



Cranedale Centre
Supporting the Edexcel International GCSE Biology Syllabus



Our objective is to make our International GCSE field courses a richly rewarding experience for students; stimulating their biological awareness, developing enquiring minds and inspiring students to widen their ecological experience both during and after the course.

The Edexcel International GCSE Biology specification offers many exciting new opportunities and challenges for biology students. To meet this challenge the Cranedale Centre has developed many new field studies units for students working towards this course.

Much of the required content from Section 3; *Reproduction and Inheritance*, Section 4; *Ecology and the Environment* and Section 5; *Use of biological resources* can be covered in a field trip to the Cranedale Centre. Please note however that we are also able to tailor and shape a course to your specific needs, choices and course duration. Inevitably the key decision will not be what to include, but what to leave out!



Below is a selection of possible fieldwork activities offered by the Cranedale Centre; the corresponding syllabus links to each fieldwork activity can also be found below.

Aquaculture

Aquaculture has now overtaken ocean fisheries of supplying fish as a source of protein for human consumption. Students visit a local trout and watercress farm and identify the methods used to farm large numbers of fish, how disease is controlled, maintenance of water quality and inter/intra-specific predation of rainbow trout. Students measure a range of abiotic variables including oxygen concentration, nitrate, pH, turbidity, conductivity and temperature of the water both upstream and downstream to assess environmental impacts of the fish farm and can also ask the farmer additional questions on selective breeding, fish growth rates and frequency of feeding.

Agricultural Energetics

Energy transfer in natural ecosystems amounts to around 10% between trophic levels, but what about an agricultural ecosystem? Students calculate and contrast the net productivity of indoor commercial breed pigs and outdoor rare breed pigs. The farming practices that are designed to increase productivity (increasing efficiency of energy transfer and reducing respiratory losses) are quantified and calculated. Students also use observations of the characteristics of the pig herd to interpret and predict the results of a monohybrid cross. Students are also able to investigate the effectiveness of a range of methods for controlling crop pests and diseases.

Impact of Farming

The impacts of farming are explored by students through visiting a mixed farm under Higher Level Environmental Stewardship on the Yorkshire Wolds. Students discuss selective breeding and engage in activities surrounding selective breeding whilst coming face-to-face with the English Longhorn, a rare breed of cattle. A farm tour helps to map elements of the Nitrogen Cycle and transects are conducted on nitrogen-sensitive lichens. Investigations into crop yields can take place during the summer and students will assess the leaching of natural and artificial fertilisers into freshwater streams by testing for nitrate using a colorimeter. Kick sampling with nets is also carried out to identify species that are biological indicators of freshwater pollution.

Freshwater Energetics

The myriad freshwater life allows students to investigate the complexities of food web interactions and to quantify the efficiency of energy transfer within an aquatic community. Students conduct kick sampling with D-nets at a local calciferous stream to capture and identify and count populations of all species using hand-lenses and dichotomous keys in order to build a pyramid of energy. Students also measure a range of abiotic variables including dissolved oxygen concentration, temperature, pH, turbidity, conductivity and nitrate and relate the findings to impacts upon different trophic levels within the food web.



Freshwater Pollution

Chalk streams are globally rare habitats. Renowned for their pristine water quality and fragility they are becoming increasingly threatened by human activity. Pocklington Beck exhibits areas of superb biological richness as well as the impact of sewage treatment and agricultural leaching. Students assess the impact of the distribution of aquatic organisms within the stream environment to assess the consequences of pollution. Students visit and kick sample control and polluted stream sites, identifying pollution-indicator species using hand-lenses and dichotomous keys. Abiotic variables are also measured including oxygen, heavy metals, ammonium, nitrate and phosphate for eutrophication, as well as temperature, pH, turbidity and conductivity.

Marine Energetics

Filey Brigg (SSSI) is a biologically rich rocky shore environment which provides a dramatic and engaging ecosystem for fieldwork. Students place random quadrats within the inter-tidal zone and quantify the biomass of all organisms found whilst observing both anatomical and behavioural adaptations. Students use their own primary data to construct a pyramid of biomass and energy.

Rocky Shore Ecology

The peninsula of Filey Brigg (SSSI) has tremendous opportunities for students to compare two shores with contrasting wave powers. Students participate in classic fieldwork techniques such as belt transects and random sampling with quadrats and can investigate differences in the morphology and population of limpets and the effect of desiccation on seaweed. Students use refractometers for seawater salinity, anemometers for wind speed and a site-specific wave height chart. Finally, students draw conclusions to explain the distribution of organisms on the rocky shore with relation to measured biotic and abiotic variables.

Woodland Ecosystems

Woodlands provide a range of opportunities to explore elements of the carbon cycle. Using atmospheric CO₂ meters and tree measurements students quantify the mass of carbon stored within coniferous and deciduous woodlands. Students also measure a range of soil and invertebrate variables to assess rates of decomposition and recycling of carbon. Microclimate variables are also investigated by the students, who are then challenged to make informed conclusions relating to the sustainable management of woodlands, both as a means of mitigating global warming as well as balancing the conflicts between human needs and conservation.



Evening Activities

Whilst evening activities can involve analysing and presenting data collected during the day's fieldwork, students also have the option instead to experience alternative activities which complement the International GCSE course. The following evening activities are:

Setting Traps

Setting humane traps including Longworth and camera for mammals, Heath traps for moths and pitfall traps for invertebrates equips students with a wide range of knowledge on equipment and techniques to monitor species populations. They are able to safely and ethically use organisms for study, hypothesise upon the effect of differing abiotic/biotic factors that affect species distribution and evaluate the limitations of each trapping method.

Bat Walk

Students are able to use specialist ICT equipment and software that collects and logs bats' ultrasonic calls. Using GPS to track the position of each bat sightings, calls are automatically interpreted and species identified whilst they explore different habitat areas and local roost sites.

Owl Pellet Dissection

Using light microscopes, students dissect barn owl pellets to help illustrate the relationship between predators and prey. The anatomical, behavioural and physiological adaptations which enable barn owls to capture prey are also observed.



Aquaculture

5.9 explain the methods used to farm large numbers of fish to provide a source of protein, including maintenance of water quality, control of disease, removal of waste products, quality and frequency of feeding and the use of selective breeding

Section 5 b) Selective breeding

5.11 understand that animals with desired characteristics can be developed by selective breeding

Agricultural Energetics

Section 5 a) Food Production

5.3 understand the use of fertiliser to increase crop yield

5.4 understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants

Section 5 b) Selective breeding

5.11 understand that animals with desired characteristics can be developed by selective breeding

Impact of Farming

Section 4 d) Human influences on the environment

4.10 describe the stages in the nitrogen cycle, including the roles of nitrogen fixing bacteria, decomposers, nitrifying bacteria and denitrifying bacteria

4.15 understand the biological consequences of pollution of water by sewage, including increases in the number of micro-organisms causing depletion of oxygen

4.16 understand that eutrophication can result from leached minerals from fertiliser

Section 5 a) Food Production

5.3 understand the use of fertiliser to increase crop yield*

5.4 understand the reasons for pest control and the advantages and disadvantages of using pesticides and biological control with crop plants*

Section 5 b) Selective breeding

5.10 understand that plants with desired characteristics can be developed by selective breeding

5.11 understand that animals with desired characteristics can be developed by selective breeding

**summer only*



Freshwater Energetics

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

4.3 explain how quadrats can be used to sample the distribution of organisms within a habitat

Section 4 b) Feeding relationships

4.4 explain the names given to different trophic levels to include producers, primary, secondary and tertiary consumers and decomposers

4.5 understand the concepts of food chains, food webs, pyramids of numbers, biomass and energy transfer

4.6 understand the transfer of substances and of energy along a food chain

4.7 explain why only 10% of energy is transferred from one trophic level to another

Freshwater Pollution

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

4.3 explain how quadrats can be used to sample the distribution of organisms within a habitat

Section 4 d) Human influences on the environment

4.10 describe the stages in the nitrogen cycle, including the roles of nitrogen fixing bacteria, decomposers, nitrifying bacteria and denitrifying bacteria

4.15 understand the biological consequences of pollution of water by sewage, including increases in the number of micro-organisms causing depletion of oxygen

4.16 understand that eutrophication can result from leached minerals from fertiliser

Marine Energetics

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

4.3 explain how quadrats can be used to sample the distribution of organisms within a habitat

Section 4 b) Feeding relationships

4.4 explain the names given to different trophic levels to include producers, primary, secondary and tertiary consumers and decomposers

4.5 understand the concepts of food chains, food webs, pyramids of numbers, biomass and energy transfer

4.6 understand the transfer of substances and of energy along a food chain

4.7 explain why only 10% of energy is transferred from one trophic level to another



Rocky Shore Ecology

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

4.2 explain how quadrats can be used to estimate the population size of an organism in two different areas

4.3 explain how quadrats can be used to sample the distribution of organisms within a habitat

Woodland Ecosystems

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

4.2 explain how quadrats can be used to estimate the population size of an organism in two different areas

4.3 explain how quadrats can be used to sample the distribution of organisms within a habitat

Section 4 d) Human influences on the environment

4.13 understand how human activities contribute to greenhouse gases

4.14 understand how an increase in greenhouse gases results in an enhanced greenhouse effect and that this may lead to global warming and its consequences

4.17 understand the effects of deforestation, including leaching, soil erosion, disturbance of the water cycle and of the balance in atmospheric oxygen and carbon dioxide

Setting Traps

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

Bat Walk

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem

Owl Pellet Dissection

Section 4 a) The organism in the environment

4.1 understand the terms population, community, habitat and ecosystem