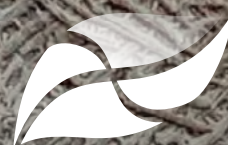


# Scottish Fossil Code



**NatureScot**  
**NàdarAlba**

Scotland's Nature Agency  
Buidheann Nàdair na h-Alba

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# FOREWORD



Scotland's nature is defined as including biodiversity, geodiversity and the natural elements of our landscapes and seascapes. Our fossil resources, some of which date back well over a billion years, can be thought of as our ancient nature providing glimpses into past environments, their plants, and the lives lived by the animals of times long gone. The extraordinary fossil heritage tells the story of evolution – how life evolved and adapted to changing environmental conditions and how ecosystems grew, responded or disappeared. Today, our understanding of what the fossil heritage has to tell us can help us anticipate how life will change and adapt as we face the twin challenges of climate change and biodiversity loss.

Scotland is the home to a remarkable and diverse fossil heritage. One of the jewels in the crown are 407 million year old fossil remains of the world's oldest known complete terrestrial wetland ecosystem at Rhynie in Aberdeenshire. Perfect preservation of the Rhynie plants and early animals, to the cellular level, allow us for example to learn about the adaptation of plants to high atmospheric levels of CO<sub>2</sub>. Another globally important asset is the Middle Jurassic vertebrate fossils of Skye, that are incredibly rare elsewhere in the world, and help inform thinking on the evolution of our mammal ancestors and iconic dinosaurs.

As the fossil heritage is vulnerable to abuse and damage, such nationally and internationally important sites have statutory protection. The Skye Nature Conservation Order (2019) provides additional protection for globally important fossil localities on Skye. However, additional approaches are required to ensure that our fossil heritage, wherever it occurs, including fossil collections, is safeguarded and managed appropriately to ensure its survival for future generations. Hence, provision for Scottish Natural Heritage (now known as NatureScot) to prepare the Scottish Fossil Code is included in the Nature Conservation (Scotland) Act 2004. The Code, which was first published in 2008, aims to provide guidance for those who have an involvement in the owning, collection and care of Scottish fossils.

The Code recognises the challenges faced in the conservation management of our globally significant fossil resource to ensure its continuing and sustainable use for scientific, educational and recreational purposes. The Code applies to all those with an interest in fossils, whatever it may be. From owners of fossil localities, to collectors for research or recreational purposes, to those with a commercial interest, and to everyone who promotes and celebrates our fossil heritage. The Code encourages all of these groups to have a role looking after Scotland's fossil heritage and chimes with Scotland's Geodiversity Charter, which encourages the wise management and promotion of Scotland's globally important geodiversity.

The Code, revised to adopt a more pragmatic and impactful approach, may be thought of as a 'can-do' document. I hope it will encourage the responsible utilisation and enjoyment of Scotland's fossil heritage. The Code's guidance should empower continuation of the Scottish amateur fossil collector tradition which

includes in its roll call famous 19th century collectors such as Hugh Miller and lesser known but important collectors including Elizabeth Gray, who made a substantial contribution to palaeontological research in the 20th century. Much remains to be discovered both in terms of actual fossil finds and interpretation of what they can inform us about our journey from the past into the future. The Code will not only encourage and enable responsible discovery it will lead to enhanced public interest in the fossil heritage of Scotland for generations to come.

I celebrate the re-publication of the Scottish Fossil Code and hope that it will continue to encourage responsible utilisation of a world-class resource that is an intrinsic part of Scotland's nature. I encourage everyone with an interest in fossils to support the guidance it contains.

A handwritten signature in dark ink, reading "Lorna Slater". The signature is written in a cursive, flowing style with a large initial 'L'.

**Lorna Slater MSP**  
**Minister for Green Skills, Circular Economy and Biodiversity**  
**Scottish Government**

# PREFACE

Scotland is recognised in the global context for its rich, diverse and highly significant fossil heritage. This geological aspect of Scotland's nature is our record of past life and environments on planet Earth and it helps us to understand the rapidly changing world that we live in today. New fossil finds are constantly being made in Scotland that help to fill the gaps in our understanding of the evolution of life on Earth.

Scotland's fossil heritage is an irreplaceable and non-renewable resource that has been millions of years in the making. Consequently, if not properly looked after and managed, aspects of it may be susceptible to damage and destruction through factors including irresponsible collecting and the neglect of collected specimens. In recognition of this the Nature Conservation (Scotland) Act 2004 required Scottish Natural Heritage, now known as NatureScot, to prepare the Scottish Fossil Code. The requirement acknowledges the value and vulnerability of Scotland's fossil heritage and that legislative measures alone cannot entirely safeguard it.

The Code provides essential information on the nature of Scotland's fossil heritage and the need for its appropriate management and safeguard. It is aimed at everyone with an interest and involvement in the fossil heritage and outlines the roles and responsibilities of those that own and utilise palaeontological resources. It therefore applies to owners and managers of fossil localities and those that collect, study and curate fossils including palaeontological research scientists, recreational collectors and those with a commercial interest.

The Code recognises that seeking out and collecting fossils is an essential activity providing the raw material and data for the science of palaeontology as well as being an educational and recreational hobby. It therefore provides information, advice and best practice recommendations concerning the responsible collection of fossil specimens in Scotland, irrespective of where they occur, with the objective of ensuring that collecting is undertaken responsibly within the law. Just as importantly the Code also provides information and best practice recommendations in the identification, conservation, acquisition, sale, careful storage and donation of specimens. In doing so it aims to ensure that Scotland's fossil-bearing resources and collections are managed in such a way that they will be useful to future generations. As well as benefiting Scotland's fossils, both in collections and that still await discovery, it is hoped that the Scottish Fossil Code will enhance public interest and awareness of Scotland's fossil heritage.



# LEGAL STATUS OF THE CODE AND ADHERENCE EXPECTATIONS

Although established by statute the Code itself is non-statutory. The Code is, therefore, not a law and so the best practice recommendations concerning the collecting and care of fossils is not mandatory. However, the Code provides important information on the legalities of ownership, and the regulations concerning protected fossil localities, which should be taken into consideration if fossil collecting in Scotland.

Whilst setting out the precise legal obligations, the Code aims to be fair and balance the objectives of helping prevent damage to fossil localities and resources whilst not impeding generally harmless and responsible fossil collecting. In this respect, the Code recognises that seeking out details of land and mineral right ownership may be beyond the resources of otherwise responsible and minor-scale collectors.

The Code's pragmatic approach means that judgement and proportionality are important when considering the legal obligations and best practice recommendations. There is an expectation that professional research scientists, recreational collectors with an interest in research, and commercial collectors, attain and adhere to the highest standards concerning the collecting and care of fossil specimens in Scotland.

Due regard of compliance or otherwise with the Code may be given in the consideration of any offences and associated prosecution.



# HOW THE SCOTTISH FOSSIL CODE IS ORGANISED

## Part 1

An introduction to fossils and the fossil heritage of Scotland, outlining their importance and use. The various threats to the fossil heritage are noted together with the means employed to conserve it.



## Part 2

Legal information and advice concerning the ownership, collecting and sale of fossils.



## Part 3

Information and best practice recommendations for the responsible collecting and care of fossils including advice on donating specimens.



## Part 4

Information and best practice recommendations for owners and managers of fossil localities, specialists and other groups with a particular involvement in Scotland's fossil heritage.



## Appendix

Information on museum and other public collections.



# ESSENTIALS OF THE SCOTTISH FOSSIL CODE

## Collector responsibilities:

If collecting fossils in Scotland, please do so responsibly and follow the best practice in the collection and storage of fossil specimens outlined in the Scottish Fossil Code.



## Seek permission

Traditionally common fossils and small geological specimens are collected without permission and hindrance. However, lawfully the right thing to do is to obtain permission to extract, collect and retain fossils.



## Access responsibly

Consult the Scottish Outdoor Access Code prior to accessing land. Be aware that there are restrictions on access and collecting at some locations protected by statute.



## Collect responsibly

Exercise restraint in the amount collected and the equipment used. Be careful not to damage fossils and the fossil resource. Record details of both the location and the rocks from which fossils are collected.



## Seek advice

If you find an exceptional or unusual fossil do not try to extract it; but seek advice from an expert. Also seek help to identify fossils or dispose of an old collection.



## Label and look after

Collected specimens should be labelled and taken good care of.



## Donate

If you are considering donating a fossil or collection choose an accredited museum, or one local to the collection area.



## Owner and land manager responsibilities:

Owners of fossil localities and those that manage the land where they occur have an important role in looking after the fossil resource. Your responsibilities may include ensuring that any fossil collecting taking place on your land follows the best practice guidance set out in the Scottish Fossil Code. This is particularly the case if a fossil locality on your land has statutory protection.







## **PART 1: INTRODUCTION TO SCOTLAND'S FOSSIL HERITAGE AND HOW IT IS USED**

## 1.1 What is a fossil?

Historically, the word 'fossil' was applied to anything dug up out of the ground. Thus, mineral deposits and archaeological relics were referred to as 'fossil'. However, since the early 19th century, the term has become exclusively applied to the remains of ancient life.

Palaeontology is the study of fossils; it may be defined as the study of life forms that existed in past geological periods, as represented by fossilised remains of plants and animals. Geologists, specifically palaeontologists, utilise and study fossils.

For the purposes of the Code the great majority of fossils can be defined simply as 'the remains of, or traces made by, an ancient animal, plant or other organism preserved in rock'. There are basically two types of fossils:

**Body fossils** – representing the whole or parts of an actual animal or plant. The actual original material of the organism, such as shell, bone and wood, may be preserved as it is, or is altered physically and chemically by rock-forming processes (fossilised) to another substance. Even if only an impression or cast of the object is preserved, it is still a fossil.

**Trace fossils** – the evidence of the activity of an organism. These include fossil footprints and trackways made by animals such as dinosaurs and scorpions; burrows made by worms and many other animals; and even fossil excrement (coprolites).

The fossilisation of an organism or its traces is an unlikely process that occurs only in certain geological circumstances. Therefore, all fossils may be regarded as special.

Most fossils that are collected are 'macrofossils', those large enough to be seen without the use of a microscope. However, many sedimentary rocks, especially limestone and shale, contain numerous 'microfossils', some of which are only fractions of a millimetre in length, that require specialist extraction and study techniques. Chalk, for example, consists almost entirely of microfossils.

Objects known as 'pseudofossils' are pieces of rock, or patterns within rock, that superficially resemble an organism. Many pseudofossils are rocks weathered by chance into a shape resembling an organism, or are chemically produced features in rocks, or marks made on rocks by modern organisms. All fossil collectors find objects that may be identified as pseudofossils.

## 1.2 Where fossils are found and collected from

Scotland's land surface is underlain by a complex patchwork of rock types of different ages. Large areas are formed from igneous rocks (derived from molten rock) and metamorphic rocks (rocks altered by heat and pressure) which are normally unfossiliferous. A few fossils occur in rocks associated with volcanic activity, and are preserved in ash, or in some exceptionally rare cases lava. However, nearly half of the 78,000 km<sup>2</sup> land surface of Scotland is underlain by sedimentary rock and it is in these rocks that Scotland's fossil heritage is found.

Sedimentary rocks generally form from the accumulation of layers of sediments such as sand and mud, within a variety of environments such as oceans, tropical seas, rivers, lakes and deserts that have existed through geological time. Fossils are the remains of life that lived in these environments.

Rocks that were originally deposited in marine conditions are generally more fossiliferous than those deposited on land, and limestones are generally more fossiliferous than sandstones. Fossils might in principle be found in any outcrop of sedimentary rock, but the most productive localities, where rock is typically more exposed, are:

- coastal exposures on foreshores;
- natural outcrops associated with streams, rivers and hills; and
- quarries and other man-made exposures.

Some of Scotland's sedimentary rocks of Precambrian age yield fossils, but the majority occur in rocks of Cambrian to Quaternary age. Marine fossils from Carboniferous limestones of the Midland Valley of Scotland are among the most commonly found Scottish fossils. These include brachiopod shells and corals found in locations such as the Fife coast, Ayrshire and East Lothian. Fossils from the Jurassic Period include those of marine animals such as ammonites and belemnites and are reasonably common in certain areas of Skye and the north-east coast of Scotland in the vicinity of Brora and Helmsdale. Fossil fish remains, dating from the Devonian Period are common in some areas of Caithness and Orkney.



The distribution of sedimentary rocks of different ages is shown on geological maps, and descriptions of fossil localities may be given in some geological field guides. Information is also available through websites and museums. Providing specific advice on localities where fossils may be collected is beyond the statutory direction given to prepare this Code. Geodiversity Conservation Groups and Geological Societies may be able to offer advice and recommendations on where fossils may be found in your local area. Advice may be available on-line posted by groups and commercial organisations. However, care should be taken to ensure that following advice and recommendations, from such sources, is not at odds with the best practice recommendations outlined in this Code.

NatureScot owns Achanarras Quarry in Caithness where the opportunity to collect fossils is available to all provided the on-site guidance is adhered to and any fossils that are collected are not sold.

### 1.3 How fossils are preserved and classified

Fossils are preserved in a wide variety of ways. The rock-forming processes, by which most fossils are preserved, can take place gradually over millions of years. This is a continuous process, and the point at which an object becomes a fossil can be the subject of debate based on a number of criteria such as the decay of organic matter, the point at which organic material is replaced by minerals (mineralised), and its age. On rare occasions fossils may be preserved by catastrophic events such as volcanic ash falls.

The process of fossilisation involves initial burial of the object beneath successive layers of sediment. Eventually the object may become buried over a time period, that may span millions of years, tens to thousands of metres below the surface. During burial, processes involving circulating ground water and elevated temperature and pressure, turns the sediment to rock and the object becomes fossilised. In most situations for a buried fossil to be found, the rocks have to go through tectonic uplift and erosion so that the fossil-bearing rock is exposed at the Earth's surface.

Examples of preservation:

**Relatively unaltered** – for example insects preserved in amber.

**Physically altered** – for example shells crushed in shale, fossil fish in Caithness flagstone.

**Chemically altered** – the organic material may be replaced by minerals (petrification), or minerals may fill spaces in the organic structure (permineralization). The internal structure in, for example, shell, wood or bone, may not be preserved if the object is replaced by a new mineral. The most commonly observed examples are the petrification of wood by silica or calcium carbonate, and the replacement of shell material by calcium carbonate (calcite), iron sulphide (pyrite) or silica (for example quartz, flint, or chert).

Fossils are sometimes found within concretions, which are spherical to oval-shaped structures, that develop inside sediments, when they are still soft, before they harden into rock. They form as minerals within a sediment precipitate around a fossil or other nucleus. When a concretion is broken open it can sometimes reveal a fossil which, in the Devonian rocks of the Moray Firth area, can be the remains of fossil fish.

It is important to be able to recognise features of physical and chemical preservation, since these have an important bearing on the methods used to extract and clean the fossil, and may affect the conditions in which it needs to be kept.

The word 'rock' in the above definitions includes not only hard ('lithified') rocks that require a hammer to break them, but also poorly consolidated clays and sands. The remains of animals and trees within peat, soil, and other unconsolidated material, that date from around the time of the last glaciation to fairly recent times, may still be regarded as fossils.

Fossils are classified in the same manner as modern animals, and are scientifically described, and given binomial formal scientific (Latin) names. Thus, *Homo sapiens* is the formal scientific name applied to human beings. Very few fossils have been given common names, hence fossils are generally referred to by their formal scientific names. Most palaeontology textbooks are organised according to biological classification.



#### 1.4 When a fossil is an archaeological find

Although animal and plant remains in peat, soil and other unconsolidated material may be regarded as fossils, when such finds are associated with archaeological sites, they are, for the purposes of this Code considered archaeological finds. They are therefore excluded from the Scottish Fossil Code, even though some processes of fossilisation may have taken place after burial.

Archaeological finds comprise all human artefacts and other objects made or modified by people, including natural objects altered by human action such as bones that had been cut or worked in any way. Archaeological finds are subject to the Crown's right to Treasure Trove and the common law of bona vacantia (the legal name for 'ownerless goods') irrespective of material, age, origin, location or context. They must therefore be reported to the Treasure Trove Unit c/o National Museums Scotland. Doubtful cases must also be reported, as failure to report is an offence.

The Scottish Fossil Code also excludes all human remains, as they have special legal status. These are not 'collectable', cannot be owned as property, and must be treated with the respect afforded them under the law.



## 1.5 The nature of the fossil resource

In general terms Scotland's fossil resource can be regarded as vast. The natural processes of weathering and erosion, such as occur at the coast, and human activities, for example quarrying, continue to reveal new fossil-bearing rocks. Together, these processes provide opportunities for the discovery and collection of fossil material.

A layer of rock that represents and preserves the floor of an ancient sea can provide a huge resource of fossilised marine creatures. However, not all fossil-bearing resources are that extensive. The remains of some ancient environments such as hot springs or lagoons, preserved as localised layers in the rock record are, by their nature, of limited extent. The fossil resource within rocks only accessible in a disused quarry or coastal cliff, where there are low rates of erosion, can also be regarded as limited. There are also many situations where the fossils themselves are naturally rare.

## 1.6 The scientific importance of the fossil heritage

Scotland has a remarkable variety of fossiliferous rocks. In what is a relatively small area, there are fossils representing all the periods of geological time from the Precambrian to the Quaternary, spanning more than 1,200 million years of Earth's history.

Some of the major geological events that shaped Scotland are documented by fossil assemblages. The similarity of Cambrian fossils in the North West Highlands with those in North America show that the two areas were once geographically very close to each other. The fossil record of Ordovician and Silurian marine animals in the Midland Valley of Scotland and the Southern Uplands shows that they were mixing with other populations of marine creatures from opposite sides of a closing ocean, as plate tectonics brought slices of the crust that forms Scotland's foundations together. During ocean closure, sediments from the ocean floor were uplifted and now form the Southern Uplands. An understanding of precisely how and when this occurred, and therefore how the evolution of the Southern Uplands took place, has been achieved partly through the study of fossilised planktonic organisms known as graptolites.



Scottish fossils have, in such ways, played an important role in the interpretation of the succession of changing geographies and environments that existed throughout Scotland's long and varied geological history. Fossils are also used to date rock sequences and enable correlation with other areas of the world allowing Scotland's geological history to be tied into the global story.

Historically, Scotland was at the cutting edge of geology when the science developed in the late 18th and early 19th centuries. The early Scottish geologists James Hutton, Charles Lyell, Roderick Murchison, James Nicol, Hugh Miller and others established basic geological principles based on rocks and fossils from Scottish localities. The fossil collecting activity of Miller and other important fossil hunters, such as Elizabeth Gray, made some of these fossil localities widely known to the general public. These fossil localities are of historical and cultural importance to the world as well as being scientifically valuable.

## 1.7 Scotland's world-class fossil heritage

Scotland has many world-class fossil localities. Examples of exceptional Scottish fossils include:

- Extraordinary Silurian sea scorpions and other arthropods found at Lesmahagow.
- Some of the world's earliest terrestrial arthropods discovered at Stonehaven, Aberdeenshire.
- Perfectly preserved small plants and arthropods in an Early Devonian hot spring deposit at Rhynie, Aberdeenshire, representing the world's earliest and most complete terrestrial wetland ecosystem.
- Middle Devonian fossil fish of Caithness, Orkney, Shetland and the Moray Firth, which lived in a vast freshwater lake that once covered the area.
- Fossilised shrimp-like crustaceans of Lower Carboniferous age, superbly preserved at Gullane, East Lothian.
- The first complete remains of a fish-like organism known as the 'conodont animal'; a formerly enigmatic organism only known by its microscopic teeth, found in Carboniferous rocks at Granton, near Edinburgh.
- One of the most important fossil shark localities in the world found in Carboniferous rocks at Bearsden in Glasgow.
- Stands of Carboniferous fossil tree stumps in Victoria Park, Glasgow, and at Saltcoats on the Ayrshire coast, which are fragments of equatorial coal forests.
- Bones, moulds and trackways of Permian and Triassic reptiles that lived around desert sand dunes in what is now the Elgin area.
- Middle Jurassic dinosaur, pterosaur and mammal remains of Skye.
- Exceptionally well preserved leaves of Palaeogene age on Mull and Skye from trees that were living in a warm climate as the North Atlantic Ocean was opening.
- The remains of animals, including polar bear, in the caves of Assynt, dating from around the time of the last glaciation.

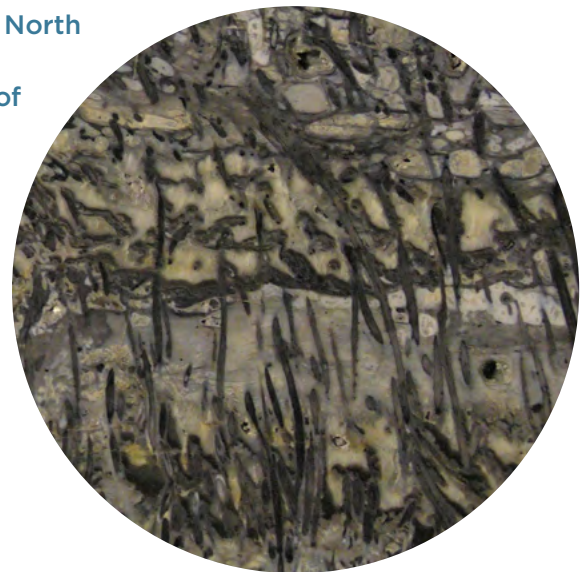
These are just a few of the fossil highlights scattered in space and time through the long geological history of Scotland. All of these locations are of great significance from the perspective of understanding the evolution of life on Earth and in the historical development of geology.

## 1.8 How fossils are used

Scotland's fossil heritage is an important scientific, economic, educational and leisure resource which has a wide range of users including research scientists, students, school pupils, recreational collectors, commercial collectors and the general public.

### 1.8.1 Scientific research and display

Scientific palaeontological research is active in Scotland, involving universities, museums, the British Geological Survey, and recreational collectors. There is little doubt that much fossil material awaits discovery and description in Scotland with new scientific techniques such as CT scanning being utilised to investigate fossil finds. Fossil discoveries are described in scientific journals such as the Scottish Journal of Geology and the Earth and Environmental Science Transactions of the Royal Society of Edinburgh, and particularly spectacular finds are frequently reported in the media. On behalf of the public, museums collect and purchase fossils for research and display.



## 1.8.2 Education

Fossils are used in teaching from primary school to postgraduate education and lifelong learning. Schools, colleges, universities and museums all have roles to play in geological education involving the use of fossil specimens. Educational themes include the use of fossils in demonstrating the evidence for biological evolution; dating and correlating rocks in different places; and interpreting ancient environments and their ecologies and geographies (palaeoecology and palaeogeography). The process of forming a documented scientific collection is also an educational exercise.

## 1.8.3 Recreational collecting

Recreational fossil collecting is an enjoyable, rewarding and popular leisure activity that can contribute to the science of palaeontology. Involvement ranges from those who casually make chance finds, to those for whom collecting is a hobby and make journeys to fossil localities specifically for fossil collecting. Such recreational 'field collecting' is educational, and finds of scientific value are frequent. Serious recreational collectors maintain labelled collections of their finds, and seek professional advice on identification. The hobby may extend to researching fossils found and the geological setting in which they occur giving rise to collaborative work with professional research palaeontologists.

There are also 'assemblers of collections of fossils', sometimes referred to as 'cabinet collectors', who choose not to undertake field collecting themselves, their collections being made through purchase and/or gift and exchange.

## 1.8.4 Tourism

International interest in Scotland's fossil heritage results in tourist visits from the rest of the UK and from overseas. Tourists visit museums to view displays, and some visit fossil localities to collect. Some locations offer spectacular fossils still in the situation where they were discovered, such as the fossil tree stumps at Fossil Grove in Glasgow's Victoria Park, MacCulloch's Tree on the west coast of Mull, the reptile footprints and trackways of Elgin and the dinosaur footprints of Skye.

## 1.8.5 Commerce

There is a worldwide market in fossils. Scottish fossils form part of that market, with specimens being extracted and then sold commercially, both in the UK and abroad. Currently, there are no figures available on the value of the fossil 'industry' to the Scottish economy.

Rare and unusual fossils may command a high price in the world of collectors and museums, and may also have a high scientific value to researchers. Common fossils such as ammonites, belemnites and brachiopods may sell for a few pounds, with larger, well-preserved and prepared specimens commanding higher prices (tens to hundreds of pounds) according to rarity and quality. Common Scottish fish fossils can be bought for less than £50, but rare fish, amphibians and reptiles can sell for many thousands of pounds depending on condition. Costs also reflect the labour and skill in preparing fossils for scientific research and display; the commercial value of the most common fossils may be below the cost of collection, when time and travel are considered.

Many large and visually impressive fossils sold for large sums are not necessarily rare, and if locality details are missing, they are of diminished scientific value. Some insignificant-looking fossils, on the other hand, may have a high scientific value, but small commercial value.

Commercial collectors provide museums, universities and educational outlets with an opportunity to purchase fossil material. Most commercial collectors are skilled and responsible and provide a service to science, to other collectors and the general public.

## **1.9 Threats to Scotland's fossil heritage**

Scotland's fossil heritage is an irreplaceable and non-renewable resource that has been millions of years in the making. Consequently, if not properly looked after and managed, it is vulnerable to being damaged and destroyed. There are six principal threats: natural erosion, climate change, quarrying, land-use change, irresponsible collecting and the neglect of collected specimens.

### **1.9.1 Natural erosion and climate change**

In certain areas, particularly sea and river cliffs, weathering and erosion can reveal fossil material. However, the natural mechanisms that uncover fossils in the first instance also damage and destroy them. In these cases, it is argued that the responsible collection of newly exposed fossils, especially if loose, is highly desirable and of conservation value, since without collection the fossils would inevitably only become weathered, eroded and lost.

Sea level rise, driven by a warming climate, is likely to lead to the loss, through submergence, of fossil resources within intertidal areas. Human activity to combat the effects of rising sea level could lead to coast protection works that may involve the building of rock armour berms, gabion banks and wave-return walls exacerbating pressure on palaeontological resources. Such development could have the impact of obscuring rock exposures and preventing access for scientific research, education and collecting.

### **1.9.2 Quarrying**

Commercial quarrying of a fossil-bearing rock, a limestone for example, is the other main means by which new fossil material is revealed, but it can also be a threat. However, this is the nature of quarrying, and in many cases the loss of fossils during the lifetime of a quarry is not significant as the resource being quarried is vast and therefore some of it will survive for scientific research and educational purposes. There are however some rare situations where quarrying could lead to the loss of a fossil-bearing rock layer that has only a very limited extent.

The importance of quarrying to palaeontology is highlighted by the fact that many extremely important fossil discoveries are made in active quarries. It is also reflected in the considerable number of disused quarries which are now geological sites protected by statute. In many instances quarrying, like natural erosion, is valuable in renewing exposures of fossil bearing rock and making available previously inaccessible rock sections.

### **1.9.3 Land-use change**

One of the primary causes of losing fossil localities in Scotland is through changes in land-use. The infilling of quarries, river valleys and disused railway cuttings with waste, are means by which fossil localities become obscured, buried and lost.

Similarly the afforestation of hillsides and river banks with conifers and woodland regeneration, undertaken without due consideration for fossil-bearing resources, can lead to the prevention of access and the accumulation of plant debris that in time can lead to soil formation and rock outcrops becoming lost from view.



Regeneration of woodland to help combat rising CO<sub>2</sub> levels and promote gains in biodiversity, if not carefully managed, could in some instances, exacerbate pressure at some palaeontological localities.

### 1.9.4 Irresponsible collecting

In some circumstances, fossil collecting may not be harmful to fossil resources and fossil localities. This is particularly true where the fossils are relatively common or the locations in which they are found are subject to high levels of natural or artificial degradation, such as coastal cliffs that are being eroded rapidly or large quarries that are being actively worked. In such situations collecting fossil specimens, that might otherwise be destroyed, can benefit our understanding of geology provided that they are properly documented and made available for study. Collecting also helps prevent fossil locations becoming neglected and overgrown. Ongoing fossil collecting can therefore be a valuable activity in the management and safeguarding of our fossil heritage.

However, some localities are highly sensitive to certain fossil collecting activities, and if these activities are not carefully managed, the scientific value of the resource can be damaged and, in the worst case, destroyed. Locations where there is either a limited fossil-bearing resource, or the fossils are exceptionally rare, are particularly vulnerable and susceptible to damage. Such locations include disused limestone and building stone quarries in the Midland Valley of Scotland and Caithness, which may date back to the 19th century and have an important role in the development of palaeontological science. Other sensitive locations include slowly eroding coastal cliffs, such as occur on Skye, and situations where fossils exposed at the surface are used for educational field demonstrations. In geoconservation terms, when a fossil-bearing resource is extremely limited in extent, it is regarded as 'finite' and particularly vulnerable to irresponsible collecting. Such resources include fossil-bearing cave deposits.

Mechanical diggers, rock saws, crowbars, sledgehammers and even explosives have all been used to collect fossils in Scotland, to the benefit of palaeontological research. However, in the hands of irresponsible collectors, such equipment can cause enormous damage and can threaten to destroy vulnerable fossil-bearing resources and the fossils they contain. Excavation by collectors at river and coastal exposures can cause undermining, resulting in the collapse of rock faces, and burial of fossil-bearing layers.

When rare and particularly significant fossils are collected by inexperienced and/or irresponsible people, the fossils can lose their geological context and much of their value as objects of study. The collectors may not recognise the importance of a find, or fail to record essential information at the locality.

### 1.9.5 Neglect of collected specimens

The failure to adequately care for collected specimens and collections as a whole can result in their deterioration and loss. This threat to the fossil heritage is not peculiar to specimens and collections in the possession of recreational collectors, since inadequacies in funding and staffing can threaten curated museum-based and research collections.



## 1.10 Conserving Scotland's fossil heritage

The landscape and its underlying geology comprise a fundamental part of the natural heritage underpinning Scotland's biodiversity. Although they give the impression that they are solid and fixed for all time, they are vulnerable to development pressures and changes in land-use. Scotland's irreplaceable geological heritage, including fossil resources, have to be adequately conserved and managed wisely for the benefit of future generations.

In an effort to conserve and afford protection to the geological heritage of Britain, the then Nature Conservancy Council undertook the Geological Conservation Review (GCR). This project, which began in 1977 and was completed in 1990, used the highest scientific standards to identify systematically the key Earth science sites in Britain. Together these GCR sites reflect the range and diversity of Great Britain's geological heritage and demonstrate the geological history and development of the country.

Each site selected for the GCR is of at least national importance for geological heritage conservation, and many of the sites are of international importance. In Scotland, the GCR process selected 804 sites, of which 84 were selected specifically for their fossil fauna and flora. An additional 107 sites selected to represent various periods in Scotland's geological history contain fossil-bearing rocks.

In time the list of Scotland's GCR sites will be reviewed. It is expected that some new palaeontological sites will be added to the register, as new discoveries are made. Some GCR sites may be removed from the register if they are destroyed by damaging over-collecting that has 'worked out' a particular fossil horizon. A public record of all Scotland's palaeontological GCR sites is available through the published Geological Conservation Review Series.

Most GCR sites in Scotland have statutory protection and are designated Sites of Special Scientific Interest (SSSI). Designation as an SSSI affords GCR sites protection from damaging activities.





## PART 2: FOSSILS AND THE LAW: OWNERSHIP, ACCESS AND CONSERVATION

The fossil heritage of Scotland, like any other aspect of our natural and cultural heritage, is owned and managed property some of which, given its national or global importance, has statutory protection. This part of the Code outlines key legalities governing how fossil resources and specimens are considered. This encompasses fossil resource and specimen ownership, protected site management, access to land for the purpose of seeing fossils and also for their excavation, collection, removal and sale in accordance with the law. It also addresses instances where collecting is not permitted and how to deal with collections that are no longer required. Best practice recommendations are also provided for the purchase of fossil material, and what ought to be done in the event of witnessing damaging fossil collecting.

**Collectors need to recognise property rights and the statutory protection that is in place for some fossil localities. Scientific researchers, recreational collectors undertaking research and those that collect for commercial purposes need to be acutely aware of their collecting activity in the context of these rights and protections.**

## 2.1 Ownership of Scotland's fossils

From the legal perspective, fossils in Scotland are treated as 'minerals' in the legal sense of the word. 'Minerals' also include coal, building stone and other substances in or under the land obtainable by underground or surface working. Scotland's fossil resources, whether they occur loose or part of bedrock exposure, are owned in law by the relevant holders of the mineral rights, be they private, public, voluntary sector or Crown Estate Scotland.

**The owner of mineral rights over an area of land may not necessarily be the owner or even the occupier or manager of the land.** This situation can arise where a fossil locality, on an area of farmland, is owned by one person, the mineral rights and thus the fossils are owned by another, and the land itself is occupied and managed by yet another. This can make the process of identifying the mineral rights owner challenging and it is recognised as probably not practically possible for many collectors. However, it becomes particularly important when larger groups are visiting and necessary when significant and large-scale collecting is proposed (see Section 3.2).

Land ownership around the Scottish coast is mixed and complex, Crown Estate Scotland manages around half of the intertidal zone, between mean high water springs (MHWS) and mean low water springs, but sea-cliffs and beaches lying above MHWS will be owned and managed by other organisations or individuals.

## 2.2 Accessing land to visit fossil localities and collect fossils

Visiting fossil localities in the countryside to see and collect fossils involves accessing land owned by an individual or an organisation. Under the Land Reform (Scotland) Act 2003, everyone has access rights over most land and inland water in Scotland, for recreational purposes, some educational and commercial purposes, and for crossing from place to place. However, access rights come with responsibilities and are conditional on those taking access doing so responsibly. Having the right to take access over land does not mean that people have the right to extract or remove fossils, which are the property of the owner of the mineral rights associated with the land. The Land Reform Act specifically excludes being on or crossing land for the purpose of taking anything away for commercial use or for profit.

The Scottish Outdoor Access Code provides guidance on the responsibilities of the public and owners and managers of land in relation to public access.

- **The Scottish Outdoor Access Code should be consulted prior to accessing land to view or collect fossils.**

Access rights do not extend to works locations such as working quarries and mines, building or civil engineering sites, and railway and motorway cuttings. Access to these places can be dangerous and is restricted by law.

- **Accessing locations such as working quarries and mines, building or civil engineering sites, and railway and motorway cuttings requires appropriate authority.**

## **2.3 Permission to collect and keep fossil specimens**

In practice common fossils and small geological specimens are collected without permission and usually without hindrance. In many situations the collection of fossils that would otherwise be lost, for example through erosion, may be regarded as an act of conservation. However, from a legal perspective removing fossils without permission is illegal. Technically this includes loose fossils, or stones containing fossils, from beaches and the intertidal zone, and in whatever other setting fossils may be found, even if they appear to be abandoned.

To lawfully extract, collect and retain fossils that are either loose or form part of any bedrock exposure, requires permission from the owner of the mineral rights. The permission of the landowner, occupier or manager of the land may also be required. In addition to obtaining permission there are procedures in place at fossil localities that are protected as Sites of Special Scientific Interest (SSSI) which may have to be adhered to. This could involve consent being sought from NatureScot (see Section 2.4.1)

- **Traditionally common fossils and small geological specimens are collected without permission and hindrance. However, lawfully the right thing to do is to obtain permission to extract, collect and retain fossils.**

If collectors decide to seek permission to look for, remove and retain fossil specimens, they should decide for themselves how to go about doing so as there is no overseeing body which undertakes that particular role on their behalf.

## **2.4 Protected fossil localities and instances where collecting may either be discouraged or not allowed**

Internationally Scotland is recognised for having a robust mechanism for the conservation of nature which includes the geological and fossil heritage as well as biodiversity. Many of the most scientifically important fossiliferous localities around Scotland have statutory protection. Locality protection is a 'site-based' approach to nature conservation the foundation of which is the protected areas network. Locations protected for the geological and fossil heritage, often referred to as 'protected areas', are established through the legal provisions in the Nature Conservation (Scotland) Act 2004.

Protected areas may also be established on a voluntary non-statutory basis. For example as part of a Local Nature Conservation Sites (LNCS) network.

### **2.4.1 Sites of Special Scientific Interest (SSSIs)**

Designation as a Site of Special Scientific Interest (SSSI) is the main statutory

mechanism for geological and palaeontological conservation in Scotland. Each palaeontological SSSI, which may be considered as the best, most important and representative palaeontological localities in the country, is underpinned by a GCR site (see Section 1.10).

NatureScot advises land owners and others on the management of SSSIs and, where appropriate, supports work to enhance the value of SSSIs, for example through clearing rock exposures of rubbish and encroaching vegetation. NatureScot also monitors the condition of the geological and palaeontological features in SSSIs, and may support their scientific study. Where SSSIs have palaeontological features, land owners and land managers have an important role to play in looking after these protected fossil resources on their land.

To ensure that protected features on a SSSI are not damaged, land owners and managers are provided with a list of 'Operations Requiring Consent' ('ORC list'). These are operations that are likely to damage any of the natural features of a SSSI. A land manager must obtain consent from NatureScot before they carry out any of these listed operations. Similarly, a land manager must obtain consent from NatureScot to allow someone else to carry out one of the operations. If NatureScot considers that an operation requiring consent, being proposed on an SSSI, is likely to damage protected features it may suggest other ways to carry out the work. This could be to only partially infill a fossil-bearing quarry, or not plant trees too close to an important fossil bed. NatureScot can only give consent to owners and occupiers of the land, or to public bodies when carrying out their normal functions. NatureScot cannot issue consent to third party members of the public. ORC lists, which are specific to each SSSI, are accessible to view on NatureScot's website.



- **Owners and managers must obtain consent from NatureScot before carrying out or permitting operations likely to damage protected features.**

In cases where public bodies need to undertake operations that affect a SSSI, the Nature Conservation (Scotland) Act 2004 places a duty on them to consult Scottish Natural Heritage (NatureScot); have regard to NatureScot's advice; and take reasonable steps, in the proper exercise of their functions, to further the conservation and enhancement of the natural features of the SSSI. Universities and some museums can be considered public bodies.

- **Public bodies have a duty to consult NatureScot before carrying out, or permitting, any activities which may affect an SSSI.**

SSSI protection helps safeguard sites from development but can also help safeguard them from damaging fossil collecting. In many cases, owners and managers of fossil localities will need consent from NatureScot to excavate and remove fossils and also to allow other people to do so (also see Section 4.1.1). **Generally speaking, collecting loose fossils in many SSSI is not a concern from conservation and scientific perspectives, but collecting fossils from bedrock is a different matter.** However, provided the required permission is sought from the land owner and any necessary SSSI consents are secured from NatureScot, particularly for scientific research, then collecting from bedrock can take place.

- **Owners and managers of fossil localities should be aware that some fossil collecting activities within SSSI, particularly the extraction of fossils from bedrock undertaken by visiting collectors, requires them to seek consent from NatureScot.**

NatureScot has sampling guidance for scientific researchers in place that, in relation to palaeontological sites, allows the development of a considered and sustainable approach to collecting fossils from bedrock in SSSIs. Although the collection of fossils from bedrock, that is a protected feature of an SSSI, is damaging, if it is undertaken for research, it is acknowledged that the gain for science can outweigh the damage.

It is important to note that in the absence of any specific mention of fossil collecting in the ORC list, for a particular SSSI, the requirement to seek permission and SSSI consent, to collect fossils, may still apply (for example where extraction of minerals is on the list). **The exclusion of an ORC pertaining to the removal of rock, minerals and fossils from an ORC list does not imply that a third party fossil collector is free to collect as they wish.** It is important to be aware that, regardless of the operations listed in the ORC list, damaging protected geological features in a SSSI, for example by hammering, is still an offence.

Having secured permission, and any necessary consents, a responsible approach to fossil collecting in SSSIs is essential to minimise damage to rock outcrop and conserve the resource. Achieving this maintains the scientific value of the sites for research and the benefit of future generations.

- **Collectors should be familiar with any collecting regulations that may be in place before visiting SSSIs. If they don't know, they should ask.**
- **Collectors should be aware that in SSSIs collecting from bedrock, and in some rare cases loose rock and fossils, may involve requesting land owners to approach NatureScot to secure SSSI consent on their behalf.**
- **If collectors are in doubt about collecting regulations at an SSSI then they should not collect.**

The fossil-bearing rock resource in some SSSIs can be very limited in extent. Similarly the fossils in a particular SSSI may be incredibly rare and of considerable scientific value. Consequently, such sites are vulnerable to fossil collecting of any kind. In these locations fossil collecting for scientific research may be regarded as acceptable 'loss' and 'damage', to the fossil-bearing resource, with all other collecting approaches being actively discouraged. Even in research situations, to ensure the information derived during excavation is maximised, investigation may have to adopt a multidisciplinary approach. A multidisciplinary approach involves a team with a wide range of specialist palaeontological and geological interests coordinating and concentrating attention on a minimum amount of excavated fossil-bearing resource. This approach avoids a particularly limited resource being targeted multiple times for excavation in pursuance of different but related scientific research projects.

It is an offence for any person to intentionally or recklessly damage the natural features of an SSSI. Some SSSIs, that have suffered damage as a consequence of fossil collecting, carry signage conveying messages specific to collecting at the site.

- **Signage regulating collecting at fossil locations must be adhered to.**
- **The absence of signage, prohibiting collecting, at fossil localities does not imply a right, freedom, or permission to collect.**

## 2.4.2 Areas of Skye protected by the Skye Nature Conservation Order 2019

In addition to the SSSI designation the Nature Conservation (Scotland) Act 2004 also includes provision for the protection of a natural feature by means of a Nature Conservation Order (NCO). There is one NCO in operation in Scotland designed to give extra legal protection to fossils. The 'Skye Nature Conservation Order 2019' was issued to prevent damage to, and removal of, Middle Jurassic vertebrate body and trace fossils on Skye. It bolsters the statutory protection of fossil remains within existing SSSI and other areas, where the principle threat is from irresponsible collecting. It is an offence for any person to undertake prohibited operations in areas of Skye protected by the NCO. Exceptions are in place to ensure the continuation of scientific research.



- **A Nature Conservation Order (NCO) affords extra statutory protection at fossil localities on Skye.**

## 2.4.3 Non-statutory Local Geodiversity Sites

Although Scotland has a network of statutorily protected sites, fossil localities in the wider countryside are also under threat from damaging activities. Some fossil locations not protected by statute have 'Local Geodiversity Site' recognition, belonging to the 'Local Nature Conservation Sites System'.

- **Fossil collecting at non-statutory protected Local Geodiversity Sites may not be encouraged. If there is doubt the local geoconservation group could offer advice.**

It is possible for individuals to volunteer and become involved in the conservation of fossil localities, through a local geological society, and by either joining or forming a local geodiversity conservation group.

## 2.4.4 The built heritage

Some Scottish building stones contain fossil material. Similarly, field boundary dry-stone dykes and animal pens sometimes incorporate fossiliferous blocks of stone. In these situations, the fossils are an educational resource to be examined in situ. They are not to be collected, as this would be a criminal offence.

- **On no account should fossils be collected from stone in dry-stone dykes, walls or buildings.**



## 2.5 Selling Scottish fossil specimens and taking fossils from the UK

In accordance with the law, in order to sell fossil specimens collected in Scotland, for example by means of the internet, a vendor requires to obtain full legal title to the specimen from the owner. The owner might be the owner of the land but sometimes title to fossils (usually under reference to “mineral rights”) will have been reserved to a previous owner of the land, so care should be taken. This requires communication between the collector and owner with agreement on title transfer.

- **“Having ownership title to a fossil means it may be sold lawfully.”**

The United Kingdom Government retains customs powers. Under the existing system controlling export from the UK, licences can be refused or deferred for certain categories of ‘cultural objects’ of special historical, aesthetic or scholarly importance (includes palaeontology), usually to provide an opportunity to UK-based institutions to buy the object.

The system for export licences is administered by Arts Council England (ACE), on behalf of the UK Department for Digital, Culture, Media & Sport (DCMS). Export licenses can apply to palaeontological material exported both permanently and temporarily (for example for display or scientific research).

- **Those intending to export Scottish fossils from the UK should check the current situation regarding export legislation.**

This brief guidance does not cover:

- General customs regulations and laws, for example on false declaration of goods.
- Special issues concerning stolen and other illicitly collected fossils (for instance, export of such fossils from the UK may be illegal depending on the cultural heritage laws or international treaties of the state of destination).
- Import of fossils into the UK.

## 2.6 Buying Scottish fossil specimens

Many collectors, and museums, purchase fossil specimens to add to their collections. This may be to gain more examples of a particular group of fossils, to obtain material from classic localities, to acquire material for scientific research, or to provide material for displays.

There are several factors to bear in mind before making a purchase:

- Is the seller the legal owner of the specimen? This may be difficult to establish. If it is unclear, you could be purchasing stolen property.
- Is the specimen correctly described, and are locality details given correctly? Vague locality details (for example ‘Caithness’) are of little scientific value.
- Are the item and its data genuine? Faking is not currently believed to be a significant problem with Scottish fossils, but the buyer should be cautious,



especially if the offer is unexpectedly good. Faking is common in the fossil trade worldwide, especially in the overseas tourist souvenir market. Fossils are also often restored or made up from incomplete specimens, or inserted into new 'stone' matrix, simply to make them look better and command a higher price as décor fossils.

- Has it been well prepared? Some material offered in rock shops has been varnished, carved, repaired and polished to enhance the superficial appearance may therefore only be useful as a decorative curio.
- Be cautious of language claiming legitimacy without proof; purchasers should always satisfy themselves of ownership and provenance.

- **If purchasing a fossil specimen it is recommended that purchasers use a reputable dealer.**
- **Purchasers should satisfy themselves that a fossil for sale is genuine and has been properly prepared.**
- **Assurance should be sought that a fossil for sale has been collected legally, that the seller has legal title to sell it and that they are prepared to provide the specimen's locality details.**

## **2.7 What to do in the event of encountering people collecting irresponsibly**

You may come across a situation where you suspect that irresponsible collecting is taking place with damage to a fossil locality and excessive fossil material being removed. For example, a crow bar, sledgehammer or rock saw being used to extract fossils from bedrock and a vehicle being loaded with broken fossil bearing-rock. If so, it may be appropriate, provided you are not putting yourself at risk, to enquire whether the person or persons has or have permission to collect fossils, and have heard of the Scottish Fossil Code. The incident ought to be reported as soon as possible to the land owner, occupier or land manager. If you consider that the collecting may be taking place illegally or you find evidence of suspected illegal collecting having taken place, for example damage at a fossil locality that is an SSSI, the incident should be reported to the police by telephoning 101 or reporting it online via the 'contact us' portal on the Police Scotland website. State that you believe a crime may have taken place and request an incident is created and titled as a 'Wildlife Crime'. You could also report by calling Crimestoppers on 0800 555 111 where you will not be asked your name and you can leave your information anonymously. The local office of NatureScot should also be contacted.

Whether you suspect either irresponsible or illegal activity a useful action would be to note down details including the date and time of the incident, an exact location or grid reference, the registration number, make, model and colour of motor vehicles in the area, description of those involved and the tools being used, but only do this if you can keep yourself safe.

- **If you encounter what you consider to be irresponsible collecting, use your common sense and do not put yourself at risk by intervening. Try to inform the land manager and, if the location is an SSSI, report the incident to the police and NatureScot as a 'Wildlife Crime'.**



## PART 3: COLLECTING AND CARING FOR FOSSILS

Fossils are a limited resource and should not be taken without good cause. Once a fossil specimen is collected and removed from a fossil locality there is a responsibility to care for it. This part of the Scottish Fossil Code provides information and best practice recommendations for the collection, identification, care and storage of fossil specimens. Whatever your reason for collecting fossil specimens, be it for scientific research, recreational, or commercial reasons, this part applies to everyone.

**Part 2 of the Code should be referred to regarding legal responsibilities associated with access to land and fossil collecting.**

### 3.1 Knowing about fossils and where they are found

In order to find fossils it helps to know what you are looking for and museum collections represent a good place to start. The more you know, the more you are likely to find and recognise fossils. There are online and other publications that provide information on the different types of fossils, and the biological groups to which they belong.

- Those interested in fossils, and fossil collecting, are encouraged to learn about the fossil heritage and to visit museums to see some of the best preserved fossil specimens.

### 3.2 Approaches to collecting and the levels at which it is undertaken

It is important to note that our fossil heritage is there to be observed and appreciated as much as to be collected from. It is not always necessary to remove fossils from a fossil locality, to learn about and enjoy them. Taking photographs, making drawings, recording what you discover and reporting any finds, can be just as rewarding. This alternative approach to collecting could also benefit palaeontological science.

- Finding fossils to observe, appreciate or record them is an alternative approach to collecting and removing them from a fossil locality.

If removing fossils from a fossil locality it is important to be familiar with the various approaches to collecting and levels at which it is undertaken. This reflects the various interests in Scotland's fossils and the purpose of those involved in collecting. If you are able to describe the purpose and level of your collecting then that can be helpful in any dialogue with landowners, land managers and others when you are either collecting or proposing to collect at a fossil locality.

**Find and observe 'collecting'** – does not involve removing fossil material but instead looking for undiscovered, or already known about, fossils to appreciate and learn from them. Can involve taking photographs, making drawings, and recording other information of what you see or find. This can extend to reporting new finds.

**Casual collecting** – represents the irregular instance of collecting and removing a small loose individual item of rock or fossil, out of general interest and curiosity, that may be retained as a memento.

**Minor collecting** – involves collection and removal of a few small pieces of loose broken rock or common fossil (that could fit in the palm of the hand or smaller), that are found lying around. Minor





collecting may be carried out by research scientists, but it is more commonly undertaken by recreational collectors, young people and groups with an educational aim or for the purposes of securing and creating a small collection.

**Significant collecting** – represents the noticeable removal of amounts of fossil-bearing rock or fossil specimens. Significant collecting may be characterised by the excavation of rock and fossils from the solid bedrock, perhaps using lightweight hammers and chisels and/or the removal of a few kilograms of already loose rock or fossil specimens. Significant collecting is an approach adopted by scientific researchers and some serious recreational collectors building a collection or perhaps undertaking research.

**Large-scale collecting** – involves excavation of many kilograms of rock from bedrock and/or the removal of many kg or more in weight of already loose rock. It is associated with the use of tools and equipment such as mash hammers, sledge hammers, crowbars, pinch bars, picks, shovels, rock saws. Rarely mechanical excavators, gas-bursting capsules and explosives are utilised. Transport is required to remove fossil-bearing rock and specimens from the locality. Large-scale collecting is necessary in certain circumstances for scientific research. It is also an approach adopted by some serious recreational collectors undertaking research and commercial collectors.



- **Given the variety of approaches to fossil collecting, it may be useful to be able to describe the purpose and level of your own collecting as this could be helpful in any dialogue you may have with landowners and others.**

Section 1.9.4 outlines the issue of irresponsible collecting and the threat that poses to Scotland's fossil heritage. In the context of the various approaches to collecting and the levels at which it is undertaken, outlined here, irresponsible collecting may be defined:

**Irresponsible collecting** – an approach that is inappropriate for the characteristics of a fossil resource, including the circumstances in which it occurs, that causes unjustifiable damage and loss.

### 3.3 Collecting fossils responsibly

#### 3.3.1 Fossil collecting and respecting wildlife

Fossil localities are usually intimately or closely associated with other features of the natural heritage. Be aware that plants and habitats can be easily damaged and that some birds and other animals can become alarmed or distressed if you do not take care. Depending on the season of the year be mindful of nesting birds on coastal cliffs, inland and quarry faces, and that some birds nest on the ground. Also be aware that disturbing soil whilst fossil collecting can lead to soil erosion affecting the biodiversity it supports.

- **Always take proper account of wildlife and other aspects of the natural heritage by following the guidance in the Scottish Outdoor Access Code.**

### 3.3.2 Equipment usage in fossil collecting and extraction

Hardened steel hammers and chisels, specifically manufactured for breaking rock, are the traditional hand tools of the fossil collector. In Scotland, most fossil-bearing rocks are hard and the careful use of such a hammer is necessary to extract a fossil in a proper manner. However, since many good specimens can be found by looking through loose and weathered material the use of a hammer is not always required.

- **It is not always necessary to use a hammer and chisel to find fossils.**

Hammering or chiselling exposed bedrock that is a protected geological or palaeontological feature in an SSSI risks recklessly damaging the site, as does clearing vegetation to expose bedrock within an SSSI. In both cases, a 'Wildlife Crime' may be committed.

- **Do not hammer exposed bedrock, if it is a protected geological feature, or clear vegetation to expose bedrock, within an SSSI, without first obtaining consent.**

Rock saws can be used responsibly in the extraction of fossils and for trimming excess rock from fossil specimens. However, the use of rock saws, power tools and other equipment, such as drills, mechanical excavators and tools, to extract fossils from outcrops is generally not regarded as a sustainable and responsible activity. Such activity accelerates the depletion of fossil-bearing resources and can cause unsightly damage to outcrops.

- **Apart from trimming specimens, the use of mechanical equipment to extract and remove fossils should only occur for the purposes of palaeontological research projects (for example by museums and universities) and then only when essential.**

A hand lens or magnifying glass is a useful item of equipment allowing the examination of details on fossils and associated rock. A GPS system and/or detailed maps, notebook and camera are essential items of equipment to record finds.

### 3.3.3 How much fossil material to take and its careful removal

At most locations where fossils are to be found there is adequate broken rock lying around from which to collect. However, it is important to consider carefully your reasons for collecting and the vulnerability of the locality to fossil extraction as fossils are a limited resource and should not be taken without good cause. You should exercise restraint ensure that you do not 'over-collect' and therefore deplete the fossil resource. It is good practice to aim for a representative collection rather than many examples of the same fossil. The exception would be, for example, an academic objective of collecting specimens ranging in age (juvenile to adult) to gather data related to growth and age related changes.

- **Do not over-collect by taking many examples of the same fossil.**
- **Ensure that you leave fossil specimens that you do not want at the locality for others to find.**

A fossil in a collected rock sample can become either damaged or destroyed through the collector's efforts to reduce the size of the fossiliferous rock sample for ease of carrying and transport. The successful reduction of a rock specimen to a more convenient size, minimising risk of damage to the fossil, will require the use of appropriate equipment.

- **You should not attempt to reduce the size of a rock sample containing a fossil without the appropriate equipment.**

Remember that incomplete specimens or specimens broken during collection have scientific value, therefore it may be worth retaining them; with the broken specimens being carefully repaired.

When collecting ensure that you have a supply of packaging materials such as boxes, bags, newspaper and tissue in which to wrap specimens even if they are broken. Secure packing of specimens will help prevent them being damaged whilst being carried and during transport.

- **Incomplete specimens may be worth retaining and broken specimens may be carefully repaired.**
- **Fossil specimens should be packaged carefully for carrying and transport.**

### 3.3.4 Respecting other users of fossil localities

Freshly broken rock debris scattered about is unsightly and can be dangerous. Rock fragments may cause injury and are a hazard to farm animals, vehicles, and other fossil collectors. It is important therefore that fossil localities are left in a tidy condition and are not made more difficult or hazardous for animals, vehicles and those coming after you. This should include returning loose and broken material to where it was found, and not spreading rock debris on pasture, footpaths and other access routes.

- **Leave fossil localities in a condition that does not present a hazard to animals, vehicles and other collectors.**

Fossils and associated rock found at one location must not be disposed of at a different locality. This is an irresponsible action that could confuse the scientific understanding of a fossil locality, with fossils being attributed to the wrong location and rock sequence.

- **Never discard fossil material and associated rock collected from one fossil locality at a different location.**

### 3.3.5 Recording fossil finds

As soon as a fossil is removed from the rock and the area in which it is found, irreplaceable scientific information is lost. This can be minimised by recording basic information at the time of collection such as the precise locality and position in the exposed rock sequence. Unless this is done, with records kept permanently with the specimen, the potential scientific value of the specimen will be drastically reduced.

- **When you collect a loose fossil take a note of where it was found.**

The locality record for fossils excavated from bedrock should be precise. Try and pinpoint the precise locality, to within a few metres, by using permanent landmarks, ten-figure Ordnance Survey grid references, or an internet available geocode system.

You could sketch the outcrop and record features of the rock, including any layering (bedding) and the position in the exposed rock sequence at which the fossil is found, in a notebook. Ideally photographs should be taken of the outcrop with the location of the fossil find identified making sure there is a scale-bar in view.

- **If you remove a fossil from bedrock, record the location, and the position it was found in the rock sequence.**

### 3.3.6 Reporting exceptional and unusual finds

An 'unusual' fossil may be:

- A species new to science.
- A species new to the country.
- A species new to the locality.
- A particularly well-preserved specimen, possibly showing features of the animal or plant that have not been previously described.
- The oldest or youngest of a known species. Such a find may extend its fossil record considerably.

If you are fortunate enough to discover an exceptional fossil (for example a rock surface with many fish fossils, a dinosaur bone, or a reptile trackway), it is best to seek advice from a palaeontological expert and report your find. Similarly, if you encounter an unfamiliar fossil or other feature in the rock and you are uncertain what it is, or in your experience it appears unusual, you should also consult an expert. It is possible that others may already know about the find. It may be the focus of a research project, be used for educational purposes, or be waiting for collection and removal by palaeontological experts and therefore should not be damaged or collected.

- **If you discover an exceptional, large, unfamiliar or unusual fossil seek expert advice and report your find.**

Record the position of the find, take photographs and contact your local or national museum, university or the British Geological Survey. An expert will then be able to assess the find, determining whether it has already been discovered and is being used for research or education purposes. If found to be of particular significance, arrangements may be made for its extraction and removal.

- **Do not attempt to extract part of a fossil specimen as this will damage it and reduce its scientific value.**

You should consider donating scientifically important specimens to an accredited museum, or other research institution. The specimen is then available for fuller study to determine its importance and may go on public display. If it proves to be new to science, it will require a name and a detailed published description and illustration. Finders of new species frequently have their name incorporated in the name of the fossil when it is described. A permanent memorial to the finder and the fossil!





- **It is good practice to donate scientifically important specimens to an accredited museum.**

### 3.3.7 Identifying fossil finds

The identification of fossils is an important part of collecting. Most fossil collections are organised according to biological classification and thus some knowledge of the classification of animals and plants is useful. Some collectors will be content to identify fossils to a general level (for example fish, trilobite, ammonite), but most wish to identify specimens to genus and species level. There are many books, with fossil illustrations, that the recreational collector can use. However, only a tiny proportion of known fossils is illustrated in such guides, and help and advice from a palaeontological expert is normally required.

- **Try to identify the specimens you have found using reference books, online resources and seek expert help if required.**

The major museums, the British Geological Survey and university geology departments generally provide an informal service for fossil identification and are pleased to help collectors through offering advice. However, the staff in these institutions do not have time to identify whole collections of fossils, and are not experts in all fossil groups. Your local or national museum or university may have a specialist geological curator and be in a position to offer advice.

### 3.3.8 Informing land owners and land managers of your finds

It is recommended that those who have given their permission to collect fossils are informed of the results of your collecting efforts.

## 3.4 How to care for the fossils you collect

Fossils are a limited resource, and are irreplaceable. You should therefore take good care of them, and also of their accompanying data once they have been found and removed from the ground. If you cannot do this, then collecting fossils, or retaining a fossil collection, is wasteful of Scotland's fossil resource. Better to leave fossils for others to find, or pass them to a more suitable home.

- **Take good care of collected fossils and the information that you have recorded about your finds.**

Standards of collections care are well established for museums. Scientific researchers, serious recreational collectors and those collecting for commercial purposes should follow broadly similar standards. However, it is unreasonable to expect young people, casual and less experienced recreational collectors to follow such high standards. Nevertheless, the basic principles still apply and are to be encouraged at all levels.

A brief outline of good practice is given here. It is not possible to be more specific, as the actual standards to be expected depend on individual collectors' expertise and resources, the content and significance of their collections, as well as currently available materials and techniques.

### 3.4.1 Cleaning and preparation of newly collected fossil specimens

To prevent damage to the specimen, fossils or fossil-bearing rock that is wet with seawater should be rinsed and soaked for at least several hours, in clean fresh water, to remove as much salt as possible. This action will help prevent damage when salt crystallises in the pores of the specimen. Other wet material should be dried gently and slowly to avoid cracking.

Soil and other substances adhering to the specimen should be removed very gently using a brush or other tool that will neither mark nor otherwise damage the fossil. Beware that cleaning of fossils preserved in soft shales can present problems, as wetting may damage the fossil or cause it to disintegrate.

Preparation of a fossil refers to the act of removing rocky matrix surrounding the fossil enabling its use in palaeontological research or for exhibition purposes. The degree of 'preparation' required to remove rock, that obscures part of a fossil, will depend on the specimen and collector. However, in general, it should inflict no damage on the fossil specimen itself, or promote cracks, which could in time lead to more damage. In general, some rock material should remain with the specimen as it, together with any associated fossils, provides information which will probably add to its scientific value.

In the laboratory a variety of tools is available for preparing fossils. Apart from hammers and chisels, electrically powered engraving tools, air abrasives, rock saws, dental tools and a variety of chemical treatments, including acids, can be used. Safety rules must be followed in preparation techniques. It is wise to practice techniques on poor material, and to take advice before attempting the preparation of a good specimen. Specimens can be ruined by poor preparation.



- **Fossil material should be cleaned and prepared for storage and display as soon as possible after collection.**
- **If you are in doubt about the techniques and lack the necessary equipment to clean and prepare a fossil specimen, consult publications on palaeontological preparation techniques and seek expert help before attempting to work on it.**

The unnecessary use of adhesives and varnishes is not considered good practice, even to 'improve' the look of a specimen. Varnish and other types of coatings may damage surface detail and reduce the scientific value of a specimen. Coatings can deteriorate with time, and further problems may arise when they are removed.

- **Varnish should not be used to 'improve' the look of fossil specimens.**

Glues used in fixing together the component parts of a broken fossil specimen should be 'reversible', i.e. soluble in a solvent such as water, so that the joint can be remade if need be. For this reason, reactive adhesives such as 'superglue', epoxy resin and contact adhesives generally, should not be considered suitable. Archival neutral pH PVA emulsion, which is a non-reactive adhesive, is recommended for those starting collecting.

- **Use reversible glues if fixing fossil specimens.**

### 3.4.2 Labelling and documentation

The basic information such as where and when found, recorded when a fossil specimen is collected (see Section 3.3.5), should be carefully transferred and included on an accompanying information label. This allows for accurate data to be attributed to the specimen before the collector's memory fades.

- **Collected specimens should be labelled.**

The information on a label ideally should include:

- find locality, including National Grid Reference;
- geological horizon (e.g. rock layer or bed, geological age);
- date collected;
- specimen number;
- name of the collection to which it belongs (this may be indicated as a prefix to the specimen number);
- identification, for example genus and species (less important than find locality, horizon and collection information, as this data can be added or modified at any time);
- collector; and
- details of collecting permission, where appropriate (although collecting permission may be better filed with the collection as a whole).

Each specimen should bear a unique number written in waterproof permanent ink, ideally on a label of acid-free paper stuck with 'reversible' glue that, if required at a later date, can be detached from the specimen. Although more difficult to remove, a patch of matt white paint may also be used to allow number labelling of a specimen. Whatever labelling method is used, it should be applied to the edge or back of the rock on which the fossil occurs so as not to obscure any details of the specimen. A coat of clear varnish should be applied over the paper label or paint patch to preserve the number. This number must also be put on the accompanying data label and on any other information records, for example field notebooks recording the location of the find. Using numbers ensures that the information on the data label cannot be mixed up with that for any other specimen. It is good practice to have a running list of all your specimens and their details in a hardbound book (a register), to avoid duplication of numbers. When labelling the matching halves of a fossil on two separated sections of rock, known as the 'part' and 'counterpart', the use of suffixes is recommended.

The information should be in good quality paper form. Computers can be used to generate and process the information, but should not be used as the primary (or sole) information store. Good documentation is essential for any fossil material that is being considered for donation to a museum.

### 3.4.3 Storing and displaying

Your fossil collection should be organised so that individual specimens can readily be located. Specimens in most fossil collections are primarily divided and stored by fossil group. Some popular ways are:

- fossil group, then geological age;
- geological age, then fossil group; and
- geological age, then locality, then fossil group.

At the simplest level, the storage and display of fossil specimens will comprise of placing them in dustproof conditions, protected to stop them rolling around and abrading each other, for instance when a drawer is opened. A simple way to do this is to keep each specimen in its own cardboard tray, with its label, and if necessary some rolled tissue padding to stop it moving around (cotton wool is not good as it catches on specimens). At a more sophisticated level, you could use museum-quality materials such as acid-free card and tissue.

Damaging environmental conditions, such as those in an unheated garage in winter, should be avoided because of the effect of damp and mould growth on storage boxes, other packaging and labelling. Direct sunlight can also cause labels to fade and lead to problems associated with excessive drying out and fluctuating temperature.

Humidity and temperature-sensitive material (see below) may need particular care, to avoid excessively high or low humidity (the latter can happen in centrally heated houses in winter). This care extends to the maintenance of a reasonably stable temperature.

- **The storage and display environment for your fossils should not damage, or cause deterioration to, the specimens.**

#### 3.4.4 Problems associated with conserving collected specimens

There are problems associated with the conservation of specimens in a collection. If these are not adequately dealt with they can permanently damage a specimen and in extreme cases lead to its loss.

**Breakage and abrasion** – are commonly the result of poor storage, and subsequent handling and not just caused through transport.

**Dust and dirt** – commonly accumulate through poor storage and display.

**Damp** – causes mould growth on specimens, especially dirty ones, and encourages insects and other pests to attack the packing and labelling.

**Extremes of humidity and temperature** – can damage vulnerable specimens especially if changes are rapid. Varnishing a specimen will not prevent or halt such damage and can make matters worse. It may be necessary to consider special storage conditions for important collections. Whether a given specimen is at risk from extremes of humidity and temperature depends on the mineralogy of the specimen and also the locality and source rock.

Fossil material potentially vulnerable to humidity and temperature includes:

- 'Poorly mineralised' bones from Quaternary deposits (for example mammal teeth and bones).
- Specimens in shale or clay rocks, especially those which expand and shrink with changes in humidity.
- Specimens containing some forms of the mineral pyrite, under conditions of fluctuating temperature and humidity, tend to deteriorate through pyrite oxidisation. This can result in the specimens falling apart. Specimens containing pyrite should be stored separately in dry stable conditions to try and prevent their loss and acidic vapours damaging other specimens.

### 3.4.5 Collection security

A collection that, for example, has significant scientific importance, should enjoy an appropriate level of physical security, and perhaps also financial insurance, against fire, flood or theft. Where appropriate, a photographic record of the collection (or at least key specimens) can help in proving the identity of stolen material and seeking to recover it, especially if it has been sold.

- **An important fossil collection should enjoy an appropriate level of physical security.**

### 3.5 Dealing with old and perhaps neglected collections

Old fossil collections, whether in museums or private hands, are an important part of Scotland's fossil heritage. They may be of interest and significance because of their history and personal connections, and because of scientific work done on the specimens. They may also contain specimens that are rare, and perhaps no longer collectable (for instance because the locality has been worked out or is a quarry that has now been infilled).

Unfortunately, old collections are sometimes neglected, badly stored or disordered, and they may suffer the problems mentioned above (for example covered in dirt or have suffered from pyrite oxidation). A natural reaction is to unpack, sort and wash the collection. Such action can be disastrous as this is the wrong treatment, which can damage the collection's labelling and documentation. Sorting out, assessing and reorganising an old collection, neglected or otherwise, needs special care to avoid loss of old information and the introduction of spurious new information.

If you have reason to believe that an old and perhaps neglected collection is important, you should, if possible, leave it undisturbed until you have sought advice from a palaeontological expert (for example through a specialist museum curator).

- **Seek expert advice when dealing with an old and perhaps neglected fossil collection.**

### 3.6 Disposing of an old or redundant collection

The method of disposal of an old or redundant collection depends on its quality. If in doubt seek advice from a specialist museum curator. If the collection is well documented and contains good specimens it may (wholly or partly) be of interest to a museum. If it is poorly documented and the specimens are generally common it may still be of interest to schools, colleges or museums to provide teaching and handling material.

- **When disposing of an old fossil collection seek advice and consider donating it to a museum or educational establishment.**

### 3.7 Donating a fossil or collection to a museum

If you are considering a home for your finds for the public benefit, you should choose an accredited museum (which may be operated by national or local government, a charitable trust, or a university) or the British Geological Survey. To avoid disenfranchising parts of Scotland, through removal of significant aspects of the fossil heritage to larger city centre museums, there should be consideration for donating a fossil or collection to a museum that is the most local to the location(s) where specimens were found.



A scientifically important specimen should normally go to a museum with specialist staff to care for it and arrange for it to be studied. Other specimens can be used by museums for any of the uses mentioned in section 4 of the Appendix. The museum will be especially accountable for the specimens added to the permanent collection.

- **If you are considering donating a fossil, or collection, to a museum you should choose one that is accredited and perhaps close to where the fossil or most of the collection was found.**

In order for a museum to accept your donation, you will need to demonstrate that you are the owner of the fossil, if the museum is to obtain valid title of ownership from you. You will also be asked to make the gift (or sale) an absolute one, without strings, and to let the museum deal with the find as it thinks fit.

The museum may decide not to accept your offer if your finds duplicate what the museum already has, or may not be a priority for the museum. It has to be judicious in what it acquires and stores, owing to limited resources and storage space. If this is the case the museum may well suggest another museum better suited for your finds. Different museums have different priorities and an accredited museum will have an acquisition policy, often on its website. National and university museums tend to be particularly interested in scientifically important fossils. Local authority and local trust museums tend to be more interested in fossils from their geographical area of coverage.

It was once common to place fossils from private collectors on 'long loan' to museums, however, this is no longer good practice. The museum has the cost of housing and insuring the fossil without being able to deal with it properly. In addition, the museum cannot plan for the future if the fossil may be removed at short notice. Therefore museums need to own collections when they accept responsibility for them. It is however quite proper for the museum to borrow a fossil for an agreed short-term period, typically for an exhibition, identification, research, or to enhance a display.

### **3.8 Bequeathing a collection**

If you are the owner of a significant private fossil collection, you cannot usually expect your family or executors to know what to do with your collection in the event of your death. Thought should therefore be given to its long-term future with instructions left in your Will. Instructions should be sufficiently flexible to allow for changing situations (for example the policies of particular museums), and for the fact that museums may not accept an entire collection, or may use some of it for exchange or as handling material (see Section 4 in Appendix). Sometimes it is best to deal with the matter yourself while you are still able to do so drawing upon the recommendations in section 3.7.

- **If you are the owner of an important fossil collection, thought should be given to its long-term future with instructions left in your Will.**



## **PART 4: ADDITIONAL INFORMATION AND BEST PRACTICE RECOMMENDATIONS FOR LAND OWNERS, LAND MANAGERS, RESEARCHERS, RECREATIONAL COLLECTORS INTERESTED IN RESEARCH AND OTHER GROUPS**

This part of the Scottish Fossil Code provides additional information and best practice recommendations in fossil resource management and the collection and treatment of fossils. It is intended for land owners, land managers, scientific researchers, recreational collectors, specialist groups and others with a particular involvement in Scotland's fossil heritage including promoters of aspects of the fossil heritage and fossil collecting.

#### 4.1 Owners of mineral rights and land managers

If you own the mineral rights for your land it is very likely that any fossil-bearing resources that occur are your property. The resource can be thought of as the rock layer or layers in which fossils occur. You are encouraged to find out about the fossil resource including its extent on your land, the particular fossils it contains, their age, their rarity and the importance of the fossils to science and education. This knowledge will guide the appropriate management and use of the fossil resource, including its conservation, if that is required.



- You are encouraged to find out about the fossil-bearing resource on your land and to conserve it through appropriate management.

The attractiveness of a fossil resource to fossil collectors, whatever their particular interest, influences how a fossil resource is managed from the perspective of collecting. It is important, if you can, to establish the level of fossil collecting the resource can sustain without it becoming 'worked-out' and effectively destroyed.

A general approach to fossil locality conservation may be to ensure that loose fossils are safeguarded through encouraging responsible collecting without hindrance, rather than letting them continue to be damaged and destroyed through natural weathering and erosion. Should a fossil discovery of major palaeontological significance be made on your property you are encouraged to help facilitate its excavation and removal for scientific research and public display. You may wish to donate the specimen to an accredited collection allowing its research and public display.

- You are encouraged to show sympathy to the interests of collectors.

**If fossil collecting is being proposed or is already happening on your land it is useful to be aware of the various approaches to collecting, and levels at which it is undertaken, as outlined in section 3.2.** In most cases the people interested in collecting fossils from your land will be recreational collectors and young people collecting on a casual or minor-scale. The fossils may also be of interest to research scientists. If the fossils on your land are particularly sought after commodities then they could be a focus for commercial exploitation.

- Be aware that there are a variety of approaches to fossil collecting and also the levels at which it is undertaken.

Fossil collectors may contact you seeking permission to access and collect in advance of collecting on your land. However, it is important to recognise that collectors may turn up on your land to collect fossils without contacting you, beforehand, probably for the simple reason they do not know who to ask. **If your land has protection status as an SSSI that has an important bearing on the character of the fossil collecting permissible (see Section 4.1.1).**



- Be aware that collectors may not know who to request permission from to collect fossils.
- If collectors are encountered, who are in ignorance of the Scottish Fossil Code, then you should bring it to their attention.

Signs of fossil collecting vary depending on the nature of the fossil-bearing rock type. Excavated freshly broken rock in heaps close to, or scattered around, a rock exposure, which may have marks consistent with being hammered or chiselled, usually indicates significant collector activity. There may also be rock-saw cut marks which could indicate large-scale collecting that could potentially have damaged the fossil resource. **It is important in this context to understand the nature of the fossil resource and to be able to appreciate what could constitute damage.**

If you come across, or find signs of, collecting that you have not given permission for and that you consider is irresponsible, causing damage to your property, or you suspect theft, then you may wish to take appropriate action. Whatever you decide to do may depend on whether or not damaging irresponsible collecting is an isolated incident or there are repeated instances and if numerous members of the public, or particular individuals, are involved. Erecting signage that discourages collecting could help prevent future instances of damage to a fossil resource.

- You may wish to take appropriate action if you suspect that irresponsible collecting activity has damaged a fossil locality on your land

#### 4.1.1 Owners and land managers of fossil localities protected as SSSIs

If you are an owner of a fossil locality that is a SSSI the guidance above concerning the appropriate management of fossil localities, including fossil collecting, applies to you. However, with SSSIs the management of the fossil resource requires particular and careful consideration.

Generally, casual and minor collecting activity, as outlined in section 3.2, does not damage notified SSSI features, and the choice is entirely yours to permit such collecting. However, if the list of Operations Requiring Consent (ORCs) for your SSSI includes “Removal of geological specimens, including rock samples and fossils” (Standard Ref. No. 25), unless you already have consent for this from NatureScot, you are required to obtain consent from NatureScot to permit collecting of geological samples even if it’s casual collecting. Significant and especially large-scale collecting, as outlined in section 3.2, is more likely to damage notified SSSI features and to require you to obtain consent from NatureScot to allow such collecting to be undertaken. ORCs involving the removal of loose material, such as numbers 20 and 24, may also apply for significant and large-scale collecting.

Where casual and minor collecting will not damage the notified SSSI feature it is suggested you might allow researchers, recreational collectors and groups of visitors such as a geological society, and young people, to visit and collect fossils.

It is also recommended that you ask them:

- who they are;
- what the purpose of the collecting is;
- if they are aware of the Scottish Fossil Code;
- not to excavate or hammer bedrock; and
- to let you know if they discover rare or unusual fossils.

In granting permission to access and to collect fossils, you may wish to set some conditions, such as:

- a restriction on equipment used; and
- being informed of what is found.

If you encounter people collecting fossils from an SSSI on your land, who have not requested permission, then it is recommended you respond in accordance with the purpose and level of collecting and the consent process for the SSSI. For casual and minor collecting that is not damaging the SSSI features, you may choose to permit collecting or not as you see fit. However, it is recommended that you are sympathetic to minor collecting by researchers, recreational collectors and educational groups.

- **It is recommended that your response to those seeking permission to collect fossils from your land, and those encountered on your land that have not sought permission, should depend on the purpose and level of the collecting and the consent process for the SSSI.**

Public bodies should apply directly to NatureScot for consent (see Section 2.4.1), but still need your agreement to excavate and remove fossils from the SSSI on your land. You may permit collecting by public bodies such as universities and some museums, providing they have secured their SSSI consent from NatureScot. If however an individual university researcher has not applied to NatureScot for consent, you may still allow them to carry out minor collecting as described above. If they wish to undertake significant or large-scale collecting and cannot produce a relevant consent it is recommended that you contact NatureScot for advice before allowing them to approach the SSSI on your land.



**It is important to the conservation of our shared palaeontological heritage that collectors are not damaging SSSI features.**

This is particularly the case if they are undertaking significant or large-scale collecting or excavating bedrock, as this could constitute the offence of ‘reckless damage’ to an SSSI. A significant level of collecting is usually undertaken for research purposes with good scientific justification. Some researchers and commercial collectors, particularly those from outside Scotland and from outside the UK, may be unaware of the Scottish Fossil Code, and the legalities of land ownership and collecting, and may unwittingly act irresponsibly causing reckless damage to the fossil resource and the SSSI.

If you encounter collectors undertaking significant or large-scale collecting from an SSSI on your land, which you believe may constitute reckless or intentional damage to the SSSI features, and therefore a ‘Wildlife Crime’, you are encouraged to contact immediately both the police and NatureScot. Be careful not to touch or move any equipment or other objects that may have been left, or otherwise disturb the scene, as it could form the basis of a criminal investigation.

- **Be aware that irresponsible collecting can damage a fossil resource and constitute the offence of ‘reckless damage’ to an SSSI.**
- **You should contact the police if you suspect that irresponsible collecting activity has damaged the SSSI.**

## 4.1.2 Those that live in close proximity to a fossil locality

If you live in close proximity to a fossil locality and have an interest in the fossil heritage, but do not have any management responsibility for the site, you may wish to keep a watchful eye over the fossil resource. You may also wish to familiarise yourself with the terms casual, minor, significant and large-scale collecting set out in section 3.2. If you suspect irresponsible collecting activity that may have damaged the fossil-bearing resource you could take action in accordance with the recommendations in section 2.7.

## 4.2 Recreational collectors interested in research

The 18th and 19th century pioneers of palaeontology were, by today's standards, almost all recreational collectors. Even today, geology and palaeontology remain accessible to all and this provides a great opportunity for highly informed hobbyists to continue to make significant contributions to palaeontological research. As a recreational collector, with an interest in research, you may have the opportunity to work on and study a particular fossil locality or area of special interest and consult research publications on a topic. In time, you may develop considerable knowledge of this special interest, and such detailed knowledge can yield important new information or highlight gaps in existing research.

### 4.2.1 Working with other recreational research collectors and sharing your knowledge

It is important to share the knowledge gained through collecting and to cooperate and work with other collectors. There are few organised clubs, including those online, that cater for fossil collectors, so it is useful to form a small group of collectors with similar interests. Excursions can be organised to localities, and finds shared, discussed and appreciated. Sharing your knowledge may also be achieved for example by giving a talk at a school or club, showing others your fossil collection, or organising a display of your collection. At such educational events you will have the opportunity to encourage others to take an interest in fossils, the local geology and responsible fossil collecting.

- **You could share your fossil collecting knowledge and news of finds with other collectors, arrange visits to fossil localities, show your collection to others and encourage others to take an interest in Scotland's fossil heritage and responsible collecting.**

### 4.2.2 Working with professional researchers

If you have an interest, for example, in taxonomy (classification of organisms) or the ancient environments in which the organisms, that gave rise to the fossils, lived you may collect material or gather data that is of scientific value, and worthy of publication. Publication is the main way in which scientific information is made public and some recreational researchers attain a level of knowledge and skill that enables them to write magazine articles and publish papers in scientific journals. However, cooperation and collaboration with a professional palaeontologist working in a museum or university is another and often quicker way to publish your finds, and is a better strategy for most recreational research palaeontologists.

- **If you undertake palaeontological research, consider working in collaboration with a professional palaeontologist.**

It is relatively straightforward to find out to whom an approach should be made at a university, the British Geological Survey, or one of the museums. Successful collaborations of this nature are common in palaeontology and the levels of achievement and subsequent rewards to the recreational researcher can be significant and satisfying. If you wish to participate in research it is essential to attain the best standards advocated in the Scottish Fossil Code. This includes ensuring that data recording and labelling is appropriate for research and the accessioning of specimens to museum and other institutional collections.

### 4.3 Commercial collectors and dealers

In the business of commercial extraction and sale of fossils, the roles of Commercial Collector and Fossil Dealer may be defined as:

**‘Commercial Fossil Collector’** – someone whose income is obtained partly or wholly through the employment of themselves and/or others in the physical collection of fossils and their sale.

**‘Fossil Dealer’** – buys, sells or exchanges fossils originally collected by others not directly in their employ.

These roles are frequently combined.

#### 4.3.1 Resource selection and the discovery of new fossil localities

As a commercial collector you should ideally be involved in identifying new locations for collection rather than seeking permission to further reduce the reserves at known localities that already have statutory protection as SSSI. Be aware that large excavations may require planning permission from the appropriate authority and that terms for the extraction and sale of fossil material will have to be agreed with the owner of the mineral rights and other land managers.

- **You must agree terms for the commercial exploitation of a fossil locality with the owners or their representatives.**

Newly discovered localities producing notable fossils should be worked in close liaison with museum, university-based or British Geological Survey palaeontologists. Working in this way will allow a co-operative and sympathetic partnership that will best serve the commercial, scientific and natural heritage interests. All parties, and Scotland’s fossil heritage, can benefit greatly from such co-operation.

For the benefit of both science and education, efforts should be made to work with landowners and the local geodiversity conservation group to document and determine the feasibility of conserving fossiliferous sections produced through large-scale excavation.

- **In partnership with others, you should consider the documentation and conservation of new exposure.**



### 4.3.2 Systematised collecting and information recording

The commercial exploitation of fossil localities should be well planned and undertaken responsibly and systematically. This should entail the keeping of accurate records of the rock layer sequence exploited, important in any future research work conducted on the fossil specimens. A photographic record of the work and a written account should be lodged with the landowner and owner of the mineral rights for posterity and with the local museum.

- **Documentation including locality information should accompany specimens that are marketed.**

### 4.3.3. Ownership of fossils extracted for commercial purposes and selling exceptional fossils

Given the scale and frequency of commercial collecting it is almost inevitable that exceptional and unusual fossils (see Section 3.3.6) will be found. Such fossils are invaluable for the advancement of palaeontological science and ought to be secured within a curated permanent collection, within an accredited museum in Scotland (see Section 3.7), where they are available for research purposes. There may be some fossil locations where access and collecting permission is given on condition that scientifically important specimens will, in the first instance, be offered to museums.

- **You should offer finds of exceptional fossils to an accredited local or national museum in Scotland for donation or possible purchase on the nation's behalf, before considering other museums and the open market.**

Commercial collectors will require the owner of the fossils (typically the owner of the mineral rights to the land on which the fossils are collected) to transfer ownership of any fossils before the collector can lawfully sell them.

- **Lawful sale of collected fossils requires ownership transfer typically from the mineral rights owner.**

## 4.4 Professional palaeontological researchers

Palaeontological research requires a resource of fossil material with which to work. However, if you are collecting for research purposes you have a duty to collect responsibly to ensure the sustainable use of the fossil-bearing resource to enable the continuation of future research. No researcher has the right to 'dig out', in other words, remove in its entirety, a fossil-bearing resource. Research collecting of a particularly limited fossil-bearing resource should adopt a multidisciplinary approach across various palaeontological and geological disciplines. This approach will minimise the impact of excavation and thereby maintain resource viability for future research.

- **You should strive to minimise the quantity of material removed and the amount of damage undertaken at a fossil locality.**
- **Research collecting from particularly limited fossil-bearing resources should be multidisciplinary.**

You should also contribute to the conservation of the fossil resource, through detailed fossil provenance recording, curating the material you collect. Effort should be made to maximise use of fossils already held in museum, university and British



Geological Survey collections. Searches should be undertaken of specimen databases for existing specimens and collections of material from a particular fossil locality. By doing so, present and future researchers can use existing collected and curated material and associated information, without having to resample a location's diminishing resource. Your responsibilities also extend to becoming familiar with the best means of preparing and preserving fossil samples.

Use should also be made of the skills, experience and knowledge of recreational researchers and commercial collectors if appropriate safeguards and checks are in place.

- **Maximum use must be made of fossils already held in existing collections, using only curated material for research that is to be published.**
- **Collected research material should be curated in a museum or British Geological Survey collection.**

You should ensure that rock faces are not disfigured with core holes and permanently engraved or painted numbers or symbols, especially in aesthetically sensitive locations. Effort should be taken to restore or/and disguise areas of rock face or loose blocks where there has been extensive sampling and excavation work to remove important fossil material. This not only has aesthetic benefit but is less likely to attract the attention of other collectors to your research locality.

- **The Geologists' Association's *Geological Fieldwork Code* should be adhered to.**

Fostering good relations with those that have given their permission to extract, collect and retain fossil specimens, should include offering copies of any resulting publications and, if appropriate, duplicates of fossils to show other visitors.

As a university or museum employee your institution may be considered as a public body which has implications for collecting in SSSI and the associated consents process. In this situation landowners are not expected to apply to NatureScot for consent to allow collecting by university or museum-based researchers to go ahead. Instead research collectors are required to secure consent directly from NatureScot. However, in addition, researchers are also expected to make contact with the landowner for their permission to collect and remove fossils.

- **University or museum researchers approaching NatureScot for SSSI consent to collect and remove fossils require landowner permission as well.**

## **4.5 Quarry operators, managers and developers**

If you operate, manage or work a quarry from which fossiliferous rock is extracted, you are encouraged to find out about any fossils that are to be found there. Any unusual or rare fossils uncovered during quarrying should be set aside and the local museum, university or the British Geological Survey alerted to enable scientific study and collection (see Section 3.3.6).

- **Any unusual or rare fossils uncovered during quarrying should be set aside and experts in palaeontology alerted to enable scientific study and collection.**

Sympathy should be given to the interests of hobbyists, researchers, commercial collectors and educational groups in granting access to the land for collecting. Those given access and collecting permission should be encouraged to collect responsibly and follow the Scottish Fossil Code. Close working and co-operative arrangements may be fostered between quarry operators and staff and those with an interest in fossils exposed by quarrying. Collaboration can be of benefit to all, and the fossil resource.

If following the cessation of quarrying, after-use proposals include infilling, efforts should be made to maximise opportunities to rescue any fossil resource and associated data which would be lost by infill of the site. In addition, efforts should be made, when planning and undertaking site restoration, to conserve the most important areas and faces in a stable and safe condition to facilitate future research, fossil collecting and use of the site as an educational resource.

## **4.6 Collectors from outside Scotland**

Fossil collectors from outside Scotland must be aware of the legalities of fossil resource ownership, and the SSSI system of palaeontological resource management, when planning and undertaking collecting visits to Scottish fossil localities (see Sections 2.1 - 2.6 inclusive) particularly the paragraph on signage in Section 2.4.1.

- **Collectors from outside Scotland have a responsibility to collect fossils in accordance with Scottish law.**

## **4.7 Those that promote awareness of the fossil heritage**

The geological and palaeontological heritage of Scotland is justifiably celebrated and promoted having significant educational, awareness-raising and tourism value. Books and Internet sites and pages highlight aspects of this heritage with some having a national, regional or locality-based focus. Interpretative panels and leaflets, associated with nationally and locally important fossil localities, highlight famous and particularly interesting or significant finds and their geological context. Local community effort can include setting up and maintaining a display of fossils in a public building. Particularly celebrated fossil localities, that become particularly well-known and accessible, may be the subject of large group visitation for educational and tourism purposes. These and other activities, that interpret and promote the fossil heritage, however, come with responsibility to ensure that information or advice provided does not give rise to irresponsible collecting and collector pressure on vulnerable fossil localities.

### **4.7.1 Operators of websites that promote fossil localities and fossil collecting**

Websites that promote fossil localities and fossil collecting can represent a useful resource, providing general geological information, illustrating fossil material and detailing information specific to particular fossil localities. They may have an associated club that organises field trips or fora through which experiences of collecting may be shared. However, promotion of the palaeontological heritage of Scotland via Internet websites should be undertaken in a responsible manner. Every effort should be made to ensure information supplied is accurate, does not encourage exploitation and damage to SSSIs and fossil localities generally

- **Websites that promote fossil locations in Scotland should encourage responsible collecting, request adherence to the Scottish Fossil Code and carry a link to the Code on NatureScot’s website.**

#### **4.7.2 Interpreters of the fossil heritage and authors of guides and other publications aimed at the general public**

Raising awareness, interest, and understanding amongst local people and visitors, of the local geological and fossil heritage, including fossil localities, is an activity pursued by individuals and groups across Scotland. There are many ways this is undertaken including:

- producing interpretative materials such as leaflets and on-site panels;
- creation of a website or using other on-line media;
- organising local talks and planning open days and activities for families;
- preparing displays of local fossils; and
- preparing press releases and engaging the media.

Promoting local palaeontological assets can benefit local communities through attracting visitors and having educational value. Such effort can also encourage interest in geodiversity and nature generally. However, the planning and execution of efforts to advertise or encourage an interest and engagement with the fossil heritage should ensure that information supplied is accurate and does not encourage damaging exploitation of the fossil heritage being interpreted and promoted. This should include reference to the Scottish Fossil Code in interpretative products, media posts, guides and displays.

Similarly the authors of publications that either have a palaeontological subject matter and association, or mention fossils or fossil localities in the wider national context, should make reference to the Scottish Fossil Code. This is particularly the case if there is encouragement for readers to visit fossil localities.

- **Efforts to raise awareness and promote the palaeontological heritage, or aspects of it, either locally or nationally, in publications and any interpretative products such as panels and leaflets, should make reference to the Scottish Fossil Code.**

#### **4.7.3 Leaders of field parties for education or tourism**

Many locations in Scotland that are important for their fossil heritage attract groups such as geological societies, and university and school study parties, largely for educational purposes. Some Scottish fossil localities are also destinations for ‘geotourists’. With the attention of many potential collectors focussed on an area, perhaps at regular intervals over time, a vulnerable fossil locality may be at threat from over-collecting.

It is essential therefore that in leading an educational group an individual, tourism business owner or organisation ensures that the spirit of the Scottish Outdoor Access Code (SOAC) and the Scottish Fossil Code is upheld by demonstrating and encouraging good practice in accessing fossil localities and in all aspects of collecting and data recording.



- **Group leaders should demonstrate and encourage good practice in accessing fossil localities and in all aspects of collecting and bring the Scottish Fossil Code and the Scottish Outdoor Access Code to the attention of group members.**
- **Be aware of any restrictions at any fossil location(s) visited and the threat to localities from over-collecting.**

#### **4.7.4 Those wishing to set up a local museum or permanent display**

Those who seek to promote and safeguard their local fossil heritage may feel it necessary to set up a publically available permanent display or museum if no local museum deals with fossils or provides a public service. The Scottish Museums Council provides valuable advice and guidance that will help you think about what you really want to do, and can realistically achieve.

Where appropriate and practical, loans from museums such as the National Museums Scotland may be organised. Clearly, if you want to display borrowed fossils in a visitor centre, then that means an appropriate degree of security and insurance cover will also be required.

- **Seek expert advice if setting up a publically available permanent display of local fossils.**





## APPENDIX: THE ROLE AND VALUE OF SCOTLAND'S MUSEUM AND OTHER PUBLIC COLLECTIONS

The main museum gallery of The Hunterian, University of Glasgow – Scotland's oldest public museum contains some of the earliest fossil and rock and mineral collections from Scotland. © Neil Clark, The Hunterian.

Many Scottish fossils are held in public museums. Museums are important places for the public to see, learn about and handle fossils. They are also important for palaeontological research, and have a role in tourism and encouraging the wider public understanding of Scotland's fossil heritage. Museums are important for preserving the information about specimens just as much as for the specimens themselves. Given their importance, this appendix to the Scottish Fossil Code concerns collections in Scotland and fossil donations to museums.

## 1. The nature of fossil collections

As an important resource of our geological heritage, fossils in museum collections must be looked after, just as much as new finds. Old museum specimens and new finds complement each other. Older finds are often the only evidence of fossils from quarries and fossil locations that are now worked out or infilled. They may also be historically interesting. Newer finds tend to have more complete information and to have been collected with more modern techniques.

Fossils in private collections are not normally publicly accessible; in the long run, well documented private collections often end up in museums, whose collections frequently grow more in this way than by direct field collection. The collections of Scottish fossils in National Museums Scotland include vast and important collections which initially were in private hands, but which are now part of the National Collections and are available for study.

## 2. Museum Accreditation

Museum accreditation is a voluntary quality assurance scheme for museums across the United Kingdom. It was formerly known as the Museum Registration Scheme. It recognizes that a museum conforms to, or is working towards, basic nationally agreed standards of collections care and documentation, organisation and management, and services to users. In particular, it helps safeguard the collection if the holding institution is dissolved (for example goes bankrupt). Accreditation is increasingly used as a benchmark by funding organisations (for instance, the National Heritage Lottery Fund).

## 3. Museum services in Scotland

Different museums are run in different ways and with different priorities as regards fossils. Many museums have collections and perhaps also displays of fossils, but only some have specialist curators such as geologists or palaeontologists on their staff, or as volunteers. In other words, not all museums, even those with fossil collections, have people with a wide knowledge of fossils.

The Scottish Fossil Code 'Further Information' pages on the NatureScot website provides a link to information on Scotland's Fossil Collections housed in museums and elsewhere. Most have displays of fossils (allowing for closures and renovations), although not all will have palaeontologists on their staff at any given time.

Museums with small collections are not listed for practical reasons, but that does not mean that their collections are not useful. Some, such as the Hugh Miller Museum at Cromarty, and the National Mining Museum Scotland at Newtongrange, hold interesting fossil collections in support of the broader aims of the organisations.

Scottish fossils are also held by museums in other parts of the UK (for example the Natural History Museum in London) and abroad. This is testimony to palaeontology being an international science.

### **3.1 National Museums Scotland**

Scotland's national museum service is National Museums Scotland, which is partly funded by the Scottish Government. It has an important national fossil collection of its own and displays fossils to the public at its museums and by loans to other Scottish museums. It has specialist palaeontological staff experienced in the study and research of fossils, and in their interpretation to the public. National Museums Scotland collects its own finds of fossils, as well as those found by others and also offers advice, expertise and co-operation to the museums community across Scotland.

### **3.2 University museums**

University museums include The Hunterian at the University of Glasgow, which collects fossils from all over the world. The Hunterian has specialist staff experienced in the study and research of fossils, and in their interpretation to the public.

### **3.3 Local museums**

Many local museums, run either by local authorities or independent trusts, have fossil collections. Local museums tend to focus on a particular geographical area, although they will sometimes have fossils from elsewhere in Scotland and beyond, to complement their local fossils.

Many local museums have geological collections, perhaps acquired long ago. Only some have specialist staff in the natural sciences including geologists or palaeontologists, but they provide a valuable service over much of Scotland.

### **3.4 British Geological Survey**

The British Geological Survey (BGS) holds a major collection of Scottish fossils palaeontological slides in its Edinburgh office including type fossil examples. Access for bona fide study is available by appointment or loan, and public displays form part of BGS Open Days. It has experienced geologists available to answer enquiries from the public. The Survey also holds significant collections of Scottish fossils at its headquarters in Keyworth, Nottinghamshire, and these are also available for study by appointment. Internet access to the collections database is available on the BGS website.

### **3.5 Scottish Museums Council**

The Scottish Museums Council (SMC) is the membership organisation for museums and galleries in Scotland. It provides advice and funding from the Scottish Government to all museums (except for National Museums Scotland which is directly funded) but does not offer specialist advice on collecting objects, and does not take a direct role in dealing with fossils.

## 4. The use of fossils in museums

Museums usually add new specimens to their permanent collections for one or more of the following reasons:

**Display** – the fossil is an especially good, complete and clear example, which will enhance a display. Only a small proportion of fossils in a museum will be on display. The majority are usually in storage. Some are unsuitable for display purposes but are held for reference and research. Many may go on display in the future, as permanent and temporary exhibitions change.

**Local provenance** – the fossil helps build up a representative collection of finds in the geographical area of especial interest to the museum.

**Study and research** – the fossil is interesting to palaeontologists, for example because it is evidence for the occurrence of a particular organism at a particular place and time, or because it shows certain features of the original animal. The most important specimens are those that have been cited in papers published in scientific journals. This reflects partly their inherent scientific value, and partly the importance which publication confers. Good science demands that work can be repeated by other scientists, thus scientists must be able to examine published specimens. Therefore it is especially important that such specimens are permanently placed in public collections. Specimens which are simply mentioned or discussed in publications are called **cited specimens**; **figured specimens** are more important, as they have been illustrated in publications; most important of all are **type specimens** – those which are the defined reference specimens for a species or genus of animal, plant or microorganism. On these rest all classification, and therefore all palaeontology.

**Teaching** – where fossils are abundant or critical in helping students understand the uses, preservation, and meaning of fossils. If the fossil is rare, but an important teaching tool, it is sometimes moulded and cast to allow more students an equal learning opportunity.

**Historical importance** – the fossil was found, or is otherwise associated with, an interesting historical figure, perhaps a famous scientist or author, or a local collector.

**Handling and exchange specimens** – these specimens are not registered in the permanent collections but provide a really worthwhile service, used for handling by school parties and visitors, or loaned out to schools. They are inevitably relatively prone to damage and loss in a way which would be unacceptable for the permanent collections. Exchange specimens are saved for swapping with collectors and other museums, or for giving out to schools for them to keep.

# ACKNOWLEDGEMENTS

NatureScot gratefully acknowledges the assistance and contribution of the individuals and organisations who helped in the preparation of the revised Code.

There is particular recognition for those on the Scottish Fossil Code Working Group, chaired by Professor Stuart Monro OBE, FRSE, which included:

Dr Elsa Panciroli (National Museums Scotland, University of Oxford and Scottish Geology Trust);

Robert G Davidson MBE (Honorary Research Fellow, University of Aberdeen);

Professor Steve Brusatte (University of Edinburgh);

Matt Dale (Mr Wood's Fossils);

Elgin Museum;

Dr Nick Fraser (Keeper of Natural Sciences, National Museums Scotland);

Gary Hoare (Geological Society of Glasgow);

Dr Tim Kearsey (British Geological Survey);

Dr Neil Clark (The Hunterian, University of Glasgow);

Pete Harrison (North West Highlands Geopark); and

Dr Colin MacFadyen (Geological Advisor, NatureScot).



Complete Ordovician trilobite fossil from Girvan, Ayrshire. Width of view 2 cm. © Colin MacFadyen/NatureScot.

**NatureScot**

Great Glen House  
Leachkin Road  
Inverness, IV3 8NW

01463 725000  
[www.nature.scot](http://www.nature.scot)



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ISBN 978-1-78391-985-7 **Published** August 2023