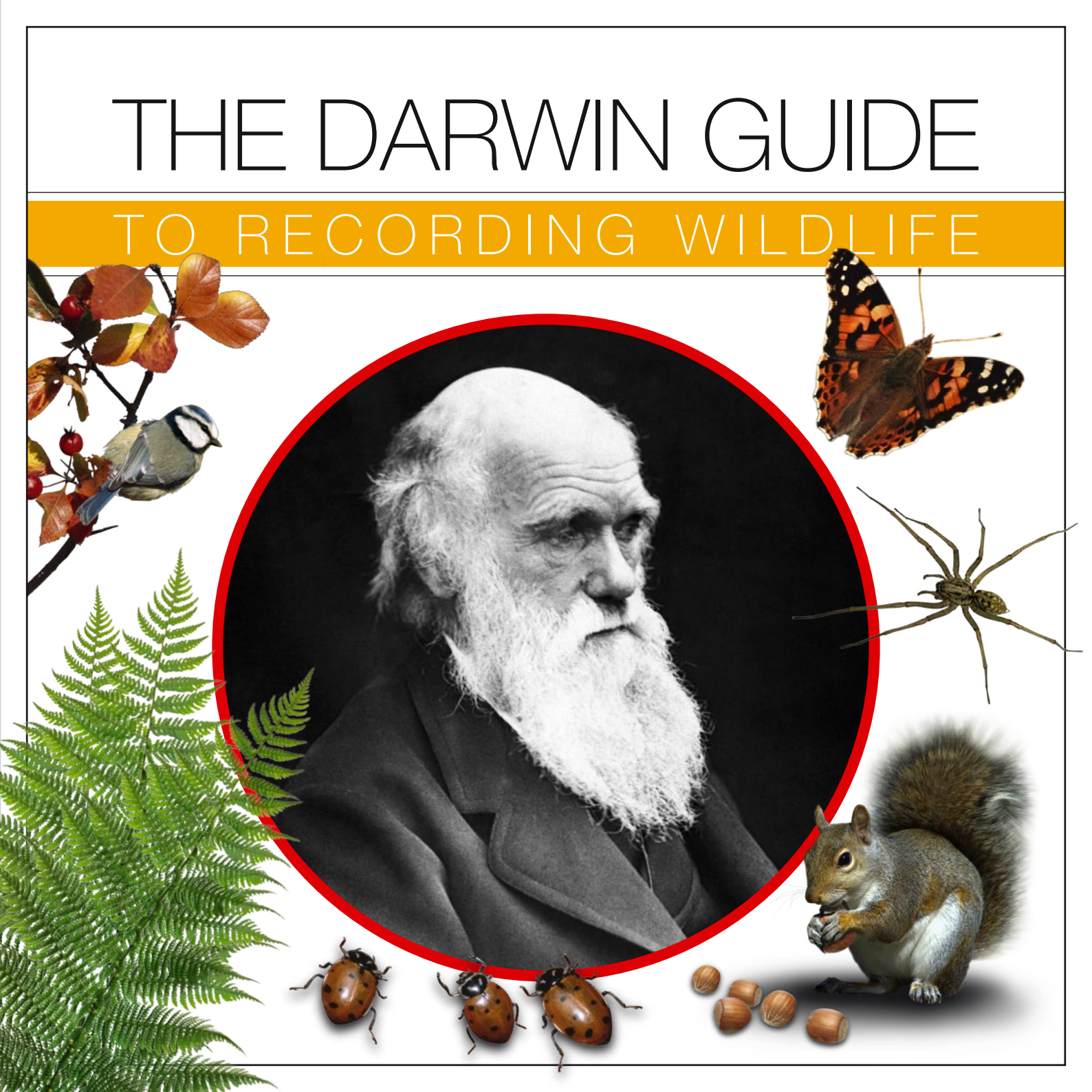
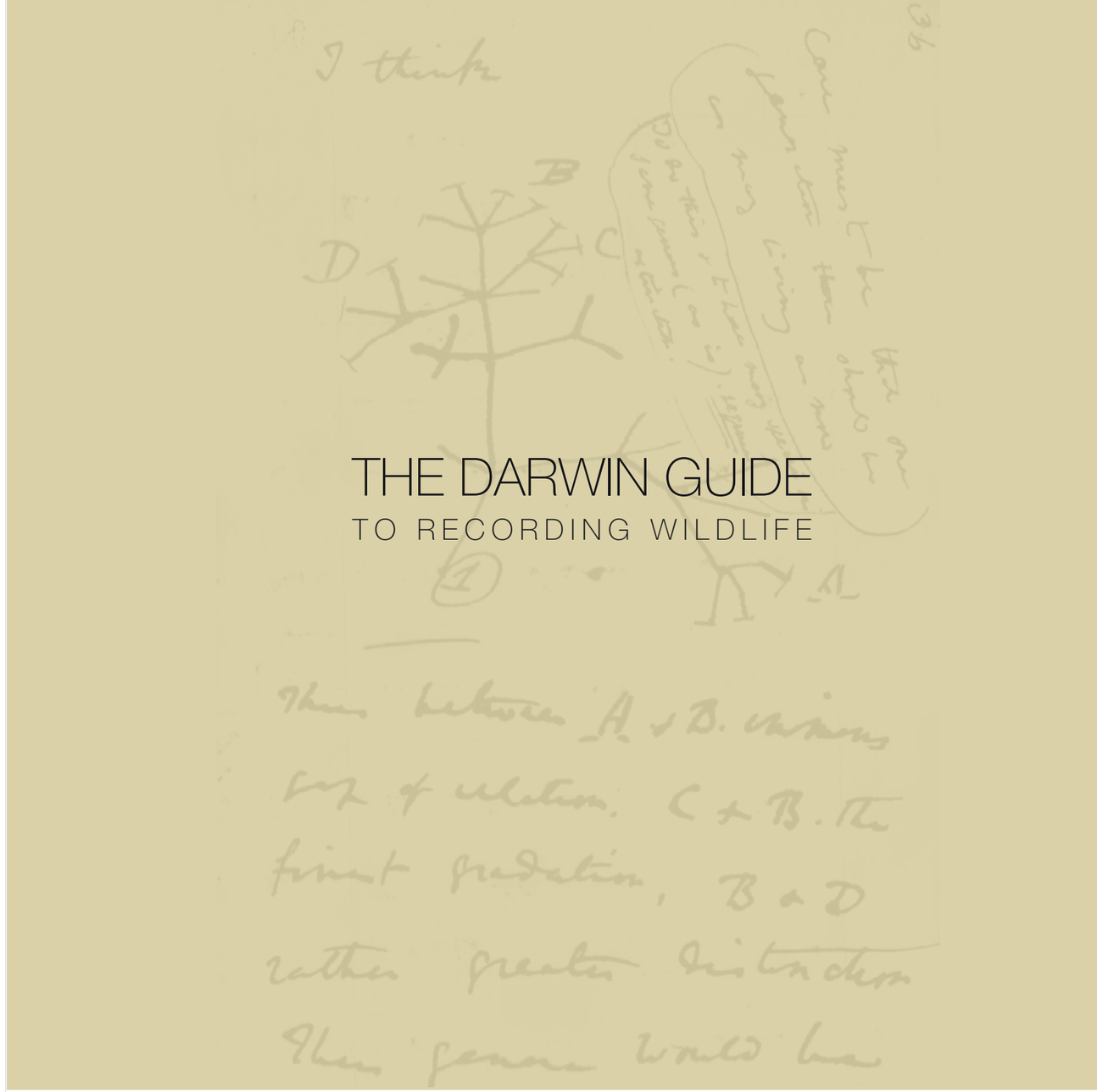
THE DARWIN GUIDE

TO RECORDING WILDLIFE





THE DARWIN GUIDE

TO RECORDING WILDLIFE

Contents

Introduction

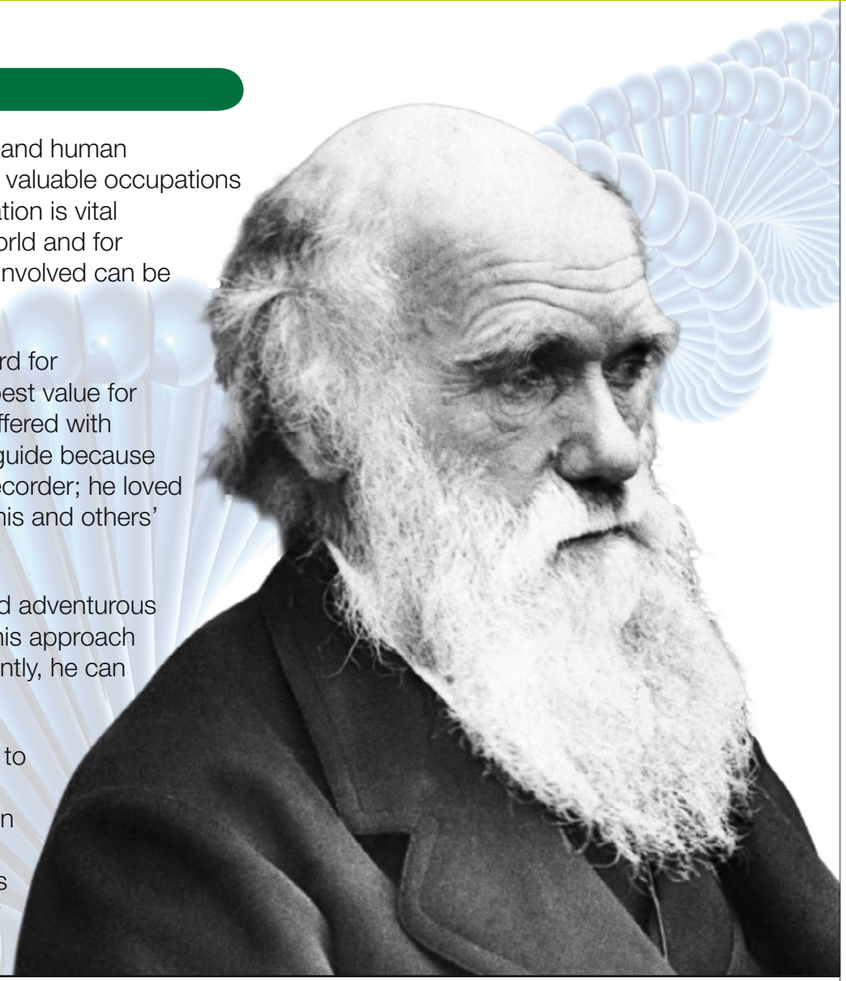
The Darwin guide

Recording wildlife in our natural and human surroundings is one of the most valuable occupations of many naturalists. The information is vital for understanding the natural world and for conservation, and the activities involved can be deeply rewarding.

This guide explains how to record for enjoyment, for interest and for best value for science and conservation. It's offered with this introduction as the Darwin guide because Charles Darwin was himself a recorder; he loved observing natural life and used his and others' records in his science.

He was also a friendly, funny and adventurous man. We can learn much from his approach to recording, and, most importantly, he can encourage us in all we do.

Read here how he was inspired to record, his ways of working, his triumphs and his failures! We can sense through his experience how we can enjoy wildlife just as he did and feel our own wonder at its endless fascination.

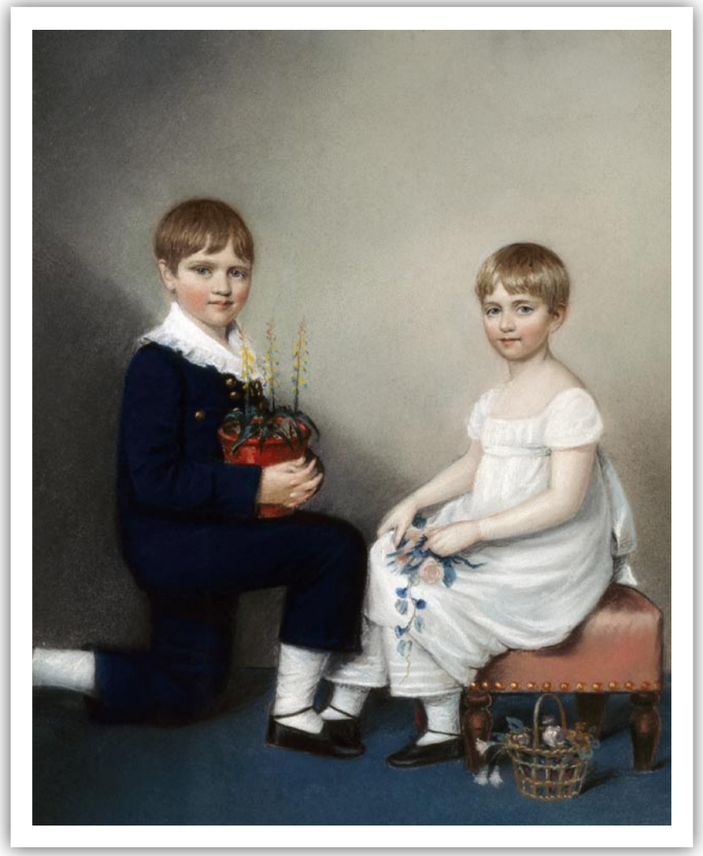


Learning

Darwin wrote 'I was born a naturalist.' When he was a young boy, he had a strong taste for long solitary walks. He liked to name and collect, first plants and stones, and later insects. Born in 1809, at ten years old he was familiar with many of the insect species around his home in Shrewsbury. During a seaside holiday on the Welsh coast, he was intrigued by the strangeness of a number of unfamiliar kinds - burnet moths he didn't recognise, a strange species of tiger beetle and a large black and white bug. He remembered later one windy day 'walking along the beach by myself and seeing the gulls and cormorants wending their way home in a wild and irregular course.' He kept his childhood fascinations through all his life. In his last years his son saw him once 'gently touching a flower he delighted in; it was the same simple admiration that a child might have.' We're all there with Darwin, child and man, when we're absorbed as we watch a living organism.

Darwin was also born with an instinct to list. From his childhood, he made lists of anything - the books he read, birds he shot, shopping lists, payments he made, tasks around the house, and even, when he came to think about marrying, the points for and against to help him decide! In one note on birds he observed during a country walk when he was seventeen, he listed yellow and grey wagtails, noting 'Diagnosis consists in former having black legs and in being more brilliantly coloured.' He then recorded a red-backed shrike and noted the bees and beetles it had spiked on nearby thorns.

When he went to Edinburgh University to study medicine, Darwin found a new interest



Charles and Catherine Darwin as children. Chalk drawing by Sharples at Down House © English Heritage Photo Library. By kind permission of the Darwin Heirlooms Trust

in the myriads of tiny water creatures he could fish out from the tidal pools on the Firth of Forth. He was introduced to a naturalist at the University and went straight to him for advice. The naturalist taught him, helped him in his work and published an article about one of his findings in a scientific journal. Darwin had worked out that some minute organisms he had found in his catch were the eggs of a salt water leech, and he'd managed to collect a number of specimens. The naturalist explained in his article that the discovery was 'due to my zealous young friend Mr Charles Darwin of Shrewsbury, who kindly presented me with specimens of the ova exhibiting the animal in different stages of maturity.' This was Darwin's first appearance in print. It makes sense for all he gave us later that he should be mentioned first like this finding a feature of natural life that had escaped others' notice and showing it to his teacher with a series of specimens that revealed the point.

When Darwin went on to Cambridge University, he was drawn back to beetles by a friend and quickly became an eager collector. He developed special methods of his own, picking through moss scraped off old trees and scouring through the rubbish in river barges that had brought reeds from the fens. He enjoyed the companionship, the rivalry and the thrill of an exciting find. 'One day, on tearing off some old bark, I saw two rare beetles and seized one in each hand; then I saw a third and new kind, which I could not bear to lose, so ... I popped the one which I held in my right hand into my mouth. Alas, it ejected some intensely acrid fluid, which burnt my tongue so that I was forced to spit the beetle out, which was lost, as well as the third one.'

While he was at Cambridge, Darwin approached two leading entomologists in

A modern day image of Panagaeus crux-major, one of the "new kind" of beetles that Darwin saw on the occasion when he put the beetle in his hand into his mouth.

Panagaeus crux-major
© Roy Anderson

THE DARWIN GUIDE TO RECORDING WILDLIFE

> "As he collected and reported, he could see how a full list of creatures and plants in one area sets out a wealth of detail that can be used to answer many questions. One list can be added easily to another, and as the information builds up, it gains and gains in value until it can present a full picture of the rich variety of natural life in a whole region,"

London and showed them his collection. One of them, James Stephens, was producing a survey of the insects of the British Isles with information about where they had been caught, and Darwin offered his finds. Stephens listed Darwin's reports of a bug and some beetles and then described a number of specimens he had that had been 'captured by the Rev. F. W. Hope and C. Darwin Esq. in North Wales'. Darwin wrote many years later, 'No poet ever felt more delight at seeing his first poem published than I did at seeing in Stephens's *Illustrations of British Insects* the magic words, "captured by C. Darwin, Esq."' His contribution was just one piece in a huge jigsaw, worth almost nothing on its own, but valuable when it could be set alongside all the other pieces provided by fellow enthusiasts. As he collected and reported, he could see how a full list of creatures and plants in one area sets out a wealth of detail that can be used to answer many questions.

One list can be added easily to another, and as the information builds up, it gains and gains in value until it can present a full picture of the rich variety of natural life in a whole region, and can be combined with other lists to show patterns of presence or absence that may hint at explanations of why and what species are found where and when!

'Go it, Charlie!' Ref: DAR.204:29.FIR. Reproduced by kind permission of the Syndics of Cambridge University Library

Travelling

After his apprenticeship as a naturalist in Edinburgh and Cambridge, Darwin was given his lifetime's opportunity to join HMS Beagle on its five-year surveying voyage in the Southern Seas, travelling to many remote places unvisited before by naturalists or collectors. He was well equipped for the voyage and hit his stride on the Beagle's first landing on Cape Verde in the Atlantic. With his geological hammer, hand lens, knife, shoulder bag, large pockets and field notebook, he showed how well a young person can do if he or she just prepares well and sets off in the right way. He improvised with his handkerchief to measure one specimen, and once weighed a weasel with his water bottle and a bullet. He lacked one thing that naturalists now take for granted. There were no field guides then with identification keys and colour pictures, only monographs and encyclopaedias with verbal descriptions. Naturalists of the time were forced to pay more attention to the precise features of a species by which it was distinguished from others, and the close attention to the descriptions was a good discipline for careful observation.

Darwin's main interest throughout the voyage was in the geology of the places he visited. Another role of the naturalist on a surveying expedition was to find species 'new to science'. As naturalists collected more specimens that turned out to be new species, experts were becoming more and more aware of the extraordinary proliferation of species in different places and their strange patterns of distribution around the world. There was no simple explanation from soil, climate or any other external factor. This proliferation of species was seen as 'the mystery of mysteries', and some hoped that close study of their distribution might provide a key to understanding how they had come into being. In a single creation, as in the Biblical account, in dispersals from separate creations in different places, or just possibly, in some pattern of branching change through time? The distribution of different species and its explanation has been a focus for recording ever since.

Beagle hand lens © English Heritage Photo Library

Darwin made full use of the voyage to find and record new species, collecting specimens as he could so that experts back home in England could identify, name and describe them. He wrote later, 'As far as I can judge of myself I worked to the utmost during the voyage from the mere pleasure of investigation, and from my strong desire to add a few facts to the great mass of facts in natural science.' In that last phrase about adding to the great mass of facts in natural science he showed his recognition of the need for recording and the putting together of data from many people on which natural science depends.

THE DARWIN GUIDE TO RECORDING WILDLIFE

Rhea Darwinii (Plate 47) from the Zoology of the voyage of HMS Beagle. Ref: Hanson.a.8. Reproduced by kind permission of the Syndics of Cambridge University Library

Darwin had many successes but also learnt from his failures and was happy to turn one into a joke on himself. Observing rheas, the ostrich of South America, on the pampas of Argentina, he learnt from the gauchos that there was a rare second kind, smaller and darker, to the south in Patagonia. When Darwin and his companions landed there, the ship's artist shot a rhea. Darwin looked at it and 'from most unfortunately forgetting at the moment the whole subject' of the rarer bird, thought it was a partly grown one of the common kind. 'The bird was skinned and cooked before my memory returned. But the head, neck, legs, wings, many of the larger feathers, and a large part of the skin, had been preserved.' Darwin collected them and on getting back to London, was able to provide enough of the parts for a nearly complete specimen to be put together. It was mounted for display at the Zoological Society's museum, and he readily admitted what had happened in his scientific work on the zoology of the voyage.

During the voyage Darwin showed his skill as an observer again and again in his grasp of likenesses, differences and patterns of different kinds. Two points that he noticed when the Beagle reached Galapagos were not difficult to spot, but the significance he found in them, the clue to the key fact that species change, is a lesson to all recorders, all naturalists. If we keep our wits about us as he did, we too may notice points that may offer clues to features of the natural world that may be of great importance for scientific understanding or conservation needs.

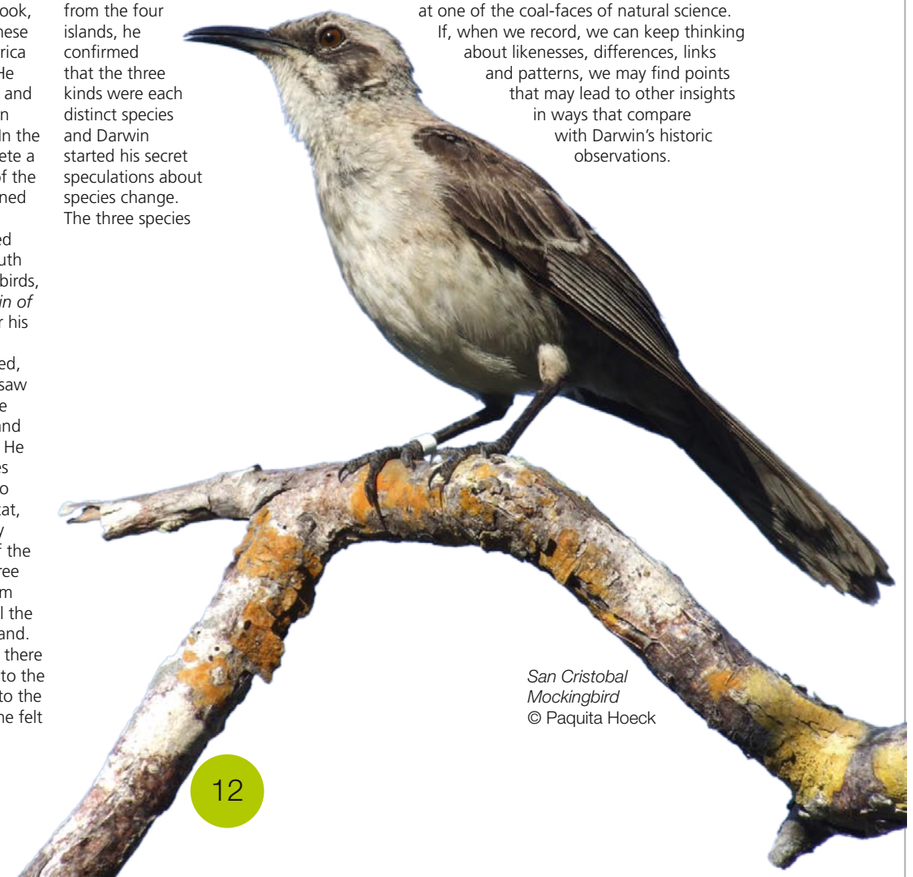
On the first island the Beagle visited, Darwin saw a bird we now recognise as one of Galapagos' unique mockingbirds.

He'd first seen a bird like it in Uruguay and had called it a shrike, *Lanius* in his notes, simply because that was the closest genus that he knew from England. (Remember the red-backed shrike he recorded in Edinburgh.) He'd then seen another similar bird in Chile which local people called the Thenca. He now saw that the bird on Galapagos was close to the Thenca, so he used the same name for it and wrote in his field notebook, 'The Thenca very tame and curious in these Islands. I certainly recognise South America in the ornithology. Would a botanist?' He was thinking at once about distribution and wondering whether there were common features between the birds and plants. In the weeks that followed he made as complete a collection as he could of all the plants of the islands. When an expert botanist examined them back in England after the voyage, he was able to answer Darwin's scribbled question. The plants were almost all South American in character like many of the birds, and Darwin put the point into *The Origin of Species* as one piece of the evidence for his theory of evolution.

On the second island the Beagle visited, forty miles away from the first, Darwin saw more Thencas, but found that they were all consistently different in their shape and markings from those on the first island. He was particularly struck by the differences because the two islands were so close to each other and almost identical in habitat, and he decided then to look out for any other Thencas there might be on any of the other islands the Beagle would visit. Three weeks later, as the boat sailed away from Galapagos towards Tahiti, he laid out all the bird skins he had collected, island by island. He saw at once that on the four islands there were three distinct kinds, one exclusive to the first island, one to the second and one to the last two. Reflecting later on this point, he felt it was the 'most remarkable fact' of all he'd discovered about the wildlife of Galapagos. He wrote in his notes on the specimens that if it was true that separate species so similar to each other could be found on islands so close together, such facts would 'undermine the stability of species'. When an expert ornithologist in London examined Darwin's specimens from the four islands, he confirmed that the three kinds were each distinct species and Darwin started his secret speculations about species change. The three species eventually appeared in *The Origin of Species* as the 'mocking-thrushes' of Galapagos.

So the Galapagos mockingbirds' likenesses with the mainland species and their differences from each other gave Darwin two pointers towards his insight into species change. He noticed the features as he was observing bird species in the archipelago. Wildlife recorders are working at one of the coal-faces of natural science.

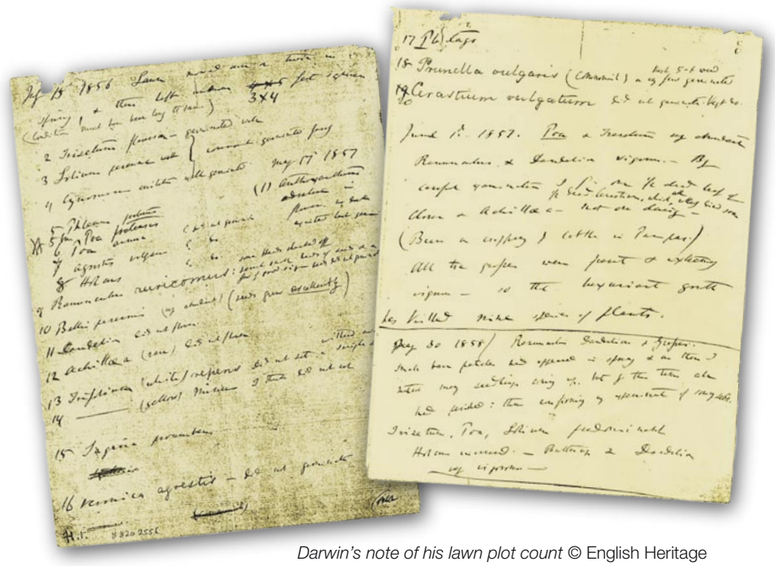
If, when we record, we can keep thinking about likenesses, differences, links and patterns, we may find points that may lead to other insights in ways that compare with Darwin's historic observations.



San Cristobal Mockingbird
© Paquita Hoeck

THE DARWIN GUIDE TO RECORDING WILDLIFE

Home ground



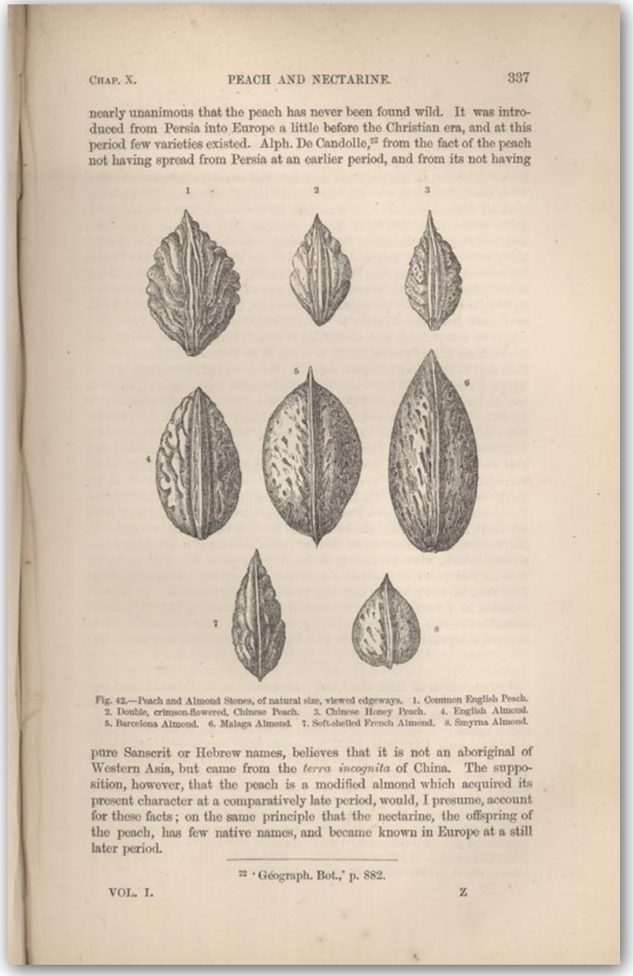
Darwin's note of his lawn plot count © English Heritage

Back from the Beagle voyage, Darwin spent a few years in London writing up his findings from the voyage and developing his secret ideas. After marrying (remember his list!) and starting a family, he moved with his wife and children in 1842 to Down House near Bromley in the Kent countryside and until 1882 spent the rest of his life there, walking every day in his garden and the woods and pastures around, along the same hedgerows and streams, observing, comparing and experimenting. His life as a naturalist was remarkable in the contrast between its two quite separate parts, the first five years on the Beagle voyaging around the world, passing quickly through places he'd never see again and just noticing what he could along the way, and the following forty years at Down House returning again and again to the same places, studying the plant and animal life of the small area with close and repeated attention. Every recorder can choose between ranging far and repeating the same track. Darwin's achievements in his two periods show how the two kinds of work differ from each other but can each have special benefits. He learnt quite as much from his observations at Down House as he had done from his voyage around the world.

If we want to understand the natural life of a neighbourhood in any depth, it helps greatly to first work out the lie of the land and its habitats. Darwin started his own careful work around his new home with a survey of the landscape, its structure and soils, the human settlement and use. Through the years he lived and worked there, he built up his knowledge and made repeated use of it in his many investigations.

Darwin quickly realised that he wanted to look closely at the plants and insects of the neighbourhood. He knew his insects well but had neglected plants since his childhood. He wrote to a botanist friend about his plan and said he'd 'want a bit of help in naming puzzlers. How dreadfully difficult it is to name plants!' A short time later he wrote, 'I have just made out my first grass, hurrah! hurrah!' He had to admit he'd been lucky as the grass he tried was the easy sweet vernal grass. 'Nevertheless it is a great discovery; I never expected to make out a grass in all my life!'

Once Darwin had mastered the naming, he quickly developed simple methods of measured sampling for a range of plant experiments and pioneered the quadrat using his back lawn for a highly effective demonstration of the extraordinary phenomenon of plant diversity in a small space. He wrote in *The Origin of Species* that to show 'the truth of the principle that the greatest amount of life can be supported by great diversification of structure. ... I found that a piece of turf, three feet by four in size, which had been exposed for many years to exactly the same conditions, supported twenty species of



CHAP. X. PEACH AND NECTARINE. 337

nearly unanimous that the peach has never been found wild. It was introduced from Persia into Europe a little before the Christian era, and at this period few varieties existed. Alph. De Candolle,[22] from the fact of the peach not having spread from Persia at an earlier period, and from its not having

Fig. 42.—Peach and Almond Stones, of natural size, viewed edgeways. 1. Common English Peach. 2. Double, crimson-flowered, Chinese Peach. 3. Chinese Honey Peach. 4. English Almond. 5. Barcelona Almond. 6. Malaga Almond. 7. Soft-shelled French Almond. 8. Smyrna Almond.

pure Sanscrit or Hebrew names, believes that it is not an aboriginal of Western Asia, but came from the *terra incognita* of China. The supposition, however, that the peach is a modified almond which acquired its present character at a comparatively late period, would, I presume, account for these facts; on the same principle that the nectarine, the offspring of the peach, has few native names, and became known in Europe at a still later period.

[22] 'Géograph. Bot.,' p. 882.

VOL. I. Z

"Peach & Nectarine" page 337 from "The Variation of Animals" Ref:CCA.24.28. Reproduced by kind permission of the Syndics of Cambridge University Library

plants, and these belonged to eighteen genera and to eight orders, which shows how much these plants differed from each other.'

We record and collect different things for different purposes. The nineteenth century was an age of collections and Darwin once commented to a friend that he was surprised there wasn't someone somewhere collecting odd-shaped biscuits! He shouldn't really have joked as during his years at Down House he formed many collections that others must have found odd, including his orchids, insect-eating plants, barnacles, fancy pigeons and plum stones. But each time he had a special interest, the collection had a special point, and he could explain it.

He took up plum-stones for example while he was working on variation in cultivated plants. He looked at the shape of different fruits as a feature that often varied markedly between varieties. He found plums were 'extremely variable'. Starting in his orchard, he made a collection of the stones of twenty-five kinds, and found that 'they graduate in shape from the bluntest into the sharpest kinds'. The shape of the stone often differed from that of fruit, with similar plums having different stones and vice versa. The set of examples offered many points to explore and test.

Two examples show how Darwin could use his familiarity with his home ground for special understanding, and suggest ways in which anyone else may be able to use theirs.

First, from his daily walks along the Sandwalk, his 'thinking path' around a

> "He pointed to the possibility and suggested that 'the power in seeds of retaining their vitality when buried in damp soil may well be an element in preserving the species, and, therefore, that seeds may be specially endowed with this capacity.'"

copse in his grounds, Darwin was familiar with normal patterns of plant growth and was able to spot exceptional occurrences. One day he noticed seedlings of Charlock sprouting in a patch of soil from which some thorn bushes had been taken out. He remembered that the ground had been ploughed nine years before and Charlock had grown up the next year but had not appeared since. He dug three two foot squares nearby and numbers of Charlock appeared in each. He found reasons to believe that the Charlock seed might have remained buried in the soil through the years since the crop after the ploughing. He pointed to the possibility and suggested that 'the power in seeds of retaining their vitality when buried in damp soil may well be an element in preserving the species, and, therefore, that seeds may be specially endowed with this capacity.' His paper on the Charlock seedlings and their possible explanation first pointed to the phenomenon of buried viable seed, a widely important feature for plant ecology.

Second, from his knowledge of his own management of the land, he could remember his own plantings and what had grown since. He had planted a hawthorn hedge in 1845 to protect a small copse from cattle grazing in the field alongside. Walking next to the hedge every day, he knew how birds used it to perch between flights out over the field. Wanting to know how plants might be sown and grow in different situations, he examined the hedge in 1880 and identified twenty plant species that had become established in it since he planted the hawthorn. He worked out that many of the seeds might have been brought there by birds feeding in the neighbourhood and then perching on the hedge; none of the plants were growing in the open field; seeds germinating in the hedge might have been able to grow there but not elsewhere because of the thorn's protection, and some of the other plants might have taken the place of the hawthorn as 'the plants ... by their growth will soon annihilate their nurse.' This was a classic recognition of an ecological succession, identified because the observer himself had watched through the long process.

School children examine the sandwalk hedge on Darwin's thinking path at Down House, Kent
© The Charles Darwin Trust by kind permission of English Heritage

Change and monitoring

Both these examples highlight another point that was fundamental for Darwin and is essential now for our understanding. What happens to any one organism in any particular situation depends not only on the organism itself, but also on all its interactions with the other organisms it is living with in their shared surroundings. Change any element and there may be knock on effects in any direction. Darwin wrote in *The Origin of Species* about an area of heathland he had studied in Surrey. One part of the heath had been enclosed, cattle excluded and some 'Scotch Firs' planted. In twenty five years there had been greater changes in the vegetation than was normally found between soils of different types. Twelve new species of plant had appeared not counting grasses and sedges; six new species of insectivorous bird now fed there, and three species found on the heath had disappeared. All as a result simply of removing the cattle and introducing the trees, and for recorders to note, all revealed by comparing two surveys of the enclosed and open land.

Darwin revealed to us how extraordinarily complicated many of the interactions are and how far beyond our power to understand; how precariously balanced some living communities are and how difficult for us to detect what may be happening to them. He emphasised in *The Origin of Species* that we humans are 'profoundly ignorant of the mutual relations of all the beings which live around us.' 'Who can explain why one species ranges widely and is very numerous, and why another allied species has a narrow range and is rare? Yet these relations are of the highest importance, for they determine the present welfare, and as I believe the future success and modification of every inhabitant of this world.'

By 'every inhabitant here', Darwin means every living organism. He is showing here the critical importance of monitoring for all nature conservation.

Recorders play an essential role in detecting the kinds of factor Darwin saw we need to understand, with their gathering of precise data over wide ranges, their meticulous analysis and their detection of hidden trends. Recorders focus on nature's traces and work at her range and pace. Their findings are essential for understanding what is happening and for taking effective action.

Randal Keynes
The Charles Darwin Trust.

THE DARWIN GUIDE TO RECORDING WILDLIFE

From Darwin to today – Why record wildlife?

'It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us. ... There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved.'

Darwin
The Origin of Species 1859

Our world is full of living things, which is what makes it so special. Human beings have always taken an interest in at least some of these, if only to feed ourselves, or safeguard us. Recognising things and communicating our observations is therefore a very basic instinct, even if we may not realise it.

Over the last three hundred years or so, we have also taken a more "intellectual" interest, partly as a pursuit of our innate curiosity, but also because, in an increasing way, we have realised that, by recording our environment, we are not only coming to understand it more, but also creating a "permanent" picture of it, against which future changes can be measured.

Wildlife recording, then, is an extension of our quest for knowledge about our natural environment. More recently, it has become an essential tool for understanding change, and for making sensible decisions about carrying out our activities so as to minimise damage to the world around us. Slowly, this process is giving us profound insights into the nature of change, and the processes that control our world.

Britain, especially, has had a reputation for widespread and systematic involvement of a very wide range of people in carrying out this activity. Wildlife recording has become a kind of tool for everyone, enabling them to engage with their environment. It is also fascinating, and can provide a lifetime's interest for people with enquiring minds and a deal of patience to undertake it.

Getting involved in recording wildlife

Before we can get involved in recording wildlife we have got to know what wildlife is, as well as where to look and how.

Wildlife is all around us, much of the time, whether we are in a town or the countryside, whether it consists of the obvious birds or animals, or the obscure creeping things under stones, or the weed in your back garden pond.

We obviously cannot immediately jump in at the deep end with recording everything. Most people start either by focusing on one group of animals or plants, and on a local patch – their garden, or the local park, even a bit of waste land. Birds are often the first choice, but they don't have to be. Mammals, butterflies or flowers can all prove a rewarding start for the beginner, while others might develop an interest in other groups of insects, freshwater life and so on.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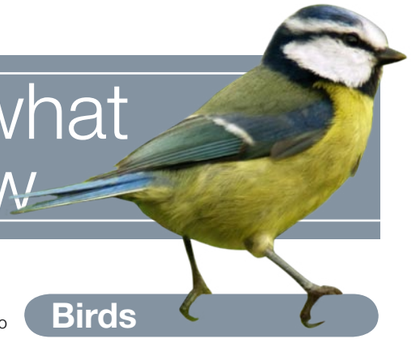
THE DARWIN GUIDE TO RECORDING WILDLIFE

Wildlife subjects: what to look for and how



Focusing, to start with, on one subject area is probably the best way of getting to know wildlife properly, even though we may not want to exclude an interest in a range of other species as well, and may well develop other interests over time. But how do we choose a subject, and how easy will it be to get to grips with it? Do we need to have special kit, or get involved with all sorts of experts before we can begin? Will we need to go to special places to find things, or can we find them locally? All these are likely to be among the first questions.

Many people will have been attracted to the idea of studying wildlife either through seeing things when they are at home, or on holiday etc., or on television. We tend to notice the most obvious things, like birds or butterflies, or we might come across frog-spawn with our children, or have been attracted to the strange behaviour of a wild animal. Each kind of wildlife comes with its own fascination, and also its own challenges for deeper understanding.

Having caught the bug of wildlife study in whatever way, we will want to know more before we can really get involved with recording. One of the key things is that we need to be pretty sure about what it is we are recording, in order to avoid misleading others. We will come to the importance of this later.

Finding the species is an essential first step. To do this effectively we need to know how to find the things we are especially interested in, and this involves that little-recognised or talked-about skill – fieldcraft. Half of the secret of finding wildlife is in the approach we take to looking for it. Each group of wildlife requires a rather different approach. All of this takes a bit of time to learn, but don't give up if it seems difficult – it is very rewarding when we just begin to understand where things live and how.

The following can only be a brief taster, looking at some of the principal things to remember for each main group. Good books on different subjects should give some clues about where to start, and how to approach the subject, but it needs stressing that being out with someone who already has some skill is by far the best way to get to know how and where to find things.

Finally, a good bit of advice for finding most things is: don't just stick to the usual path followed by everyone else. Getting off the beaten track often gives the best results (but remember, you may need permission in some places).

Birds

Birds are often very conspicuous, and make a good choice for many beginners. They are perhaps the one group that tends to attract most youngsters, partly through the challenge of seeing something new, partly because they are so varied, readily accessible and charismatic. Their comings and goings throughout the year are a continual source of fascination, while at the same time challenge us to try and find them.

Scope of the subject

The list of British birds, published by the British Ornithologists' Union (the main UK scientific organisation concerned with bird biology) currently includes 572 species of bird that have been or still are 'recorded in the wild' in Britain. Of these, a large proportion is regarded as rare, so that any one local area might only have some 70 or so regular bird species, and even fewer that are actually breeding locally. If you are lucky enough to live near some good bird habitat, such as a river valley wetland nature reserve, or the coast, then you will be privileged to see a lot of species that do not usually turn up elsewhere. If you live

Mammals

in a large city or town, there are many places to observe wildlife and it is often surprising how many unexpected things turn up.

Things to study

Apart from just seeing new species, birds also offer a whole range of potential interests for more serious study, such as year to year monitoring of populations, breeding bird recording, migration watches, or studying behaviour. Some people take up sound recording bird song, while others find that they offer superb opportunities for creative photography.

Fieldcraft tips

Even though many birds are conspicuous and can readily be identified by anyone, getting to know many other species can take time, patience, and care in approaching them. A good ear for their calls and songs is also a great advantage, although it takes practice and care tracking the singing bird down, and then getting a sure identification. Quite often, beginners find they end up re-learning identifications and calls afresh at the start of each year, so do not be frustrated if this is what you feel. You are not alone! A bit of advice though – be wary of using a set of bird-song recordings at the outset – too many bird sounds are similar, and recordings can be confusing – much better to track your particular birds down and get a handle on them, one at a time.

Begin to learn the way different birds do things – pick up what bird watchers call the 'jizz' of a particular species, its particular movement, flight or poise. Such things help in identifying birds at a distance or in poor light. Above all, learn to look carefully at plumages – the colour and form of things like wing bars, leg colour, eye-stripes and so on. Be aware, also that bird plumages vary depending on the season, as well as often between sexes, and during juvenile stages. A good bird field guide will explain all these, and show you what to look for.

Good ornithologists (students of birds, as opposed to just casual bird watchers) also know where to look, and what might be expected in different situations. Woodlands obviously hold different species from arable farmland, but there are also other, more subtle differences. Scrubby, open ground, with low bushes, for example, might have whitethroats, while taller, denser bushes with open spaces, might hold willow warblers. Areas with at least some surface water will attract more species than drier ground, but dry, heathy areas can have species not found elsewhere, such as stonechat and nightjar. Some birds have specific habits that mean we only find them if we know exactly where to look. An example might be the woodcock, which can lie very hidden and quiet by day in damp, shady hollows in woods. Time of day is important, as all birds go through daily routines. Early morning is best, when they might be concentrating on establishing territories, and therefore singing more

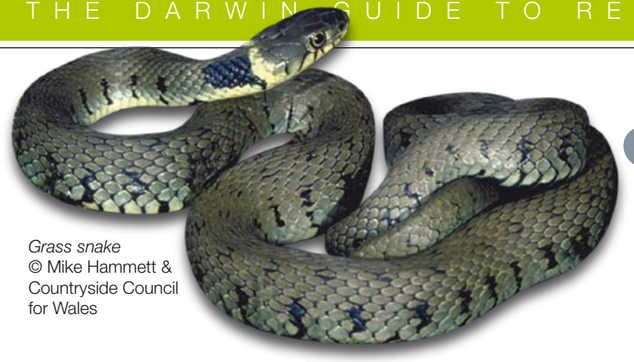
Mammals are a bit more of a challenge than birds, at least in Britain, partly because they are often nocturnal, but also because they are very wary of us humans, for good reason.

Scope of the subject

There are far fewer wild mammal species in the UK than birds, with some 77 species listed at 2009, and even this includes a fairly long list of rare visitors, in the form of either migrant bats, or scarce visiting seals (but not including entirely marine species of whales, porpoises and dolphins) that occasionally turn up along our coast. It also includes extinct species, like the wolf, and a fair number of introduced animals, a few of which are highly localised, like the red-necked wallaby. Other species, such as reindeer and beaver, although recently re-introduced, are, as yet, still very local. A more realistic total, not counting humans, is 55 species in mainland Britain, including the 13 or so regular bats; and many of these species are distinctly uncommon or hard to find. In any one local area, again, you may well be hard-pressed to find more than 20 species, unless your local habitat is particularly rich. But, once again, you may find the unexpected – such as foxes in towns or rare seals in a river estuary.

Things to study

Because there are far fewer species than there are birds, most of them being resident, people tend to focus not just on seeing them, but more on their behaviour, breeding biology, populations etc. They too offer opportunities for a wide range of studies, and also things like photography, but need rather more perseverance and skill.



Grass snake
© Mike Hammett & Countryside Council for Wales

Amphibians and reptiles

Our cold-blooded cousins attract many people, especially younger children. Kids often love to hunt for frog-spawn, while the thrill of seeing a snake, for some at least, can be great. Pond-dipping is a perennial attraction.

Scope of the subject

As with mammals, we do not have many native species in the country – just seven native amphibians (one of which – the rare pool frog – was only recently recognised as a native, promptly became extinct, and has now been re-introduced); and six native land-based reptiles, including two snakes and the slow-worm, two of which are very scarce. In addition, there are a range of introduced species that have become established from the unofficial release of pets.

Things to study

As with mammals, studying these tends to revolve around their behaviour and breeding etc., and, like mammals, can involve the need for much patience. Because most species are also protected by law, this places some restrictions on what can and cannot be done without a licence. Studies of populations or breeding behaviour are possible for many species, though, while many people get involved in conservation measures, such as toad lifts over roads.

Fieldcraft tips

Although the two groups tend to get lumped together, looking for them can involve very different approaches. Both groups, being cold-blooded, hibernate in winter, and therefore recording them will

Fieldcraft tips

Finding mammals often involves tracking, reading signs in the landscape, licensed trapping or night watching. Only occasionally are we privileged to see wild mammals active during the day in full view, except for a few species, like the rabbit, or the occasional hare, fallow deer or fox. Care in stalking is often essential, and also, again, working with experienced observers is both more rewarding and effective for a beginner. Being aware that our own scent is a distinct turn-off for most species is essential! For some groups, we also need to be specially aware of restrictions on our activity through legal protection. It is, for example, illegal to disturb any bats in their roosts without a licence, or to interfere with a badger sett.

The most useful asset for a beginner is to get to know signs – identifying animal tracks in wet mud or snow, or finding the remains of food, droppings, or old nests. For example, dormouse nests in bushes can be distinctive, with their woven shape, including a few leaves. Hair tufts left on fences where animals pass underneath are also a good clue. Bats can be identified, with skill, to some extent at least from the nature of their droppings. Otters leave special, scented droppings called scats at vantage points along rivers; while badgers dig characteristic latrines and have regular paths through scrub or woodland, as do deer.

In a few cases, there are special ways of studying species. Bats, for example, are often best identified by their echo-location calls, which can be picked up by electronic bat-detectors, available from specialist suppliers. Nocturnal small mammals are also often best surveyed using specialised live traps, such as the Longworth trap, which can be placed in suitable habitat. Knowledge of where and how is important, and best acquired through working with a local group. There are also some legal constraints on this kind of activity.

Another way of recording that has provided useful results is to find owl pellets and dissect the remains to identify skeletal remains or teeth; while finding old discarded bottles in hedges can prove rewarding, if rather disgusting, because they will often contain the dead remains of trapped small mammals that have ventured in to find a meal and could not get out. A strong stomach may be required!

Fish

usually involve fieldwork at the right time of year, often when they emerge to breed.

Amphibians, of course, are basically wetland species, often found in ponds etc., although they may roam widely after breeding. Reptiles, however, tend to live a secluded life in dry, rough habitat where there is both a good food supply and open areas to bask. Both groups, however, need some skill to find them. Amphibians can be relatively easy to record when they are breeding, as they may congregate in some numbers at favoured sites, or be evident when they are migrating to and from them. Toads on roads attract attention when they are squashed! Frog-spawn is obvious. Newts take more finding, because they lay single eggs on special plants etc.; and they are often nocturnal, so finding them with a torch at night is the best way for some. We need also to be aware that all amphibian species are protected by law to some degree or other, and the great crested newt and natterjack toad are especially protected, so that disturbing them requires a licence.

With reptiles, knowing their general habitat preference might lead us to explore such places, especially on warm days in the spring, when they are emerging, such as the rough margins of allotments, for example, or heathy banks. They often lie concealed under old bits of tin or board left lying around, and may bask on these if undisturbed. As they can pick up vibrations readily as we move, tracking them takes care. Again, many species are protected, especially the rare sand lizard and smooth snake, but away from their southern heathland haunts you are unlikely to find these anyway.

Fishing has always been a potential fellow-interest for naturalists, even if the motives may be somewhat different, and the fisherman's single-minded doggedness at one spot can be considered by others as extreme. Studying fish, though, tends to be rather a rare sport for people at large, partly probably because they can be difficult to observe without actually going fishing.

Scope of the subject

Britain has a good range of freshwater and brackish water species – about 40 natives, together with some 18 introduced species. Many more species are involved if we include marine species of in-shore waters.

Things to study

Apart from distribution, fish behaviour and breeding biology studies are possible. Many species have complex courtship and breeding behaviours, which could be studied by direct observation in some cases. Captive populations can also sometimes yield useful results, but require substantial equipment to maintain.

Fieldcraft tips

As mentioned earlier, fish can be difficult to study because they live entirely in an aquatic environment. They are also usually cryptic (camouflaged against their backgrounds, both from above and below), sometimes rather inactive during the daytime, or have specialised habitat requirements (specific bottom sediment types, speed of flow, depth of water, temperature levels and so on).

Fishing is, of course, a sport and pastime in its own right, but fishermen often only take an interest in certain quarry species, and their methods of capture involve skills honed from lifetimes of experience in many cases. Fish study, though, can include all species, so things like sticklebacks and minnows would count. Ponds, as well as small streams will hold their own communities, as long as they are not polluted, or have not been too severely mismanaged. It is often surprising how quickly fish can re-colonise sites – through eggs attached to birds' feet or feathers (although often fish are artificially introduced for fishing purposes, sometimes to the detriment of other wildlife in a pond).

Professional ichthyologists (studiers of fish) may use specialised techniques, requiring special gear, such as electro-netting, but it is still possible to do useful work through direct, careful observation of shoals moving along rivers, for example, or sample netting, using standard pond nets available from biological suppliers. Avoidance of vibrations while walking river banks, or avoiding shadows being cast over water is often essential. Use of anti-glare polarised sun-glasses can be useful, as these cut out reflections from the water surface.

At one time, it was customary for young lads especially to go and catch sticklebacks in their local streams, but nowadays, this pastime seems to have waned, through concerns about safety, which is a shame. There can however be some legitimate health and safety worries about working near water, and not just from drowning – Weil's disease, for example, caught from rat-infested waters, can be a problem locally, so wearing protective clothing may be advisable.

Insects and other invertebrates

Many bird watchers, becoming bored during the breeding season, and waiting for the autumn migration, have traditionally turned to dragonflies as an alternative – being big and often showy, occurring by the lakes that attract wildfowl, and able to be watched with binoculars. On the other hand, a lot of people will have taken to butterflies – bright, colourful, often conspicuous. Moths can also be a spur to enthusiasm – attracted to our lights, therefore obvious. Even some beetles, like the ladybirds, attract attention from even the most casual observer, and children often love them for their colourfulness, and for their ease of observation.

Darwin once carried out a fascinating experiment with worms.

Worms do not possess any sense of hearing. They took not the least notice of the shrill notes from a metal whistle, which was repeatedly sounded near them; nor did they of the deepest and loudest tones of a bassoon... Although they are indifferent to undulations in the air audible by us, they are extremely sensitive to vibrations in any solid object. When the pots containing two worms, which had remained quite indifferent to the sound of the piano, were placed on this instrument, and the note C in the bass clef was struck, both instantly retreated into their burrows. After a time they emerged, and when G above the line in the treble clef was struck they again retreated. Under similar circumstances on another night one worm dashed into its burrow on a very high note being struck only once, and the other worm when C in the treble clef was struck.

Darwin

Formation of Vegetable Mould through the Action of Worms (1881) pp. 26-27

Scope of the subject

There are well over 22,000 species of insect in the country, but many of these are in obscure groups, difficult to find and identify.

The most conspicuous and self-evident group is probably the butterflies, with only 67 species on the British list, of which quite a few are migrants. In most parts of the country, and especially in the north, there are far fewer. Moths, with many more of them than the butterflies (over 900 larger species – the so-called macro-moths), are a bit more of a challenge!

There are 40 species of dragonfly and damselfly currently resident in the UK, with another 12 migrants on the UK list, and a few extinct species, making them a relatively easy group to get started on.

Grasshoppers and crickets, with only 28 native species, also offer a useful starting point, and have the advantage, for many at least, that they often make a noise at the appropriate time of year, even if they can be hard to spot.

Beetles, including many of the 26 ladybirds, can be found almost anywhere. However, with over 4000 resident species, and more appearing all the time, getting to grips with them as a group, as with the 5000+ flies, is not a task for the faint-hearted!

With the bees and wasps – the bigger ones at least are increasingly accessible for even relative beginners, because of the availability of good books, but probably not so easy to get to grips with in terms of identification. There are 22 existing bumblebees and cuckoo bumblebees in the country, while there are some 9 social wasps; along with a host of other usually so-called

solitary bees and wasps.

Other insect groups include a wide range of species, such as bugs, ants, lacewings, mayflies, scorpion flies, stoneflies, fleas, tree-hoppers, bark-flies, and caddis-flies, all of which have specialist groups that study them. Some groups, such as the aphids and thrips, tend only to be studied by professionals interested in them as pest species.

For beginners, getting involved with more obscure invertebrate groups is probably not an immediate option. Things like woodlice, millipedes, spiders, harvestmen, pseudoscorpions, snails and slugs, all have their devotees, but may not immediately attract casual observers, although woodlice are becoming an exception, with several good new publications available to help us along. The other crustaceans, apart from the crayfish (of which there are some five invading alien species) are usually not noticed, because most of them are small, freshwater species. Nevertheless, we should not forget all these groups, because not only are they important in the web of life, but they each have their own fascination.

Things to study

There is almost an endless list of opportunities with these groups to make a useful contribution in studying them. Most insects, if not the more obvious ones, have yet to have their life-cycles fully explored. Many insects have unknown larval stages or unknown food-plants. Very little is known of their ecology or even their distribution in many cases, giving great scope for new finds. As new species, even to science in more obscure groups, are being found every year, this also makes their study especially appealing for some, if not for the beginner! New species to Britain are also arriving on a regular basis, a process that is increasing with warming climatic conditions, while the shift of species in response to climate change offers great scope for recording these movements. Most recently, there has also been developing an increasing awareness of and interest in studying the impacts of introduced alien species on our native wildlife and environment.

Fieldcraft tips

It is impossible in a short space to give much guidance on the ways in which different groups of insects etc. are studied, although some general pointers may be useful.

There are only a very few groups of invertebrates that lend themselves to casual observations because they tend to be quite large and conspicuous, much as birds are. The main ones, of course, are butterflies, dragonflies and some moths, and the first two of these groups are often studied by people who have come at the subject through bird watching to start with. Molluscs can be quite conspicuous and, often, relatively easy to find and collect (at least the dead shells). Most of the rest, with a few exceptions, tend to be small, quite tricky to find, and often difficult to name for beginners with any confidence, despite the existence of books that claim to be "complete guides" to this or that.

The other thing that can cause beginners difficulty, especially with the more tricky groups, is that, in order to progress very far in their study, it is absolutely essential to be able to collect sample specimens for proper study, often under a microscope, involving dissection and the retention of specimens. If you don't like the idea of having to kill a few insects in order to make sure you know what it is you are looking at, and eventually to learn how to identify at least some of them with confidence in the field in future, then it is best to stick to other things.

But a lot can be done in the field, and, as with other subject areas, knowing where to look, how, and at what time is the key to success.

Our butterflies, for example, have relatively short life-spans as adults, and fly at specific times to mate and lay eggs. A few hibernate, but most develop from eggs that have over-wintered. It is therefore essential to know, firstly what sort of habitat they are likely to occur in (woodland glades, for example), and also often to have an idea of where they lay eggs, and therefore what sort of plants are needed (and where on the plant they might be). It is no use looking for a purple emperor if there are no sallow bushes about! Different species have very different behaviours, as well. A grizzled skipper zips about, low over the ground in open, heathy grassland; while the purple hairstreak may spend much of its time sitting about high on an oak tree, flitting occasionally around sprays of leaves in the sun. It is also usually a waste of time trying to record butterflies unless the sun is out.

Dragonflies and damselflies can be somewhat similar, in that they have specific places that they favour. They may not necessarily be limited to water bodies. Observing them can also require some care, because they are often very wary, although, as with some butterflies, using a pair of binoculars to get a better look can be a distinct advantage, at least for the larger species.

Once you have begun to understand where such insects occur, more systematic ways of studying them can be employed. Transect studies can be undertaken – recording the number of species over set distances throughout a period of time. Breeding studies may be possible – finding caterpillars on food plants, or hunting for pupae in favoured spots (for example some hawk moths bury their pupae at the base of specific species of tree over winter). In the case of dragonflies, with their aquatic larvae, these can either be sampled using a simple pond net (but beware – they can have sharp, powerful jaws!), or the cast skins of their emerging larvae (called "exuviae"), which have climbed plant stems to hatch into adults, can be collected for later study, making a confirmed breeding record in the process.

With moths, people often nowadays concentrate their activities around a light trap, of which there are several types. This results in a great social activity, not just a loner's pursuit, which is possibly why moth studies have blossomed over the last 20 years. But we need to be aware that this is not the only way they can be found, and some species are not readily attracted to light traps. Use of techniques like "sugaring", with special mixes of honey and alcohol spread on tree trunks etc. is one way, while hunting for the traces of larval activity, such as leaf-mines in food plants is another.

Tracking down most other species groups depends on a knowledge of where to look in detail, and how, at what time of year etc. Piles of rotting herbage (grass cuttings etc.) or manure (as long as it is not laced with pesticides) will have their own inhabitants. Searching under stones by water is productive for some, or under logs in woodland (remembering always to put the log back the way it was found). Many species live specifically under bark, in old fungi, or are found associated with corpses (with different things at different stages of decay!), or on animal droppings of different sorts. Some species like bare, open, sunny ground, with sandy soil to dig nests in; while others are found on specific types of flower heads, such as hogweed, for example. Even with aquatic species, it is essential to realise that different species live in running and still water, and some like dense vegetation, while others prefer, for example, stony bottom sediments. Some even occur especially in wet moss at the edge of water. Using a sweep net, beating tray or special kinds of trap, such as a pitfall trap or a flight-interception trap are special ways of collecting specimens. Having a few tubes or old pill bottles handy to put things in at all times is, though, probably one of the most useful hints. You never know when things might just "turn up"!

Plants

Flowering plants, including trees, grasses, sedges, rushes and so on, make up the bulk of our wild and not-so-wild landscape, but we often take them for granted in our pursuit of animals of one sort or another. Maybe it is because they are static, and therefore familiar. But some people will be attracted to them either through their beauty, or maybe through the business of cultivation, when we tend to have to battle against various "weeds"; or maybe also we get to realise that our "garden plants" are just "weeds" in places where we happen to like them.

For beginners, for some reason, wild plants can be daunting – perhaps because of the way some field guides tackle the subject. Getting to grips with the way they are classified is one headache, but so too can be technical terminology. Once you "get your eye in" though, things slot into place, and the hunt is on for more. As we come across them and recognise where they grow, we get to know intimately what makes a habitat tick, because plants often form the backbone of the habitats in which everything else lives.

What about other plants? Most beginners might not want to get down on hands and knees to examine mosses and liverworts, let alone dredge algae from ponds or hunt for diatoms! Ferns are easier, and often attractive, growing widely in woodland and stream-sides or in mountainous areas, as well as on old walls, even in towns. These groups have a world of fascination of their own, not to say beauty.

Scope of the subject

Britain has a reasonable list of higher plants – more than 2000 regular species, with several thousand more introduced species – but these include a lot that are only found in

special places, such as mountains, moorland, marshes, heaths, downland and so on. That is also one of their attractions. We can go on holiday somewhere and find a whole suite of species with which we are not familiar back at home. In fact, even in a well-maintained, but chemical-free suburban garden in southern England, we might find upwards of 50 wild species of plant lurking here and there in lawns and flowerbeds, cracks in paths and on old walls. Some are troublesome weeds, but most will just add colour to the lawn or green up the garden path.

Of the non-flowering plants, Britain has about 80 species of ferns, although a few are rare introductions, while others may be very local in occurrence. Mosses and liverworts, numbering something over 1000 species, can be studied in most places, although access to a high power microscope is necessary to get very far in the subject.

Things to study

Plants, being the backbone of most habitats, lend themselves to studies of 'plant communities', while we can also study things like their phenology (timing of flowering/fruiting etc.), or their relationship with other aspects of the environment, especially soils and water (their ecology). With many species, even common ones, there is much to be found out about these factors. On a broader scale, people usually get involved with distribution mapping, either at a county or broader scale, but sometimes looking at the distribution of species at a micro-scale in a single locality. Changes in populations over time, and in response to management can be fruitful. For many lower plant species, even basic information on regional occurrence may be lacking, giving plenty of scope for new finds.

The relationship between plants and insects is also a fascinating one and much can be observed in a short space of time as demonstrated by Darwin's son, George.

June 20 1862. George watched Orchis maculata in big woods today and in a hour caught six Flies (Empis livida named by Mr. Walker) with long hard proboscis, inserting proboscis into the nectaries. These all had pollinia attached to one or both spherical and rough eyes. ... I saw the large fly inserting proboscis.

Darwin
scientific papers, 1862

Fieldcraft tips

Looking for plants is, in essence, not that different from hunting for insects. Both need knowledge of where species are likely to live. The main differences are probably that plants tend to be apparently everywhere, whereas insects only turn up here and there; and that plants are rooted to the spot, not mobile! This is actually a misperception, to some extent, because many plants can be a little unpredictable. They may not put in an appearance one year, or they can suddenly colonise new localities. It is also true that there are almost no plants that are so generally distributed that we can pretty well find them anywhere.

Not only do different major habitats have different plants (woods, meadows, mountains, heaths), but also most plants have very special needs. They may specialise in seepages of water with high mineral content; or they may require sunny banks on a dry soil, with good run-off of rain water. Different soil types have whole suites of different species: chalk downland is a good example and sandy heathland; although different woodland types on different soils can be just as different in species composition.

Over the last 100 years, we have come to understand what we think of as "plant communities", and ecological text books have codified these, so that there is often an expectation that certain things will occur together. This is also to some extent misleading, as each species has its own "niche", which therefore tends to lead it to occur alongside other species that create

Fungi and their relations

that niche, along with the nature of the soils and water supply etc. Experienced botanists get to know when a species might "turn up" through recognising the precise type of species mix and the kind of micro-environment that it likes. This "eye" for plant habitat takes time to learn, but, once appreciated, is often the surest way to track things down. It can even take the form of recognising from a considerable distance the colour of vegetation on a hillside, for example, betraying a specific soil or drainage characteristic where something is likely to occur.

As for the 'lower plants', mosses and liverworts, these are not dissimilar, in that they will occur on specific soil types, or other places, like boles of trees, or on rocks, walls and so on. Finding many of them, though, requires a very fine eye for a precise mix of species in a small space, where they often grow together. This gives a different level of focus on the plant community from higher plant botanists, who may look at the bigger picture rather than the fine detail in order to find things.

Lastly, but not least, there are the fungi – mushrooms and toadstools to beginners – that appear and disappear without warning, neither plants nor animals. For many people, these are especially charismatic, often very beautiful or strange. As such, they have tended to have a very distinct following. As accessible literature has improved, they are also more approachable, although still fraught with many difficulties.

Allied to fungi are the lichens – strictly speaking not species but strange alliances between a specialised fungus and an alga. These often go rather unnoticed. However, as our smoky atmosphere has improved, so has the number of more obvious lichens visible around most of us, on tree trunks and old walls, on tombstones in churchyards and the like.

Scope of the subject

With over 14,000 species in the UK, the fungi might seem a too-daunting task to start with, but we do tend to notice the bigger, more colourful ones at least (of which there are probably between 3-4,000 in the UK), and there are a lot of fairly good books about them, although no one book has them all, Nevertheless, we don't have to be put off by numbers (let alone fears of being poisoned), but focus on what we can readily find to start with.

It helps that they tend to come in groups that occur in different habitats. Species in deciduous woodlands can be very different from those under pine trees; and things in old grassland will be different again. Species that turn up in the spring may well also be different from others that occur in autumn; while species in northern Britain are often different from those in the south. All this cuts down the difficulty, but we do have to recognise that there are a lot of pitfalls for the unwary, not least if anyone wants to try and eat some of the finds.

In addition to the strict fungi, Britain has upwards of 600 species of more widespread lichens, but any one area will have far fewer, and your local churchyard may not have more than 50 or so. While many of the bigger ones are pretty obvious, a good number are obscure, even microscopic spots on stones or tree bark that would go unnoticed by the beginner.

Things to study

Most mycologists (students of fungi) tend to study occurrence, including time of year, seasonality and so on, and other aspects of the ecology of species. Much is unknown, for example, about especially their relationships with higher plants (where the fungus often makes a link with plant roots, through what is known as its mycorrhiza – the fungal 'root' system). Other subjects of study include the effects of fungi on other species, or their use as food sources for insects etc. Professional studies also involve biochemical analysis, which is leading to new understandings of fungal inter-relationships.

Fieldcraft tips

The traditional excursion to find fungi is the 'foray' – a group activity at the appropriate season, often in the autumn, when most species are in evidence. This may be centred on a wood or other well-known site, and

usually has an expert leading, participants spreading out to see what they can find on the forest floor or on trees etc. The foray may or may not revolve around a place where specimens can be taken back for further study. Apart from these organised events, though, there is nothing stopping an enthusiast following their own path to find species, although getting 'difficult' specimens checked by an expert is usually essential, just to get someone started.

It is important to remember that fungi can turn up in most long-standing (and even some man-made) habitats, at most times of the year, not just in woods in the autumn, although this is usually the most prolific season, from August through to the first frosts. Their unpredictability can cause problems for surveying systematically, because one year can be different from another. Warm, humid conditions in early autumn are ideal, but damp weather in spring is also productive. Old grasslands, such as in old churchyards or stately parks, can have very characteristic groups of species, like waxcaps etc.; while ancient semi-natural woodland will also be rich, although even modern conifer plantations will have their own special kinds.

Another thing to remember is that specimens can change dramatically in their appearance as they mature and die off, so it is important both to know what these stages are, and also to get to know what features need to be examined – the way the gills attach to the top of the stem (called the 'stipe'), for example, or the texture of the cap flesh. Spore colour in a mass is important for many (and this can be checked by allowing a fungal cap to drop its spores on paper overnight under an airtight cover to avoid desiccation), while for more difficult groups of species, microscope study of spores etc. is often necessary. Collecting specimens needs care – often requiring them to be picked right to the stipe base, to ensure important characters are not missed. As the colour of freshly picked specimens can also be important, as well as smell, notes on these need to be taken, and care taken while transporting specimens that there is no cross-contamination. Collecting specimens is often done in open baskets or 'trugs', but smaller specimens need separate storage boxes or tubes for safekeeping.

While most people might stick to studying the larger, more obvious species, it is also possible for even beginners to take up the study of things like rusts, for example, which are often specific to particular plants (assuming you can name these correctly as well!).

For those concerned about potential poisoning, it is worth remembering that there are only a few dozen really poisonous species, most of the rest being inedible rather than a threat. The important thing is not to eat things you do not know are safe, and to wash hands before touching food. As for collecting to eat, which is not really the subject for discussion here, it needs to be remembered that permission to collect may be needed.

Lichens lend themselves to people who want something to do especially in the winter months, because they are often at their best then, when the atmosphere is damper. These can be conspicuous on trees, tree-stumps and old walls, while other, sometimes less conspicuous species occur on rocks or even on soils in heathy places etc. Particular tree species can have their own suites of lichens, depending where they grow, and many species grow especially in the canopy, so that after storms it can be productive checking out fallen boughs. A drawback for many beginners getting to know them is that specific chemical tests are required for some species, requiring the collection of a specimen and checking it at home. But they do have the advantage of being widespread and easily accessible in many cases, and have their own attraction in terms of colour and shape.

Collecting specimens – why and how?

"We often used to go out with [our father] on his mid-day walk, generally down the hill to Cudham Lodge Woods, the 'big woods', and do a little collecting as we walked. He seemed to know nearly all the beetles and was immensely interested when any of the rarer sort were found. ...

George Darwin
about his father, 1892

Why should anyone collect wildlife specimens?

In the discussion above, there have been several mentions of the need to collect specimens. Many beginners and non-naturalists are often rather bemused by the apparent need to collect, while there has been a movement generally recently, fuelled to some extent by a certain revulsion against killing, and also by concerns over "animal rights" which has insisted that, with modern digital photography, this is now not needed. Nothing could be further from the truth, if we are to be able to record wildlife in a reliable way, even if, for some groups, we no longer need to do so.

The important point is that collecting should only be done when it is not possible, or reliable to identify specimens in the field. The days of collecting for collecting's sake are more or less over, thankfully. But collecting itself should not be seen as in itself wrong, if we are serious about a true understanding of our natural world.

Making a collection is not only a useful exercise, but is also often essential to make any real progress in our subject of study. It need not be enormous, but a collection has two specific and very legitimate functions – it retains specimens that you or others have named in the past, therefore being able to prove the accuracy of a particular record, where this is necessary – providing what is called a "voucher specimen"; and it also acts as a self-help tool for you, the recorder. By having reference specimens, already correctly named, it is possible to use these as a much more effective comparison with new specimens than is possible just with pictures, however good they might be.

What do we need to collect?

This will depend enormously on the group of species we are dealing with. For a few, such as birds (at least in Britain), it is not only unnecessary to collect, it is also mostly illegal, because in the past direct destruction of especially rarer species was a real threat to their survival. The same goes for many mammals (although some species are trapped to find them, and then released), and for amphibians and reptiles (which are mostly also protected by law, to some extent at least).

For things like insects and plants, while there are some that are protected by law, such as rare orchids or endangered butterflies, there may be a need to collect, depending on the group concerned, and the difficulty of reliable identification. For most plants, collecting a specimen for checking through an identification key is often extremely helpful, and results

ultimately in not needing to do so for that species again. With insects and other invertebrates, things like butterflies can usually be identified in the field even by relative beginners; while for groups like dragonflies etc. adult specimens might be reliably identified from a good photograph. For most other groups, such as most flies, beetles, bugs etc., apart from a few showy species, it may well be essential to collect specimens, especially as a beginner getting used to what they look like.

How do we make a useful collection?

It is no use collecting in a haphazard fashion, and with no understanding of how we might need to use the specimen being collected.

There are some basic considerations:

- Only collect when you need to carry out further study, at home, under a microscope etc. There can now be no moral justification for collecting just for its own sake.
- Make sure you are collecting within the law. This applies not only to protected species, but also may involve the law of trespass. In Britain, be aware in particular of the Wildlife & Countryside Act and its implications. For example, for most plants, it is perfectly acceptable to pick parts of a specimen from public land, but not to dig it up, although local bye-laws may apply; while on private land there may be a case of technical trespass in collecting plants or fungi, while mobile insects etc., are not subject to the same protection. There may also be some differences in different constituent countries of the United Kingdom.
- Only collect when doing so is unlikely to affect the existence of the species. So, make sure you don't take a sole specimen if it is likely not to have many others in the area. For plants, for example, do not pick solitary flower spikes (in some species it may only be necessary to pick a few pieces for sure identification). For insects – solitary individuals of some slowly reproducing species, such as some longhorn beetles, should only be collected when the habitat is likely to support a good population.
- Learn how much you need to collect for reliable identification. For plants, this may need a whole stem or you may only need a basal leaf and a flower spike. However, if a voucher specimen is likely to be needed, then make sure a reasonable size specimen is collected if at all possible – giving a range of stem, fruit, flower and leaf shapes and sizes, as well as showing growth form. For fungi, collecting one or two fruiting bodies at different stages of growth is often useful, and will not damage the mycorrhiza; although excessive collecting can undermine reproductive success. However, beginners often fail to realise that a whole fungus specimen is needed – including the very base of the stipe, and maybe even a bit of the ground or whatever that it was growing on.
- Make sure you transport the specimens carefully, avoiding damage to necessary features. For small fungi, for example, plastic boxes can be useful; while small transparent collecting tubes for insects are necessary. Botanists often use what is called a "vasculum" – a special container designed to protect specimens in transit. However, if used carefully, plastic bags are nowadays often enough, as long as specimens are not crushed, or left in them too long.
- Learn how to look after specimens for further study in the future. Making an effective reference collection needs us to know about mounting specimens in order to make it possible to examine features. For example, beetles are often set on stiff card with water-soluble gum (so they can be soaked off if necessary), with their legs spread out, and antennae (feelers) carefully spread and fixed down, because it is often essential to count the segments of the feet ("tarsi") or the antennae, and to compare shapes and sizes of these. For plants, it may be necessary to dissect an individual flower and mount its parts. Plant voucher specimens are also usually mounted on stiff herbarium paper, using either strong thread, or soluble wood glue etc. (but not so much as to obscure necessary features). Standard sized sheets are usually essential to facilitate easy storage. With most fungi, specimens need to be dried rapidly and thoroughly, and then kept free of pests in sealed containers; while making a spore print on white or coloured paper soon after collection, and then retaining this alongside the specimen for future study may be necessary, as well as making permanent mounts of spores etc. for microscope use. Some specimens may need to be sectioned to allow quick drying, while professional collections often use special freeze-drying facilities. Finally a few groups, such as most spiders, many freshwater invertebrates etc. require retention of collections in preserving fluids, such as industrial methylated spirit, which requires special storage facilities and regular maintenance. Guidance on all these areas can be found in specialist literature, such as guides produced in the past by the Natural History Museum, or through other museum-based organisations.
- Make sure that all specimens are properly documented at the outset, with details of locality (including 6 or even 8-figure grid references, or latitude/longitude co-ordinates), date of collection, person who collected it, and details of habitat and substrate (surface on which it was found). This information needs to be maintained with the specimen at all times (on the herbarium sheet, or on a label on the same mounting pin as the insect etc., not kept separately, because it is so easy to separate data from specimen, which makes the former less reliable, and the latter more or less useless in the future. In making such labels, if the specimen is to be kept permanently, ensure the label is produced using permanent inks, rather than inks like biro, which can fade over time, or can be affected by chemicals. Modern computer ink-jet inks may be acceptable, although laser-printed labels are likely to be best.

Many organisations involved with species recording or conservation issue their own guidelines for collectors. The internet is a good tool for finding this information and a simple request such as "guidelines for collecting plant specimens" will deliver useful results.

THE DARWIN GUIDE TO RECORDING WILDLIFE

How do I go about recording wildlife?

Having got the bug of studying wildlife, and then wanting to make a useful contribution to the subject, getting involved in recording is the next logical step.

Advice in almost any natural history guide in the early 20th century started off with the injunction to "always carry a notebook and pencil/pen with you when out and about". This advice remains fundamental and very true. If you are serious about your studies, you need to be prepared as and when the opportunity arises to make an observation. Nowadays, it might not necessarily be a pencil and notebook – a PDA (personal digital assistant) might be your preference (although remember a notebook doesn't need a battery!); but the basic idea remains the same: being prepared for the unexpected to turn up, and for the need to make a direct note of it at the time, rather than relying on later memory.

The basics of a record

A wildlife record is essentially a documentation of the occurrence of a thing (species etc.) at a place, at a time, by a particular person. It is essentially a fixed record of an ephemeral event (even if things like oak trees don't usually move overnight).

THE DARWIN GUIDE TO RECORDING WILDLIFE

To be any real use, a wildlife record, therefore, needs to have a few basic components:

- ***What?***
  What is it we are recording? This may well be a species, although other things such as habitat features can also in themselves be a focus of attention. Although it may seem obvious, the nature of the name we give a thing is of crucial importance. Although most people start off with "common" names (English names etc.), these are, in fact, often rather poor in terms of precision. *We* may know what we mean by "robin", but people from North America may think of a different bird. This is why, for many groups (if not birds), we find that experienced naturalists will use a "scientific" name – that is, the taxonomic binomial, following the system that was introduced by Carl Linnaeus in the mid 18th century, consisting of a capitalised first name (the 'Genus'), followed by a lower-case second, descriptive name (the 'species'). In pretty well any good field guide, as well as more heavy-weight literature of course, we will find these names alongside (or even without) "common" names. By using these, we are saying – this animal/plant/fungus is definitely this thing, not a closely related one. We might also notice that these names are often followed by an abbreviated string of letters, or a name in brackets of a person. This is the 'Authority' – the name(s) of the person(s) who gave the species this name in the first place. This can also be important, at least for more obscure groups, or groups where names are changing regularly because of increased knowledge. By including the 'Authority', we are saying – "this thing is this species, as defined by that person". Most of the time, we might not bother with the Authority, though, if we are using some sort of standard guide to the group. In this case, all we (and others) need to be aware of is that the names we are using are those given in that guide.
- ***Where?***
  Any record of a species (or a habitat), to be of any use, needs to be localised. At one time, most people might have been pretty vague about locations (and many still are), but increasingly we are realising that there is enormous usefulness in being rather precise about things we record. So, rather than just recording the vague area we are in, we nowadays might have a GPS (global positioning system) gadget with us, so we can record 8 or even 10-figure grid references, or latitude/longitude, with amazing accuracy (as long as we get a decent satellite fix!). Even without this, we can use a good Ordnance Survey map or A-Z (in Britain, at least), and its standard grid to pinpoint our location (remembering how to give the grid reference, of course – Eastings first, and Northings second – instructions for which are on every paper map), recording this alongside the name of the nearest feature on the map, so that the name and the grid reference can be compared with one another – just in case we make a mistake with one or the other!

  If you are recording in a defined area such as a local nature reserve, the site name may also suffice. Local recording groups and local record centres will have a good local knowledge of these sites and may be able to supply a list of the official site names and grid references for your use.

  If you have access to the internet, there are various mapping websites that show the grid references of locations. If you are recording in your garden you can convert your full postcode to a grid reference using various web-based services too.
- ***When?***
  Again, our predecessors may have been content with a year, at best, but now we are a bit more exacting. For most purposes, a precise day is perfectly possible, and may be essential, if not even a precise hour. While, for things like perennial plants, a year may still be acceptable for an occurrence record, even for these, if we are noting whether it is in flower or not, a date will give that much more information.
- ***Who?***
  This may well be us, but it might be more than one person. Being careful about how we quote names is also important – because there may well be more than one J. Smith. The 'who?' might also include the name of the person that actually named the plant/animal/fungus, rather than just the name of the person who found it, for example if we have got an expert to help us with identification. This can be important for others to accept a record, especially of a 'difficult' species.

In addition to these basics of a biological record, though, nowadays we might want to be even more precise about exactly what we are recording. An important extra might be detail of the habitat in which the species was found – what plant it was on, or if it was under bark or a stone, whether it was on sandy ground or clay, whether it was in full sun or shade and so on. We might also want to be precise about the animal or plant itself – how many there were, whether they were breeding or flowering, etc. All these extra bits of information, put together over time, give us a very powerful view of the way species live.

How do I know what wildlife to record?

All the previous information may be the basics of recording, but how do we sort the wheat from the chaff in knowing what is, and what is not worth recording? After all, with so much around us, we could be noting down an awful lot, all of the time. And what do we do with the results? Do we just hoard them, or can they be of any use elsewhere? A systematic approach for any recording may, ultimately, yield the best results, and with this in mind, the following might be some use in guiding activities from the outset.

Recording rarities, oddities or everything?

Even if we have focused on a species group and a geographical area, such as our home patch, we are still faced with the question of what is really worthwhile recording, and what is not. The answer to this lies to some extent with what we are interested in, and whether we think we are recording just for personal interest, or for broader purposes.

- ***Recording what is there***
  A basic kind of recording is to document what is there in terms of species. A lot of people set out to produce a species list of their patch, which is known as an 'inventory'. If this is time-limited, it can become a basic survey (see below). Such information, if coupled with a knowledge of the ecological requirements of the species concerned, can give us a great insight into the local environment. If the process is repeated over time it can provide the basis of 'surveillance' (see also below). If we add to it some idea of abundance, we build up a good picture of the overall 'biodiversity' of our patch.

- ***Recording the special***
  If we are not interested in recording everything, then we may focus on the "special". The problem with this is in being able to discern what is, and what is not special. If we mean "rare", then we need a point of reference relevant to our area of study. If that is a local parish, say, what is "rare" locally may be quite common elsewhere, perhaps on different soils. Access to the relevant information may also be difficult to make this judgment, and we may have to do our own work to find out just what is and what is not "rare". Accepting received wisdom may also be tricky in this, because it may be out-of-date, based on historic ideas of what was once common. Part of the value of recording, after all, is identifying these changes. Another form of "special" recording can be a focus on the abnormal, such as monstrosities, colour forms, or odd behaviour.

- ***Recording what makes the environment tick***
  More sophisticated is the recording of information on the relationship between species and their environment or on the way that a species lives. It is quite usual for many naturalists to move in the direction of a deep understanding of a few species that they are especially interested in. This can take the form of either behavioural studies (ethology), or environmental relationships (ecology). If we aim to pursue these effectively, we need to be more systematic, especially in recording standard factors, such as sward height in plants, or standard ways of defining population sizes etc., although it is still possible for casual observations to make a contribution. We may also need to use standardised terminology or to define or use existing classifications of habitat type and so on.

Recording for a reason

Making random records of what we are interested in can be rewarding, both for us, and to some extent for others, if we pass our records on. Most of the general knowledge of Britain's wildlife has stemmed from casual observations being compiled in large enough quantities over quite long periods of time so as to provide a fairly consistent picture of species occurrence. From this, we have been able to generate distribution maps of species in the country (or more local areas) for example; we have also shown that it is possible to plot change over time, if we have records with dates attached. These distributions can be compared with other recorded variables, such as geology or climatic factors.

However, increasingly, we find that we get the most out of our efforts if we record to some extent systematically, and in collaboration with others.

- ***The survey***
  Even the basic dot atlas will often have derived from what is loosely termed a 'survey' – an attempt at a systematic process of visiting every part of a county or country over a fixed period of time. The familiar atlases of breeding birds, produced by the British Trust for Ornithology, for example, are data collected on the basis of a 10km square on the Ordnance Survey map being visited enough times by recorders during a fixed period of time to be able to locate most, if not all, the birds breeding in that area. Such surveys are becoming more sophisticated. They may record numbers of pairs of birds, or estimate population sizes of other groups. They may record associated species, and give details of habitats.

  Guidance on what to record, in these circumstances, is often given by an organisation involved in the subject of study. This doesn't mean that all our recording has to be dictated by surveys, of course – but if we want to make the most of our effort, we may want to get involved in such a survey. Our work will then feed into the finished product, often a species atlas, or a county annual report, for example.

- ***Surveillance and monitoring***
  Some people might also want to go beyond just occurrence recording. They might be especially attached to a particular locality, such as a local nature reserve, and be interested in seeing how species respond to its management. Or they might just be interested in watching changes over time.

  In these cases, we are in the realms of 'surveillance' and 'monitoring'. Species surveillance is the systematic observation of the geographical occurrence of species, at repeated intervals to ascertain changes. Monitoring concerns the recording of species (or habitat features) in such a way as to attempt to measure their response to specific changes in the environment.

  In some cases, wildlife organisations have tapped into their members' willingness to get involved to this degree, and have used volunteer manpower to carry out quite detailed surveillance or monitoring work. For example bird organisations get the public to survey the birds in their gardens during the year, even to the extent of measuring their activity levels on specific days. Other organisations have got their members to record sizes of populations and associated species (for example targeted scarce plant species), which are sometimes selected as 'indicators' of the health of specific habitats or the effectiveness of site management.

- ***Sampling***
  If data are collected in carefully specified ways, and enough such records are compiled across an area, the resulting data can be what is known as 'statistically significant' – that is, they can be relied upon in an analysis to give a robust, genuine picture of some underlying trend or distribution. Even casual observations, in enough quantity, may generate reliable statistical information, if treated with care, but this is greatly enhanced if what is being recorded is carefully defined.

  It is never possible to record everything, everywhere. Any recording activity is always selective, because it is essentially an attempt to document one event picked almost at random. To make these recorded events more reflective of reality, a systematic approach to how we record is used. This is called the "sample". It may take the form of a fixed route along which records are made over a fixed period of time, on specific days (known as a "transect"). It may involve the measurement of a species or a number of species in a fixed area (often in the form of a "quadrat" – a square of known size, which may be selected "at random", or be recorded according to a standard grid, usually related to the Ordnance Survey grid itself). Even a basic dot atlas survey is effectively a sampling exercise, because it will involve an attempt at even coverage of a specific geographic unit (a 10km square, or a 2 x 2km square – known as a "tetrad", for example). The extent to which the recording is systematised within a survey will render the resulting records more or less statistically significant, which can be measured by a range of statistical tests by those organising a survey.

THE DARWIN GUIDE TO RECORDING WILDLIFE

Making records using the Ordnance Survey (OS) grid has necessitated the development of a whole range of notations and approaches to recording to suit. At the national scale, the 10 km square has often been used as the basis of 'sampling' – involving recording across relevant habitat in each square across the UK. Each 10 km square is then given a notation based on the OS notation, e.g. TL10 (representing the 100km square 52 or 'TL' + the 10km grid co-ordinates for the bottom left-hand corner of each 10km square, in this case '1' and '0' for the Eastings and Northings respectively).

At the local level 2 x 2km squares, otherwise known as 'tetrads', are often used. There is no easily identified OS notation for this, the most commonly used method being the so-called 'DINTY' system, with alphabetical letters given to each of the 25 tetrads in a 10km square (its acronym formed by the letters of the second row of tetrads down in a 10km square). It uses 25 of the 26 letters of the alphabet to denote individual tetrads: TL10A, B, C, D...Z (omitting 'O'). These are designated from the bottom left-hand corner of the 10km square to the top right:

E	J	P	U	Z
D	**I**	**N**	**T**	**Y**
C	H	M	S	X
B	G	L	R	W
A	F	K	Q	V

0 2 4 6 8 0

Many of these types of recording activity are organised by societies or other organisations for specific purposes. These will have developed standardised methods for their survey activities, and recording then becomes a process of gathering the relevant field information, and supplying it in a standard format for later processing.

The mechanics of recording

At the start, the need to write things down was emphasised. There can be no wildlife record without it being written down or documented in some other way. Ways of doing this have developed over time, but they generally fall into three main types:

- ***The casual record***
  This is essentially the field notebook/ notepad record. It may be relatively unstructured, and the information in it is later compiled in some form of listing, such as a personal catalogue of observations, a report to a natural history society recorder, or nowadays just an email. Such records are of some value, but their lack of structure, the danger of omitting vital bits of information (such as the grid reference) and the lack of attribution of the record to the real source can all be problems later down the line.

- ***The standard recording card***
  For a long time, the usual approach to systematising recording has been to produce a standard recording card. Examples are the UK Biological Records Centre's freely-available recording cards for different groups, which have a list of the species (using the current accepted taxonomic names), together with boxes for other essential information – the "where", "when", "who" of the record, as well as "how" (how was the record made? – field observation or specimen etc.), sources, and the compiler and date of compilation of the card.

  These cards have been distributed widely, and the intention was for them to be completed either in the field or subsequently, submitted to the relevant species recording scheme, and ultimately for the data to be compiled onto the Centre's or the Recording Scheme's computer database.

  Other organisations have emulated the approach. Standard habitat recording cards were used for a time by the Wildlife Trusts, while organisations like Butterfly Conservation, the British Trust for Ornithology and the Botanical Society of the British Isles have also issued standard cards, sometimes alone, sometimes in association with the BRC. Local societies and groups have also produced cards. They have the advantage of standardising the way details are documented, but they can cause problems of data backlogs because of the need to carry out mass data entry processes.

- ***Electronic recording***
  More recently, there has been the development of electronic recording for field naturalists themselves, as opposed to the organisations that run the surveys. At the moment, this is still relatively in its infancy. It can take one of three forms:

  o Compilation by the field recorder into his/her own computer records system. This can be a very simple spreadsheet format, or a more sophisticated system, such as a proprietary database. Using a standardised data system has enormous advantages, in both efficiency, as well as tapping into facilities provided by the supplier. However, using such systems takes a substantial amount of effort in both acquiring the skills, as well as to maintain the system. They tend to shift the data entry backlog problem from the recording scheme to the field recorder, while their large variation in format and non-standard approaches can cause severe difficulties for those compiling records.

  o Field recording using a PDA or similar hand-held device, where information is keyed directly into the device in the field using standard data formats, and then transferred to either their own or another organisation's database. This kind of recording is mostly only used by larger organisations, with access to the relevant equipment, although its potential for use in mobile phones and the like will undoubtedly develop in the future.

  o Online recording, where the recorder is asked to compile their field records directly into a remotely-run online system operated by a recording organisation. An example is the British Trust for Ornithology's online Atlas recording system. These have the potential to vastly streamline recording, and to enable far more people to be involved, although the volume of records generated can overwhelm systems for them to be checked and analysed. This looks set to be one of the key mechanisms for recording in the future.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What do we do with wildlife records?

Having got involved with a subject, and made a start on recording, in whatever way we have, what do we do with our records, and what do other people do with them?

Submitting records to a recording scheme or survey

If we are recording for a specific survey, it is likely we will have been supplied with a pack of information about how to submit records to the survey, and at what intervals, etc. We may have detailed instructions in how to complete record cards and so on, or recommendations about the electronic supply of data.

For many recording activities, however, recording is a bit more low-key, and we may need to seek out where to send records, and to find out how.

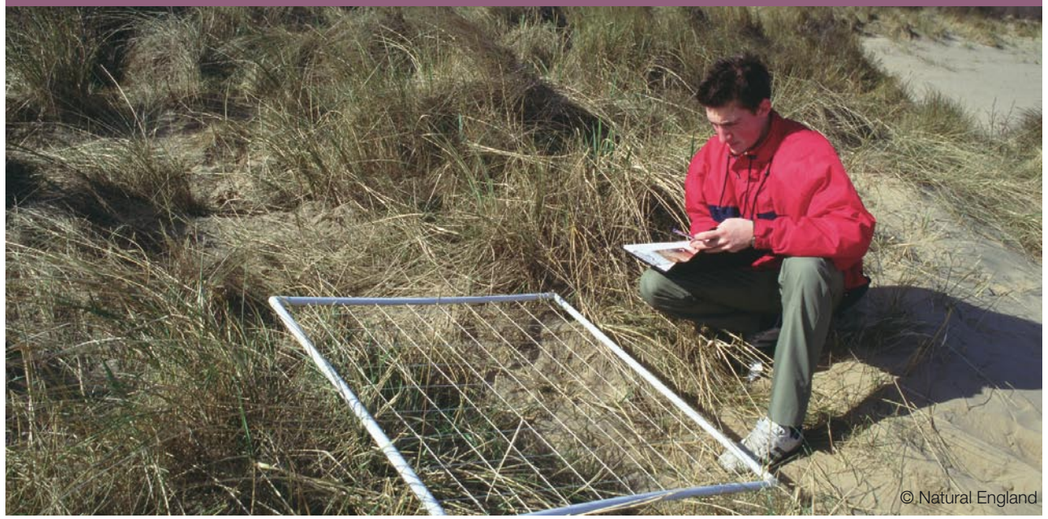
- ***National Recording Schemes***
  For most (but by no means all) groups of wildlife there are one or more recording schemes, or a society running recording activities. The more prestigious subjects all have their own societies (see the list at the end), while the less well-known subject areas may have smaller organisations, or even only a small recording scheme, focused on the Biological Records Centre (BRC) at the Centre for Ecology & Hydrology, Wallingford. There are well over 70 of these schemes and societies nationally.

  Most of the larger recording organisations issue their own guidance on recording their groups. Some run regular surveys, while others run occasional major projects, maintaining background recording in between. Smaller recording schemes tend to collect data in readiness for the production of a new or updated national atlas, although web publishing of data (see below) is changing the way this occurs, and is likely to result in a continuously updated publication of distribution information, or at least a more frequently revised picture.

  The way that recording schemes collect and manage their data also varies widely. Some operate quite sophisticated data management systems, using proprietary databases, and collating data electronically from their suppliers. Others are less well-developed, and some rely almost entirely on the BRC still to computerise their records. Advice on the way that individual schemes like to receive records can usually be had either from the Scheme Organiser direct, or from the BRC.
- ***Other recording organisations***
  Many other bodies also organise recording, especially at the local level. Local record centres, for example, often collaborate with local natural history organisations and Wildlife Trusts to carry out surveys. These are either focused on a local or county project to produce an atlas, or more often are designed to generate information to enable evidence-based decision making, including informing planning decisions and practical conservation work.

One issue that stems from this apparent competition for the attention of recorders is that they may not be sure where to send records for the best. In practice, this may not be as serious as it seems, as long as either the national recording scheme or the local record centre is communicating data to potential users effectively. However, a rule of thumb might be that if records are being collected for a national atlas project, then these records need to go direct to the organisation in control of the project. If records are being gathered for a local reason, then it is most important that, where necessary, these records are checked by a competent individual or organisation before being used. So, for species in groups that do not tend to have experts at the local level, it may be best to submit them to the national scheme direct, while for groups where there is accepted local expertise, it may be sensible to send them to the local collating organisation, for onward transmission as well as local use.

Field recording – the basics



Actually carrying out field recording can be great fun, as well as good exercise. There is also no one way of doing it, because each subject area will tend to have its own approach.

However, there are some obvious basics for any recording activity. The key things are: knowing where to go, safety, and having the right equipment with you.

- ***Knowing where to go.***
  Good Ordnance Survey maps, and off-prints from satellite maps, such as Google Earth, are essential. Knowing properly how to read a map is an absolute pre-requisite – much information can be gleaned from a careful reading of contours, drainage systems, etc. as well as the more obvious features. Handling maps in the field can be a pain, especially large-size OS sheets. Cutting them down into manageable chunks and inserting them in waterproof covers might be an option (earlier, smaller editions came equipped often with plastic folders). GPS gadgets are very useful (but beware of false readings). In remote places, a good compass is essential. In addition

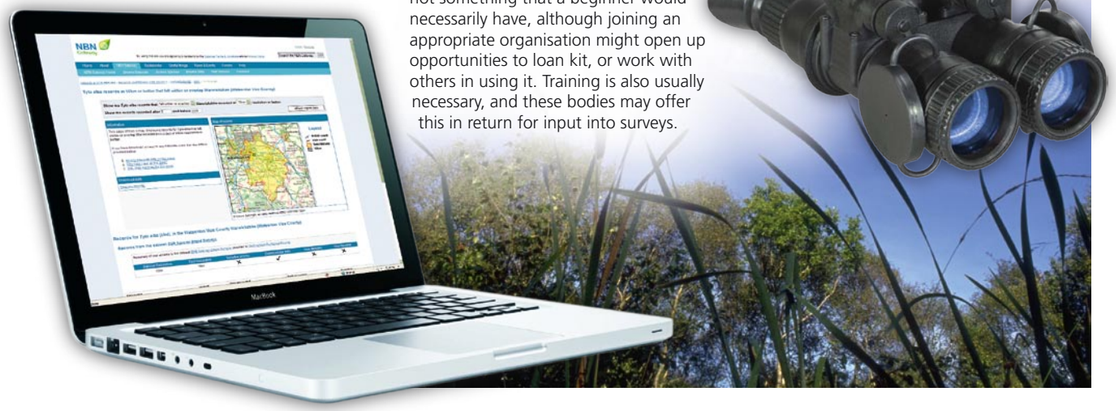
> *In remote places, a good compass is essential. In addition to 'knowing where to go', we will also need to focus on the target area of our recording, which may have been proposed by a recording organisation, or one that we have decided upon ourselves.*

to 'knowing where to go', we will also need to focus on the target area of our recording, which may have been proposed by a recording organisation, or one that we have decided upon ourselves. We also perhaps need to remind ourselves, especially, that it is vital to know how our intended recording relates to the survey's requirements. This is important, for example, if we are involved with a dot-mapping survey, where we need to know which 'square' we are in. Watching our location in relation to the Ordnance Survey grid may be vital (and can sometimes be tricky, for example in a large open area or a large wood, where the grid boundary is an imaginary line on the ground and our GPS may not work).

- ***Safety.***
  Enthusiastic wildlife recorders tend to forget about this. Having a mobile phone with you (even if it might need to be switched off if you need to be quiet) is nowadays a very useful adjunct. Carrying essential first-aid kit is also recommended (and knowing how to use it). Protective clothing (wet gear that actually works, as well as protection against sun), and kit to attract attention if in remote places (a good whistle). Having plenty of water, and remembering to drink it is also a prerequisite in hot weather. Making sure people at home know where you are going is a basic safeguard, and possibly making sure, especially in quiet places near housing, that you are accompanied might also be worth considering.
- ***Having the right equipment.***
  Some of this related to safety and location-finding has already been mentioned. We could, of course, add stout footwear, warm (or cool) and thorn-proof clothing to the list. For the recording itself, the obvious first thing is to remember a notebook and pen/pencil (the latter especially if in damp weather). Clear, undamaged plastic bags (both for specimens and for keeping things like maps and notebooks dry) are basic; specimen tubes/bottles/boxes; kit needed to pick up/collect specimens (e.g. a pen-knife – but bearing in mind large knives are classed as dangerous weapons in public places). For insect studies, a properly constructed insect sweep-net might be essential (obtainable from standard entomological suppliers, but expensive), along with a beating tray – although the latter can be substituted by an old umbrella, while a plain white bit of sheet for laying on the ground is also useful. Catching nets, as used by butterfly recorders to examine specimens in the field, can also be purchased, or constructed from open mesh netting. Freshwater sampling equipment would include the basic pond net (good quality, strong material being essential). Standard versions of these can also be bought from specialist suppliers, along with tough plastic trays for examining the catch. Entomologists that occasionally need to look for specimens in shallow water often carry an old kitchen sieve for the purpose. Other specialist kit for insects etc. could include a 'pooter' – a tough glass or clear plastic tube with flexible rubber tubes attached for 'sucking up' insects off surfaces; and a good hand-lens, preferably one that can magnify either 10 or 20 times (depending on the object of study). Having the lens on a lanyard, for putting round the neck in the field is very useful – it can save all manner of hassle looking for it. For botanists, a 'grapple' is often needed – a strong, hooked metal device, with a tough line attached, for throwing into ponds to dredge out plants; as well as a pair of secateurs for cutting tough specimens. Small blank labels with strings to attach to specimens are also important if collecting especially larger plant specimens comprising several different pieces. Apart from these more specialist things, though, it is worth noting that a pair of binoculars is often very useful for even a botanist to see things in tricky places, while the modern digital camera is now a very useful adjunct to the record itself. Finally, of course – if you are carrying out any systematic survey – copies of the relevant field recording card need to be at hand. With all these things to carry, of course, you will need that other bit of kit – the good field rucksack (and some people add to this a field jacket with lots of small pockets).

High tech wildlife recording

There is no space here to develop the subject of high tech approaches to recording, as these will vary enormously between objects of study. Suffice it to say that many subject areas will have a range of equipment available for carrying out its work. An example might be mammal studies. Apart from some things already mentioned, such as the Longworth trap for small mammal studies, mammalogists may make use of a range of equipment, such as infra-red binoculars for night stalking, radio-tracking equipment and tags for attaching to animals in the field, fibre-optic lenses and video-recording equipment for examining possible nesting holes and roosts, bat detectors for tracing flying bats in the dark, and so on. Access to this sort of equipment is obviously not something that a beginner would necessarily have, although joining an appropriate organisation might open up opportunities to loan kit, or work with others in using it. Training is also usually necessary, and these bodies may offer this in return for input into surveys.



Getting records together - data and data handling

This is also a subject that merits a book on its own, and there is guidance available, particularly through the National Biodiversity Network, to help with these areas. Some basic advice can be given here, though.

If you have got involved in recording anything, then you will be on the road to producing data. The basics of a record have already been discussed, and your way of making records in the field will depend on whether you are using a field recording card, a hand-held device, or a simple field notebook. The basic products should be the same: a biological record consisting of at least the what, where, when, and who of a field record. Transferring this to a system that can handle multiple records effectively is the business of data management.

The important thing to remember is that each bit of information in the field record needs to be able to be used on its own. So, for example, we may need to use the species name as a way of bringing together all the records of that species from different places; or we may want to compile a list of all the species that have been made at a specific place. In order to do this, no matter what system we use for recording, we need to set it up so that each of these bits of information (called 'fields' in databases) is handled uniformly, while keeping the whole record intact. In a computerised (or manual) spreadsheet, this is done by having each of these bits of a record in separate columns, while the record itself is entered into a single row: *(see Fig 1.)*

This general pattern can be expanded upon to accommodate all sorts of extra 'fields' of information, and computerised databases will handle these in sophisticated ways, but ultimately this is the basis for handling records in a way that enables them to be used elsewhere.

Notice that the record is given a number. Used in one's own system, this can help in keeping track of your own records. However, the record number 'field' is also able to be used by standard databases to allocate your record with a unique identifier, so that it will at all times be directly attributed to the correct source. This facility also enables tracking of any changes made in e.g. identifications.

Notice also that the "where" information in the example below consists of two separated bits of data – the name of the place, and the Ordnance Survey grid reference. This is not only recorded in this way so that we can be more precise about where in "Great Wood" we might be, but also enables us to do other things. For a start, we can compare the grid reference on a map with the name of the place, so that we can check one or the other is correct. This is called "validation" of the record. We can also use the numbers of the grid reference for automated analysis of the subsequent records to produce a distribution map. With more sophisticated records, where, for example, another person's name is added as the "determiner" of a species identification, where an expert has been asked to give an opinion on a specimen, then further checks can also be made. We may also add a "source" field to our database, to show where a record is backed up by a specimen (and where this is being kept), or if we have compiled the record from another source.

When records are compiled in this way, they become usable in a wide variety of ways by others. Data in a spreadsheet format of this form can easily be imported into standard databases. It is often possible to get standard existing spreadsheet formats supplied from recording organisations (or the BRC) that will enable you to compile these yourselves in a simple way, ready for sending on elsewhere. Some organisations also make these available for download from their websites.

Fig 1.

Record ID number	Species name	Locality seen	Grid reference	Date of record	Observer
1	Fox	Great Wood	TL288038	12/5/2009	J. Bloggs

THE DARWIN GUIDE TO RECORDING WILDLIFE

If you want to compile your own records onto more sophisticated databases, allowing you to make your own analyses, or distribution maps etc., then it is advisable to use an existing standardised database, rather than re-inventing the wheel by constructing your own, even though the latter may be an interesting challenge. The reason is that bespoke systems make use of things like standard checklists of species names that have been 'validated' by specialist organisations. They will also have built-in capabilities of handling the sort of information you are holding, and also processes for passing on data in standard formats for specialist bodies to make use of.

Where to send records and how

Once compiled on at least a basic spreadsheet, records can easily be submitted to most recording schemes and local record centres. However, if you are not computerised, this does not stop you sending in records to the relevant places. Using standard recording cards (e.g. BRC cards) helps enormously, because it ensures you include the right details (as long as you fill in all the relevant boxes). These can usually either be supplied by the relevant recording scheme, or be obtained direct from the BRC. Other organisations also will supply appropriate cards, and instruction packs for their use.

It is important to check with the intended recipient what formats records should be in before submitting them, and whether or not they might want supporting evidence (e.g. a voucher specimen for certain species). Most recording schemes and societies are run by volunteers, and so their time is limited. Submitting records efficiently is not only good practice, it also helps enormously in the time-consuming business of sorting out data. One thing that is not helpful is sending in records in a vague, unstructured format. Every recording scheme or local record centre gets a lot of records 'on the back of a fag packet' – casual jottings – either in the post, through email or even just over the phone, and these can take a lot of sorting out (e.g. with missing grid references, ambiguous place names, uncertain observers' names, or vague species etc.). While these may (or may not) be useful records, they do present the organisation with a lot of often unnecessary work.

A list of national recording schemes and their contact addresses/emails can be obtained from the Biological Records Centre at CEH Wallingford, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB (or from their website at: www.brc.ac.uk).

For records being submitted to local record centres, information and resources are available via the Association of Local Environmental Records Centres (ALERC) website, or directly from the local record centre's website that covers your area. For other organisations involved in recording, a basic list is given on page 47.

With the development of online recording, as mentioned earlier, the process of submitting records gets more streamlined as time goes on. It will no longer be necessary either for the field recorder to compile records manually or electronically themselves, or for the Scheme to have to manually transfer or digitise records at their end. The more sophisticated of these systems allow the field recorder to set up their own 'account' online, where their own records are held and accessed direct, and can be compared with data submitted by others. Instant 'mapping' of records submitted is often enabled, while some recording bodies will use the system to check submitted records, and get back to suppliers with any queries.

> "Most recording schemes and societies are run by volunteers, and so their time is limited. Submitting records efficiently is not only good practice, it also helps enormously in the time-consuming business of sorting out data."

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Wildlife on the Web

Putting wildlife information on websites has been carried out in one way or another for some time. However, this has usually taken the format of static presentation of information either as straightforward information in text form, or as dot distribution maps, or both, often alongside supporting information about the species (photograph, identification tips, occurrence details etc.).

The advent of the National Biodiversity Network after 2001 has begun to enable people to use it to make dynamic use of their own and other people's records in quite new ways. When records are incorporated into recording scheme and local record centre datasets that are then transmitted through the NBN Gateway, these records can individually be used by anyone who has the right level of access granted to them by the dataset manager. This means, for the recorder, that their records not only contribute directly to the overall understanding of a species in Britain, but also that their individual records could contribute to a very wide range of other work, such as analysis of species occurrence relating to climate change or assessments for conservation action and policy decisions. Because it is a dynamic system, records can be updated on a regular basis by data suppliers, enabling recorders to see their records being made available directly rather than taking sometimes years before they are incorporated into a published atlas. The output from the Gateway can also be used dynamically by other organisations through what is known as a "web-service", enabling them to make use of whatever datasets they feel they want to use to power maps or other outputs in their own websites. By contributing to this process, volunteers can see that their records are being actively used.

Getting involved

All the discussion in this introductory guide has shown how people can get to know wildlife, and then how they can make use of that knowledge to contribute to our overall understanding of the subject they are interested in.

The biggest steps are, firstly, making that initial move beyond mere casual interest in wildlife to take a more serious interest in finding out about it; and then, secondly, taking that interest one further step and making a 'permanent' record of your observations.

The third step is to get actively involved with one or more recording processes. This often takes some courage, because so many people feel that their records are 'not good enough'. They also might not know quite where to start.

- *'Who do I contact to get involved?'*
- *'How much time will it take up?'*
- *'Do I end up committed for ever to doing recording?'*

All these and others will be questions asked by beginners. For many, our engagement with a subject might be through personal contact. We might also think about making contact through an organisation related to our main area of interest, such as the Royal Society for the Protection of Birds, or the local Wildlife Trust. Your local record centre will have a good knowledge of groups who are active locally such as the local natural history society (if there is one) or 'friends of' groups. Another option is the British Naturalists Association, with a number of local groups, whose remit is to attract beginners to general natural history. We may hear about courses locally being run by one or other wildlife body, sometimes through public library notice boards – always a good source of information; or we may come across the excellent courses run by the Field Studies Council in its various centres and through them be introduced to the world of natural history study in all its ramifications. Other courses are run by various local universities.

> "Your local record centre will have a good knowledge of groups who are active locally such as the local natural history society (if there is one) or 'friends of' groups. Another option is the British Naturalists Association, with a number of local groups, whose remit is to attract beginners to general natural history."

As for the other two questions? Well, it will all depend on a person's circumstances, not to say stamina, as to how much they devote to recording! Serious involvement with some subject areas can be quite expensive, in terms of necessary books and equipment for example, but others will require very little beyond a few essential reference books, a hand lens and a notebook.

As to being committed forever? That will depend on your personal level of interest. None of the voluntary organisations running recording schemes under-estimate the sacrifice, in terms of time and commitment, which their volunteers make in carrying out recording. Generally speaking, they are all too happy with whatever amount of effort you feel you can afford to make for as long as you want to make it.

Appendix: Selected organisations involved with recording

Name of Organisation/ Recording Scheme	Specialist interest
Amateur Entomologists Society	Insects in general (beginners)
Aquatic Heteroptera Recording Scheme	Water bugs
Association of British Fungus Groups	Fungi (local groups)
Auchenorrhyncha Recording Scheme	Froghoppers
Balfour-Browne Club/Water Beetle Recording Scheme	Water beetles
Bat Conservation Trust	Bats (especially monitoring, through local groups etc.)
Bees, Wasps & Ants Recording Society	Bees, wasps and ants of all sorts
Biological Recording in Scotland (BRISC)	General recording and its promotion in Scotland
Biological Records Centre, CEH Wallingford	Main UK records centre collating species data
Botanical Society of the British Isles	Vascular plants
British Arachnological Society	Spiders and allies
British Bryological Society	Mosses & liverworts
British Deer Society	Deer
British Dragonfly Society	Dragonflies and damselflies
British Entomological & Natural History Society	Insects etc. general (a key organisation for insects)
British Lichen Society	Lichens
British Marine Life Study Society	Marine life of all sorts

Name of Organisation/ Recording Scheme	Specialist interest
British Mycological Society	Fungi (both amateur and scientific)
British Myriapod & Isopod Group	Woodlice, millipedes and centipedes
British Naturalists Association	General natural history (mainly beginners)
British Phycological Society	Seaweeds (no longer runs recording)
British Plant Gall Society	Plant galls and their causes
British Pteridological Society	Ferns (does recording alongside the BSBI)
British Trust for Ornithology	Birds (especially systematic UK-wide surveys)
Bruchidae & Chrysomelidae Recording Scheme	Seed and leaf beetles
Buglife	Invertebrate conservation, some outreach recording.
Butterfly Conservation	Butterflies and moths
Camstars: Ephemeroptera Recording Scheme	Mayflies
Camstars: Plecoptera Recording Scheme	Stoneflies
Camstars: Trichoptera Recording Scheme	Caddis flies
Cantharoidea & Buprestoidea Recording Scheme	Soldier and jewel beetles
Cerambycidae Recording Scheme	Longhorn beetles

Name of Organisation/ Recording Scheme	Specialist interest
Conchological Society of Great Britain & Ireland:	Snails and slugs (terrestrial, freshwater and marine)
Cranefly Recording Scheme	Craneflies etc.
Culicidae Recording Scheme	Mosquitoes
Dermestoidea & Bostrichoidea Recording Scheme	Larder beetles
Dipterists Forum	Flies (general) (covers most groups)
Elateroidea Recording Scheme	Click beetles
Empididae Recording Scheme	Soldier flies
Field Studies Council	Produces guides to many groups, runs courses; part of OPAL Project
Freshwater Biological Association	Does not run separate recording schemes
Freshwater Flatworm Recording Scheme	Freshwater flatworms
Froglife	Amphibians & reptiles (general)
Ground Beetle Recording Scheme	Ground beetles
Herpetological Conservation Trust	Amphibians & reptiles (main contact)
Heteroptera Recording Scheme	Terrestrial bugs
Highland Biological Recording Group	General recording (Scotland)
Hoverfly Recording Scheme	Hoverflies
Hypogean Crustacea Recording Scheme	Subterranean crustaceans

Name of Organisation/ Recording Scheme	Specialist interest
Imperial College, University of London	Oversees OPAL Project to involve people in recording
Incurvarioidea Recording Scheme	Longhorn moths
Ladybird Recording Scheme	Ladybirds and allies
Larger Brachycera Recording Scheme	Soldier and horse-flies
Leaf-mining Moth Recording Scheme	Leaf-mining moths
Linnean Society of London	Natural history & evolution (scientific). Supports broader recording strategies.
Mammal Society	Mammals
Marine Biological Association	Marine recording in general (main contact)
National Biodiversity Network	Collaboration of organisations committed to sharing wildlife data
National Biodiversity Network Trust	Runs NBN Gateway; part of OPAL Project
National Federation for Biological Recording	Biological recording support organisation
National Federation of Badger Groups	Badgers and their conservation
National Trust	Runs its own recording programmes
Natural History Museum	Principal natural history museum in UK; runs NBN Species Dictionary and Darwin Centre; engaged with OPAL Project

Name of Organisation/ Recording Scheme	Specialist interest
Natural Sciences Collections Association	Biological collections (museums)
Neuropterida Recording Scheme	Alderflies/lacewings
Open University	Engaged with OPAL Project to promote biodiversity recording.
OPAL (Open Air Laboratories)	A partnership initiative celebrating biodiversity, environmental quality and people's engagement with nature
Orthoptera Recording Scheme	Grasshoppers/crickets
Parasitic Wasps Recording Scheme	Ichneumon wasps
People's Trust for Endangered Species	Special surveys of endangered species
Plantlife	Plant conservation, some surveys to attract beginners
Ponds Conservation	Freshwater recording of ponds
Pseudoscorpions Recording Scheme	Pseudoscorpions
Psocoptera Recording Scheme	Bark flies
Pyralidae & Plume Moth Recording Scheme	Pyralid and plume moths
Royal Entomological Society	Insect science, and publication of specialist literature
Royal Society for the Protection of Birds	Birds, including focused surveys, public outreach, conservation

Name of Organisation/ Recording Scheme	Specialist interest
Scarabaeoidea Recording Scheme	Dung beetles
Sciomyzidae Recording Scheme	Snail-killing flies
Scottish Ornithologists Club	Bird recording in Scotland
Sea Watch Foundation	Marine mammals etc.
Siphonaptera Recording Scheme	Fleas
Slime Mould Recording Scheme	Slime moulds (Myxomycetes)
Staphylinidae Recording Scheme	Rove beetles
Symphyta Recording Scheme	Sawflies
Tachinidae Recording Scheme	Tachinid flies
Tenebrionid Beetle Recording Scheme	Darkling beetles and allies
Tick Recording Scheme	Ticks
The Wildlife Trusts	Conservation (general) Local trusts may run surveys
Whale & Dolphin Conservation Society	Whales and dolphins
Wildflower Society	Wildlfower recognition (no formal recording)
Wildfowl & Wetlands Trust	Wildlfowl counts etc.
Woodland Trust (and UK Phenology Network)	Trees and /phenology of species in Britain

The National Biodiversity Network (NBN) is a collaboration of the UK's wildlife organisations, the government and country agencies, and many voluntary groups, all of whom are committed to making biodiversity information available. The principal way in which it does this is through the NBN Gateway, which is available to all at www.nbn.org.uk.
The NBN Trust which runs the Gateway is registered as a company limited by guarantee and is a registered charity. Charity number: 1082163

To learn more about the landscape and wildlife that inspired Darwin in Bromley: www.darwinslandscape.co.uk

The Charles Darwin Trust uses the intellectual and cultural heritage of Darwin, through his approach to science and his work at Down House and in the immediate countryside, to inspire a deep understanding of science and the natural world: www.charlesdarwintrust.org

Greenspace Information for Greater London (GiGL) is the capital's open space and biodiversity records centre - it collates, manages and makes available detailed information on London's wildlife, parks, nature reserves, gardens and other open spaces. www.gigl.org.uk

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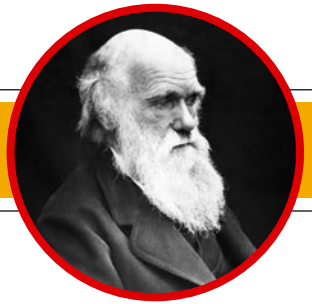

THE DARWIN GUIDE TO RECORDING WILDLIFE

The United Kingdom is a nation of nature lovers and because of this we are extremely fortunate to have many thousands of people who take an active part in observing and recording wildlife - just as Darwin did. This is one of the reasons why we know so much about our biodiversity. But, there is still much to do if we are to fully appreciate and understand the changes that are taking place from one year to the next; from one region to another.

If you are already interested in nature and would like to become more involved by recording wildlife, then this book will explain how you can take your love of nature a stage further, allowing you to play a vital role in today's conservation efforts.

To set the scene, we look back at Darwin's work and draw inspiration from the hours, months and years he spent observing wildlife. From there we move to what is the essence of recording wildlife today. This can be as simple as noting what you see in your garden, but we will give you some basic steps to help you look for certain species and give you advice on how to go about recording them.

Darwin didn't have the tools and resources that are available to us today, so be inspired by his stories and then read on to follow in his footsteps!