The Great British Year

START

Seen one of these species? Record the date and upload a photo to iSpot.org.uk

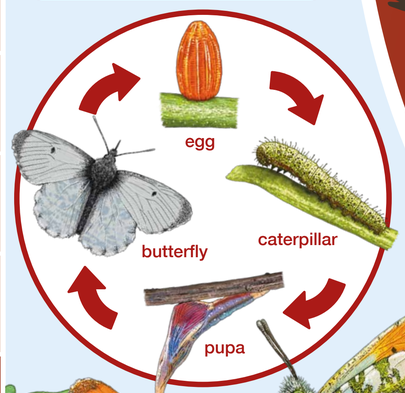
BBC

The Open University

Migration of the cuckoo

Did you know?
The hen cuckoo has a rich bubbling song, which is very different from the male's call.

Life cycle of the orange-tip butterfly



Did you know?
Only the males have bright orange wing tips and both sexes can blend into the background by closing their wings, displaying only their moss-coloured camouflage.

Did you know?
Being curled up reduces the surface area available for heat loss to occur.

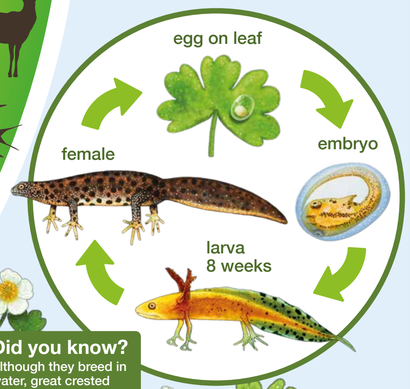
Surviving the winter

body temperature

37 °C normal body temperature

5 °C hibernation body temperature

Life cycle of the great crested newt



Did you know?
Although they breed in water, great crested newts spend most of their life on land.

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44 wild teasel — Date first seen

43 alder — Date first seen

42 pintail — Date first seen

41 winter moth — Date first seen

NOVEMBER
Winter berries: These provide a splash of colour to brighten up your photos.

40 yarrow — Date first seen

39 fly agaric — Date first seen

38 harlequin ladybird — Date first seen

37 redwing — Date first seen

OCTOBER
Fungi: Many types of fungi send up their fruiting bodies at this time of year.

36 horse-chestnut conker — Date first seen

35 blackberry — Date first seen

34 waxcap mushroom — Date first seen

33 bittersweet (berries) — Date first seen

SEPTEMBER
Rock pools: There is a wealth of biodiversity in these tiny ecosystems.

32 6-spot burnet — Date first seen

31 stinkhorn — Date first seen

30 rosebay willowherb — Date first seen

DECEMBER
Winter waders: When the tide comes in, birds huddle together in larger groups and it's a spectacular sight.

45 black-tailed godwit — Date first seen

46 candlesnuff fungus — Date first seen

47 daisy — Date first seen

48 grey squirrel — Date first seen

JANUARY
Coastal scenes: The days are short but dramatic scenes await the hardy.

1 greylag goose — Date first seen

2 jelly ear fungus — Date first seen

3 ash keys (seed) — Date first seen

4 snowdrop — Date first seen

FEBRUARY
Bird feeders: With food in short supply your bird feeder is an ideal place to photograph wild birds.

5 7-spot ladybird — Date first seen

6 lesser celandine — Date first seen

7 common frog — Date first seen

8 bumblebee — Date first seen

MARCH
Ponds: It's amphibian breeding season so there are loads of frogs.

9 wood anemone — Date first seen

10 peacock butterfly — Date first seen

11 adder — Date first seen

12 blackthorn — Date first seen

APRIL
Woodland flowers: In the woods, many plants are coming into bloom.

13 pipistrelle bat — Date first seen

14 comma butterfly — Date first seen

15 chiffchaff — Date first seen

16 bluebell — Date first seen

MAY
Hedge and verge flowers: Plants are bursting into flower everywhere.

17 4-spotted chaser — Date first seen

18 speedwell — Date first seen

19 banded demoiselle — Date first seen

20 hawthorn — Date first seen

JUNE
Butterflies: These are abundant now. Spot them in early morning while they rest with wings open to warm up in the sun.

21 reed warbler — Date first seen

22 dog-rose — Date first seen

23 skylark — Date first seen

24 seaweed — Date first seen

JULY
Dragonflies: These beautiful insects become sluggish when the weather cools.

25 rook — Date first seen

26 hawk-moth — Date first seen

27 cinnabar — Date first seen

28 coot — Date first seen

AUGUST
Reptiles: They are at their most active in the warmth, with snakes and lizards out hunting for prey.

29 bush-cricket — Date first seen

The Great British Year

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Published in 2013 by The Open University, Walton Hall, Milton Keynes, MK7 6AA, to accompany the **BBC/OU** series ***The Great British Year***, first broadcast on BBC One in 2013.

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Acknowledgements

Front Cover Image: © BBC

Patricia Ash, Peter Brown, David Chesmore, Andrew Cooper, Mike Dodd, Miranda Dyson, Mark Gardener, Christine Gehrig, Paul Kingwell, Luke Massey, Steve McWilliam, Todd Murray, David Robinson, Russell Savoy, Philip Sims, Tony Tilford, John Toon, Tom Walker, Roger Whiteway.

Edited by The Open University.

Printed in the United Kingdom by Belmont Press.

SUP 017706.

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Swallow and cuckoo migration

Many birds in northern temperate regions feed only on insects, which provide essential fats and proteins. In winter insects are scarce, and insect-eating birds migrate south in Autumn to warmer areas where insects are abundant. The trigger for migration is uncertain but may be reducing daylight hours, or low ambient temperatures. Two familiar migratory birds are the barn swallow and the cuckoo.

In northern Europe, swallows set off on their 9700 km journey to South Africa in late August and September. A migrating flock can include 2000–3000 birds. Ringing studies were used by the British Trust for Ornithology (BTO) to investigate the route taken by the swallows. Rings were retrieved from live captured or dead birds and showed that swallows fly over south-west France to Morocco, and then fly 2000 km across the Sahara desert. Some swallows fly along the West African coast instead.

Migrating swallows fly in daylight, using stopovers for feeding. Their flight speed is about 27–35 km per hour, and they travel about 320 km per day. Once in South Africa the swallows join other flocks and feed. Huge numbers of swallows from northern Europe feed and roost in the Lake Victoria wetland at Mount Moreland. About 3 million birds were there from October 2012 to March 2013, feeding on insects and roosting in phragmites reed beds. In late March to April the swallows leave their winter quarters in South Africa and fly northwards.

Swallows arrive in northern Europe to breed from April to May. The nest is a cup of mud mixed with vegetation, about 20 cm wide and 10 cm deep. The cup is stuck to a wall or beam about 2–5 m off the ground. Usually four to five eggs are laid and incubated by the hen bird. The eggs hatch after 14–16 days. Both parents feed the chicks about 400 times a day, so plenty of flying insects are needed. The chicks fledge about 17–24 days after hatching. Long spells of rain cause chicks to starve as very few insects fly during rain.

The Royal Society for the Protection of Birds (RSPB) and BTO estimate that there are 678 000–726 000 breeding territories of swallows in the UK. Another migratory bird, the cuckoo, is as familiar as the swallow, but is rarely seen. It is the 'cuckoo! cuckoo!' call of the cock bird that is well known. The BTO estimates about 9600–20 000 cuckoo breeding territories in the UK. There is concern that cuckoo numbers in the UK and other European countries have declined by about 65% since the 1980s. The decline could link partly to the reducing populations of beetles and hairy caterpillars that cuckoos eat.

Cuckoos overwinter in Africa and their migratory route is being investigated using electronic satellite tags weighing just 5 g. In May 2011 the BTO tagged five British cuckoos with 5 g solar-powered satellite tags. The tags transmit data for 10 h and then stop for 48 h to recharge the battery using sunlight as the energy source.

Four tagged cuckoos from England left the UK in late June 2011, and the fifth left on 22 July. Three cuckoos flew to Italy, where they had a month stopover by the River Po. Subsequently the birds flew across the Sahara desert. The other two tagged cuckoos headed to Spain and stopped over at a site north of Madrid. The birds then flew southwards along the western edge of the Sahara via Senegal and the Gambia. All five birds reached the Congo rainforest by the end of November 2011. Just two of the cuckoos, Chris and Lyster, made it back to the UK in Spring 2012. In May 2012 five cuckoos from Scotland and Wales were also tagged.

Presumably Chris and Lyster, like other cuckoos returning to the UK, found partners for breeding. A mated hen cuckoo lays a single egg in up to 25 host nests, commonly those of dunnocks, reed warblers and meadow pipits. The cuckoo chick pushes the host's chicks and eggs out of the nest and the parents usually switch to feeding the cuckoo chick. Young cuckoos are ready to migrate to Africa by about July.

Identifying the routes, stopover sites and destinations for northern European birds undergoing their winter migrations is of crucial importance for investigating factors contributing to declining numbers of migratory birds.

Going to ground: surviving the winter

Some animal species remain in northern temperate and boreal latitudes for the long winter months. One established way to survive the cold is to shut down all non-essential processes to preserve energy and await warmer weather. Many deciduous trees and perennial plants lose their leaves and remain dormant throughout winter. Smaller plants may persist either above or below ground and some make use of subterranean energy stores.

Larger mammals such as badgers can become lethargic during very cold periods but otherwise remain active in winter, feeding when they can. Larger mammals are able to conserve heat better than smaller ones because they have a much smaller surface area to volume ratio, so heat loss is reduced. Larger animals are also able to accommodate thicker layers of insulating white adipose (fat) tissue to help retain heat and at the same time provide an internal energy source to get them through the leaner periods. Smaller organisms have to resort to other strategies, sometimes hiding food in external caches, otherwise undergoing variable time periods of sustained inactivity, depending on the prevailing circumstances.

Biologists refer to periods of decreased activity and metabolism as a state of torpor and the use of such strategies is seen across a wide range of species, including some bees, wasps, butterflies such as the peacock, as well as in amphibians and reptiles. Although the terms hibernation and torpor are often used interchangeably, torpor is distinct from the 'true' hibernation process observed in smaller mammals such as the European hedgehog, native dormouse and some bats.

Torpor saves energy and avoids challenging colder temperatures, sometimes for a temporary period of time, such as during the daylight hours for bats or throughout dark cold nights for birds. Reduced food availability throughout longer winter periods, for smaller animals, means they may also have to resort to other more complex strategies to conserve energy, for sustained periods of time. Hibernation is a much longer period in a resting state similar to deep sleep, when the metabolic rate can decrease to less than 10% of its usual value, the heart and breathing rates slow, and body temperature drops considerably from about 38 °C to just above ambient, which may often be close to freezing.

One defining feature of true hibernation is that hibernators arouse spontaneously throughout the hibernation period, unrelated to temperature. Thus, on multiple occasions during hibernation, the metabolic rate and temperature increase to approximately normal levels, before dropping again.

There is a unique, specialised tissue that occurs in many mammals known as brown adipose tissue (BAT). Deposits of BAT are generally found on the back between the shoulder blades and close to vital internal organs. This tissue generates heat without body movements such as shivering, hence the process is known as non-shivering heat generation. For this tissue, heat generation is its main function.

Hibernators (and non-hibernators) typically build up their white adipose tissue energy reserves by spending a lot of time feeding before the onset of winter. Only a few species eat food from stored caches on temporary arousal but most do take the opportunity to excrete urine and faeces. Hibernators generally make use of burrows, nests or natural shelters such as log piles. As well as providing further insulation, these afford some protection from predators that would otherwise find them in a rather vulnerable position, in a deep hibernation sleep.

Winter is spent alone for some individuals, but many others resort to safety in numbers. Ladybirds overwinter as adults and can congregate in large numbers (up to thousands) and reptiles such as the common lizard can be found sheltering in groups. Larger British mammals such as badgers do not hibernate but may spend many days underground in particularly cold spells where the temperature in their setts can be considerably warmer than the outside environment.

The emergence from hibernation, any time between approximately February and April, coincides with increasing temperatures, longer daylight hours and also availability of food sources. It is also, for many, time to focus their attention and energies on finding mates or moving to spawning grounds.

What to photograph this month

January

Coastal scenes: The days are short but dramatic scenes await the hardy. Try a wide-angle lens to take in the big picture. A polarising filter can increase contrast and pick out cloud formations.

February

Bird feeders: Your house makes an ideal hide: photograph through an open window and the birds will not notice you. A telephoto lens and tripod are useful to get good close-up shots.

March

Ponds: It's amphibian breeding season so there are loads of frogs. Keep quiet, wear dull clothing and keep low down. Use a polarising filter to reduce glare from the water surface.

April

Woodland flowers: In the woods, plants are coming into bloom. Get down low and use a small tripod to keep your lens steady. Try using a piece of white card to reflect extra light onto your subject.

May

Hedge and verge flowers: Plants are bursting into flower. Catch the morning dew or try the evening; the low sun makes interesting shadows and colours are richer. A tripod helps keep the lens steady.

June

Butterflies: These insects are abundant now. Spot them early in the morning whilst they rest with wings open to warm up in the sun. If you cannot sneak up close, try a telephoto lens and a fast shutter speed.

July

Dragonflies: These magnificent insects are sluggish if the weather is a bit cool and more easily photographed. Early in the day is best before they warm up. Try using a telephoto lens to get close-up shots.

August

Reptiles: These animals are at their most active, with snakes and lizards out hunting for prey. Get out early while they are still cold, watch for them warming up in sunny spots and be careful not to disturb them.

September

Rock pools: There is a wealth of biodiversity in these tiny ecosystems. Get down close, but don't let your shadow fall across your subject. A polarising filter is useful to cut glare from the water surface.

October

Fungi: Many types of fungi send up their fruiting bodies at this time of year. Get down on your elbows to get up close. A small tripod is useful to keep the lens steady, especially as the light can be low.

November

Winter berries: Berries provide a splash of colour to brighten up your photos. Use a macro lens to get really close, with a tripod for support. Sunlight reflecting off dew or rain gives an extra sparkle.

December

Winter waders: When the tide comes in birds huddle together in groups. Wrap up warm and wear dark clothing so the birds are not alarmed. A telephoto lens and tripod are essential as you won't get close.

Insects and plants

Insects and plants have evolved alongside each other for millions of years. Many insects feed on plants and may themselves be parasitised or eaten by other insects. The relationships between insects and plants offer a fascinating insight into the complexity of links between species. If you think about where you encounter insects, most are seen on or around plants – apart from those that invade our homes, of course.

The orange-tip butterfly (*Anthocharis cardamines*) is a common and conspicuous butterfly that appears in April. It is the male that has the orange tips to the wings and such a conspicuous butterfly in flight ought to provide an easy snack for a bird. However, it is possible that the orange tips actually flash a warning to possible predators – the warning that the butterfly is not good to eat.

The female lays her eggs on plants that contain mustard oils, such as garlic mustard (*Alliaria petiolata*) and cuckoo flower (*Cardamine pratensis*). When the eggs hatch, the caterpillars feed on the leaves of the host plant and accumulate chemicals from the mustard oils, called glucosinolates. These persist in the butterfly tissues through the pupal stage to the adult. It is interesting that the female butterfly does not have orange tips to the wings. Both males and females are well camouflaged when at rest and it is possible that the male flies much more than the female. Being at greater risk of being eaten when flying, the flash of the orange wing tips would be easy for a predator to see and this acts as a warning.

The species of plant that the orange-tip lays its eggs on are not always very leafy and therefore the female lays a single egg. The caterpillars can be cannibalistic, eating other eggs or smaller caterpillars that they encounter, so laying a single egg makes sense. It is thought that the female might avoid a plant on which an egg has already been laid. The caterpillars themselves are at risk from parasitic flies and wasps that lay their eggs into the skin of the caterpillar.

The common ragwort (*Senecio jacobaea*) is notorious for being poisonous to horses but it is also a food plant for a number of insect species. The black and red cinnabar moth (*Tyria jacobaeae*) can be seen flying around from May onwards into the summer and it is very visible. The caterpillars appear on ragwort and groundsel plants from July onwards and they are also brightly coloured. The bright colouring of the adults is another example of warning colouration. The food plants contain alkaloids that cause liver damage and horses seem particularly susceptible. Interestingly, the live plants are unpalatable, but the dried plants lose their unpalatability while retaining their toxicity. This is what makes their presence in bales of hay so dangerous for horses.

Female cinnabar moths lay large batches of eggs and when they hatch the caterpillars can very quickly strip the host plant of all its leaves. Although there are initially large numbers of caterpillars, relatively few make it through to pupation. The caterpillars are, or course, almost free of predation, due to their warning colouration, but they are so voracious that they can exhaust their food supply before they have built up sufficient body mass to pupate. Like the orange-tip caterpillars, the cinnabars may also be cannibalistic.

A number of butterflies in the UK have blue wings; the first one to appear in early spring is the holly blue (*Celastrina argiolus*) and it has an unusual selection of food plants. As the name suggests, the female preferentially lays her eggs on holly (*Ilex aquifolium*) but this is only the case for the females that emerge from the pupa in the spring. There is a second generation that emerges in the summer and these lay their eggs on ivy (*Hedera helix*). This is the only UK butterfly that is known to switch during the year between two preferred food plants.

The links between insects and food plants are often quite specific. Insect and plant have obviously evolved together. The poisonous substances from the plants do not harm the insects that eat them. These insects are unpalatable and exhibit warning colouration.

Amphibians

The British Isles have six native species of amphibians. Two of these are toads, the common toad (*Bufo bufo*) and the natterjack toad (*Epidalea calamita*) and one is a frog, the common frog (*Rana temporaria*).The other three species are newts, the smooth newt (*Lissotriton vulgaris*), the palmate newt (*Triturus helveticus*) and the great crested newt (*Triturus cristatus*). Both the natterjack toad and the great crested newt are listed as European protected species.

Frogs and toads overwinter under piles of damp leaves, rotting logs or in underground cavities. They emerge from refuges in spring and migrate to breeding ponds to mate and spawn. Frogs usually breed before toads because they can tolerate much lower temperatures. Breeding takes place over a few days to several weeks, depending on temperature and rainfall.

Common toads return to their natal ponds year after year and large numbers may travel distances of over a kilometre to do so. At this time they are vulnerable when crossing roads and in many places in the UK special toad patrols are put in place to help them. Males usually arrive first at the breeding site and may mate several times with different females during a single breeding season. Females mate only once a season and only remain at the breeding site long enough to mate and spawn.

In some populations, males produce a 'mating call' to which females are attracted. However, in many populations, males don't call but use a tactic known as 'scramble competition' to obtain females. Males wait for females approaching the pond and then clasp them under the forearms in a grip that is known as amplexus. Males try to clasp anything that moves in their vicinity, including other male toads and even frogs. Often, more than one male will attempt to clasp a single female, resulting in a mating ball (which sometimes results in the female drowning in the centre of a ball of males). Males try and dislodge each other from the backs of females by kicking each other with their hind legs. Large males are more successful than small males at dislodging other males and so have higher mating success than small males.

Natterjack toads are rare in the UK and confined to coastal sand dune systems, coastal grazing marshes and sand heaths. Males have a rasping call which they use to attract females and which can be heard from several kilometres away. The pitch of the male's call is used by rival males to assess fighting ability.

In both frogs and toads fertilisation is external: the female extrudes her eggs into the water and the male deposits his sperm over the eggs. Frogs lay their eggs in large clumps that float in the water while toads lay eggs in long double strings that are usually wound around vegetation.

Great crested newts are the largest of the UK newts. Like smooth and palmate newts, they normally live on land but breed in ponds and pools. Males develop a characteristic large crest along their back during the breeding season. The belly is brilliantly patterned and the pattern is unique to individuals. Smooth and palmate newt males also develop a crest but it is much less obvious than that of the great crested newt.

Breeding is similar in all three species. After performing an elaborate courtship display, consisting of sending pheromones under water by tail-fanning towards the female, the male deposits a spermatophore (a small packet of sperm) from his cloaca (reproductive and excretory opening) in the path of the female. He then moves sideways in front of her and encourages her into a position where the spermatophore is picked up by her cloaca. 'Mating' is therefore achieved without direct contact between the male and female. The female lays two to 12 eggs a day (depending on the species) until 200 to 400 eggs have been laid. Each egg is laid singly on the leaf of an aquatic plant, and is wrapped carefully in the leaf. The eggs hatch after about 3 weeks and the larvae take about 12 weeks to metamorphose into juveniles. In great crested newts and smooth newts there is some evidence that the height of the male's crest affects male mating success.

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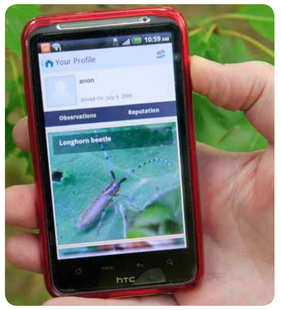

www.ispot.org.uk is a website aimed at helping you identify any species you have seen. On iSpot you can share your interest with a friendly community, take a look at the latest spots, add your own observations, join in discussions and get help identifying what you have seen.

Go to **www.ispot.org.uk** (or search for 'ispot'). You can also download the iSpot app for Android phones by going to the Google Play app store. Link the app to your iSpot account and then you can upload photos of what you have seen, directly from your phone.

What happens on iSpot?

You can browse thousands of observations from other users and once registered you can add your own, suggest an identification yourself or see if anyone else can identify what you have seen.

You can also help others by adding identifications to their observations, which you may like to do as your knowledge increases. Your reputation on the site grows as people agree with your identifications.

iSpot and *The Great British Year*

The TV series and this poster encourage you to observe the different seasons. On the poster there are four organisms to find each month; try to take a photo and share your observation with the iSpot community. By using iSpot to record the observations you have made, you will contribute to a seasonal data set that will build throughout the year. On iSpot you can also browse through other people's observations and see the top ten species for each season.

What else can you do on iSpot?

Use the identification keys

The identification keys on iSpot can also assist you in identifying what you have seen. There are keys available for a number of different groups, from minibeasts to lichens, and for all levels of ability.

Record ecological relationships

You can also use iSpot to learn about the relationships between different organisms. You might see a butterfly visiting a flower, or a lichen growing on a tree; record the ecological interactions between your observations and get help understanding the importance of these connections.

Test your iSpotting skills

Want to find out how much you have learned? Take a quiz on iSpot for a fun way to test your knowledge. You can even personalise your quiz to relate it to your own activity on iSpot.

Start a discussion

The iSpot forums offer a place for lively debate about a whole variety of wildlife topics. Join in the discussions, or put your own question to the friendly iSpot community.

Find out what's in your area

Keep up to date with what iSpot is doing near you by visiting the regional forums for iSpot's Biodiversity Mentors (**http://www.ispot.org.uk/in_your_area**). The iSpot Mentors attend different events across the UK to promote iSpot and encourage people to get outdoors and enjoy nature.

OpenLearn

On OpenLearn, the OU's home for free learning, you can discover more about nature and *The Great British Year*. OpenLearn will be collecting together all the seasonal observations of the organisms featured on this poster and giving you more information as the year progresses. Explore some of the data generated by observations posted to iSpot.

Visit OpenLearn to find out more about nature and the environment and discover season-by-season stories from British habitats.

open.edu/openlearn/seasons

Dip into free course material on science and natural history.

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