



## **Croatia Schools' Booklet 2019**

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## 1. Structure of the Croatian Expedition

This expedition combines a week working in the spectacular Krka National Park and a second week on Silba Island in northern Dalmatia. The Krka National Park, lying only a short drive from the coastal city of Split, surrounds the middle-lower course of the Krka River, as it runs through limestone karst valleys on a steep gradient towards the Dalmatia coast. The island of Silba, which has a population of just 250 people, is a beautiful car free island that has not yet been discovered by western tourism. Here the Opwall partners are building a diving and marine research centre. The island is accessed via ferry from Zadar.

Groups will fly into the city of Split and take a bus straight from the airport to the Krka National Park, where they will be based in a tented camp on the edge of the valley. After a week in Krka, where the students will work on a mixture of research projects focused on the unique fauna of the forests, caves, river valleys and rivers of the park, the groups will travel by bus to Zadar (approx. 1.5 hrs) and take the ferry to the island of Silba (approx. 3 hrs). On Silba the groups will spend a week learning to dive, participating in an Adriatic marine ecology course and participating in several marine research projects. After this week, they will take the ferry from Silba to Zadar and will fly home either from Zadar or Split(see figure 1).



**Figure 1: Map of Croatia showing the locations of Split, Krka, Zadar and Silba Island.**

## 2. Week 1: Krka National Park

The high Dinaric Arc mountains which run along the border of Bosnia and Croatia separate much of the European continental fauna from the Mediterranean fauna of coastal Croatia. The Krka River in only 60 km runs from the high Dinaric mountains down to the sea and contains an excellent example of this speciation gradient. The National Park is rich in freshwater biodiversity because of the long geographical isolation of the catchment and has around 20 unique species of fish to the river. Since much of the water in the karst (limestone) region is found underground, the cave systems and this habitat provide the highest rate of new species discoveries from any habitat in Europe. One of the unique cave species is the blind Cave Salamander featured in a 2012 David Attenborough film of 10 species to be included in an imaginary conservation Ark. The salamander is the third most genetically distinct amphibian in the world with its closest relative found now in the Yucatan Peninsula of Mexico having separated 200 million years ago when Pangea supercontinent was separating.

### Week 1 Itinerary

The groups will be met in Split on the Thursday when their flight arrives, and will be taken directly to the research base in Krka by bus. The journey takes an hour and a half to two hours. When they arrive, they will be given some time to settle in to the camp, before attending a series of safety and welcome presentations. The objectives from these presentations are:

- To explain the overall objectives of the Krka surveys
- To explain the risks associated with working in this area, including:
  - Safe trekking procedures
  - Appropriate footwear and other clothing
  - Avoiding heatstroke
  - Working near and in the rivers

There are 5 core survey projects running at Krka: invertebrates including grasshoppers, crickets and butterflies, tortoises and terrapin surveys, snake surveys, bird surveys from mist nets and point counts, cave surveys with boat based otter surveys plus the opportunity to join a couple of the nocturnal surveys for cat snakes and bats over the week.. The groups will be split into 5 teams and will rotate around each of these projects. Before each of the groups departs for the field to take part in one of the surveys they will be given a comprehensive briefing by the survey leader to explain the objectives, the methods, and any relevant safety information. There will also be daily lectures delivered as part of a Mediterranean ecology course which will take place during either the middle of the day when it is harder to work outside in the heat or in the evening.

Day	Group 1	Group 2	Group 3	Group 4	Group 5
<b>Thursday</b>	Arrive Krka late-afternoon. Welcome and Health & Safety presentation. <b>Lecture 1: Introduction to Krka and Mediterranean ecology</b>				
<b>Friday am</b>	Bird point count surveys	Snake surveys	Boat based otter surveys	Tortoise surveys	Grasshopper and cricket surveys
<b>Friday pm</b>	Bird mist net and raptor Surveys	Snake surveys	Cave surveys	Terrapin surveys	Butterfly surveys
<b>Friday before dinner</b>	<b>Lecture 2: Herpetofauna communities and niche overlap</b>				
<b>Friday after dark</b>	Hunt for potential owl roosting sites	Nocturnal cat snake surveys	Analysis of cave samples and otter spraints	Bat surveys	Evening off
<b>Saturday am</b>	Snake surveys	Boat based otter surveys	Tortoise surveys	Grasshopper and cricket surveys	Bird point count surveys
<b>Saturday pm</b>	Snake surveys	Cave surveys	Terrapin surveys	Butterfly surveys	Bird mist net and raptor Surveys
<b>Saturday before dinner</b>	<b>Lecture 3: Mediterranean mammal communities</b>				
<b>Saturday after dark</b>	Nocturnal cat snake surveys	Analysis of cave samples and otter spraints	Bat surveys	Evening off	Hunt for potential owl roosting sites
<b>Sunday am</b>	Boat based otter surveys	Tortoise surveys	Grasshopper and cricket surveys	Bird point count surveys	Snake surveys
<b>Sunday pm</b>	Cave surveys	Terrapin surveys	Butterfly surveys	Bird mist net and raptor Surveys	Snake surveys
<b>Sunday before dinner</b>	<b>Lecture 4: Invertebrates and cave biodiversity</b>				
<b>Sunday after dark</b>	Analysis of cave samples and otter spraints	Bat surveys	Evening off	Hunt for potential owl roosting sites	Nocturnal cat snake surveys
<b>Monday am</b>	Tortoise surveys	Grasshopper and cricket surveys	Bird point count surveys	Snake surveys	Boat based otter surveys
<b>Monday pm</b>	Terrapin surveys	Butterfly surveys	Bird mist net and	Snake surveys	Cave surveys

			raptor Surveys		
<b>Monday before dinner</b>	<b>Lecture 5: Bird communities of the Mediterranean</b>				
<b>Monday after dark</b>	Bat surveys	Evening off	Hunt for potential owl roosting sites	Nocturnal cat snake surveys	Analysis of cave samples and otter spraints
<b>Tuesday am</b>	Grasshopper and cricket surveys	Bird point count surveys	Snake surveys	Boat based otter surveys	Tortoise surveys
<b>Tuesday pm</b>	Butterfly surveys	Bird mist net and raptor Surveys	Snake surveys	Cave surveys	Terrapin surveys
<b>Tuesday before dinner</b>	<b>Lecture 6: Threats to Mediterranean wildlife and conservation initiatives</b>				
<b>Tuesday after dark</b>	Evening off	Hunt for potential owl roosting sites	Nocturnal cat snake surveys	Analysis of cave samples and otter spraints	Bat surveys
<b>Wed am</b>	Depart for Silba island				

### 3. Biodiversity Monitoring

#### Invertebrate surveys

These surveys are concentrating on two main groups: the Orthoptera (grasshoppers and crickets) and the butterflies. In the case of Orthoptera, the objective is to produce a species list for the Park using sweep net surveys over a wide range of grassland and scrub habitats and microhabitat analysis. After collection of the Orthoptera the transect will need to be characterised (eg height of grass sward, percentage of bushes, slope, dominant floral species and others) will need to be determined 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.

40 species of diurnal butterfly have been recorded in the Krka national park including two species of swallowtails. However, data on the ecology of these species is still missing and for this group the project will concentrate on completing Pollard counts of butterfly communities in different 6 vegetation communities and habitats. All butterflies along the Pollard count will be recorded and analysis can compare usage of different habitats/vegetation communities. Observations on food plants, timings of daily activity, heights of flight and other factors can also be included in the analysis for different species.

### **Snake surveys**

These surveys are performed by checking under previously placed cover boards and completing standard search times in different habitats and heights in the valley. Capture – mark – recapture techniques will also be employed. The Park authorities are keen to determine how the Four Lined Snake (*Elaphe quatuorlineata*) which grows to 2.5m, the venomous Nose Horned Viper (*Vipera ammodytes*) and the Leopard Rat Snake (*Zamenis situla*) separate their niches. In addition, the surveys will be recording the distribution of the giant Glass Lizard (*Pseudopus apodus*), which grows to a length of 1.2m and tortoises (*Testudo hermanni*). Night surveys are also done for the Cat Snake (*Telescopus fallax*) which is the only nocturnally active snake species in the region.

### **Terrapin and tortoise surveys**

The European pond terrapin (*Emys orbicularis*) is a data deficient Natura 2000 species that is a priority for the park. This project is designed to estimate the population size of this species in the Monastery Lake (the main population centre) and in the rivers either side of the lake with the 20km study area of the Krka river between two waterfalls. In the last 2 years, 50 terrapins from incidental captures have been measured and marked. The project will concentrate on marking a large percentage of the lake population and then using recapture data to estimate population size, and growth rates from those terrapins marked in previous years. Sampling will use crayfish traps with bottle floats so there are air pockets for captured terrapins. Sampling will also need to be done in the 20km study stretch of the Krka river to determine if there are small populations in these areas or indeed whether the river is being used for migration to new sites. The traps will be set at standardised points (kept constant throughout the years) and all terrapins will be released at the point of capture. This will also allow the determination of territory sizes and dispersion rates.

Hermann's tortoise (*Testudo hermanni*) is another 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 total population size and size and age group class structure of the population, plus additional information on movement patterns and habitat usage. In the past two years 65 tortoises from incidental captures within the park have been measured and marked with an individual mark but from 2019 onwards transects will be searched on a daily basis to increase the percentage of the population sampled and provide the population data required. 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. Recapture data can then be analysed to estimate population size and growth rates.

### **Cave and otter surveys**

The cave surveys will be led by cave biology specialists in caves not open to the public and will involve completing transects and quadrats within the cave systems to estimate diversity of groups adapted to cave living. In addition, soil, sand, and guano samples from different parts of the cave system will be taken and analysed to find out what is living there (bacteria, fungi, insects, etc.).

The other part of this survey is to study the otters. Otters (*Lutra lutra*) are one of the priority species for the park but to date little research has been completed on the Krka river population. This project will involve searching exposed rocks along the 20km study length of the Krka river for otter scat. These scats can then be analysed to determine the fish species being preyed upon from analysis of the otoliths, scales and other remains of the fish. The majority of the fish in the Krka river are invasives, but there is a small percentage of endemic trout species with very low populations. It would be valuable data to determine the size range of fish being targeted (this can be determined by aging the fish from the scales or otoliths) and whether or not the otters are selectively targeting endemic fish species. The otter team will be using a boat to search the full length of the study area

### **Bird surveys**

Bird surveys – these surveys will involve early morning point counts at a series of habitats within the valley and surrounding area to examine how habitat affects the bird communities and to monitor changes in the bird communities between years. In addition a constant effort mist net site will be run in the valley and raptor surveys completed at the same sites.

### **Nocturnal surveys**

Each team will spend one night helping with the bat mist netting surveys. In addition, the echolocation calls of bats will be recorded using a bat detector to determine if there are additional species present. The bird team will also be out in the evening looking for potential owl roost sites so they can collect owl pellets. The snake team also complete specialist surveys at night looking for the rare nocturnal cat snake.

## **4. Research and learning objectives**

The Krka National Park authorities have established a research base station in the centre of the valley that they want to develop into a central biodiversity research hub for the eastern Adriatic region. Two new museums have been built on the site to illustrate the unique ecology of the valley and the historical context since there are numerous Roman sites in the Park and surrounding plateaus. The Opwall role in this plan is to develop the most detailed biodiversity annual monitoring programme of key taxa yet undertaken in Croatia and from this programme to examine community structure and changes over time. The site selected for a long term study of biodiversity in the valley is a 20km stretch between two major waterfalls



and encompassing a lake and the full variety of habitats found in the valley. The survey site include the river, valley sides and surrounding plateau areas and the research objectives are:

- To describe the Orthopteran communities and identify any species that are under threat
- To describe the habitat associations of the butterfly community
- To quantify the population of terrapins in the study area of the river
- To quantify the population of Herrman's Tortoises in the study valley area
- To describe niche separation in the diurnal snake species found in the valley
- To provide ecological data on the rare nocturnal Cat Snake
- To describe the bird community in the valley and their habitat associations and changes in abundance between years
- To provide data from a permanent mist netting and ringing site in the Krka valley on bird moult patterns and longevity
- To provide additional data on the cave fauna of the valley
- To determine usage of the valley by European otters
- To quantify small mammal community structure from analysis of owl pellets
- To quantify the bat fauna of the Krka valley

### **Learning outcomes from week 1**

The students should achieve the following learning outcomes from the fieldwork, practicals, lectures and discussions/activities:

- Be able to define karst landscape
- Be able to describe the biogeography of the Dinaric mountains
- Be able to explain speciation processes that have occurred in the region
- Be able to identify and describe the ecology of the herpetofauna of the region
- Be able to identify 5 common bird species from their call and/or by sight
- Be able to identify the most common small and large mammals
- Be able to discuss human-wildlife conflicts in the Dinaric mountains
- Identify the major threats and conservation efforts in the region

## **5. Week 2: Silba Island**

For the second week, the groups will be based on Silba Island. Silba is a small island with an area of 15 km<sup>2</sup>, and 250 inhabitants during winter and up to 6000 during the summer. No cars are allowed on the island and it is a very scenic island that is visited mainly by Croatians. However, tourism is increasing each year and with increased numbers the threats to the local fishery and marine habitats is increased. As a result, a Croatian NGO has been formed to establish a dive and marine research centre on the island to map and quantify the marine habitats and associated species and then to establish a long term monitoring programme to assess whether increased tourism is adversely affecting these marine communities. The whole marine area around Silba and Grebena islets has been designated as a Natura 2000 area, because of the largest breeding colony of Shag (*Phalacrocorax aristotelis*) in the

Adriatic, and endemic seagrass *Posidonia oceanica* which supports high levels of biodiversity and also acts as a refuge and nursery for juvenile fish.

## Week 2 itinerary

On Wednesday morning, the group will leave Krka site to catch a ferry from Zadar to Silba island. Students here will either:

- complete a PADI Open Water SCUBA course, with some additional lectures and practicals focusing on Adriatic Ecology or
- complete the full Adriatic Ecology course with SCUBA and/or snorkel practicals to illustrate the lectures, and will also participate in some of the biodiversity surveys

Day	Open Water group	Open Water referral group	Full Adriatic Ecology course group
Wednesday pm	Arrive and settle in		
Wednesday eve	Documentation/check dive/swim test		
Thursday am	Dive theory	Skills check	Buoyancy dive
Thursday pm	Confined water	Open Water 1	Snorkel and free dive training
Thursday eve	Dive theory	<b>Lecture</b>	
Friday am	Confined water	Open Water 2	Seagrass survey training
Friday pm	Free-diving theory and practice	Open Water 3	Seagrass survey
Friday eve	Dive theory	<b>Lecture</b>	
Saturday am	Confined water	Open Water 4 & exam	Fish survey training
Saturday pm	Open Water 1	Snorkel and free dive training	Fish survey
Saturday eve	Dive theory	<b>Lecture</b>	
Sunday am	Open water 2	Seagrass survey training	Sea urchin survey training
Sunday pm	Open water 3	Seagrass survey	Sea urchin survey
Sunday eve	Dive theory exam	<b>Lecture</b>	
Monday am	Open water 4 & Dive certification	Fish survey training	Fish survey training
Monday pm	Research dive	Fish survey	Fish survey
Monday eve	Science presentation	<b>Lecture</b>	
Tuesday am	Research dive	Research dive	Research dive
Tuesday pm	Seagrass survey	Seagrass survey	Seagrass survey
Tuesday eve	Packing - Social evening		

<b>Wednesday am</b>	Depart Silba island
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The practicals will include trips to various bays around the island to conduct underwater visual census (UVC) surveys on the marine fish, sea urchins and sea grass meadows. Before each of the groups departs for the field to take part in one of the surveys they will be given a comprehensive briefing by the survey leader to explain the objectives, the methods, and any relevant safety information.

The expedition finishes at 05.00hrs on the Wednesday at the end of the second week. The group will then take a ferry to Zadar where the bus will wait and take them to Zadar or Split airports

## **Biodiversity Monitoring**

### **Fish surveys**

Fish surveys are done using stereo video surveys in areas around the Greben Islets that are proposed as potential No Take Zones. Analysis of the footage will be completed back in the lab with the students helping.

### **Sea-urchin surveys**

Line transects of 10m length and 2m width are completed at the range 3-8m depth. The researcher records the presence and types of echinoderms found in the transect with a special emphasis on sea urchins. Data recorded include whether the urchins are adult or juvenile and their location (eg sheltered in a hole or crevice). Sea urchins in the Adriatic compete with valuable commercial fish species such as White and Gilthead Sea Bream which also feed on algae

### **Sea-grass surveys**

The south Adriatic has some of the most extensive seagrass beds in the Mediterranean and because of the exceptional water clarity these seagrass meadows extend in some areas down to a depth of 40m. These meadows are important nursery areas for many juvenile fish and crucial for security of the fishery. The aims of this project are:

- To map and monitor the distribution of sea grass beds around Silba Island
- To assess the health of *Posidonia oceanica*
- To quantify the percentage coverage of invasive algae around Silba Island

This team will be doing detailed surveys of the seagrass beds up to 15m depth using the same protocol used in all MPAs in Croatia. At each site a buoy will be set down, and from this buoy a circle marked out with a 10m radius. Quadrats will be placed randomly on the seabed within the circle and the following data will be collected by groups of students:

#### **Group 1**

- Taking a photo of each quadrat so the edge of the quadrat is just in the frame of the photo
- Describe seagrass species composition
- Measure the depth of each quadrat

#### Group 2

- Count seagrass rhizomes within the quadrats
- Estimate percentage of seagrass and algal cover and species composition
- Estimate percentage of dead matter

#### Group 3

- Describe sediment composition into mud, fine sand, sand, coarse sand and gravel
- Identify any macroinvertebrates within the quadrat

## 6. Research and learning objectives

The research outputs from this first season of the new dive and marine research centre are:

- Establish baseline data on the fish communities around a proposed Greben Islet No Take Zones.
- Determining the distribution of the sea urchins and habitat interaction around the island
- Monitoring seagrass *Posidonia oceanica* meadows and interaction with invasive algae

The Adriatic Ecology course consists of lectures and in water practicals and teaches identification of common genera and species of algae and other macroinvertebrates, identification of the major fish families and common species. It is designed to introduce a variety of methods and practices used for scientific research in the marine environment.

### Adriatic Ecology course

The Adriatic Ecology course covers the following topics which are designed to train students in the ecology, conservation issues and survey techniques that are being used on the surveys. The lectures, films and practical exercises on this course will help the students become immersed in the ecology and conservation issues of the Mediterranean and will cover the following areas:

**Lecture 1:** Introduction to Silba Island, Adriatic Marine Ecology and research objectives

**Lecture 2:** Marine Survey techniques

**Lecture 3:** Flora and fauna biodiversity

**Lecture 4:** Invasive species in the Mediterranean

**Lecture 5:** Problem of plastics pollution in the sea

**Lecture 6:** Fisheries and MPAs in the Mediterranean and Croatia

**Lecture 7:** Sustainability of resources

## **Learning outcomes from week 2**

The students should achieve the following learning outcomes from the fieldwork and activities at the Silba Island site:

- To understand the importance and changes of flora and fauna in different marine ecosystems
- To understand the threats to the Mediterranean Sea and coast
- Be able to identify at least 5 marine invertebrates and 10 fish species
- Be able to conduct snorkel and SCUBA based surveys of marine flora and fauna
- To have an understanding of small scale fisheries and the importance of MPAs and no take zones
- To have a raised awareness of plastic pollution and ideas of how to reduce it
- To understand the importance of seagrass and its connection to fish biodiversity and climate

## **7. PADI Open Water training**

### **Full course**

This course consists of theory lectures and tests which are completed with instruction from a fully trained Dive Instructor at the research centre. This is accompanied by a series of skills that need to be learned and these are completed in shallow water in front of the base. Once the theory and skills training has been completed the students will then complete 4 Open water dives to qualify the students to a maximum of 18m. They will then be signed off as qualified Open Water divers and can register with PADI (Professional Association of Dive Instructors). Students will need to bring their PADI Open Water manuals with a PIC (Personal Identification Card) that is then used to register with PADI once the training course has been completed. These can be purchased from the Operation Wallacea website prior to expedition <https://divematerials.com/>

### **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 Adriatic marine ecology 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 management natural resources.

## 8. Links to biology, geography and environmental science syllabuses

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	CEA		C.Int		Ed/Sal		OCR		SQA		WJEC		AP	IB	
		S	2		S	2	S	2	S	2	S	2	H	A	S	2			
Levels: S=AS 2=A2 H=Highers																			
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	◆		◆	◆			◆	◆	◆	◆			◆	◆		◆		◆
	PCR; Genome sequencing; Genetic fingerprinting; DNA profile		◆	◆	◆					◆		◆	◆				◆	◆	◆
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)

**Table 2: Geography and Environmental Science**

Topic	Geography, APES and ESS	IB ESS	APE S	AQA		CCEA		Edex		OCR		WJEC	
				S	2	S	2	S	2	S	2	S	2
Levels: S=AS 2=A2													
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	◆											
	PCR; Genome sequencing; Genetic fingerprinting; DNA profile												
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)



## **Academic Benefits and background reading**

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 are taking 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 educational 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 and the logistical constraints within which our expeditions operate.

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 ecological and biodiversity 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.

### **More information:**

Use this [link](#) or email [schoolresearchprojects@opwall.com](mailto:schoolresearchprojects@opwall.com)

### **Suggested background reading list:**

Bradt Travel Guide: Croatia

Piers Letcher and Rudolf Abraham – (2016) ISBN: 13: 9781784770082  
(nhbs.com)

DK Eyewitness Travel Guide: Croatia (2015) ISBN-10: 1465426140  
(Amazon)

Eastern Europe: An Introduction to the People, Lands, and Culture. ABC-CLIO. ISBN 978-1-57607-800-6. Retrieved 18 October 2011. Richard C. Frucht (2005).

Red List of Plant Taxons, Animal Taxons (Mammals) of the Republic of Croatia  
E.Draganovic – State Institute for Nature Conservation (1994) ISBN:9539606829  
(nhbs.com)

Bradt Wildlife Guide: Central and Eastern European Wildlife: A Visitor's Guide  
Gerard Gorman – (2008) ISBN-13: 9781841622316  
(nhbs.com)

The Status and Distribution of European Mammals – IUCN  
Helen Temple – (2007) ISBN-13: 9789279048159  
(nhbs.com)

RSPB Birds of Britain and Europe  
Rob Hume (2014) RSPB Birds of Britain and Europe  
(nhbs.com)

Adriatic East Coast: Seeing Birds and Experiencing Nature in Historic Landscapes on the  
Mediterranean Coast – EuroNatur Travel Guide.  
Martin Schneider-Jacoby – (2012) ISBN-13: 9783000359521  
(nhbs.com)

Field Guide to the Amphibians & Reptiles of Britain and Europe  
Jeroen Speybroeck – (2016) ISBN-13: 9781408154595  
(nhbs.com)

British & European Wild Flowers: Identification Guide  
Pamela Forey (2007) ISBN-13: 9781844518401  
(nhbs.com)

Flowers of Greece and the Balkans: A Field Guide  
Oleg Polunin (1987) ISBN-10: 0192819984  
(2nd hand from Amazon)

The Northern Adriatic Ecosystem: Deep Time in a Shallow Sea  
Frank McKinney (2007) ISBN-13: 9780231132428  
(nhbs.com)

Marine Wildlife of the Mediterranean  
Eric Ballesteros (2015) ISBN-13: 9788415885276  
(nhbs.com)