THE STATE OF
IRELAND'S BEES

Environment & Heritage Service
www.ehsni.gov.uk

National Parks & Wildlife Service

HEA
Higher Education Authority
An tÚdarás um Ard-Oideachas

Queen's University Belfast

SUMMARY

Bees are essential because they are very important pollinators of plants. They help pollinate both crops and native plants, making them of huge economic and ecological importance to Ireland.

Bees vary in their social organization. Bumblebees and honeybees are highly social insects. They live in colonies consisting of a queen, many female workers and some males. Other bees live alone instead of in a colony and are called solitary bees, though a few also live in rather simple societies. Only 3% of the 20,000 bee species worldwide are social, colony forming bees.

There are 101 bee species in Ireland. Nineteen of these species are bumblebees, and more than half of these bumblebee species are in decline.

Ireland has one native honeybee species.

Most of the other 81 bee species in Ireland are solitary. Nearly half of these solitary species are in decline.

A regional Red Data List of bees has been produced and tells us which bee species are in most danger in Ireland. Six species are critically endangered (CR), 7 are endangered (EN), 16 are vulnerable (VU) and 13 are near threatened (NT). Sadly, three bee species have become extinct in Ireland within the last 80 years.

Despite lots of species being in serious decline, there are no protected bee species here. The Marsh Fritillary butterfly is the only insect that is protected by law in the Irish Republic. The Marsh Fritillary and five other butterfly species are the only insects protected by law in Northern Ireland.

Bees are declining because we are making them homeless by using most of the landscape for farming, forestry and housing and not leaving enough natural habitats for them to live.

Climate change threatens many species but is a worse threat for those species that are habitat specialists, as the habitats they rely on may disappear or shift position too rapidly for the bees to adapt to the change.

BUMBLEBEES

There are 13 species of true bumblebee in Ireland. Bumblebees are identified by the colour patterns on their body (thorax) and 'tail' (abdomen).

Queen bumblebees emerge from hibernation in spring, make a nest, often in an abandoned mouse nest, and lay eggs in it. Fertilized eggs become female worker bees whose job it is to raise the young and look after the colony. Unfertilized eggs become males, who leave the colony and try to find another queen with which to mate. Towards the end of the season (late summer) fertilized eggs will become new queens instead of workers. The whole colony dies as winter approaches, except for the new queens who go into hibernation until the following spring.

There are 6 species of cuckoo bumblebee in Ireland. They are called cuckoo bumblebees because they steal the nest of a true bumblebee instead of making their own. Cuckoo bumblebee queens emerge from hibernation a few weeks after true bumblebee queens. The cuckoo queen waits until the true queen has made a home, then sneaks in, kills the true queen, and lays her eggs in the nest. The true bumblebee workers mistake these eggs for their own queen's and raise them for the cuckoo queen. Cuckoo bumblebees are more difficult to identify, as some closely resemble true bumblebees. This may make it easier for them to sneak into the true bumblebee nest. Insects who steal food or shelter from other insects are called kleptoparasites.

Bumblebees are very important pollinators. Pollination is the transfer of pollen from an anther (male structure of a flower) to stigma (female structure of a flower) of the same or a different flower that fertilizes plant seeds. When a female bee visits a flower she drinks nectar and gathers pollen on her hairs (fur), which is combed off into pollen baskets on her back legs. Back in the nest, the bees store some of the nectar in a honey pot for emergencies or in case they need a midnight snack. The pollen is made into a pellet and is used to feed the growing larvae. Some of the pollen that attaches to the bee's body at one flower will be transferred to the next flower as the bee flies from flower to flower; this allows the important process of pollination to occur.

Only female bees (both the queen and workers) can sting. Bumblebees do not swarm and are generally not at all aggressive

Buff tailed bumblebee

Garden bumblebee

Shrill carder bee

Large carder bee

until their colony is disturbed. Unless you really upset a bumblebee it is unlikely that you'll get stung. But watch out if you do because bumblebees can sting you more than once. Honeybees only get one chance as they lose their sting and die once it has been used.

Some insects, especially hoverflies, are very good at mimicking bees. To a predator such as a bird, these mimics look like they have a dangerous sting while in fact they are harmless.


White tailed bumblebee

To the right are two of the most common bumblebees in Ireland – the white tailed bumblebee and the common carder bumblebee. See if you can find them in your garden or local park. Also watch out for the red tailed bumblebee, which is a lot less common but can sometimes be spotted.


Carder bumblebee

HONEYBEE

The honeybee is the type of bee that most people are familiar with. There are estimated to be 3000 beekeepers in the Republic of Ireland and 700 in Northern Ireland who keep hives of honeybees and produce honey. That adds up to a lot of bees, making the honeybee a very important pollinator of crops and flowers. Honeybees lived in Ireland long before beekeepers started building hives and keeping them for honey. In the wild they make their nests in hollow trees and don't have to share their honey with anyone! Unlike the honeybee, solitary bees and bumblebees produce very little or no honey.


Red tailed bumblebee

It is very difficult to assess the conservation status of Ireland's native honeybee because beekeepers import bees from outside Ireland and these have mixed with the native species.


Native honeybees nesting in a tree

SOLITARY BEES AND OTHERS

Solitary mining bee

Although most people don't know they even exist, solitary bees make up most of the bee species in Ireland. There are 19 species of bumblebee, one species of honeybee and 81 species of other bee, most of which are solitary and 22 of which are cuckoo bees, kleptoparasites of solitary bees. Solitary bees are not big and furry like bumblebees. Most are much smaller and come in lots of different shapes and colours. Some species are small and black and look like flying ants, and some have black and yellow striped bodies like wasps.

Solitary leaf cutter bee

Bees, like all animals and plants, have common names and scientific names. The scientific name is made up two parts, a genus name and a species name. The mountain bumblebee's scientific name is *Bombus monticola*. *Bombus* means it belongs to the bumblebee genus and *monticola* is its own name and distinguishes it from all other bumblebee species, like *Bombus lapidarius*, the red-tailed bumblebee. The grey striped mining bee is a solitary species whose scientific name is *Andrena cineraria*. It belongs to the *Andrena* genus and is one of 29 different species within that genus in Ireland.

Cuckoo bee

Solitary bees take one whole year to pass though a complete life cycle, and may only survive as adults for 2 weeks. This isn't long enough for them to raise their offspring, so the young bees have to fend for themselves, hence the term 'solitary bee'. Mum makes a nest, lays eggs in it and leaves a food supply of honey and pollen, and then dies when the colder weather arrives. The offspring survive the winter and emerge the following spring, when they try to find a mate and the cycle begins again. Although most solitary bees prefer to live alone, some species are more sociable and like to build their nests in little groups or aggregations.

Cuckoo bee

Just like cuckoo bumblebees, some solitary bees are kleptoparasites and steal the nest of another solitary bee instead of preparing their own. The female of these so-called cuckoo bees enters the nest of another species and lays an egg near the pollen food supply gathered by the owner. When the parasite's egg hatches into a larva, it eats the owner's egg then uses the food supply intended for the owner's young.

Solitary species can be grouped by how they make their nests, with each group having its own special way of doing it. Leafcutter bees cut circular pieces out of leaves with their teeth and carry them

back to line their nests in hollowed out twigs and bamboo canes. Mining bees, like those in the genus *Andrena*, make their nests by digging holes in the ground.

Female solitary bees can sting but many are too small to sting humans. Watch out for the bigger species, like the leaf cutter bees, which will manage it if you irritate them enough!

South facing bank, ideal nest site for solitary bees

WHERE DO BEES MAKE THEIR NESTS?

Bees nest in a variety of places. Some bumblebee species make nests underground, while others nest above ground in thick grass. Many of the solitary species like to nest in south facing banks of exposed soil so that the nest will get plenty of sun to keep them warm. Bees need a lot of energy to keep warm because they have a large surface area to volume ratio. This is a particular problem for the smaller solitary species, which therefore rely more on the sun's rays to warm them up. Ireland is a difficult place for them to live because the weather is so unpredictable. If it suddenly becomes cloudy and the temperature drops while solitary bees are out feeding on flowers they can get stuck and will have to wait until the sun comes out again to warm them up before they can move. Watch out for solitary bees snoozing in flowers like dandelion on days with sunshine and showers!

Bumblebee entering its underground nest

Other solitary species prefer to nest in old beetle holes in dead wood or in cavities in walls. One solitary species called *Osmia aurulenta* lives in sand dunes and will only nest in empty snail shells.

As you can imagine, it must be a difficult task for bees to locate the entrance hole to their tiny nest again when they've been out foraging on flowers. They find their nest by learning the layout of twigs and leaves around the hole – quite a feat of memory for an animal with a brain smaller than a pin-head!

Solitary bee nest holes

Solitary bee nest holes

WHERE DO BEES LIVE?

Bees live in lots of different habitats. For a habitat to be suitable for bees it has to have both flowers to feed on and a suitable place to build a nest. Lots of common species can live in a range of habitats and will happily live in your garden or in the local park. Other species are very fussy and will only live in a particular habitat. They are called habitat specialists. Below are some examples of habitat specialists and the places where they live.

Osmia aurulenta

Andrena fuscipes

Bombus sylvarum

Osmia aurulenta lives in sand dunes

Andrena fuscipes lives in heath land

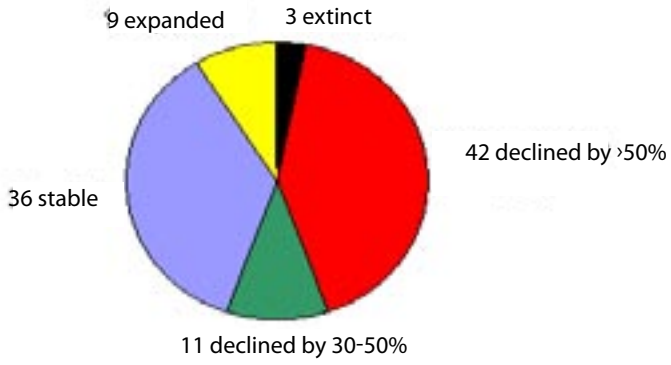
Bombus sylvarum lives in flower rich grassland

CHANGES IN BEE ABUNDANCE AND DISTRIBUTION SINCE 1980

Three of the total 101 species have become extinct in Ireland and more than half have undergone substantial declines in their numbers since 1980. The distribution of 42 species has declined by more than 50% and these species will need to be closely monitored so that they don't go extinct in Ireland.

Species worst affected are those that are habitat specialists and those that forage on a particular type of plant. Polylectic species can feed on a range of different plants while those that only feed on one or a few plants are called oligolectic species. Polylectic species that can survive in a range of different habitats are less likely to become extinct through loss of their home or the plants they need for food.

All bumblebees are polylectic but different species have different tongue lengths. Scientists have noticed that the species with long tongues, like the great yellow bumblebee, are much more likely to go extinct. This is because they prefer to feed on plants with long flowers. In the past Ireland had lots grasslands and hay meadows with these kinds of plants, but unfortunately almost all of this habitat has been lost.



CAUSES OF DECLINES

Sand dune partially converted to a golf course

Habitat loss

Large areas of the natural environment have been lost in Ireland to make room for farming, forestry and housing. Like bees, people need to use the environment but unfortunately they sometimes don't have any consideration for the other animals and plants that also have to survive there. We need to leave natural areas like sand dunes, bogs, woodlands and grasslands for bees and other insects to live. The loss of flower rich meadows across Ireland is probably having the most impact on bee species. Bees are not the only animals suffering because of declines in this habitat type. Lots of other species that also live in flower rich meadows are also severely threatened e.g. the Corncrake, an endangered bird.

Habitat loss

Habitats that remain also have to be correctly looked after so that they stay in their natural condition. Some sand dune systems have been converted to golf courses, with only a small area of dunes remaining. Bees can't live on a golf course because their nests get trampled and there aren't enough flowers for them to feed on. Sometimes grasslands have too many sheep or cattle on them and this results in overgrazing. Overgrazing removes lots of flowers from the habitat and means that there is less food for the bees.

Habitat fragmentation

Many natural habitats, like grassland meadows, used to exist as extensive areas across Ireland but have now been reduced to small patches here and there, with large areas of housing or intensively farmed land in between. This is called habitat fragmentation. When one of these remaining habitat patches is destroyed, the bees that live there may not be able to move because often the nearest area of suitable habitat is just too far for them to fly. With nowhere to go, the bees become homeless and the population that lived there dies out. When this happens across Ireland, the number of populations can fall to a very low level and the species runs the risk of extinction. Insects have a tough life, and they face lots of natural hardships. Sometimes the weather in summer will be unexpectedly cold and large numbers of young bees will freeze to death. Events like these are natural and a large healthy population will be able to recover. However, if numbers have already been reduced through human destruction of the environment, the chance of recovery is much smaller.

The second problem with habitat fragmentation is that bees from one population may live too far away from the next population for individuals to socialise. Bees play a very important role in nature because they help plants to cross-pollinate. Just like the plants they help, bees also need to mate with someone who is not related to them. If bees continuously mate with individuals related to them then the population will suffer from inbreeding. When scientists carry out conservation genetic studies on rare species they look at their DNA to see how inbred the population has become.

Climate change

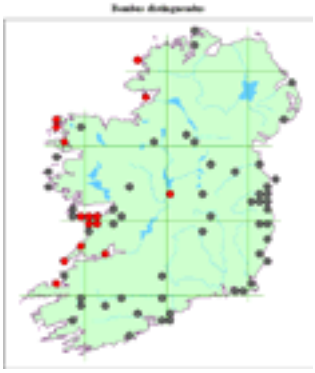
Climate change is a huge threat to bees and other insects because the habitats where they live may disappear or shift position too quickly for them to adapt to the change. The widespread loss of natural habitats that has already occurred in our environment will make dealing with climate change an even greater problem for bees. Some bee species currently can only live in the southern half of Ireland where the climate is slightly better. If global warming makes Ireland warmer and drier then those species might be able to live as far north as Counties Donegal or Antrim. The problem is that for bees to move home from Wexford to Antrim they would need to move from one area of suitable habitat to the next, like stepping stones, in a journey that will take many years. Unfortunately, because we have lost so many natural habitats in Ireland and many species live in isolated areas, they won't be able to move because the nearest patch of good habitat is too far for them to fly. So if the temperature increased and it was warm enough for those species to survive in counties like Donegal, where there would be lots of good places to live, they wouldn't be able to get there.

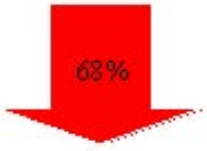
Each country in the EU, including the Republic of Ireland and Northern Ireland, must designate small areas of important habitats and protect these by law. These are called Special Areas of Conservation (SACs) and are designed to protect the habitat type and the animals and plants that live there. Conservation efforts need to focus on using these SACs, along with National Parks, to build an extensive network of suitable habitats for bees and other insects that will allow them to move around and give them a realistic chance of survival in an ever-changing environment.

SPECIES OF CONSERVATION CONCERN

Red data lists are very important because they tell us which species are in most danger. In a red list, threatened species can be placed in one of four different categories: critically endangered (CR), endangered (EN), vulnerable (VU) or near threatened (NT). Red lists are an internationally recognized system for highlighting species in danger. Species can only be placed in one of these categories if they meet strict guidelines produced by the IUCN. IUCN stands for The International Union for the Conservation of Nature and Natural Resources, and is an international organization responsible for conservation.

Great yellow bumblebee





ENDANGERED

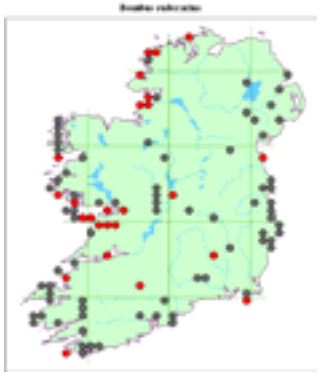
Grey dots are pre 1980 records and red dots are from 1980 onwards

The great yellow bumblebee, *Bombus distinguendus*, is under extreme danger in Ireland. It needs large areas with lots of flowers, like unimproved grasslands and hay meadows, to survive, but unfortunately there are very few of these areas left. It used to be found across Ireland but is now almost homeless and is very close to extinction. Currently the only places in Ireland where it still lives are along the west coast and on the Aran Islands where there are still flower rich meadows. The great yellow bumblebee has a very long tongue and can only feed on particular types of plants. Its favourite food is red clover, which used to be common on farms but unfortunately isn't planted much anymore.

There are lots of flowers in parks and gardens around Ireland and these are an important food source for many insects, including bees. Lots of these plants are not native to Ireland, and while this doesn't bother many species, others, like the great yellow bumblebee, are fussier and prefer to feed on native plants.

The great yellow bumblebee is in general decline across central Europe and is the focus of a species recovery plan in Britain, where it was once widespread but now exists only in the very north and west of Scotland. It needs to become a protected species in Ireland and we need to provide more suitable areas for it to live before it's too late.

Red shanked carder bee

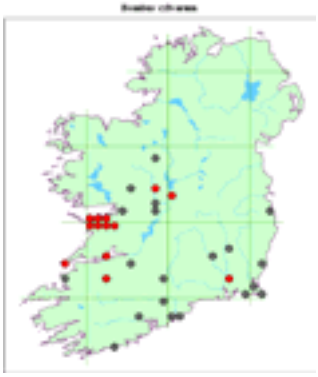


VULNERABLE

Grey dots are pre 1980 records and red dots are from 1980 onwards

The red-shanked carder bee, *Bombus ruderarius*, is also showing evidence of serious decline in Ireland. Carder bees are named after the device used to straighten wool before spinning - these bees use their legs to comb moss to make a nest in the same way that we use a carder to straighten wool. This species is called the red-shanked carder bee because it has a fringe of red hairs on the upper part of its rear leg. The red-shanked carder bees' favourite habitat is flower rich grasslands. It has also declined in England where they have introduced a special species recovery programme to try and rescue it.

Shrill carder bee

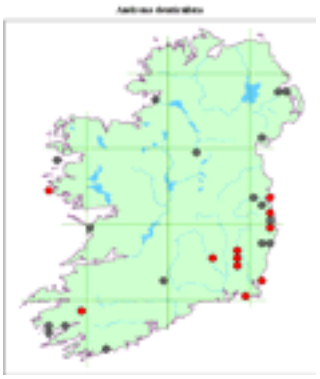


VULNERABLE

Grey dots are pre 1980 records and red dots are from 1980 onwards

The shrill carder bee, *Bombus sylvarum*, is another species associated with flower rich grasslands that is showing declines in line with the loss of this habitat in Ireland. It gets its name because it has a higher pitched buzz than the other bumblebee species. It is also declining in England and Wales where it is the focus of another species recovery programme.

Andrena denticulata



VULNERABLE

Grey dots are pre 1980 records and red dots are from 1980 onwards

The solitary species, *Andrena denticulata*, has declined significantly in Ireland since 1980 and is also threatened in a number of other European countries. It has been found living in a range of different habitats in Ireland and has a strong preference for yellow flowers within the Daisy family. Unfortunately, as is the case for many of the solitary species, we don't know exactly why it has declined. Biologists need to study these species, and how they use the environment, so that effective plans can be drawn up for their conservation.

EXTINCT SPECIES

The tawney mining bee is a large colourful solitary bee that was last seen in Co. Kilkenny in 1925. Unfortunately it is now extinct in Ireland. Unless we are careful, many other species will soon follow it.

The tawney mining bee

INTERNATIONALLY IMPORTANT SPECIES

The northern Colletes bee, *Colletes floralis*, is a coastal solitary species that lives on sand dunes around Ireland. It has undergone severe declines in other countries across northern Europe. Fortunately in Ireland it is not declining and there are still lots of healthy populations on the east and west coasts. Many of the remaining *Colletes floralis* populations in the world are now in Ireland, making this a very important location for the species. These populations and the sand dunes they live on need to be closely monitored so that this important species is protected and remains in Ireland. In Northern Ireland the Environment and Heritage Service (EHS) have already put together a plan that outlines exactly how to protect the small populations on the north coast.

The northern Colletes bee

DECLINING COMMON SPECIES

Some bumblebees that were once common are now beginning to decline in Ireland. Two of the most worrying are the red tailed bumblebee, *Bombus lapidarius,* which is jet black with a red tail, and the large carder bee, *Bombus muscorum,* which is a blond bumblebee. Both can sometimes be seen in parks and gardens but have declined in many of their natural habitats. The red-tailed bumblebee looks very like the rare red-shanked carder bumblebee. The red-shanked carder bee has a fringe of red hairs on the upper part of its rear leg while in the red-tailed bumblebee these hairs are black.

The red tailed bumblebee

The large carder bee

EXPANDING SPECIES

Many bumblebees have been in Ireland for a very long time, but other species arrived only recently. The early nesting bumblebee, *Bombus pratorum,* was first recorded in Ireland in 1947 and is now widespread and abundant throughout the country. The most recently arrived bumblebee is the mountain bumblebee, *Bombus monticola*, which was first recorded in the Wicklow Mountains in 1974. Since then it has been spreading south into counties Carlow and Wexford. It has also been found in counties Antrim, Tyrone and Derry in Northern Ireland. The most common way for bees to get to Ireland is to be blown across from Wales to eastern Ireland or from Scotland to Northern Ireland.

The early nesting bumblebee

The early nesting bumblebee can live in lots of different habitats but the mountain bumblebee is a habitat specialist and is found only in heather-rich areas like upland heaths and bogs. It is unlikely to spread as rapidly as the early nesting bumblebee because it can only move from one area of upland bog to the next. The expansion of the mountain bumblebee in Ireland is very important because the species is currently declining in England, Scotland and Wales.

The mountain bumblebee

In 2004 five new solitary bee species were found that were never before recorded from Ireland.

CONCLUSIONS

Bees are declining in Ireland for two main reasons. The first and most important reason is habitat loss. The declining habitat of most importance to bees is flower rich grassland. The second reason is fragmentation of the habitats that remain.

National Parks and Special Areas of Conservation (SACs) are very important because they provide protected areas for bees and other animals and plants to live. Ideally bees would be able to move from one national park or SAC to another if they wanted. We need to pressurise governments to designate a more extensive network of suitable sites stretching across Ireland and Northern Ireland to prevent bees becoming isolated and to allow them to move throughout the country . These networks would provide homes, not only for bees but also for other insects, as well as mammals, birds and plants.

Research is currently being carried out in Trinity College Dublin and Queen's University Belfast on the genetics of some of the threatened species in Ireland. Fortunately DNA for genetic analysis can be extracted from a small segment of a bee's leg without harming the insect.

The bee red data list is the first regional red list that has been produced for any of the insect groups in Ireland. These lists are very important because they tell us which species are in most danger of extinction. Similar red data lists need to be produced for other insects like dragonflies, butterflies, and beetles so that we know which other species need to be protected.

There are many species that face the real threat of extinction in Ireland. Plans need to be drawn up by experts explaining how to safeguard these species. Future conservation strategies must be more proactive so that causes of declines are dealt with and worrying trends recognised before it becomes too late. It is much easier to rescue a species that is just beginning to decline than one that is about to go extinct.

Parks and gardens can play an important role in bee conservation. Important actions to attract bees to your garden include the planting of a range of native species to provide flowers for the bees throughout the season. The best plants for bees are often those with white, blue or yellow flowers because bees can see these colours

(as well as ultraviolet) and will make a beeline straight for them! Spring is the hardest time for bees because often there aren't many plants in flower yet. Things like pussy willow and bluebell are ideal early-year food sources. In early summer honeysuckle and thyme are ideal, and in late summer heathers and non-native species like *Fuchsia* and Lavender and will provide plenty for bees to eat.

Many solitary species nest in south facing banks, so leaving exposed areas of soil at the edges of lawns or creating south facing banks of sandy or clay soil may attract ground nesting species. Other species will nest in dead wood or in south facing stonewalls.

BUMBLEBEE IRELAND

A national recording scheme, encouraging everyone in Ireland to send records of any bumblebees they see, would provide important data on the distribution and abundance of the Irish species. It is hoped that a scheme will be launched in the near future through the National Biological Records Centre.

FURTHER READING

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IMAGE CREDITS

Bryan Pinchen: Bumblebee drawings (pages 4 & 16). Taken from 'A Pocket Guide to the Bumblebees of Britain and Ireland'
Keith Edkins: *Andrena* on front cover, *Andrena fulva* (p.15)
Robin Wynde: *Colletes floralis* (p.15)
Ted Benton: *Bombus lucorum* (p.5), *Bombus lapidarius* (p.5), *Bombus muscorum* (p.15), *Bombus ruderarius* (p.13)
Peter Harvey: *Bombus sylvarum* (front cover and pages 8 & 14)
Peter F. Gurrie: Honeybee nest (p.5)
Nicolas J. Vereecken: *Bombus lapidarius* (p.15), *Sphecodes* (p.6).
Andrej Gogala: *Andrena denticulata* (p.14), *Megachile centuncularis* (p.6), *Andrena fuscipes* (p.8)
Jane Stout: *Bombus pascuorum* (p.5)
Dave Goulson: *Bombus distinguendus* (p.12) www.bumblebeeconservationtrust.co.uk
Huib Koel: *Osmia aurulenta* (p.8) www.wildebijen.nl
All other photographs belong to the authors

WEBSITE

The HEA funded researchers are currently putting together a website on Bees in Ireland. This site is under construction and when completed will be available at: www.tcd.ie/zoology/bees

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