



Department
for Education

Natural history GCSE

Proposed subject content

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The content for GCSE natural history

Introduction

1. This document sets out the subject aims and content coverage required for GCSEs in natural history. The GCSE subject content sets out the knowledge, understanding and skills common to all GCSE specifications in a given subject. Together with the assessment objectives, it provides the framework within which awarding organisations create the detail of their specifications, so ensuring the possibilities of progression into further academic and vocational study, training or employment.

Subject aims

2. GCSE specifications in natural history should provide a knowledge-rich, coherent, and worthwhile course of study.
3. GCSE specifications in natural history should give students the opportunity to:
 - demonstrate substantial knowledge of the natural world and understand the importance of looking after it
 - demonstrate knowledge and understanding of the range of habitats found in the UK and some of the species typically found in each habitat
 - build on knowledge of the wildlife in the UK gained in the classroom, through the study of real plants and animals *in situ*
 - demonstrate knowledge and practice in natural history fieldwork, the tools needed, the approach to record keeping and analysis skills and use this in the detailed study of specific organisms and the contexts in which they live, including habitat types
 - demonstrate knowledge of a range of human influences on the natural world to understand the implications for habitats, ecosystems, organisms and species, as well as how the natural world can be preserved and supported
 - understand that climate change is a natural and human accelerated phenomenon, demonstrating knowledge of the impact on the natural environment and the measures that can be taken to manage and mitigate these impacts
 - demonstrate knowledge of the global dynamic and important relationships between species, through study of migrations, introductions and invasions.

Subject content

4. GCSE specifications in natural history should reflect the aims and objectives outlined above and must include the knowledge, understanding and skills listed below, giving due consideration to the assessment objectives. The subject content outlined here provides the framework for developing a coherent study programme at GCSE. GCSE specifications must require students to extend the knowledge of the natural world acquired at key stage 3 of the national curriculum, to gain knowledge of classification and taxonomy and enable them to identify plants, animals and fungi found in the UK, both native and alien (non-native, including invasive).
5. Specifications must provide opportunities for students to develop and reinforce their knowledge through fieldwork, which should equip them with a sufficient understanding of the tools needed, along with appropriate approaches to record keeping and analysis, so that students can undertake research of specific organisms in their natural habitats.
6. The mathematical techniques required for this GCSE are included in Appendix 1. In order to develop their skills, knowledge and understanding in natural history, students must develop the ability to select and use appropriate mathematical processes.

Knowledge and understanding

Habitats and wildlife in the UK

7. GCSE specifications in natural history must require students to know and understand the main groupings and characteristics of each of the following wildlife groupings generally, as well as each of the specified sub-groupings: **invertebrates** (including insects, arachnids, crustaceans, molluscs, and worms), **vertebrates** (including mammals, birds, amphibians, reptiles, and fish), **flowering and non-flowering plants** (including vascular plants, trees, ferns, bryophytes), **lichens and fungi**. Awarding organisations must select an appropriate number of characteristics to effectively distinguish between each of the groupings. See Appendix 2 and Section 8 for further coverage requirements.
8. GCSE specifications in natural history must require students to know and understand the key characteristics of the main habitats¹ of the UK (see Section 10 for more detail):

¹ There are a range of possible habitat classifications. For ease of access by schools and colleges, the habitat groupings chosen for the natural history criteria have been based on classifications from the BBC/Open University co-produced Wild Isles work, 2023 (<https://connect.open.ac.uk/wildisles>). Note that the definition of marine here includes cliffs, rocky shores, sand and shingle beaches, sand dunes, mud flats, salt marshes and machair (coastal species-rich grassland).

- Urban
- Freshwater
- Woodland
- Grassland
- Farmland
- Marine

Awarding organisations are actively encouraged to identify their own focuses of study for each habitat. Appendix 3 provides further detail on habitat coverage requirements².

9. Students must know and understand how indicator species can provide information on the condition of a habitat. This includes the importance, and use of, biodiversity as an indicator of habitat quality.
10. Students must know and understand the following for each of the habitat groupings listed above:
 - what the habitat is, its key features, recognising and describing key habitats of the UK
 - how the habitat is formed (e.g. a combination of underlying rock and soil), its distinct vegetation and dependent animal life. (Farmland and Urban groupings excluded)
 - be able to identify some of the wildlife and species typically found in each habitat using a taxonomic key(s) (not limited to the illustrative examples given in Appendix 2)
 - at least 4 examples of wildlife typically found in each habitat and their niche in that habitat (see Appendix 2, note: niche is limited to biotic interactions of predation/prey and competition)
 - the interdependencies between different species in that habitat.
11. GCSE specifications in natural history must require students to know and understand how habitats in general form, and how changes on Earth have affected wildlife as follows:
 - how habitats form and naturally change over time and understanding of:
 - the role of pioneer species
 - stages of succession up to a climax community³
 - that the sustainable functioning of a habitat requires complex and balanced interplay between all the components of the habitat and that a change to any component can change the habitat significantly

² Specifications must include what the focus of study will be for each habitat from that list, e.g. for marine they may choose sand dunes.

³ An ecological community in which populations of plants or animals remain stable and exist in balance with each other and their environment.

- the complex interactions between habitats – mosaic habitats⁴, spatiotemporal heterogeneity⁵ and implications for biodiversity of habitats
- interconnectedness of species in a functioning system
- how wildlife adapts to seasonal changes, including migratory behaviours and factors, as follows:
 - day length
 - temperature
 - food supply
 - canopy shade
 - weather patterns
- the response of wildlife to climate change as a result of (human and natural factors).

12. GCSE specifications in natural history must require students to know and understand how the landscape of the UK and the wildlife in it has changed over time from prehistoric to modern times as follows:

- how fossil and pollen records can be used to understand what wildlife and habitats looked like over long periods of geological time, including how the fossil record and wildlife observation can provide evidence for evolution of species
- knowledge of glacial–interglacial cycles including the most recent glacial period, the Devensian
- the causes and effects of species extinctions (including competition, habitat destruction, changes to climate, hunting), and evidence for large scale species extinctions in the past and present. This includes understanding that extinction can be a natural phenomenon, but can also be caused by human activity and understanding of the impact of coextinction (e.g. when keystone species become extinct)
- understanding that pre-historic oxygen levels, CO₂ levels and climate were markedly different from those today and how those variations contributed to a different scale of life. (For example, the size of pre-historic insects compared to modern day equivalents linked to different oxygen levels in the past).

Human influence on the natural world

13. GCSE specifications in natural history must require students to know and understand the effect of human activities on wildlife and habitats and how the natural world can be preserved and supported. Students must develop a general understanding of:

⁴ Mosaic habitats – complexes of habitat types within a wider habitat area, largely unable to individually tease out from each other – for example complexes of wet/dry heathland interspersed with acid grassland.

⁵ Spatiotemporal heterogeneity – complexes of habitat types which change over time, providing a range of features such as structure, fruiting, and flowering diversity which benefit biodiversity in an area through their complexity.

- the effect on wildlife of the following activities:
 - urbanisation and urban planning
 - gardening practices
 - farming practice (e.g. use of pesticides and herbicides, fertiliser, grazing, regenerative)
 - fishing practice (e.g. bottom trawling, mussel farming)
 - afforestation and deforestation
- how indicator species (and biodiversity) can provide information about the impact of different practices on wildlife and habitats
- how habitats can be managed, directly preserving wildlife and approaches to conservation (marine, nature reserves, national parks, zoos and Sites of Special Scientific Interest (SSSIs)). This must include:
 - species and habitat protection/reintroduction
 - effects of introducing non-native species
 - methods of controlling invasive species
- how museum collections and biodiversity records can be used to understand species and habitats
- how other human activities in the UK can be used to preserve, improve and support the natural world and improve biodiversity (e.g. reduced mowing of roadside verges, bug hotels, hedgehog highways, wildlife-friendly gardens, bird feeders, seed preservation).

Fieldwork

14. Time outside of the classroom is an essential element of the study of natural history, giving students the opportunity to consolidate and extend their learning beyond the classroom. Specifications must require that fieldwork takes place outside the classroom.
15. Specifications must allow schools to choose location(s) for fieldwork based on their own local contexts and circumstances, as long as students are able to meet specification requirements. While schools may consider locations in their local areas and further afield, we also encourage schools to consider using school grounds as a location for fieldwork study.
16. As part of the fieldwork, students must be given the opportunity to observe, engage and relate with the natural world (nature connectedness).
17. Awarding organisations must require evidence of this fieldwork being carried out, and the opportunity for students to reflect on their connection with nature. Evidence should

be in the form of a written statement from centres, providing the date(s) and locations(s) for fieldwork carried out.

18. Throughout the duration of the course, students' fieldwork experience in total should cover at least 20 hours of activity. The 20 hours is the minimum fieldwork time for students to develop fieldwork skills which will be assessed indirectly in exams.
19. To allow for different and valid approaches to fieldwork, centres may cover the fieldwork requirement through the study of one, or more, habitats. Centres can choose how they plan their approach to the fieldwork. Examples of approach are below:

Fieldwork approach	Example of activities to meet the total 20-hour requirement
Range of habitats	Time outdoors during regular timetabled lessons to study a range of different habitats over a period of time [20 hours]. Time outdoors during regular timetabled lessons to study 3 different habitats over a period of time [e.g. 15 hours] with one other habitat covered through a specific trip to e.g. a local nature reserve [e.g. 5 hours]. Time outdoors during regular timetabled lessons to study different habitats over a period of time [e.g. 10 hours]. Students carry out fieldwork outside of a timetabled lesson over several occasions in an environment of their choice e.g. a butterfly count near their home environment [e.g. 10 hours].
One habitat	Time outdoors during regular timetabled lessons to study a specific habitat outdoors over a period of time, e.g. during different seasons [20 hours].

This is a non-exhaustive list of examples. It is designed to provide centres with ideas on how they can meet the fieldwork requirement within their centre and encourage nature connectedness.

20. Specifications must require students to be able to demonstrate understanding of the following range of knowledge, and practical and research skills, developed as part of fieldwork in natural history:
- the ability to develop a plan to study an organism/s or habitat/s
 - appropriate sample sizes

- classification systems
- biological records, including the critical elements of every biological record (who, what, where, and when)
- primary and secondary sources of information and appropriate recording of the sources used
- document and record evidence collected in the field, e.g. through use of illustration, photographic/film portfolios, wildlife journaling/field notebooks
- collating, analysing and explaining data gathered in the field
 - interpretation of visual imagery (photographs, diagrams)
 - ability to analyse written and visual interpretations of the natural world
 - ability to analyse and interpret data/statistics on the natural world
- appropriate digital technology to support species identification/analysis
- the ability to select an appropriate range of observational techniques which are safe, legal, ethical and minimally disruptive, and allow accurate and comprehensive observation and collection of data
- safe use of techniques for monitoring/detecting organisms
- indirect evidence, e.g. animal tracks, landscape analysis
- the range of techniques, equipment and methods used in fieldwork, including practical management of observation, and undertaking systematic data collection
- emerging technologies such as remote sensing and eDNA
- presentation methods of research findings
- methods for preservation/recording/cataloguing/curation of specimens (limited to plant specimens at a practical level)
- drawing evidenced conclusions and summaries from fieldwork notes and data
- the benefits of sharing observational data about wildlife and nature, and the importance of data verification (citizen science).

Appendix 1: Use of mathematics and statistics in natural history

The list below outlines the range and extent of mathematical and statistical techniques considered appropriate to the study and practice of natural history at GCSE. Students will apply their knowledge and understanding of these techniques to, for example, the data collected during fieldwork. This will support the development of their capacity in analysis and evaluation.

Numerical skills

- Demonstrate an understanding of number, area and scale and the quantitative relationships between units
- Use of approximation
- Collect data with an understanding of accuracy, appropriate sample sizes and control groups
- Draw informed conclusions from numerical data.

Statistical skills

- Calculate percentage increase and percentage decrease and understand the use of percentiles
- Use and understanding of median, mean, range, quartiles and mode
- Describe relationships in bivariate data: sketch trend lines through scatter plots; draw estimated lines of best fit; make predictions; interpolate and extrapolate trends
- Select appropriate methods for gathering and analysing data; relate data to observation objectives, describe and interpret data
- Be able to identify problems which can affect data gathering protocols and problems of selective presentation of data.

Graphical skills

- Select and construct appropriate graphs and charts to present data, using appropriate scales and including bar charts, pie charts, pictograms, line charts and histograms with equal line intervals
- Interpret and extract information from different types of graphs and charts including any of the above.

Appendix 2: Examples of wildlife typically found for each habitat

Students must study at least 4 species for each habitat found in the UK (whilst also recognising that some of these may be found outside of the UK).

Taken together, across all the defined habitats, there must be a representative species example from each of the following (each habitat does not need to cover all the below):

1. Insect
2. Arachnid
3. Crustacean
4. Mollusc
5. Worm
6. Mammal
7. Bird
8. Amphibian
9. Reptile
10. Fish
11. Flowering plant
12. Tree
13. Fern
14. Fungi
15. Bryophytes
16. Lichens

The species chosen must align with the precise focus of study that the awarding organisation has chosen for each habitat (see Appendix 3, for example if streams was chosen as the focus of study for 'Freshwater', the species chosen must be typically found in and around streams).

The list below is **illustrative** and contains more examples than the 4 species required, to demonstrate what could be covered. Awarding organisations can create their own list, for each habitat provided. Scientific nomenclature is provided for accuracy only, not required knowledge.

This list contains examples of wildlife found in the habitat. Not all species are exclusive to a particular habitat.

Urban

- Bindweed (*Convolvulus arvensis*)
- Common Blackbird (*Turdus merula*)

- Common Daisy (*Bellis perennis*)
- Common House Spider (*Tegenaria domestica*)
- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Dandelion (*Taraxacum officinale* agg.)
- Eastern Grey Squirrel (*Sciurus carolinensis*)
- Elephant Hawk Moth (*Deilephila elpenor*)
- European Robin (*Erithacus rubecula*)
- Garden Snail (*Cornu aspersum*)
- Hedgehog (*Erinaceus europaeus*)
- Muntjac (*Muntiacus reevesi*)
- Red Fox (*Vulpes vulpes*)
- Ribwort Plantain (*Plantago lanceolata*)
- Seven-spot Ladybird (*Coccinella septempunctata*)
- Silverfish (*Lepisma saccharina*)
- Stinging Nettle (*Urtica dioica*)
- Sycamore (*Acer pseudoplatanus*)
- Wall Screwmoss (*Tortula muralis*)
- Yellow Wall Lichen (*Xanthoria parietina*)

Freshwater

- Cased caddisfly species (larvae) [e.g. Two-spotted Great Reed Sedge Caddisfly (*Phryganea bipunctata*)]
- Common Blue Damselfly (*Enallagma cyathigerum*) (adult and larvae)
- Common Carp (*Cyprinus carpio*)
- Common Backswimmer (*Notonecta glauca*)
- Common Frog (*Rana temporaria*)
- Common Pond Skater (*Gerris lacustris*)
- Common Reed (*Phragmites australis*)
- Emperor Dragonfly (*Anax imperator*) (adult and larvae)
- Freshwater shrimp species [e.g. American Freshwater Shrimp (*Crangonyx pseudogracilis*)]
- Frogbit (*Hydrocharis morsus-ranae*)
- Great Pond Snail (*Lymnaea stagnalis*)
- Great Ramshorn Snail (*Planorbis corneus*)
- Greater Water Moss (*Fontinalis antipyretica*)
- Grey Heron (*Ardea cinerea*)
- Northern Pike (*Esox lucius*)
- Osprey (*Pandion haliaetus*)
- River Freshwater Shrimp (*Gammarus pulex*)
- Smooth Newt (*Lissotriton vulgaris*)
- Three-spined Stickleback (*Gasterosteus aculeatus*)

- Water boatmen species [particularly Lesser (*Corixa punctata*)]
- Water Scorpion (*Nepa cinerea*)
- White Willow (*Salix alba*)

Woodland

- Ash (*Fraxinus excelsior*)
- Bracken (*Pteridium aquilinum*)
- Brown Centipede (*Lithobius forficatus*)
- Chicken of the Woods Fungus (*Laetiporus sulphureus*)
- Common Wasp (*Vespula vulgaris*) (NB – ‘yellow jacket’ refers to two genera of wasp in the UK, it is not a UK term)
- Common Wood Pigeon (*Columba palumbus*)
- English Bluebell (*Hyacinthoides non-scripta*)
- European Badger (*Meles meles*)
- Foxglove (*Digitalis purpurea*)
- Goshawk (*Accipiter gentilis*)
- Hart’s Tongue Fern (*Asplenium scolopendrium*)
- Jay (*Garrulus glandarius*)
- Oakmoss (*Evernia prunastri*)
- Stoat (*Mustela erminea*)
- Treecreeper (*Certhia familiaris*)
- Wild Garlic (*Allium ursinum*)
- Wood Anemone (*Anemonoides nemorosa*)
- Wood Bristle-moss (*Lewinskya affinis*)

Grassland

- Common Blue Butterfly (*Polyommatus icarus*)
- Common Eyebright (*Euphrasia officinalis*)
- Common Green Grasshopper (*Omocestus viridulus*)
- Common Starling (*Sturnus vulgaris*)
- Creeping Bent (*Agrostis stolonifera*)
- Curlew (*Numenius arquata*)
- European Mole (*Talpa europaea*)
- Grass Snake (*Natrix natrix*)
- Green Woodpecker (*Picus viridis*)
- Red Admiral (*Vanessa atalanta*)
- Rough-stalked Feather-moss (*Brachythecium rutabulum*)
- Spear Thistle (*Cirsium vulgare*)
- Tawny Owl (*Strix aluco*)
- Thick-legged Flower Beetle (*Oedemera nobilis*)

- Yorkshire Fog (*Holcus lanatus*)

Farmland

- Blackthorn (*Prunus spinosa*)
- Brown Hare (*Lepus europaeus*)
- Buff-tailed Bumblebee (*Bombus terrestris*)
- Common Buzzard (*Buteo buteo*)
- Common Earthworm (*Lumbricus terrestris*)
- Common Poppy (*Papaver rhoeas*)
- Dog Rose (*Rosa canina*)
- Eurasian Skylark (*Alauda arvensis*)
- Hawthorn (*Crataegus monogyna*)
- Lapwing (*Vanellus vanellus*)
- Marmalade Hoverfly (*Episyrphus balteatus*)
- Springy Turf-moss (*Rhytidiadelphus squarrosus*)
- Weasel (*Mustela nivalis*)
- Wood Mouse (*Apodemus sylvaticus*)

Marine/Coastal

- Beadlet Anemone (*Actinia equina*)
- Bladderwrack (*Fucus vesiculosus*)
- Common Limpet (*Patella vulgata*)
- Common Rock Barnacle (*Semibalanus balanoides*)
- Common Starfish (*Asterias rubens*)
- Dilated Scalewort (*Frullania dilatata*)
- European Herring Gull (*Larus argentatus*)
- Gannet (*Morus bassanus*)
- Grey Seal (*Halichoerus grypus*)
- Kittiwake (*Rissa tridactyla*)
- Long-snouted Seahorse (*Hippocampus guttulatus*)
- Marram Grass (*Ammophila arenaria*)
- Puffin (*Fratercula arctica*)
- Sea grass species [e.g. Common Eelgrass (*Zostera marina*)]
- Sea Kale (*Crambe maritima*)
- Shore Crab (*Carcinus maenas*)
- Sugar Kelp (*Saccharina latissima*)

Appendix 3: Habitat coverage requirements

Students must study each habitat listed below (1 to 6).

Awarding organisations must define the focus of study for each habitat. There must be at least one area of focus for each habitat, and that focus can be from the illustrative list below or chosen by the awarding organisation.

The options for focus of study list below are illustrative. Awarding organisations can create their own focus of study for each habitat.

Habitat	Illustrative options for focus of study for each habitat
1. Urban	• Housing estate • Gardens • Parks • Paved areas • Sports grounds
2. Freshwater	• Canals • Fens • Lakes • Ponds • Rivers • Streams
3. Woodland	• Ancient woodland • Broadleaved woodland • Plantations • Temperate rainforest
4. Grassland	• Heathland • Unimproved grassland • Wildflower meadows
5. Farmland	• Arable fields • Field margins • Hedgerows • Orchards
6. Marine	• Coastal cliffs • Mud flats • Sand dunes • Salt marshes • Seagrass meadows



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