BeeWalk
Annual Report 2020

Richard Comont and Helen Dickinson

Bumblebee Conservation Trust

BeeWalk Annual Report 2020

About BeeWalk

BeeWalk is a standardised bumblebee-monitoring scheme active across Great Britain since 2008, and this report covers the period 2008–19. The scheme protocol involves volunteer BeeWalkers walking the same fixed route (a transect) at least once a month between March and October (inclusive). This covers the full flight period of the bumblebees, including emergence from overwintering and workers tailing off. Volunteers record the abundance of each bumblebee species seen in a 4 m x 4 m x 2 m 'recording box' in order to standardise between habitats and observers.

It is run by Dr Richard Comont and Helen Dickinson of the Bumblebee Conservation Trust (BBCT). To contact the scheme organisers, please email **beewalk@bumblebeeconservation.org**.

Acknowledgements

We are indebted to the volunteers and organisations past and present who have contributed data to the scheme or have helped recruit or train others in connection with it. Thanks must also go to all the individuals and organisations who allow or even actively promote access to their land for bumblebee recording.

We would like to thank the financial contribution by the Redwing Trust, Esmée Fairbairn Foundation, Garfield Weston Foundation and the many other organisations, charitable trusts and individuals who have supported the BeeWalk scheme in particular, and the Bumblebee Conservation Trust in general. In particular, the Biological Records Centre have provided website support, data storage and desk space free of charge.

Finally, we would like to thank the photographers who have allowed their excellent images to be used as part of this BeeWalk Annual Report.

Citation

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This report can be downloaded from **www.bumblebeeconservation.org**

Further information on the scheme can be found on the BeeWalk website, **www.beewalk.org.uk**.

Cover photo: Moira Brooks undertaking her BeeWalk at Weighton Wold Farm.

Photo credit: Moira Brooks.

Contents

BeeWalk and COVID-19

As I write these words, the world is in the grip of the COVID-19 coronavirus pandemic. The UK is in lockdown, with people only allowed to leave their properties for essential purposes. The BeeWalk team are keeping the homepage of the BeeWalk website up to date with advice to BeeWalkers as the official guidance changes or is clarified.

Inevitably, this means that BeeWalk, like all other wildlife surveys, will receive fewer records than usual during 2020. However, monitoring is a long-term project which will not suffer unduly from occasional short-term crises. The key thing for us is that you all remain safe: your health, and that of those around you, is more important that bumblebee recording and you should follow official guidance and not do anything to put it at risk.

All Bumblebee Conservation Trust events have been cancelled for as long as is required to remain safe. This has unfortunately included cancelling many BeeWalk training days, but we are working to rearrange these for as soon as possible once the crisis is over. In the meantime, we have a video training session online at **bit.ly/BBCTyoutube**, and we'll be investigating online virtual training.

If you can't walk your BeeWalk transect, you can still submit records of bumblebees as and when you see them on iRecord (**www.brc.ac.uk/iRecord**), or join in with the National Pollinator Monitoring Scheme's (PoMS) Flower-Insect Timed Count surveys (FIT Counts) at **bit.ly/fitcount**.

Keep safe, and we look forward to seeing you all again once the crisis is over

The BeeWalk Team

News and research

BeeWalk highlights in numbers

587 BeeWalk continues to grow, with a record 587 sites submitting data for 2019

38 extra transects were walked during 2019, an 6.8% increase on the 559 walked during 2018

151,233 The number of records submitted to BeeWalk to the end of the 2019 season

30,858 Records submitted for 2019 alone

480,113 The number of individual bees recorded on BeeWalk so far

23 The number of bumblebee species recorded on BeeWalk transects so far

97,550 The most individual bees recorded in a single year on BeeWalk – in 2019

BeeWalk mentoring

BeeWalk Mentors are experienced BeeWalkers who volunteer to be local points of contact for new volunteers. BeeWalk Mentors can offer a variety of help, including finding a suitable transect location, helping out with setting up transects online, basic bumblebee identification and how to record your data in the field.

As of early 2020 we have 19 Mentors covering around 15 counties across Britain.

To find out if your area is covered by a Mentor, please see the BeeWalk Mentors map on page 12. If you would like to be in touch with your local Mentor or would like to offer your assistance as a Mentor please email **beewalk@bumblebeeconservation.org**.

Adopt-a-transect

We have a number of established transects fully set up on the website which are not currently being walked, and are consequently looking for a new BeeWalker. If you could help increase our number of active transects, please see the transect map on page 10, or contact us on **beewalk@bumblebeeconservation.org**.

Pollinator Monitoring Scheme (PoMS)

The Bumblebee Conservation Trust has come together with a range of organisations including universities, research institutes, recording schemes and other charities in order to understand how all pollinating insects are doing nationwide.

Data from BeeWalk is feeding into the new scheme, but there's also scope for anyone to contribute directly to the scheme, either by carrying out short FIT counts (watch a patch of flowers for 10 minutes and see what turns up) or by taking on monitoring a 1km square – for details, see page 9 of this report.

BeeWalk Annual Survey

Every autumn we invite BeeWalkers to give us feedback on their experience of the scheme through the BeeWalk Annual Survey. It is our main way of taking the temperature of the BeeWalk community, highlighting any issues and suggesting potential ways we could improve the experience for BeeWalkers.

In 2019, over 100 people completed the survey. Identification confidence was generally good, with an average score of 3.8 out of 5 (5 being very confident) for confidence recording to species level and an average score of 3/5 for confidence recording to caste level.

Despite this, the main request was for more training. At the moment the Trust delivers around 50 identification and survey training days annually at entry, intermediate and advanced levels. Many of these are funded by our conservation projects so are carried out in areas where we are already working, but around a third of them are scattered across the rest of the country, where we've been invited by local groups interested in starting BeeWalking.

Perhaps unsurprisingly, the majority of BeeWalkers were also interested in online training (to complement our current online resources and printed identification leaflets and book) and in accessing a range of targeted ID guidance videos on the Trust YouTube page. We already have a video of an entry-level training day and a how-to guide for separating the Common and Brown-banded Carders online and we'll hopefully be developing more during 2020, though this will be dependent on the pandemic to a certain extent.

As requested we will begin to provide regular identification quizzes over the season via the enewsletter, this will allow all BeeWalkers to refresh their skills and us to monitor identification levels.

Two-thirds of BeeWalkers were not aware of the BeeWalk Mentor Scheme and interest in being in touch with a Mentor where possible, or other local BeeWalkers was generally high. Details of locations covered will be published on the BeeWalk website (see the map of page 11 for current Mentor-covered areas). We will also investigate other options for BeeWalkers to be in touch.

Unfortunately, the website was not at its most reliable during the 2019 field season and this was reflected in the survey results. This was largely caused by an update to increase the overall security of the website as well as changes within the Google maps service. We have been working with our web hosts and developers to address any remaining issues over the winter.

Overall satisfaction levels were scored high (1–5, 5 being very satisfied)

- How would you rate your overall experience of being involved with BeeWalk in 2019?
  - Good, 4.4/5
- How would you rate using the BeeWalk website in 2019?
  - Good, 4.4/5
- How would you rate your experience surveying your transect in 2019?
  - Good, 4.4/5
- How would you rate your overall satisfaction with the level of support provided in 2019?
  - Good, 4.1/5

We would like to thank everyone who provided feedback for this survey. The next survey will be issued at the end of the field season, but we are always open to comments at any point (email beewalk@bumblebeeconservation.org).

Dates for your diary

December 2020 annual AGM and Members' Day

The Trust's 2020 AGM and Members' Day has been postponed and will take place at Birmingham Botanical Gardens in mid-December 2020. It is open to all members of the Trust. Details will be announced via Buzzword and the website later in the year once the programme is confirmed.

Training days

Unfortunately, our training programme has been hit hard by the COVID-19 restrictions during spring 2020. At the time of writing it is unclear when it will be possible to restart face-to-face events while ensuring the safety of participants. This will remain under active consideration within the Trust and updates will be posted on our website and social media channels. Where training is open to all the details will be added to our events calendar: **www.bumblebeeconservation.org/events-calendar/** and this will be updated throughout the season.

BeeWalk trivia

- 487 BeeWalkers submitted sightings in 2019!
- 272 new transects were set up in 2019, of which 179 submitted data.
- Top five counties with new transects in 2019:
  - Kent 46 (27 submitted data)
  - Devon 15 (13 submitted data)
  - Cornwall 10 (9 submitted data)
  - Gloucestershire 10 (6 submitted data)
  - Highlands and Islands 7 (5 submitted data)
- Most new transects set up by a single BeeWalker: Patrick Saunders, 6 new transects set up in Cornwall for a new Trust project. Patrick is also of the author of the Bumblebees of Devon, published in conjunction with the Trust this year.
- Most remote transect set up in 2019 goes to Bragar on the west coast of Isle of Lewis in the Outer Hebrides.
- Most southerly transect set up in 2019 goes to the Isles of Scilly for the second year running.

Photo credit: Nikki Gammans

Identification in process during a BeeWalk in Kent.

Research and collaborations

BeeWalk was established with the twin aims of collecting abundance and distribution data on Britain's bumblebees, and using this data as widely as possible to analyse population trends and carry out other research as appropriate. The Trust carry out some of this research in-house, but we also collaborate widely with other researchers on shared projects such as the State of Nature reports and the national Pollinator Monitoring Scheme (PoMS – see more below).

Additionally, we make the BeeWalk data freely available on the National Biodiversity Network (NBN) website for others to use (as long as they acknowledge us as the source of the data): our profile is viewable at **bit.ly/NBNbeewalk**. We also share our data with the national Bees, Wasps and Ants Recording Society (BWARS), and with several Local Environmental Records Centres.

We are keen to work with students at all levels, and can both help with project ideas and provide data. The Trust are currently collaborating with undergraduate, Masters and PhD students on a range of topics, with BeeWalk projects generally concerned either with elements of phenology (seasonal timings) and flower visitations.

Photo credit: Nikki Gammans

A BeeWalk in progress in Kent.

Major ongoing collaborations

UK Pollinator Monitoring Scheme (PoMS)

One of the main take-home messages of the all the National Pollinator Strategies (NPS) has been the lack of available data on wild pollinators. To help solve this, since 2015, the Bumblebee Conservation Trust have worked with a group of research institutes, universities, national recording schemes, and other charities to devise and carry out a new survey approach.

This new scheme – the National Pollinator Monitoring Scheme, PoMS – began gathering data in 2017 and will run to at least 2021, funded by the UK, Welsh and Scottish Governments, and JNCC. Part of the approach is pulling together all the data currently collected separately to analyse together, and we supply BeeWalk data for this.

Additionally, you can get involved directly. PoMS includes two new surveys, FIT Counts (for anyone, anywhere), and a more in-depth 1 km grid square survey.

FIT Counts

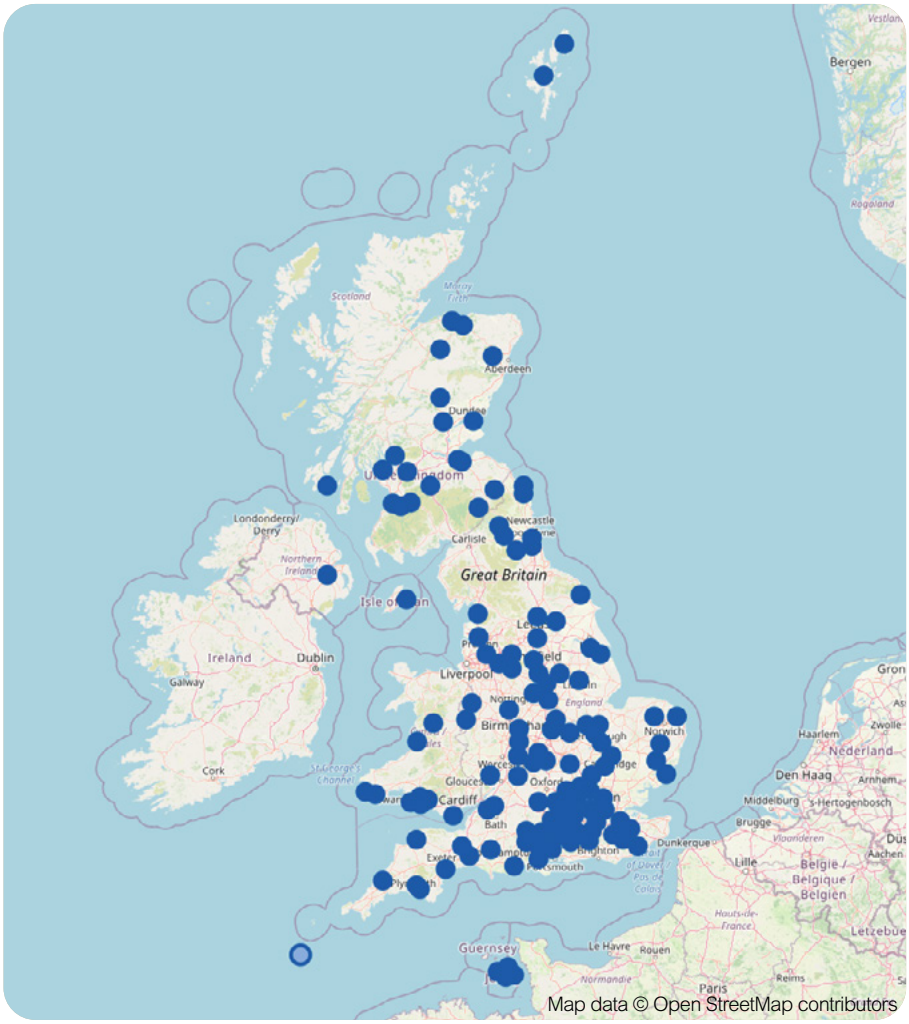
Short for 'Flower-Insect Timed Counts', FIT counts involve watching a small patch of flowers (ideally a species from the PoMS shortlist) for 10 minutes and recording the insects that visit

the flowers themselves. The insect visitors don't need to be identified to species, just broad groups (butterfly, beetle, bumblebee, etc) so you don't need to be an expert. It's a great activity for school groups and bioblitzes, but also to get to know what's visiting your garden while also contributing to pollinator science. This survey is running despite the COVID-19 restrictions but should be carried out on your own property until advice says otherwise.

1km square survey

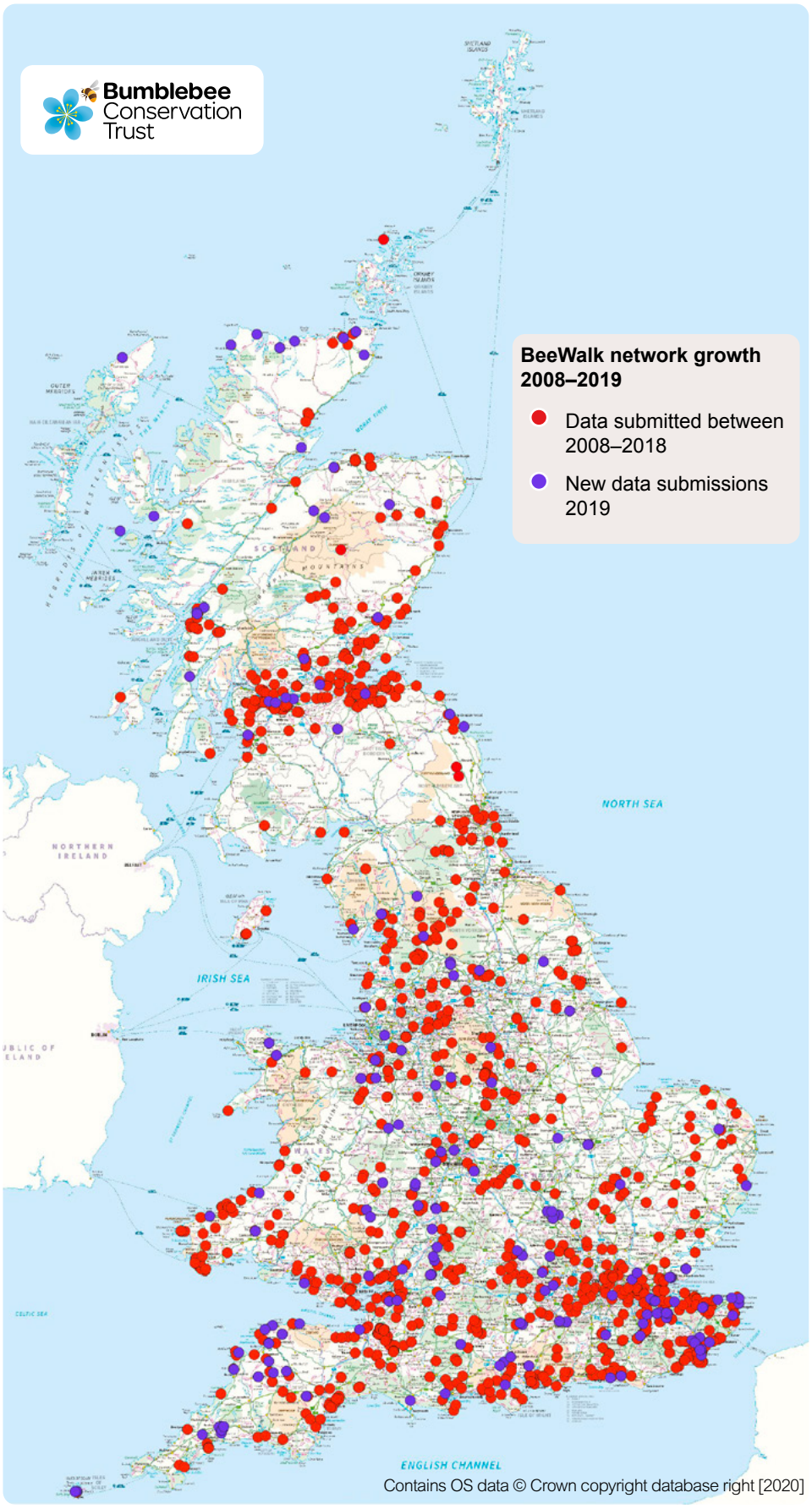
A selection of 1km grid squares across the country have been picked to be monitored in depth for their pollinators. These grid squares are all monitored for other reasons so it will be possible to track pollinator numbers and changes against other wildlife, plants and abiotic factors such as rainfall. This survey would involve up to four day-long site visits across the field season, carrying out FIT counts, transect walks and pan trapping to get a full understanding of the pollinator species present. This survey is currently not running because of the COVID-19 restrictions, but it is hoped that the disease will relent sufficiently to allow some survey visits later in the summer.

For full details of how to join in with either survey, please visit the PoMS website for more details and survey packs: **www.ceh.ac.uk/our-science/projects/pollinator-monitoring**.

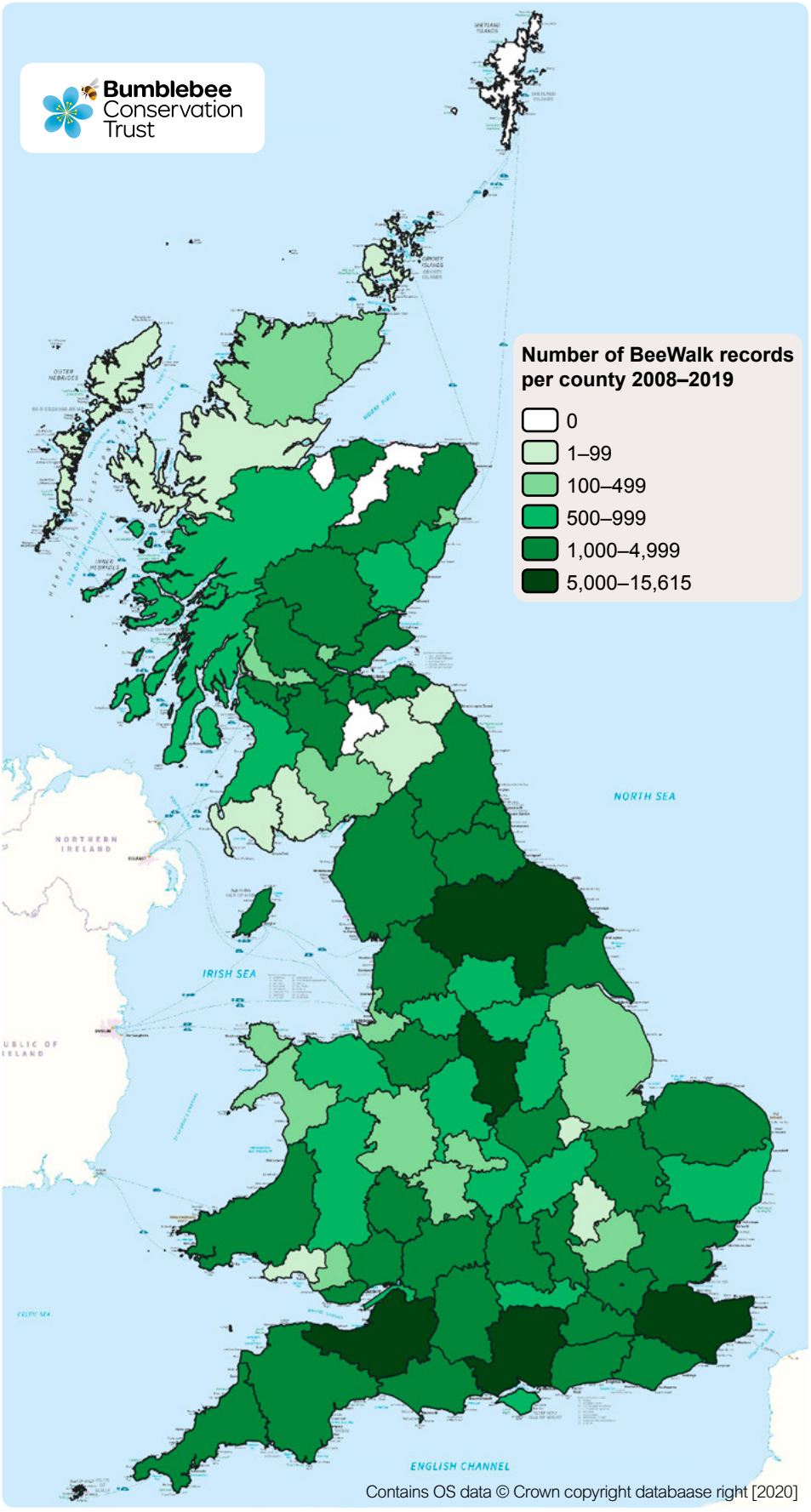


FIT counts carried out during 2019.

Mapping BeeWalk



BeeWalk network growth during 2019. Red dots indicate transects where data was first submitted between 2008 and 2018, blue dots show transects which first submitted data in 2019.



Number of records submitted to BeeWalk for each county, 2008–2019.

Areas covered by BeeWalk Mentors for 2020. Contact beewalk@bumblebeeconservation.org to be put in contact with your local Mentor, or to become one yourself.

Our projects need your help

Making a Buzz for the Coast spans 135 miles of Kent coastline from Dartford to Deal, an area recognised as nationally important for its diversity of bumblebee species. Starting in 2017, the project aims to protect and strengthen these wild bee populations, some of which are isolated and vulnerable to further decline or loss. Surveying key habitats and bumblebees is an ongoing and essential part of the project and will enable us to gather better data, evaluate our activities and monitor bumblebee populations along the coast.

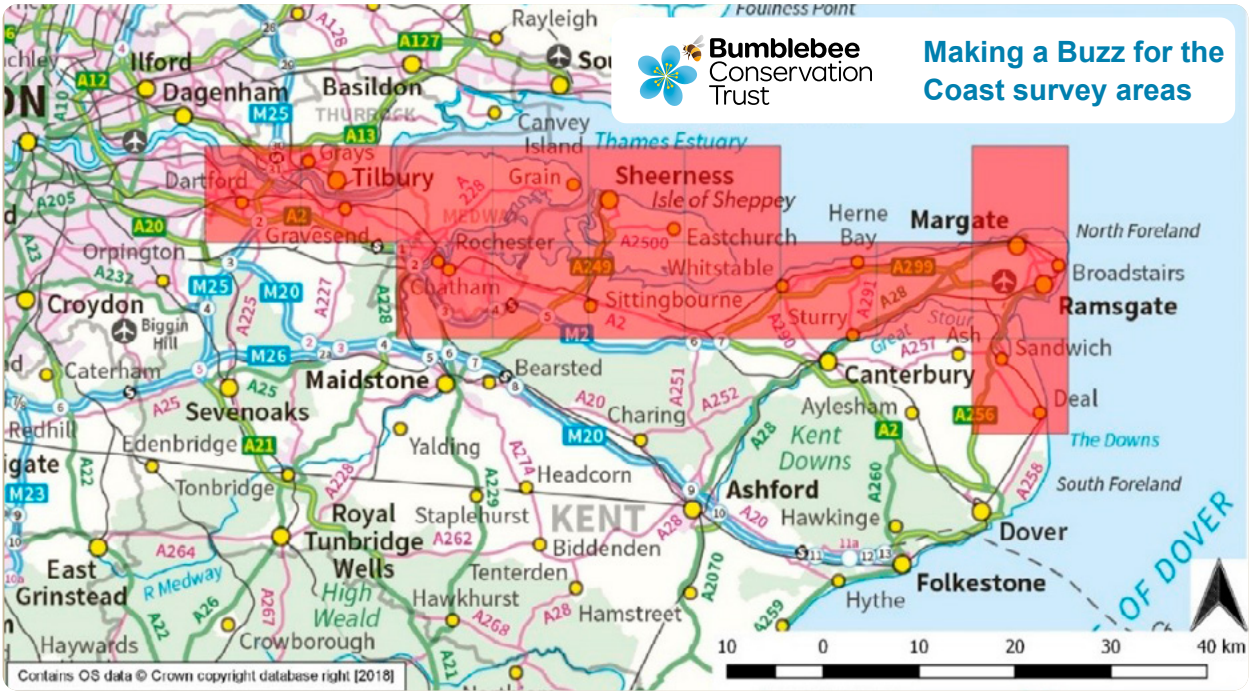


Photo credit: Laren Kennedy

BeeWalkers at Milton Creek.

Of the five rare species present, the Shrill carder bee (*Bombus sylvarum*) is particularly important to the project. Currently known from scattered sites along the Kent coast, BeeWalk data are already helping to build a greater understanding of the species' distribution and abundance, with data from the first two years of the project increased records for Shrill carder bee. Once COVID-19 restrictions are lifted and it's safe to do so, carrying out even more BeeWalks will continue to improve our understanding of this and other rare species. This will help us better target our conservation work to link up fragmented populations. We can be contacted on **mab@bumblebeeconservation.org**. For more information on the project as a whole, visit **www.bumblebeeconservation.org/making-a-buzz-for-the-coast**.

The Short-haired Bumblebee Reintroduction Project was formed in 2009 with the aims of reintroducing the nationally-extinct Short-haired bumblebee (*Bombus subterraneus*), and advising farmers and land owners on improving management of flower-rich areas for bumblebees more generally. The project focusses on Dungeness and the surrounding area.

The project provides bespoke habitat-management advice to over 100 landowners, including farmers and conservation organisations. We also have 45 volunteers who carry out practical conservation work in normal times, including wildflower and bumblebee surveys. We are looking to increase our BeeWalk transects in the project area. If you are interested in starting a BeeWalk in one of these areas please contact **nikki.gammans@bumblebeeconservation.org** who can give individual mentoring and discuss specific locations. For more information on the project as a whole, visit **www.bumblebeeconservation.org/short-haired-bumblebee-reintroduction-project**.

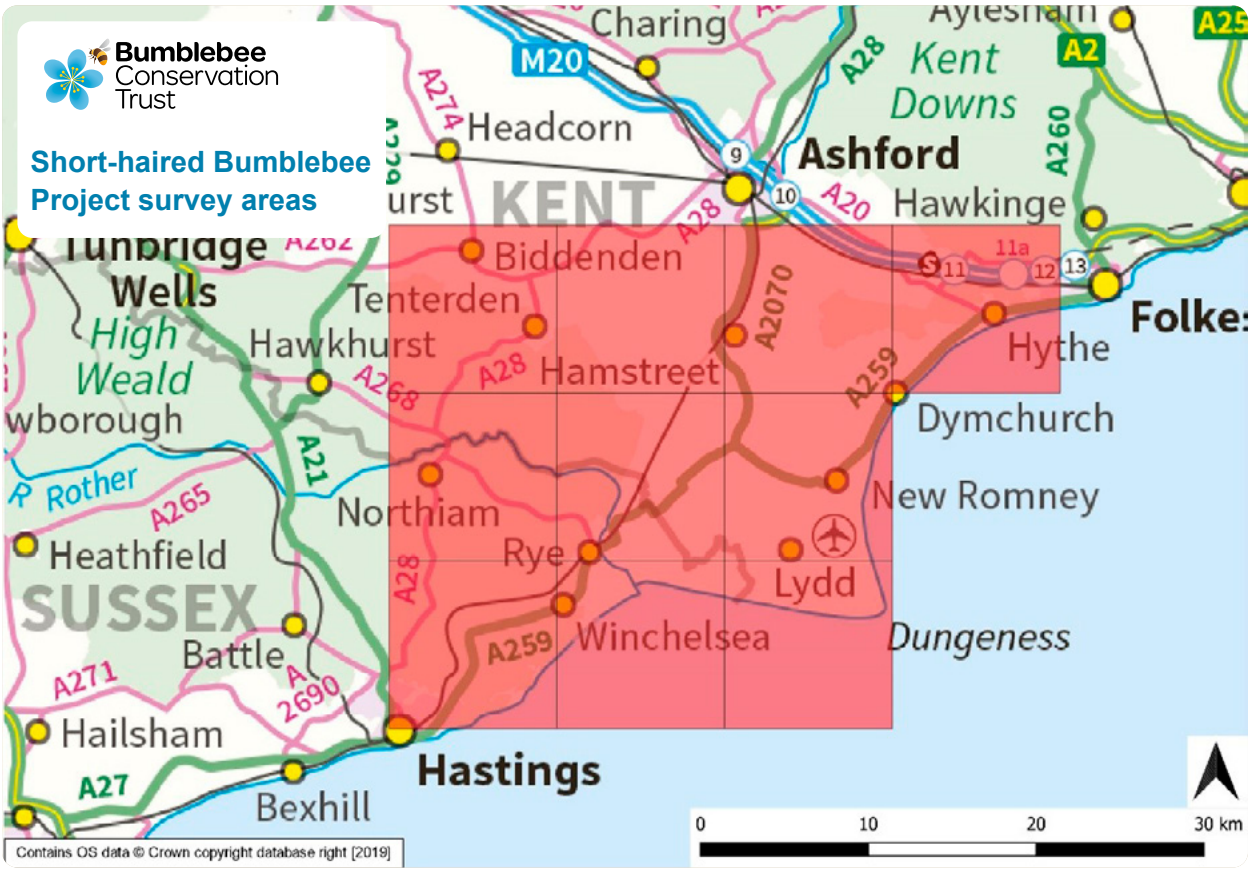


Photo credit: Nikki Gammans

Wildflower surveys as part of the Short-haired bumblebee Reintroduction Project

The West Country Buzz project is calling for BeeWalkers to help survey and monitor the nationally declining Brown-banded carder bee (Bombus humilis) and Moss carder bee (*Bombus muscorum*) bees on the North Devon coast, once it is safe to do so. Both species were once found widely across Devon, but sadly this is now the last remaining area in the county for them. More positively, in 2019 the Ruderal bumblebee (*Bombus ruderatus*) was found in North Devon at Braunton Burrows during a survey for the project. This species had been thought to be extinct in the county, and further survey work is needed to establish whether it occurs elsewhere. With generous support from the Bannister Trust and Natural England, we are surveying and monitoring these target species.

The area is big and under-recorded, and we need more BeeWalkers to get involved to help protect these remaining populations. Please contact **alex.worsley@bumblebeeconservation.org** if you can help. For more on the project, see **www.bumblebeeconservation.org/west-country-buzz**.

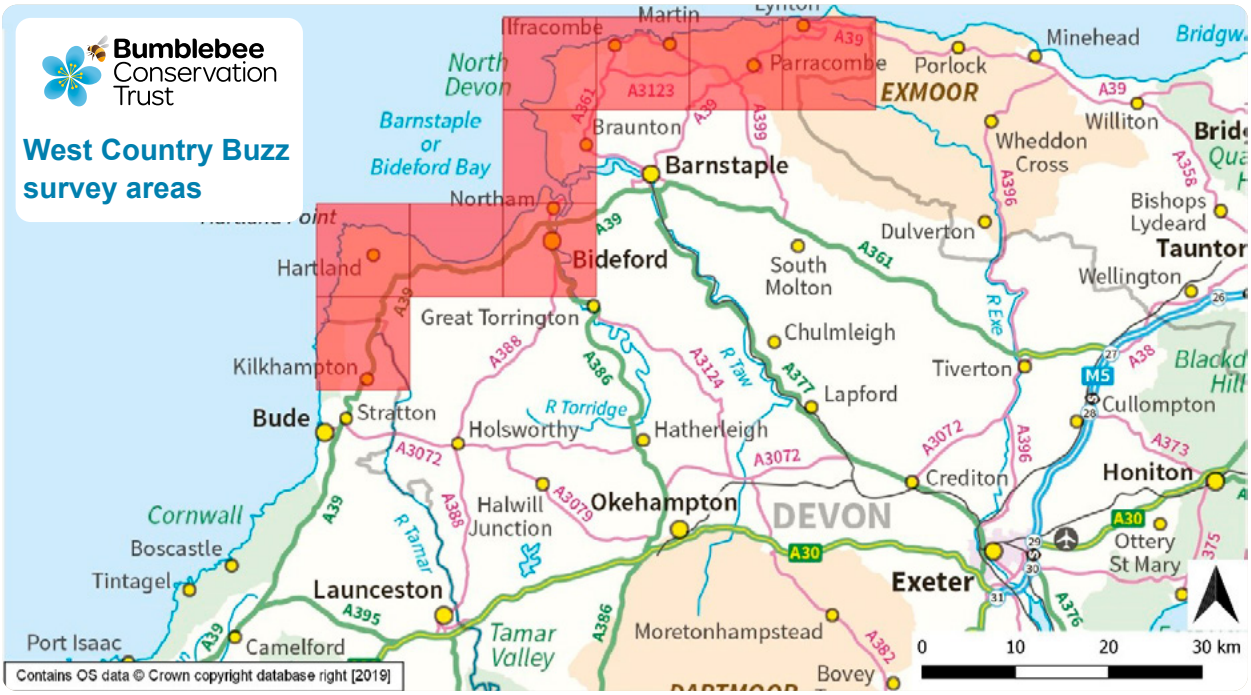
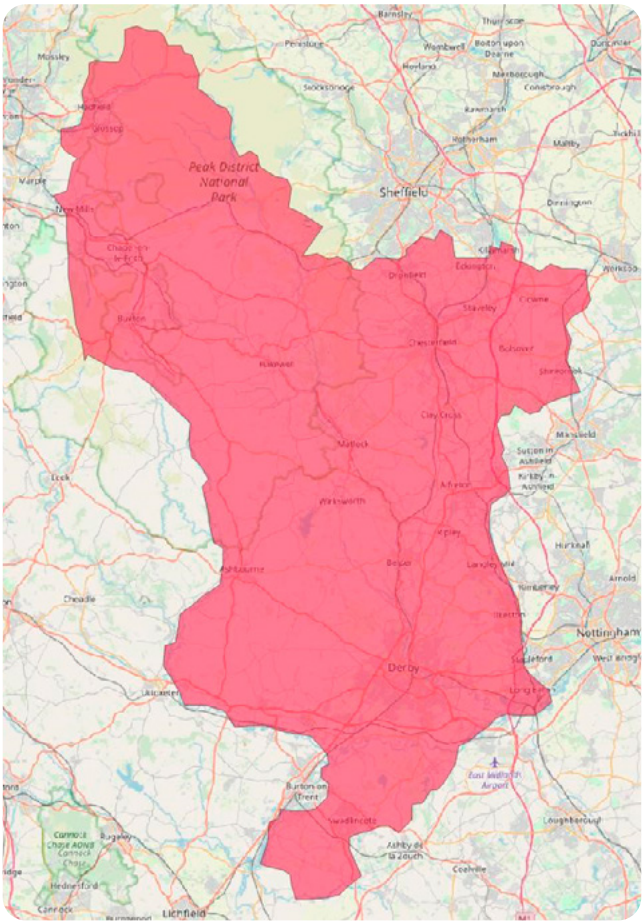


Photo credit: Ray Reeves

The Brown-banded carder bee is a West Country Buzz target species.

Pollinating the Peak is working with partners across the Peak District and Derbyshire to improve public understanding and identification of bumblebees, with a view to reversing the decline of iconic species such as the Bilberry bumblebee (*Bombus monticola*). Surveying habitat and bumblebees is an essential part of the project and enables us to gather better data, evaluate our activities and monitor bumblebee populations.



Surveying in the Peak District.

Photo credit: Bumblebee Conservation Trust

The rare but iconic Bilberry bumblebee is particularly important to our project, and is found in and around the bilberry moorland. We are really keen to find and monitor local populations to gain a greater understanding of the species' local distribution and abundance.

We're looking for people who are interested in helping us find this precious 'Treasure of the Peak' once it's safe to do so. We can offer advice, site suggestions, and a field session with one of our team to prospective BeeWalkers – contact **rhodri.green@bumblebeeconservation.org**. For more information on the project as a whole, visit **www.bumblebeeconservation.org/pollinating-the-peak**.

Saving the Great Yellow Bumblebee aims to increase awareness of bumblebees and recording of one of the rarest UK species, the Great Yellow bumblebee (*Bombus distinguendus*). This species now only occurs in a handful of areas on the north and west coast and the Islands of Scotland. The project would like to increase the number of BeeWalk transects in these vastly under-recorded areas. We have set up case study Beewalks in Keiss and Thurso (Caithness), and Durness and Bettyhill (north coast of Sutherland). We are particularly keen to hear from potential volunteers in these areas who could take on the monitoring of these key sites. If you could help us increase recording in these areas please see **www.bumblebeeconservation.org/saving-scotlands-bumblebees**.

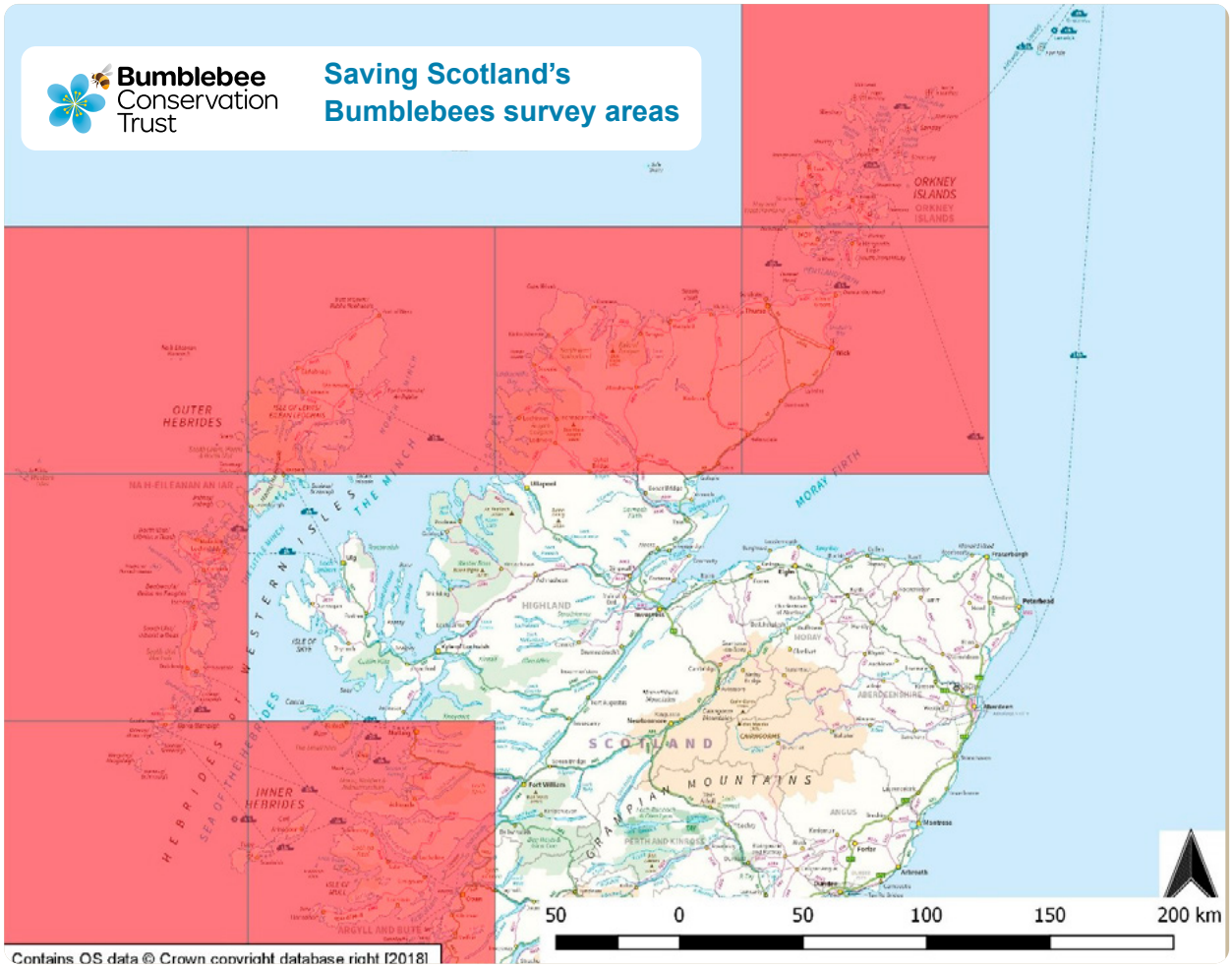


Photo credit: Helen Dickinson

The Great Yellow bumblebee, one of our most endangered bumblebee species.

Fowey Valley Bumblebee Project aims to test if computer models of bumblebee behaviour and colony dynamics (BEE Steward) can be used to assess, and target, how pollinator-friendly land management can be used to support and increase bumblebee populations.

The Fowey Valley Bumblebee Project is a partnership between the Trust, landowners and managers in the upper Fowey Valley, Cornwall, and the University of Exeter who developed the model. It is funded by the Prince of Wales Charitable Foundation and Kellys.

Once the health situation improves we are planning on monitoring the impact of land use changes using BeeWalks, and would be keen to hear from any volunteers who would like to carry out a BeeWalk in the area. For more information see **www.bumblebeeconservation.org/fowey-valley-bumblebee-project** and contact **rosalind.shaw@bumblebeeconservation.org** if you would like to be part of the monitoring team.

Felicia Jones the Trust's Local Volunteer Coordinator for Cornwall will also be organising wildflower patch creation in the area, so if you would like to be involved with some hands-on habitat change, please contact **cornwallvolunteers@bumblebeeconservation.org** once it is safe to do so.

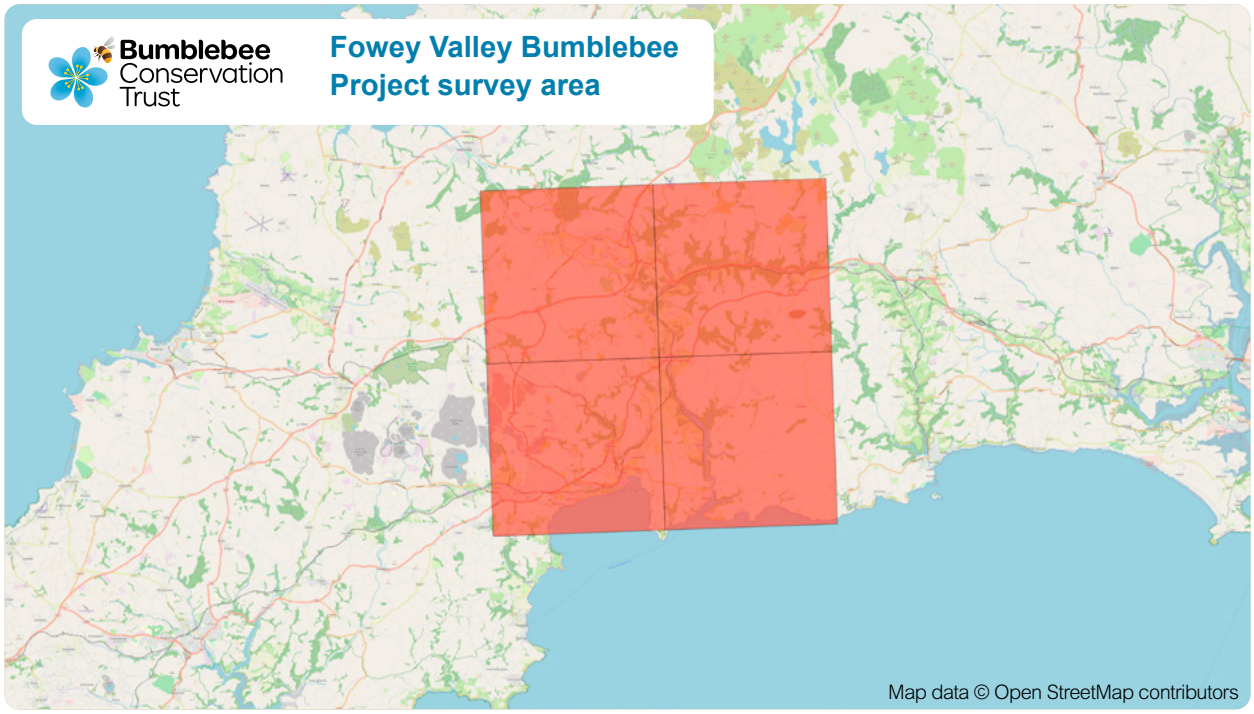


Photo credit: Laura Spiteri.

One of the White-tailed bumblebee species.

Background and methods

Background to BeeWalk

The Bees, Wasps and Ants Recording Society (BWARS) has been collecting data on the distribution of hymenoptera since 1978. This provides a good understanding of the distribution of bumblebee species across the UK, but there has been a significant lack of data on bumblebee abundance. Abundance data, knowing the size of populations and how these change over time, is key to monitoring population trends for bumblebee species, identifying which species are most at risk and acting as an early warning system for significant declines.

The lack of abundance data, alongside the need to better understand what's happening to all our species, not just the rarest, led to the development of the BeeWalk project. BeeWalk collects bumblebee data from across the UK to gain an accurate understanding of current bumblebee populations and distributions. In particular, the scheme aims to:

- Collect long-term data on bumblebee distribution and abundance.
- Analyse data to identify population trends and drivers thereof.
- Use these and other findings to inform policy and conservation interventions by the Trust and others, including improved understanding of forage plants & identification of management impacts.
- Encourage the public understanding of bumblebees.

BeeWalk transects (fixed monitoring routes) are monitored by volunteers using a standardised methodology to ensure accurate and comparable data is gathered. Most transects are roughly 1–2 km in length and take in some flower rich habitat. Transects are walked a minimum of once a month between March and October (the main bumblebee flight period), ideally between 11 am and 5 pm on days with minimal wind or rain.

Bumblebees are identified to species and caste where possible (and recorded as 'unknown bumblebee' or 'unknown caste' where not) and the number of each entering the 'recording box' on each section of the transect is recorded. The recording box covers an area up to four metres in front of the recorder, two metres either side of them (4 m wide in total), and between ground level and two metres up. This is employed in order to standardise between habitats, which may have very different levels of visibility, as well as between recorders (different people will be

Photo credit: Nikki Gammans.

Practising bumblebee identification at a BeeWalk training day.

able to identify bees from different distances, depending on experience) and species (more distinctive species can be identified from further away).

Recorders who are confident of their plant ID skills also have the option to record which flower species the bumblebees are visiting. This provides us with a better understanding of the forage preferences of bumblebee species nationwide and across a range of habitat types, which will allow us to better tailor our flower advice to gardeners and landowners. Holding up-to-date national population data allows us to better target our conservation activities and ensure that the advice we provide, including to governmental organisations, results in policies which reflect the current needs of our bumblebees.

BeeWalk from the beginning

The survey methodology for the BeeWalk scheme is based on existing transect-walking schemes such as the UK Butterfly Monitoring Scheme, with minor changes to reflect the facts that bumblebees are harder to identify than butterflies (so the recording box was made slightly smaller) and that bumblebees are less reliant on good weather to be flying (so the weather criteria were relaxed slightly). Transects are registered and records submitted directly on the BeeWalk website **www.beewalk.org.uk**, hosted by the Biological Records Centre.

A typical BeeWalk transect (Radley Lakes, Oxfordshire).

The project was trialled during 2008 and 2009, opened to Bumblebee Conservation Trust members in 2010, and launched as a scheme for the general public in 2011. The first year with more than a thousand records was 2010, and this is taken as the first year of the survey for analysis purposes.

The scheme has a high degree of focus on accuracy, validation and verification in order to meet the high standards required for monitoring scheme data to be viewed as scientifically robust and reliable. After three scoping years and nine in operation as a public recording scheme, the BeeWalk dataset now stands at 151,223 validated records of 22 bumblebee species (records of *Bombus lucorum*, *B. magnus* and *B. cryptarum* are combined as the *B. lucorum* aggregate for analysis as they can only be reliably separated by DNA analysis). Additionally, workers of the *B. lucorum* aggregate cannot be reliably separated from workers of *B. terrestris* in many cases so a further aggregate, *B. terrestris/lucorum* is used which potentially contains workers of all four species.

Bumblebee population trends

The central goal of the BeeWalk programme is to be able to reliably evaluate the trends in British bumblebee populations. Transect counts provide an annual estimation of the abundance of a species. They do not provide an absolute measure of the total abundance, but a relative measure which requires statistical interpretation to evaluate changes over time. This is complicated by the fact that transect locations change over time, allied to the effects of short-term weather conditions, etc.

Estimates of population trends across the 2010–19 period were calculated using a method similar to the analysis methodologies used by the UKBMS and the BTO's Breeding Bird Survey. First, a list is generated of the sites that each species has ever been recorded on within BeeWalk. This is used to establish the sites that each species could be expected to occur at, and thus the distance walked each month in those areas. This is in order to act as a measure of the area surveyed whilst improving analyses for more range-limited species.

Next the bumblebee counts submitted by BeeWalkers were added up to produce total counts of each caste of each species per month surveyed. The resulting monthly counts were then analysed using a log-linear model. This works out the monthly counts as a rate (count/distance), which allows for the fact that the distances walked per month varies between months, years, and species. The model estimated abundance trends across the 2010–2019 period.

These data were also used to demonstrate the abundance of each of the species or species aggregates in 2019 against the 2010–18 mean monthly abundance per kilometre surveyed, in order to see whether 2019 was statistically a 'good', 'bad', or 'standard' year for each species.

Photo credit: Richard Comont.

Tree bumblebee numbers dropped massively after June 2019.

Bumblebee population and phenology trends

Overall, 2019 appears to have been an average year for British bumblebees. Trends and phenology figures have been calculated for 18 bumblebee species, two bumblebee species aggregates, total bumblebees, and the honeybee over the survey period (2010–2019). Of these, ten have increased and twelve have decreased.

The warm late winter/early spring got bumblebees off to a good start, with a series of record-breaking warm days in February and the 10th warmest March on record and a record-breakingly hot Easter weekend. The bumblebees made the most of this, with most species reaching above-average numbers during the March–June period.

June itself was comparatively cold and wet, with below-average temperatures and heavy rainfall. This is likely to have minimised foraging opportunities through the month. In turn it resulted in bumblebee numbers crashing in July, as elderly workers died off and could not be replaced. This was particularly noticeable for the Early and Tree bumblebees, where it hastened the end of spring nests.

The mid and late summer were warm and wet, so although there was a new record hottest UK day ever on the 25 July, there was little drought and the later bumblebee species such as the Garden and Common carder bee were able to recover during August and into September.

Three of the species which have shown an increase in abundance are rarities, listed as conservation priority species in England and Wales (none of the three are present in Scotland). The Shrill carder bee (*Bombus sylvarum*) is perhaps Britain's most threatened bumblebee but has shown the largest increase of any species over the survey period. In part this may be due to increased monitoring in strongholds for the species (particularly through the Back from the Brink and Making a Buzz for the Coast projects), but separate analysis for the Back from the Brink final project report and the Shrill Carder Conservation Strategy show the species has become more abundant even when only long-term transects are considered. Similarly, the Brown-banded carder bee (*Bombus humilis*) and Ruderal bumblebee (*Bombus ruderatus*) are largely monitored in areas which are undergoing bumblebee-focused conservation efforts: the success of these species stands in testament to the ongoing efforts of the staff and volunteers of the many organisations working to conserve them.

Unsurprisingly the range-expanding Tree bumblebee (*Bombus hypnorum*) has increased in abundance over the survey period. The method of trend calculation used means that the species spreading into a new area does not by itself increase the abundance trends; only increasing numbers recorded at known sites does that. As 'known sites' are recalculated each year based on records, the trend increase shows the species increasing in abundance behind the range front, consolidating the species' overall range.

An abundance trend has been calculated for the honeybee for the first time and the species shows a modest increase, greater than all but four bumblebee species (two of which are benefitting from specific targeted conservation work).

The 'total bumblebees' group showed a slight increase over the survey period. This grouping consists of all the bumblebee records submitted to BeeWalk, including those recorded as 'unknown bumblebee species' as well as all species records, and is a measure of how bumblebees are doing overall.

Common species did not seem to be doing particularly well during the survey period. As well as the Tree bumblebee, the Buff-tailed bumblebee has increased, as has the field-indistinguishable aggregate of worker Buff-tailed/White-tailed bumblebee. However, the White-tailed bumblebee complex has declined, so the overall trajectories of the four individual species (*B. terrestris*, *B. lucorum*, *B. cryptarum*, and *B. magnus*) are unclear (The *B. terrestris* taxon analysed here, although a single species, is heavily biased towards queens as these are notably more field-identifiable than workers or males). The remainder of the common species – Common carder bee (*B. pascuorum*),

Red-tailed bumblebee (*B. lapidarius*), Early bumblebee (*B. pratorum*), and Garden bumblebee (*B. hortorum*) – have all shown an overall decline in abundance during the survey period.

Similarly, five of the six cuckoo bumblebee species have declined over the decade: the Southern cuckoo bee (*B. vestalis*) is the exception. Each cuckoo species is highly host-specific, usually choosing to parasitise just one host species (all members of the 'Big 8' in the UK). As such, they are highly sensitive to fluctuations in the host population, and small changes in the seasonal timing or abundance of the host can potentially have larger knock-on effects on the cuckoo populations. It is likely that the decline in abundance recorded for the common bumblebee species is at least partially responsible for the decline in cuckoo numbers, and this is backed up by the fact that the only cuckoo species to show an increase is the Southern cuckoo bee, which is parasitic on the Buff-tailed bumblebee, a host which is increasing in abundance.

The two species which arouse the greatest concern from this analysis are the Bilberry bumblebee (*B. monticola*) and the Moss carder bee (*B. muscorum*). Both are already listed as rare conservation-priority species after large-scale distributional declines during the 20th century, and our data shows that they are both continuing to decline in abundance at their remaining sites. However, it is important to caveat this: both species have large Scottish populations which are currently not well covered by the BeeWalk network, and which ad hoc recording suggests continue to do well. The Scottish Highlands and the Orkney and Hebrides archipelagos remain a high-priority target for transects to help fill in this gap, as well as upland areas in general.

Three species have not been analysed as there is insufficient data for the analysis to be robust. These are the Great Yellow bumblebee (*B. distinguendus*), Broken-belted bumblebee (*B. soroeensis*), and Red-shanked carder bee (*B. ruderarius*).

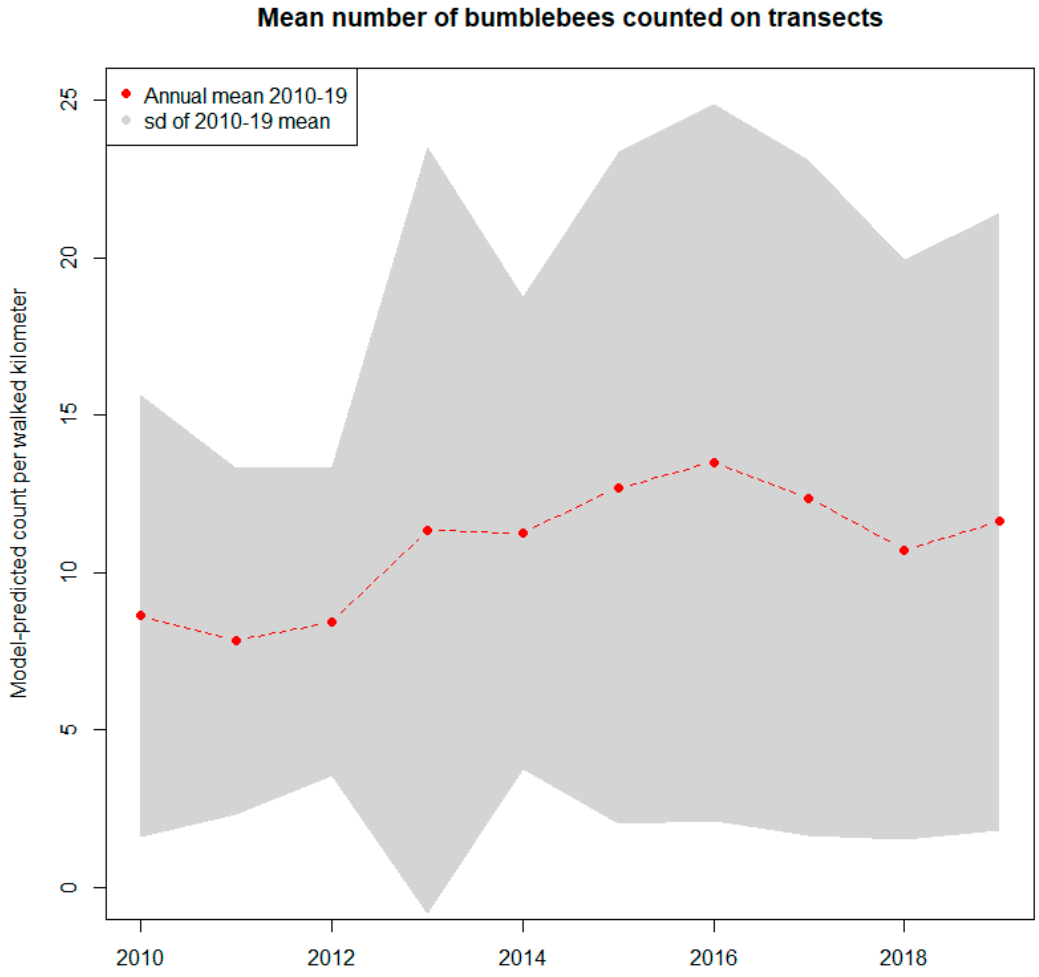
2010–2019 population trends for the species with sufficient records in the BeeWalk dataset (18 bumblebee species, 3 bumblebee species aggregates, and the honeybee). Species showing population increases are on the left of the table, those showing decreases are on the right. Species are ordered from most positive change to most negative change and ranked accordingly, with last year's rank in brackets for each species. Conservation priority species have been highlighted in blue, cuckoo species in red, and the 'Big 8' common species in green.

Rank	Species	Records	Trend	Rank	Species	Records	Trend
1 (1)	*B. sylvarum*	226	0.257	**11** (8)	*B. pascuorum*	32,234	-0.00886
2 (7)	*B. ruderatus*	192	0.131	**12** (10)	*B. lapidarius*	18,814	-0.0121
3 (17)	*B. lucorum/terrestris workers*	12,527	0.093	**13** (11)	*B. monticola*	137	-0.0152
4 (3)	*B. hynorum*	6,138	0.062	**14** (16)	*B. pratorum*	8,430	-0.0319
5 (2)	*Apis mellifera*	9,869	0.045	**15** (17)	*B. lucorum agg.*	13,430	-0.0373
6 (5)	*B. humilis*	1,020	0.0431	**16** (13)	*B. hortorum*	6,002	-0.0437
7 (7)	*B. vestalis*	1,461	0.0273	**17** (18)	*B. barbutellus*	100	-0.060
8 (12)	*B. terrestris*	21,974	0.0264	**18** (15)	*B. muscorum*	428	-0.0815
9 (14)	*B. jonellus*	430	0.0219	**19** (19)	*B. rupestris*	366	-0.0917
10 (9)	*TOTAL bumblebees*	146,892	0.0139	**20** (20)	*B. sylvestris*	626	-0.138
				21 (21)	*B. bohemicus*	538	-0.152
				22 (22)	*B. campestris*	360	-0.170

The social bumblebees parasitised by each of the six British cuckoo bumblebee species. Apparent primary hosts are in bold.

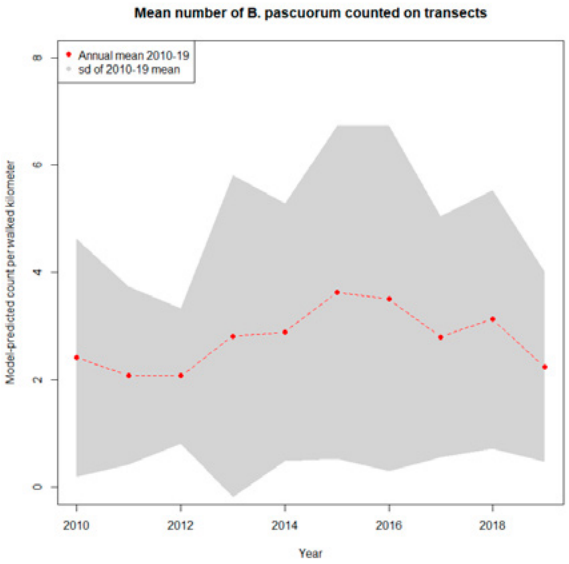
Cuckoo species	Host bumblebee species
Barbut's cuckoo (*Bombus barbutellus*)	***Bombus hortorum***, *B. ruderatus*
Gypsy cuckoo (*Bombus bohemicus*)	***Bombus lucorum* agg.**
Field cuckoo (*Bombus campestris*)	***Bombus pascuorum***, *B. humilis, B. muscorum*
Red-tailed cuckoo (*Bombus rupestris*)	***Bombus lapidaris***
Forest cuckoo (*Bombus sylvestris*)	***Bombus pratorum***, *B. monticola, B. jonellus*
Southern cuckoo (*Bombus vestalis*)	***Bombus terrestris***

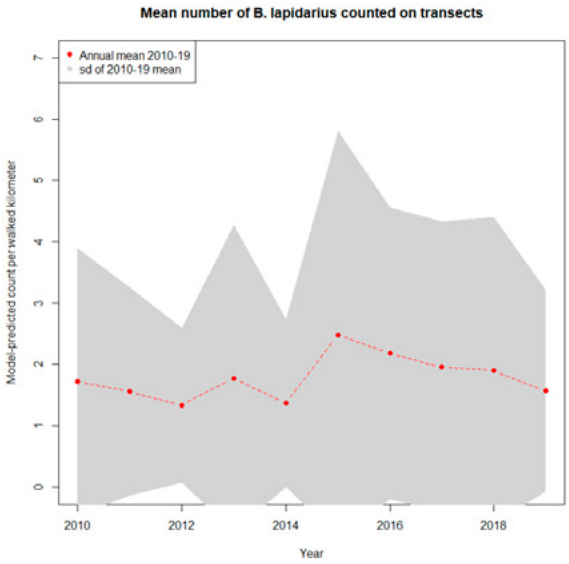
Yearly trends in overall abundance for UK bumblebees

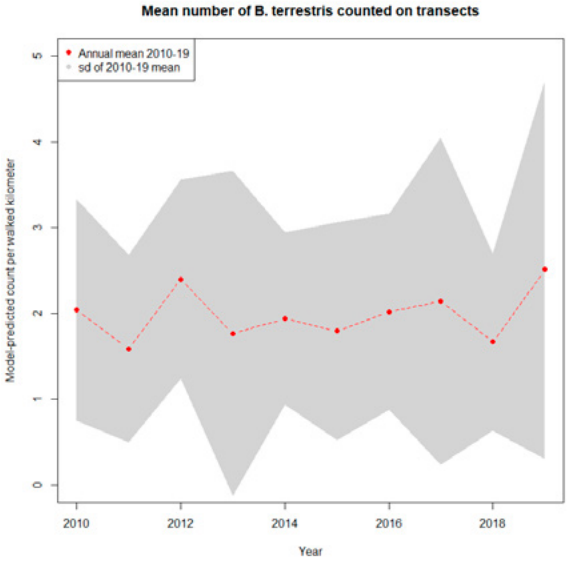


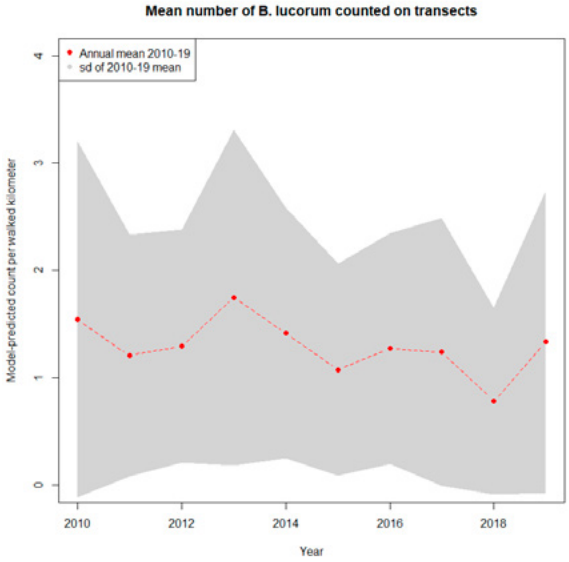
The abundance trend of all bumblebees recorded on BeeWalk transects between 2010 and 2019, including individuals not identified to caste or to species. This is shown as the mean number of bumblebees counted per kilometre walked each year (red line). The grey cloud is a measure of the annual variation around this average (standard deviation).

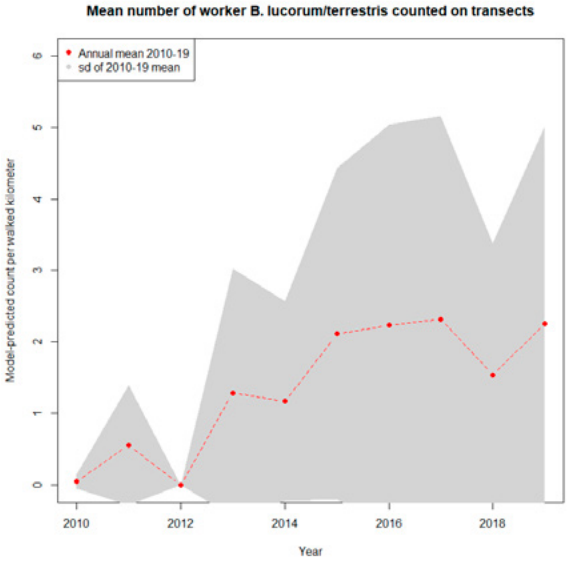
Widespread bumblebee species









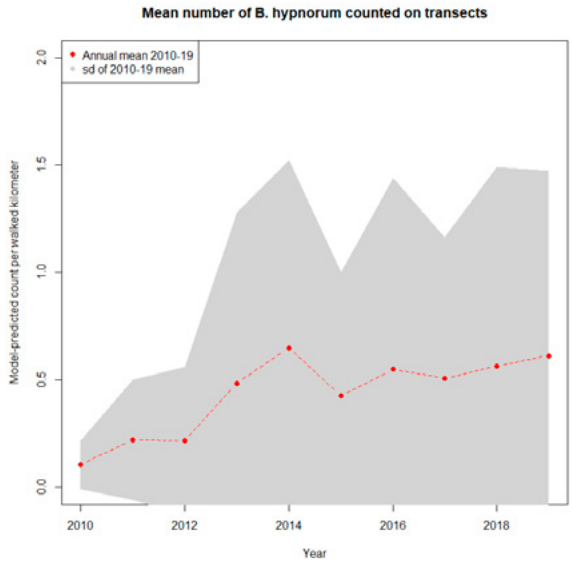


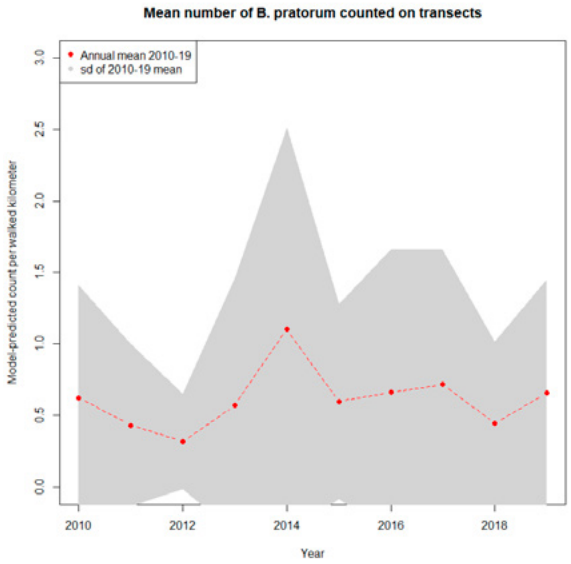
Abundance trends for the eight widespread British bumblebee species 2010–19, shown as the mean number of bumblebees of that species counted per kilometre walked each year on transects where the species has ever been recorded (red line). The grey cloud is a measure of variability (standard deviation).

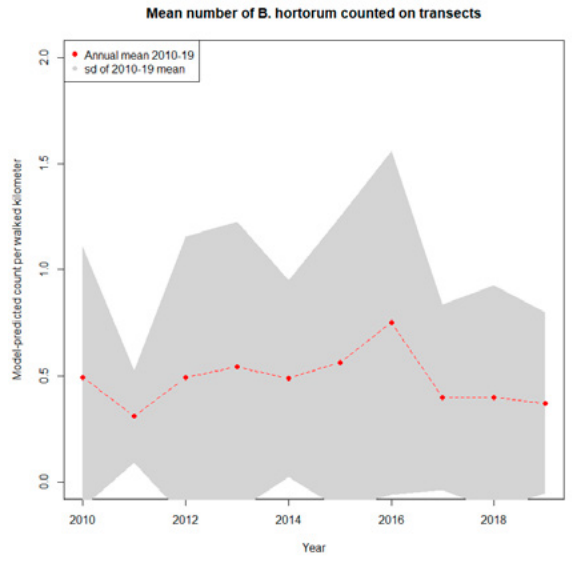
Note: the vertical axis varies with species' abundance and thus differs between plots.

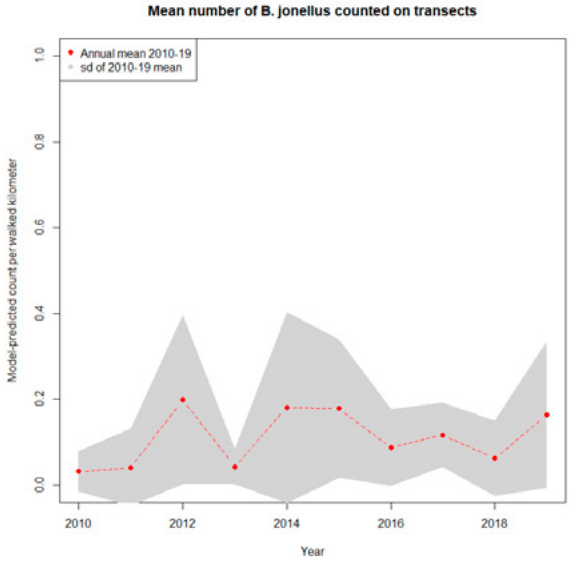
Bombus lucorum & B. terrestris often cannot be reliably split as workers, so records submitted as '*B. lucorum/terrestris workers*' are plotted in addition to both species.

Widespread bumblebees species

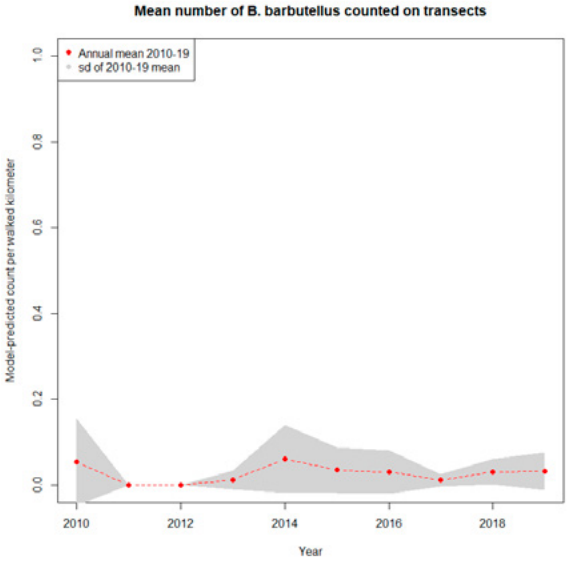


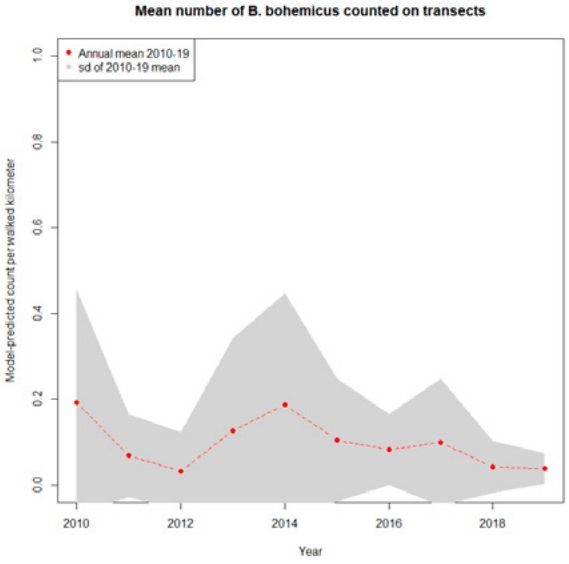


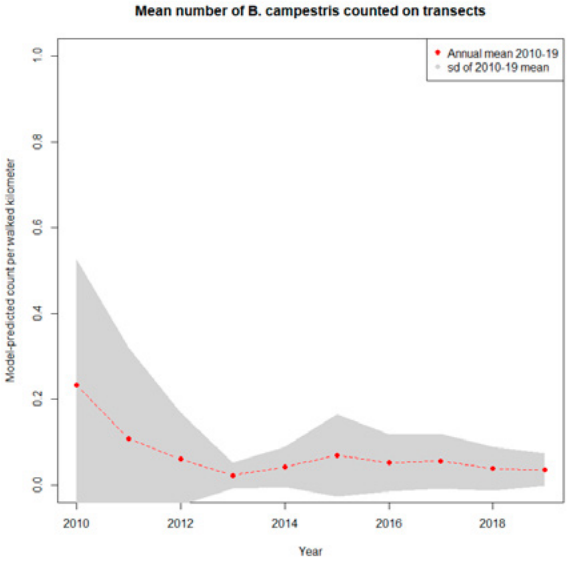


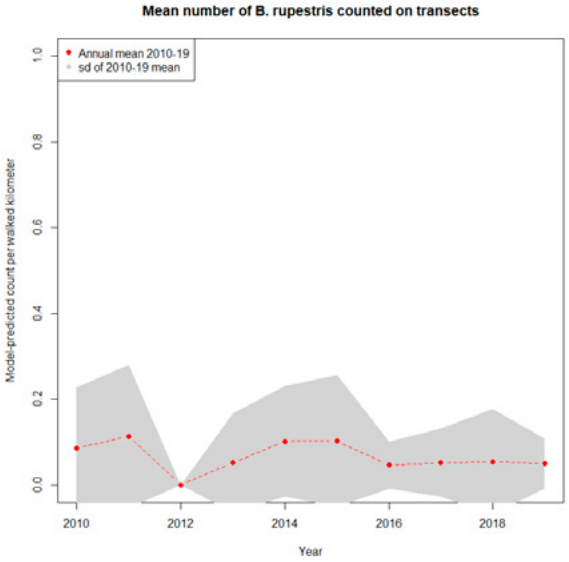


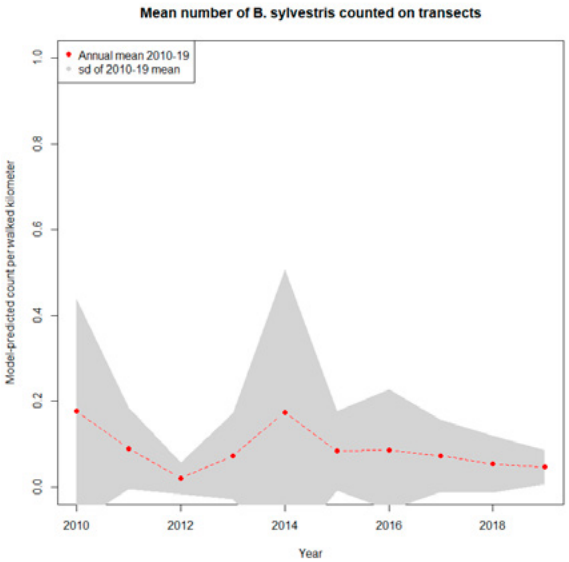
Cuckoo bees

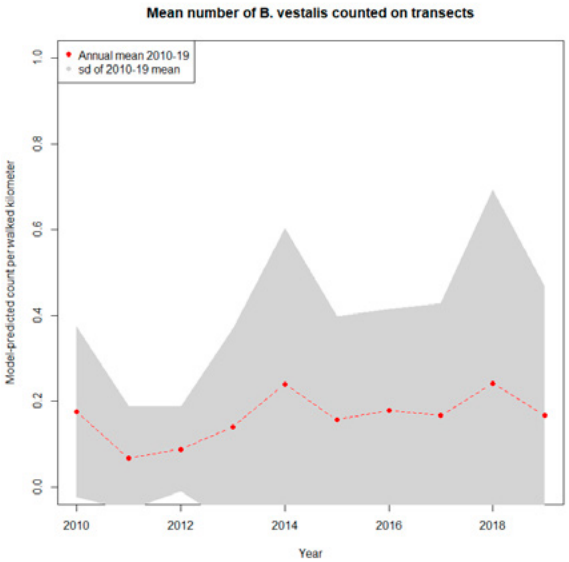

Mean number of B. barbutellus counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year


Mean number of B. bohemicus counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year

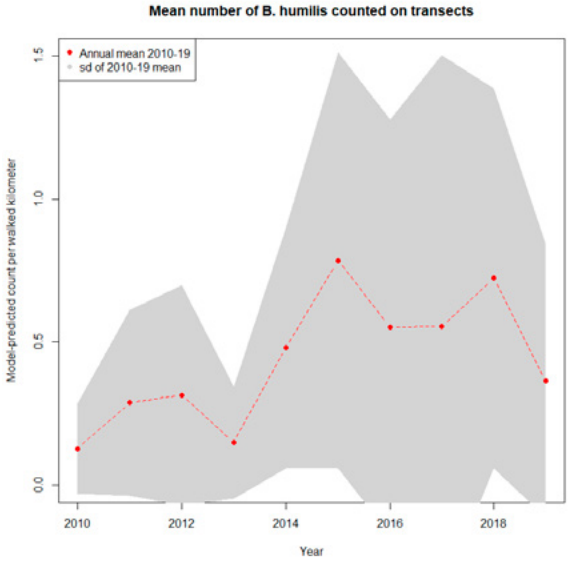

Mean number of B. campestris counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year

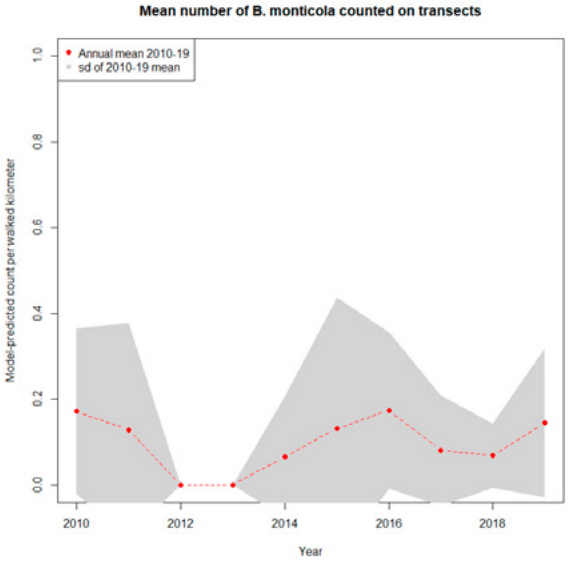

Mean number of B. rupestris counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year

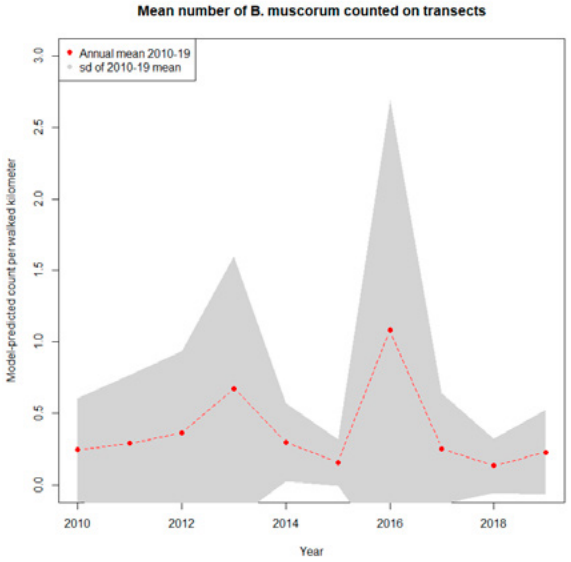

Mean number of B. sylvestris counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year

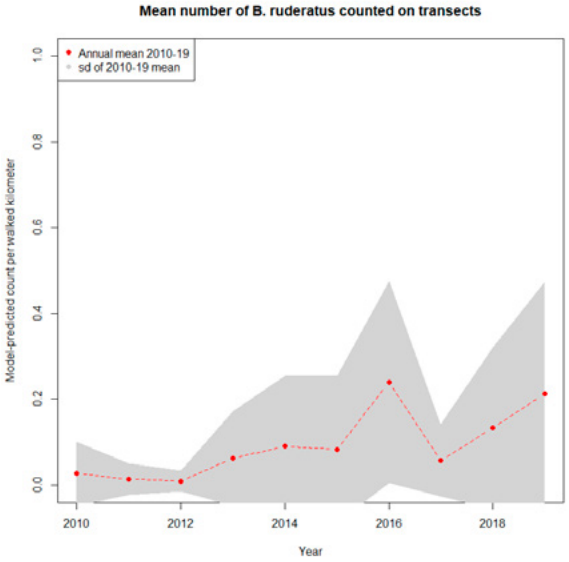

Mean number of B. vestalis counted on transects
Annual mean 2010-19
sd of 2010-19 mean
Model-predicted count per walked kilometer
Year

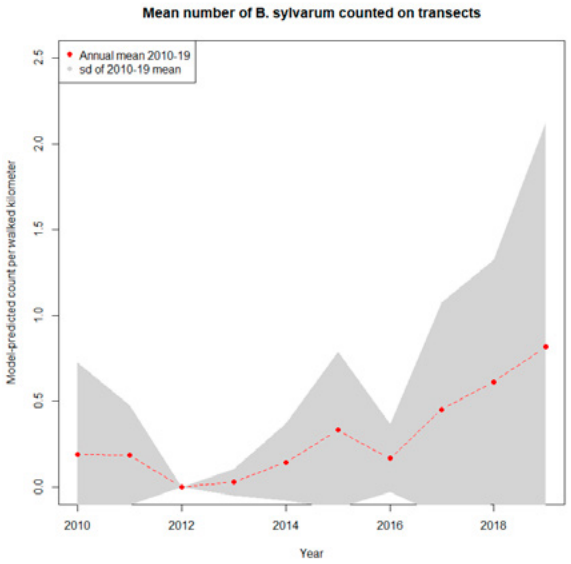
Conservation priority bumblebees species



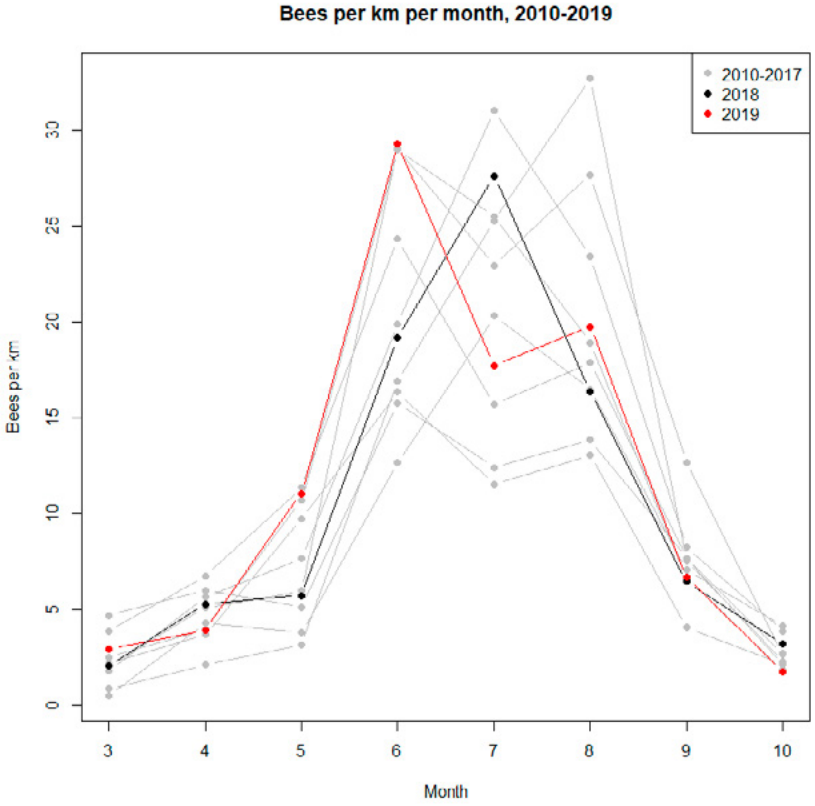




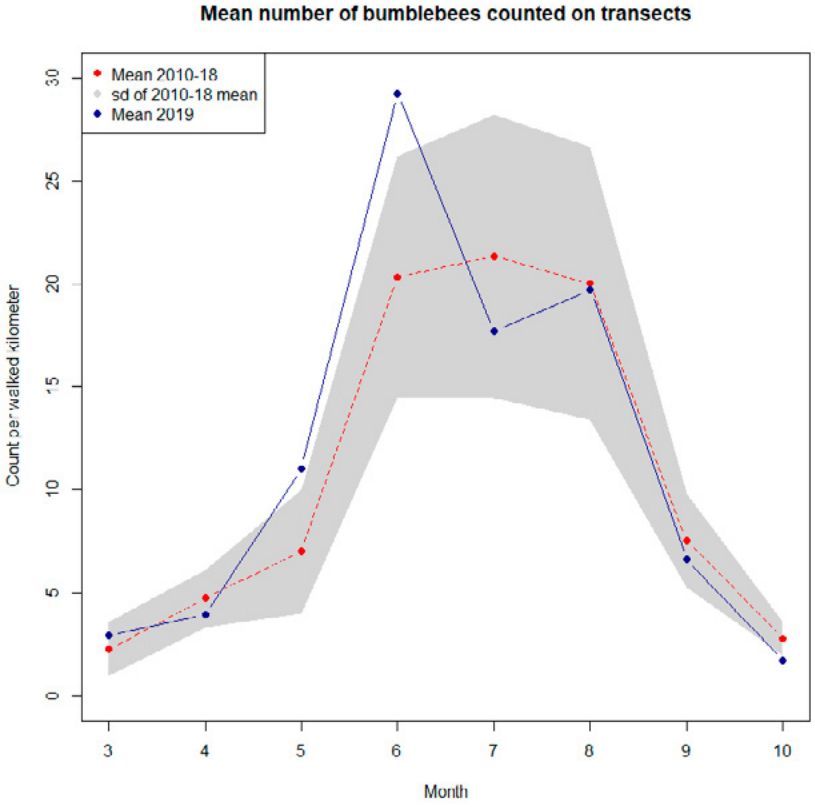




Bumblebee phenology plots 2019

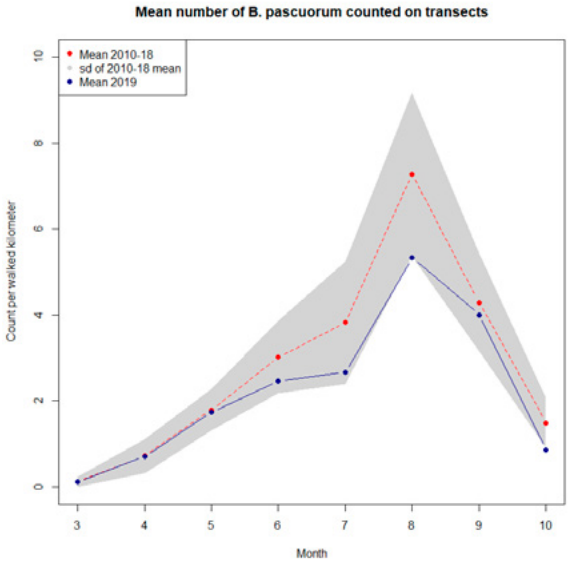


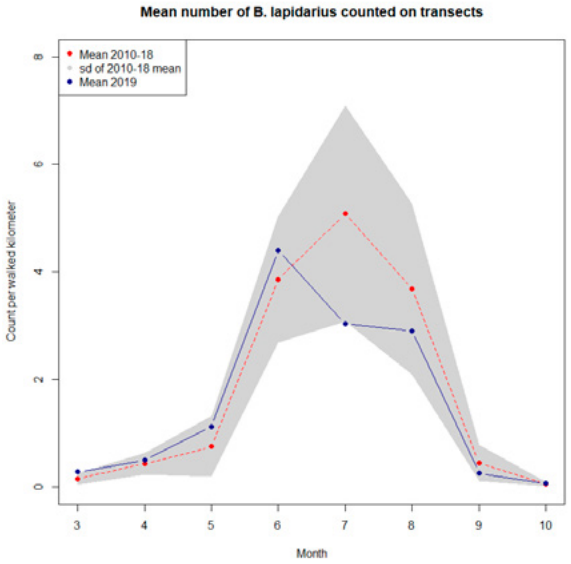
The mean number of bumblebees per kilometre recorded per month (March–October) for each year the BeeWalk survey has been in operation.

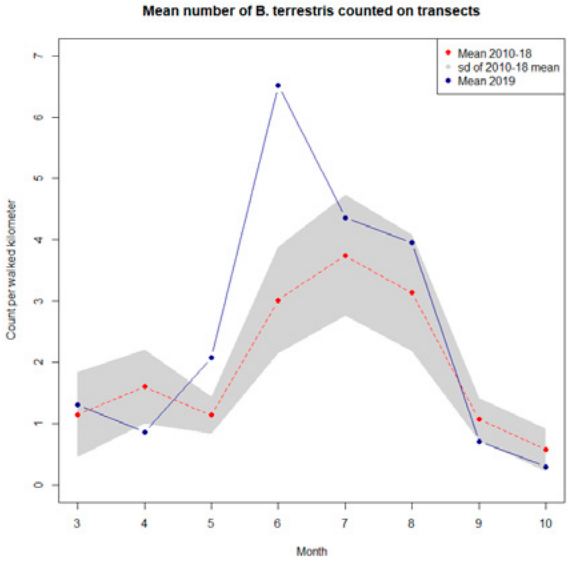


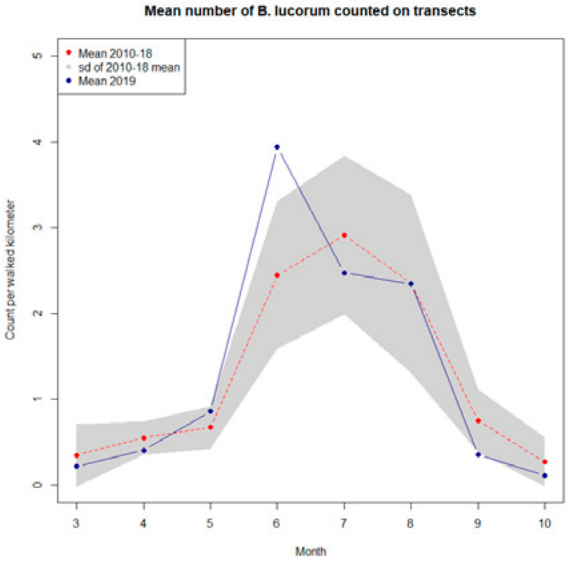
The mean number of total bumblebees per kilometre per month between March and October 2018 (blue line), plotted against the average monthly abundance for the seven-year period 2010–17 (red line). The grey cloud indicates the variability of the 2010–17 average – where the blue (2018) line is outside this grey area the count is significantly different to what would be expected.

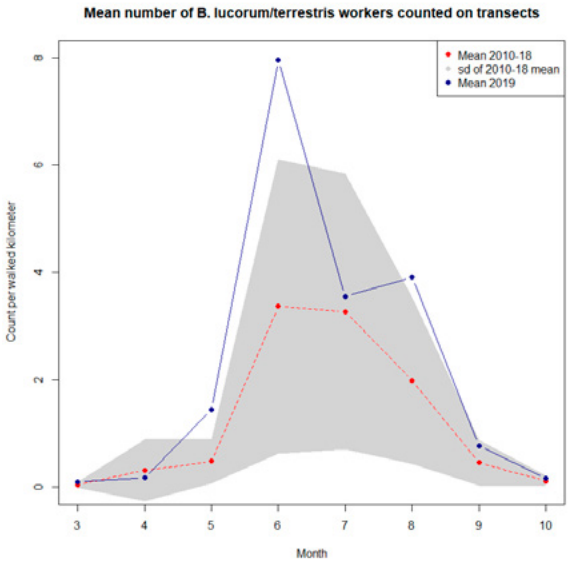
Widespread bumblebees species









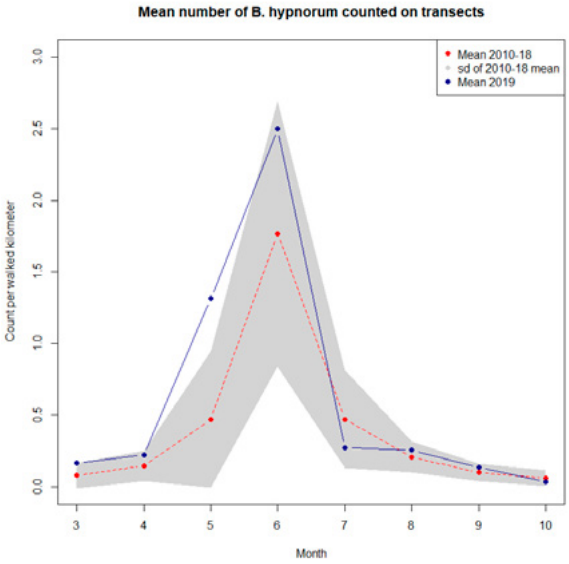


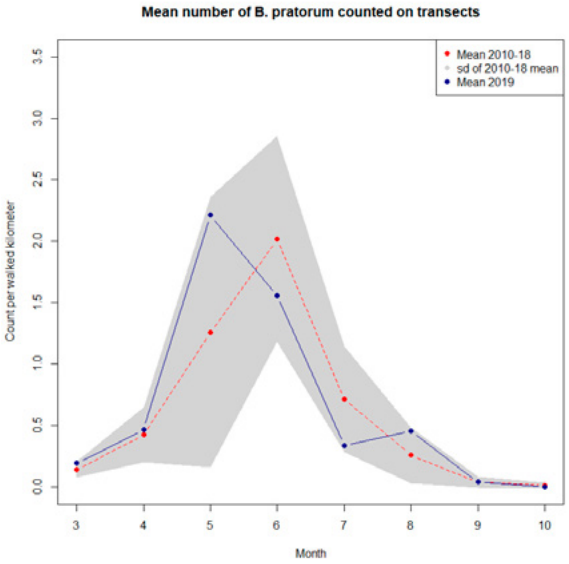
The mean number of bumblebees per kilometre per month between March and October 2019 (blue line), plotted against the average monthly abundance for the nine-year period 2010–18 (red line). The grey cloud indicates the variability of the 2010–18 average (standard deviation.

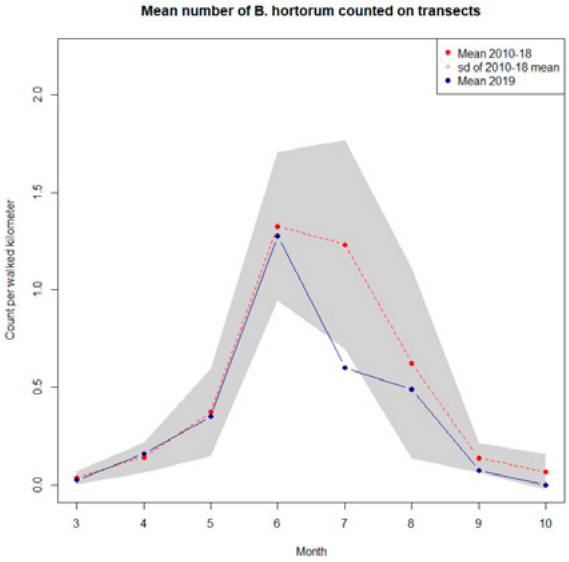
Note: the vertical axis varies with species' abundance and thus differs between plots.

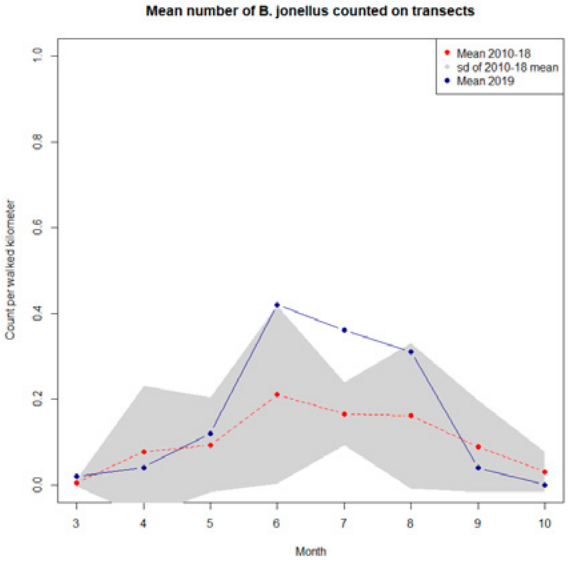
Bombus lucorum & *B. terrestris* often cannot be reliably split as workers, so records submitted as '*B. lucorum/terrestris workers*' are plotted in addition to both species.

Widespread bumblebee species

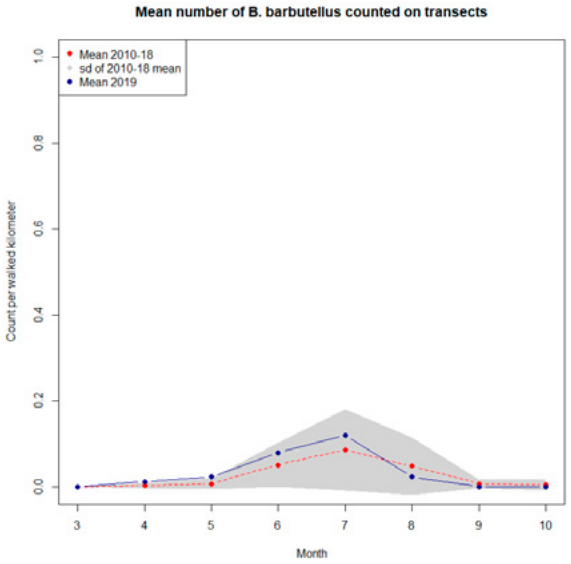


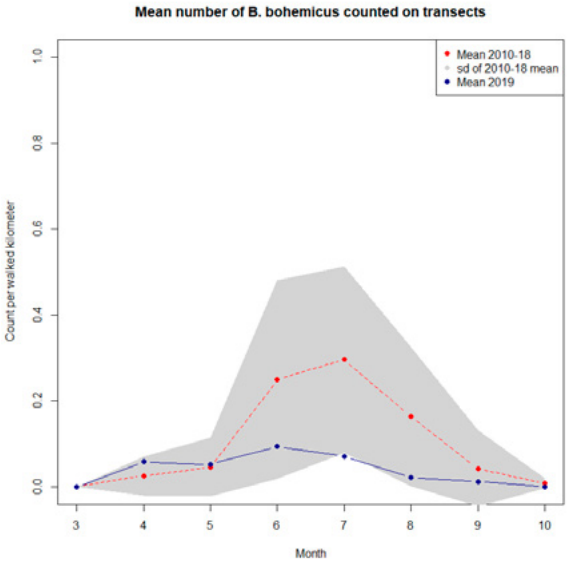


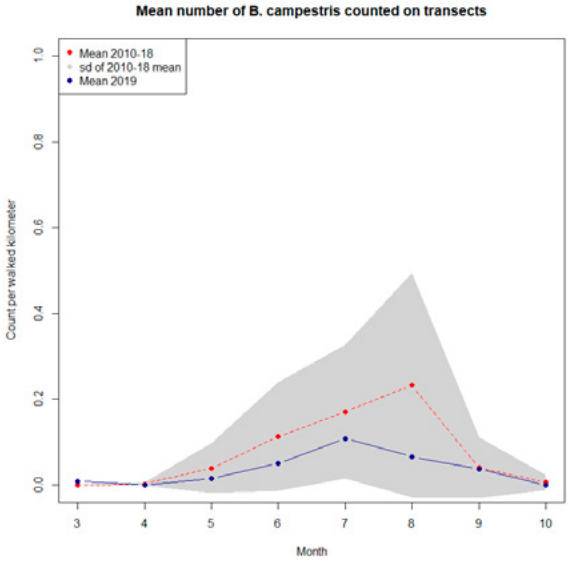


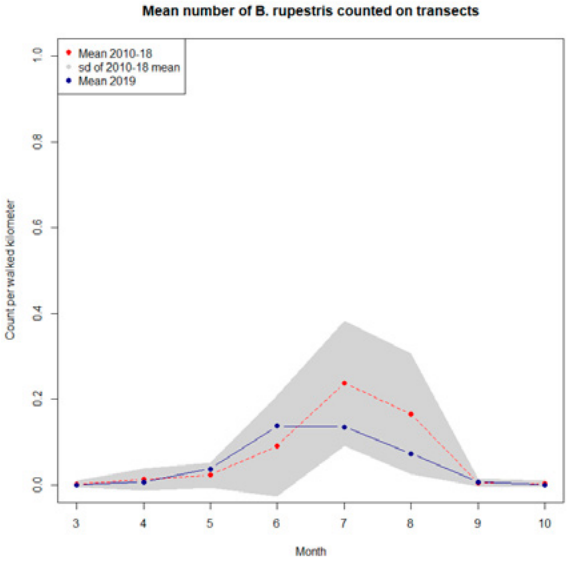


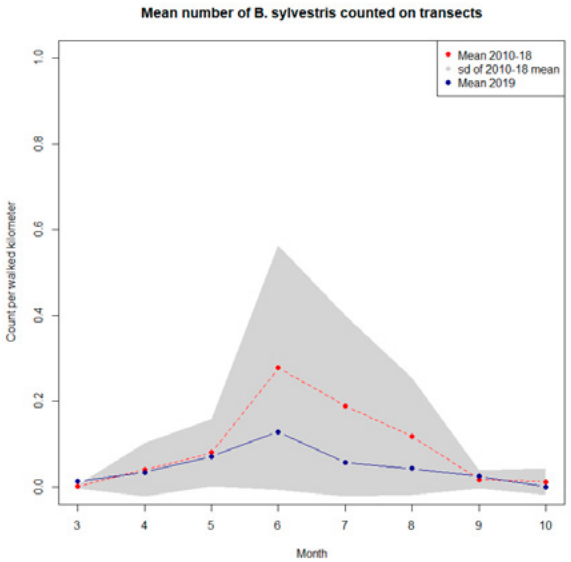
Cuckoo bees

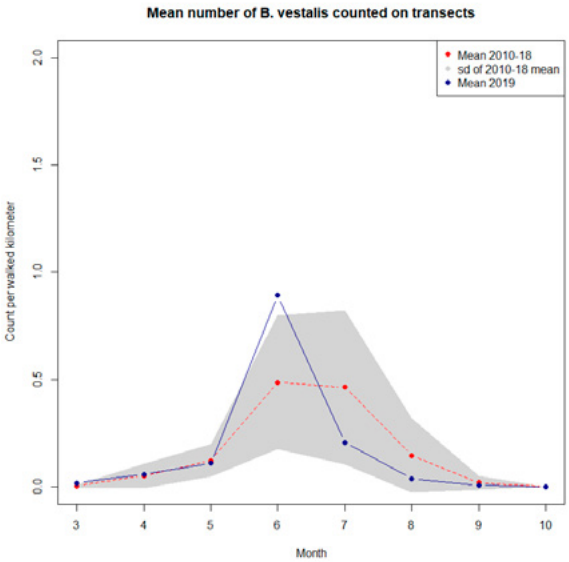

Mean number of B. barbutellus counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month


Mean number of B. bohemicus counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month

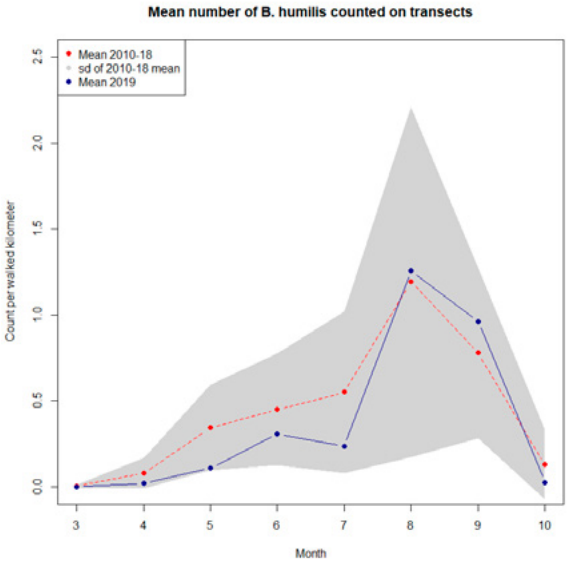

Mean number of B. campestris counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month

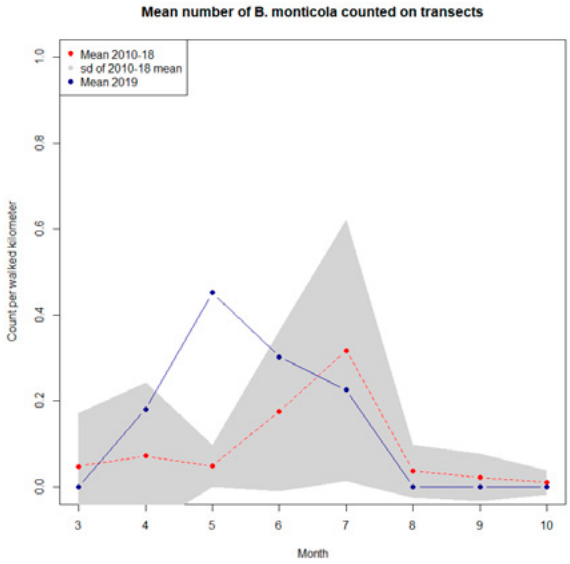

Mean number of B. rupestris counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month

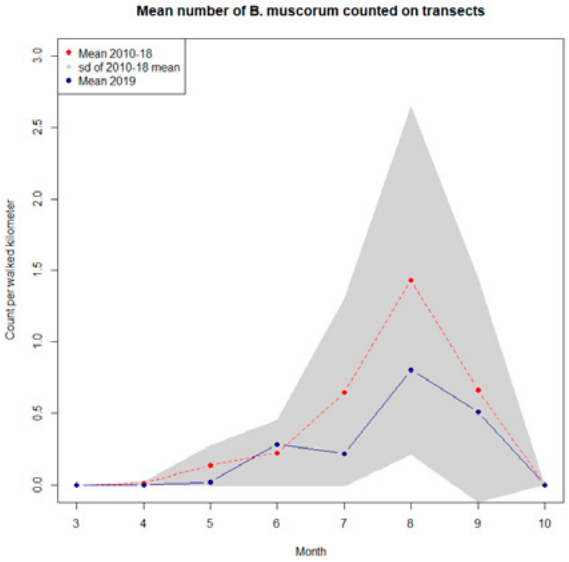

Mean number of B. sylvestris counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month

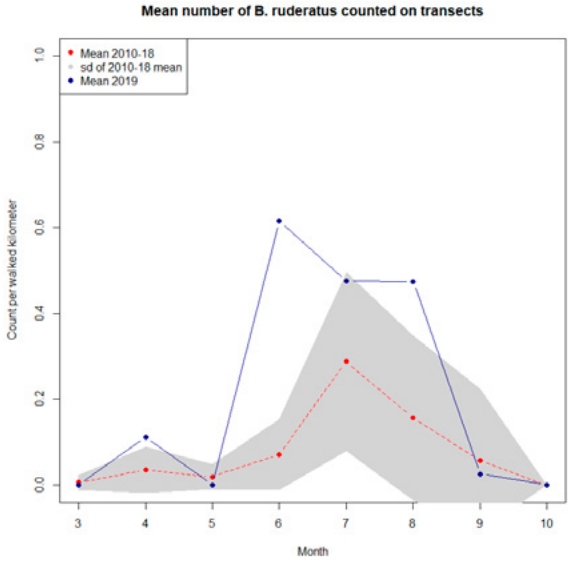

Mean number of B. vestalis counted on transects
Mean 2010-18
sd of 2010-18 mean
Mean 2019
Count per walked kilometer
Month

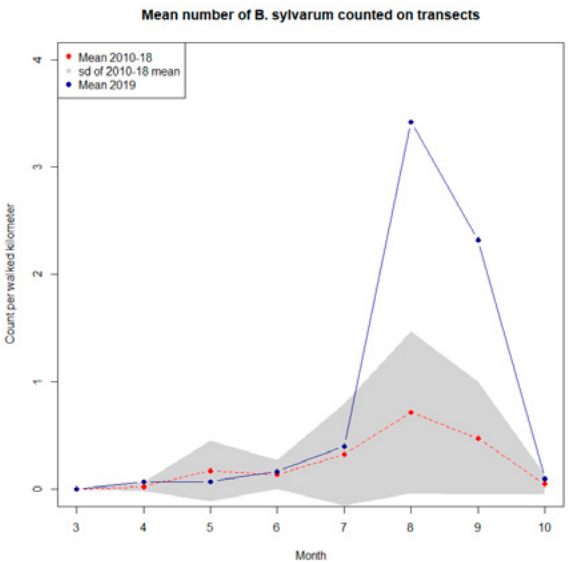
Conservation priority bumblebee species











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It can be downloaded from **www.bumblebeeconservation.org** and further information can be found on the BeeWalk website, **www.beewalk.org.uk**.