Indonesia Schools' Booklet 2017

Contents

1. Study area and research objectives

Sulawesi and the surrounding smaller islands of the Lesser Sundas and the Moluccas were identified as a unique biogeographic region by the naturalist Alfred Russell Wallace in the late 19th century. These islands are now known as the Wallacea region of Indonesia (defined by the area within the dotted line on the map below), and formed their unique fauna due to their isolation from other landmasses by the deep ocean channels that surround the islands. During past Ice Ages sea levels here dropped by up to 100m. This led to the large 'Greater Sunda' islands to the west (Borneo, Java, Sumatra and Bali) being linked to mainland Asia by land-bridges, and therefore allowing large mammalian fauna to spread throughout this area. However, the deep ocean channel between Borneo and Wallacea remained impassable to large mammals, so few are found in the region. The islands to the east of Wallacea would have been linked to Australasia, and have many species of marsupials and other Australian fauna. Again, the ocean channels between Wallacea and New Guinea were too deep for most mammals to cross. However, birds, reptiles and insects were able to cross the channels, and Wallacea has species of both Asian and Australian origin.

Figure 1. Location of the Wallacea biogeographical region

Sulawesi is the fourth largest island in Indonesia (159,000 km2) and has a high percentage of endemic species (those that occur nowhere else in the world other than in Sulawesi). There are 127 known mammal species in Sulawesi, of which 62% (79 species) are endemic; 700 species of bird (36% endemic); and 74 species of herpetofauna (38% endemic). Despite such high numbers of endemic species in these forests the Wallacea region remains one of the least biologically studied areas in the world, and one of the most likely places to discover vertebrate species that are new to science.

The first week of the expedition is spent in one of the field camps located across Buton Island. The teams will help collect data on the carbon stocks and biodiversity of the forest which are then being used as part of a submission under the Reducing Emissions from Deforestation and forest Degradation (REDD+) scheme for funding the protection of the Buton forests. Lambusango reserve is one of the largest remaining stands of forest on Buton as much of the island has been heavily deforested. Lambusango contains a rare and interesting type of forest known as Limestone Karst Forest, where the forest grows on limestone rock

that was formerly coral reef and has been heavily weathered. As limestone is porous, these forests contain many underground river systems that rise to the surface as streams and springs and disappear underground. The second week will be run at the Bau Bau marine research centre (Pantai Nirwana), on Buton Island. This is the newer of our two marine sites. We have set up a biodiversity monitoring programme here in order to use this as a comparison site for our long standing research programme on Hoga. There has been far less subsistence fishing here, and as a result the reefs remain in pristine condition.

Figure 2. Survey locations.

2. Week 1 itinerary

The students on site will complete six days of training and research. These are divided into two days of jungle skills training, one full day of forest habitat surveys and three days of learning about biodiversity monitoring techniques and assisting our field scientists. There are three forest camps that the students could be located in. Students working in the south of the Island will pass through Labundo village on their first and final nights. Students will arrive in Labundo on Tuesday morning or afternoon (depending on flights) and will then be shown to their accommodation. That evening there will be introductory lectures on health and safety, and site orientation. Students working in the central or north of the Island will travel directly from Bau Bau to the forest camp and will receive their orientation and introductory lectures there.

All school groups will follow the timetable below; Table 1 shows an example timetable – please note that the students will work in smaller groups for the field practicals. The students should complete each of the activities listed but the timing of the sessions may vary depending upon factors such as weather conditions and fitness of the students.

Table 1. Example timetable for the forest week. Timetables will vary slightly dependent on your forest camp, and whether the group are taking part in Canopy Access. Note there may be changes depending on fitness of students, weather conditions or operational issues.

Day	Activity
Tuesday am	Arrive in Bau Bau and have breakfast/lunch (flight time dependent) before transferring to Labundo (south only) or field camp
Tuesday pm	Arrive in camp or Labundo (south only) Health and safety briefing, site orientation
Tuesday evening	Lecture 1 – Introduction to Biodiversity, Endemism and Wallacea
Wednesday am	Canopy access (optional) or Field practical – invertebrates, birds, herpetofauna or megafauna
Wednesday pm	Transfer to forest camp (south only) Field practical – Invertebrates, birds, herpetofauna or megafauna (central and north)
Wednesday evening	Lecture 2 – Endemism, hotspots and Wallacea Field practical – Bats or spotlighting for amphibians
Thursday am	Field practical – invertebrates, birds, herpetofauna or megafauna
Thursday pm	Jungle skills 1
Thursday evening	Lecture 3 – Wallacea birds and bird survey techniques Field practical – Bats or spotlighting for amphibians
Friday am + pm	Habitat survey all day
Friday evening	Lecture 4 Wallacean herpetofauna Field practical – Bats or spotlighting for amphibians
Saturday am	Field practical – invertebrates, birds, herpetofauna or megafauna
Saturday pm	Jungle skills 2
Saturday evening	Lecture 5 - Wallacea mammals Field practical – Bats or spotlighting for amphibians
Sunday am	Field practical – invertebrates, birds, herpetofauna, or megafauna
Sunday pm	Transfer back to Labundo (south only) Field practical – Invertebrates, birds, herpetofauna or megafauna (central and north)
Sunday evening	Lecture 6 – An introduction to invertebrates/Survey data and the REDD+ project Social night
Monday	Depart to marine site

3. Jungle survival skills

Introduction to life in forest camps, and how to identify and reduce risks throughout the forest. Each group will learn how to live in hammocks and how to select a safe camp site, make fires, shelters, field cooking, etc. During their walks into and out of the camp they will have constant reinforcement of the health and safety messages and identifications of common trees, birds and reptiles encountered.

Learning outcomes:

- Awareness of dangerous plants and animals - from the briefings and demonstrations in the field
- Awareness of disease and health issues working in a tropical rainforest -from the medical briefings and additional information given by the accompanying medic
- Safe working practices in remote locations- this is to do with trekking procedures, river crossings, taking water, hat, sunblock, organising communications etc gained through lectures and field experience

4. Week 1 lectures

Lecture 1: Introduction to Biodiversity, Endemism and Wallacea

- Welcome to Indonesia
- What is Biodiversity
- Wallacea and Buton
- Research for 2017

Lecture 2: Endemism, hotspots and Wallacea.

- Understanding endemism
- Use of Biodiversity measurements
- Conservation and Hotspots
- Wallacea and Wallace
- The forests of Buton

Lecture 3: Wallacean birds and survey techniques

- Bird diversity
- Examples of Wallacean bird species
- Survey techniques for bird communities
- Birds as indicators of forest disturbance

Lecture 4: Wallacean herpetofauna

- A brief introduction to classification
- Endemism in Wallacea herpetofauna
- Main families of herpetofauna found in Sulawesi
- Example species

- Chytrid fungus impacts on amphibians
- Herpetofauna survey methods

Lecture 5: Wallacean mammals

- Mammal diversity
- Wallacean mammals
- Survey techniques
- Civets ranging behavior
- Estimating populations of forest mammals such as anoa
- Macaque social structure
- Harmonic hopping in Sulawesi bats

Lecture 6: An introduction to invertebrates/Survey data and the REDD+ project

- Invertebrate introduction
- Indicator species
- Description of data sets held
- REDD+ scheme
- Carbon trading and how data from the Buton Forests are being used for REDD+ funding

5. Biodiversity practicals

In the forest camps (working in small groups) students will complete the following field practicals:

Wallacean birds

This practical involves an early morning bird point count survey with an ornithologist. The objective will be to learn the principals of the point count survey methodology and to learn how to identify as many species by sight and sound as possible.

Herpetofauna pitlines

The students will be helping with the checking of pitfall traps for amphibians, reptiles and small mammals. The objective will be to learn about standardised pitfall trapping methodologies and identify the common herpetofauna species of the Buton Forests.

Megafauna surveys

This survey involves walking linear forest transects and looking for evidence of occupancy by the Islands megafauna species, most notably Lowland Anoa, Booted Macaque, and Sulawesi Wild Pig. Most of these species are very shy, and are usually detected by their tracks and signs rather than by sight. The objectives of this survey are to learn the basics of patch occupancy methodologies and to learn how to determine the presence of different mammal species by locating and identifying indirect signs.

Invertebrate surveys

This practical starts with a briefing on survey techniques followed by a butterfly survey. These surveys will use transect-based timed Pollard counts to monitor the butterflies of the Buton forests in a systematic

manner. The objectives of this survey are to learn the basics of the Pollard count methodology and learn how to identify common butterfly species found in the project area.

Nocturnal amphibian surveys

This practical will involve spotlight surveys of river systems after dark with a herpetologist to monitor frog communities and opportunistically sighted reptiles. Species encountered will be identified and the main identification features explained. Students participating in this survey will learn sweep-transect methodologies, distance sampling methods, and how to identify the common amphibian species found in the Buton forests.

Bat surveys

This practical is subject to availability. It will involve working with a bat scientist in the evening to set and empty harp traps and/or mist nets. The captured bats will be identified and the main identification features explained. Students participating in this survey will learn capture-mark-recapture methodologies as well as familiarity with the common bat species found on the Island.

Learning objectives:

1. Be able to identify 10 local bird species by sight and sound.
2. Describe how to identify different reptile families
3. Be able to identify five species of reptile and amphibian found in Sulawesi
4. Learn how to identify large mammal species from their tracks and signs
5. Learn how to conduct butterfly Pollard counts
6. Identify five species of bats found in Sulawesi
7. Be able to describe the differences between harp and mist net trapping for bats

Canopy Access

This training course is optional and is an additional cost. Students will learn how to ascend into the canopy with Canopy Access Ltd.

6. Research contribution

The major research contribution of schools students on Buton has been their efforts towards our forest habitat surveys. Since Operation Wallacea began working with groups of school students on Buton in 2007, their crucial contributions in this area have allowed us to gather large-scale forest vegetation structure data sets which form the foundations of our ongoing REDD+ funding application. These data have also been analyzed to produce two publications which are in the latter stages of editing prior to submission. The first of these publications is a study of the accuracy of the school groups' work on Buton. Notably, the value of volunteers for collecting data on tropical forest vegetation structure has not previously been published. By comparing the plots surveyed by the students under the leadership of the local and Western experts to the plots surveyed purely by the experts, strengths and weaknesses of the students' surveys have been identified. This paper provides robust statistical support to the value of the students as surveyors and has enabled areas of weakness within the students' surveys to be targeted for improvement. The second paper presently in preparation for publication, which uses the 2008 and 2009 data sets, is an assessment of the

small-scale selective logging by the local community that occurs within the area of forest which runs between the road and the old Lapago field camp. This paper seeks to answer the question of whether there is a relationship between accessibility and the degree of small-scale selective timber harvesting in this forest. In addition these data are being used as part of a study of zonation patterns of tree species on using Bayesian statistical analyses – a robust method of interrogating data that provides conclusions often regarded as more secure than frequentist analyses (such as the commonly used t-test).

The surveys will be managed by Barnabas Harrison and Dr Tom Martin, assisted by local Indonesian staff who have an intimate knowledge of the trees of Buton. The habitat surveys are an incredibly important part of the students' time on Buton and whilst the other parts of the programme can be missed if the students do not wish to participate this is the one element of the programme that must be completed by all participating students. The vegetation structure research project looks set to provide answers to many under-studied questions.

In 2017 the surveys are being used for two main purposes – to quantify the carbon storage value of the forest as part of the ongoing REDD+ funding application for the Buton forests and to continue the study of the effect of forest structure and disturbance levels around the biodiversity study sites being used for the study of other taxa (butterflies, herpetofauna, birds and megafauna).

Students will use a verified methodology and spend one full day collecting data. Sample size needs to be of sufficient size to ensure main forest characteristics such as tree basal area can be assessed within each sample. Data from forest surveys on different sample sizes on Buton has indicated that 50m x50m squares is the minimum size for accurately assessing basal area (a 'cross-section' of a tree's trunk) and other forest characteristics.

The survey teams will be divided into four groups, each under the supervision of an expert, and all students should have a chance to work with each group during the survey. Firstly, the team will use two 100 m surveying tapes and compasses to mark out the perimeter of the 50 m x 50 m quadrat and then divide it into the smaller twenty-five quadrats using ropes. The local experts will use two 100 m surveying tapes and compasses to mark out the perimeter of the 50m x 50 m quadrat and then divide it into the twenty-five smaller quadrats using ropes.

Group 1 will take the GPS coordinates of the four corners of the 50 m x 50 m plot using the averaging feature a GPS unit. The group will also take a canopy photo in each of the sub plots that will later be analysed to determine canopy cover, and therefore a measurement of light hitting the forest floor. This group will also make a basic profile of the plot, taking 17 angle measurements around the perimeter of the plot.

Group 2 will obtain data on the vegetation structure of the survey plots. A 3 m long vegetation touch-test pole will be used to quantify the density of the understory at 100 points spatially arranged with 4 samples within each sub plot.

Group 3 will collect data on the trees throughout the plot. For each tree over 15.7cm in circumference at chest height, the local guide will identify the species and the circumference will be measured. This will allow us to calculate the biomass of each tree.

Group 4 will examine disturbance and regeneration patterns throughout the plot. Within each 10 m x 10 m quadrat, the number of saplings in a 5 m x 5m quadrat will be counted. A sapling is defined $>$1.5 m in height and $<$15.7cm in circumference. Within this quadrat a 2 m x 2m quadrat will be positioned and the

number of tree seedlings within it will be counted. A seedling is defined as <1.5 m in height and with a woody stem. For each 10 m x 10 m quadrat the number and circumference of any cut stumps will be recorded

7. Week 2 itinerary

The students will complete six days of training and research in marine science arriving at their marine site on the Monday evening or Tuesday morning (travel dependent) and leaving the following Monday morning to start their journey back to their home country. These six days are divided according to the dive options selected for the week; Indo-Pacific Reef Ecology Course (with the practicals done either by diving or snorkeling), PADI Open Water, or Dive Referral (see sections 8 – 11 below). Students will be occupied in the evenings through a series of science talks, documentary viewings and discussions/activities relative to the Coral Reef Ecology Course.

8. Coral Reef Ecology Course

Table 2 shows an example timetable of the activities that students undertaking the Indo-Pacific Coral Reef Ecology Course will complete over the week. The contents of the timetable are comprehensive but the timing of the sessions will vary for each group. The practical element of the reef ecology course can be completed by either diving or snorkeling. If students are already qualified divers by the time they arrive on site, they will be required to complete a compulsory check dive with a PADI Professional at the start of the course. The Indo-Pacific Coral Reef Ecology Course is designed specifically for students aged 16-18rs in mind. It covers a range of topics suitable to support A-Level biology and geography students, IB Biology and ESS over a range of different syllabuses. Lectures will be supported by in-water practicals. In addition to the lectures, a discussion/activity element will be sure to engage the students into the science and get them thinking themselves of the importance of the study topic.

Table 2. Indicative timetable for those taking the Reef Ecology Course. Note there may be changes depending on fitness of students, weather conditions or operational problems.

Day	Schedule for reef ecology students
Tuesday am	Arrive marine site, welcome and house allocations
Tuesday pm	Health and safety briefings
Tuesday pm	Dive documentation
Tuesday eve	Lecture - Science on Hoga
Wednesday am	Lecture 1 – Introduction to coral reef ecology Dive/snorkel practical 1 – check dive/skin diver course (snorkelers)
Wednesday pm	Lecture 2 – Identification of coral and algal Species Dive/snorkel practical 2 – coral and algal identification skills
Wednesday evening	Dive Logs & Science Activity session
Thursday am	Lecture 3 – The importance of mangrove and seagrass habitats Snorkel practical 3 – snorkel in mangroves
Thursday pm	Lecture 4 – Identification of ecologically important invertebrate species Snorkel practical 4 – snorkel seagrass beds / invertebrate identification skills
Thursday evening	Dive Logs & Science Activity session
Friday am	Lecture 5 – Identification of coral reef fish Dive/snorkel practical 5 – fish identification skills
Friday pm	Lecture 6 – How to survey a coral reef Dive/snorkel practical 6 – quadrat and transect survey
Friday evening	Dive Logs & Science Activity session
Saturday am	Lecture 7 – Global threats to coral reefs Dive/snorkel practical 7 – quadrat and transect survey
Saturday pm	Lecture 8 – Methods to protect the world's coral reefs Dive/snorkel practical 8 – fun dive
Sunday am	One of the following: Fun dive/catch up dive/Kaledupa visit
Sunday pm	Social night
Monday am	Depart marine site

9. PADI Open Water Diver Course

This course consists of three different elements of learning; dive theory (knowledge development), confined water dives and open water dives. Each component plays its own role in the students' development to meet the performance requirements and objectives they need to become a qualified diver.

Please be aware that as a part of the PADI Open Water Course, all students will be required to complete some basic stamina tests on site. Student divers will need to demonstrate that they can comfortably maintain themselves in water too deep in which to stand by completing a 10-minute swim/float without using any swimming aids. Instructors will also have students complete a 200m continuous surface swim or a 300 m swim with mask, fins and snorkel. Table 3 shows an example timetable of the activities that students complete during the PADI Open Water Course. The contents of the timetable are comprehensive but the timing of the sessions will vary for each group.

Table 3. Indicative timetable for those taking the PADI open water diver course. Note there may be changes depending on fitness of students, weather conditions, tides or operational problems.

Day	Activity
Tuesday am	Arrive marine site, welcome and house allocations
Tuesday am	Health and safety briefings
Tuesday pm	Dive documentation
Tuesday eve	Dive theory
Tuesday am	Confined water
Wednesday pm	Confined water / Science Centre visit*
Wednesday evening	Dive theory
Thursday am	Confined water
Thursday pm	Open Water 1
Thursday evening	Dive theory
Friday am	Open water 2
Friday pm	Open water3
Friday evening	Dive theory exam
Saturday am	Open water 4 & Dive certification
Saturday pm	Lecture – Methods to protect the world's coral reefs Dive/snorkel practical – fun dive
Sunday am	One of the following: Fun dive/catch up dive/Kaledupa visit
Sunday pm	Social night
Monday am	Depart marine site

*Science Centre visits for students completing the Open Water Course will be subject to student progress through dive training

10. PADI Open Water Referral Course

For those students who have completed both the dive theory and confined water sessions prior to expedition they can complete their PADI Open Water Referral Course on site. The students will first complete a check dive with their instructor to demonstrate that they still remember and can confidently perform the necessary skills to progress on to complete their open water dives.

Once referral students have successfully completed the final stages of their PADI Open Water course, they will be able to progress on to the Coral Reef Ecology course. Although there will not be enough time to run the full course, referral students will be able to join at a stage where they can get the chance to learn about the application of survey techniques in the marine environment and how that supports the all-important management of coral reefs. The lectures of the coral reef ecology course are organized so that all referral students and PADI open water students will be able to attend these lectures around their dive training requirements. Table 5 shows an example timetable of the activities that students finishing the PADI Dive Referral Course will complete over the week. The contents of the timetable are comprehensive but the timing of the sessions will vary for each group.

Table 4. Indicative timetable for those taking the PADI open water referral course. Note there may be changes depending on fitness of students, weather conditions, tides or operational problems.

Day	Activity
Tuesday am	Arrive marine site, welcome and house allocation
Tuesday pm	Health and safety briefings
Tuesday pm	Dive documentation
Tuesday eve	Dive theory review
Wednesday am	Check Dive / Science Centre visit*
Wednesday pm	Open Water 1 / Science Centre visit*
Wednesday evening	Dive theory
Thursday am	Open Water 2
Thursday pm	Open Water 3
Thursday evening	Dive theory exam
Friday am	Open Water 4 & Certification
Friday pm	Lecture – How to survey a coral reef Dive practical 1 – quadrat and transect survey
Friday evening	Dive Logs & Science Activity session
Saturday am	Lecture – Global threats to coral reefs Dive practical 2 – quadrat and transect survey
Saturday pm	Lecture – Methods to protect the world's coral reefs Dive practical 3 – fun dive
Sunday am	One of the following: Fun dive/catch up dive/Kaledupa visit
Sunday pm	Social night
Monday am	Depart marine site

*Science Centre visits will be subject to student competency during check dive and availability of scientists

11. Reef Ecology lectures and practicals

Lecture 1: Introduction to coral reef systems

Objectives

- What is a coral reef?
- Characteristics – climate conditions etc.
- Geography – areas of the world it is found, why and where?
- Island biogeography – endemic species etc.
- Formation of a coral reef – primary production etc.
- Site specific – why are we working there, what types of reef will they see etc.

Activity – General feedback session on dive skills and their experience on the reef.
Practical 1 – 'Reef Structure and Topography': Check dive/snorkel – PADI Skin Diver course with DM

Lecture 2: Identification of coral and algal species

Objectives

- Coral – growth forms and species that are commonly found on the reef
- Algae – Common names

Activity – ID quiz
Practical 2 – coral and algal identification skills (DIVING)

Lecture 3: The importance of mangrove and seagrass habitats

Objectives

- Types of seagrass and mangrove
- Importance of connective systems – coastal protection, nursery grounds
- Threats to these environments i.e. tourism – getting rid of these systems to be more aesthetically pleasing
- Case studies

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 3 – snorkel in mangroves (SNORKELLING)

Lecture 4: Identification of ecologically important invertebrate species

Objectives

- Invertebrates – Learn about families and the most common species (through ID guides as well).

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 4 – snorkel seagrass beds / invertebrate identification skills (SNORKELLING)

Lecture 5: Identification of coral reef fish

Objectives

- Fish – teach students about families, common characteristics and the evolutionary significance of these characteristics.

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 5 – fish identification skills (DIVING)

Lecture 6 – How to survey a coral reef

Objectives

- Survey design
- Case studies
- Methods of assessments
- Stereo video

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 6 – Survey Methods Quadrats/Transects (DIVING)

Lecture 7: Global threats to coral reefs

Objectives

- Climate change
- Reef exploitation
- Local communities
- Destructive fishing methods
- Invasive species

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 7 – Survey Methods Quadrats/Transects (DIVING)

Lecture 8: Methods to protect the world's coral reefs

Objectives

- MPAs
- Restoration
- Artificial reefs
- Management
- Social implications; Socio-economics

Discussion/Activity/Debate (subjects to be selected based on the groups interests and syllabus)
Practical 8 – Fun Dive!

12. A-Level exam board table

The following two tables highlight how your Opwall expedition relates to the As and A level syllabuses across all exam boards. The red and blue blocks indicates that the keywords listed are covered on our expedition (through lectures, practical's or in discussion topics) and that these keywords are also within As or A level topics as shown.

Topic	Biology	AQA		C	CCEA		C.Int		Ed/Sal		OCR		SQA		WJEC		AP	IB
	Levels: S=AS 2=A2 H =Highers	S	2		S	2	S	2	S	2	S	2	H	AH	S	2		
Evolution, Classification and DNA	Evolution; Speciation; Species; Endemism; Gene pool; Allopatric; Sympatric; Isolation; Variation; Adaptive radiation Adaptation; Wallace; Darwin		◆	◆		◆		◆	◆		◆		◆	◆		◆	◆	◆
	Classification; Taxonomy; Binomial system; Dichotomous Keys	◆		◆	◆			◆	◆	◆	◆			◆	◆			◆
Ecology and Ecosystems	Ecology; Habitat; Niche; Abiotic; Biotic		◆	◆	◆		◆		◆	◆	◆					◆	◆	◆
	Biome; Ecosystems; Rainforests; Deserts; Coral reefs; Mangroves; Marine; Coasts; Hot arid; Semi-arid; Woodland Bush; Tropics; Tropical		◆	◆		◆	◆					◆				◆	◆	◆
	Populations; Competition; Interspecific; Intraspecific; Predator Prey; density dependent; independent: Symbiosis		◆	◆		◆	◆					◆				◆	◆	◆
	Succession; Climax community		◆			◆				◆	◆	◆				◆		◆
	Biodiversity	◆		◆	◆			◆	◆	◆	◆				◆		◆	◆
	Practical work; Field techniques; Ecological sampling; Random sampling; Transects; Capture, mark, release and recapture; Biodiversity indexes; Data handling and; presentation; Quadrats; Statistical testing; Measuring; GIS; Research tools		◆	◆		◆				◆	◆	◆	◆			◆	◆	◆
	Written reports; Research project; Report; Case studies			◆					◆				◆	◆		◆	◆	◆
Agriculture, Human activities, Conservation and Sustainability	Sustainability	◆		◆					◆	◆		◆				◆		
	Agriculture; Agricultural impact; Agricultural exploitation; Cultivation crops; Food production; Sustainable agriculture; Sustainability; Forestry; Timber; Deforestation; Fisheries; Over fishing; Deforestation; Human management; Human effects; Human activities	◆				◆						◆	◆			◆	◆	
	Fair-Trade; Coffee; Rain Forest Alliance; Ecotourism; Tourism; Carbon trading; Greenhouse gas emission control (REDD+)															◆		
	Indicator species; Pollution; Climate change; Global warming Carbon footprint; Fossil fuels		◆	◆		◆				◆	◆		◆				◆	◆
	International conservation; Endangered species; Invasive species; Biological control; Pests; CITES; Ethical, Local; Global	◆	◆	◆		◆		◆			◆	◆	◆			◆		◆
	National Parks; Wildlife reserves							◆										◆
	Environment; Environmental monitoring; Environmental impact; SSSI																	
Behaviour	Animal behaviour; Primate Social behaviour; Courtship; Territory; Co-operative hunting; Herbivores; Grazing	◆		◆	◆			◆				◆	◆	◆		◆	◆	◆

Table: Highlighted in Black are topics that you might experience at your research site. Key: C = Cambridge. Pre-U, C.int = Camb. Int. CCEA = N.Ireland; Ed/Sal = Edexcel Salters, S= SQA ; Edex = EdExcel ; IB = International Bacc; AP=Advanced Placement (v. 20/11/14)

Topic	Geography, APES and ESS	IB ESS	APES	AQA		CCEA		Edex		OCR		WJEC	
				Geography									
	Levels: S=AS 2=A2			S	2	S	2	S	2	S	2	S	2
Evolution, Classification and DNA	Evolution; Speciation; Species; Endemism; Gene pool; Allopatric; Sympatric; Isolation; Variation; Adaptive radiation Adaptation; Wallace; Darwin												
	Classification; Taxonomy; Binomial system; Dichotomous Keys	◆											
Ecology and Ecosystems	Ecology; Habitat; Niche; Abiotic; Biotic	◆	◆							◆			
	Biome; Ecosystems; Rainforests; Deserts; Coral reefs; Mangroves; Marine; Coasts; Hot arid; Semi-arid; Woodland Bush; Tropics; Tropical	◆	◆	◆	◆		◆		◆	◆	◆	◆	◆
	Populations; Competition; Interspecific; Intraspecific; Predator Prey; density dependent; independent: Symbiosis	◆	◆										
	Succession; Climax community	◆											
	Biodiversity	◆	◆		◆				◆				
	Practical work; Field techniques; Ecological sampling; Random sampling; Transects; Capture, mark, release and recapture; Biodiversity indexes; Data handling and; presentation; Quadrats; Statistical testing; Measuring; GIS; Research tools	◆	◆		◆	◆		◆		◆	◆	◆	
	Written reports; Research project; Report; Case studies	◆	◆		◆		◆	◆		◆	◆		
Agriculture, Human activities, Conservation and Sustainability	Sustainability	◆	◆		◆		◆			◆	◆		
	Agriculture; Agricultural impact; Agricultural exploitation; Cultivation crops; Food production; Sustainable agriculture: Sustainability; Forestry; Timber; Deforestation; Fisheries; Over fishing; Deforestation; Human management; Human effects; Human activities	◆	◆		◆		◆						
	Fair-Trade; Coffee; Rain Forest Alliance; Ecotourism; Tourism; Carbon trading; Greenhouse gas emission control (REDD+)						◆	◆		◆	◆		◆
	Indicator species; Pollution; Climate change; Global warming Carbon footprint; Fossil fuels	◆	◆				◆	◆		◆			
	International conservation; Endangered species; Invasive species; Biological control; Pests; CITES; Ethical, Local; Global	◆			◆					◆			
	National Parks; Wildlife reserves								◆				
	Environment; Environmental monitoring; Environmental impact; SSSI												
Behaviour	Animal behaviour; Primate Social behaviour; Courtship; Territory; Co-operative hunting; Herbivores; Grazing												

Table: Highlighted in Black are topics that you might experience at your research site. Key: C = Cambridge. Pre-U, C.int = Camb. Int. CCEA = N.Ireland; Ed/Sal = Edexcel Salters, S= SQA ; Edex = EdExcel IB ESS = Env Systems and Societies; APES = Advanced Placement Env. Science (v. 20/11/14)

13. Reading and research questions

Many students are now involved in producing Independent Research Projects (IRP) as part of their 2 year educational programme and many hope to carry this out whilst on an Opwall Expedition. If you are an IB school you will be involved in the EE or Extended Essay or if in the UK an EPQ or Extended Project Qualification. Those involved in CoPE will also have a similar task in which they carry out some research. There are many similar projects in most countries.

One of the key features of all of these 'Essays' or 'Projects' is that you have to choose your own research question but it is often difficult to find out exactly what is happening at each Opwall research site. To help in this, we have produced a 'Research' lookup database on the Opwall website – http://opwall.com/epq-research-topic/ but you can also 'download' a more detailed version as an Excel Spreadsheet.

The database lets you find out what is happening at each site and there are links to pdf files and video clips. You can search the 'database' using a variety of filters such as research area and location.

This booklet also contains detailed information on the research projects you will be involved in and this may help you to locate your particular area of interest.

The type of IRP will vary but it is less suitable for individual investigations where you collect your own primary data although in some cases you might be able to get hold of raw data and you will often have the opportunity to help collect some of this data yourself. You will certainly have the opportunity 'on-site' to meet up with the scientists involved which will allow you to get a deeper insight into your research question.

Many of you will also have seen the Wallace Resource Library (WRL) which contains many datasets based around the research being carried out and it has been prepared by the actual Opwall scientists involved. It is a very valuable source of ideas with comprehensive datasets to look at and study.
Demo version – http://wallaceresourcelibrary.com
Do also make use of the research library on the OpWall website - http://www.opwall.com

How does it work?

Once you have an idea send an email to schoolresearchprojects@opwall.com with your initial ideas and contact details so that one of the academic staff working with Opwall can contact you to discuss possible research questions. We can also send you further information to help you choose a suitable title for your research site.

Once you have decided on a title you will then be asked to complete a registration form (supplied on request) which we can then forward to the appropriate country manager or scientist. This will then inform those at the research site about what you are hoping to achieve plus for us to give you as much assistance as we can.

In some cases we will also be able to provide you with data sets from previous years which some students will find very useful.

Deadlines:

Although each school will be operating their own schedule we would like registrations to be competed at least 3 months before their expedition begins although the earlier the better.

Useful reading:

Malay Archipelago, Alfred Russell Wallace (1850) – available in Kindle format from Amazon for £6-57. The whole text is also available online here: http://www.papuaweb.org/dlib/bk/wallace/cover.html

Song of the Dodo, David Quammen (1997).Best description of island biogeography

A Naturalists Guide to the Tropics, Marco Lambertini (2000).Best introduction to tropical forests

Coates, Brian J. and Bishop, K. D. - A Guide to the Birds of Wallacea: Sulawesi, the Moluccas and Lesser Sunda (1997). Best bird ID guide for Sulawesi and the surrounding islands, Indonesia.

de Lang, Ruud and Vogel, Gernot - The Snakes of Sulawesi: a Field Guide to the Snakes of Sulawesi with Identification Keys (2005).

SAS Survival Guide Wiseman, J. (1999) Collins GEM. Best overall guide to field survival

Robson, Stuart and Millie, Julian (2004) Instant Indonesian: Everything You Need to Speak Indonesian in 100 Key Words and Phrases.

Research areas and activities being carried out in Indonesia:

Examining the roles of NGOs and government in improving natural resource management in Indonesia.
Bird point count surveys.
Pollard walks for butterflies.
Forest plot measurements to understand the role of disturbance.
Influence of habitat structure on herpetofaunal assemblage composition on Buton Island. Night time frog and reptile transects.
Factors affecting bat assemblage composition in lowland forests of Indonesia.
Density and distribution of Sulawesian megafauna.
Bat netting: evening to set and empty mist nets.
Assessing the impacts of tourism in the Wakatobi Marine Park, Indonesia.
Supporting fisheries management policies in the Wakatobi
Quantifying the resilience of marine dependent communities to climate change and resource depletion in Indonesia.
Environmental impact and feeding habits of the Crown of thorns starfish Acanthasterplanci in a low density population in the Wakatobi, Indonesia.
The importance of different coral growth forms for reef biodiversity in Indonesia.
Physiological adaptations of the unique salt-water frog.
The physical and biological structure of a light-limited coral reef.
Environmental driven variations in reef architecture.
Environmentally driven changes to the primary causes of coral mortality.
Wakatobi Culture, Community and Environment.
The sustainability of fisheries activities within the Wakatobi.
The environmental impact of fish fences within the Wakatobi.
Niche partitioning of Fiddler crabs in biodiverse and highly competitive environments in Indonesia.
Mangrove habitats of the Wakatobi, Indonesia.
Seagrass habitats of the Wakatobi.
Ecology and behaviour of fiddler and sentinel crab populations.

Sponge ecology and coral reef phase shifts in Indonesia.
Competitive interactions between sponges and other reef organisms in Indonesia.
The diversity, distribution and abundance of Nudibranchs in Indonesia.
The role of territorial Damselfish in sculpturing coral reef biodiversity in Indonesia.
Resource utilisation of reef fish across environmental gradients in Indonesia.
The ecology of Anemonefish in Indonesia.
The ecological impact of smothering sponge and ascidians on coral reefs in Indonesia.
The behaviour and functional role of reef fish cleaners in Indonesia.
The abundance and impact of coral bio-eroding invertebrates across environmental gradients in Indonesia.
The ecology and biology of shallow subtidal patch reefs in Indonesia.
Methods of reef assessment and the effect different survey techniques have on estimations of reef fish abundance and functional biomass in Indonesia.
Conservation of herbivore biomass and functional biology of reef systems.
Opwall Coral Reef monitoring programme underpinning scientific research - focus 2014 on Crown-of-thorns starfish.
The eco-physiology of juvenile reef fish: preparing for future climate change.
Are animals living in extreme environments best equipped to deal with climate change?
Thermal induced rapid coral mortality in Indonesia.