



## Malawi Schools' Booklet 2019

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## 1. Expedition Location and structure

This 2-week expedition takes place in three locations within Malawi:

1. Lilongwe Research Centre, outside Lilongwe city (5 days)
2. Liwonde National Park in Malawi, in a safari campsite (1 day)
3. Nkhata Bay, on the shores of Lake Malawi (7 days including travel)

Students will fly into Lilongwe International Airport (sometimes also known as Kamuzu airport), where they will be taken to the research centre (approx. 1h) ready to start their expedition on the Tuesday morning. After spending the next 5 days living and working here they will spend a day traveling to Liwonde National Park, where they will spend two nights at a safari camp before travelling up to Nkhata Bay (approx. 10h). At the end of the week, the group will transfer back to Lilongwe on the Monday to catch their international flights home.

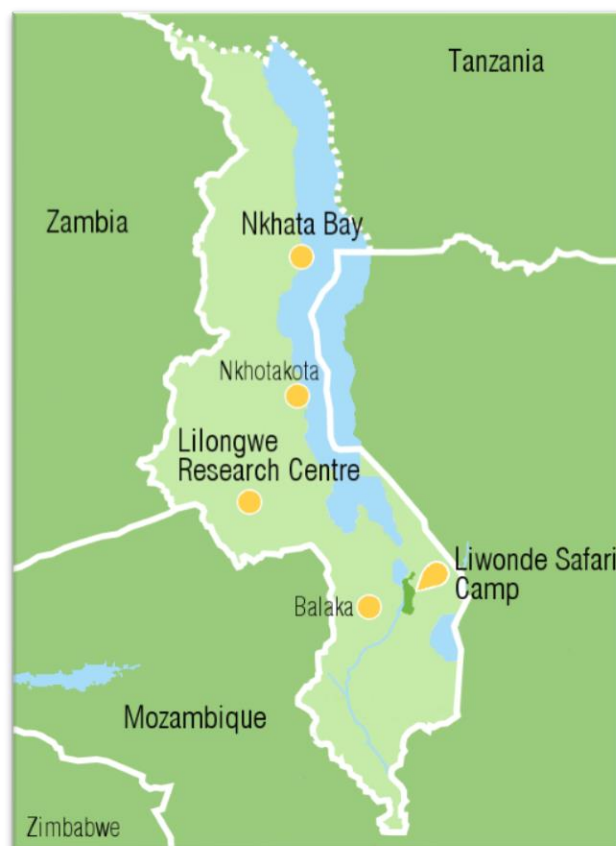


Figure 1. Map showing the location of Lilongwe Research Centre, Liwonde National Park and Nkhata Bay

## 2. Objectives

The objectives for the expedition can be separated into four areas: research, cultural exchange, skills training, and wildlife experience.

### a) Research

This first part of the expedition is based at Lilongwe Research Centre. Here we are assisting a local charity – Conservation Research Africa – to expand their urban biodiversity monitoring program. Much reserve has been done in eastern and southern Africa regarding species composition and dynamics in protected areas and reserves. Even within Malawi, population monitoring is performed regularly in many of the national parks. What's not known, is how any of these species react to being around human populations. Malawi has one of the highest population growth rates in the world, and as such human encroachment into wild habitat is continuous and inevitable. However, many species in Malawi have made a niche for themselves living amongst the human developments. Lilongwe city is home to predators such as hyenas, jackals and servals, meaning there must be a wealth of yet un-studied diversity supporting these species. Our aim is to better understand the interactions between humans and wildlife in Lilongwe and its surrounding areas through the following research objectives:

- To quantify spatial and foraging behaviour of the urban spotted hyenas to inform human-wildlife conflict mitigation in Lilongwe. Students will use GPS tracking to locate collared individuals, as well as set up and check a series of camera traps located in areas of known hyena activity
- To determine and monitor bat population trends and assess species threats using a variety of methods. In pre-determined research sites students will use harp traps and mist nets to capture individuals and take morphometric measurements. Acoustic measurements will also be taken where possible, and emergence surveys performed at locations of known bat roosts.
- To establish baseline bird population and diversity estimates. Students will perform ten-minute bird point counts at dawn at the same surveys sites as the bat work. These surveys will also be recorded for acoustic analysis of the calls.
- To create a database of invertebrate species found at each site. Light-traps will be used to collect samples that will then be taken back to camp for pinning and species identification.
- To determine habitat preferences for bats and birds through assessing the vegetation at each site. Students will record data including species, height, diameter etc for all tree species above 1m found in a set radius around the research site.

The second part of the expedition is based at Nkhata Bay and there are two main research objectives for this part of the expedition:

- To compare cichlid species composition and abundance at a range of depths and habitat types around Nkhata Bay. Replicate 50m transects have been installed at 3m, 6m, 9m, 12m and 15m depths around the Bay in different habitat types. The survey teams will be completing Underwater Visual Census surveys of the cichlid diversity and abundance and these data are then being compared with similar studies completed at Kande Bay, approximately 20 miles south of Nkhata Bay.

- To compare the catch per unit effort of the fish landings in Nkhata Bay made by canoe based fishermen using deep water gill nets set overnight. This involves sampling catches of fish from canoes as they come into the beach to take their catch to market. These data are being used as a comparison with the catch per unit effort data using the same methods elsewhere on the lake.

## b) Cultural Exchange

In addition to the intrinsic benefits of working and living in Malawi for 2 weeks and meeting many local staff throughout this time, the students will have a specific cultural exchange focus whilst they are in Lilongwe. Here they will get the opportunity to visit a local school or community group to take part in one of the regular environmental education workshops run by our partners. This may include sharing information about the diversity found in the students' home countries to increase awareness of diversity across the world, not just within Malawi.

## c) Skills training

### Malawi Conservation Course

Whilst in at Lilongwe all students will be taught the various survey techniques needed in order to participate in the terrestrial surveys. In addition to this, the students will attend a series of lectures constituting a Malawi Conservation course. The course is comprised of six lectures that are accompanied by workshops:

***Lecture 1: Introduction to Africa's biodiversity*** This lecture will outline the term 'biodiversity' and what this can mean in different situations to different groups of people. Students will also learn about the biodiversity of Africa and how humans, latitude and other gradients affect biodiversity.

***Lecture 2: Speciation and species concepts*** – what is a species and how do they form? This lecture describes historical and current theories on species formation including possible mechanisms of ecological speciation – blocks genes on genomic islands, divergent mate preferences and role of sexual selection, developmental plasticity and epigenetics. The various species concepts are compared and the definition of a species challenged.

***Lecture 3: Human population growth and its effect on biodiversity*** Human evolution and their growth and movement through Africa are discussed in this lecture, along with the effects – positive and negative – this had on biodiversity. Current examples of human activity working both for and against biodiversity are explored, as well as the importance of developing a balance between human and wildlife.

***Lecture 4: Ecological monitoring methods – urban vs rural*** Many monitoring techniques traditionally used in rural settings can also be applied to urban settings – but not all. This lecture will look at the most common methods used in both situations and how they can complement each other.

***Lecture 5: Human wildlife conflict mitigation*** From beehive fences to dung bombs, there are many innovative ways being developed to help mitigate human wildlife conflict. The aim of these is to offer protection for both animals and humans so that the two can co-exist. This lecture will describe some of the successful (and unsuccessful!) attempts to mitigate these conflicts and discuss options for future.

***Lecture 6: Management of large game reserves*** – the national park and game reserve system in East and South Africa. The main mammalian predators and herbivores and how they occupy different ecological niches. The 'Tragedy of the Commons': Why open-access resources need to be controlled. The benefits

of fencing reserves and economic benefits from well-run National Parks. Poaching in East Africa, bushmeat and firewood harvesting.

### **Aquatic training at Lake Malawi**

Whilst in Malawi, students will participate in one of two courses:

#### ***PADI Open Water***

This is the default course in which the majority of students will participate. Those completing this course will end up with a PADI Open Water dive qualification which is the first qualification on the Professional Association of Dive Instructors (PADI) scheme for SCUBA diving. The course consists of theory work, gaining pre-diving skills in confined shallow water, which is done in the lake just off the private beach and then 4 dives to a maximum depth of 18m. The course will occupy the full time that the groups are on site. Those students arriving having completed the theory and confined water skills with a PADI Dive Instructor at home (known as a referral) will be able to complete the rest of the course in 2-3 days and then spend the rest of their time helping with the qualified diving team on the research projects. *Please note, medical screening is necessary in order to determine whether a participant is medically suitable for SCUBA diving. For participants with certain medical conditions (such as asthma) this may include needing to visit a dive medic prior to coming out to site.*

#### ***Cichlid identification and in-water survey techniques (by diving or snorkelling)***

Those who already have a recognised dive qualification or have decided to snorkel will participate in this course. After an initial check dive/snorkel, this group will need to spend most of their first 2 – 3 days learning the 30+ species of cichlids likely to be encountered on the surveys as well as the survey techniques. This involves classroom learning and twice daily in-water activities to test out the survey method and improve identification skills. At the end of this period there will be a test where the main surveyor records the diversity and abundance of the cichlid species along a transect and the students swimming with this surveyor independently record their own data from the same transect and the results are compared. Those students passing this test can then go on to help record data from other transects albeit with accompany dive staff. Those that don't reach the required level of skill or have joined the qualified diver team part way through the week having completed their Open Water dive training from a referral, will be able to provide support for the trained surveyors in the transect surveys. In addition, there will be morning surveys of landings of deep water fish.

Accompanying this course are a series of lectures that cover the following topics:

***Introduction to the science of Lake Malawi***

***Lake ecology research techniques***

***Fish identification techniques***

***Cichlid ID***

***Threats to lake biodiversity***

***Lake conservation strategies***

#### **d) Wildlife experience**

The time spent at Lilongwe Research Centre and Nkhata Bay will be an excellent opportunity for students to learn about the fauna of these urban and lake systems. Additionally, both areas have large numbers of bird species and some very interesting flora (such as Baobab trees). No visit to eastern Africa is complete, however, without seeing some of the large game species that provide such a draw for tourists. The time spent in Liwonde in the middle of the trip will offer just this opportunity.

The Liwonde National Park has a total area of 538 km<sup>2</sup> and is approximately 50km by 15km at the widest point. Like many other parks in Malawi, Liwonde has previously struggled with high levels of poaching and deforestation. In 2015, the park management was taken over by African Parks, who have implemented a number of strategies – including installing fenced boundaries and training local anti-poaching rangers – in order to protect the park and its inhabitants. These strategies have been so successful that the elephant browsing pressure grew to an almost unsustainable point. In 2016, 261 elephants were translocated out of Liwonde to increase the populations in another Malawi reserve – Nkhotakota. Despite this move, Liwonde still boasts over 500 elephants, along with healthy populations of game such as buffalo, hippo, waterbuck, sable and impala. Black rhinos and cheetah are also found on the reserve, but in much lower densities.

### **3. Itinerary and site facilities**

The expeditions start at Lilongwe Research Centre at 08:00hrs on a Tuesday. You will need flights which arrive into Lilongwe on the Monday before your expedition starts and the group will overnight at the research centre before starting the expedition activities the next morning. The expedition finishes at Lilongwe International Airport in Malawi on Monday afternoon and international flights can be caught after 20:00 hrs.

#### **a) Lilongwe Research Centre**

For the first 5 days the groups will be staying in dormitories in Lilongwe Research Centre, in the rural suburbs of Lilongwe city. There are bunk beds, latrine toilets and jungle showers at this camp and the students will gain an insight into rural communities in Malawi.

After initial briefing the group will be split into teams to rotate amongst the various data collection methods outlined in the research objectives. Groups will split their time between being in the field and out on survey, with in-camp activities including data entry, sample processing and the Malawi Conservation Course.

#### **b) Nkhata Bay**

After their time in Lilongwe, the group will travel by bus to a lodge in Nkhata Bay. Accommodation here will be in shared dormitories set on the side of a hill leading into the Lake. There are shared bathrooms and shower blocks, and there is a dining room and rest areas overlooking the lake.

Students' itineraries will be dictated by the course that they are participating in (see section 2c), but each day will consist of one or two classes and in-water practical sessions, which will occur just off the shore at the lodge.

### c) Liwonde National Park

At the end of the expedition, the group will travel by bus down to the Liwonde National Park where they will be able to see many of the charismatic species that draw tourists to East Africa.

Accommodation will be in thatched dormitories in the Liwonde Safari Camp with separate toilet and shower blocks in the camp. The camp is currently unfenced although there are several guards who operate through the night to ensure the elephants and hippos don't come into camp.

The group will spend 2 nights and a full day in Liwonde and all students will complete a boat-based safari and a vehicle safari with experienced local guides.

### d) Draft Itinerary

The following is an *example* itinerary to demonstrate how these various activities would fit together during the expedition.

|           |     | Group 1  | Group 2                               | Group 3                               |
|-----------|-----|--|---------------------------------------|---------------------------------------|
| Tuesday   | PM  | Camp orientation and safety briefing   |                                       |                                       |
|           | EVE |  |                                       |                                       |
| Wednesday | AM  | Intro to monitoring techniques   |                                       |                                       |
|           | PM  | Carnivore scat transect  | Carnivore scat analysis               | Carnivore camera trapping             |
|           | EVE | Bat emergence survey   | Bat and invertebrate trapping surveys | Hedgehog survey                       |
| Thursday  | AM  | Bat box survey   | Bird point counts                     | Bird point counts                     |
|           | PM  | Lecture 1: Introduction to Africa's biodiversity<br>Lecture 2: Speciation and species concepts |                                       |                                       |
|           | EVE | Hedgehog survey  | Bat emergence survey                  | Bat and invertebrate trapping surveys |
| Friday    | AM  | Hyena den checks   | Carnivore scat transects              | Carnivore scat analysis               |
|           | PM  | Environmental education session with a local school / community group                          |                                       |                                       |
|           | EVE | Lecture 3: Human population growth and its effect on biodiversity                              |                                       |                                       |
| Saturday  | AM  | Bird point counts  | Bat box survey                        | Bat box surveys                       |
|           | PM  | Carnivore camera trapping  | Hyena den checks                      | Carnivore scat transect               |
|           | EVE | Bat trapping surveys   | Hedgehog survey                       | Bat emergence surveys                 |



|           |     |   |   |  |
|-----------|-----|---|---|--|
| Sunday    | AM  | Lecture 4: Ecological monitoring techniques - urban vs rural<br>Lecture 5: Human-wildlife conflict mitigation                       |   |  |
|           | PM  | Carnivore scat analysis   | Carnivore camera trapping                                   | Hyena den check  |
|           | EVE | Traditional Boma Braai with dancers at Kumbali  |   |  |
| Monday    | DAY | Travel to Maru Lake Research Centre, Nkhata Bay, Malawi   |   |  |
|           | EVE | Welcome to Maru Lake Research Centre camp, health & safety briefing and completion of PADI documentation                            |   |  |
| Tuesday   | DAY | PADI Open Water dive training course  |   |  |
|           | EVE | Lecture 5: African Rift Valley Ecology and Evolution course - Formation of the African Rift Valley and characteristics of the lakes |   |  |
| Wednesday | DAY | PADI Open Water dive training course  |   |  |
|           | EVE | Lecture 6: African Rift Valley Ecology and Evolution course - Fishery management of Lake Malawi                                     |   |  |
| Thursday  | DAY | PADI Open Water dive training course  | Dive trained group helping on lake and fish landing surveys | Snorkel group helping with lake and fish landing surveys |
|           | EVE | Lecture 7: African Rift Valley Ecology and Evolution course - Human evolution in the Rift Valley                                    |   |  |
| Friday    | DAY | PADI Open Water dive training course  | Dive trained group helping on lake and fish landing surveys | Snorkel group helping with lake and fish landing surveys |
| Saturday  | DAY | PADI Open Water dive training course  | Dive trained group helping on lake and fish landing surveys | Snorkel group helping with lake and fish landing surveys |
|           | EVE | End of dive training and lake research party  |   |  |
| Sunday    | DAY | Travel to Liwonde National Park   |   |  |
| Monday    | DAY | Game viewing in Liwonde National Park   |   |  |
|           | EVE | Lecture 6: Management of large game reserves  |   |  |
| Tuesday   | DAY | Travel back to Lilongwe to catch flights home   |   |  |

## 4. Academic Benefits

Apart from the most obvious values of going on an expedition such as contributing towards conservation, the physical challenge and adventurous travel, the experience can also benefit a student by increasing their chances of gaining entry to university or being successful in a job application and impressing at interview. This can be achieved in many different ways but it will often depend upon which country and educational system a learner is from. Common to most countries the experience will:

- Enhance their understanding of course syllabuses
- Allow learners to gain specific qualifications such as:
- Research Qualifications e.g. Extended Essays for IB and UK EPQs
- University Course Credits
- Creativity, Action and Service (CAS) for IB
- Universities Award from ASDAN

### IRPs or Individual Research Projects

In the last few years an increasing number of students joining our research programmes take this opportunity to undertake **IRPs**. These research projects take many different forms, but what they all have in common is the need to pose and answer a research question. Examples of these include **Extended Project Qualification** (EPQ), **Extended Essay** (EE) for IB, as well as many different projects specific to many education systems worldwide.

We are able to support the **dissertation essay style** research question; however individual scientific investigations (in which students design and collect their own data) are more difficult to facilitate given the short amount of time students are present on-site.

It is a great opportunity for a student to witness first-hand many of the aspects of their research question and, in many cases, they will have access to samples of past datasets for their project. Students may also have the opportunity to talk with the actual scientists involved which will give them a convincing 'slant' to the way in which they answer their research question.

Much of the research they will be able to get involved with is specific to their expedition location. The projects that students will come into contact with range from students helping to collect data through to working and learning alongside the scientists where primary data collection by school students is less practical or more difficult.

For success with IRPs, careful planning is needed by the student and a lot of the work will be done prior to their expedition. They will need close guidance from their school supervisor and the scientists in the field need to be briefed so that support can be provided where they can. We have now developed an application system to ensure that the student will be able to realistically undertake such a project, that their choice of topic is appropriate to their expedition site, the science staff 'on-site' are aware of the project and where practical can assist in a constructive way before, during and after their expedition.

For more information visit the Opwall website - <http://opwall.com/sixth-form-high-school/independent-research-projects/>

## Relevance of their expedition to the syllabus

Specific specifications for Biology, Geography and Environmental Studies have been reviewed for over 10 examination boards from around the world to see how relevant a student's expedition experiences will be when related to what they learn in their classroom. The tables in the appendix section show how this matching works although not all topics are relevant to all sites so have been grey-out.

## 5. Additional Reading

### Books

Terry Stevenson(Author), John Fanshawe(Author), Brian E Small(Illustrator), John Gale(Illustrator) July 2015 **Birds of East Africa** - ISBN-13: 9781408157367 £29.99

Charles Foley(Author), Lara Foley(Author), Alex Lobora(Author), Daniela De Luca(Author), Maurus Msuha(Author), Tim RB Davenport(Author), Sarah M Durant(Author) July 2014 **A field Guide to the larger Mammals of Tanzania** ISBN-13: 9780691161174 £13.97

David Hosking and Martin Withers 2007 **Collins Traveller's Guide - Wildlife of Kenya, Tanzania and Uganda** ISBN-13: 9780007248193 £15.99

Mary Fitzpatrick & Tim Bewer (2012) [Lonely Planet Travel Guide: Tanzania](#) 2012 ISBN-13: 9781741792829 £16.99

Andreas Spreinat (1995) **Lake Malawi Cichlids from Tanzania** ISBN: 3931328007 £12.99

George W Barlow (2002) **The Cichlid Fishes: Nature's Grand Experiment in Evolution** ISBN: 0738205281 £11.99

Jos Snoeks (2004) **The Cichlid Diversity of Lake Malawi/Nyasa/Niassa: Identification, Distribution and Taxonomy** ISBN: 0966825586

### Articles

Barley, S. (2009) Kenya's lions could vanish within 10 years. New Scientist Online available at <http://www.newscientist.com/article/dn17648-kenyas-lions-could-vanish-within-10-years.html>

Maslin, M (2013) How Climate Change and Plate Tectonics Shaped Human Evolution  
A new study links the emergence of new hominid species, expanding brain capacity and early human migration with the appearance of deep freshwater lakes. [The Conversation](#) on November 14, 2013  
<https://theconversation.com/how-a-changing-landscape-and-climate-shaped-early-humans-19862>

### Electronic media

BBC Last Chance to See, Episode 3: Northern White Rhino. Available online at <http://www.bbc.co.uk/programmes/b00mvbbx>

BBC Life of Mammals, Episode 4: Plant Eaters

BBC Life of Mammals, Episode 5: Meat Eaters

BBC Planet Earth, Episode 7: Great Plains

The Secret Life of Elephants. BBC Video. Available from NHBS - [www.nhbs.com/](http://www.nhbs.com/)

## Appendix

The following tables suggest how specifications for Biology, Geography and Environmental Studies might link with your expedition experience through lectures, practicals or in discussion topics: keywords are used for the matching. Topics which have been greyed-out are unlikely to be relevant at this expedition location.

Table 1: Biology

| Topic   | Biology  | AQA |   | C | CEEA |   | 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   | A | H    | S | 2  |    |   |   |
| <b>Evolution, Classification and DNA</b>                              | Evolution; Speciation; Species; Endemism; Gene pool; Allopatric; Sympatric; Isolation; Variation; Adaptive radiation<br>Adaptation; Wallace; Darwin  |     | ◆ | ◆ |      | ◆ |       | ◆ | ◆      |   | ◆   |   | ◆   | ◆ |      | ◆ | ◆  | ◆  |   |   |
|   | Classification; Taxonomy; Binomial system; Dichotomous Keys  | ◆   |   | ◆ | ◆    |   |       | ◆ | ◆      | ◆ | ◆   |   |     | ◆ |      | ◆ |    |    | ◆ |   |
|   | PCR; Genome sequencing; Genetic fingerprinting; DNA profile  |     | ◆ | ◆ | ◆    |   |       |   |        | ◆ |     | ◆ | ◆   |   |      |   | ◆  | ◆  | ◆ |   |
| <b>Ecology and Ecosystems</b>   | Ecology; Habitat; Niche; Abiotic; Biotic   |     | ◆ | ◆ | ◆    |   | ◆     |   | ◆      | ◆ | ◆   |   |     |   |      | ◆ | ◆  | ◆  |   |   |
|   | Biome; Ecosystems; Rainforests; Deserts; Coral reefs; Mangroves; Marine; Coasts; Hot arid; Semi-arid; Woodland<br>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  |     |   | ◆ |      |   |       |   |        | ◆ |     |   | ◆   | ◆ |      |   | ◆  | ◆  | ◆ |   |
| <b>Agriculture, Human activities, Conservation and Sustainability</b> | 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<br>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  |     |   |   |      |   |       |   |        |   |     |   |     |   |      |   |    |    |   |   |
| <b>Behaviour</b>  | 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)

Table 2: Geography and Environmental Science

| Topic   | Geography, APES and ESS  | IB ESS | APES | AQA       |   | CCEA |   | Edex |   | OCR |   | WJEC |   |  |  |
|---|--|--------|------|-----------|---|------|---|------|---|-----|---|------|---|--|--|
|   |  |        |      | Geography |   |      |   |      |   |     |   |      |   |  |  |
|   |  |        |      | S         | 2 | S    | 2 | S    | 2 | S   | 2 | S    | 2 |  |  |
| <b>Evolution, Classification and DNA</b>                              | Evolution; Speciation; Species; Endemism; Gene pool; Allopatric; Sympatric; Isolation; Variation; Adaptive radiation<br>Adaptation; Wallace; Darwin  |        |      |           |   |      |   |      |   |     |   |      |   |  |  |
|   | Classification; Taxonomy; Binomial system; Dichotomous Keys  | ♦      |      |           |   |      |   |      |   |     |   |      |   |  |  |
|   | PCR; Genome sequencing; Genetic fingerprinting; DNA profile  |        |      |           |   |      |   |      |   |     |   |      |   |  |  |
| <b>Ecology and Ecosystems</b>   | Ecology; Habitat; Niche; Abiotic; Biotic   | ♦      | ♦    |           |   |      |   |      |   | ♦   |   |      |   |  |  |
|   | Biome; Ecosystems; Rainforests; Deserts; Coral reefs; Mangroves; Marine; Coasts; Hot arid; Semi-arid; Woodland<br>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  | ♦      | ♦    |           | ♦ |      | ♦ | ♦    |   | ♦   | ♦ |      |   |  |  |
| <b>Agriculture, Human activities, Conservation and Sustainability</b> | 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<br>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  |        |      |           |   |      |   |      |   |     |   |      |   |  |  |
| <b>Behaviour</b>  | 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)