

BUMBLEBEES IN THE CAIRNGORMS

ANNIE IVES

Introduction

You might be wondering... why bumblebees? I hope that I can enlighten you about these fantastic, but declining, cold-adapted mountain creatures, and how you could help us learn more about rare bumblebees in the Cairngorms.

The Bumblebee Conservation Trust was established in 2006 by two leading bumblebee scientists, Professor Dave Goulson & Dr Ben Darvill, in response to worrying evidence of bumblebee declines. From these beginnings to now, the Bumblebee Conservation Trust emphasises an evidence-based and science-led approach to conservation. The project that I work on, *Skills for Bees: Scotland*, focuses on monitoring bumblebee populations in the Cairngorms through training and supporting people living, working and visiting the National Park to look out for and look after bumblebees.

There are three groups of bees in Britain – honeybees, bumblebees, and solitary bees. Honeybees (*Apis mellifera*) live in hives and are looked after by beekeepers, they make honey, and they die if they use their sting. They are the only bees in the UK that do any of these typical ‘bee things’. The vast majority of honeybees in Britain belong to hobbyist or commercial beekeepers, though occasionally swarms will leave the hive and set up nests in hollow trees or even chimneys, as feral honeybee colonies.

Truly wild bees in the UK can be split into two groups – solitary bees and bumblebees. Most bee species in the UK are solitary, with approximately 80 solitary bee species in Scotland and over 250 species across the UK. Solitary bees lead an independent life. Individual females look after their own nest, without co-operation from others, although other females often will nest nearby on the same patch. Nests are small tunnels, from the size of a woodworm hole up to about the width of a pencil. Evidence of solitary bee nests can often be seen where tracks in the moorland have eroded and exposed soil or created south-facing banks. On warm, bright summer days, look out for aggregations of hundreds of male Heather Colletes (*Colletes succinctus*) hovering around small holes in the track surface or edges, waiting for females to emerge and mate. The Cairngorms is home to some particularly rare species of solitary bee, including the Small Scabious mining bee (*Andrena marginata*).

By contrast, bumblebees are generally social insects which means that individuals work together within a nest to ensure success. Like honeybees, they form colonies with two types of female bee (queens and workers), and males, each playing a different role. Some bumblebee species choose to nest in old

mouse or vole holes (recycling the rodent's nest) while others prefer grass tussocks, long vegetation, compost heaps, bird boxes or even in loft insulation. The number of bumblebees in a nest varies from around 50 to 400 depending on species, but each begins in spring with a single queen. Nests last for around three months, before new queens are produced, which mate and then go into hibernation, searching out north-facing banks to spend the winter. All of the other bumblebees (males, workers, and the old queen) die off, while the hibernating new queens hope to survive until the following spring to set up nests and start a new generation of bumblebees. A bumblebee's lifespan is around 12 months for a queen (including 6-9 months in hibernation), 4-6 weeks for workers and just 1-2 weeks for males.



Left: A queen White-tailed bumblebee (*Bombus lucorum agg.*) feeding on Devil's-bit scabious at Glenmore Forest Park. Top right: A Heather colletes (*Colletes succinctus*) solitary bee excavating a nest in a soil bank. Bottom right: An escaped swarm of honeybees being collected from a churchyard by a local beekeeper. Photo credit Annie Ives

Sadly, many bumblebee species are declining in numbers, across the UK and across the globe. Within the last century, two species have gone extinct and more than a third of social species have declined by over 70% in the UK. Habitat

loss is the main cause – bumblebees need flowers to feed from but across the UK at least 97% of our wildflower-rich grassland habitat has disappeared since the 1930s, mainly as the result of intensive farming practices and urbanisation. This means there are fewer suitable nesting spaces and fewer flowers to feed our bumblebees. Global warming is likely to increase the pressure on these cold-adapted insects, particularly for upland species - as the cooler climes they need shift northwards and to higher altitudes, the bees must follow to survive (Powney et al., 2019). The increasing frequency and severity of extreme weather events, caused by climate change, are another concern. Summer flooding can destroy underground bumblebee nests, while heatwaves and droughts desiccate the flowers they rely on for food. Research also shows that keeping honeybees could have a detrimental effect on wild pollinators, as diseases jump from domesticated honeybee hives into wild bumblebee populations, passed from bee to bee when they visit the same flowers (Mallinger et al., 2017).

Why are bumblebees so important?

Pollination of flowers and trees produces fruits and seeds – enabling reproduction of the plant itself, while also supporting biodiversity: from the birds and mice that feed on fruits and seeds, to the larger predators that feed on those small animals. Over 87% of flowers globally are pollinated by animals, and in the UK, its mostly bees and other insects that carry out this important work (Ollerton et al., 2011).

On top of this, bees and other pollinators are estimated to contribute more than £500 million per year to the UK economy through pollination of crops (Breeze et al., 2011, as updated). In parts of China, where bumblebees have been wiped out, this service is replicated by people, paid to move pollen from flower to flower with tiny paintbrushes!

Bumblebees are among the best pollinators and are well adapted for this purpose. From the static electricity on their hairy coats attracting pollen, to the variety of tongue lengths across species which enables them to visit a greater diversity of flowers. Without them, our environment would be very different, and our food choices would be limited and expensive.

A brief evolutionary history of bumblebees

Around 130 million years ago, in the Cretaceous period, insect life included large, carnivorous insects such as hunting wasps, which caught and killed smaller insects for food. However, as flowering plants came into being and started producing pollen for the first time, some meat-eating wasps changed their eating habits. They chose pollen from these flowers as a more convenient

source of protein – flowers tend to be easier to catch than prey insects! These newly vegetarian wasps gradually became what we now know as bees.

Fast-forward to around 25-40 million years ago, and some of the bees living in colder climates of the Tibetan Plateau, surrounded by the Himalaya and other mountain ranges, evolved new ways to keep warm. They became large and hairy, essentially developing their own belay jackets – a vital piece of kit for mountain life! They became bumblebees.

Bumblebees even evolved an unusual skill in the insect world: a form of thermoregulation. Incredibly, they create heat within their bodies by detaching and vibrating their wing muscles, essentially shivering (much like mammals) to create the 30°C internal temperature that they need to take flight.

Bumblebees on Everest!

From the high Himalaya where they originated, these cold-adapted bumblebees gradually spread out across Eurasia and North America and then south to the Andes, thriving in cool climates and at high altitudes.

The highest altitude confirmed record of a bumblebee was collected on the 1921 Everest Expedition, at 5,640m (18,500 ft) above sea level and is still held in the Natural History Museum's collections (Richards, 1930; Williams, 2018). In those days, it was (commendably!) common practice to have a naturalist involved in expeditions. In 1921, this duty fell to Dr. A. F. R. Wollaston - the expedition medic. It seems that natural history was of interest to other members of the expedition party as well, as shown by G. H. Bullock's extensive diary of the reconnaissance mission:

"Friday July 1st. Mallory off early after a disastrous struggle with the primus, and a somewhat similar experience the night before. Got up at 8.15 and had a good wash. Caught 3 butterflies and some flies and bees."

"Thursday July 14th. Rested. Caught a number of butterflies and bees in the morning. Wandered around the camp. There are a number of little streams and shelves watered from the small glacier above us."

[Extracts from The Everest Expedition, 1921. Diary of G. H. Bullock, presented to the Alpine Club by Bullock's wife in 1960 (Bullock, 1962)].

Glacial outlets in the Himalaya, such as those described in Bullock's diary, are still key habitats for bumblebees today, with this region home to the greatest diversity of different bumblebee species in the world. Closer to home, we might think of bumblebees as being garden or grassland animals (which many are), but it's not uncommon to find certain species on or close to mountain summits. Bumblebee sightings have been reported at over 1000m

altitude in the Cairngorms, but the inaccessibility of these habitats makes monitoring them a challenge.

Bumblebees in the Cairngorms

Today, there are more than 270 species of bumblebee worldwide. 24 of these are found within the UK, and Scotland is home to 20 species. Within the Cairngorms, we have 15 species of bumblebee confirmed, with potential for three more which are expanding their range northwards and may already be here in small numbers but are yet to be found and recorded.

The Cairngorms is a beautiful and unique place, home to so many types of wildlife and habitats – some of which cannot be found anywhere else in the UK and are globally threatened. Much of this wildlife is well-documented and researched through various monitoring programmes run by organisations and volunteers, such as red squirrel surveys, butterfly surveys, wetland bird surveys, and even botanical surveys on mountain summits. Unfortunately, in this region, bumblebees seem to have fallen through the net. We know that the Cairngorms has the right habitat and climate for some rare, conservation-priority bumblebee species, but it's an area that has historically been under-recorded, so we have very little data on bumblebees here. Biological recording is a vital part of conservation. We can't protect what we don't know about, and we need data to both focus conservation efforts, and measure impact.

The 'Everest Bumblebee' record is an example of an early biological record, which was catalogued and included a museum specimen. These days, a biological record can be submitted by anyone and there are some very useful apps made specifically for this purpose. Our favourite is iRecord (www.irecord.org.uk), which transforms your wildlife sighting into valuable data that can be used by local and national conservation, planning and research organisations. You can also email or write directly to your local records centre. In the Cairngorms, these are North East Scotland Biological Records Centre (NESBReC) and Highland Biological Recording Group (HBRG). A biological record consists of four key pieces of information –

what? (identify what you've seen, take a photo if you can)

where? (a six-figure grid reference)

when? (the date)

who? (your name as the recorder)

Casual, one-off wildlife sightings are a fantastic way to contribute to knowledge and conservation in your local area but to study changes and trends over time, we need standardised monitoring schemes. This is why the Bumblebee

Conservation Trust runs the national monitoring scheme for bumblebee abundance – BeeWalk.

A BeeWalk is a fixed route, walked monthly between March & October by volunteers who count and identify the bumblebees they see and submit their sightings to us. This helps us to measure how bumblebees are managing overall. Over the past two years, our project has seen the number of BeeWalks in the Cairngorms grow significantly, establishing new survey routes through our work with partners at Cairngorms National Park Authority, Glenlivet Estate, Muir of Dinnet National Nature Reserve, Mar Lodge and Abernethy as well as other local farmers and landowners. Importantly, I've been supporting local communities and individuals who have turned their regular walking routes in to their own 'BeeWalk' once a month. This is replicated across the rest of Scotland, England & Wales, where hundreds of volunteers collectively count and identify hundreds of thousands of bees on BeeWalk routes each year!

My work on the Skills for Bees: Scotland project involves supporting locals and visitors in the Cairngorms National Park to look out for bumblebees by building skills in identification and surveying. I have been running practical training courses enabling anyone to start identifying the bumblebees they see: from their gardens to the summit of Ben Macdui! I also demonstrate different survey techniques from recording using mobile phone apps, to more regular surveying through BeeWalks.



Teaching basic bumblebee identification and searching for Blaeberry bumblebees on the Mar Lodge estate. Photo credit: Robert Pineda

Our activities also include carrying out targeted surveys to fill in data gaps and find out more about how rare local bumblebee species are faring in the Cairngorms. I have been gathering volunteers to search for bumblebees in key locations that we've identified as being suitable for rare species. So far, we've found two out of our three rare target species in new areas across the Cairngorms, including Blaeberry bumblebees (*Bombus monticola*) and Broken-belted bumblebees (*Bombus soroensis*) on the Glenlivet Estate, the Mar Lodge Estate (not far from Muir Cottage!) and even a carpark in Ballater. We're yet to confirm records of our third target species, the Moss carder bumblebee (*Bombus muscorum*), but we are continuing our surveys for all three species across the Cairngorms into 2024 and hopefully beyond.

The mountain bumblebee

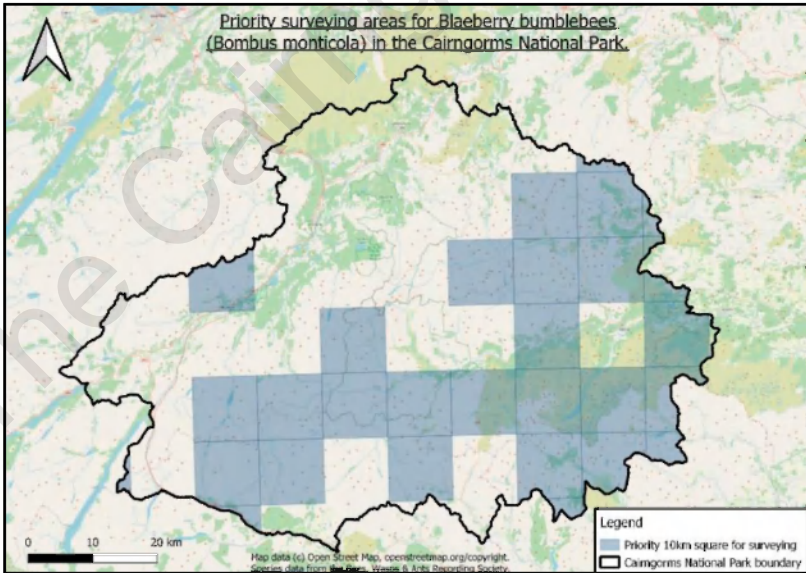
There is one particular species of bumblebee that I would encourage anyone who spends time in the mountains to get to know. It has many names depending on where you come from but in Scotland, it's generally known as the Blaeberry bumblebee because of its association with higher altitude blaeberry-rich moorland. Its scientific name - *Bombus monticola* - translates roughly to the mountaineer or highlander bumblebee, so you will have plenty in common! It is a bright and beautiful bee, with a distinctive appearance: small with two yellow stripes and a fiery orange-red tail that covers more than half of the bee's abdomen. It's the extent of this red tail which helps the Blaeberry bumblebee stand out from similar bumblebees, and – along with the environment where it's found - makes it easy to recognise.



A Blaeberry bumblebee flying in a previously unrecorded location, near Balmoral Castle in 2023. Photo credit: Annie Ives

The Blaeberry bumblebee is one of four bumblebee species on the Scottish Biodiversity List – meaning that it is a conservation priority for the Scottish Government. It was added to the list because of concerns that sightings have declined by more than a quarter over a 25-year period, and because of the potential future impact of climate change on this upland species. In a UK context, it's rather scarce, but in the Cairngorms, it could be one of the most common bumblebees you see when you are walking through blaeberry carpeted forest floors, or heather-clad moorland between April and July. We are lucky to have one of the few strongholds for this species in the UK, and therefore we are in a very important position to support its conservation.

We have mapped out priority areas where there is suitable habitat for Blaeberry bumblebees, but where we have no recent records of the species, we don't know whether they are present or not. Hillwalkers can really help with this work by keeping an eye out for bumblebees on your routes wherever you walk or climb and submitting photos and records of bumblebees either directly to the iRecord website, to your local records centre (North East Scotland Biological Records Centre or Highland Biological Recording Group) or sending your photos to the Bumblebee Conservation Trust for identification help.



The blue squares show our priority areas to survey for Blaeberry bumblebees within the Cairngorms National Park # . Photo credit: Bumblebee Conservation Trust.

For more information about bumblebees, our project work in the Cairngorms or how to get involved, please contact Annie by email (annie.ives@bumblebeeconservation.org)

You can also visit the Bumblebee Conservation Trust www.bumblebeeconservation.org

Annie Ives is Project Officer for Skills for Bees: Scotland, a Bumblebee Conservation Trust project working in partnership with the Cairngorms National Park Authority, local estates, landowners, community groups and individuals to increase and improve long-term recording of bumblebees in the Cairngorms.

References

Breeze, T. D., Bailey, A. P., Balcombe, K. G., & Potts, S. G. (2011). Agriculture, ecosystems and environment Pollination services in the UK: How important are honeybees? *Agriculture, Ecosystems and Environment*, 142(3–4), 137–143. <https://doi.org/10.1016/j.agee.2011.03.020>

Bullock, G. H. (1962). The Everest Expedition, 1921: Diary of G. H. Bullock. *The Alpine Club Journal*, 130–149.

Mallinger, R. E., Gaines-Day, H. R., & Gratton, C. (2017). Do managed bees have negative effects on wild bees?: A systematic review of the literature. In *PLoS ONE* (Vol. 12, Issue 12). Public Library of Science. <https://doi.org/10.1371/journal.pone.0189268>

Ollerton, J., Winfree, R., & Tarrant, S. (2011). How many flowering plants are pollinated by animals? *Oikos*, 120(3), 321–326. <https://doi.org/10.1111/j.1600-0706.2010.18644.x>

Powney, G. D., Carvell, C., Edwards, M., Morris, R. K. A., Roy, H. E., Woodcock, B. A., & Isaac, N. J. B. (2019). Widespread losses of pollinating insects in Britain. *Nature Communications*, 10(1). <https://doi.org/10.1038/s41467-019-08974-9>

Richards, O. W. (1930). LXV.— The humbles-bees captured on the Expeditions to Mt. Everest (Hymenoptera , Bombidæ) . *Annals and Magazine of Natural History*, 5(30), 633–658. <https://doi.org/10.1080/00222933008673177>

Williams, P. H. (2018). In a group of its own? Rediscovery of one of the world's rarest and highest mountain bumblebees, *Bombus tanguticus*. *Journal of Natural History*, 52(5–6), 305–321.

<https://doi.org/10.1080/00222933.2018.1428377>