centre and finish at this same location on a Wednesday at 1000hrs. Expedition 5 starts on a Thursday at 1800hrs on Silba Island and finishes on a Wednesday at 1000hrs in the same location.

For expeditions 1-4 and all the dissertations you need to book your international flights to arrive in to Split airport on Thursday before 1500hrs and to return from there on a Wednesday after 1600hrs. If you are joining expedition 5 then arranging flights to arrive in Zadar airport on a Thursday before 1000hrs and to leave on a Wednesday after 1500hrs will be more convenient.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Krka:
Dorm accommodation in a research centre with shared bathrooms.

Silba:
Tents under shade with shared bathroom and toilet facilities.

For more Images and details visit the Opwall website www.opwall.com

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
11 June 17 June	18 June 24 June	25 June D 1 July	2 July 8 July	9 July 15 July	16 July 22 July	23 July 29 July	30 July 5 August	6 August 12 August
1		2					3	
4				5				

Croatia details of Research Assistant projects

Two Week Options

Mediterranean forest and marine biodiversity research experience

2 weeks

Why choose these expeditions? Introduction to biodiversity survey techniques and diving in one of the most beautiful parts of Europe.

The first week of this two-week expedition is spent in the valley of Krka National Park. At this site you will be working from dawn until late morning and then again in the late afternoon and evening helping a series of different research teams. During the heat of the midday period you will have a series of lectures about Balkans wildlife and conservation and help with data input and lab-work using samples sourced from the field. The projects include standardised transect surveys through a series of different habitats for butterflies (Pollard surveys), herpetofauna (standard search transects), birds (point counts), mammals (standard search transects for scat and spoor) and bats (acoustic surveys). In addition, there are standardised monitoring locations for bird and bat mist netting in a range of habitats and surveys to quantify the habitat at each of these standardised survey locations. On top of these standardised surveys designed to provide long-term data on the different faunal groups there are a series of investigations to describe population densities and ecology of groups such as moths (light trapping), grasshoppers, crickets and spiders (sweep netting), cave fauna (standard search transects and quadrats), fish communities throughout the valley (beach seining), nocturnal surveys of cat snakes (*Telescopus fallax*), Hermann's tortoise (*Testudo hermanni*), Dalmation algyroides (*Algyroides nigropunctatus*) lizards, Beech Marten (*Martes foina*) and the effect of wolves on predator composition (camera trapping). In the second week, you will move to the beautiful and peaceful Silba Island. During this week if you are not dive trained you will complete a PADI Open Water dive training course. If you are already dive trained or would prefer to snorkel this week you can complete the Mediterranean ecology and survey techniques course, with two lectures and two practicals each day (either by diving or snorkelling). Alongside these training courses students can assist with some of the research projects, such as estimating and monitoring fish populations and seagrass surveys.

Expedition 1:
Thursday 11 June – Wednesday 24 June 2020 ●○
Expedition 2:
Thursday 25 June – Wednesday 8 July 2020 ●○
Expedition 3:
Thursday 30 July – Wednesday 12 August 2020 ●○

Four Week Options

Detailed forest and marine biodiversity research experience

4 weeks

Why choose this expedition? More in-depth experience of the terrestrial and marine research techniques.

The first two weeks of this four-week expedition will be at the Puljane Mediterranean ecology research centre in the heart of the spectacular Krka National Park. There are over 12 different research projects and surveys running from this site each day (see above) and the two-week expeditions with only 6 days at the centre only allow participants to try a few of these whereas this longer expedition allows you to rotate between all the surveys and investigations or to specialise in one of them. For the second two weeks you will be based at the Northern Dalmatia marine research centre on the beautiful island of Silba. If you are not dive trained you will complete a PADI Open Water dive training course in your first marine week followed by the Mediterranean ecology and survey techniques course, with two lectures and two practicals each day for the second week. Alternatively, if you are already dive trained or would prefer to snorkel this week you can complete the Mediterranean ecology and survey techniques course in your first week. Alongside these training courses students can assist with some of the research projects, such as estimating and monitoring fish populations and seagrass surveys. If you arrive dive trained or don't want to dive at all then you complete the Mediterranean ecology and survey techniques course in your first marine week and then for your last week join the research teams helping with Noble Pen mollusc, sea urchin, seagrass, fish and marine plastics surveys.

Expedition 4: Thursday 11 June – Wednesday 8 July 2020 ●●○○

Mediterranean marine research

4 weeks

Why choose this expedition? In-depth experience of diving and Mediterranean marine ecology research.

If you are not dive trained you will complete a PADI Open Water dive training course in your first marine week followed by the Mediterranean ecology and survey techniques course, with two lectures and two practicals each day for the second week. Alternatively, if you are already dive trained or would prefer to snorkel this week you can complete the Mediterranean ecology and survey techniques course in your first week. For the remaining 2 or 3 weeks you can then join the different marine research teams helping with Noble Pen mollusc, sea urchin, seagrass, fish and marine plastics surveys.

Expedition 5: Thursday 9 July – Wednesday 5 August 2020 ○○○○

Croatia independent research projects

Suitable for: dissertations ✓

All dissertations start on Thursday 25 June and finish on Wednesday 5 August 2020.

The Croatian dissertations are run from the Puljane Mediterranean Ecology research centre in the central part of the Krka National Park.

CR01 Ecology of diurnal butterfly communities in Krka National Park

With over 40 species including the Natura 2000 protected scarce swallowtail (*Iphiclides podalirius*) observed regularly, Krka National Park is a true hot spot for European butterflies. New Park records for butterflies are still being recorded and in the 2019 season a further six new species were discovered on the Opwall surveys. This project is centred around butterfly ecology to improve conservation of butterflies in Krka National Park. The complex habitat mosaic and successional stages from naturally burned Juniper dominated grassland and disturbed forests transitioning to mixed forests of holm oak and flowering ash (*Orno-Quercetum ilicis*), mixed forests of downy oak and white hornbeam (*Querco-Carpinetum orientalis*), and black hornbeam forests with autumn moor grass (*Seslerio-Ostryetum*), support diverse and different butterfly communities. This project will concentrate on completing Pollard counts of butterfly communities in different vegetation communities and habitats. All butterflies along the Pollard count will be recorded and analysis can compare usage of different habitats/vegetation communities and a wide range of environmental variables. More focussed projects could examine the habitat preferences of specific species, as well as determine population sizes through mark-recapture analysis or density through distance sampling, observations of food plants (caterpillars), flight height, and timings of daily activity, amongst other possibilities.

CR04 Population density and movement patterns of Hermann's Tortoise in Krka National Park

Hermann's tortoise (*Testudo hermanni*) is a data deficient Natura 2000 species and is a priority species for the Park to investigate. In the past this species has been heavily collected for the pet trade but within the park this is now well policed. This project is designed to produce data on the density of this species in different habitats and determine the age group class structure of the population, plus yield additional information on movement patterns and habitat usage. Despite tortoises being relatively slow moving and fairly easy to spot in open terrain, estimating their population levels is surprisingly difficult. During low and high temperatures they tend to hide in the shade under impenetrable thickets of juniper or dig themselves underground, so an area can apparently be searched efficiently with no results, only for the same area to reveal a good population when they come out of hiding during more congenial temperatures! This project will look at how best to assess the populations in 500m x 500m plots using both mark release recapture and from catch per unit effort at the best times of day. All tortoises captured will be given an individual mark by clipping the marginal scutes in a defined pattern, measured (carapace length, plastron length, weight etc) and released at the same site of capture. In addition, movement patterns can be monitored within the study squares using direct observation and also by use of fluorescent powder and tracking the trails after dark using UV light.

CR02 Ecology of Orthoptera communities in Krka National Park

This study will be the first investigation into Orthoptera diversity and habitat associations in the Park and the results will be added to the national park website (http://www.np-krka.hr/stranice/invertebrates/68/en.html). Incidental observations have shown the large Spiked Magician Cricket, which is predatory on other insects and grasshoppers, to be present, but little is known about these grassland cricket and grasshopper communities. This study will use sweep net surveys over a wide range of grassland and scrub habitats with transects selected to incorporate similar habitat throughout their length. After collection of the Orthoptera the transect will then need to be characterised (e.g. height of grass sward, percentage of bushes, slope, dominant floral species and others) so that Principal Component Analysis can be used to determine community patterns of Orthoptera. In addition, marking and release of crickets and grasshoppers could enable population densities to be determined.

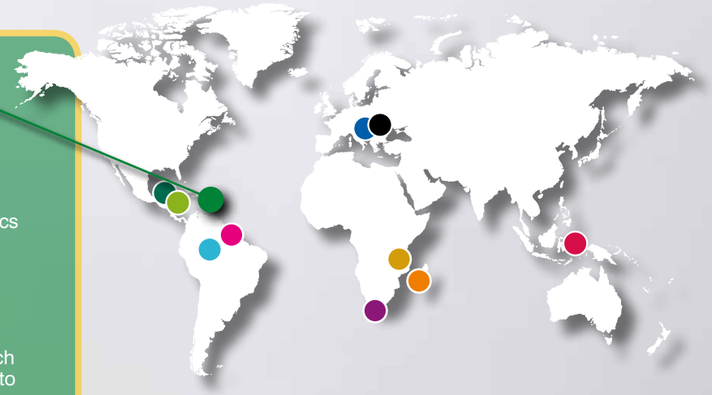
CR05 Niche occupation of Beech Marten in Krka National Park

The Beech Marten (*Martes foina*) is an adaptable generalist species which occurs in a wide range of habitats, including open grasslands, forested habitats and in close proximity to villages. Beech Martens are the most common carnivore in Krka National Park and possess an omnivorous diet which includes seeds, insects and small rodents. Students taking this option could look into the densities of Beech Marten within Krka, as well as their feeding ecology and niche occupation, potentially in comparison with some of the other large mammals with an overlapping niche such as Red Fox (*Vulpes vulpes*). Projects could also specifically focus on the impact of habitat type on Beech Marten densities, as well as proximity to landscape features such as waterways, ponds and agricultural lands. Data will be collected through camera trapping and scat surveys. The project could also include a detailed examination of the collected scat in order to identify and quantify consumed seeds, insects and rodents. Additionally, niche modelling on a landscape scale could provide information on the overall distribution of the Beech Marten within Krka National Park.

CR03 Microhabitat and population ecology of Dalmatian Algyroides lizards

The Dalmatian Algyroides (*Algyroides nigropunctatus*) is a scarce species in Croatia but a sizeable population has recently been discovered in Krka National Park. This project involves catching lizards using a pole and noose and then marking the exact location of the initial observation. Habitat and environmental measures of the capture point (aspect, slope, habitat and vegetation, temperature and humidity at ground and 60cm above ground level, light levels) can then be taken and Principal Component Analysis can then be used to identify the factors affecting the distribution of this species. The captured animals will be returned to the lab for detailed morphometric measurements and sex determination and for marking by scale clipping in an agreed combination pattern on the belly and sides to enable individual markings. The measured and marked animals will then be returned to the exact place of capture. Other projects could also look at time budgets for male and female lizards.

Dominica overview



Key facts

- Dominica was the last island to be formed in the Caribbean
- Opportunity to research the recovery dynamics of tropical forests following a catastrophic weather event
- Specific research on how climate change and ocean acidification may affect tropical island species
- Combines whale watching with forest research and a chance to learn to dive and contribute to marine research

> One of the most hands-on research extensive programs ever. Truly enriching and informative experience.
>
> **Judy Wu,** *McMaster University*

Expedition Details

Research assistant places for 2 weeks

RESEARCH OBJECTIVES

The Caribbean region is a Biodiversity Hotspot and is recognised as a conservation priority area. Despite occupying just 0.15% of Earth's surface, the Caribbean is home to 2.3% of the planet's primary vegetation and 3.5% of all vertebrate species. Endemism in the region is also high with 100% of amphibians and 95% of reptiles found only in this hotspot. Operation Wallacea began surveying on the island in 2014, with large scale biodiversity surveys for birds, bats, invertebrates, reptiles and habitat structure. This has resulted in the discovery of many new species for the island and a much better understanding of the ecology of Dominica's wildlife.

On September 18th 2017 Dominica was hit by a devastating hurricane. Hurricane Maria hit Dominica at category five speed, with all areas of the island affected. The high winds and rains have had a significant environmental impact: early estimates predict 30% tree loss across the island, with most of the remaining trees losing foliage and branches. The impact on wildlife is currently unknown, so Opwall and its volunteers now have a unique opportunity to study the recovery of the forest after such a big event, using data from years previous to the hurricane for comparison. Our current focus is to study the impacts of Hurricane Maria and investigate ways to mitigate against biodiversity loss in the future from such events.

In addition to the forest conservation priorities, Operation Wallacea, in partnership with the Dominican Fisheries Department, have identified priority marine areas around the island for investigation. These areas are surveyed using stereo video, 3D modelling and benthic study methods. Results from these surveys will begin a marine monitoring scheme that can measure changes in the reef over time, and help advise the Dominica Fisheries department of any conservation measures that may need to be put in place.

Costs to consider £$

International flights to and from Douglas Charles Airport (DOM) ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Visa – not required for most countries but see http://www.dominica.gov.dm/services/passports-and-travel-documents-non-nationals/124-do-i-need-a-visa-to-enter-into-dominica ✓

Park Entrance Fees ✓

Spending Money ✓ (Local currency is **Eastern Caribbean Dollars)**

Optional extra – canyoning experience ✓

If diving or snorkelling: Equipment Hire ✓

If dive training: PADI Manual & PIC ✓

Travel information

Your expedition will begin at 0800hrs on Monday and finish at 0800hrs on Saturday. You need to land at Douglas Charles Airport (DOM) on the Sunday afternoon before your expedition starts and you need to depart from Douglas Charles Airport (DOM) after 1000hrs on the Saturday your expedition ends. Some routes may require you to stay overnight in Puerto Rico, Barbados or Antigua.

If you choose our internal travel package when you arrive at Douglas Charles Airport you will be met by an Opwall representative and transferred to the expedition site. This journey takes around 1.5 hours. On the Saturday at the end of your expedition you will be transferred from the marine site to Douglas Charles Airport for your homeward flight.

The internal travel package will be arranged once we have the details of your international flights.

As part of the internal travel package it is possible to arrange additional nights in Dominica before and after your expedition, and the relevant airport transfers. However, this will be at an additional cost – please contact us for more details.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Forest site:
Dorm/tented accommodation in a research camp with shared bathrooms.

Marine site:
Dorm accomodation with shared bathroom and toilet facilities.

For more images and details visit the Opwall website **www.opwall.com**

Dominica details of Research Assistant project

Two Week Option

Caribbean forest and marine biodiversity research experience

2 weeks

Why choose this expedition? The project in Dominica gives you the chance to study the flora and fauna of one of the most pristine islands in the Caribbean, whilst contributing to projects looking at the impact of climate change on island flora and fauna.

The first week will be spent in the tropical forests of Dominica, where you will be based in the east of the island, but will have opportunity to complete surveys in locations across Dominica. The first day will be spent on lectures and orientation. The Caribbean Island ecology course runs throughout the first week and will cover topics such as the importance of the Caribbean biodiversity hotspot, the formation of the Lesser Antilles and biodiversity of Dominica, volcanology and survey techniques being used on the various projects during the week. From day two the group will be divided into teams which will spend the next five days rotating around the different research activities, spending either a full or part day in turn on a series of biodiversity surveys including invertebrates, birds, bats and habitat. These surveys will be interspersed with lectures, talks and practical sessions. In this first week there is also the opportunity to assist in the marine surveys at Champagne reef. Champagne reef is a unique location, which naturally mimics ocean acidification, with volcanic bubbles coming out of the ground containing CO2. The CO2 dissolves into the water, thus lowering the pH in that area. Predictions are that in 100 years' time our oceans could have a pH as low as 7.7, whist the current pH of the ocean is 8.1, therefore we are able to use this study to look into the future of our Caribbean coral reefs, assessing the impacts of ocean acidification.

The second week will begin by travelling to Roseau, the capital of Dominica, where students will join a sea mammal search on a small catamaran. Here they will learn about some of the sea mammal research taking place around Dominica, and hopefully locate a sperm whale pod using hydrophones. For the second week you will be based in one of two MPA (Marine Protected Areas), Cabrits National Park or Soufriere and Scott's Head. Students will then take part in one of the courses, either learning to dive, or taking part in the Caribbean reef ecology course if they are already dive trained or have chosen to snorkel instead. Students will attend reef ecology lectures and assist in stereo video and 3D modelling surveys.

Expedition 1: Monday 13 July – Saturday 25 July 2020

Guyana overview

Key facts
- Part of the Guiana Shield – a huge expanse of undisturbed tropical rainforest and one of the last frontier forests on Earth
- One of the most diverse ecosystems on the planet – with a very high abundance of Neotropical megafauna
- Most remote of the forest and savannah expeditions
- Unique opportunity to visit two contrasting biomes
- Examine whether logging can be managed to have minimal impact on biodiversity, whilst generating revenue for management of the reserve
- Run in partnership with Amerindian tribes eager to share traditional knowledge, tracking skills, forest skills, and medicine

> "Totally unique experience, amazing opportunity for fieldwork, like nothing could have imagined!"
>
> **Ellie Payne,** *University of Liverpool*

Expedition Details

Research assistant places for 2, 4 & 6 weeks

RESEARCH OBJECTIVES

The Iwokrama forests on the Guiana Shield in Guyana cover 1 million acres of mainly pristine lowland rainforest, these have been handed by the Guyanese government to the Commonwealth Secretariat to manage as a demonstration site, in a way that protects both biodiversity and develops income for local communities. The first attempt to develop such a strategy was the idea of using the site for ecotourism to sustainably produce income. However, this failed to attract sufficient numbers to what is a very remote area. The decision was made to develop a limited logging programme in such a way that it had minimal impact on the spectacular wildlife of these forests. Half of the Iwokrama Forest was set aside as a Wilderness Preserve where no activities or extraction is allowed. The remaining forest is the Sustainable Utilsation Area of which part is set aside for selective timber harvesting on a 60-year rotation. The area that is set aside for logging makes up only 29 percent of the entire Iwokrama Forest. The thesis that the foresters started with was that only a handful of the species have any commercial value and that only these would be targeted. Detailed maps are prepared of each 1km x 1km block of forest showing the position of each of the trees to be targeted and where the skid trails should be installed to minimize any losses of other species. The net result is that only 1% of trees (5% by volume) in any block are being harvested or damaged by the extraction process. This harvesting seems to produce as much return on investment as traditional harvesting techniques which are considerably more damaging, but does this new approach also minimise impacts on wildlife? The Opwall teams are helping scientists to compare the biodiversity value of a range of taxa in sites that have been recently logged, logged some years previously and pristine wilderness areas..

In 2020 we are starting with provision of help to a research programme in the South Rupununi centred around the Dadanawa Ranch. At one point, Dadanawa was one of the single largest ranches in the world, and it is still an active cattle ranch today. Initial research efforts include surveys on Giant Anteaters, as well as birds of the savannah (including the endangered Red Siskin). This new site will also serve as the hub for surveys up the Rupununi River into the recently protected Kanuku Mountains, with survey work focused on bats, herpetofauna, mammals and birds. To date, very little formal survey work has been done in the region, so the Opwall teams will be gathering valuable baseline data that can help inform the management of the Kanukus, as well as provide valuable contrasts to surveys in the Iwokrama forests of the North Rupununi.

Costs to consider £$

International Flights to and from Georgetown ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to Georgetown airport ✓

Visa - free for most participants but check on minfor.gov.gy/visa-entry-requirements-countries/ ✓

Park Entrance Fees ✓

Spending Money ✓
(local currency is **Guyanese dollar**)

Travel information

The expeditions start at Iwokrama River Lodge and Research Centre on a Tuesday at 1600hrs. If you are joining expedition 1 then the finish point is at the same point on a Monday at 0800hrs. If you are on expedition 2 or 3 then the finish point is Lethem airport on a Monday at 0800hrs. You need to arrange your flights to overnight in Georgetown on the Monday before your expedition starts and to leave from Georgetown on the Tuesday after your expedition finishes.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using either flights on small planes to Lethem or a bus for getting you to and from the start and finish points of your expedition. Please note that there are limited places available on the small planes so if you book late then you may be restricted to the bus options only.

Accommodation

Iwokrama Forest Research Centre: Accommodation is in shared single sex dorm rooms.

Forest camps and Dadanawa ranch: Hammocks and field toilets.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
9 June – 15 June	16 June – 22 June	23 June – 29 June	30 June – 6 July	7 July – 13 July	14 July – 20 July	21 July – 27 July	28 July – 3 August
1				2			
		3					

Guyana details of Research Assistant projects

Two Week Option

Guiana Shield rainforest biodiversity

2 weeks

Why choose this expedition? Taster of remote forest and river research experience.

This expedition is to the spectacular Iwokrama forests on the Guiana Shield, which have the same megafauna species and abundances as the best remaining parts of the Amazon, but are actually within arguably the best-preserved rainforest on the planet. You will spend your first two days in the Iwokrama River Lodge and Research Centre on the banks of the Essequibo River completing a lecture course on Guiana Shield wildlife and conservation, accompanied by practicals teaching you the survey techniques being used. From there, you will spend a week in a forest camp conducting surveys on forest structure, dung beetle communities, reptile and amphibian surveys from standard search transects and spotlighting at night, point counts, soundscape analysis and mist netting for birds, distance sampling to survey primates, patch occupancy and camera trapping for jaguars, pumas and other large mammals, mist netting and sound analysis surveys for bats. This work also helps to support the Iwokrama's monitoring programme.

Expedition 1: Tuesday 9 June – Monday 22 June 2020 ●●

Four Week Option

Biodiversity and Neotropical megafauna of the Iwokrama rainforest and Rupununi savannah

4 weeks

Why choose this expedition? Biodiversity research in incredible lowland rainforest and visit to the superlative grassland savannahs of the South Rupununi.

If you want to see spectacular Neotropical megafauna and experience living and travelling in remote forest and savannah areas, then this is the project for you. For the first three weeks you will be based at three different camps in highly biodiverse Iwokrama forests on the Guiana Shield, which have the same megafauna species and abundances as the best remaining parts of the Amazon, but are actually within arguably the best-preserved rainforest on the planet. Between forest camps you will spend a couple of nights at the Iwokrama River Lodge and Research Centre on the banks of the Essequibo River. After that you will survey a site where recent selective logging (only 1% of the trees by number and 5% by volume) has been completed, a second camp where harvesting was 3 – 4 years previously, and a camp in wilderness forest that is not to be exploited in any way. The long-term datasets sourced from these sites are designed to identify the impact of selective logging, and you will be assisting surveys on forest structure, dung beetle communities, reptile and amphibian surveys from standard search transects and spotlighting at night, point counts, soundscape analysis and mist netting for birds, distance sampling to survey primates, patch occupancy and camera trapping for jaguars, pumas and other large mammals and mist-netting and sound analysis surveys for bats. This work also helps to support the Iwokrama's monitoring programme.

At the end of three weeks you will travel to the Dadanawa Ranch in the outstanding South Rupununi savannah. The contrast between the grasslands of the South Rupununi and the rainforest of the North Rupununi is both striking and fascinating, affording the opportunity for landscape level contrasts. This final week is highlighted by a 3-day river trip through the savannah into the forested hills of the Kanuku Mountains to a remote river camp, where you will survey bats, herpetofauna, mammals and birds. In addition to the river trip, there are practicals on the history of ranching in the region, Amerindian management of the savannah, as well as surveys on giant anteaters and the endangered Red Siskin.

Expedition 2: Tuesday 7 July – Monday 3 August 2020 ●●●●

Six Week Option

Biodiversity and Neotropical megafauna of the Iwokrama rainforest and Rupununi savannah

6 weeks

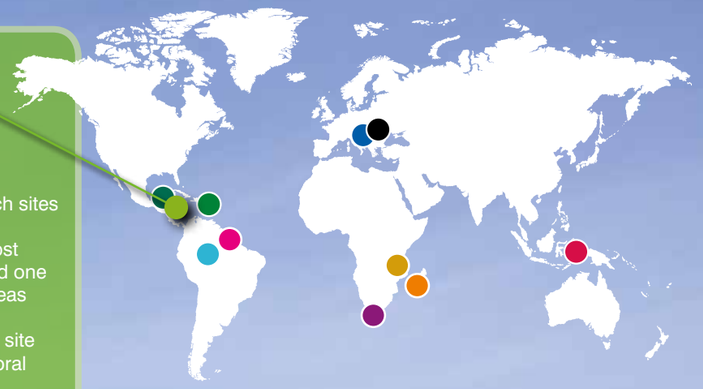
Why choose this expedition? Complete immersion at the widest variety of rainforest camps surveying biodiversity research in incredible lowland rainforest and visit to the superlative grassland savannahs of the South Rupununi.

If you want to maximize your experience conducting biodiversity surveys and see the widest variety of research camps in one of the best rainforests on the planet, while also visiting the stunning South Rupununi savannah, then this is the project for you. For the first five weeks you will be based at five different camps in the highly biodiverse Iwokrama forests on the Guiana Shield. Between forest camps you will spend a couple of nights at the Iwokrama River Lodge and Research Centre on the banks of the Essequibo River. After that you will survey a site where recent selective logging (only 1% of the trees by number and 5% by volume) has been completed, a second camp where harvesting was conducted 3 – 4 years previously, and a camp in wilderness forest that is not to be exploited in any way. The long-term datasets sourced from these sites are designed to identify the impact of selective logging, and you will be assisting surveys on forest structure, dung beetle communities, reptile and amphibian surveys from standard search transects and spotlighting at night, point counts, soundscape analysis and mist netting for birds, distance sampling to survey primates, patch occupancy and camera trapping for jaguars, pumas and other large mammalsand mist-netting and sound analysis surveys for bats. This work also helps to support the Iwokrama's monitoring programme.

At the end of five weeks you will travel to the Dadanawa Ranch in the outstanding South Rupununi savannah. The contrast between the grasslands of the South Rupununi and the rainforest of the North Rupununi is both striking and fascinating, affording the opportunity for landscape level contrasts. This final week is highlighted by a 3-day river trip through the savannah into the forested hills of the Kanuku Mountains to a remote river camp, where you will survey bats, herpetofauna, mammals and birds. In addition to the river trip, there are practicals on the history of ranching in the region, Amerindian management of the savannah, as well as surveys on giant anteaters and the endangered Red Siskin.

Expedition 3: Tuesday 23 June – Monday 3 August 2020 ●●●●●●

Honduras overview



Key facts
- Largest number of forest research scientists
- Most published terrestrial and marine research sites in Honduras
- Cusuco National Park is one of the top 50 most irreplaceable protected areas in the world and one of the top 25 most irreplaceable protected areas for amphibians
- Opwall's flagship Caribbean marine research site with a focus on integrating technology into coral reef research
- Home to Opwall's 3D modelling of coral reefs initiative

> "Made friends and memories to last a lifetime, whilst also gaining invaluable field work skills."
>
> **Amy Bell,** *University of Birmingham*

Expedition Details

Research assistant places for 2, 4 & 6 weeks | **Research topics for dissertation students for 6 weeks**

RESEARCH OBJECTIVES

The forests of Central America are some of the most biologically diverse ecosystems in the world, partly because they are the meeting point of two great faunas – those from North America and those from South America – which have evolved separately. Many of these ecosystems have been badly degraded but there is a proposal to join currently discontinuous areas of forest into a continuous Mesoamerican forest corridor running from the Yucatan peninsula in Mexico (where there are other Opwall teams) to Panama. Part of this corridor will encompass the cloud forests of Cusuco National Park in Honduras – a site rich in endemics and endangered species yet threatened by unchecked illegal deforestation. The Opwall survey teams have been working in Cusuco since 2003 and the data produced has resulted in the Park being listed as one of the top 50 most irreplaceable protected areas in the world (based on a review of 173,000 sites worldwide). As well as underlining the biological value of Cusuco, the datasets collected by the Opwall teams are also being used to make an application for funding through Natural Forest Standard (NFS). This will allow carbon credits from the Park to be issued, which can then be sold to multinational companies wishing to offset their carbon emissions and at the same time help protect biodiversity. Funding obtained in this way will then be used to manage and protect the park and the many unique species it supports.

In the Caribbean, there are a number of core issues that have been affecting the biodiversity of coral reefs, including the mass mortality of keystone sea urchins that have allowed algal colonisation of reef areas, an invasive predator (lionfish) originally from the Indo-Pacific that has spread across the Caribbean, and overfishing of reef fish by local communities. Opwall has two marine research sites in Honduras where these issues and many more are studied: one is on the island reefs of Utila and the second on the coastal barrier reef of Tela. At both sites, teams of Opwall scientists and students collect annual monitoring data to assess temporal patterns in reef community health, alongside novel research to address key conservation priorities and gaps in our current understanding of these fragile ecosystems. Honduras is also home to Opwall's pioneering efforts to integrate technological solutions into the monitoring and study of coral reefs, including our 3D computer modelling method. Opwall's team of marine scientists in Honduras helps to support not only international academic research and new method development, but also supports local non-governmental organisations with their efforts to improve marine conservation in Honduras.

Costs to consider £$

International flights to and from San Pedro Sula airport (SAP) ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Visa* ✓ Park Entrance Fees ✓

Spending Money ✓

(Local Currency **Lempira)**

If diving: Equipment Hire ✓

If dive training: PADI Manual & PIC ✓

* A 90 day visa is issued free of charge on entry to Honduras for people travelling on an UK, EU, US and Canadian passport. Non-US and Canadian students will need an ESTA for transiting through the US (cost approximately $14).

Example day

Time	Activity
0700	Reef ecology dive practical
1100	Reef ecology lab practical
1300	Lunch
1430	Reef ecology dive practical
1800	Dinner
1900	Evening research lecture/talk

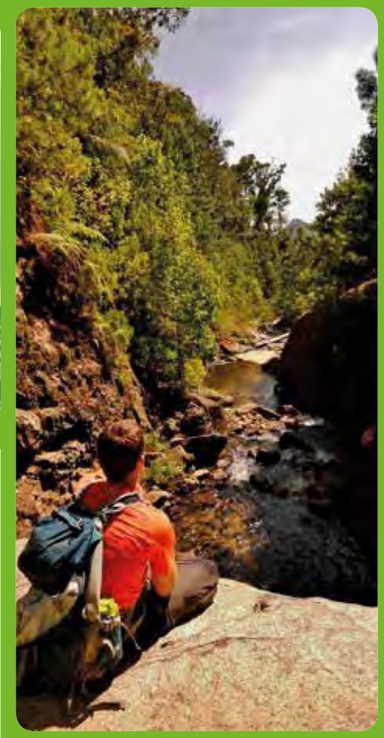
Schedule on Utila for a qualified diver

Travel information

For those joining **forest only** or **forest-marine combined projects** the expeditions start in San Pedro Sula on Wednesday at 0700hrs. For travelling to these projects you need to book your international flights to San Pedro Sula to arrive by the Tuesday and overnight there. The **forest only project**s finish in San Pedro Sula on Tuesday at 1300hrs and you can book your international flights from there after 1600hrs. The forest-marine combined projects finish at your marine site on Tuesday at 0800hrs and you can book your international flights from San Pedro Sula on Tuesday after 1600hrs, although more commonly flights will depart on the Wednesday.

For those joining **marine only projects**, the expeditions start on a Wednesday at 0900hrs and finish on a Tuesday at 0800hrs. For travelling to these projects you need to book your international flights to arrive in San Pedro Sula by Tuesday night and overnight there. On your return home you can book your flights from San Pedro Sula from 1600hrs on the Tuesday, although more commonly flights will depart on the Wednesday.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

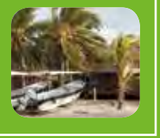


Accommodation

Cusuco base camp: Shared tents with camping toilets and showers.

Cusuco field camps: Hammocks, shared tents, field toilets and river showers.

Utila: Shared bunk beds in air-conditioned dormitory style rooms with shared bathroom and toilet facilities.



Tela: Shared bunk beds in air-conditioned dormitory style rooms with shared bathroom and toilet facilities.

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
10 June D 16 June	17 June D D 23 June	24 June D 30 June	1 July 7 July	8 July 14 July	15 July 21 July	22 July 28 July	29 July 4 August
		1			2	3	
4							
	6		5				
	7						
				8			
		10		9			
	11						
	12						

Honduras details of Research Assistant projects

Two Week Options

A taste of Caribbean coral reefs

2 weeks

Why choose this expedition? Dip your toes into Caribbean coral reef research skills.

This expedition gives an introduction to the practical and theory skills needed for tropical marine research, and would take place either at Opwall's marine research site on Utila island or in the mainland bay of Tela. You would start by completing a PADI Open Water dive training qualification if you aren't already qualified and want to learn, followed by our week-long Caribbean coral reef ecology course with practicals via SCUBA diving. If you are already a qualified diver, or will be snorkelling instead, you will start with our Caribbean coral reef ecology course before joining our research teams for your second week. Our Caribbean coral reef ecology course will focus on local species identification, tropical marine ecology theory, and common survey methods used in coral reef research. The course involves two lectures and two in water practicals by diving or snorkelling each day. Those joining our research teams for their second week will get a flavour of what marine field research is about by joining one of our core survey projects. The projects taking place vary from year to year, but generally focus on stereo-video surveys of fish biomass, benthic video surveys of reef health, and 3D modelling of coral reef architecture. You should complete up to 15 dives on this expedition and be familiar with most of the Caribbean coral and fish species.

Expedition 1:
Wednesday 24 June – Tuesday 7 July 2020 ●●
Expedition 2:
Wednesday 15 July – Tuesday 28 July 2020 ●●

Cloud forest highlights

2 weeks

Why choose this expedition? Taster of forest research.

This project is based for two weeks in the cloud forests of Cusuco National Park. The first week provides training to enable students to join the research projects and involves a jungle survival skills course (can include a canopy access course for an additional cost) and a field course on Neotropical forest ecology, comprising lectures and field based practicals. For the second week you will be working with the forest researchers on a series of biodiversity projects in one of the more remote satellite camps. Research topics that you will be involved with includes patch occupancy surveys for large mammals, small mammal trapping, bird point counts, genetic screening of amphibians for chytrid infections, and light trapping for moths, alongside many other projects.

Expedition 3:
Wednesday 22 July – Tuesday 4th August 2020 ●●

Four Week Options

Cloud forest and reef biodiversity highlights

4 weeks

Why choose this expedition?
Best expedition if you can't choose between forest and marine research.

This expedition involves spending two weeks in the endemic-rich cloud forests of Cusuco National Park followed by two weeks in the Caribbean working with a team of marine scientists. The first week of the expedition involves three days of jungle skills training (can include a canopy access course for an additional cost) followed by three days completing a Neotropical forest ecology field course comprised of a lecture series and practical sessions to get you acclimatised to the forest and familiar with the research projects. In your second week you will work with a diverse team of researchers on projects which include determining infection rates of chytrid fungus within critically endangered amphibian species, calculating carbon content within forest plots, light trapping for moths, and constant effort site mist netting for birds, alongside many other projects. For your third and fourth weeks you are allocated one of our research sites in either Utila island or Tela. If you aren't already dive qualified, then your first week here will be training to PADI Open Water level and then for your final week completing a Caribbean coral reef ecology course with practicals done by diving. If you are already a qualified diver by the time you arrive with us (or just want to snorkel) then in your third week you complete a Caribbean coral reef and survey methods course with practicals done by diving (if you are trained) or snorkelling. For your last week you will then join the marine research teams for a taste of Caribbean coral reef research.

Expedition 4:
Wednesday 10 June – Tuesday 7 July 2020 ●●●●
Expedition 5:
Wednesday 1 July – Tuesday 28 July 2020 ●●●●

Divemaster training with marine research

4 weeks

Why choose this expedition? Become a PADI professional SCUBA diver working alongside marine researchers

This expedition is based on Utila island and is aimed at training you to become a PADI Divemaster (DM). You need to be qualified to PADI Rescue Diver and have 40 logged dives before starting on this course. The course involves a combination of dive theory, in water practical sessions, and shadowing instructors teaching PADI Open Water and Advanced Open Water courses. The training costs of the course are included in the expedition, though you will have to purchase the necessary PADI training materials ahead of joining the expedition and pay PADI registration fees after completion. During your expedition you will also have time to complete our Caribbean coral reef ecology course and will learn how to identify most of the coral and fish species encountered in the Caribbean, as well as gain an insight into the marine research being carried out by our team. One of the benefits of Divemaster training with Opwall is that, assuming you perform well on site, we can offer Divemaster positions on our various expeditions around the world in subsequent summers. There is also the option to extend this expedition to 6 weeks and spend the additional time collecting data with our team of scientists on a range of research projects.

Expedition 6:
Wednesday 17 June – Tuesday 14 July 2020 ●●●●

Applied Caribbean coral reef research

4 weeks

Why choose this expedition? Gives a good all-round experience of tropical marine research.

This project would take place at Opwall's marine research site on Utila island or in Tela Bay. For everyone wanting or needing to learn, this expedition would start with the PADI Open Water dive qualification, followed by our week-long Caribbean coral reef ecology course. For those already dive qualified or preferring to snorkel, they would start with the Caribbean coral reef ecology course. This course focuses on local species identification, tropical marine ecology theory, and common survey methods. The course involves two lectures and two in water practicals by diving or snorkelling each day. Afterwards, the focus switches to putting these new skills into practice with the opportunity to join multiple marine research projects led by our team of scientists. On these projects, you will help collect valuable data to contribute towards our Caribbean research and conservation goals, and you will have the choice of rotating between multiple teams or focusing on a single project, depending on your own interests. Projects will either focus on the use of technological solutions in coral reef research (e.g. stereo-video surveys of fish biomass, machine learning in reef health surveys, and 3D computer modelling of reef architecture), or on improving our understanding of the ecology and behaviour of key coral reef organisms (e.g. cleaning interactions, invasive lionfish). You should complete 40 dives or more on this expedition and be familiar with multiple survey methods as well as common fish and coral species. If desired, additional PADI dive training can be done in your spare time, at an additional cost.

Expedition 7: Wednesday 17 June – Tuesday 14 July 2020 ●●●●
Expedition 8: Wednesday 8 July – Tuesday 4 August 2020 ●●●●

Honduras details of Research Assistant projects

Four Week Options

Cloud forest biodiversity with a taste of diving

4 weeks

Why choose this expedition? Better for more detailed forest research but also includes diving.

This expedition starts with three weeks in the cloud forests of Cusuco National Park; a site which has been listed in a review of 173,000 protected areas in the world as being in the top 50 most important sites to conserve. The first week is spent learning to live safely in the forest during a jungle survival course (can include a canopy access course for an additional cost) and a lecture course with practicals on Neotropical forest ecology. The next two weeks will be working with the largest group of forest researchers we have at any site, on projects as diverse as bird mist netting surveys, determining chytrid infection rates within amphibians, calculating the carbon content of the forest and light trapping for moths, alongside many other projects. For at least one of these weeks the team will be helping out in one of the more remote satellite camps. The last week you will be based at the Opwall marine research camps in either Utila or Tela completing a PADI Open Water dive training course or a coral reef ecology and marine survey methods course with practicals by diving (if already trained) or snorkelling.

Expedition 9: Wednesday 8 July – Tuesday 4 August 2020 ●●●●

The cloud forest adventure

4 weeks

Why choose this expedition? Most detailed forest research with trekking in remote areas.

This project is based entirely in the cloud forests of Cusuco National Park, which has been identified as one of the top 50 most irreplaceable protected areas on Earth (based on an analysis of 173,000 sites worldwide). The first week will be in and around base camp where you will complete jungle training (can include a canopy access course for an additional cost) and a Neotropical forest ecology lecture course with associated practicals. After this week you will be trekking across the Park in order to join the research teams in a series of remote satellite camps. Survey work will include patch occupancy surveys for large mammals, bird point counts, small mammal trapping, mist netting for bats, forest habitat structure surveys, screening amphibians for chytrid fungus infections, spotlighting surveys for amphibians and light trapping for moths, alongside many other projects.

Expedition 10: Wednesday 24 June – Tuesday 21 July 2020 ●●●●

Six Week Options

Cloud forest and coral reef research

6 weeks

Why choose this expedition? Combines forest research and more in-depth marine research.

This expedition is based for three weeks in the Cusuco cloud forest site, followed by three weeks at one, or both, of the Opwall marine research sites in Utila and Tela. The first three weeks are as for expedition 4 with training in jungle survival, canopy access (optional - for an additional cost) and Neotropical forest ecology followed by 2 weeks working with the various forest scientists, who's projects include collecting data on forest structure, amphibian spotlighting, small mammal trapping and mist netting for bats, alongside many other projects. The next three weeks are based at one of our marine research sites, either Utila island or the mainland bay of Tela. You will learn to dive to PADI Open Water level in your first marine week (if not already qualified) and then progress to our week-long Caribbean coral reef ecology course with practicals by diving. If you are already dive trained or would prefer to snorkel you will start with the Caribbean coral reef ecology course. For your remaining weeks you will join our team of marine scientists helping to collect data on one or more of our research projects. These would include 3D modelling of coral reefs, using stereo-video to survey fish biomass and invasive lionfish ecology, amongst many more.

Expedition 11: Wednesday 17 June – Tuesday 28 July 2020 ●●●●●●

Advanced Caribbean coral reef research

6 weeks

Why choose this expedition? Our most comprehensive option for those wanting in-depth knowledge and expertise of Caribbean coral reef research.

On this expedition you will have the opportunity to spend time at both of Opwall's marine research sites in Honduras: Utila island and the mainland bay of Tela. The reef systems found at each site differ enormously, and visiting and studying both offers a unique perspective into the extreme variability of coral reef systems and challenges our assumptions on what a healthy Caribbean coral reef should look like. For everyone wanting or needing to learn, this expedition would start with the PADI Open Water dive qualification, followed by our week-long Caribbean coral reef ecology course. For those already dive qualified or preferring to snorkel, they would start with the Caribbean coral reef ecology course. This course focuses on local species identification, tropical marine ecology theory, and common survey methods. The course involves two lectures and two in water practicals by diving or snorkelling each day. Afterwards, the focus switches to putting these new skills into practice by helping to collect valuable data to contribute towards our Caribbean research and conservation goals. Working alongside our team of scientists, you will have the choice of rotating between our full range of projects or focusing on just one or two, depending on your own interests. Projects will either focus on the use of technological solutions in coral reef research (e.g. stereo-video surveys of fish biomass, machine learning in reef health surveys, and 3D computer modelling of reef architecture), or on improving our understanding of the ecology and behaviour of key coral reef organisms (e.g. cleaning interactions, invasive lionfish). You should complete 60 dives or more on this expedition to become a highly competent scientific diver and become comfortable using multiple underwater survey methods and the software used to accompany them. These skills will improve the CV of any aspiring marine biologist looking to take their studies or careers further. If desired, additional PADI dive training can be done in your spare time, at an additional cost.

Dr Dan Exton
Head of Research, Opwall

"Collecting data underwater poses significant challenges, and so training is crucial in developing a marine biologist's capabilities. This expedition allows students to complete our comprehensive skills and theory training with loads of time spare to put those skills into practice on a wide range of projects and really develop their CV."

Expedition 12: Wednesday 17 June – Tuesday 28 July 2020 ●●●●●●

Honduras forest independent research projects

Suitable for: dissertations ✓ master's thesis ✓

The start date for these expeditions is either Wednesday 10 or 17 June and end on either Tuesday 21 or 28 July 2020.

All these independent topics are suitable for high quality undergraduate dissertation/thesis projects, and most are also suitable for masters level projects. They take place at our terrestrial site in Cusuco National Park, Honduras.

Before starting your data collection, you will need to complete a week-long jungle training and Neotropical ecology course which involves a series of practicals and lectures, as well as three nights in temporary field camps in the forest to adjust to expedition life!

There is an option for an 8 week expedition from the first intake if your dissertation requires more in depth data collection – this is sometimes recommended for masters level projects.

HO08 Assessing carbon stocks in the forests of Cusuco National Park

The forests of Cusuco National Park support a rich biodiversity and provide vital ecosystem services, including the sequestration of vast carbon stocks. The importance of such tropical forest carbon stocks is reflected by the creation of bodies such as REDD+ and the Natural Forest Standard which provide large-scale funding to key forest ecosystems to ensure their trees are kept standing, thus mitigating the quantity of greenhouse gases released into the atmosphere and curbing the effects of global climate change. Mesoamerican cloud forests are, however, complex ecosystems which span significant altitudinal gradients and are comprised of several different forest types, and the exact carbon stocks they possess within their various habitat stratifications remains poorly understood. This project seeks to develop a better understanding of the distribution of carbon stocks within the forests of Cusuco National Park. Students working on this project will work with the habitat survey teams, taking detailed forest structure measurements (most significantly circumference, height, and type of all mature trees within specific plots) in order to produce estimates of carbon stocks across the Park.

HO09 Effects of Habitat on Ectomycorrhizal Fungi

Fungi are the least studied biological Kingdom, with only 1-2% of the estimated 5–10 million species being described, and there are groups for which even basic molecular phylogenetic work is lacking. The incorporation of DNA-based methods has exposed the restrictions of morphological assessments and casts doubt upon some earlier taxonomic assignments. Generally, however, taxonomic implications of molecular data should only be put in place after careful examination of specimens and after a thorough search for morphological and/or ecological evidence and confirmation. At a moment of global losses of biodiversity, and with a vast majority of fungal species being undescribed, it is important not only to take advantage of state-of-the-art technologies, but to push forward collecting efforts. The ectomycorrhizal (ECM) plant-fungal mutualism is globally widespread, but knowledge of the diversity of the fungi involved in this keystone symbiosis is incomplete, especially in tropical areas. ECM fungi enhance host plant nutrient uptake, provide protection against root diseases, and alleviate effects of abiotic stresses. The aim of this project is to quantitatively investigate how environmental factors influence the genus-level diversity of ECM fungal communities. Fruiting bodies of ECM formers will be collected (e.g., Amanita, Cortinarius, Lactarius, Russula, Suillus) in designated 20m x 20m plots and associations with habitat data will be assessed.

HO10 Community ecology of insect herbivores associated with coffee and its wild relatives

Insects on plants make up the majority of terrestrial macro-diversity and underpin tropical ecosystems. While some insects provide vital pollination services, others are antagonistic herbivores. In response to herbivory plants have developed a bewildering array of chemical defences, and insects must contend with a complex landscape of toxic plant compounds (e.g. polyphenols, alkaloids and terpenes). This in turn has led to the evolution of specialisation of insect herbivores onto groups of closely related and chemically similar plants. The alkaloids contained in the coffee family (Rubiaceae) are consumed by humans for their stimulant and hallucinogenic effects. One of the largest genera in the family is *Psychotria* (>2,000 species); as such it has become a model for studying the evolution of plant defences and insect diversity. This project aims to study insect herbivores associated with the 15 local species of *Psychotria* found in Cusuco. Approaches can include insect surveys and focused feeding experiments connecting to large datasets from Panama. A separate project can focus on both the wild relatives of coffee and the abandoned coffee gardens within the national park. How great is the overlap in insect community structure between forest habitats and the coffee plantations of Buenos Aires? There is also further scope to study other large tropical genera such as *Miconia* and *Piper* which are both locally abundant and chemically diverse.

HO11 Community ecology of moths in the tropical cloud forests of Honduras

The moths of Cusuco are among the strangest and most beautiful in the world. This project would take advantage of the network of new high-intensity mercury vapour collecting lamps installed at each camp site in Cusuco National Park to study the diversity of moths attracted to light. Currently, two Families (Sphingidae and Saturniidae) are well-studied and identifiable to species-level in Cusuco. Projects could focus on examining the effect of habitat variables on the abundance and diversity of these groups, or patterns of community composition over the wet-dry season transition. There would also be scope to improve our knowledge about the process of light trapping by studying little-known aspects such as the effects of surrounding habitat structure and the attractive radius of traps.

HO12 Ecology of cloud forest butterfly communities

The butterfly community of Cusuco National Park includes many species, including the glass wings (Ithomiinae); forest specialists well known as Müllerian mimics of each other. Due to their high diversity and habitat specificity, butterflies are often hypothesized as strong biological indicators of neotropical forest quality. This project seeks to examine tropical butterfly ecology in the cloud forests of Cusuco National Park, using Pollard walks as a principal methodology. The range of specific questions this project could encompass are broad, but a focus could be on alpha and beta diversity of butterfly communities in relation to habitat structure, elevation, and other specific parameters such as sun patches and presence of food plants. The project could also look into the ecology of specific species and involve mark-recapture studies to estimate population size or look into biotic interactions such as predation rates or interspecific competition. Alternatively, the evaluation of an umbrella group such as the glass wings as indicators for the butterfly community as a whole would be a most valuable research avenue and a potential great tool for future monitoring of butterfly communities in CNP.

HO13 Aquatic invertebrate communities in tank bromeliads

Several hundred species of aquatic organisms can be found living in the unique habitats of bromeliad pools. This project aims to gain insight into some of the deep ecological mechanisms driving diversity patterns. Building on a detailed study of the aquatic invertebrates in bromeliads carried out over the last eight years, a series of experimental setups will be used to look into metacommunity dynamics and how dispersal affects alpha, beta and gamma diversity of invertebrates. Cusuco National Park has the highest diversity of passive dispersers (invertebrates that need a vector to move between bromeliads) recorded, and the presence of both these and active dispersers allows projects to be developed that study how dispersal strategies affect community assemblages and diversity patterns. In this project students will use small plastic cups as artificial bromeliads strategically placed in the forest to experimentally test hypotheses concerning the impact of factors such as metacommunity size (the number of bromeliads) and patch size (bromeliad size) on the aquatic invertebrate diversity. This can help us to better understand the relationships of tank bromeliads with a wide variety of other organisms.

HO14 Investigation into the effectiveness of two survey methods for monitoring cloud forest herpetofauna

Cusuco National Park supports more than 100 species of herpetofauna which together occupy a wide range of ecological niches. Monitoring changes in herpetofauna populations and community composition over time can therefore be valuable with regards to determining trends in overall ecosystem health. However, cloud forest herpetofaunal communities remain poorly explored generally and within Mesoamerica in particular, and methodologies for determining how best to monitor these communities remain largely untested. Students involved with this research theme will be investigating the relative effectiveness of two commonly-used survey techniques; sweep transects and pitfall trapping – in detecting overall community assemblages and specific subgroups of the herpetofauna found in Cusuco National Park. Time on-site will be spent completing extensive surveys of both methodologies, with an ultimate goal of determining which method, or combination of methods, should be employed to most effectively monitor cloud forest herpetofauna.

HO15 Evolution of aposematic coloration and mimicry in Neotropical snakes

Brightly coloured and deadly coral snakes and their harmless mimics are some of the most striking denizens of Cusuco National Park. The primary driver of this type of bright coloration is convergent evolution, where natural selection impels distantly-related organisms towards a shared phenotype. Biologists have long been fascinated by how selection can cause organisms to converge on a single phenotype despite different developmental and genetic backgrounds and being separated by millions of years of evolution. Mimicry is one of the most dramatic examples of convergent evolution and in particular, coral snake mimicry is a powerful example of Batesian mimicry, which occurs when a harmless species resembles a harmful species for a protective purpose. Coral snakes are dangerously venomous elapid snakes that are usually brightly coloured and banded. Across the geographical range of coral snakes, and sometimes outside of their geographical range, harmless snakes mimic coral snakes with the same coloured crossbands. For this project you will study the ecological and evolutionary dynamics of coral snake mimicry in Cusuco National Park, which is home to at least two coral snake species and nine coral snake mimicking species. Dissertation students will participate in all aspects of this project (except that venomous snakes will only be handled by a trained herpetologist), which will include 1) using spectrophotometry or photography to quantify color of coral snakes, mimics, and non-mimicking snakes, 2) characterizing the ecological and habitat distributions of coral snakes and mimics, and 3) using plasticine models to test for predation rates on different coral snake and coral snake mimic banding patterns.

Senior Scientist
Dr Tom Martin

"This is a highly recommended project which allows students to answer extremely interesting questions relating to mimicry strategies and evolutionary processes using a large quantitative dataset".

HO16 Prevalence of chytrid in amphibian populations within Cusuco

The effective conservation of Cusuco National Park is imperative for many endemic species, none more so than cloud forest 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 visualized 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 uninfected areas to contribute to the investigation into the underlying mechanism of infectivity.

HO17 Niche partitioning and characterisation of Anolis lizards in the tropical cloud forest of Honduras

Anolis lizards are the most diverse tetrapod clade on the planet, with over 400 species occurring in the neotropics. Despite being charismatic and well known, the natural history of many Anoles is highly understudied. Cusuco National Park (CNP) supports 13 distinct species of Anole lizards, four of which are endemic to Honduras. These sympatric species must avoid both inter- and intra-specific competition. Anoles may do this by partitioning their niches with regards to their diurnal active locations and their nocturnal sleeping sites. This project aims to determine the degree of habitat specificity in CNP's Anoles, investigating how their niches are separated in terms of their diurnal active locations and nocturnal sleeping sites. Data collection involves conducting visual encounter surveys (day & night) for the most common species of Anole lizards using the pre-established network of transects in CNP. When encountering individuals, data is collected on anole morphology (body size, condition, sex, etc.), behaviour (activity, orientation, etc.) and micro-habitat use (i.e. height above ground, perch substrate, dimensions, etc.). The collection of such data will allow conclusions to be made on species interactions, behaviour, ecology and niche preference; seeking to form an understanding of how these synoptic species avoid competition in nature.

HO18 Evolution and ecology of feeding and trophic morphology of Neotropical snakes

The montane tropics of the western Hemisphere are a hotspot of biodiversity for both flora and fauna. One of the outstanding questions in ecology and evolutionary biology is how this diversity can evolve and persist. In particular, taxonomic groups with constrained morphology are predicted to have limited ability to partition resources to permit coexistence. Snakes are an excellent example of morphologically and ecologically conserved animals, with all snakes limbless and obligate predators of both invertebrate and vertebrate prey. Despite this morphological and ecological conservatism, snakes are a species-rich lineage that is especially diverse in the montane tropics. You will study morphological and ecological diversity of snakes in Cusuco National Park in northwestern Honduras. You will be involved in all aspects of the research, working with an expert herpetologist to find, identify, and study Neotropical snakes. Our research will focus on four ecologically and morphologically distinct guilds of snakes that includes 1) vipers, 2) leaf-litter dwelling/fossorial species, 3) diurnally active and cursorial snakes and 4) specialist nocturnal species. For all species within these guilds, you will measure 1) body size and morphology, 2) trophic morphology (e.g., head dimensions), 3) ecology (diet, habitat type, thermal ecology and 4) parturition status (gravidity, number of eggs or neonates). The ultimate goal of this work is to contribute to an understanding of the drivers of morphological and ecological diversity of snakes in the tropics.

HO19 Factors affecting bird communities in the cloud forests of Cusuco

Birds are excellent indicators of forest ecosystem health as their abundance and diversity are closely related to habitat disturbance and they make ideal models because they are relatively easy to monitor and study. This topic takes advantage of fixed point count survey work being undertaken for birds at over 100 survey sites across Cusuco, as well as the long-running mark-release-recapture mist netting survey data. By examining species distributions and species richness across varying habitats, projects could: compare bird communities in different administrative divisions of the Park (e.g. the buffer/core zones that differ in degrees of wildlife preservation and human activity); study the impact of differing disturbance levels on bird communities; investigate the impacts of habitat type on bird community composition; or look at the effect of altitude on bird composition. By using covariates such as habitat structure and forest type, threshold limits for the different species could be elucidated which may have interesting implications for the impact of habitat alteration (e.g. by deforestation) in the future.

HO20 Monitoring the effects of hunting pressure on the large mammal populations of Cusuco National Park

Large mammals, despite their size, are often difficult to observe directly in tropical forests due to their shy nature, frequent nocturnal activity cycles, and low population densities. This means indirect surveys, such as patch occupancy analysis (which relies on sightings of field signs such as tracks and droppings, rather than visual encounters), is usually required to detect species within these tropical forest ecosystems, and subsequently determine trends in their populations. Patch occupancy surveys have been successfully employed in Cusuco National Park for 13 years, and have established the presence of 23 large and medium-sized mammals, including the globally endangered Baird's Tapir, the Red Brocket Deer, and the Collared Peccary. Students taking this option would join our long-term transect-based patch occupancy surveys, noting the presence or absence of large mammal species in 50m 'patches' of each transect. This patch occupancy data can then be correlated with information from our large-scale habitat datasets or satellite imagery of deforestation patterns to ascertain the key determinants of large mammal distribution patterns in Cusuco.

HO21 Ecology and behaviour of bats in tropical cloud forests, Honduras

Cusuco National Park has a fantastic diversity of bats that have adapted to the incredibly complex landscape; the huge variation in elevation, temperature and rainfall here has resulted in a wide range of habitats, which in turn support a highly speciose bat community. Bat mist-net surveys in the Park have been conducted between June and August annually since 2006, resulting in the detection of over 60 species, which include insectivores, nectarivores, frugivores, carnivores and sanguivores. As well as the core mist-netting surveys, abiotic data has also been collected on lunar phase, precipitation and temperature, which can also be correlated with the large-scale habitat structure data collected by the habitat survey teams working in the Park. Students joining this project can utilize these datasets to address a wide range of ecological questions relating to the bat community of Cusuco National Park. Such questions could examine how habitat type or altitudinal variables affect bat abundance and diversity on a community scale, or could focus on the effect of these variables on specific feeding guilds.

HO22 Assessing the 'dilution effect' in Cusuco National Park: bats and bat flies

Bats (Chiroptera) are the second-most diverse group of living mammals, after rodents, and comprise more than 1,300 species. Several adaptations have uniquely and effectively expanded their ecological breadth – including flight, echolocation, and a generally nocturnal lifestyle. Moreover, bats have many different food sources such as insects, other vertebrates, blood, fruit, and nectar. These feeding guilds are associated with distinctive morphological adaptations, especially in the New Worlds leaf-nosed bats. Bats vary in the roosts they use, from permanent structures such as caves and mines to ephemeral structures such as 'leaf tents.' Owing in part to these unique adaptations, bats are parasitized by a plethora of organisms: mites, bugs, fleas, and flies. Among these, the flies are among the most conspicuous. They live in the fur and on the flight membranes of bats where they feed on blood. There are several recent studies about bat flies, discussing host specificity, unbalanced sex ratios in bat fly populations, associations with functional traits in bats, and population structure.
The problem often is that datasets are too small to make far-reaching conclusions. This project will contribute to a new dataset encompassing large numbers of bat flies and focuses on effects of habitat. Students will test whether logged areas show increase parasitism with bat flies – in line with the 'dilution effect.' In addition, effects of altitude and roosting behavior and feeding guilds of bat hosts will be assessed.

Honduras

Honduras marine independent research projects

Suitable for: dissertations ✓ master's thesis ✓

These expeditions start on either Wednesday 17 or 24 June and end on either Tuesday 28 July or 4 August 2020.

All these independent topics are suitable for high quality undergraduate dissertation/thesis projects, and most are also suitable for masters level projects. They take place at one or both of Opwall's marine research sites in Honduras: Coral View Research Centre on the island of Utila or the Tela Marine Research Centre in the mainland bay of Tela.

For those projects requiring data collected by diving, you need to either arrive already qualified, or alternatively you can spend your first week on site completing the PADI Open Water dive training course with our team of instructors. Before starting your data collection, you also need to complete our week-long Caribbean coral reef ecology course which involves lectures and in water practicals by diving/snorkelling. Both dive training and the ecology course is included in the six week total duration of these projects.

HO23 Coral reefs in three-dimensions: using technology to explore patterns in Caribbean reef health

This project is based on the island of Utila

Coral reefs are complex ecosystems that are vital to the food security and livelihoods of local communities. Of particular importance are three key characteristics: (1) the underlying physical structure of the reef which provides habitats for a diverse community of animals, (2) the community of plants and invertebrates, such as corals, living attached to the surface of the reef (known as the benthic community) which both creates the physical structure and forms the basis of the reef's food web, and (3) the fish community which both relies on and helps sculpt the benthic community, whilst also providing a major source of protein to local human populations. Traditionally, these three characteristics of a reef have been studied using basic methods based on diver observations in the water, and although more technology-driven alternatives have recently emerged, they are yet to be combined into a single unified approach that addresses all three characteristics to provide a snapshot of an area of reef. Students on this project will use multiple underwater videography techniques whilst SCUBA diving. They will then use state-of-the-art computer 3D modelling to measure the structural complexity of the reef, stereo-video analysis to assess the fish community structure and biomass, and machine learning algorithms to estimate the benthic community structure and overall reef health. Historical data also exists for both fish and benthic assessments, annually since 2012, allowing a temporal element to be added.

Dr Dan Exton
Head of Research, Opwall

"The study of coral reefs is undergoing something of a revolution, with the long term reliance on effort intensive in situ surveys being replaced by novel technological alternatives that improve accuracy and open new possibilities for the questions that can be answered. This project allows students to use three core technologies alongside plenty of SCUBA diving, preparing them for a career in the future of coral reef research."

Computer-generated 3D model of a Honduran coral reef

HO24 Assessing the recovery of a keystone urchin species and its role in reef restoration

This project is based both on the island of Utila and the mainland bay of Tela

Under natural conditions the long-spined sea urchin, *Diadema antillarum*, is the most important herbivore on Caribbean coral reefs and is 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 extremely limited, with populations on most reefs still severely depleted, and Utila island is a classic example of this. Remarkably, the Banco Capiro reef system in Tela Bay has a population density of *D. antillarum* at astonishingly high levels. It also boasts extremely high cover of live healthy coral, despite historical overfishing leading to a complete collapse of the fishery. Since its recent discovery, Operation Wallacea scientists began detailed population studies in 2013 which have continued annually ever since. Students on this project will continue collecting this long-term dataset, and will have access to historical data where needed. The primary objective is to quantify changes in the abundance and population structure of *D. antillarum*, its competitors and its predators, on the reefs of Utila and Banco Capiro, as well as assessing the reef health at both locations.

HO25 Lionfish as an invasive predator on Caribbean coral reefs

This project is based in the mainland bay of Tela

Since they first invaded the Caribbean in the 1980s, lionfish (Pterois spp.) have proved to be the perfect predator and have had a devastating impact on local fish communities throughout the region. A single female can produce up to 2 million eggs per year, while they are generalists who feed on almost anything including fish, invertebrates and even each other! They are also habitat generalists, tolerating a wide range of environmental conditions which has allowed them to spread as far as New York City in the north and Brazil in the south. They also have no natural predators in the Caribbean, whilst at the same time the native fish have struggled to adapt to their sudden appearance. They are now considered to be one of the greatest threats to the future of Caribbean coral reef fish communities. Management approaches to dealing with the lionfish invasion are limited, with one of the most common being direct removal via spear fishing, although research by Operation Wallacea scientists has shown significant populations of lionfish at extreme depths, far beyond the reach of even the deepest divers. Technological solutions such as robots are therefore also being tested to help control populations at depth. Lionfish as a food source in the restaurant trade is also growing in popularity, alongside other products such as jewellery which can help provide financial support to removal efforts. Students on this project will work with our lionfish team who are involved in various areas of research. Projects could focus on investigating changes in population structure and morphology over time through dissections of culled individuals, or could explore food preferences via gut content analysis. Alternatively, projects could focus on the ecology of invasive lionfish by studying their habitat preferences and behaviour on local coral reefs.

HO26 Reefs at war: the disruptive impact of Damselfish

This project is based in the mainland bay of Tela

There is an age-old battle taking place on coral reefs between slow growing corals and fast growing macroalgae. Historically corals have been victorious thanks to the combination of low nutrient concentrations in tropical coastal waters and the actions of herbivores. However, deterioration in water quality and the loss of herbivores have tipped the balance in favour of macroalgae, leading to phase shifts towards algal dominated systems, especially in the Caribbean. Damselfish have emerged as key players in this war. They kill patches of coral and use them to actively farm algae. But they are also highly aggressive, and will attack fish many times their own size who try to enter their territory. These fish that are usually only 10cm in size will even regularly attack SCUBA divers! This aggression impacts the activities of herbivores who provide a vital ecosystem service in clearing growth of macroalgae. In addition, damselfish are too small to be of value to fishers, meaning that while predators of damselfish such as groupers have been decimated by overfishing, damselfish have been able to thrive in many parts of the Caribbean. Students on this project will assess the population of damselfish in relation to herbivores and predators. They will also quantify the impacts of dense damselfish populations on nearby coral health, and could also study their aggressive behaviour towards other reef organisms. This will help improve our understanding of the disruptive role of damselfish on modern Caribbean coral reefs and explore its implications for conservation.

HO27 The behaviour and ecological role of coral reef cleaning interactions

This project is based on the island of Utila

On coral reefs, the cleaning behaviour of certain species provides a vital ecological service to the wider reef fish community. It also gives a fascinating insight into how different species interact mutualistically in such a hyperdiverse ecosystem. In the Caribbean, cleaning is performed by both fish (primarily gobies) and invertebrates (primarily the Pederson cleaner shrimp, *Ancylomenes pedersoni*). Cleaner species occupy cleaning stations that are sought by client fish who perform set behaviours in order to initiate cleaning. The dynamics of these interactions are complex and span the taxonomic spectrum of the reef fish community, with Pederson cleaner shrimp alone known to service over 20 families of fish. Students will use SCUBA diving, first to map the cleaning stations present on a reef, and then to deploy remote underwater video cameras to film the natural behaviour at cleaning stations in the absence of divers. Projects could focus on drivers of client composition, or how cleaning frequency and duration varies between client species. Alternatively, projects could explore the role of habitat, structural complexity and environmental variables on cleaning station densities and distributions.

HO28 Long-term changes in reef fish and benthic communities in a newly established marine protected area (MPA)

This project is based in the mainland bay of Tela

The coral reefs of Banco Capiro in Tela Bay are an ecological mystery; they boast a surprisingly high percentage cover of healthy corals, despite what appear to be unfavourable environmental conditions and a low abundance of reef fish. They are also home to one of the last remaining dense populations of a keystone herbivore, the urchin *Diadema antillarum*. Operation Wallacea scientists have been monitoring Banco Capiro for a number of years, including both benthic video surveys to assess the health of the reef, and stereo-video surveys to quantify not only fish abundance, but also biomass. In early 2018, the Honduran government designated the area as a new marine protected area (MPA), in an attempt to protect such a valuable and unique marine environment. Students on this project will help expand Operation Wallacea's long-term monitoring efforts to new reef sites around the bay. By using these data in combination with those from previous years before and after MPA designation, questions can be answered on the impact of this new MPA on the reefs of Banco Capiro, and framed within a broader discussion of the pros and cons of MPAs as a conservation tool.

HO29 Tracking the fine-scale movement of coral reef fish in response to natural and artificial cuess

This project is based on the island of Utila

Understanding how fish move across the surface of a reef is important in answering questions about natural behaviour, resource utilisation, and responses to habitat change. Large-scale fish movements can be recorded using catch/release fishing, tags, and acoustic telemetry, but these methods are unsuitable for fine-scale movement studies where centimetre resolution is needed. These fine-scale movements are often estimated from visual observations, which give a broad overview of fish movement and location, but lacks precision. Over the past ten years, Operation Wallacea has helped pioneer the use of stereo-videography in estimating the length of reef fish, which can then be used to estimate biomass. However, this same method can also be applied to tracking the movement of objects in time and space, and Operation Wallacea are developing this approach to study fine-scale fish movements. Students on this project will be some of the first to ever use this method, and will deploy static stereo-video systems onto areas of coral reef chosen due to their natural habitat features, presence of key territorial species, or to which artificial stimuli will be added. The movement of fish will then be recorded across these areas of reef, allowing the responses of individual species of fish to be explored, and individual territories to be mapped in three dimensions.

HO30 Behaviour of the long-spined sea urchin, a keystone Caribbean coral reef herbivore

This project is based in the mainland bay of Tela

The long-spined sea urchin, *Diadema antillarum*, was historically responsible for the maintenance of coral reef health throughout the Caribbean. However, in the early 1980s a disease reduced their populations by an average of 98% throughout the region, which stimulated the widespread macroalgal phase shifts that currently plague the Caribbean. Despite restoration of *D. antillarum* being a conservation priority there is still much we don't know about their behaviour. Tela Bay in Honduras is home to a bizarre coral reef system called Banco Capiro, which is home to one of the only remaining healthy populations of urchin. Students on this project will be based here and have access to the laboratory facilities at Tela Marine Research Centre. The behaviour of *D. antillarum* individuals could be explored under controlled conditions in the lab, on the reefs themselves, or a combination of both. Of particular interest is to improve our knowledge of habitat preferences, feeding behaviour, and grouping cues.

*This project is predominantly lab based and therefore can be undertaken by non-divers, although additional data can also be gathered from dives.

HO32 Noisy neighbours: the role of underwater acoustics in the behaviour of reef organisms

This project is based on the island of Utila

Coral reefs are a naturally noisy place, with a diverse community of sound-creating organisms combined with the ambient sounds of the ocean itself such as waves. Unsurprisingly, many of the species found on coral reefs have evolved to use this complex soundscape for aspects of their ecology, such as communication, feeding and navigation. For example, sounds have been shown to be one of the factors used by fish and invertebrate larvae to seek a suitable reef to settle upon. As reefs become degraded, their soundscape changes, and this can in turn impact larval recruitment rates if the acoustic triggers that stimulate larval attraction are diminished or lost. Alongside these natural reef sounds, humans have introduced numerous sources of noise pollution into the marine environment, including from boat traffic and SCUBA divers. This anthropogenic noise can disrupt natural behaviours and initiate flight responses in resident coral reef species. On this project, students will use a combination of underwater acoustic recorders and speakers to explore specific sounds created by Caribbean reef species and their human visitors, and investigate the effects of these sounds on the behaviour of local species and the composition of reef communities.

HO31 Assessing the population status of the Caribbean spiny lobster *(Panulirus argus)*

This project is based in the mainland bay of Tela

As a mesopredator the Caribbean spiny lobster (*Panulirus argus*) feeds on a wide range of prey including snails, crustaceans and sea urchins, but is also itself predated by larger reef dwelling organisms such as snappers, groupers and sharks. *P. argus* therefore sits at the centre of Caribbean coral reef food webs, meaning that changes in population size can lead to dramatic trophic cascades affecting the entire ecosystem. As well as being ecologically important, lobsters are also hugely economically valuable, and it is estimated that over-harvesting has reduced *P. argus* populations by up to 50% in some parts of the Caribbean since the 1950s. Despite these dramatic population declines, *P. argus* has been assessed as 'data deficient' by the IUCN and is therefore afforded little protection. Lobsters in Honduras have been largely neglected by the scientific community, but this project aims to redress this by using a combination of population surveys by SCUBA diving to assess their size-distribution structure and habitat selectivity. This project has now been running for several years, allowing changes in lobster populations over time to be addressed. We hope these data will ultimately be used to increase the degree of protection provided to the Caribbean spiny lobster and prevent further declines to their population sizes.

Honduras

Indonesia overview

Key facts
- Endemic rich forests with many new species described and more still to be discovered
- In the centre of the Coral Triangle – the world's most biodiverse reefs
- Most published site in the Coral Triangle and third most published terrestrial site in Sulawesi interventions with carbon and seaweed projects
- Most developed Opwall site for conservation interventions with carbon and seaweed projects

> "There is nothing in this world you can compare this experience to. It has unique moments of beauty and wonder than can never be replicated."
>
> **Erin Flathers,** *Grant MacEwan University*

Expedition Details

Biodiversity Trainee projects for 2, 4, 6 & 8 weeks

Topics for dissertation students for 6 or 8 weeks

OBJECTIVES

The Wallacea region comprises islands of the central part of the Indonesian archipelago that are separated by deep ocean trenches which prevented them from being joined to the main continental land masses during the lowered sea levels of the Ice Ages. As a result of subsequently long periods of isolation, a large number of unique species evolved. The forests of the Wallacea region are one of the least biologically studied areas in the world and one of the most likely places to discover vertebrate species new to science. Since 1995, the Opwall teams have been surveying the biodiversity of Buton Island in SE Sulawesi, so that more information is now available on the wildlife of this well studied area than anywhere else in the Wallacea region. The Opwall gathered data are being submitted to support a REDD+ application to protect the carbon and biodiversity of the forests and ensure that local communities have a financial benefit from this conservation programme.

There is a triangle of reefs in Eastern Indonesia that have the highest diversity of hard coral genera, the proxy commonly used to assess overall diversity of coral reefs, anywhere in the world. Both the marine stations being used by the Opwall teams are in the centre of this triangle. The South Buton Marine Centre has established a series of standard monitoring sites on reefs south of Bau Bau and around the surrounding small islands, with the objective being to use the data to develop plans for conserving these reefs. The Hoga Island Marine Station is located in the heart of the Wakatobi Marine National Park. Over the last 20 years, a series of scientists have been based at this site during the Opwall survey seasons and as a result, this is now the most published site in the Coral Triangle. For the last 15 years a series of constant monitoring sites around Hoga and eastern Kaledupa have been monitored for macroinvertebrates, fish communities, coral cover and community structure. The 2020 season will complete this monitoring plus some additional projects.

Costs to consider **£$**

International flights - return to arrival and departure airports listed right ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Visa* (+ extension - if required) ✓

Park Entrance Fees ✓

Spending Money ✓

(local currency is **rupiah)**

If diving: Equipment Hire and 3-5mm full length wetsuit ✓

If dive training: PADI Manual & PIC ✓

* For people travelling on passports of 169 countries worldwide including EU, US or Canadian passports a 30-day free visa on arrival is issued. For stays of longer than 30 days two types of visa are available (for a fee); visa exemption is issued and social visa.

Operation Wallacea Trust

www.owt.or.id

Travel information

For those joining **forest only or forest and marine combined projects** the expeditions start in the North Buton town of Ereke on a Sunday at 1500hrs. For travelling to these projects you need to book your flights to either Jakarta or Makassar in order to arrive on the Saturday by no later than 1300hrs (for Jakarta arrivals) or 1500hrs (for Makassar arrivals). Your Internal Travel package will then book you through to the provincial capital of Kendari that same afternoon prior to travelling overland to your expedition start point (Ereke) on the Sunday. The **forest only projects** will finish in Bau Bau on Saturday at 1800hrs. You will therefore be able to book your onward flights from Makassar on Sunday from 1000hrs or from Jakarta after 1500hrs. The **forest and marine projects** finish at the Wakatobi Airport on the Saturday at 0500hrs so please book your onward flights from Makassar from 1200hrs or from Jakarta from 1400hrs on the Saturday that your expedition ends.

For those joining **marine only projects in Bau Bau**, the expeditions start on a Sunday at 1200hrs and finishes on a Saturday at 0500hrs. For travel to these projects you will need to book your international flights to arrive in Makassar on the Saturday (anytime) where you will overnight prior to onward travel to site the next day. On your return home, you will be able book your onward flights from Makassar from 1000hrs.

For those joining **marine only projects on Hoga Island**, the expeditions start on a Sunday at 0700hrs in Wanci (main town in the Wakatobi Archipelago) and finishes at the Wakatobi Airport on the Saturday at 0500hrs. For travel to this project, you need to book your international flights to Makassar to arrive anytime on the Friday, where you will overnight prior to flying to Wanci the next day. Your return flights can be booked from Makassar on Saturday from 1200hrs or from Jakarta from 1400 hours.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

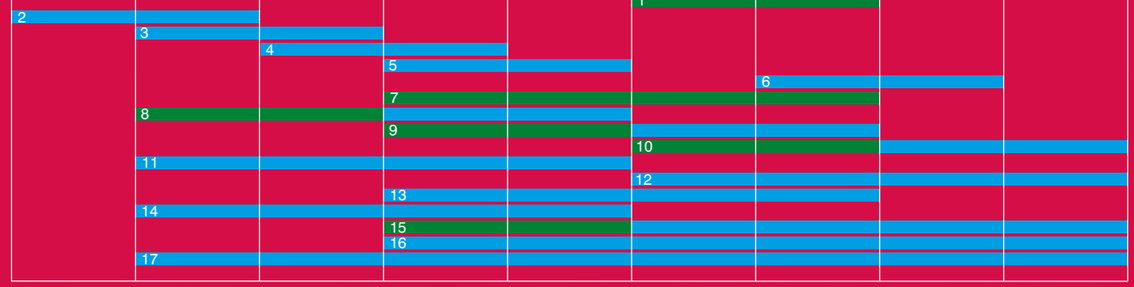
Forest and field camps: Hammocks or shared tents with camp beds, field toilets and river showers.

Bau Bau marine camp: Shared room with own bathroom and toilet facilities.

Hoga marine camp: Traditional wooden houses with shared mandi style bathrooms.

For more images and details visit the Opwall website www.opwall.com

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
7 June – 13 June	14 June – 20 June D	21 June – 27 June	28 June – 4 July D	5 July – 11 July	12 July – 18 July	19 July – 25 July	26 July – 1 August	2 August – 8 August



Indonesia details of Biodiversity Trainee projects

In Indonesia you have the opportunity to participate in wildlife training courses located in remote primary forest habitats within the North Buton Nature Reserve. These courses are operated by our local Indonesian counterparts, the University of Haluoleo (terrestrial) and University of Hasanuddin (marine).

Two Week Options

Introduction to forest biodiversity and wildlife survey techniques

2 weeks

Why choose this expedition? A taster of a range of forest biodiversity survey techniques.

This expedition is based in the forested and remote Langkube Valley on Buton Island and surrounding areas. The Langkube Valley lies within the North Buton Nature Reserve (82,000 ha) and represents a vast area of unexplored, primary rainforest. The region supports an array of different habitats that remain largely unknown to science. Importantly, it is also a stronghold for the endangered Anoa, a CITES listed dwarf buffalo. After completing training in jungle survival skills and learning about Wallacean wildlife and conservation, volunteers will assist a team of biologists documenting the valley's rich biodiversity. Biologists will focus on mammalian, avian and herpetological assemblages together with forest structure and carbon surveys. Particular attention will be given to records of endangered Sulawesi endemics, such as the Anoa and the Maleo, both rarely sighted but critically important species for local conservation efforts. There exists a high likelihood that new species records for Buton Island will be made given that this expedition will be working in remote and previously unsurveyed forests. Survey techniques include the use of camera traps, distance and patch occupancy estimates for large mammal species, mist netting for bats, Pollard counts for butterflies, standard search transects for reptiles, spotlight surveys for amphibians, and point counts for birds. Due to the demanding nature of this expedition, volunteers will be required to live in a basic camp environment and undertake long treks under challenging conditions.

Expedition 1:
Sunday 12 July – Saturday 25 July 2020 ●●

Diving and marine biology in the Coral Triangle

2 weeks

Why choose these expeditions? A taster of diving and marine biology survey techniques.

These expeditions are designed for those who want a taster of diving and marine biology and the survey techniques used to quantify different coral reef taxa. There are two marine centres operated by Opwall: South Buton and Hoga Island. South Buton is a small friendly site on Buton Island and has the advantage of less travel being required to get there. The site lies outside the Marine National Park and the information being gathered is being used for an application to extend the park. The Hoga Island marine centre is much bigger and is surrounded by white sand beaches. There are much larger teams of marine scientists based at this site which is in the heart of the Wakatobi Marine National Park and it hosts up to 120 marine biology specialists and students a week each summer. Expeditions 2 & 3 are based for the first week on the South Buton Island marine centre and the second week is based on Hoga Island. Expeditions 4 & 5 are based for the whole 2 weeks in the South Buton marine centre whilst expedition 6 is based entirely on the Hoga Island Centre. These are ideal places to learn to dive to PADI Open Water level, which you will do in your first week on expedition if you are not already dive trained. For your second week you will complete an Indo-Pacific reef survey techniques course with two lectures and two dives each day to learn about the survey methods used to assess different aspects of the reefs and some of the commonly encountered species. If you are already dive trained or would prefer to snorkel when you arrive then you start with this course and assist with the marine surveys in your second week. You can complete up to 22 dives on these expeditions and develop your interests in marine biology. For an additional cost you can also take your diving qualifications to a higher level than PADI Open Water.

Expedition 2:
Sunday 7 June – Saturday 20 June 2020 ●●
Expedition 3:
Sunday 14 June – Saturday 27 June 2020 ●●
Expedition 4:
Sunday 21 June – Saturday 4 July 2020 ●●
Expedition 5:
Sunday 28 June – Saturday 11 July 2020 ●●
Expedition 6:
Sunday 19 July – Saturday 1 August 2020 ●●

Four Week Options

Immersion in forest biodiversity and wildlife survey techniques

4 weeks

Why choose this expedition? Rapid biodiversity assessment of previously unexplored forests.

The Langkube Valley lies within the North Buton Nature Reserve (82,000 ha) and represents a vast area of unexplored lowland rainforest. The region supports an array of different habitats that remain largely unknown to science. Importantly, it is also a stronghold for the endangered Anoa, a dwarf buffalo. After completing training in jungle survival and learning about Wallacean wildlife and conservation, volunteers will assist a team of biologists seeking to document the valley's rich biodiversity. Biologists will focus on mammalian, avian and herpetological and faunal assemblages together with forest structure and carbon surveys. Particular attention will be given to records of endangered Sulawesi endemics, such as the Anoa and the Maleo, both rarely sighted but critically important species for local conservation efforts. There exists a high likelihood that new species records for Buton Island will be made given that this expedition will be working in remote and previously unsurveyed forests. Survey techniques include the use of camera traps, distance and patch occupancy estimates for large mammal species, mist netting for bats, Pollard counts for butterflies, standard search transects for reptiles, spotlight surveys for amphibians and point counts for birds. Due to the demanding nature of this expedition, volunteers will be required to live in a basic camp environment and undertake long treks under challenging conditions.

Expedition 7 –
Sunday 28 June – Saturday 25 July 2020 ●●●●

Remote forest biodiversity assessment and marine survey techniques

4 weeks

Why choose these expeditions? Provides an introduction to both forest and marine survey techniques.

These expeditions are based in the forested and remote Langkube valley on Buton Island for the first two weeks, followed by two weeks in the Wakatobi Marine National Park. After some initial jungle skills training and learning about Wallacean wildlife and ecology, you will be assisting a team of biologists who are hoping to uncover records of threatened Sulawesi endemics such as the Anoa and threatened bird species such as the Maleo, as well as to document the main species of mammals, birds, reptiles, amphibians and butterflies present in the area. Surveys will include distance and patch occupancy estimates of large mammal species, mist netting for bats, standard search transects for reptiles, butterflies, spotlight surveys for amphibians and point counts for birds. The third and fourth weeks will be based on Hoga Island in the Wakatobi. If you are not already dive trained then you will start your time on Hoga with a PADI Open Water dive training course and then in your final week you will complete an Indo-Pacific reef survey techniques course with lectures and dive based practicals. If you are already dive trained when you arrive, or would prefer to snorkel, you start your third week on this Indo-Pacific reef survey techniques course and then assist the marine scientists working on a range of projects including stereo-video surveys of reef fish, 3D mapping of coral reefs, behaviour studies on cleaner fish, coral regeneration, marine plastics and many other projects.

Expedition 8: Sunday 14 June – Saturday 11 July 2020 ●●●●
Expedition 9: Sunday 28 June – Saturday 25 July 2020 ●●●●
Expedition 10: Sunday 12 July – Saturday 8 August 2020 ●●●●

Indonesia details of Biodiversity Trainee projects

Four Week Options

Marine survey techniques and biodiversity in the Coral Triangle

4 weeks

Why choose these expeditions? Introduction to marine survey techniques in the Indo-Pacific.

Expeditions 11 & 12 are based at the Opwall Hoga Island Marine Centre run by the University of Hasannudin, which is the most published centre in the Coral Triangle (the triangle of reefs stretching from the Philippines to Borneo in the west and New Guinea in the east, which together possess the highest species richness of hard coral species globally). Hoga Island has no roads or vehicles and is surrounded by long white sand beaches. Every summer the island has a big influx of marine specialists and students helping complete both an annual monitoring programme for reef changes and innovative projects. If you are not dive trained then your expedition will begin with completing a PADI Open Water dive training course and then an Indo-Pacific reef survey techniques course in your following week. This course consists of daily lectures and dive based practicals. If you arrive already dive qualified or would prefer to snorkel you would spend your first week completing the Indo-Pacific reef survey techniques course. After this, for the remaining weeks, you will join a wide range of projects such as: video transect surveys of the reefs, 3D mapping of the reefs, stereo-video surveys of fish populations, seagrass health and coral nursery and reef rehabilitation projects amongst others. On this expedition you should complete around 40 dives, and for an additional cost you can also take your diving qualifications to a higher level than PADI Open Water. Expedition 13 is based at the smaller Bau Bau centre and has a smaller range of projects available mainly concentrating on reef monitoring techniques and video monitoring of sharks and rays.

Expedition 11:
Sunday 14 June – Saturday 11 July 2020

Expedition 12:
Sunday 12 July – Saturday 8 August 2020

Expedition 13:
Sunday 28 June – Saturday 25 July 2020

Divemaster training

4 weeks

Why choose this expedition? Opportunity to gain a Divemaster qualification whilst working with marine scientists.

This expedition is based on Hoga Island in the Wakatobi Marine National Park where upwards of 120 marine biologists and students are based for an eight week season each year. If you want to gain your Divemaster qualification at a site where everyone is interested in and working on marine biology projects, then this is an ideal location. To qualify for this training you need to be Rescue Diver qualified and have completed at least 40 dives. Over the course of the four weeks you will be helping to train and provide in-water support to new divers and those completing marine projects. During this expedition you should complete at least 40 dives on some of the most biodiverse reefs in the world.

Expedition 14:
Sunday 14 June – Saturday 11 July 2020

Six Week Options

Wallacea forest & marine surveys in the Wakatobi Marine National Park

6 weeks

Why choose this expedition? Introduction to forest biodiversity survey techniques and more in-depth marine experience.

The first two weeks of this six-week expedition are spent in the forests of the Wallacea region, on Buton Island, followed by four weeks with the marine teams on Hoga Island. The first few days are split between jungle skills training and learning about Wallacean wildlife and ecology from lectures and field based practicals. For the remaining time in the forest, the group will help a team of biodiversity specialists complete surveys targeting bird communities using point counts, distance sampling and patch occupancy analysis for large mammals, mist netting for bats, Pollard walks for butterflies, and herpetofauna surveys. The teams will be based in the primary forests in the little studied northern forests of the island. The remaining four weeks will be based on Hoga, at the centre of the Coral Triangle - the most biodiverse reefs in the world. If you are not already dive trained but want to learn then you will start your time on Hoga with a PADI Open Water dive training course and then in your next week you will complete an Indo-Pacific reef survey techniques course with lectures and dive based practicals. If you are already dive trained or wishing to only snorkel on the expedition, you will complete the Indo-Pacific reef survey techniques course during your first week. After completing the Indo-Pacific reef survey techniques course you will then join the large team of specialists including coral intercept video transects and 3D mapping of reefs, fish behaviour surveys, stereo-video surveys of reef fish communities, marine plastics and many other projects. For an additional cost you can also take your diving qualifications to a higher level than PADI Open Water.

Expedition 15: Sunday 28 June – Saturday 8 August 2019

Advanced marine biology and survey techniques in the Wakatobi Marine National Park

6 weeks

Why choose this expedition? An in-depth marine biology experience.

This expedition is based on Hoga Island in the Wakatobi Marine National Park which is in the centre of the Coral Triangle (most diverse reef systems in the world as judged from the diversity of hard corals). If you are not dive trained then your first week is spent learning to dive to PADI Open Water level. Then you will need to complete an Indo-Pacific reef survey techniques course which as part of the course will start training you in the identifications of some of the most common fish, macroinvertebrate and coral species. If you are already dive trained on arrival then you will complete the Indo Pacific reef survey techniques course in the first week. For the rest of your time you will be helping a series of scientists with marine biology projects. There is a whiteboard system in operation and each of the scientists writes up what they are doing the following day and you can sign up for projects as diverse as butterflyfish diversity as an indicator of reef health, to new technology projects such as 3D mapping of reefs. During the six weeks you should complete 60+ dives, become familiar with different marine biology survey techniques and how to identify the main species of fish and coral. For an additional cost you can also take your diving qualifications to a higher level than PADI Open Water.

Expedition 16: Sunday 28 June – Saturday 8 August 2020

Eight Week Option

Marine biology immersion in the Coral Triangle

8 weeks

Why choose this expedition? Best expedition for an in-depth marine biology experience.

This expedition is based on Hoga Island in the Wakatobi Marine National Park which is in the centre of the Coral Triangle (most diverse reef systems in the world as judged from the diversity of hard corals). The expedition starts earlier than any of the other marine projects and you travel into the site with the incoming scientists and dive staff and help with opening up the marine base. It also means that since only very small numbers of potential marine biologists are allowed onto this expedition you get very close attention in your first week as you are completing training. If you are not dive trained then your first week is spent learning to dive to PADI Open Water level. You will then complete an Indo-Pacific reef survey techniques course which will start training you in the identifications of some of the commoner fish, macroinvertebrate and coral species. If you are already dive trained on arrival, then you will complete the Indo-Pacific reef survey techniques course in that first week. For the remaining weeks of your time on site you will be working with different scientists helping with their projects. The aim should be by the time you leave, to be proficient in the identification of fish, corals and macroinvertebrate species. The diversity here is approximately 10X greater than the Caribbean and few people can claim to have this competence. You should complete 80 dives over the course of the expedition involving line transect surveys for corals, stereo-video surveys for reef fish and many other projects. For an additional cost you can also take your diving qualifications to a higher level than PADI Open Water.

Expedition 17: Sunday 14 June – Saturday 8 August 2020

Indonesia marine independent projects

Suitable for: dissertations ✓

The start dates for these topics is either Sunday 14 June or Sunday 28 June finishing on either Sunday 25 July or Sunday 8 August. An 8 week project would start on Sunday 14 June and finish Sunday 8 August.

All these independent topics are completed at the Hoga Island Marine Station within the Wakatobi National Park, and provide unique opportunities for students to work within their chosen field in the heart of the Coral Triangle. All dissertation projects are conducted in conjunction with our local partners, Hasanuddin University in Makassar and as such all students are registered with them as part of an existing student program known as PKL (Praktek Kerja Lapangan).

For those projects requiring data collected by diving, you need to be dive qualified or to have completed a PADI Open Water dive training course with us in your first week on site. You also need to have completed the week-long Indo-Pacific reef ecology and survey techniques course with associated diving or snorkelling practicals before you start on your project. Both of these courses, if required, are included in the dissertation dates.

*projects do not require data to be collected by diving, although you could still dive in your spare time and on some of the projects additional data could be collected by diving.

IN35 The relationship between reef complexity and fish communities

Hard corals are the key ecosystem architects on coral reefs and produce a physical complexity that provides habitat for associated reef fish species. One of the effects being noted around the world due to increased storm damage or destructive fishing techniques such as bomb fishing, is a decline in this physical complexity which then will have negative consequences for associated fish communities. Until recently, physical complexity of reefs was measured using a basic technique known as chain-and-tape, whereby a chain is laid across the surface of the reef to give a simple rugosity value. This crude method is limited in its accuracy, and can even cause damage to the reef itself. An alternative method uses diver observations to assign a complexity score based on set criteria; this method is known as the Habitat Assessment Score (HAS), but is subjective and can also lack accuracy. More recently, advances in underwater videography and computing have led to the development of 3D modelling as a tool for accurately quantifying reef complexity. Opwall scientists have developed their own 3D modelling approach that uses structure-from-motion photogrammetry applied to video footage from underwater cameras, and in 2020 this method will be launched at our Indonesia site in conjunction with our fish and benthic survey teams. Students on this project will film different areas of reef across multiple sites, and construct 3D models from the footage. Analysis of these models will give accurate measurements of structural complexity, and these can be compared to data on fish community structure and benthic reef health to explore fine-scale patterns in the importance of complexity as a driver of reef biodiversity.

IN36 Long-term changes in the community ecology of coral reefs

The reefs of the Wakatobi have been monitored by Operation Wallacea teams since 2002 and in recent years by teams from the Hasanuddin University in Makassar. These datasets provide an increasingly valuable resource to monitor how reefs in the heart of the coral triangle are changing. Initial observations suggest that the abundance of reef building corals has declined but other functional benthic taxa, such as soft corals, have increased. As well as an overall decrease in reef building corals, the types of corals present, both in terms of species and colony structure have also changed. Where once reefs in the region harboured a mix of different colony growth forms (including branching, table and foliose corals) the system today is dominated by massive (boulder-like) and encrusting corals. The physical form of the reef is therefore changing which has implications for resident and transient fish communities. During 2020 the Hasanuddin University researchers will be repeating the reef monitoring programme on the reefs around Hoga island, data from which can be compared to previous years to determine rates of change in key coral and reef fish community characteristics. The data consist of replicate 50m long transects at multiple depths over a series of reef sites. Benthic community structure is assessed using point intercept technique, more recently via underwater videography. Fish community structure was initially assessed using underwater visual census (UVC), but since 2013 has used state-of-the-art stereo-video surveys which allow accurate biomass measurements to be estimated. Students involved in this project will be assisting with the Hasanuddin led surveys but will have access to the larger datasets so that changes over time can be quantified.

N37 Moving to better places: An assessment of the abundance and behaviour of butterflyfish species around Wakatobi National Park, Indonesia

Human induced rapid environmental change (HIREC), along with other anthropogenic impacts such as overfishing and destructive fishing methods, are having an ever-increasing impact on the world's coral reefs. Such changes will first induce behavioural changes, with further implications to the distribution, abundance, and persistence of affected species. Butterflyfish (Chaetodon spp.) are of particular interest as they rely on live coral as a food source, and are therefore potentially severely impacted by coral cover decline. Some species of butterflyfish are obligate corallivores, others are facultative and can utilise other food items in addition to coral polyps. One project could identify behavioural differences between individuals of both a facultative and obligate corallivore between high and low coral cover sites. Abundance surveys will then be conducted to identify the abundance of the focal species and all other butterflyfish species to identify any differences between the number of obligate and facultative corallivores between the study sites. Another project using the same high and low coral cover site comparison could look at a territorial obligate corallivore that not only depends upon coral as its only food source but, under optimal conditions, will hold and defend a coral territory, often aggressively. Data collection will involve assessing the diversity of corals selected as a food source by the focal species, the number of bites taken out of each coral colony, the amount of time spent swimming between feeding bouts, aggressive interactions with other individuals and different butterflyfish species. These projects have the potential to apply modelling methods to predict the persistence of focal species in the future, based on the observed abundances and behaviours collected throughout the work.

IN38 *The behaviour and functional role of reef fish cleaners in Indonesia

Cleaner fish play an important role on coral reefs around the world. Recent studies have shown that the health of reef fish and the biodiversity of reef systems increase when cleaners are abundant. The Wakatobi National Park is unusual in that three species of cleaner wrasse are present on its reef. The most abundant is the Bluestreak Cleaner Wrasse (*Labroides dimidiatus*) which has been fairly well studied. Much less research effort has focused on the ecology of the other two species: Blackspot Cleaner Wrasse (*Labroides pectoralis*) and the Bicolour Cleaner Wrasse (*Labroides bicolor*). Another species, this time a fang blenny, mimics the most dominant cleaner species (*L. dimidiatus*) in colouration pattern and morphology, but rather than providing an important ecological service it attacks and bites clients waiting at cleaner stations. One study could look at how this 'cheating' behaviour survives and quantify the incidence rates of cheats versus genuine cleans. Another project could explore the client pool making use of cleaning stations, including whether there is a hierarchy of service quality given to different taxonomic groups. Research could also focus on investigating niche differentiation through resource partitioning amongst the different cleaner species, or could be based around the complexities of cleaning behaviour and advertising strategies.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN39 *Behavioural adaptations of dwarf cuttlefish, *Sepia bandensis*

As a group, cephalopods display a high level of nervous integration resulting in complex behavioural responses and social interactions that rival those seen in vertebrates. Within the Wakatobi National Park, dwarf cuttlefish, *Sepia bandensis*, is the most abundant cephalopod species, occurring in large numbers near rocky shorelines, on coral rubble, in seagrass meadows and at mangrove margins. While the species has some commercial value in local artisanal markets, its major importance lies in their ability to shape habitat ecology. Cuttlefish feed on various sized shrimp, crabs, and small fish. Despite their ecological importance, little is known about the behaviour or social interactions in this species. This topic could examine aspects of feeding behaviour and the effects of competition, social, and mating interactions between individuals. All studies would be conducted using captive animals housed in the Hasanuddin laboratory facilities and proposed studies must be non-lethal. In addition to the lab-based observations students would be encouraged to add snorkel based observations of behaviour in their natural environment.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN40 *The biodiversity of coral patch reefs and their conservation value

Located within the zone separating the coral reef from seagrass beds are numerous coral patch reefs. These patches range in size and distance from the main reef system and represent a unique opportunity to study the impacts of different levels of isolation. Locally called coral bommies, they are home to numerous fish and invertebrate species and have varying levels of biodiversity. It appears most likely that the patch reefs represent important species rich "islands", but the factors that influence fish species richness and the stability of resident fish assemblages remain largely unknown. It is generally thought that larger patches will house greater species richness, as will those patches closer to the main reef. But it is also possible that other factors such as the biological and physical complexity of the patches are more important, or that coral patches close together could act as a single patch for resident fish. This research could take a number of approaches to examine the physical and biological attributes of reef patches, the factors that drive patch reef biodiversity, and how reef size/complexity and biodiversity are related. A high abundance of juveniles would mean patches have high conservation value, although they are currently given little attention from reef managers. Therefore, as well as addressing fundamental ecological questions, research within this subject area has direct conservation implications and may lead to recommendations for conservation intervention to increase the protection afforded to these habitats.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN41 *Role of seagrass beds in the Wakatobi marine ecosystem

Seagrass beds in the Wakatobi are amongst the most diverse on the planet and provide many important ecosystem services, yet remain relatively unstudied compared to the nearby coral reefs. A healthy and productive seagrass bed provides refuge and nursery grounds for ecologically and economically valuable fish species. They also entrap sediments which otherwise smother reef organisms. There are extensive seagrass beds around Hoga island and studies could focus on the community structure, zonation and diversity of the plants themselves, their standing biomass, associated biodiversity and usage by fish and invertebrate communities. Another project could examine the impacts of resource exploitation such as reef gleaning on the ecology of seagrass and associated species. Alternatively a study could be completed on the impact of agar beds (ropes anchored just above the seagrass beds and are used to grow seaweed for sale) which have a shading effect on the seagrass but which also provide physical complexity that may be used by fish. Yet another approach could be to quantify the impact of fish fences that have been constructed over the seagrass beds on the seagrass fish communities by sampling at differing distances away from the fish fences.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN43 *Quantifying marine plastic pollution levels in the Wakatobi Marine Park

The problem of plastic pollution even in remote parts of the globe has recently received huge media attention and this is borne out even in the remote Wakatobi National Park. The rates of macro plastic (>5mm) accretion on a series of coral reef sites on Hoga and Kaledupa Islands could be quantified by cleaning study areas using SCUBA diving and then measuring accretion rates over time. If a good representation of the range of reef types and environmental conditions seen around the park can be surveyed, the total annual tonnage of macro-plastic waste reaching the Wakatobi National Park via the ocean could be quantified. A second, non-diving project could look at the total weight of plastic waste found along the shoreline. Again, a series of sites representing the variety found in the park could be sampled to give a total weight of plastic waste per unit length of coastline, allowing the total found throughout the Wakatobi to be estimated. This study could also identify the industries responsible for the plastic waste, and in some cases even its geographic origin. A third project could look at microplastics (<5mm) in the ocean and sediment by filtering water and sieving sediment samples. This project is particularly suitable for geography students.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN42 Reach for the Stars: Coral Reef Restoration in Indonesia's National Parks

The Mars Assisted Reef Recovery System is one of the leading techniques for actively restoring large areas of loose coral rubble and has been adopted by the Indonesian National Parks authority to try and bring degraded reefs across the country back to life. The system relies on 60cm diameter steel re-bar units coated with fibre glass resin and sand and colloquially known as reef stars. The stars are secured in a network over the unconsolidated rubble beds next to areas of healthy reef and coral fragments are attached to this framework, rapidly overgrowing the reef stars to form new healthy reef areas. By the time of the 2020 season, several zones of the reef stars and attached corals will have been in the water for between one and 12 months, providing exciting opportunities for potential dissertation projects focusing on several key themes. One project can assess the survival and growth rates of coral fragments transplanted onto the reef stars, as well as using 3D modelling techniques to look at associated increases in habitat complexity. Students may also compare species abundance and diversity on restored areas and adjacent areas of healthy reef using in-water reef monitoring survey techniques, while another project could focus on the success of the restoration programme's mid-water coral nurseries as biomass production systems for reef restoration efforts.

Indonesia

IN44 *Some Like it Hot! Thermal Tolerance and Dynamics of Reef Fishes

The tropical Indo-Pacific warm pool (IPWP) is a major heat reservoir that influences global atmospheric circulation. The IPWP affects temperatures in the Wakatobi on an annual basis causing large temperature changes. Reconstructions from Foraminefera cores covering a span of 2000 years suggest that the temperatures at times over those 2000 years may have been even higher than at present. This might be one of the reasons why corals in the Wakatobi appear to be more resilient than in the Great Barrier Reef with much less bleaching occurring. This topic makes use of Hasanuddin University facilities to examine temperature tolerances of reef fish species and more thermal dynamics studies have been published from Hoga Island than anywhere else in the Indo-Pacific. This topic could include: determination of critical thermal limits of field acclimated fishes, acclimation dynamics of fish exposed to different temperature treatments, and thermal acclamatory capacity and plasticity. All studies will involve animal husbandry and feeding, field collections, and laboratory-based experiments but will also involve field work and ecological observations of the study organisms.

*Does not require data to be collected by diving, although you could still dive in your spare time.

IN45 Using community dynamics to predict the future of coral reefs in the Wakatobi

Globally coral reefs are being exposed to an extensive list of climate and anthropogenic related stressors, which is causing a considerable decline in the diversity and abundance of many reef species. The Wakatobi region of Indonesia, situated in the Coral Triangle and home to rich coral reef ecosystems, is no exception to this rule. However, the losses and impacts reported from this area are not as significant as some of those documented in other locations such as the Caribbean. Consequently, there is urgent need to not only understand the implications of the changes recorded in the Wakatobi, but also why the reef environments here appear more resilient than similar environments elsewhere. Population ecology is the study of population compositions and structures, together with the processes driving them. These types of assessments have huge conservation potential, allowing ecologists to quantify how environmental impacts on the performance and success of individual organisms can affect the future development, stability and viability of populations and communities. Studies investigating the size structure of different coral populations subjected to varying environmental regimes or stressors can reveal compensatory mechanisms offering resilience, or inform local management of specific ways to effectively conserve endangered populations. Analysis of juvenile coral abundance can also be used to determine the future stability and persistence of populations. Alternatively, novel demographic techniques widely employed in other branches of ecology could be applied to assess the composition of coral populations in the Wakatobi, and predict future population characteristics.

Madagascar overview

Key facts
- 90% of all animals and plants found on Madagascar are endemic to the island
- Madagascar has 50% of the World's chameleons
- Only 10% of original Madagascar forest coverage remains, so urgent need for conservation
- Unstudied coral reef systems at Nosy Be
- World's fourth largest island

> "Make the most of every minute – there is always something amazing around the corner."
>
> **Rose French,** *University of Southampton*

Expedition Details

Research assistant places for 2, 4 & 6 weeks | **Research topics for dissertation students for 6 weeks**

RESEARCH OBJECTIVES

Madagascar has declared 17% of its land as protected areas, but much of this land is already severely degraded, so the actual area of land under protection is much smaller. An alternative approach to assigning protected area status and prohibiting usage is to develop community managed areas such as Mahamavo, where there is a mosaic of protected and managed areas. DTZ, the German Technical Support Agency, has established a series of community managed forests in the Mahamavo area that appear to be successful and may form the basis for conservation and improving livelihoods in other parts of Madagascar. The Opwall teams here are monitoring how the forest structure and biodiversity in these community managed forests are changing over time to identify whether this management strategy can provide a viable alternative to national parks in terms of protecting biodiversity.

The dry forests around Mahamavo have exceptional diversity with two species of diurnal lemur and another five to six species of nocturnal lemurs, two spectacular species of chameleons, three known species of leaf-tailed geckos, and many endemic birds. In addition to the forest work, the Opwall teams are also carrying out long term monitoring surveys in the adjacent wetlands, which have recently been given Ramsar status (a Ramsar Site is a wetland site designated of international importance under the Ramsar Convention).

Nosy Be is the premier dive destination on Madagascar, but there are few data on the coral reef communities that support this industry. Opwall teams will be gathering baseline data on these reefs, including data on fish community structure from stereo-video surveys, coral cover from video transects and 3D modelling.

Costs to consider £$

International Flights - return to arrival and departure airports listed right ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Visa – all foreign nationals can obtain a visa on arrival for 30, 60 or 90 days on arrival (madagascar-consulate.org/visainfo). Alternatively you can obtain your visa in advance on line at worldtravelguide.net/guides/africa/madagascar/passport-visa/ which saves a lot of waiting in the airport on arrival ✓

Park Entrance Fees ✓

Spending Money ✓

(Local currency is **Malagasy Ariary**)

If diving: Equipment Hire and 3/5mm full length wetsuit ✓

If dive training: SSI Dive Materials downloaded ✓

Travel information

For those joining **forest only or forest and marine combined projects** the expeditions start on Sunday at 1200hrs. For travelling to these projects you need to book your international flights to land into Antananarivo airport anytime on the Friday before your expedition start date and you will overnight there.

The **forest only projects** finish at 1800hrs on Friday and you will need to book your flights from Antananarivo anytime the following Monday.

The **forest and marine projects** finish in Nosy Be on Friday at 1900hrs. You can book your international flights directly from Nosy Be on the following Saturday, or from Antananarivo anytime on the following Monday.

For those joining **marine only projects**, the expeditions start on a Sunday at 1200hrs and finish on a Friday at 1900hrs. For travelling to these projects, you need to book your international flights to arrive into Nosy Be before 1100hrs on Sunday your expedition starts. On your return home you can book your flights from Nosy Be anytime on Saturday following your expedition end date.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Mahamavo:
Shared tents, field toilets and bucket showers.

Field camps:
Shared tents, field toilets and bucket showers.

Nosy Be:
Single sex dormitories with toilet and shower blocks in camp.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
14 June D – 19 June	21 June – 26 June	28 June – 3 July	5 July – 10 July	12 July – 17 July	19 July – 24 July	26 July – 31 July
1						
2						
		3				
		4				
			5			
6						

Madagascar details of Research Assistant projects

Two Week Option

Lemurs and chameleons

2 weeks

Why choose this expedition? Introduction to Madagascan wildlife.

On this expedition, you will spend two weeks in the dry forests of Mahamavo. During the first week you will have lectures about Madagascar wildlife and conservation but for most of the time you will be rotating between a series of research projects. These projects include studies on the structure and species composition of the forest, Pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, bird point counts and mist netting, and distance sampling for lemurs (both day and night). In addition, there are other projects running such as colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark release-recapture of nocturnal mouse lemurs and others that also require assistance from time to time.

Expedition 1:
Sunday 14 June – Friday 26 June 2020

Four Week Options

Madagascan Forest Wildlife

4 weeks

Why choose this expedition? The opportunity for more in-depth study of Madagascar forest wildlife.

On this expedition, you will spend four weeks in the dry forests of Mahamavo with the opportunity to move around the three different field sites. During your first week in the forest you will receive lectures about Madagascar wildlife and conservation, but for most of the time you will be rotating between a series of research projects. With four weeks in the forest, you will have the opportunity to try out all projects, and then either continue rotating across all of them, or specialise and gain more specific field skills in particular surveys. Our biodiversity surveys include studies on the structure and species composition of the forest, Pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night). In addition, there are other more specialist projects running such as colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs and others that also require assistance from time to time. During your time on site it will also be possible to be involved with a mangrove replantation project, working with people from the local community to restore the mangrove forests in the adjacent wetlands.

Expedition 2:
Sunday 14 June – Friday 10 July 2020

Diving and marine research on Madagascar reefs

4 weeks

Why choose this expedition? Best expedition for in-depth marine research training.

On this expedition, you will spend four weeks on the island of Nosy Be. If you are not already dive trained then your first week on site will involve completing the SSI Open Water dive training course.

During the second week you will complete a lecture series on Indian Ocean reef ecology and two dive based practicals will be undertaken each day. If you are already dive trained, or if you only wish to snorkel, you will start your first week with the Indian Ocean reef ecology course. After completing the reef ecology course, you will spend your remaining weeks assisting our researchers with data collection and analysis working with the 3D modelling of the reefs, quantification of the fish communities from stereo-video surveys, benthic composition and contributing to a local sea turtle identification database. For an extra charge there is also the option of completing additional SSI dive training in your spare time.

Expedition 3:
Sunday 28 June – Friday 24 July 2020

Lemurs and marine research

4 weeks

Why choose this expedition? Introduction to Madagascar wildlife and diving.

On this expedition, you will spend two weeks in the dry forests of Mahamavo and then two weeks on the reefs in Nosy Be. During the first week at the forest camp you will have lectures about Madagascar wildlife and conservation, but for most of the time you will be rotating between a series of research projects. These projects include studies on the structure and species composition of the forest, Pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, bird point counts and mist netting, and distance sampling for lemurs (both day and night). In addition, there are other projects running such as colour change in chameleons, sifaka population studies, herpetofauna DNA sampling, mark-release-recapture of nocturnal mouse lemurs and others that also require assistance from time to time.
At the end of the two weeks you will transfer to the island of Nosy Be. If you are not dive trained then your first week at the marine site will involve completing the SSI Open Water dive training course and then for your final week you then move onto the Indian Ocean reef ecology course which is two lectures each day and two dive based practicals. Alternatively, if you are already dive trained or just want to snorkel then your first week at the marine site will be spent completing the Indian Ocean reef ecology course and then your last week will be spent helping the researchers with the 3D modelling of the reefs and quantification of the fish communities from the stereo-video surveys. For an extra charge there is also the option of completing additional SSI dive training in your spare time.

Expedition 4:
Sunday 28 June – Friday 24 July 2020

Madagascar details of Research Assistant projects

Four Week Options

Forest wildlife and diving

4 weeks

Why choose this expedition? An opportunity for more detailed study of terrestrial Madagascar wildlife with a week of diving.

On this expedition, you will spend three weeks in the dry forests of Mahamavo with the opportunity to move around the three camp sites, and then one week on the reefs in Nosy Be. During the first week at the forest camp you will receive lectures about Madagascar wildlife and conservation, but for most of the time you will be rotating between a series of research projects. Having three weeks at this site enables you to try all the projects and continue rotating or to specialise and gain some additional field skills in particular surveys. These projects include studies on the structure and species composition of the forest, Pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night). In addition, there are other more specialist projects running such as colour change in chameleons, sifaka population studies, herpetofauna DNA sampling, mark-release-recapture of nocturnal mouse lemurs and others that also require assistance from time to time. There is also the opportunity to be involved with a local mangrove replantation project in the adjacent wetlands. At the end of the three weeks at the forest site, you will transfer to the island of Nosy Be. If you are not dive trained then your week at the marine site will involve completing the SSI Open Water dive training course. If you are already dive trained or just want to snorkel, then your week at the marine site will be completing the Indian Ocean reef ecology course with two lectures each day and two in-water practicals either by diving (if qualified) or snorkelling. For an extra charge there is also the option of completing additional SSI dive training in your spare time.

Expedition 5: Sunday 5 July – Friday 31 July 2020

Six Week Option

Forest wildlife and Indian Ocean marine research

6 weeks

Why choose this expedition? Best expedition for in-depth study of forest wildlife in Madagascar and Indian Ocean marine research.

On this expedition, you will spend four weeks in the dry forests of Mahamavo with the opportunity to move around the three camp sites, and then two weeks on the reefs in Nosy Be. During your first week in the forest you will receive lectures about Madagascar wildlife and conservation, but for most of the time you will be rotating between a series of research projects. With four weeks in the forest, you will have the opportunity to try out all projects, and then either continue rotating across all of them, or specialise and gain more specific field skills in particular surveys. Our biodiversity surveys include studies on the structure and species composition of the forest, Pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night). In addition, there are other more specialist projects running such as colour change in chameleons, sifaka population studies, analysis of land change from satellite data, mark-release-recapture of nocturnal mouse lemurs and others that also require assistance from time to time. During your time on site it will also be possible to be involved with a mangrove replantation project, working with people from the local community to restore the mangrove forests in the adjacent wetlands. At the end of the four weeks you will transfer to the island of Nosy Be for two weeks. If you are not dive trained then your first week at the marine site will involve completing the SSI Open Water dive training course, then moving onto the Indian Ocean reef ecology course which is two lectures each day and two dive based practicals. Alternatively, if you are already dive trained or just want to snorkel then your first week at the marine site will be spent completing the Indian Ocean reef ecology course and then your last week will be spent helping the researchers with the 3D modelling of the reefs and quantification of the fish communities from the stereo-video surveys. For an extra charge there is also the option of completing additional SSI dive training in your spare time.

Expedition 6: Sunday 14 June – Friday 24 July 2020

Madagascar independent research projects

Suitable for: dissertations ✓ master's thesis ✓

All projects start on Sunday 14 June and finish on Friday 24 July 2020.

All these independent research topics are completed in the Mahamavo forests. Students start by completing a Madagascar wildlife and conservation course with associated practicals to give background to the ecology of the area in which you will be working.

MA48 Tree biodiversity and ecosystem function

Trees in tropical forests are fundamental to key ecosystem processes such as primary production and evapotranspiration which can be measured by satellites. In Mariarano there is considerable spatial variability in these functions, as well as temporal variability from year to year. Some variation may be explained by abiotic factors such as soils, relief or landscape configuration. However, what is the relationship between tree biodiversity and ecosystem function? In this project, you would work with expert botanists to contribute to long-term monitoring of trees in 20m botanical plots. You might want to test hypotheses relating to species diversity, or you could also use our plant trait datasets to also calculate trait diversity metrics for forest plots. You may also wish to use hyperspectral remote sensing data to investigate the relationship between biodiversity and spectral diversity.

MA49 Microhabitat analysis of mangrove forests in the Mahamavo watershed

The mangrove forest is widespread and of critical importance along the north-western coast of Madagascar but it is increasingly under threat of deforestation as the logs are used in construction and more importantly in this region, charcoal production. In the Mahamavo watershed there are eight species of mangroves that exhibit zonation from sea level to the highest tidal inundation. These trees are salt-tolerant evergreen trees from a number of taxonomic families. A microhabitat analysis both on foot and by boat will be conducted to determine which environmental characteristics are most important in determining zonation. A variety of environmental characteristics including salinity, soil oxygen and carbon dioxide, sulphide, nitrate and phosphorus levels will be measured where these trees occur to look at niche partitioning. A limited reforestation effort over the past several years has indicated that trees in different locations are growing at different rates so it will also be determined if these differences in growth rates correlate with microhabitat composition as well. This analysis will also assist in optimising our efforts in replanting mangrove forests in this area.

MA50 Ecology of leaf litter ants

Ants are a globally distributed group of social insects, and in the Mariarano tropical dry forest they comprise a large share of animal biomass and carry out many ecosystem functions. Ants are also an important indicator group for monitoring and evaluating environmental conditions and biodiversity. Ant taxonomy is stable and excellent reference materials are available for species identification. Around 30 species are known from Mariarano. We monitor ants in Mariarano using the Ants of the Leaf Litter Protocol (Agosti 2000). This involves pitfall trapping and extraction of ants from leaf litter from sets of 20 sub-sample locations along a 200m line within each segment of the forest sample routes. These routes were designed as a stratified sample of forests of different configurations (patch size and edge distance) and levels of disturbance. You would also measure environmental variables (air temperature, relative humidity, leaf litter depth, canopy cover) at each sample location. Point centered quadrats are used to sample and identify the four trees nearest each sub-sample location. In camp, specimens are sorted under the microscope in Mariarano to morphospecies, and where possible identified using our reference collections and Fisher (2016) Ants of Africa and Madagascar. It is also possible to confirm identifications by barcoding. Projects could use these rich datasets to test for the landscape configuration sensitivity of ant species; investigate ecological interactions between ants and trees; look at the assembly of ant communities; test for congruence between ants and other taxonomic groups to evaluate the complementary value of monitoring ants in addition to plants and vertebrates.

MA51 Spatial behavioural ecology of the Malagasy giant hognose snake

The Malagasy giant hognose snake, *Leioheterodon madagascariensis*, is Madagascar's largest lamprophiid snake, attaining sizes greater than 1.5m in length. This species has been documented engaging in ritual combat and active nest defence, and a preliminary investigation suggests that the behavioural ecology of *L. madagascariensis* is more complex than previously thought. For this project all observations will be recorded using a GPS receiver and all animals encountered will be captured, measured, and weighed. Furthermore, individuals captured within a designated research area will then be microchipped to allow individual identification. Other novel methods may also be employed to investigate the daily activity patterns of chipped individuals in order to understand how these snakes interact with each other and the environment. All data collected will be visualised and analysed utilising GIS software.

MA52 Colour variability and the ecological use of colour in lizards of Mahamavo

Colour is used in fundamentally distinct ways by the different taxonomic groups of reptiles found in the Mahamavo forest. Colour-change in chameleons is depicted as being involved in crypticity, but is really primarily used for communicating intraspecifically. There is colour variability in both Oustalet's and Angel's chameleons found in this region. Experiments can be devised to research specific facets of communication and the role of colour. There are also three species of Leaf-tail geckos that really do use colour and colour change primarily for crypticity. One is a bark mimic (Uroplatus henkeli), a second is a twig mimic (Uroplatus guentheri) and the third is a dead-leaf mimic (Uroplatus ebenaui). Experiments can be generated to look at the role of colour-change in these responses as well as the degree to which background matching is occurring.

MA53 Sound-induced colour-change modulation in day geckos

Koch's giant day gecko, *Phelsuma kochi*, is one of the most abundant lizards found in the Mahamavo forest. At mid-day adults are a bright green colour. Previous research has indicated that these lizards will change colour from green to brown when hearing a variety of sounds, including alarm-calls from the Paradise Flycatcher, calls from the Madagascar Buzzard (a potential predator) as well as simply white noise. The biological mechanism for this colour change is well characterized, but the triggering stimulus is not. Colour-change is quite rapid occurring in about fifteen seconds or so and returning to its original green in just a few minutes. Colour can be quantified using standardized photographs and statistical comparisons can be conducted comparing hue, saturation and lightness values from photographs taken before and after stimulation. Colour-change here is sensitive enough that the specific characteristics of sound that cause colour modulation will be addressed. Other bird (and lemur) calls will be tested as well sounds of different intensity and frequency to determine the threshold levels required to elicit colour-change in these lizards. It will also be determined if these lizards can change colour in a quantitative fashion or if this is more of an all-or-nothing response.

MA54 Edge effects, microclimate and thermal ecology of reptiles or birds in Mahamavo

Changes to forest habitat configuration, such as forest loss and fragmentation create greater amounts of forest edge habitat. It is important to understand the mechanisms whereby forest edges affect edge sensitive species in order to better plan forest management for biodiversity conservation. Forest edges may experience microclimatic effects such as increased temperature or light intensity, or decreased humidity. These abiotic effects may extend tens to hundreds of metres into the forest interior from the forest edge, depending on the environmental variable, the vegetation structure and weather conditions. In this project you will test how species of either birds or reptiles respond by habitat selection to microclimate variation caused by edge effects at fine spatial scales. You will participate in biodiversity surveys and draw upon our long-term monitoring dataset of forest structural properties in plots, and either reptile route data or bird point count data. For many years we have measured ambient temperature and humidity at the exact location and time of each biodiversity record (e.g. individual reptile). You will also be able to use data from a network of light, temp and humidity dataloggers deployed across the forest, as well as thermographic camera data if you wish to investigate patterns of thermal heterogeneity in habitats. Micrometerological software libraries (e.g. microclima) can also be used to estimate the landscape pattern of microclimate variation from directly received satellite data and meterological observations made in the field.

MA55 Niche separation and the impacts of disturbance on bird communities in Mahamavo

Studying the effects of edge effects and fragmentation on animals and plants is essential for conservation efforts because it causes disturbances to communities across landscapes worldwide. 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 range- and habitat- restricted species. Students working on this project will collect data on birds in the forest with our science teams using timed species counts and mist net surveys. The spatial data collected will be combined with trait data (e.g. feeding guild), with other surveys from the field seasons, and with previous years' data to give a large dataset. Statistical models can account for species' locations in relation to environmental data (e.g. tree size, canopy cover, distance to forest edge) to analyse bird communities in different parts of the forest, study how communities change across the landscape in relation to disturbance and how individual species' distributions and niche overlap. These topics will contribute to our understanding of the avian communities of Mahamavo, 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.

MA56 Acoustic techniques for monitoring forest birds

It is important to develop efficient methods for monitoring forest bird communities in Madagascar in order to know whether conservation measures are working to conserve important biodiversity features. Acoustic methods can be an effective monitoring approach to monitor organisms which produce vocalisations, such as birds. In this project sound recordings made simultaneously with standard bird point counts across the Mariarano forest will be treated as a representation of a whole bird community rather than trying to classify individual species. It will then be possible to derive monitoring indices based on the acoustic dissimilarity between pairs of recordings made at a network of sites across a landscape and through time. This approach will allow comparison of the power of automatic acoustic methods and standard monitoring to estimate alpha and beta diversity. It will also be possible to explore whether environmental covariates from satellite remote sensing such as Landsat data can allow estimated acoustic dissimilarity to be modelled across whole landscapes using generalised dissimilarity modelling. Sound recordings from previous years can be used to test whether temporal differences in bird communities can be detected between years and whether any differences are associated with forest disturbance.

MA57 Monitoring bat populations in Madagascar using acoustic methods

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 analyse ultrasound recordings. You would make use of a set of audiomoth acoustic devices deployed at forest edges and near water bodies across the Mariarano landscape. These can be programmed to record at set times of day and are left unattended. The sound recordings can then be viewed as sonograms and automatically compared with published sonograms using machine learning to identify how many individuals of each species were present on a sampling occasion at each location. You might also want to use environmental data on vegetation structure or landscape configuration to test whether bat community composition and activity can be explained by environmental factors.

Dr Heather Gilbert
African Research Manager, Opwall

"New technology allows us to increase the efficiency and scope of our research immeasurably. By using acoustic monitoring for echolocating bats, students on this project have the chance to open up a new avenue of research in Mariarano."

MA58 Occupancy modelling for nocturnal lemurs, carnivores, bush pigs and introduced species with camera traps in Madagascar

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 pallescens*) and fat-tailed dwarf lemur (*Cheirogaleus medius*), are seldom seen by the field teams. Additionally, the forest is within the range of aye-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*), (*Falanouc Eupleres goudotti*), and 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, we use a network of 40 camera traps 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.

MA59 Demography and spatial ecology of the endangered Coquerel's sifaka (*Propithecus coquereli*)

Coquerel's sifaka (*Propithecus coquereli*) are one of >100 species of lemur in the world. Over the last half century, *P. coquereli* have experienced a decline of >50% due to habitat fragmentation and restriction, and are currently classified as endangered (IUCN, 2018). Despite this, the species are relatively abundant in the Mahamavo forests, providing the opportunity to study their ecology in the wild. This project will aim to study the demographic composition of *P. coquereli* populations, as well as their spatial ecology, to gain an understanding of how this species is using the forests in our study area. To do this, data collection will focus on topics such as group size, habitat use, and the possible effects of anthropogenic influence on ranging patterns. These data can eventually be used to inform management strategies for *P. coquereli* and provide a baseline for future more in-depth behavioural studies.

MA60 Regional biogeography, ecology and behaviour of nocturnal lemurs in the dry deciduous forest of Mahamavo

Lemurs are endemic to Madagascar and are confined to the remaining forest habitats of the island. They are a highly diverse taxonomic group (>100 species) and at the same time the most threatened group of mammals with about 94% of all assessed species being categorized as either vulnerable, endangered, or critically endangered (IUCN, July 2012). In this situation it is vital to understand their local and regional distribution as well as the behavioural constraints, ecological plasticity and ecological requirements of each lemur species in order to determine their vulnerability towards becoming extinct in the near future. Among the nine lemur species that have been reported from the Mariarano area, six are nocturnal (*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. They are therefore chosen as models for this project. The aim of this research is to study the abundance, spatial distribution, ecology, and behaviour of three different nocturnal lemur genera (*Microcebus spp., Lepilemur edwardsi, Avahi occidentalis*) in various forest fragments in the Mahamavo region, (NW Madagascar).

MA61 Species distribution modelling in Madagascar

Understanding where species are, why that is, and how this might change is essential for reliable conservation planning. Species distribution models (SDMs) are one way of approaching this. SDMs combine occurrence data (i.e. where we have observed an individual animal) with environmental data (e.g. climate, topography, land cover, vegetation properties, and proximity to forest edge) to construct and validate a statistical model that will tell you the probability of a particular species occurring in a given location in your study landscape and give you a habitat suitability map for each species. Students on this project can study any or all of the following taxa: reptiles and amphibians, lemurs, forest birds, or wetland birds (we recommend choosing just one of these groups). Students will have access to our extensive dataset, as well as actively contribute to data collection on surveys throughout the field season alongside the science teams. SDMs (using, e.g. Maxent or generalised linear modelling) can then be produced for each species in your chosen group and sub-analyses conducted for different families or genera, for example. Overall, this will give you a detailed view of landscape-scale species distribution patterns. The maps produced provide invaluable communication tools to inform conservation efforts in our study area.

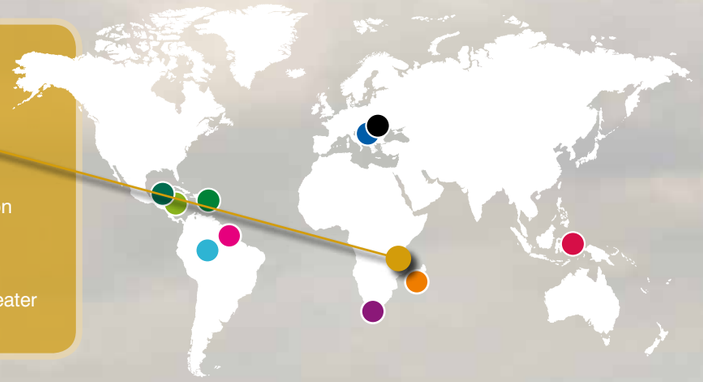
MA62 Landscape ecology in Madagascar

Landscapes are the product of living nature (i.e. animals and plants), humans, and the physical environment: understanding how these factors relate to one another and how they affect biodiversity is one of the goals of landscape ecology. In the Mahamavo landscape in Northwest Madagascar, we collect data on lemurs, forest birds, and reptiles to build knowledge concerning spatio-temporal patterns of biodiversity. 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 that are affecting the distribution and density of species across the landscape. Students on this project will have access to our extensive dataset (biodiversity and environmental data), as well as actively contribute to data collection on surveys throughout the field season alongside the science teams. Statistical analyses would be used to assess biodiversity, nestedness, or species rarity patterns (for example) for various populations, families, genera, or feeding guilds in relation to the human (e.g. villages, tracks, and farmland) and physical environment (e.g. vegetation health, proximity to rivers and lakes). Students could include analyses relating to forest patch size, edge effects, isolation, and compactness towards understanding the likely consequences of further habitat fragmentation in this changing landscape.

MA63 Community ecology in Madagascar

Which processes (including habitat and ecological interactions) structure communities of forest birds, reptiles and lemurs in Mahamavo? In terms of habitat, there is scope for comparison of primary and secondary dry forest and exploration of the effects of gradients in moisture between relatively moist and highly xeric forests. This might permit the identification of indicator species for particular forest types. A more sophisticated approach would be to use Mantel tests to test a suite of competing hypotheses about the environmental processes which explain pairwise dissimilarity in the community of reptiles/birds/lemurs. Pairs could be studied, and differences investigated as a function of distance, difference in environmental variables such as moisture, and difference in habitat configuration. Additionally, it would be possible to test whether ecological interactions, especially competition, within a taxonomic group may be structuring the community. This could be achieved by co-occurrence tests or generalised dissimilarity models. For some groups, development of ecological dissimilarity (ED) based monitoring indicators for environmental condition which track communities through ecological space through time would be a very promising direction to investigate. Alternative directions to take might be to make distribution models and then maps of beta diversity or to use numerical classification to make maps of community types. Finally, for individual taxonomic groups such as birds, it is possible to test for nestedness of communities among a set of sites.

Malawi
overview



Key facts
- Study human-wildlife conflict and its effects on biodiversity
- Cultural exchange with local people in the Lilongwe area
- Learn to dive in Lake Malawi, which has a greater diversity of fish than any other lake on Earth

> "One of the best things I have ever done, reminded me why I love ecology and conservation."
>
> **Bailey Brown,** *Edinburgh Napier University*

Expedition Details

Research assistant places for 2 weeks

RESEARCH OBJECTIVES

Biodiversity has never been more in danger than it is today. With human encroachment expanding, the wild areas in which biodiversity is traditionally thought to thrive are diminishing. But what about species that have found a niche outside of these "wild" areas? Species that have learnt to live alongside humans in the most unorthodox of places? Lilongwe – Malawi's capital – is small and rural in comparison to many African cities and maintains healthy populations of several carnivores, including spotted hyena and jackal. So, if the predators can survive here, what other biodiversity is supporting them?

Opwall and its scientists are working with local experts from Conservation Research Africa to monitor the biodiversity of this area and use this data to inform human-wildlife conflict mitigation. Carnivores are tracked to monitor their distributions, movement patterns and dietary composition. Trapping and acoustic surveys for bats and point counts for birds are performed at areas of high, medium and low disturbance to assess overall biodiversity in the area. Vegetation surveys are also performed at these sites to understand how changes in species composition and density might impact bat and bird populations.

Lake Malawi has more species of fish than any other lake in the world, but most are more closely related to other species living in the lake than to species living elsewhere. So, it appears that speciation is happening within the lake, but surprisingly little is known about how this occurs. Our lake research centre, The Maru, conducts underwater population and biodiversity surveys of the Lake's cichlid fish populations using a remote-operated vehicle (ROV). This underwater camera allows transects to be recorded at depths recreational divers cannot reach, giving a greater insight into how cichlid diversity might change with depth. At shallower depths, cichlid surveys are performed by snorkelling, diving and the ROV to compare the accuracy of these three research methods.

Costs to consider £$

International Flights ✓

Internal Transfer from around £165 ✓

Visa* ✓ Park Entrance Fees ✓

Spending Money ✓
(Local Currency **Malawian Kwacha)**

If diving: Equipment Hire ✓

PADI Manual & PIC ✓

* For many nationalities, a visa can be acquired on entry to Malawi for $75 USD.

For full costing details please visit the money section on the Opwall website **www.opwall.com**

Dr Heather Gilbert
African Research Manager, Opwall

"So much modern conservation work is centred around balancing the needs of humans and wildlife living within the same environment. This expedition is an amazing opportunity to gain first-hand involvement in collecting vital data to inform human-wildlife conflict mitigation whilst also experiencing the huge biodiversity Malawi has to offer."

Travel information

The expedition starts at Lilongwe research camp on a Tuesday at 0700hrs and finishes at Liwonde National Park on a Monday at 0600hrs.

You need to book your international flights to arrive at Lilongwe International airport to arrive on the Monday before your expedition start date and to depart on the Monday after 1300hrs. Getting from the airport to the expedition start point can be organised by the Opwall travel team: **internaltravel@opwall.com.** You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Lilongwe Research Camp:
Accommodation is in dorm rooms with bunk beds and shower facilities.

Nkhata Bay:
Accommodation is in dorm rooms on the shores of Lake Malawi with bunk beds and shower facilities.

Liwonde:
Situated inside the reserve, accommodation comprises of mattresses in dormitories, with shared bathroom and shower facilities.

For more images and details visit the Opwall website www.opwall.com

Malawi details of Research Assistant project

Two Week Option

Human-wildlife conflict research and diving

2 weeks

Why choose this expedition? Taster of human-wildlife conflict research and freshwater diving.

This expedition is split into three components. The first five nights will be based in Lilongwe Research Centre helping to assess the biodiversity of the many green spaces, wetlands and river corridors in the area. The groups will be split into smaller teams that will assist with various research activities including carnivore monitoring, bat surveys, bird surveys and vegetation assessments. You will also take part in a cultural exchange with a local community group to share ideas about human-wildlife interactions. The next six days will be based on the shores of Lake Malawi in Nkhata Bay. The groups will be split into those learning to dive to PADI Open Water level, qualified divers helping with the dive-based research surveys and snorkelers helping with other parts of the research programme. The final day will be spent in Liwonde National Park, getting the opportunity to see many of the charismatic megafauna of the area including elephant, hippo and rhino.

Expedition 1: Tuesday 30 June – Monday 13 July 2020

Mexico overview

Key facts
- The Selva Maya (Mayan Jungle) is the largest expanse of tropical forest in the Mesoamerican biodiversity hotspot
- Calakmul is one of the two largest ancient Mayan ruined cities
- Good chance of seeing charismatic neotropical megafauna such as Jaguar
- Akumal has huge numbers of nesting turtles and a permanent population of green turtle

> "One of the best places to learn about marine biology. The reefs, the fish, the people, all amazing."
> **Colin Brock**, *UCD*

Expedition Details

Research assistant places for 2, 4 & 6 weeks | **Research topics for dissertation students for 6 weeks**

RESEARCH OBJECTIVES

The Calakmul Biosphere Reserve (CBR) in Mexico is an UNESCO World Heritage Site of Culture and Nature and is part of the largest expanse of neotropical forest north of the Amazon, filled with ancient Mayan ruins and supporting one of the highest biodiversity levels in the world. The CBR is also an extremely important wildlife corridor that is crucial for migrating birds and mammals with extensive ranging patterns such as jaguar and Baird's tapir. Over the last 10 years the reserve has experienced a notable reduction in rainfall. Monitoring data on birds, bats, herpetofauna, butterflies, ungulates, felids and primates are being used to evaluate the impact of climate change and changing rainfall patterns on the abundance, ranging and diversity of fauna to help determine when and where mitigation should be used to restore water sources. Data are also used to assess the efficacy of a range of sustainable development projects with buffer zone communities designed to minimise forest encroachment. In addition, there are specialist studies on jaguar and their preferred prey, behaviour of spider monkeys and population demographics of Morelet's crocodiles.

At the marine site, the research is focussed on assessing the efficacy of the newly formed Akumal marine protected area on the abundance and health of seagrasses and the impact of snorkel tours on the abundance, health and behaviour of sea turtles. Research also aims to monitor the combined impacts of water quality and turtle grazing on the abundance and health of the seagrass ecosystem. In addition, the new protected area provides the opportunity for recovery of the coral reefs, but as natural coral recovery rates are so slow, coral reef restoration projects are extremely important. Assisted fertilisation of coral gametes is used by restoration managers to improve genetic diversity before corals are grown and transplanted to nurseries as coral recruits. Corals spawn only once or twice per year at full moons during the summer and in Akumal and Puerto Morelos these gametes are collected ready for fertilization in the laboratory at UNAM university. Operation Wallacea is assisting this long-term research project in Akumal by mapping the distribution of healthy colonies of hard coral species.

Costs to consider £$

International Flights return to arrival and departure airports listed on the right ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport ✓

Park Entrance Fees ✓

Spending Money ✓
(local currency is **pesos**)

If diving: Equipment hire (BCD, regulator, mask and fins – wetsuits are generally not required as the water temperature is warm, but bringing a rash vest is advised) ✓

If dive training: PADI Manual & PIC ✓

Travel information

For those joining **marine only projects** the expeditions start in Akumal on a Monday at 0800hrs and finish on a Sunday at 1200hrs. For travelling to these projects, you need to book your international flights to Cancun to arrive by 2200hrs on the Sunday and overnight there. Return flights from Cancun must be after 1600hrs on the Sunday.

For those joining **forest and marine combined projects** the expeditions start in Calakmul on a Monday at 1300hrs and finish in Akumal at 1200hrs on a Sunday. For travelling to these projects you need to book your international flights to Cancun to arrive by 2200hrs on the Sunday and overnight there. Return flights from Cancun must be after 1600hrs on the Sunday.

The **forest only projects** start in Calakmul on a Monday at 1300hrs and finish in Calakmul at 0600hrs on a Monday. For travelling to these projects you need to book your international flights to Cancun to arrive by 2200hrs on the Sunday and overnight there. Return flights from Cancun must be after 1800hrs on the Monday.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Calakmul:
Shared tents with dry toilets and showers.

Calakmul field camps:
Shared tents, dry toilets and bucket showers.

Dos Naciones field camp:
Hammocks, field toilets and rain showers.

Akumal:
Shared bunk beds in dormitory style rooms with shared bathroom and toilet facilities.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
15 June D D 21 June	22 June 28 June	29 June D D 5 July	6 July 12 July	13 July 19 July	20 July 26/27 July	27 July 2 August	3 August 9/10 August
1 2		3 6	4 5				

Mexico details of Research Assistant projects

Two Week Options

Introduction to the Caribbean

2 weeks

Why choose this expedition? Introduction to diving and marine research.

This expedition is based at the marine research site in Akumal. If you are not already dive trained, you can spend your first week completing a PADI Open Water dive training course, before moving onto the Caribbean reef ecology course in your final week. This course consists of lectures, morning and afternoon in-water practicals, and trains you in some of the survey techniques used in the marine environment to assess the status of reefs and their associated fish communities. If you are already dive trained or just wanting to snorkel your first week is on the Caribbean reef ecology course and the second would be spent working with different researchers on site. Projects you will join include monitoring of sea turtle abundance, turtle grazing and seagrass biomass in Akumal Bay and assessment of the abundance, distribution and health of scleractinian coral species.

Expedition 1:
Monday 15 June – Sunday 28 June 2020 ●●○○

Four Week Options

Tropical forest and Caribbean biodiversity

4 weeks

Why choose this expedition? Good introduction to both forest and marine biodiversity surveys.

The four-week expedition splits your time in half between both the jungles of Calakmul Biosphere Reserve and the picturesque Caribbean marine site of Akumal Bay. Spending your first two weeks in the Mayan jungle, you will complete an introduction to the ancient Maya and Mayan jungle ecology course alongside practicals in survey techniques. Following this you will spend a week helping teams of field biologists completing standardised surveys on a series of key taxa. Surveys include mist netting long into the night for bats, where morphometric measurements of captured bats are taken and species identified. Mist netting is also conducted early in the morning for birds as well as point count surveys. Large mammal surveys involve recording primate sightings (distance sampling) and terrestrial mammal tracks (patch occupancy sampling) encountered along forest transects during morning surveys accompanied by an afternoon session analysing camera trap data. Herpetofauna are surveyed using line transect surveys and timed searches of aguada habitats. Frugivorous butterflies are surveyed using baited traps in different forest types. Forest structure is an essential dataset for the project and you will also assist with carrying out quadrat samples.

For your last two weeks you will be at the Opwall Akumal marine site. If you are not already dive trained, then you will be able to complete a PADI Open Water dive training course before moving onto the Caribbean reef ecology by diving in the following week. If you are already dive trained or just want to snorkel and not dive, then your first Akumal week will be spent on the Caribbean reef ecology course with practicals by either diving or snorkelling. Once having completed this course your last week in Akumal will be spent working with a range of different marine scientists including projects on mangrove carbon levels, mapping of hard corals and rapid assessment of habitat quality across the Akumal reefs and reef restoration nurseries and monitoring of sea turtle grazing of seagrasses and seagrass biomass in Akumal Bay.

Expedition 2:
Monday 15 June – Sunday 12 July 2020 ●●●○

Four Week Options

Tropical forest and Caribbean diving

4 weeks

Why choose this expedition? Broad forest experience and a taste of Caribbean reefs.

These four-week expeditions involve three weeks in the jungle of the Calakmul Biosphere Reserve and a final week in the picturesque Caribbean marine site of Akumal Bay. During your first week in the Mayan jungle, you will complete an introduction to the ancient Maya and Mayan jungle ecology course alongside practicals in survey techniques. For your next two weeks you can travel to different forest camps to assist with biodiversity surveys or remote biodiversity surveys. You could therefore opt for two weeks of standard surveys, two weeks of remote surveys or one week of each. Mist net surveys including morphometric measurements of captures are used to monitor birds and bats and the species captured varies considerably across camps. Large mammal surveys involve recording primate sightings (distance sampling) and terrestrial mammal tracks (patch occupancy sampling) encountered along forest transects during morning surveys accompanied by an afternoon session analysing camera trap data. Herpetofauna are surveyed using line transect surveys and timed searches of aguada habitats. Frugivorous butterflies are surveyed using baited traps in different forest types. Forest structure is an essential dataset for the project and you will also assist with carrying out quadrat samples.

For your last week you will be at the Opwall Akumal marine site to complete a PADI Open Water dive training course. If you are already dive trained or just wanting to snorkel and not dive, then you will complete the Caribbean reef ecology course with practicals by either diving or snorkelling. Diving and snorkelling in Akumal provides an excellent example of the Caribbean reef with an abundant population of sea turtles.

Expedition 3:
Monday 29 June – Sunday 26 July 2020 ●●●○
Expedition 4:
Monday 13 July – Sunday 9 August 2020 ●●●○

Remote biodiversity monitoring of the Mayan jungle

4 weeks

Why choose this expedition? Best project for learning and monitoring techniques on a wide array of terrestrial wildlife.

This expedition is based in the Calakmul Biosphere Reserve and provides the opportunity to visit multiple different camps and see first-hand how the forest changes, in relation to water distribution and Mayan ruins, impacts the diversity of fauna. Your first week will be spent completing an introduction to the ancient Maya and Mayan jungle ecology course which involves field practicals to illustrate the survey techniques being used. Then you will spend the next two weeks in a remote camp in the humid forests near the Guatemalan border which has large fruiting trees and an abundant food supply resulting in a high density of wildlife. Initial data collected at the remote Dos Naciones camp indicates that these humid forests are crucial for the conservation of flagship species such as jaguar, tapir and spider monkeys and have the highest diversity of birds, bats and herpetofauna in the reserve. Here you will help with surveys on forest structure and tree species composition, birds, bats, herpetofauna, primates and large terrestrial mammals using the same methods as the standard biodiversity surveys and will experience a high number of animal sightings and captures. During remote biodiversity surveys, students will need to help with running the field camp as well as assisting with surveys and a good level of fitness is required due to the hilly terrain. In the last week of the expedition you will travel to the core zone of the reserve to focus on biodiversity surveys in this pristine habitat. Mist net surveys include taking morphometric measurements of captures to monitor birds and bats and the species captured vary considerably across camps. Large mammal surveys involve recording primate sightings (distance sampling) and terrestrial mammal tracks (patch occupancy sampling) encountered along forest transects during morning surveys accompanied by afternoon sessions analysing camera trap data. Herpetofauna are surveyed using line transect surveys and timed searches for crocodiles and other aquatic species. Frugivorous butterflies are surveyed using baited traps in different forest types. Forest structure is an essential dataset for the project and you will also assist with carrying out quadrat samples.

Expedition 5:
Monday 13 July – Monday 10 August 2020 ●●●●

Mexico details of Research Assistant projects

Six Week Option

Jaguars, monkeys and turtles

6 weeks

Why choose this expedition? Best project for learning about forest and marine biodiversity research.

This six-week expedition gives you an in-depth research experience with three weeks in the Calakmul Biosphere reserve forests and then three weeks working on marine research projects at Akumal. Your first week in the forest would start with the introduction to the ancient Maya and a Mayan jungle ecology course. For the next two weeks you will be focussing on remote biodiversity surveys helping teams of field biologists in the remote Dos Naciones camp. Initial data in this area indicates that these humid forests are crucial for the conservation of flagship species such as jaguar, tapir and spider monkeys and have the highest diversity of birds, bats and herpetofauna in the reserve. Here you will help with surveys on forest structure and tree species composition, birds, bats, herpetofauna, primates and large terrestrial mammals using the same methods as the standard biodiversity surveys and will experience a high number of animal sightings and captures. During remote biodiversity surveys, students will need to help with running the field camp as well as assisting with surveys and a good level of fitness is required due to the hilly terrain.

Your next three weeks will be spent at the Akumal marine protected area. If you are not already dive trained, then you will be able to complete a PADI Open Water dive training course before moving onto the Caribbean reef ecology course by diving in the following week. Your final week will then be spent assisting the marine science team. If you are already dive trained, or wanting to only snorkel, then your first Akumal week will be spent on the Caribbean reef ecology course by diving/snorkelling and having completed this course your next two weeks will be spent working with different marine scientists. The monitoring programme focusses on mapping hard corals and rapid assessment of habitat quality across the Akumal reefs and reef restoration nurseries, combined with monitoring of the seagrass ecosystem and abundance of turtles in Akumal Bay. Students participating in this monitoring programme will have an active schedule that involves dive or snorkel surveys to assess the health of the reefs and snorkel surveys for monitoring turtles and seagrasses.

Expedition 6: Monday 29 June – Sunday 9 August 2020 ○○○●●●

Mexico forest independent research projects

Suitable for: dissertations ✓ master's thesis ✓

There are two dates for these topics: Monday 15 June to Monday 27 July or Monday 29 June to Monday 10 August 2020.

All these independent research topics are completed in the Calakmul Biosphere Reserve. All students start by completing an introduction to the ancient Maya and Mayan jungle ecology course with associated practicals to give background to the ecology of the area in which you will be working.

ME65 Climate change, reduced water distribution and herpetofaunal abundance and species distribution in Calakmul Biosphere Reserve

The herpetofauna of the Yucatan Peninsula is diverse and contains a high percentage of endemic species that have evolved to adapt to the unique forest habitat. 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. This variation in habitat is likely to have a notable effect on the abundance and distribution of herpetofauna within Calakmul. Moreover, the only source of water in the reserve comes from lakes known as aguadas. Some are permanent, but the majority are temporary that form on low lying ground during rainy season. Due to increasingly longer dry seasons, many of these aguadas are drying up, which is expected to have a catastrophic effect on herpetofauna especially the aquatic and semiaquatic species. Herpetofauna surveys will be conducted at 5 different research locations within the reserve that have notable differences in habitat type. Within each location, herpetofauna will be surveyed using diurnal and nocturnal active searching along transects, combined with timed diurnal and nocturnal surveys at aguadas. Students will also assist with habitat surveys in which tree diversity, tree DBH, understorey vegetation, leaf litter and sapling density are recorded in a selection of 20m x 20m forest plots at each survey location. Research projects could investigate differences in herpetofaunal species assemblages between different sites and in relation to forest strucute and distance from aguadas. Alternatively, projects could focus on herpetofauna community structure in aguadas of varying sizes and permanence. In addition, projects could use the long-term dataset to investigate changes to herpetofauna abundance and diversity in relation to climate change and water distribution in the reserve.

José António Lemos Barão-Nóbrega
Mexico Biodiversity Coordinator & Senior Herpetologist

"This is a great project option for those with keen interest in herpetology! Calakmul holds about 45% of the herpetofaunal species richness observed in the Mayan jungle and knowledge on spatial and temporal variation of their assemblage and distribution is of great relevance for development of conservation actions across a region which is enduring prolonged droughts associated with climate change"

ME66 Felid and ungulate abundance and distribution patterns in relation to changing water distribution and hunting in a Mayan forest

Large mammal density at Calakmul Biosphere Reserve is very high and the forest is one of the last remaining strongholds regionally of endangered mammals such as spider monkeys, jaguar and tapir. Although these species are not hunted, indigenous people are allowed to hunt other large mammals such as peccary and deer (which are the preferred prey of jaguar and puma). As there are no rivers or streams in the reserve, forest structure is also heavily affected by distance from the few permanent water sources in the reserve known as aguadas. Prolonged periods of drought over the last 10 years have resulted in the disappearance of aguadas, especially in the core zone of the reserve. Operation Wallacea monitoring data suggests that ungulates and felids are leaving the safety of the core zone of the reserve and migrating into the South East buffer zone where the climate is more humid and the aguadas still contain water. This is a particularly concerning situation because once the ungulates range into indigenous community land they are extremely vulnerable to hunting, resulting in a loss in abundance of these species and a reduction in available prey for jaguar and puma that in turn can lead to increased human-felid conflict as felids start to attack livestock. The aim of this large mammal research project is to investigate the relationship between water distribution and large mammal ranging and to investigate the impact of hunting of preferred prey species on the abundance and distribution of felids. Mammal abundance data will be collected along a series of forest transects using patch occupancy sampling (based on tracks and signs of more). Additional data will be collected using camera traps, enabling comparison of density estimates produced by the different types of surveys. The survey transects are distributed across a wide range of forest habitat types and each transect contains a number of 20m x 20m habitat survey plots. In each of these plots, tree species will be identified, and DBH and tree height will be measured. Large mammal data from each transect can then be related to mean habitat characteristics for the transect and comparisons between mammal abundance and habitat variables may be investigated.

Dr Kathy Slater
Senior Scientist Mexico

"This project provides an amazing opportunity to study elusive species such as jaguar and tapir made possible by their high abundance in Calakmul. Climate change and the disappearance of water bodies in the reserve is causing significant changes to the distribution and behaviour of felids and ungulates and our transect and camera trap data enables investigation of their ability to adapt to the changing environment, and identify priorities for their conservation."

ME67 Primate abundance and distribution patterns in relation to forest structure and Ancient Mayan agroforestry

The tropical semi-deciduous forest in Calakmul Biosphere Reserve (CBR) largely consists of low to medium canopy forest with limited fruit production, with pockets of high forest containing large fruiting trees. The limited distribution of high canopy forest. appears to be closely related to the location of Ancient Mayan ruin sites. Over 2,000 years ago the Mayans cultivated large fruiting trees such as Ramon (*Brosimium alicastrom*) as a food supply and other fruiting trees such as Chicozapote (*Manilkra zapota*) and Mora (*Maclura tintoria*) were cultivated for extraction of resins and dyes, but also produce abundant fruit. These cultivated trees were generally planted near water sources and irrigated to enable them to grow as large as possible. Remnants of these forest gardens are still found today adjacent to ruin sites and result in areas of forest with high fruit production containing trees that are notably larger than elsewhere in the forest. There are two species of primate in CBR, Geoffroy's spider monkey (*Ateles geoffroyi*) and the black howler monkey (*Alouatta pigra*). Operation Wallacea monitoring data has indicated that they are not evenly distributed across the reserve and occur in high densities in some areas while being virtually absent from others. The aim of the primate monitoring project is to investigate the relationship between habitat characteristics, water distribution and vicinity to Mayan ruins and the abundance and distribution of primates. Primate abundance data will be collected along a series of forest transects across different locations in the reserve with varying distances from ruin sites using distance sampling (based on visual sightings). The survey transects are distributed across a wide range of forest habitat types and each transect contains a number of 20m x 20m habitat survey plots. In each of these plots, the distance to water and Mayan ruins is recorded, saplings and understory vegetation are measured, and for each tree, the DBH will be measured and the species will be identified. Primate distribution in relation to habitat will be assessed using the same transect data combined with opportunistic sightings of primates along transects. Floristic predictors of primate distribution can then be determined by linking each primate sighting to the nearest habitat plot, providing a corresponding set of habitat variables for each primate record suitable for statistical modelling.

ME68 Spider monkey grouping patterns, habitat use and behaviour in relation to fluctuating fruit availability

Spider monkeys are frugivorous primates that live in complex societies characterised by high degree fission 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 size is adjusted to food patch size and when fruit is abundant the spider monkeys can be found in large groups. Group size and composition can have a notable effect on activity budgets, ranging and social interactions, particularly as there are notable sex-differences in the quality of social relationships and the type of social interactions exchanged by males and females. A large habituated community of spider monkeys in the Calakmul Biosphere Reserve has been studied each summer since 2013. The summer months are associated with the onset of rainy season and high fruit production resulting in large subgroups of spider monkeys. However, between 2015-2016 the reserve suffered a severe drought and during this time virtually no fruit was available. By 2017 rainfall and fruit production had returned to normal, but drought then continued throughout 2018 and 2019. Using the long-term dataset students can investigate changes to ranging patterns, subgroup composition and the associated effect on rates of social interactions in relation to rainfall patterns and food availability. Another project could focus on spider monkey activity and habitat use. Spider monkeys can have large home ranges that encompass different forest types, but it is not clear if they use all forest types for food and shelter. An investigation of how spider monkeys use the different forest types will determine whether spider monkey populations could survive in disturbed areas with limited availability of high forest. Activity budget data will be recorded using instantaneous scan sampling, noting the behaviour of each individual in view, the GPS location and forest type. Subgroup composition will be recorded in real time throughout the day and all occurrences of social interactions will be recorded noting the individuals involved, behaviour and context.

ME69 Bat abundance, diversity and distribution patterns in relation to habitat characteristics of a Mayan forest

Bat abundance in the Calakmul Biosphere Reserve is very high due to the huge expanse of primary forest and presence of multiple caves that act as roost sites. Moreover, some of the rarer carnivorous bats such as the great false vampire bat are flourishing in Calakmul due to abundant food supply and Mayan ruins which they use as roost sites. Calakmul, therefore provides an excellent site for bat research projects as the large numbers of captures provide a substantial dataset and the opportunity to learn bat handling techniques. Bat diversity is unlikely to be uniform throughout the reserve due to changes in the habitat resulting from vicinity to ruins sites (Mayan ruins contain unusually high densities of large fruiting trees as a result of ancient Mayan agroforestry) and distance from temporary lakes knows as aguadas that are the only sources of water in the reserve. Students will investigate bat abundance and diversity using mist net surveys in conjunction with bat detectors that record bat vocalizations. These combined methods will provide data on the carnivorous, frugivorous and nectivorous bats that are frequently caught in the nets and the insectivorous bats that have such fine-tuned echolocation that they can detect mist nets and are therefore virtually impossible to capture. These data will be collected across a range of transects in the reserve that encompass different habitat characteristics. Each transect contains a number of 20m x 20m habitat survey plots that provide detailed information of the forest characteristics in the area. In each of these plots, tree species will be identified, tree DBH, understorey vegetation, canopy openness, and the number of saplings will be measured. Bat data from each transect can then be related to mean habitat characteristics for the transect and comparisons between bat diversity and habitat variables may be investigated.

ME70 Frugivorous butterfly abundance, diversity and distribution patterns in relation to habitat characteristics of a Mayan forest

Frugivorous butterflies from the Charaxinae family are often used as indicators of forest disturbance as their abundance and diversity is directly impacted by changes to the forest environment and they only persist in high numbers in primary forest. However, in Calakmul, these butterflies appear to behave differently. A pilot study indicated that Charaxinae abundance and diversity does not vary in relation to disturbance factors but does appear to vary considerably across different locations in the forest. This unusual behaviour is likely an artefact of the unique forest in Calakmul created by ancient Mayan agroforestry. The relationship between forest structure and tree species composition with butterfly community structure will be investigated by placing a series of conical traps in different forest locations. Traps will be made from mosquito netting rolled into a large cylinder with a plastic plate hung from the bottom. The plastic plate will be baited with rotten bananas and other fruit each morning at 10-11am and then checked in the afternoon between 3-4pm. Traps will be hung from suitable trees in different areas of the forest and a 20m x 20m habitat plot (using the previously described methods) will be conducted around each trap in order to record forest structure variables and tree species composition. A total of 10 traps (5 understorey and 5 canopy) will be used in each of the research camps. Each butterfly caught in the trap will be identified to species level and will then be released.

Mexico marine independent research projects

Suitable for: dissertations ✓ master's thesis ✓

There are two dates for these topics: Monday 15 June to Sunday 26 July or Monday 29 June to Sunday 9 August 2020.

All these independent research topics are completed at the Akumal Marine Research Centre in the Yucatan Peninsula. Some of the research topics require collection of data by snorkelling and diving is not required*. For those projects requiring data collected by diving then you need to be dive qualified or will have to complete a PADI Open Water dive training course in your first week on site. For all reef monitoring projects you need to have completed the week-long Caribbean reef ecology course with associated practicals before you start on your project. Both of these courses are included within the dates given below.

ME71* Abundance of immature green turtles in relation to seagrass biomass in Akumal Bay

There are seven species of sea turtle in the world, all of which are either threatened or endangered. Akumal (meaning "home of the turtles") contains one of the few remaining healthy seagrass habitats in the Mexican Caribbean coastline and is home to a large resident population of green turtles, *Chelonia mydas*. Immature green turtles (roughly 5-20 years of age) feed exclusively on seagrasses before reaching sexual maturity and travelling out to sea. Due to an influx of sargassum macroalgae in the Yucatan Peninsula in 2015, many of the seagrass habitats in the region died, meaning that Akumal is one of only a small handful of suitable feeding grounds for immature turtles. Over 80 individuals have been recorded in the seagrasses of Akumal Bay, but several years of unregulated snorkel tours with these turtles resulted in a decline in the turtle population and considerable damage to the seagrasses. As Akumal Bay is now a marine protected area, the hope is that the turtle population will recover. Snorkel tours with turtles have been restricted to a set route around the bay and the use of snorkel fins is prohibited in order to allow seagrasses chance to recover. As the turtles preferentially graze in different areas each year, the distribution of seagrasses in the bay changes over time and the location of the designated snorkel route needs to change in line with this to ensure the continued recovery of the ecosystem. Research into green turtle feeding preferences will involve snorkelling with the turtles throughout the day to record their foraging patterns. Seagrass quadrat surveys will be used to determine the availability of the various species of seagrasses, which can then be compared to turtle feeding preferences obtained from behavioural observations. Belt transects throughout the bay will be used to estimate population density of the turtles and photographs of turtles along transects will be used to identify individuals in order to monitor departure of turtles as they reach sexual maturity and new arrivals into the bay. Photographs will also be used to monitor the recovery of turtles suffering from tumours that resulted from the combination of water contamination and chronic stress from unregulated snorkel tours prior to the formation of the new protected area.

ME72* Effect of tourism on immature green turtle behaviour in Akumal Bay

Year-round you can find immature green turtles, *Chelonia mydas* feeding on the seagrasses in Akumal Bay. These turtles have become a popular tourist attraction and there is concern that both the number and behaviour of tourists is affecting the behaviour and welfare of the turtles. Multiple studies of "swim with wild dolphin" based tourism have indicated that when the number of tourists gets too high, or the tourists attempt to touch them, the dolphins issue evasive responses to attempt to escape from the tourist. If the tourism continues to maintain high numbers, the dolphins simply move their home range to areas inaccessible by tour boats. As the availability of healthy seagrasses in the Mexican Caribbean coastline is limited, the turtles in Akumal Bay may not have the option of leaving the area to avoid large numbers of tourists so the snorkel with turtle tours need to be strictly regulated. As Akumal Bay has just been declared a protected area, data is urgently required to determine the carrying capacity of snorkel-based tourism. Data collected since the formation of the protected area can also be compared to previous data as a means of investigating positive behavioural changes in the turtles as a consequence of more sustainable management. Research into green turtle behaviour will involve snorkelling with the turtles throughout the day to record their activity budgets and rates of evasive responses to tourists using focal animal sampling with continuous recording. Each turtle can be recognised individually and at the start of each focal sample the turtle will be photographed from various angles for subsequent identification from the turtle photo ID database. The number of tourists within a 5m radius of each turtle and the behaviour of these tourists (whether they abide by the rules and maintain a safe distance from the turtles or attempt to interact with them) will be recorded throughout each focal sample to determine the effect of tourism on turtle behaviour.

ME73 Assessing the health and distribution of Scleractinian coral colonies in Akumal

Scleractinian coral is vital for coral reefs providing 3D structure as well as a diverse food supply for a variety of species. These reef-building corals are facing extinction, and, without maintaining genetic diversity on the reefs, we risk losing entire populations if multiple colonies are descended from an individual lacking resistance to disease, warming oceans and eutrophication. Assisted fertilization of coral gametes has been pioneered over the last decade by local researchers, the Coralium Laboratory of the National Autonomous Univeristy of Mexico (UNAM) to improve fertilisation and genetic diversity juvenile coral recruits which are grown and transplanted onto the reef in the National Park of Puerto Morelos. Corals spawn only once or twice per year at full moons during the summer and in Akumal these gametes are collected for assisted fertilization and rearing in our on-site laboratory. However, with only a few nights each year in which gametes can be collected, the Coralium group urgently need data showing where the largest and healthiest coral colonies are located so they can target gamete collection appropriately and maximise success. Operation Wallacea is assisting this long-term research project in Akumal by mapping the distribution of colonies of coral species from the genera *Acropora, Orbicella, Montastraea, Diploria, Pseudodiploria* and *Dendrogyra*. Coral colonies will be assessed using belt transects in which all colonies of target coral genera are georeferenced, each colony is assigned to a size category and the health of the colony (% bleaching and evidence of coral disease) is recorded. Scleractinian coral distribution maps are then created for the Coralium coral reproduction research team to determine the best locations of gamete collection during spawning.

ME74 The application of coral reef monitoring data: from carbon budget calculations to reef restoration performance assessments

As plants photosynthesise, they capture carbon dioxide and release oxygen. This carbon sequestration is well documented in terrestrial ecosystems and with the concept of "Blue Carbon" it has similarly been quantified for mangroves and seagrasses. However, for coral reefs it remains poorly understood, despite carbon sequestration increasing conservation value. Tropical coral reef biodiversity and the unique physiology of calcifying corals makes their carbon budget more complex than other ecosystems, as their metabolism includes multiple processes: photosynthesis, respiration, calcification and dissolution, which all have different roles in coastal carbon cycling. Another important coral reef management tool is reef restoration, which aims to return balance to the ecosystem by artificially increasing the cover of reef-building scleractinian corals. In Akumal preliminary research has been conducted to trial success rates of coral nurseries where Acropora cervicornis, one of the Caribbean's fastest growing but most threatened corals, is grown, propagated and then transplanted onto the reef. The methods used are minimally invasive and require cheap materials. Once blue carbon potential of a reef has been calculated, this can be used to measure changes in carbon processes, for example during reef restoration. At each reef site, benthic transects at two different depth profiles will be used to assess coverage of live and dead coral, macroalgae and sponges, measuring the number and size of individuals to estimate their rates of calcification, photosynthesis and respiration. Additional transects will then be conducted for key algal grazers such as urchins and herbivorous fish. The information gained from these data can then be used to calculate community metabolism and contribute to our understanding of the carbon cycle of Caribbean reefs, and to discuss their conservation implications in relation to reef restoration efforts.

Peru overview

Key facts
- The only Opwall site with pink and grey river dolphins
- Staying on fully restored historic ships from the Amazon rubber boom and in traditional lodgings within an Amazonian community
- Research conducted within an area with one of the world's richest variety of plants, amphibians, reptiles and birds, as well as numerous rare mammal species

Expedition Details

Research assistant places for 2 & 4 weeks

Research topics for dissertation students for 6 weeks or 8 weeks

RESEARCH OBJECTIVES

The primary study site is an area of seasonally flooded forest that connects the Pacaya-Samira National Reserve and the Tamshiyacu-Tahuayo Community Reserve. Surveys are conducted in the forest and white-water systems of the Lower Yarapa River from the confluence with the Amazon upriver towards its origin in the Ucayali river. A secondary field site extends from a base within an Amazonian community in the Tamshiyacu Tahuayo Community Reserve, surveying the black water system of the Tahuayo River and surrounding forests.

The overarching goal of this project is to help conserve the Peruvian Amazon through field research that provides the science base for biodiversity conservation. Community-based conservation dominates the landscape of the western Amazon with large community-based reserves, community co-managed reserves and indigenous territories covering 98,800km2. Opwall teams work closely with local communities, with particular areas of focus studying sustainable use of fish and bushmeat to support community management, and monitoring the recovery of endangered species such as giant river otter and jaguar populations.

The flooded forests (várzea) of this area are particularly susceptible to global climate change which appears to be increasing the frequency of extreme flooding events and low water periods. Research will be conducted into how wildlife and people have been impacted by recent historic floods and droughts, especially in the flooded forests where effects have been devastating for terrestrial mammals, such as tapir, peccaries, armadillos and large rodents.

Opwall teams contribute to one of the most extensive datasets in the Amazon and this information, managed by our Peruvian partners Fund Amazonia, is showing the impact of climate change on a range of taxa and on the livelihoods of indigenous people. It is being used to inform management decisions for community reserves and protected areas, and policy decisions for conserving the Peruvian Amazon.

Costs to consider £$

International flights to and from Iquitos ✓

Internal transfers – travel costs to and from the airport, overnight stays in Iquitos and transfers to and from the field site ✓

Visa* – not needed for most nationalities – see limaeasy.com/peru-info/peruvian-visa#tourist-visa-peru-needed ✓

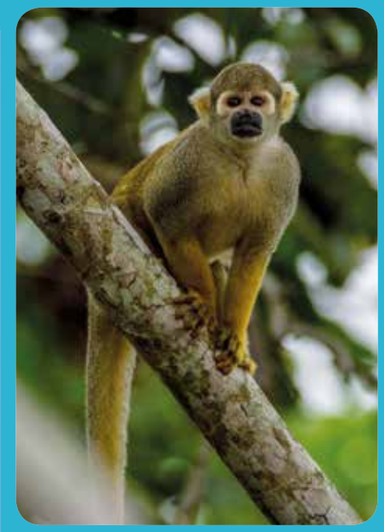
Community Fees ✓

Spending Money ✓
(local currency is **Soles**)

Travel information

The expedition begins on a Sunday morning, departing Iquitos at 0900hrs, and finishes upon return to Iquitos at approximately 1700hrs on a Friday. You need to arrange flights to arrive in Iquitos on or by the Saturday before your expedition begins, with the return flight leaving no earlier than the Saturday after your expedition ends.

Once you have booked your international flights, please send your itinerary to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.



Accommodation

Research boat:
Based on the Yarapa River, accommodation is in bunk beds in single-sex communal dormitories with shared toilet and shower facilities.

Satellite site:
Community lodgings in bunkbeds in single-sex communal dormitories with shared toilet and shower facilities.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
7 June D – 12 June	14 June – 19 June	21 June D – 26 June	28 June – 3 July	5 July – 10 July	12 July – 17 July	19 July – 24 July	26 July – 31 July
1	1					2	2
3	3	3	3				

Peru details of Research Assistant projects

Two Week Options

Squirrel monkeys, sloths and dolphins

2 weeks

Why choose these expeditions? Taster of Amazonian wildlife research.

This two-week project is based on a historic research ship moored in the Yarapa river and a field camp in an indigenous village on the Tahuayo river. The first day you will be having a series of lectures on Amazonian wildlife and and survey methods. You will then be rotating between a series of projects including boat-based surveys of pink and grey dolphin populations, gillnet and rod surveys of fish communities and point counts of macaws and wading birds. After dark you will venture out to assist with fishing bat, amphibian and caiman surveys. Foot-based surveys of the flooded forests and transitional forests include forest structure surveys, mist net surveys of understorey birds, butterfly surveys, terrestrial frog surveys, camera trap points for big cats, tapirs, peccary and other terrestrial mammals, and distance sampling for primate species and other arboreal mammals.

Expedition 1:
Sunday 7 June – Friday 19 June 2020 ●●
Expedition 2:
Sunday 19 July – Friday 31 July 2020 ●●

"Really great to get some real-life scientific experience outside of university."

Johan Laurie, *Research Assistant, University of St Andrews*

Four Week Options

Tapir, fish, caiman and frogs

4 weeks

Why choose these expeditions? Best project for large forest and river animal research.

This project runs for four weeks and is based on a historic research ship moored in the Yarapa river and a field camp in an indigenous village on the Tahuayo river. The first day you will be having a series of lectures on Amazonian wildlife and survey methods. You will then be rotating between a series of projects including boat-based surveys of pink and grey dolphin populations, gillnet and rod surveys of the fish communities and point counts of the macaws and wading birds. As water levels drop over the season, the ecology of the flooded forests changes and you will record the transition from high to low water while on site. During these falling water level periods, water birds migrate to this site to predate on the fish fry that are returning to the river from the flooded forest. Foot-based surveys of the flooded forests and transitional forests include forest structure surveys, mist net surveys of the understorey birds, butterfly surveys, terrestrial frog surveys, camera trap points for big cats, tapirs, peccary and other terrestrial mammals, and distance sampling for primate species and other arboreal mammals. In the evening, you will have the opportunity to join fishing bat, amphibian and caiman surveys.

Expedition 3:
Sunday 7 June – Friday 3 July 2020 ●●●●

Peru independent research project descriptions

Suitable for: dissertations ✓ master's thesis ✓

All expeditions start on a Sunday and finish on a Friday, with projects in the 2020 season starting on the following dates: 6-week expeditions are from 7 June to 17 July and 21 June to 31 July. 8-week expeditions are from 7 June to 31 July.

All these independent research topics are completed in the waters and flooded forests of the Lower Yarapa River based on a research ship, and in the Tamshiyacu-Tahuayo Community Reserve lodging within a remote Amazonian village. Before starting on your dissertation project, you will first complete the Amazonian wildlife and conservation course and associated practicals, and this is included within the dates given.

PE75 Tropical butterfly diversity and environmental gradients

The forest of the study site is awash with a diversity of bright and colourful butterflies and moths (Lepidoptera), notably including species of the beautiful blue morpho. Lepidoptera make excellent indicators of environmental change due to their variety of life-history strategies and their rapid life cycles. The Lepidoptera of the Yarapa and Tahuayo river basins are monitored using baited catch-and-release traps containing fermenting fruit. Projects could investigate the diversity and community composition changes along the natural environmental gradients from forest edge to centre; temporal niche-partitioning between butterflies and moths and whether the response to forest edges differs between day and night is also of interest; additionally, there is an opportunity to study the vertical stratification of the Lepidoptera community between the understorey and the mid-canopy. Permission is not granted to collect specimens, but as a diverse and abundant study group, the Lepidoptera project can be tailored to address any number of environmental questions, whilst also contributing to the long-term climate change dataset.

PE76 Species assemblages and niche separation of amphibians within the flooded and transitional forests of the Yarapa-Tahuayo river basins

Amphibians are a highly diverse class, with species specialising across all habitats (terrestrial, aquatic, arboreal and fossorial). The forests of the Yarapa-Tahuayo rivers are composed of seasonally flooded forests and transitional upland forests which create several unique habitats for amphibians resulting in very interesting species assemblages and high abundances of specialist species within the area. Climate change has been having a huge impact on flooded forests of western Amazonia in recent years, resulting in extreme periods of flooding and drought. This in turn is affecting habitat availability for certain specialist species of amphibians present. Data is collected across the main macrohabitats (flooded forests, transitional forests and floating meadows) using visual encounter surveys via transects on the terrestrial habitat and quadrats from a boat on the floating meadows. One project could look at how species assemblages differ across the macrohabitats and try to determine specialist and generalist species. Another project could examine niche separation within each macrohabitat. Climate change could also be linked into a project to determine whether changing habitat availabilities are influencing species presence or habitat choices.

PE77 Ecology and population monitoring of caiman species

Caiman are amongst the largest animals found in this region, and are important apex predators in the river ecosystem. There are three species of caiman found in this part of Peru (common, black and smooth-fronted), each of which has suffered different historical levels of exploitation. Opwall has been involved in local caiman research for a number of years, and this research effort is set to continue as part of a broader project led by a PhD student. Although the specific focus of this research is still being finalised, the overarching theme is to better understand the ecology of these charismatic animals, including factors such as their abundance, behaviour, habitat usage and spatial/temporal patterns in their distribution. Data could be collected via a range of methods, including spotlight surveys conducted at night along the edges of the main river and in a series of oxbow lakes within the forest (some connected to the river and others separated during the dry season). During these surveys, the size and species identification of each individual will be recorded, allowing spatial distributions to be estimated alongside size frequency to derive broad population structure. It may also be possible to capture smaller individuals (<2m) using a noose, allowing more detailed morphometric data to be collected (e.g. length, weight, sex and the presence of parasites).

PE78 Sustainability of fishing resources in the Yarapa river

The fish populations of the Yarapa river are a vital resource for the local indigenous people, making up to 70% of the protein of their diet. Fund Amazonia and Opwall have been monitoring the fish populations of the Yarapa river using a variety of methods, including side-scan sonar, gill net capture rates, demography of size classes, and socio-economic analysis. Results from the research has shown how climate fluctuations affect fish communities and hence the people who depend on them for their livelihood. This project could combine studying fish abundance and diversity to harvest rates to determine sustainable use, coupled with the socioeconomics of fishing to evaluate use and sustainability by local indigenous people and the impact of climate change. Fish populations are counted using side-scan sonar, fish diversity, abundance and size classes are determined using catch and release sampling using gill nets set for one hour. Socio-economic data on fish harvest, subsistence use, market sales, management actions and other economic and sociological variables could be collected by interviewing local people in nearby villages.

PE79 Population structure and abundance of understorey birds

The flooded forests of the Peruvian Amazon support over 440 bird species. More than 135 understorey bird species have been recorded within the flooded forest field sites. On this project mist netting will be used to collect data on the tropical understorey bird assemblages in flooded and transitional forests, offering valuable information on the lower and mid-storey birds not recorded by other methods. Mist nets are set for 5 days in each location and riverine habitat, open understorey flooded forests, levee forests, transitional upland forests and palm swamps are surveyed. The number of repeats on each habitat type is largely influenced by the water levels experienced each year. A series of morphological measurements are recorded for each captured bird and birds are ringed before their release. The project could focus on a variety of topics and utilise previous datasets. One project could identify the abundance of species found in different habitat types and their response to different water levels. Another project could look at the species and abundance differences between transitional and flooded forest landscapes.

PE80 Population trends, habitat preferences and social structure of pink and grey river dolphins in the Amazon River and Yarapa tributary

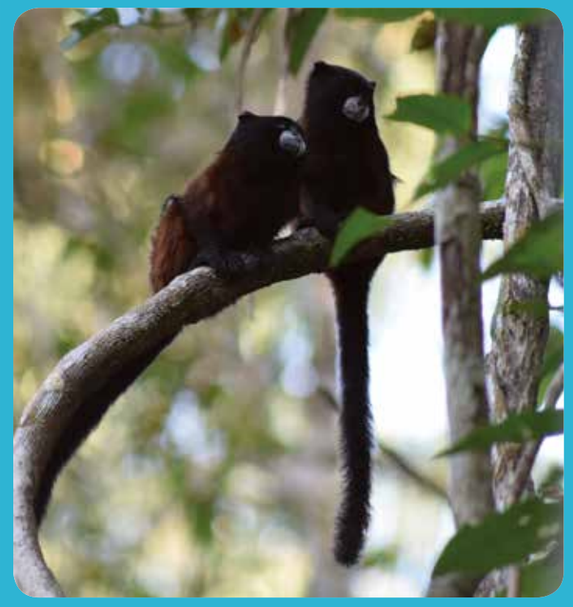
The pink dolphin, *Inia geoffrensis* and grey dolphin, *Sotalia fluviatilis* are endemic to the Amazon rivers and function as indicator species for the general health of aquatic habitats. Dolphins make an excellent indicator species because they rapidly move out of polluted or degraded habitats and in turn quickly indicate changes in the condition of aquatic systems. Moreover, dolphin abundance directly relates to food supply and thus dolphins can be used to monitor the health of fish populations. Dolphins are also easy to count and observe since they frequently surface, are large-bodied and very distinctive. The river dolphin population in the Amazon River and Yarapa tributary has been monitored for several years using transect surveys, side-scan sonar and high frequency hydrophone along rivers, lakes and channels via small boats. During these surveys, all dolphin encounters are recorded noting the species, pod size, habitat, angle, distance 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 over time, or could focus on habitat, behaviour and group size differences between the two species. Research could incorporate the social structure of pods and inter-specific relationships between pink and grey dolphins using observations and high frequency hydrophone. Dissertations could also incorporate the fish monitoring dataset to investigate changes to dolphin abundance over time in relation to changing fish stocks.

PE81 Population monitoring and habitat preferences of mammals in the flooded, transitional and upland forests of the Yarapa-Tahuayo landscape

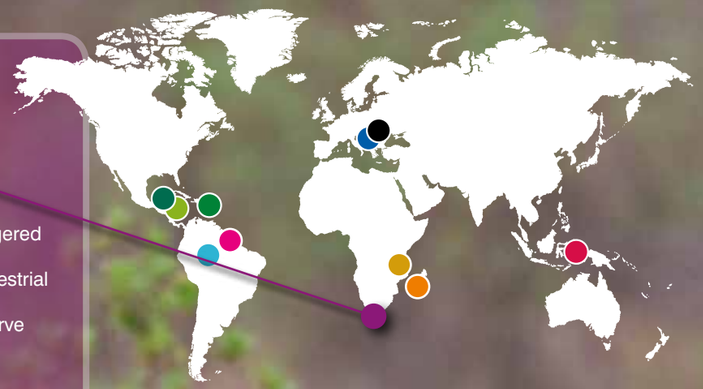
The ecology of seasonally flooded forests is driven by the extrinsic forces of large fluctuations in water level between the high and low water seasons. In contrast, the relatively aseasonal upland (non-flooded) forests are regulated by intrinsic biological drivers, such as competition and predator-prey interactions. The transitional forest between flooded and upland forests is a unique habitat that has features of both ecological systems. Primates, ungulates, rodents, felids and other mammals will be surveyed using line transects and camera traps to determine habitat preferences and abundances in flooded, transitional and upland forests. Flooded forest is a volatile ecosystem with annual and inter-annual fluctuations and is vulnerable to climate change, whereas upland forest is more stable and more resilient to climate change. Dissertation topics could examine the differences in terrestrial and arboreal mammals between the three forest types to examine vulnerability and resilience to climate change. Differences in predators, such as jaguars, pumas and ocelots, could be used to look at predator-prey relationships between upland, transitional, and flooded forests. Transect surveys will use Distance analysis and camera traps will be set along transects on 14-day rotations and can be analysed by capture rates or occupancy. Forest structure and fruit availability data may be collected from a series of habitat plots along transects.

PE82 Niche separation in squirrel monkeys, capuchin, tamarins and other primates in the Peruvian Amazon

Multiple primate species can be found in 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). Fourteen species of primates have been recorded in the Tamshiyacu-Tahuayo Community Reserve, but three species (common squirrel monkeys, brown capuchins and saddleback tamarins) 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, behavioural data can be collected and information recorded such as troop size, position in the canopy and food preferences. Fruit samples may also be collected to investigate species preference for colour and hardness, and forest structure and fruit availability data may be collected from habitat plots along transects.



South Africa
overview



Key facts
- Perform research in one of the most endangered biodiversity hotspots regions in the world
- The Opwall site with the most abundant terrestrial megafauna
- Opportunity to work on foot in a Big-5* reserve
- Diving in the UNESCO World Heritage site, iSimangaliso Wetland Park

*Big 5 refers to African lion, African elephant, Cape buffalo, African leopard and rhinoceros

> "Take the leap and make the choice, no regrets."
>
> **Greg Stanger,** *Bangor University*

Expedition Details

Research assistant places for 2 & 4 weeks | **Research topics for dissertation students for 6 weeks**

RESEARCH OBJECTIVES

Operation Wallacea and our partners, Wildlife and Ecological Investments (WEI), coordinate large-scale research programmes to provide an empirical backbone for key conservation projects in South Africa. Our main aim is to assist conservation managers with pressing large-scale issues that they do not necessarily have the resources to address themselves. The South Africa research programme covers a series of reserves across the country, each using slightly different management strategies to conserve wildlife in their reserves. Big game areas in South Africa are fenced to avoid the spread of disease and conflicts between communities and dangerous animals. However, in reserves surrounded by densely populated areas such as Dinokeng Game Reserve, human-wildlife conflict can be a major challenge. Here, our research teams are looking at the extent of this conflict with a special focus on large mammal species. Large mammal distributions are monitored regularly through game transects, and nocturnal mammal distributions are assessed using a matrix of camera traps set up throughout the reserve. By combining this information with our knowledge of areas of dense human activity, we can begin to understand how human disturbance can alter large mammal movement and behaviour.

The restriction of natural movement caused by fences can also lead to locally dense mammal populations with high levels of vegetation impact. Elephants, for example, are ecosystem engineers and their impact can alter vegetation structure and composition. By directly monitoring both fire and feeding impact on vegetation and its knock-on effects to other taxa, such as birds, our teams can assist the reserve managers to better understand how elephants can affect long-term change in the ecosystem. Monitoring of this type is also highly important in Gondwana Game Reserve, which is situated in the biodiversity hotspot of the Cape Floral Kingdom in the Western Cape. This Big-5 reserve has converted agricultural land to conservation, with the large mammals feeding on old agricultural grasslands as fynbos vegetation holds little nutritional value for large herbivores. Reserve management here have therefore asked us to monitor how the large, enigmatic game species are utilising the various vegetation types found within the reserve, to conserve the diversity of critically endangered vegetation types while supporting Big-5 tourism and conservation of the area.

Costs to consider £$

International Flights ✓

Internal Transfer from £90 to £280 site dependent ✓

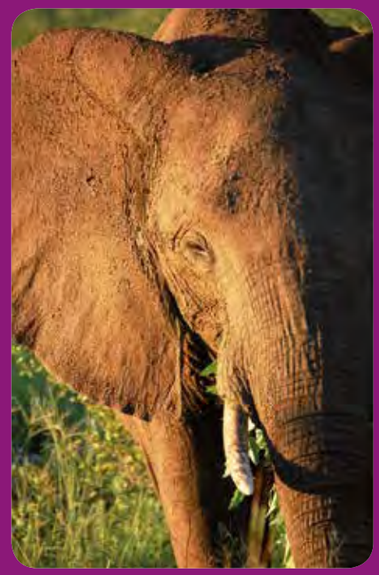
Visa - A 90 day visa is issued free of charge on entry to South Africa for people travelling from over 40 countries, including the UK, US and Canada. For other nationalities, please check your specific personal visa requirements before travelling - thesouthafrican.com/travel/south-africa-visa-requirements/ ✓

Park Entrance Fees ✓

Spending Money ✓
(Local currency is **Rand**)

If diving: Equipment Hire 5mm Full Length Wetsuit ✓

If dive training: PADI Manual & PIC ✓



Travel information

Expeditions 1, 3 & 4 start in Dinokeng Reserve on a Saturday at 0600hrs and finish at Sodwana Bay on a Friday at 0600hrs. International flights for these expeditions need to arrive in Johannesburg before 1200hrs Friday before expedition starts and leave after 2000hrs on Friday night.

Expeditions 2 & 5 and the Gondwana based dissertations start in Gondwana Game Reserve on a Saturday at 0600hrs and finish on a Friday at 0600hrs. International flights for these expeditions need to be booked to arrive into Cape Town by 1000hrs the Friday before the expedition starts and to leave Cape Town after 2000hrs on the Friday at the end of the expedition.

The Dinokeng based dissertations start in Dinokeng Game Reserve on a Saturday at 0600hrs and finish on a Friday at 1000hrs. International flights for these expeditions need to arrive in Johannesburg on the Friday before expedition starts by 1200hrs and leave after 1400hrs the Friday expedition ends.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Dinokeng:
Accommodation is in shared tents with shared bathroom facilities in a fenced camp within the reserve.

Gondwana:
Large shared tents within a fenced compound inside the reserve. Students will be preparing their own meals.

Sodwana:
Tents situated in a shaded bush camp. There is a shared toilet and shower block.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
20 June D 26 June	27 June D 3 July	4 July 10 July	11 July 17 July	18 July 24 July	25 July 31 July	1 August 7 August	8 August 14 August
1	1						
	2	2					
	3	3	3	3			
				4	4	4	4
			5	5	5	5	

South Africa details of Research Assistant projects

Two Week Options

Large mammal research and diving

2 weeks

Why choose this expedition? Great taster of large mammal research and diving.

The first week of this expedition is based in Dinokeng Game Reserve, where you will be based in a tented, fenced camp. You will spend half of your time in the field, helping with vehicle-based distance sampling of large mammals. You will also be working on foot, completing biodiversity assessments of birds and vegetation, estimating the level of fire and herbivory impacts on vegetation across the whole reserve. The rest of your time will be spent in camp where you will have daily lectures on "An Introduction to African wildlife conservation and management". You will also assist with the analysis of camera trap data from an extensive network of cameras placed across the reserve to capture evidence of illusive and nocturnal species. For your last week you will be based in Sodwana Bay where you have the option to complete a PADI Open Water dive training course. Alternatively, you will join the Indian Ocean reef ecology course as a diver or snorkeler depending on your experience.

Expedition 1:
Saturday 20 June – Friday 3 July 2020

Large mammal and fynbos biodiversity research

2 weeks

Why choose this expedition? In-depth option for large mammal and biodiversity research.

This expedition is based in Gondwana Game Reserve in the Western Cape. Here, reserve managers are trying to balance the conservation of large mammal species that have been reintroduced to the area, with protection of the hyper-diverse fynbos habitat within the reserve. These two objectives are potentially at odds given the low nutritional value of fynbos for browsing herbivores. The reserve therefore needs to maintain a balance between managing for fynbos biodiversity and more nutritional grassland areas for herbivore. The reserve is using a number of active management strategies, including regular burning, to find this balance and Opwall teams are working to monitor the success or otherwise of these techniques. You will be based in a fenced tented camp inside the reserve and will spend time each day in camp completing an Advanced wildlife conservation and management course, specialised in fynbos ecology. When in the field you will be involved in assessing vegetation usage by monitoring floral diversity and browsing pressure at exclosure plots set up in each of the main habitat types in the reserve. You will also perform bird point counts at each of these sites and assist with vehicle-based large mammal distribution surveys that run throughout the reserve.

Expedition 2:
Saturday 27 June – Friday 10 July 2020

Four Week Options

Large mammal research and diving

4 weeks

Why choose this expedition? Good option for large mammal research in a Highveld reserve and diving in the Indian Ocean.

This expedition is primarily based in Dinokeng Game Reserve in the Highveld. This reserve is home to the Big 5* and was formed through the inclusion of land from multiple small and large landowners in the area, many of whom still live within the reserve in fenced homesteads. The animals can roam freely around the individual properties within the reserve, leading to a higher than usual occurrence of human-wildlife interactions. Opwall teams are assisting local researchers to assess the success of this novel model of South African conservation and provide the reserve management with the empirical data they need to make informed decisions. On this project you will be involved in distance sampling from vehicles of large mammal species, completing bird point counts, undertaking surveys of browsing and grazing pressure and analysing camera trap data for elusive species such as lion and hyena. You will spend half of your time in the field with locally trained guides, with the remaining time spent in camp processing camera trap data and completing an African wildlife conservation and management course. For your last week you will be based in Sodwana Bay and will then complete a PADI Open Water dive training course or an Indian Ocean reef ecology course by diving (if already trained) or snorkelling.

Expedition 3:
Saturday 27 June – Friday 24 July 2020
Expedition 4:
Saturday 18 July – Friday 14 August 2020

Introduction to Applied Conservation GIS

4 weeks

Why choose this expedition? Good option for gaining practical GIS skills using QGIS software in an African conservation setting.

This expedition is based in Gondwana Game Reserve in the Western Cape where the managers of the reserve are trying to balance the conservation of large mammal species that have been reintroduced to the area, with protection of the hyper-diverse fynbos habitat within the reserve. The spatial diversity of habitat types means this is an ideal reserve to collect spatial ecological data to analyse within GIS. You will have GIS workshops led by a GIS lecturer in our research camp. You will learn the basics of GIS data creation and analysis using existing basemap shapefiles, remotely sensed satellite imagery, and telemetry data from GPS collars of large mammals. The course structure will follow the official QGIS training manual and is suitable for students with variable GIS experience. You will work on an independent project towards the end of your expedition, producing a map of animal movement across the reserve. Alongside this, you will also gain experience collecting the type of spatial data often used in these analyses in the form of vehicle-based habitat mapping, distance sampling of large mammals, and monitoring alien plant invasions. You will also contribute to our long-term biodiversity data collection on-foot, on vegetation and bird surveys. All of this takes place in a Big-5 reserve in a hyper diverse fynbos ecosystem.

Dr Gabi Teren
Research and Training Manager, WEI

"Remote sensing gives researchers a unique insight into environments that are otherwise inaccessible. This expedition gives students chance to develop their mapping skills using GIS, while also gaining experience collecting this valuable data."

Expedition 5:
Saturday 11 July – Friday 7 August 2020

South Africa independent research topics

Suitable for: dissertations ✓ master's thesis ✓

Projects based in Dinokeng will start on Saturday 20 June and finish on Friday 31 July 2020.
Projects based in Gondwana will start on Saturday 27 June and finish on Friday 7 August 2020.

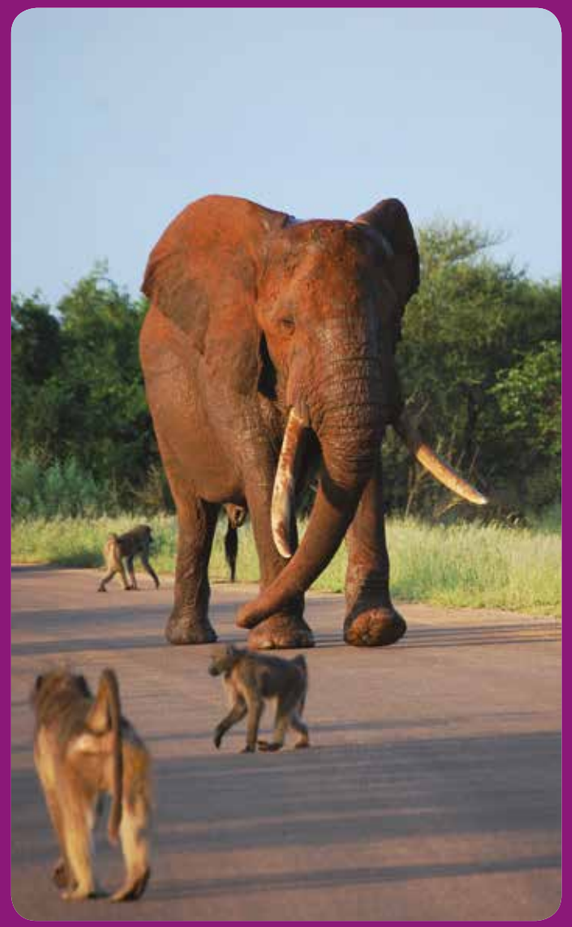
These independent research topics are completed in either Dinokeng Game Reserve on the Highveld or Gondwana Game Reserve in the Western Cape.

SA85 Savanna community ecology in a human-affected ecosystem

Over the past four years, our teams have collected data to help us better understand the distribution, diversity, health and variation of flora and fauna within Dinokeng Game Reserve. These data span large mammal, bird and vegetation communities. Specifically, including monitoring of impacts from fire and elephants. This information can be combined in a variety of ways to answer questions on how the environment has changed over space and time and how different taxonomic groups interact. By mapping and assessing vegetation communities in Dinokeng, we can better understand the distribution of herbivore species across the reserve, as well as the bird abundance and diversity. Projects in this area present a great opportunity to work on African savanna ecology, using long-term data in a Big-5 reserve to answer questions on wildlife management in the presence of human disturbance.

SA87 Assessing predator-prey interactions in Dinokeng Game Reserve

A network of over 30 camera traps has been running since 2018 in Dinokeng Game Reserve, collecting continuous data evenly across the human-influenced central portion of this 21,000 ha reserve. As well as picking up elusive and rare species, this network allows data collection of animal visitation across large spatial and temporal scales. The camera trap network has been placed on a grid system to monitor mammal occupancy through a highly varied environment. Of particular interest is how carnivore species and assemblages are influenced by landscape fragmentation and prey distribution. As well as the large predators (e.g. lions and cheetah), the reserve has healthy populations of meso-carnivores such as black-blacked jackal, caracal and brown hyena. The camera traps give a unique insight into the movements and distributions of these animals, as well as the many various prey species found in the reserve. The presence of roads, properties and vegetation.



SA86 Road ecology in Dinokeng Game reserve

Road ecology is one of the most important subjects in modern conservation. The direct threat that roads pose to wildlife is universal and increasing. Dinokeng is a perfect place to study road ecology as its variable traffic volumes and complex road network can present problems to the abundance of at-risk species; including black-backed jackal, scrub hare and many bird species. Roadkill surveys are conducted to improve our understanding of the direct risks to wildlife, and we also collect data aiming to better understand how drivers react to wildlife at different points across the reserve, through rubber snake trials. Additionally, a system of camera traps placed at strategic locations on the road network allows us to assess how both animals and humans are using these areas. By combining these different aspects, we aim to answer questions assisting with road policy and wildlife management in Dinokeng and other areas.

SA89 Assessing the ranging patterns and habitat use of large mammals in Gondwana Game Reserve

Gondwana Game Reserve is a fenced reserve situated in the hyper-diverse Cape Floral Kingdom, which is dominated by fynbos and renosterveld. Many large mammals that were previously extinct from the area, including elephant, rhino and buffalo, have been reintroduced to the reserve and the income that results from tourists coming to see these species allows the reserve to protect the area. However, while the dominant fynbos and renosterveld are highly diverse and endangered plant communities, they offer very little nutritional value for large herbivore species and the large mammals graze predominantly on old agricultural grasslands. The reserve management must therefore carefully balance the desire to protect this amazing floral diversity with the need to maintain healthy megafauna. By assessing the movement and habitat preferences of large mammals, Opwall and its partners hope to assist the reserve in future management decisions. To do this, regular large mammal surveys are conducted in which all visual encounters with the herbivores are recorded. The GPS location of the animal, the species, condition score, number of individuals and age-sex class of each individual are also noted. Students will also assist with habitat mapping across the reserve at a broad-scale and detailed vegetation surveys, in which the level of physical impact on the plants from key herbivores is recorded.

SA88 Fynbos ecology in the hyper-diverse Cape Floral Kingdom

The only floral kingdom contained within a single country, the Cape Floral Kingdom is home to endemic and highly threatened fynbos vegetation. Gondwana Game Reserve is situated within this kingdom and is currently trying to balance the conservation of the over 8000 plant species in the region with the reintroduction of large herbivore species such as elephants. This fenced reserve represents a pocket of protection for these species, amid a landscape dominated by agriculture. Floral and avian diversity and composition within the reserve are currently very poorly understood, and the reserve management are eager to understand how different land use and management histories are affecting them. Experimental exclosures have been erected to understand how fire and herbivory interact to influence plant diversity and grazing potential. Each site has four treatments of burned and not burned, grazed and not grazed. Data on vegetation composition, density, and grazing impact are collected both inside and outside of these exclosures to assess the effect animals have on vegetation. Likewise, mammal dung counts help determine how animals are using the sites. Bird point counts are also performed at these locations, allowing us to determine the effects of treatments across vegetation types on avian diversity across the reserve.

> "Best experience I could've hoped for. Loved every moment!"
>
> **Freddie Kerner,** *Research Assistant, University of Southampton*

Transylvania overview

Key facts
- The largest population of brown bears anywhere in Europe
- Unique medieval high nature value landscape
- The most diverse wildflower meadows in lowland Europe

> "Such an amazing life-changing experience. I wasn't planning on doing a Masters but now I'm very much considering going as far as a PhD because of this expedition."
>
> **Aishah Binti Muhammed Shafeeq Wilson,** *University of Oxford*

Expedition Details

Research assistant places for 2 & 4 weeks

Research topics for dissertation students for 6 weeks

RESEARCH OBJECTIVES

The foothills of the Carpathian Mountains in Transylvania are one of the most spectacular and biodiverse areas in Europe. The species-rich landscape has been nurtured by the low intensity farming practices stretching back up to 900 years. However, since Romania joined the European Union there was a gradual depopulation of the countryside coupled with moves to increase the efficiency of farming by combining fields and more intensive agricultural practices. To mitigate against these areas of outstanding natural beauty in the foothills of the Carpathians being affected by intensification, the EU offered farmers grants to continue farming using traditional techniques to maintain the landscape. The Opwall teams in Transylvania are working with a local NGO called ADEPT and a series of scientists monitoring whether farming practices and biodiversity are changing in a series of eight valleys within the Tarnava Mare region. Changes in farming practices such as any moves to silage production, removal of hedges, usage of fertilisers and pesticides or drainage of wetland areas are being monitored since they could have a big impact on the biodiversity. Direct monitoring of the biodiversity of groups such as meadow plant indicator species, butterflies, birds, small mammals and large mammals such as bears are also being monitored as part of this programme.

Costs to consider £$

International Flights return to arrival and departure airports listed right ✓

Internal Transfer – travel costs from the start and finish points of the expeditions to the international airport including overnight stay in Sighisoara ✓

Visa – not required for most countries but please check http://romaniatourism.com/entry-requirements ✓

Spending Money ✓

(local currency is **Lei**)

Example day

Time	Activity
0700	Emptying small mammal traps
1200	Lunch
1300	Visit to local farm to see traditional agriculture
1800	Dinner
1900	Evening trek to locate bear, wild boar and deer

Travel information

The expeditions start in one of the Tanarva Maru village on a Wednesday at 12 noon and finish in a different village on a Tuesday at 12 noon. You need to book your international flights to Cluj-Napoca for the Tuesday at 1800hrs before your expedition starts and from Wednesday after 1000hrs after your expedition finishes. Note the groups are taken to the mediaeval city of Sighisoara on the Tuesday afternoon and the groups will be able to explore this touristic town and stay overnight on the Tuesday on their way out.

Once you have booked your international flights to coincide with the international airport gathering and departure points described above then please send those itineraries to **internaltravel@opwall.com**. You will then receive a quote using the least expensive options for getting you to and from the start and finish points of your expedition.

Accommodation

Camp sites:
Depending on the valley being surveyed the accommodation can be shared tents with field toilets and bucket showers, guest houses, or shared rooms with bathroom facilities.

For more images and details visit the Opwall website **www.opwall.com**

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
17 June D – 23 June	24 June – 30 June	1 July – 7 July	8 July – 14 July	15 July – 21 July	22 July – 28 July	29 July – 4 August	5 August – 11 August
3	3	3	3	1	1	2	2

Transylvania details of Research Assistant projects

Two Week Options

Carpathian meadows and ancient forests

2 weeks

Why choose these expeditions? Taster of field survey techniques and seeing some of the amazing Transylvania wildlife including bears.

These expeditions have a week each in two different valleys in the foothills of the Carpathian Mountains in Transylvania. The area is one of outstanding natural beauty with species rich meadows that have been managed with late hay cuts and no fertilisers for the last 700 years and ancient forests that were once part of the forest that covered much of Europe. On this project you will be working with specialists quantifying change in different taxa and using a wide variety of ecological survey techniques. The surveys include assessing the value of meadows from the occurrence of 30 species of plants that are indicators of high quality meadow communities, Pollard counts and sweep net surveys of butterflies, species assessments of other invertebrate groups such as grasshoppers, bees, beetles, point count and mist net surveys for birds, opportunistic surveys for herpetofauna (depending on village), small mammal trapping and camera trapping for the large mammal species including bears. In addition, there is the opportunity to go out with a member of the local community and see if you can see some of the larger mammals in person, for example bears, wild boar and wild cat. Interview-based surveys of small farms are used to assess whether the farming practices (date of hay cuts, amalgamation of fields, use of fertiliser etc.) are changing in a direction that would threaten this spectacular scenery and wildlife. At the end of each week you will travel over the mountains and down into the next valley to repeat the surveys. Note, with European train passes it is possible either before or after your expedition to explore by train other parts of Europe including Budapest, Vienna, Prague and many other sites.

Expedition 1: Wednesday 15 July – Tuesday 28 July 2020 ●●

Expedition 2: Wednesday 29 July – Tuesday 11 August 2020 ●●

Four Week Options

Bears and Carpathian wildlife

4 weeks

Why choose this expedition? Best option to learn field survey techniques and see some of the amazing Transylvania wildlife including bears.

This expedition has a week in each of four different valleys in the foothills of the Carpathian Mountains in Transylvania. The project is based in an area of outstanding natural beauty that represents how most of Europe looked prior to the intensification of agriculture, when there was no fertiliser, herbicide or insecticide use. Working with a number of specialists quantifying change in different taxa, the four week project gives more opportunity to fully experience the wide array of different survey types conducted in Transylvania. The surveys include assessing the value of meadows from the occurrence of 30 species of plants that are indicators of high quality meadow communities, Pollard counts and sweep net surveys of butterflies, point count and mist net surveys for birds, small mammal trapping and camera trapping for the large mammal species including bears. In addition, there is the opportunity to go out with a member of the local community and see if you can see some of the larger mammals in person, for example bears, wild boar and wild cat. Interview-based surveys of small farms are used to assess whether the farming practices (date of hay cuts, amalgamation of fields, use of fertiliser etc.) are changing in a direction that would threaten this spectacular scenery and wildlife. At the end of each week you will travel over the mountains and down into the next valley to repeat the surveys, allowing you to experience the diversity of a number of different villages. It is possible to specialize in one or more of the projects or to keep circulating between the different survey teams and by the time you have finished your four week stay in this beautiful part of the world, you will have an excellent grounding in survey techniques used to quantify different taxa.

Expedition 3: Wednesday 17 June – Tuesday 14 July 2020 ●●●●

Transylvania independent research projects

Suitable for: dissertations ✓ master's thesis ✓

The expeditions will start on Wednesday 17 June 2020 and will finish on Tuesday 28 July 2020.
If you are doing a Masters project then 8 weeks is preferable and these projects would finish on Tuesday 11 August 2020.

These 6-week dissertations are based in a series of mobile camps established for week long periods in different villages in the Tanarva Maru region and using standardised methods and effort between years to monitor change.

TR92 Plant indicator species of grasslands in Transylvania

Transylvania has some of the most species-rich hay meadows and pastures in Europe, with traditional management, low fertilizer input and low stocking rates. Fundatia ADEPT, Opwall's partner in Romania, has with the help of some experienced botanists, identified a guide of 30 plant species indicative of high conservation dry grasslands. What is not known is whether some of the indicators are more commonly associated with the highest value meadows or pastures and so act as 'super indicators'. This can be judged by comparing the occurrence of each species against quality of habitat i.e. the total number of indicator species at a site. An association analysis of indicator species is also needed to identify which species tend to occur together (and so can be considered to be replicates of each other) and which are more unique. This study will be conducted at least 12 sites already identified around eight villages across the Natura 2000 site in Transylvania. Grassland surveys using these 30 indicator species were conducted at a series of sites around eight villages within the Tarnava Mare region between 2013 and 2019, so there are existing datasets to compare against the survey data in 2020.

TR93 Butterfly communities as indicators of habitat changes in Tarnava Mare

Pollard counts of butterfly communities in different habitats (species-rich grasslands, species-poor grassland, abandoned land, scrub areas and farmland) have been completed at a series of sites around eight villages across the Tarnarva Mare region between 2013 and 2019. These surveys are revealing interesting patterns in butterfly habitat associations and changes in the communities over time. The same sites surveyed since 2013 will be resurveyed in 2020 and these data can be used to identify habitat associations and changes between years within the butterfly communities. One useful output from these studies might be the identification of butterfly species which could be used as indicators of high nature conservation grassland.

TR94 Changes in bird communities in Tarnava Mare and habitat associations

Point counts for 10 minutes of all birds seen or heard were completed twice at each of over 250 sites across the Tarnava Mare region between 2013 and 2019. The 250+ sites are being resurveyed in 2020 and these datasets, together with those from previous years, would enable a number of different questions to be addressed. For example, what changes in the bird communities over the study period have been noted? What are the preferred habitats of the main species and how has the proportion of these habitats changed over the study period? If farming practices change how could this affect the bird communities? Are there species which could be used as indicators of habitat quality? This project is data rich and should enable some complex analyses to be performed.

Research Assistant Summary Table

Ex No.	Length	Summary	Start date	Finish date	Courses	Research Activities	Accom part 1	Accom part 2	Places
Croatia									
1	2 weeks	1 week terrestial and 1 week marine	Thursday 11th June	Wednesday 24th June	Balkans Wildlife & Conservation, PADI Open Water dive training & Mediterranean ecology & survey techniques	Terrestrial surveys include: Pollard walks for butterflies; standard searches for herpetofauna; point counts and mist netting for birds; mammal tracking; acoustic surveys and mist netting for bats; light trapping and sweep netting for invertebrates; cave surveys for invertebrates; trap surveys for fish; camera trapping for large mammal surveys. On the marine side: stereo-video and UVC surveys for fish; seaurchin surveys and seagrass surveys; marine plastics surveys.	Dorms with shared bathrooms	Tents with shared bathrooms	12
2	2 weeks	1 week terrestial and 1 week marine	Thursday 25th June	Wednesday 8th July	Balkans Wildlife & Conservation, PADI Open Water dive training & Mediterranean ecology & survey techniques	Terrestrial surveys include: Pollard walks for butterflies; standard searches for herpetofauna; point counts and mist netting for birds; mammal tracking; acoustic surveys and mist netting for bats; light trapping and sweep netting for invertebrates; cave surveys for invertebrates; trap surveys for fish; camera trapping for large mammal surveys. On the marine side: stereo-video and UVC surveys for fish; seaurchin surveys and seagrass surveys; marine plastics surveys.	Dorms with shared bathrooms	Tents with shared bathrooms	24
3	2 weeks	1 week terrestial and 1 week marine	Thursday 30th July	Wednesday 12th August	Balkans Wildlife & Conservation, PADI Open Water dive training & Mediterranean ecology & survey techniques	Terrestrial surveys include: Pollard walks for butterflies; standard searches for herpetofauna; point counts and mist netting for birds; mammal tracking; acoustic surveys and mist netting for bats; light trapping and sweep netting for invertebrates; cave surveys for invertebrates; trap surveys for fish; camera trapping for large mammal surveys. On the marine side: stereo-video and UVC surveys for fish; seaurchin surveys and seagrass surveys; marine plastics surveys	Dorms with shared bathrooms	Tents with shared bathrooms	18
4	4 weeks	2 weeks terrestrial and 2 weeks marine	Thursday 11th June	Wednesday 8th July	Balkans Wildlife & Conservation, PADI Open Water dive training & Mediterranean ecology & survey techniques	Terrestrial surveys include: Pollard walks for butterflies; standard searches for herpetofauna; point counts and mist netting for birds; mammal tracking; acoustic surveys and mist netting for bats; light trapping and sweep netting for invertebrates; cave surveys for invertebrates; trap surveys for fish; camera trapping for large mammal surveys. On the marine side: stereo-video and UVC surveys for fish; seaurchin surveys and seagrass surveys; marine plastics surveys.	Dorms with shared bathrooms	Tents with shared bathrooms	7
5	4 weeks	4 weeks marine	Thursday 9th July	Wednesday 5th August	PADI Open Water dive training & Mediterranean ecology & survey techniques	Stereo-video and UVC surveys for fish, seaurchin surveys and seagrass surveys; Noble Pen mollusc surveys; marine plastics surveys.	Tents with shared bathrooms	Tents with shared bathrooms	6
Dominica									
1	2 weeks	1 week terrestrial 1 week marine	Monday 13th July	Saturday 25th July	Caribbean Island ecology, PADI Open Water dive training & Caribbean reef ecology	Specialist invertebrate surveys to build species lists in target taxa, bird point count and mist net surveys, lizard distribution surveys, forest structure and carbon surveys, acoustic an dmist nets sjrveys of bats, whale surveys, assessing the impact of acidification on the reefs, steroe video fish counts, coral transects surveys, stereo video fish counts.	Tents with shared bathrooms	Dorms with shared bathrooms	20
Guyana									
1	2 weeks	2 weeks terrestrial	Tuesday 9th June	Monday 22nd June	Guiana Shield wildlife & ecology	Forest structure surveys; pit trapping for dung beetles; standard search transects and spotlighting for reptiles and amphibians; mist netting, point counts and soundscape analysis for birds; distance sampling, patch occupancy surveys and camera trapping for large mammals and primates; and mist netting and echolocation sound analysis for bat communities.	Iwokrama Forest Research Centre: Shared dorm rooms	Field camps: Hammocks and field toilets	27
2	4 weeks	4 weeks terrestrial	Tuesday 7th July	Monday 3rd August	Guiana Shield wildlife & ecology	Forest structure surveys; pit trapping for dung beetles; standard search transects and spotlighting for reptiles and amphibians; mist netting, point counts and soundscape analysis for birds (including the Red Siskin); distance sampling, patch occupancy surveys and camera trapping for large mammals (including giant anteater) and primates; and mist netting and echolocation sound analysis for bat communities; history of ranching; savannah management.	Iwokrama Forest Research Centre: Shared dorm rooms	Field camps: Hammocks and field toilets	20
3	6 weeks	6 weeks terrestrial	Tuesday 23rd June	Monday 3rd August	Guiana Shield wildlife & ecology	Forest structure surveys; pit trapping for dung beetles; standard search transects and spotlighting for reptiles and amphibians; mist netting, point counts and soundscape analysis for birds (including the Red Siskin); distance sampling, patch occupancy surveys and camera trapping for large mammals (including giant anteater) and primates; and mist netting and echolocation sound analysis for bat communities; history of ranching; savannah management.	Iwokrama Forest Research Centre: Shared dorm rooms	Field camps: Hammocks and field toilets	5
Honduras									
1	2 weeks	2 weeks marine	Wednesday 24th June	Tuesday 7th July	PADI Open Water dive training & Caribbean coral reef ecology course	Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	25
2	2 weeks	2 weeks marine	Wednesday 15th July	Tuesday 28th July	PADI Open Water dive training & Caribbean coral reef ecology course	Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	25
3	2 weeks	2 weeks forest	Wednesday 22nd July	Tuesday 4th August	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals	Tents with shared bathrooms	Hammocks or shared tents with field toilets and river showers	20
4	4 weeks	2 weeks forest, 2 weeks marine	Wednesday 10th June	Tuesday 7th July	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course, PADI Open Water dive training, Caribbean coral reef ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals. Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Tents with shared bathrooms / Hammocks or shared tents with field toilets and river showers	Dorms with shared bathrooms	15
5	4 weeks	2 weeks forest, 2 weeks marine	Wednesday 1st July	Tuesday 28th July	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course, PADI Open Water dive training, Caribbean coral reef ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals. Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Tents with shared bathrooms / Hammocks or shared tents with field toilets and river showers	Dorms with shared bathrooms	20
6	4 weeks	4 weeks marine DM training	Wednesday 17th June	Tuesday 14th July	PADI Divemaster Training, Caribbean Reef Ecology Course	Stereo-video fish surveys and 3D reef modelling	Dorms with shared bathrooms	Dorms with shared bathrooms	25

Ex No.	Length	Summary	Start date	Finish date	Courses	Research Activities	Accom part 1	Accom part 2	Places
Honduras									
7	4 weeks	4 weeks marine	Wednesday 17th June	Tuesday 14th July	PADI Open Water dive training, Caribbean coral reef ecology	Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	25
8	4 weeks	4 weeks marine	Wednesday 8th July	Tuesday 4th August	PADI Open Water dive training, Caribbean coral reef ecology	Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	20
9	4 weeks	3 weeks forest, 1 week marine	Wednesday 8th July	Tuesday 4th August	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course, PADI Open Water dive training, Caribbean coral reef ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals. Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Tents with shared bathrooms / Hammocks or shared tents with field toilets and river showers	Dorms with shared bathrooms	20
9	4 weeks	3 weeks forest, 1 week marine	Wednesday 8th July	Tuesday 4th August	JJungle survival, Canopy Access (additional cost), Neotropical forest ecology course, PADI Open Water dive training, Caribbean coral reef ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals. Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Tents with shared bathrooms / Hammocks or shared tents with field toilets and river showers	Dorms with shared bathrooms	20
10	4 weeks	4 weeks forest	Wednesday 24th June	Tuesday 21st July	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals	Tents with shared bathrooms	Hammocks or shared tents with field toilets and river showers	20
11	6 weeks	3 weeks forest, 3 weeks marine	Wednesday 17th June	Tuesday 28th July	Jungle survival, Canopy Access (additional cost), Neotropical forest ecology course, PADI Open Water dive training, Caribbean coral reef ecology course	Forest structure; light trapping for moths, jewel scarabs and longhorn beetles; pitfall trapping for dung beetles; invertebrates in bromeliads; sweep netting for dragonflies; dip nets for crabs; spotlighting and transect searches for amphibians and reptiles; genetic sampling of amphibians for chytrid; point count and mist netting for birds; mist netting for bats; camera trapping for large mammals; Sherman trapping for small mammals. Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Tents with shared bathrooms / Hammocks or shared tents with field toilets and river showers	Dorms with shared bathrooms	20
12	6 weeks	6 weeks marine	Wednesday 17th June	Tuesday 28th July	PADI Open Water dive training, Caribbean coral reef ecology	Stereo-video fish surveys of fish biomass; 3D reef modelling; urchin abundance surveys; lionfish surveys; cleaner shrimp and fish behaviour studies; benthic video belt transect surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	25
Indonesia									
1	2 weeks	2 weeks forest	Sunday 12th July	Saturday 25th July	Jungle survival, Wallacean wildlife and conservation	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats	Hammocks and field toilets	Hammocks and field toilets	15
2	2 weeks	2 weeks marine	Sunday 7th June	Saturday 20th June	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Baited Underwater Remote Video systems (BRUVs) for studying shark and ray abundance; invertebrate and coral cover transects; Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Shared room	Shared room	10
3	2 weeks	2 weeks marine	Sunday 14th June	Saturday 27th June	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Baited Underwater Remote Video systems (BRUVs) for studying shark and ray abundance; invertebrate and coral cover transects; Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Shared room	Shared room	10
4	2 weeks	2 weeks marine	Sunday 21st June	Saturday 4th July	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Baited Underwater Remote Video systems (BRUVs) for studying shark and ray abundance; invertebrate and coral cover transects	Shared room	Shared room	10
5	2 weeks	2 weeks marine	Sunday 28h June	Saturday 11th July	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Baited Underwater Remote Video systems (BRUVs) for studying shark and ray abundance; invertebrate and coral cover transects	Shared room	Shared room	10
6	2 weeks	2 weeks marine	Sunday 19th July	Saturday 1st August	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Shared room	Shared room	20
7	4 weeks	4 weeks terrestrial	Sunday 28th June	Saturday 25th July	Jungle survival, Wallacean wildlife and conservation	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats	Hammocks and field toilets	Hammocks and field toilets	10
8	4 weeks	2 weeks terrestrial, 2 weeks marine	Sunday 14th June	Saturday 11th July	Jungle survival, Wallacean wildlife and conservation, PADI Open Water dive training, Indo-Pacific reef survey techniques course	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Hammocks and field toilets	Shared room	15
9	4 weeks	2 weeks terrestrial, 2 weeks marine	Sunday 28th June	Saturday 25th July	Jungle survival, Wallacean wildlife and conservation, PADI Open Water dive training, Indo-Pacific reef survey techniques course	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Hammocks and field toilets	Shared room	15
10	4 weeks	2 weeks terrestrial, 2 weeks marine	Sunday 12th July	Saturday 8th August	Jungle survival, Wallacean wildlife and conservation, PADI Open Water dive training, Indo-Pacific reef survey techniques course	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies	Hammocks and field toilets	Shared room	15

Research Assistant Summary Table

Ex No.	Length	Summary	Start date	Finish date	Courses	Research Activities	Accom part 1	Accom part 2	Places
Indonesia continued									
11	4 weeks	4 weeks marine	Sunday 14th June	Saturday 11th July	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; seagrass health; coral nursery and reef rehabilitation	Shared room	Shared room	25
12	4 weeks	4 weeks marine	Sunday 12th July	Saturday 8th August	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; seagrass health; coral nursery and reef rehabilitation	Shared room	Shared room	15
13	4 weeks	4 weeks marine	Sunday 28th June	Saturday 25th July	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; seagrass health; coral nursery and reef rehabilitation	Shared room	Shared room	10
14	4 weeks	4 weeks marine DM training	Sunday 14th June	Saturday 11th July	PADI Divemaster training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys and 3D reef modelling	Shared room	Shared room	3
15	6 weeks	2 weeks terrestrial, 4 weeks marine	Sunday 28th June	Saturday 8th August	Jungle survival, Wallacean wildlife and conservation, PADI Open Water dive training, Indo-Pacific reef survey techniques course	Forest structure and carbon content; Pollard counts of butterflies; point counts for birds; standard search transects for reptiles and spotlighting for amphibians; distance sampling, camera trapping and patch occupancy sampling for large mammals; mist netting for bats Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; marine plastics	Hammocks and field toilets	Shared room	5
16	6 weeks	6 weeks marine	Sunday 28th June	Saturday 8th August	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; seagrass health; coral nursery and reef rehabilitation; marine plastics	Shared room	Shared room	10
17	8 weeks	8 weeks marine	Sunday 14th June	Saturday 8th August	PADI Open Water dive training, Indo-Pacific reef survey techniques course	Stereo-video fish surveys; 3D reef modelling; coral restoration monitoring; fishery landings; fish and invertebrate adaptations to climate change; coral and invertebrate belt transects; fish behaviour studies; sponge diversity studies; mangrove studies; seagrass health; coral nursery and reef rehabilitation; marine plastics	Shared room	Shared room	5
Madagascar									
1	2 weeks	2 weeks forest	Sunday 14th June	Friday 26th June	Madagascar wildlife and conservation course	Structure and composition of the forest, pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night), colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs	Tents with field toilets and showers	Tents with field toilets and showers	15
2	4 weeks	4 weeks forest	Sunday 14th June	Friday 10th July	Madagascar wildlife and conservation course	Structure and composition of the forest, pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night), colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs	Tents with field toilets and showers	Tents with field toilets and showers	5
3	4 weeks	4 weeks marine	Sunday 28th June	Friday 24th July	PADI Open Water and Indian Ocean reef ecology and marine survey techniques	Stereo video fish counts, coral and macro-invertebrate reef transects, 3D mapping of the reefs	Dorms with shared bathroom and toilet blocks	Dorms with shared bathroom and toilet blocks	5
4	4 weeks	2 weeks forest, 2 weeks marine	Sunday 28th June	Friday 24th July	Madagascar wildlife and conservation course, PADI Open Water and Indian Ocean reef ecology and marine survey techniques	Structure and composition of the forest, pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night), colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs. Stereo video fish counts, coral and macro-invertebrate reef transects, 3D mapping of the reefs.	Tents with field toilets and showers	Dorms with shared bathroom and toilet blocks	15
5	4 weeks	3 weeks forest, 1 week marine	Sunday 5th July	Friday 31st July	Madagascar wildlife and conservation course, PADI Open Water and Indian Ocean reef ecology and marine survey techniques	Structure and composition of the forest, pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night), colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs.	Tents with field toilets and showers	Dorms with shared bathroom and toilet blocks	15
6	6 weeks	4 weeks forest 2 weeks marine	Sunday 14th June	Friday 24th July	Madagascar wildlife and conservation course, PADI Open Water and Indian Ocean reef ecology and marine survey techniques	Structure and composition of the forest, pollard counts of butterflies, spotlighting for amphibians, crocodile transect surveys, herpetofauna routes, mist netting and point counts for birds, distance sampling for lemurs (both day and night), colour change in chameleons, sifaka population studies, DNA sampling of herpetofauna, mark-release-recapture of nocturnal mouse lemurs. Stereo video fish counts, coral and macro-invertebrate reef transects, 3D mapping of the reefs	Tents with field toilets and showers	Dorms with shared bathroom and toilet blocks	5
Malawi									
1	2 weeks	1 week terrestial, 1 week marine	Tuesday 30th June	Monday 13th July	Malawi Ecology & Wildlife, PADI Open Water dive training, Lake ecology & survey techniques	Camera trap surveys for predators; bird point count and mist net surveys; transects searches for herpetofauna; invertberate diversity surveys using sweep nets; pitfall traps for dung beetles; mist netting for bats. On Lake Malawi there are UVC counts of cichlids, limnology and fisheries surveys	Dorms with shared bathrooms	Dorms with shared bathrooms	27
Mexico									
1	2 weeks	2 weeks marine	Monday 15th June	Sunday 28th June	PADI Open Water dive training, Caribbean coral reef ecology	Coral restoration; turtle behaviour and abundance; seagrass biomass; mangrove research	Dorms with shared bathrooms	Dorms with shared bathrooms	20
2	4 weeks	2 weeks forest, 2 weeks marine	Monday 15th June	Sunday 12th July	PADI Open Water dive training, Caribbean coral reef ecology	Forest structure quadrats; baited traps for butterflies; standard search transects of forest and aguada studies for reptiles and amphibians; point counts and mist netting for birds; distance and patch occupancy studies for primates and large mammals; camera trap surveys of large mammals; mist netting for bats. Coral restoration; turtle behaviour and abundance; seagrass biomass; mangrove research	Tents/hammocks with dry or field toilets, and bucket or field showers	Dorms with shared bathrooms	20
3	4 weeks	3 weeks forest, 1 week marine	Monday 29th June	Sunday 26th July	Neotropical forest ecology, PADI Open water dive training, Caribbean reef ecology course	Forest structure quadrats; baited traps for butterflies; standard search transects of forest and aguada studies for reptiles and amphibians; point counts and mist netting for birds; distance and patch occupancy studies for primates and large mammals; camera trap surveys of large mammals; mist netting for bats. Coral restoration; turtle behaviour and abundance; seagrass biomass; mangrove research	Tents/hammocks with dry or field toilets, and bucket or field showers	Dorms with shared bathrooms	15
4	4 weeks	3 weeks forest, 1 week marine	Monday 13th July	Sunday 9th August	Neotropical forest ecology, PADI Open water dive training, Caribbean reef ecology course	Forest structure quadrats; baited traps for butterflies; standard search transects of forest and aguada studies for reptiles and amphibians; point counts and mist netting for birds; distance and patch occupancy studies for primates and large mammals; camera trap surveys of large mammals; mist netting for bats. Coral restoration; turtle behaviour and abundance; seagrass biomass; mangrove research	Tents/hammocks with dry or field toilets, and bucket or field showers	Dorms with shared bathrooms	20

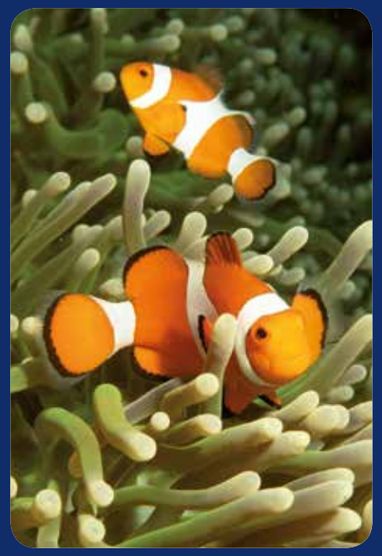
Ex No.	Length	Summary	Start date	Finish date	Courses	Research Activities	Accom part 1	Accom part 2	Places
Mexico									
5	4 weeks	4 weeks forest	Monday 13th July	Monday 10th August	Neotropical forest ecology	Forest structure quadrats; baited traps for butterflies; standard search transects of forest and aguada studies for reptiles and amphibians; point counts and mist netting for birds; distance and patch occupancy studies for primates and large mammals; camera trap surveys of large mammals; mist netting for bats.	Tents/hammocks with dry or field toilets, and bucket or field showers	Tents/hammocks with dry or field toilets, and bucket or field showers	20
6	6 weeks	3 weeks forest, 3 weeks marine	Monday 29th June	Sunday 9th August	Neotropical forest ecology, PADI Open water dive training, Caribbean reef ecology course	Forest structure quadrats; baited traps for butterflies; standard search transects of forest and aguada studies for reptiles and amphibians; point counts and mist netting for birds; distance and patch occupancy studies for primates and large mammals; camera trap surveys of large mammals; mist netting for bats. Coral restoration; turtle behaviour and abundance; seagrass biomass; mangrove research	Tents/hammocks with dry or field toilets, and bucket or field showers	Dorms with shared bathrooms	20
Peru									
1	2 weeks	2 weeks forest	Sunday 7th June	Friday 19 June	Amazonian wildlife ecology and conservation	Boat-based surveys of pink and grey dolphin populations, gillnet and rod surveys of the fish communities,point counts of the macaws and wading birds, fishing bat, amphibian and caiman surveys after dark, foot based surveys of forest structure, mist net surveys of the understorey birds, butterfly surveys, terrestrial frog surveys, camera trap points for the big cats, tapirs, peccary and other terrestrial mammals, and distance sampling for primate species and other arboreal mammals.	Bunk beds in a cabin and with shared bathrrom and shower facilities	Bunk beds in a cabin and with shared bathrrom and shower facilities	30
2	2 weeks	2 weeks forest	Sunday 19th July	Friday 31 July	Amazonian wildlife ecology and conservation	Boat-based surveys of pink and grey dolphin populations, gillnet and rod surveys of the fish communities,point counts of the macaws and wading birds, fishing bat, amphibian and caiman surveys after dark, foot based surveys of forest structure, mist net surveys of the understorey birds, butterfly surveys, terrestrial frog surveys, camera trap points for the big cats, tapirs, peccary and other terrestrial mammals, and distance sampling for primate species and other arboreal mammals.	Bunk beds in a cabin and with shared bathrrom and shower facilities	Bunk beds in a cabin and with shared bathrrom and shower facilities	8
3	4 weeks	4 weeks forest	Sunday 7th June	Friday 3rd July	Amazonian wildlife ecology and conservation	Boat-based surveys of pink and grey dolphin populations, gillnet and rod surveys of the fish communities,point counts of the macaws and wading birds, fishing bat, amphibian and caiman surveys after dark, foot based surveys of forest structure, mist net surveys of the understorey birds, butterfly surveys, terrestrial frog surveys, camera trap points for the big cats, tapirs, peccary and other terrestrial mammals, and distance sampling for primate species and other arboreal mammals.	Bunk beds in a cabin and with shared bathrrom and shower facilities	Bunk beds in a cabin and with shared bathrrom and shower facilities	10
South Africa									
1	2 weeks	1 weeks bush - Dinokeng Game Reserve, 1 week marine	Saturday 20th June	Friday 3rd July	Advanced wildlife conservation and management course, PADI Open Water dive training, Indian Ocean reef ecology	Grazing and browsing pressure from elephants and other herbivores; bird point count surveys; camera trap surveys of nocturnal predators; distance surveys of large mammals from vehicle based transects	Tents with shared bathrooms	Tents with shared bathrooms	27
2	2 weeks	2 weeks bush - Gondwana Game Reserve	Saturday 27th June	Friday 10th July	Advanced wildlife conservation and management course	Vegetation assessments; grazing and browsing pressure from elephants and other herbivores; bird point count surveys; camera trap surveys of nocturnal predators; distance surveys of large mammals from vehicle based transects	Tents with shared bathrooms	Tents with shared bathrooms	18
3	4 weeks	3 weeks bush - Dinokeng Game Reserve, 1 week marine	Saturday 27th June	Friday 24th July	Advanced wildlife conservation and management course, PADI Open Water dive training, Indian Ocean reef ecology	Grazing and browsing pressure from elephants and other herbivores; bird point count surveys; camera trap surveys of nocturnal predators; distance surveys of large mammals from vehicle based transects	Tents with shared bathrooms	Tents with shared bathrooms	9
4	4 weeks	3 weeks bush - Dinokeng Game Reserve, 1 week marine	Saturday 18th July	Friday 14th August	Advanced wildlife conservation and management course, PADI Open Water dive training, Indian Ocean reef ecology	Grazing and browsing pressure from elephants and other herbivores; bird point count surveys; camera trap surveys of nocturnal predators; distance surveys of large mammals from vehicle based transects	Tents with shared bathrooms	Tents with shared bathrooms	22
5	4 weeks	4 weeks bush - Gondwana Game Reserve	Saturday 11th July	Friday 7th August	Advanced wildlife conservation and management course, GIS workshops	Vegetation assessments; grazing and browsing pressure from elephants and other herbivores; bird point count surveys; camera trap surveys of nocturnal predators; distance surveys of large mammals from vehicle based transects	Tents with shared bathrooms	Tents with shared bathrooms	18
Transylvania									
1	2 weeks	2 weeks meadows and forest	Wednesday 15th July	Tuesday 28th July	Carpathian meadow and mountain ecology course	Indicator plant species surveys of meadows; Pollard and sweep net surveys for butterflies and other invertebrates; opportunistic surveys for herpetofauna; forest structure and carbon surveys; point count and mist net surveys for birds, small mammal trapping; distance sampling, patch occupancy and camera trap surveys for large mammals; farming practices surveys	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	12
2	2 weeks	2 weeks meadows and forest	Wednesday 29th July	Tuesday 11th August	Carpathian meadow and mountain ecology course	Indicator plant species surveys of meadows; Pollard and sweep net surveys for butterflies and other invertebrates; opportunistic surveys for herpetofauna; forest structure and carbon surveys; point count and mist net surveys for birds, small mammal trapping; distance sampling, patch occupancy and camera trap surveys for large mammals; farming practices surveys	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	12
3	4 weeks	4 weeks meadows and forest	Wednesday 17th June	Tuesday 14th July	Carpathian meadow and mountain ecology course	Indicator plant species surveys of meadows; Pollard and sweep net surveys for butterflies and other invertebrates; opportunistic surveys for herpetofauna; forest structure and carbon surveys; point count and mist net surveys for birds, small mammal trapping; distance sampling, patch occupancy and camera trap surveys for large mammals; farming practices surveys	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	Tents with field toilets and bucket showers, guest houses, or shared rooms with bathrooms	12

Dissertation Summary Table

Code	Title	Page	Botany	Invertebrates	Herpetofauna	Birds	Mammals	Primates	Marine ecology	Intertidal ecology	Environmental science	Experimental biology	Fisheries	Genetics	Spatial ecology	Community ecology	Conservation management	Behaviour	Dive projects	Snorkel projects
Croatia																				
CR01	Ecology of diurnal butterfly communities in Krka National Park	11		●												●				
CR02	Ecology of Orthoptera communities in Krka National Park	11		●												●				
CR03	Microhabitat and population ecology of Dalmation Algyroides lizards	11			●											●				
CR04	Population density and movement patterns of Hermann's Tortoise in the Krka National Park	11			●											●				
CR05	Niche occupation of Beech Marten in Krka National Park	11					●									●				
Honduras																				
H008	Assessing carbon stocks in the forests of Cusuco National Park	24	●														●			
H009	Effects of Habitat on Ectomycorrhizal Fungi	24	●								●					●				
H010	Community ecology of insect herbivores associated with coffee and its wild relatives	24		●												●				
H011	Community ecology of moths in the tropical cloud forest of Honduras	25		●												●				
H012	Ecology of cloud forest butterfly communities	25		●							●				●	●				
H013	Aquatic invertebrate communities in tank bromeliads	25		●								●								
H014	Investigation into the effectiveness of two survey methods for monitoring cloud forest herpetofauna	25			●							●								
H015	Evolution of aposematic colouration and mimicry in Neotropical snakes	26			●													●		
H016	Prevalence of chytrid in amphibian populations within Cusuco	26			●									●						
H017	Niche partitioning and characterisation of Anolis lizards in the tropical cloud forest of Honduras	26			●											●				
H018	Evolution and ecology of feeding and trophic morphology of Neotropical snakes	26			●						●					●				
H019	Factors affecting bird communities in the cloud forests of Cusuco	27				●									●	●	●			
H020	Monitoring the effects of hunting pressure on the large mammal populations of Cusuco National Park	27					●										●			
H021	Ecology and behaviour of bats in tropical cloud forests, Honduras	27					●									●	●			
H022	Assessing the 'dilution effect' in Cusuco National Park: bats and bat flies	27		●			●									●				
H023	Coral reefs in three-dimensions: using technology to explore patterns in Caribbean reef health	28							●		●		●		●	●			●	
H024	Assessing the recovery of a keystone urchin species and its role in reef restoration	28		●					●			●				●			●	
H025	Lionfish as an invasive predator on Caribbean coral reefs	29							●				●			●	●		●	
H026	Reefs at war: the disruptive impact of Damselfish	29							●							●		●	●	
H027	The behaviour and ecological role of coral reef cleaning interactions	29							●									●	●	
H028	Long-term changes in reef fish and benthic communities in a newly established marine protected area (MPA)	30		●					●				●			●	●		●	
H029	Tracking the fine-scale movement of coral reef fish in response to natural and artificial cues	30							●			●			●			●	●	
H030	Behaviour of the long-spined sea urchin, a keystone Caribbean coral reef herbivore	31		●					●			●					●	●	●	
H031	Assessing the population status of the Caribbean spiny lobster (*Panulirus argus*)	31		●					●				●					●	●	
H032	Noisy neighbours: the role of underwater acoustics in the behaviour of reef organisms	31							●		●					●		●	●	
Indonesia																				
IN35	The relationship between reef complexity and fish communities	38							●							●	●		●	
IN36	Long-term changes in the community ecology of coral reefs	38							●							●			●	
IN37	Moving to better places: An assessment of the abundance and behaviour of butterflyfish species around Wakatobi National Park, Indonesia	39							●						●	●		●	●	
IN38	The behaviour and functional role of reef fish cleaners in Indonesia	39							●									●	●	●
IN39	Behavioural adaptations of dwarf cuttlefish, *Sepia bandensis*	39		●					●									●		●
IN40	The biodiversity of coral patch reefs and their conservation value	39							●	●	●				●					●
IN41	Role of seagrass beds in the Wakatobi marine ecosystem	40							●				●			●				●
IN42	Reach for the Stars: Coral Reef Restoration in Indonesia's National Parks	40							●		●	●				●	●		●	
IN43	Quantifying marine plastic pollution levels in the Wakatobi Marine Park	40							●		●	●					●		●	●
IN44	Some Like it Hot! Thermal Tolerance and Dynamics of Reef Fishes	41										●					●		●	●
IIN45	Using community dynamics to predict the future of coral reefs in the Wakatobi	41							●							●				
Madagascar																				
MA48	Tree biodiversity and ecosystem function	48	●							●					●	●				
MA49	Microhabitat analysis of mangrove forests in the Mahamavo watershed	48	●														●			
MA50	Ecology of leaf litter ants	48		●												●				
MA51	Spatial behavioural ecology of the Malagasy giant hognose snake	48			●										●			●		
MA52	Colour variability and the ecological use of colour in the lizards of Mahamavo	49			●													●		
MA53	Sound-induced colour-change modulation in day geckos	49			●							●						●		

Code	Title	Page	Botany	Invertebrates	Herpetofauna	Birds	Mammals	Primates	Marine ecology	Intertidal ecology	Environmental science	Experimental biology	Fisheries	Genetics	Spatial ecology	Community ecology	Conservation management	Behaviour	Dive projects	Snorkel projects
Madagascar																				
MA54	Edge effects, microclimate and thermal ecology of reptiles or birds in Mahamavo	49			●	●										●				
MA55	Niche separation and the impacts of disturbance on bird communities in Mahamavo	49				●									●		●			
MA56	Acoustic techniques for monitoring forest birds	50				●						●								
MA57	Monitoring bat populations in Madagascar using acoustic methods	50					●					●								
MA58	Occupancy modelling for nocturnal lemurs, carnivores, bush pigs and introduced species with camera traps in Madagascar	50				●	●	●									●			
MA59	Demography and spatial ecology of the endangered Coquerel's sifaka *(Propithecus coquereli)*	50						●							●					
MA60	Regional biogeography, ecology and behaviour of nocturnal lemurs in the dry deciduous forest of Mahamavo	51				●		●								●		●		
MA61	Species distribution modelling in Madagascar	51	●			●	●	●							●					
MA62	Landscape ecology in Madagascar	51	●			●	●	●							●					
MA63	Community ecology in Madagascar	51	●				●	●							●					
Mexico																				
ME65	Climate change, reduced water distribution and herpetofaunal abundance and species distribution in Calakmul Biosphere Reserve	59			●										●		●			
ME66	Felid and ungulate abundance and distribution patterns in relation to changing water distribution and hunting in a Mayan forest	59					●								●		●			
ME67	Primate abundance and distribution patterns in relation to forest structure and Ancient Mayan agroforestry	60						●								●	●			
ME68	Spider monkey grouping patterns, habitat use and behaviour in relation to fluctuating fruit availability	60						●										●		
ME69	Bat abundance, diversity and distribution patterns in relation to habitat characteristics of a Mayan forest	61					●								●	●				
ME70	Frugivorous butterfly abundance, diversity and distribution patterns in relation to habitat characteristics of a Mayan forest	61		●												●				
ME71	Abundance of immature green turtles in relation to seagrass biomass in Akumal Bay	62			●												●			●
ME72	Effect of tourism on immature green turtle behaviour in Akumal Bay	62			●												●			●
ME73	Assessing the health and distribution of Scleractinian coral colonies in Akumal	63	●						●							●	●		●	
ME74	The application of coral reef monitoring data: from carbon budget calculations to reef restoration performance assessments	63							●							●	●		●	
Peru																				
PE75	Tropical butterfly diversity and environmental gradients	67		●							●					●				
PE76	Species assemblages and niche separation of amphibians within the flooded and transitional forests of the Yarapa-Tahuayo river basins	67			●											●				
PE77	Ecology and population monitoring of caiman species	67			●											●				
PE78	Sustainability of fishing resources in the Yarapa river	68											●				●			
PE79	Population structure and abundance of understorey birds	68				●										●				
PE80	Population trends, habitat preferences and social structure of pink and grey river dolphins in the Amazon River and Yarapa tributary	68					●									●	●			
PE81	Population monitoring and habitat preferences of mammals in the flooded, transitional and upland forests of the Yarapa-Tahuayo landscape	69					●									●				
PE82	Niche separation in squirrel monkeys, capuchin, tamarins and other primates in the Peruvian Amazon	69						●								●				
South Africa																				
SA85	Savanna community ecology in a human-affected ecosystem	74	●			●	●				●					●	●			
SA86	Road ecology in Dinokeng Game reserve	74				●	●					●					●			
SA87	Assessing predator-prey interactions in Dinokeng Game Reserve	74					●										●	●		
SA88	Fynbos ecology in the hyper-diverse Cape Floral Kingdom	75	●	●		●	●									●	●			
SA89	Assessing the ranging patterns and habitat use of large mammals in Gondwana Game Reserve	75					●								●		●			
Transylvania																				
TR92	Plant indicator species of grasslands in Transylvania	79	●									●				●	●			
TR93	Butterfly communities as indicators of habitat changes in Tarnava Mare	79		●								●				●	●			
TR94	Changes in bird communities in Tarnava Mare and habitat associations	79				●									●	●				
Totals			11	17	16	13	18	9	22	2	10	14	6	1	18	47	30	16	19	8

Feedback from the 2019 Opwall Season



“Fantastic experience, I would highly recommend to anyone. I learned so much about everything. Would love to do it again!”

Alfie Cavaliero,
Research Assistant, TCD

“A fun packed action filled adventure that everyone should have the chance to complete.”

Euan Craig Fraser,
Edinburgh Napier University

“This expedition changed my life by bringing me into the extraordinarily diverse ecosystems I had always dreamt of visiting. It let me experience beautiful cultures and meet friends for life. An amazing time beyond words.”

Tsvetoslav Georgiev, *UCL*

“Educational and fun, the best trip I’ve ever been on. Loved every second being here and everyone I’ve met.”

Chloe Grant, *University of Salford*

“Learnt so much about animals, habitat and conservation. Trip to the ruins and explanation about the Mayans was incredible.”

Clea Audin,
University of Bath

“Everyone works really hard for you to have the best camp and in-field experience. They provide a warm and inclusive environment for students.”

Swarna Naojee,
University of New Brunswick

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THE WALLACEA TRUST

INTERNATIONAL | COMMUNITIES | CONSERVATION

All of the data collected on our expeditions is shared with our partner charity, the Wallacea Trust, who use this information to identify and develop projects of conservation importance, and to raise funds to implement them on the ground. These projects help to translate our biodiversity research into tangible conservation initiatives and Opwall's long-term ecosystem monitoring efforts then provide a cost-neutral mechanism for assessing the performance of these conservation interventions indefinitely.

The main work of the Trust falls into three categories:

- **Helping to gazette new protected areas:** The Wakatobi National Park (Indonesia), Tela Bay Marine Reserve (Honduras), and a turtle protection area in Akumal (Mexico) are just three examples of our successful involvement in new protected areas.
- **Using new species to help identify the biodiversity value of sites:** 56 new species to science have been formally described, including a new Swallowtail butterfly on Fiji which is helping drive the development of a potential new national park, a new genus of tree which was saved from being logged by the Honduran government at the last minute and many other examples.
- **Developing applied conservation interventions:** Over $2 million has been raised to date to support large-scale conservation initiatives, whilst a number of sites are currently being packaged under carbon trading schemes. There are numerous examples of small locally run businesses being established as part of the Trust's activities that are associated with protecting forests and reefs and providing sustainable income to local communities. Providing local communities with a financial opportunity and incentive to protect their own forests and reefs is a key strategy of the Trust.

To find out more about the work of the Wallacea Trust, please visit their website at **www.wallaceatrust.org**.

Please note that by joining Opwall your trip will involve carbon emissions from air travel. However, your input will be helping to save threatened species and also provide the information needed for the Wallacea Trust to protect threatened species from extinction. A number of the projects are working on packaging the studied forests to stop deforestation and save the carbon that would otherwise have been emitted if the forests are destroyed.

A recent paper in Science showed that reforesting 0.9 billion hectares of non-forested land would reverse the warming effects being seen now and predicted for the future. This paper though did not identify how such a scheme could be funded and implemented. The Wallacea Trust is funding a demonstration project covering 100ha in north Buton Island, Indonesia where farmers adjacent to a nature reserve are being given annual payments to reforest their land, maintain the growing forest and also prevent access over their land for illegal loggers entering the nature reserve. When you receive your Internal travel quote you will have a sum added at a rate of $10 per ton for the carbon emissions generated by your flights that have been calculated using an on-line carbon flight carbon calculator. You do NOT have to pay this sum (it is an optional payment) but if you do then this sum will be paid to the Wallacea Trust and used for the reforestation scheme in north Buton. The payments for the reforestation are going directly to poor local farmers, so have a substantial community benefit as well as helping with reforestation. If the project can be shown to be successful over this 100ha then the same approach could be scaled up around the world to hit the target proposed in the Science paper and could be funded by just 1% of all those flying paying a $10/ton charge and with substantial benefits to poor rural communities.

PARTNERS: We have a number of partners in each country but the principal ones for each country are listed

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.

ABTOT
The Association of Bonded Travel Organisers Trust Limited (ABTOT) provides financial protection under The Package Travel and Linked Travel Arrangements Regulations 2018 for Operation Wallacea, and in the event of their insolvency, protection is provided for the following:
1. non-flight packages and
2. flight inclusive packages that commence outside of the EU, which are sold to customers outside of the EU.
ABTOT cover provides for a refund in the event you have not yet travelled or repatriation if you are abroad. Please note that bookings made outside the EU are only protected by ABTOT when purchased directly with Operation Wallacea.
In the unlikely event that you require assistance whilst abroad due to our financial failure, please call our 24/7 helpline on 01702 811397 and advise you are a customer of an ABTOT protected travel company.
You can access the The Package Travel and Linked Travel Arrangements Regulations 2018 here: https://www.legislation.gov.uk/ukdsi/2018/9780111168479/contents

ATOL
Flight inclusive packages travelling from the UK are covered under the ATOL scheme.

ATOL protection does not apply to all services listed in this brochure. Please ask us to confirm what protection may apply to your booking. If you do not receive an ATOL Certificate then the booking will not be ATOL protected. If you do receive an ATOL Certificate but all the parts of your trip are not listed on it, those parts will not be ATOL protected. Please see our booking conditions for information, or for more information about financial protection and the ATOL Certificate go to: www.atol.org.uk/ATOLCertificate.