



# BeeWalk Annual Report 2023

Dr Richard Comont and Helen Dickinson



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## About BeeWalk

BeeWalk is the standardised bumblebee-monitoring scheme active across Great Britain (the [All-Ireland Bumblebee Monitoring Scheme](#) collects equivalent data), running since 2008 (opened to the public from 2011). Volunteer BeeWalkers survey a fixed-route transect once a month between March and October (inclusive), recording the abundance of each bumblebee species seen. This data is submitted via the [BeeWalk website](#) (hosted by the Biological Records Centre), enabling population trend analysis to be undertaken. The outputs of BeeWalk are now widely used to inform policy and conservation interventions.

## The BeeWalk team

BeeWalk is run by Dr Richard Comont (Science Manager) and Helen Dickinson (Surveys Officer) of the Bumblebee Conservation Trust.

## Contact us

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## Acknowledgements

We would like to thank the financial and in-kind contributions to the BeeWalk scheme by the many organisations, charitable trusts and individuals who have over the years supported the BeeWalk scheme in particular, and the Bumblebee Conservation Trust in general. Thanks to the Biological Records Centre, who have provided website support and data storage free of charge.

We would also like to thank the photographers who have allowed their images to be used as part of this BeeWalk Annual Report.

## Citation

Comont, R. F., & Dickinson, H. L. M. (2023). BeeWalk Annual Report 2023. Bumblebee Conservation Trust, Stirling, UK.

This report can be downloaded from [www.bumblebeeconservation.org](http://www.bumblebeeconservation.org)  
Further information on the scheme can be found on the BeeWalk website, [www.beewalk.org.uk](http://www.beewalk.org.uk).

Cover photo: A BeeWalk in progress as part of the Bee Connected Project (photo © Dr. Nikki Gammans).

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## Thank you

We are indebted to the volunteer BeeWalkers, BeeWalk Mentors 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.

# Contents

<b>BeeWalk background, aims and methods</b>	4
BeeWalk background and aims	4
BeeWalk survey methods	4
BeeWalk data verification and analysis	4
<b>BeeWalk 2022 highlights in numbers</b>	5
<b>Mapping BeeWalk</b>	6
<b>Bumblebee Population &amp; Phenology Trends</b>	7
2022 season	7
Long-term trends	9
<b>Research and collaborations – how BeeWalk data is used</b>	11
<b>BeeWalk data use</b>	<b>11</b>
Ongoing collaborations	11
In-progress PhDs	11
UK Pollinator Monitoring Scheme (PoMS)	12
<b>Our projects</b>	13
Skills for Bees	14
Skills for Bees: Scotland	14
Skills for Bees: Cymru	14
Bee Connected	15
Species (bees) on the Edge	15
West Country Buzz	15
Conservation Strategy for the Shrill carder bee and Save our Shrills Somerset (S.O.S Somerset)	15
<b>Appendix</b>	18
Abundance trends	18
Widespread bumblebees	18
Cuckoo bumblebees	20
Conservation priority bumblebee species	21
Phenology trends	22
Widespread bumblebee species	22
Cuckoo bumblebees	24
Conservation priority bumblebee species	25

# BeeWalk background, aims and methods

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## BeeWalk background and aims

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

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 BeeWalk. BeeWalk collects bumblebee data from across Britain to gain an accurate understanding of current bumblebee populations and distributions.

Key aims:

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

## BeeWalk survey methods

BeeWalk transects (fixed monitoring routes) are established and monitored by volunteers (BeeWalkers) using standardised methodology to ensure accurate and comparable data is gathered. Transects are generally around 1-2 km in length, and are walked a minimum of once a month between March and October inclusive (the main bumblebee flight period). BeeWalkers record the abundance of each bumblebee species seen in a 4m x 4m x 2m 'recording box' in order to standardise between habitats and recorders.

Bumblebees are identified to species and caste where possible (recorded as 'unknown

bumblebee' or 'unknown caste' where not) and the number of each entering the 'recording box' is recorded. Those recorders confident in plant ID also record which flower species bumblebees are visiting. Survey results are submitted via the BeeWalk website, [www.beewalk.org.uk](http://www.beewalk.org.uk).

## BeeWalk data verification and analysis

Each year data is downloaded and prepared for analysis, requiring an intensive process of data validation and verification. This is essential to meet the high standards required for monitoring scheme data to be scientifically robust and reliable. Records of rare/difficult to identify species and species which appear outside known ranges, are queried with the recorder to establish supporting evidence.

Data received provide an annual estimation of the abundance of a species. This is a relative measure which requires statistical interpretation to evaluate changes over time.

Estimates of population trends are calculated using statistical modelling. Bumblebee counts submitted by BeeWalkers are summed to produce total counts of each caste of each species, for each month surveyed.

These monthly counts are analysed using statistical modelling to work out the monthly counts as a rate; bees seen per kilometre walked. This allows for the fact that the distances walked per month varies between months, years, and species. As all species are not found on all transects, a list is generated of sites each species has ever been recorded on within BeeWalk. This is used to calculate the distance walked each month across the species' range.

We can use the results to demonstrate the abundance of each species in a given year against the mean monthly abundance across previous years, in order to see whether a given year was statistically a 'good', 'bad', or 'standard' year for each species.



## BeeWalk 2022 highlights in numbers

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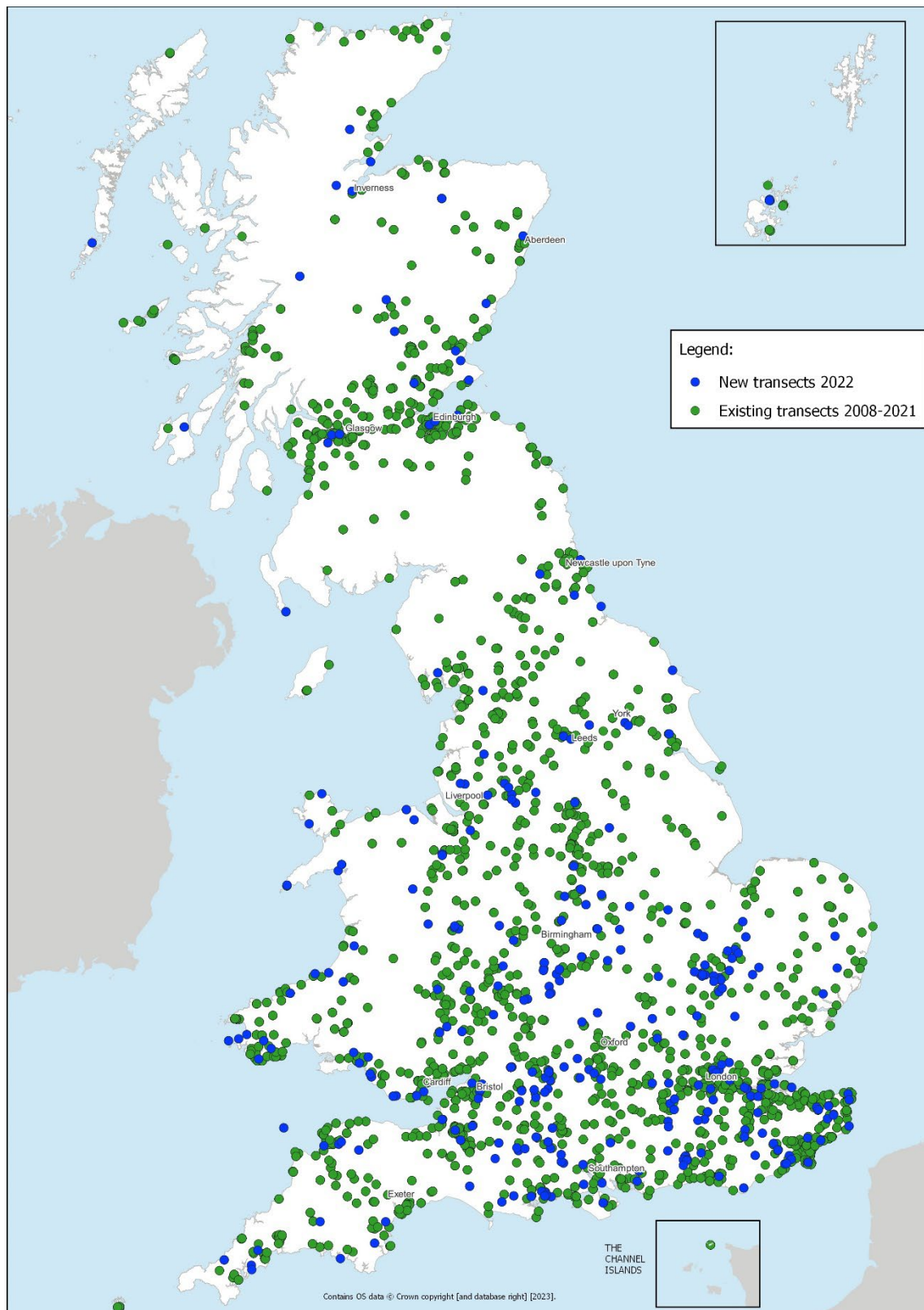


© Louise Gorrigan



© Dr. Nikki Gammans

# Mapping BeeWalk



New (blue) transects showing the growth of the BeeWalk network during 2022

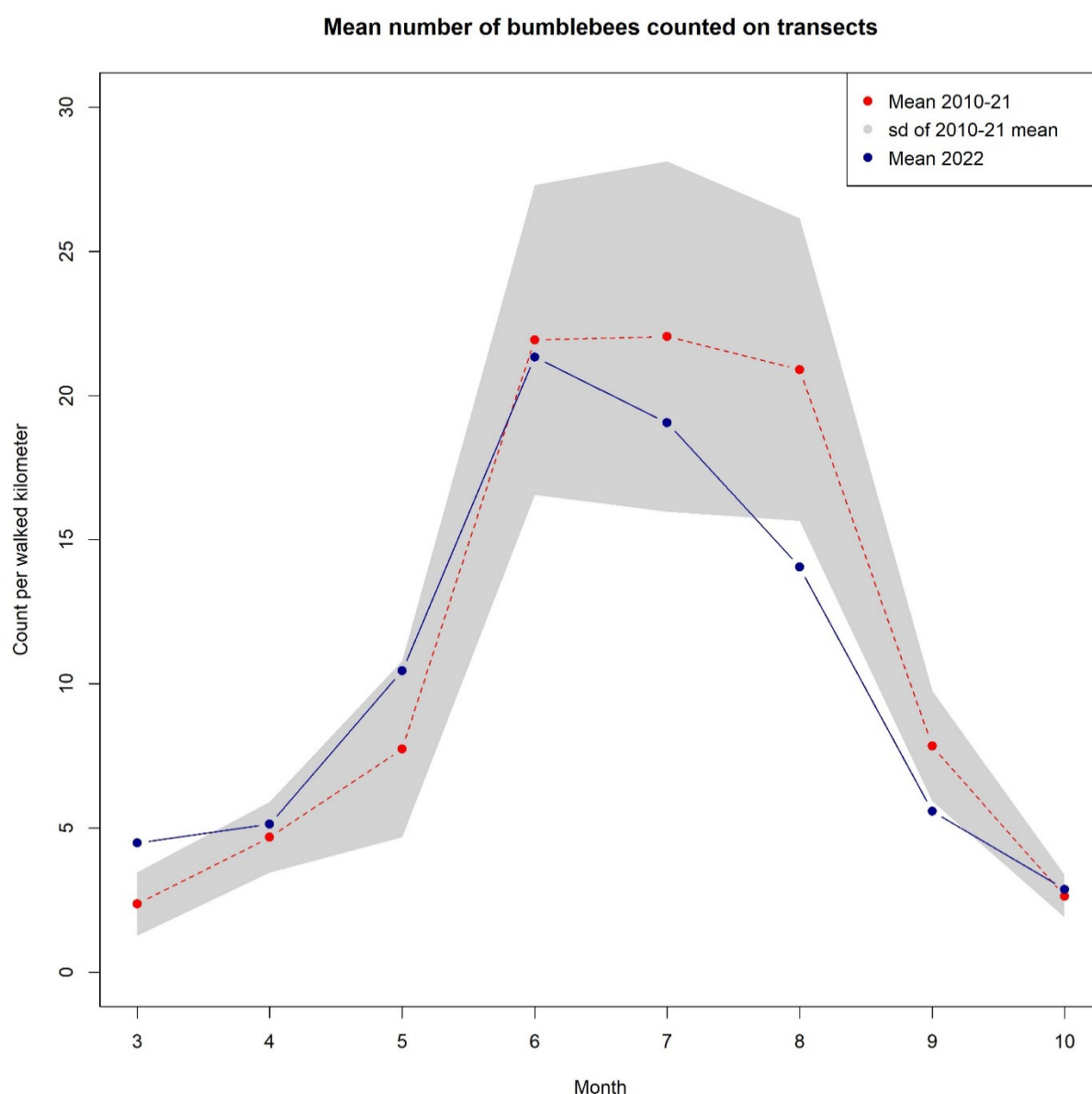


## Bumblebee Population and Phenology Trends

Records of *B. lucorum*, *B. magnus* and *B. cryptarum* are combined as the *B. lucorum* aggregate, as they can only be reliably separated by DNA analysis. Additionally, workers of the *B. lucorum* aggregate are frequently impossible to reliably separate from workers of *B. terrestris* so a further aggregate, *B. terrestris/lucorum* is used which potentially contains workers of all four species.

We do not receive enough records of the Great Yellow bumblebee *B. distinguendus* to calculate an index.

### 2022 season



The mean number of bumblebees per kilometre recorded per month (March-October). Results for 2022 (blue line) are plotted against the average monthly abundance for the nine-year period 2010-21 (red line). The grey cloud indicates the variability of the 2010-21 average – where the blue (2022) line is outside this grey area the count is significantly different to what would be expected.

The year 2022 was the warmest on record overall, and each of the seasons was also above average for temperature. This conceals some different patterns at local scales though: the second half of March and the first half of April were cool and wet, with bumblebees getting off to a slow start and numbers not increasing much in April versus March for most species.

May and then June were warmer and brighter, and bumblebees picked up correspondingly. Overall, numbers were middling – around 20 bumblebees seen per kilometre walked in June, the 5<sup>th</sup> lowest June count in the 13-year sequence and well below the peak of 30 which has been reached on a couple of occasions.

The Early bumblebee *Bombus pratorum*, a spring specialist, actually declined in April compared to March, but the bee tends to peak in May in early years with warm springs, and in June when the spring is cooler. In 2022 it duly rebounded from the April low to record a peak count for the year in May (2.5 bees per KM walked, the second-highest May count for the species). It then declined rapidly through the rest of the summer, although a handful were still around to be recorded in August and even September, potentially from a second generation.

Similarly, the closely-related Bilberry bumblebee *B. monticola* reached a much higher June peak than normal, and several other species did well in this spring/early summer period. The Common carder bumblebee *B. pascuorum* and Moss carder bumblebee *B. muscorum*, Buff-tailed bumblebee *B. terrestris*, and Garden bumblebee *B. hortorum* all recorded noticeably above-average monthly counts at least once by the end of June, and so were poised to become more abundant as the summer wore on.

Then, of course, the really memorable weather set in. July and August saw an unprecedented heatwave across most of the country, with temperatures topping 40°C for the first time ever. While many insects seemed to thrive in

the heat, bumblebees did not – numbers dropped off in July (4<sup>th</sup> lowest July count ever) and again in August, when just under 15 bumblebees were recorded per kilometre walked, the lowest August count ever on BeeWalk.

Late-flying species seemed to be particularly affected by this, probably because July and August are the peak months for worker recruitment and the production of males and new queens for these species. The Common carder bumblebee, Red-tailed bumblebee *B. lapidarius*, and White-tailed bumblebee *B. lucorum* agg. all saw numbers markedly and unusually decreased over the heatwave period. More worryingly, so did two of our rarer species – the Brown-banded carder bumblebee *B. humilis* and Moss carder bumblebee *B. muscorum*, both of which have suffered a huge decline in distribution during the 20<sup>th</sup> century.

The mechanism for this decline is likely to be twofold. Firstly, the heatwave caused a drought, browning vegetation and reducing both the number of flowers available to bumblebees and the amount of nectar to be found in the remaining flowers, so reducing the amount of food present for bumblebees to feed on, and less food means fewer bees. Secondly, bumblebees struggle to fly when the air temperature is too high – they overheat very quickly because of the amount of heat that their wing muscles generate during flight. Depending on species, an air temperature of about 28-32°C seems to be the threshold above which few foraging individuals are seen. Bumblebees usually forage from dusk til dawn, so even if they are under-recorded during the hot spell (because they have to forage in the comparative cool of the early morning and late evening, while surveys generally happen more in the middle part of the day), it is still indicative of a reduction in foraging time, with concomitant reductions in the quantity of food foraged and the number of larvae able to be fed.



Some species did seem to thrive in the heat – or at least, survive it better than others. The Bilberry bumblebee *B. monticola* followed its June peak with an above-average count in July, while the Ruderal bumblebee *B. ruderatus* was recorded in high numbers in June, July and August. Shrill Carder bumblebees *B. sylvarum* peaked in July, earlier than the usual August peak and with around twice as many reported per KM walked, though numbers were below-average in September and October, suggesting a shorter season for the species.

The Broken-belted bumblebee *B. soroeensis* – our latest-nesting species – saw high numbers in July and September, with average numbers in August. This species is mostly recorded in Scotland for the BeeWalk network, so may not have experienced the same extreme temperatures as did species found further south.

September and October stayed mild as we had the third-warmest autumn on record, with several species flying later than usual in the absence of frosts. In particular, good numbers of Common Carder were being reported right up to the end of October.

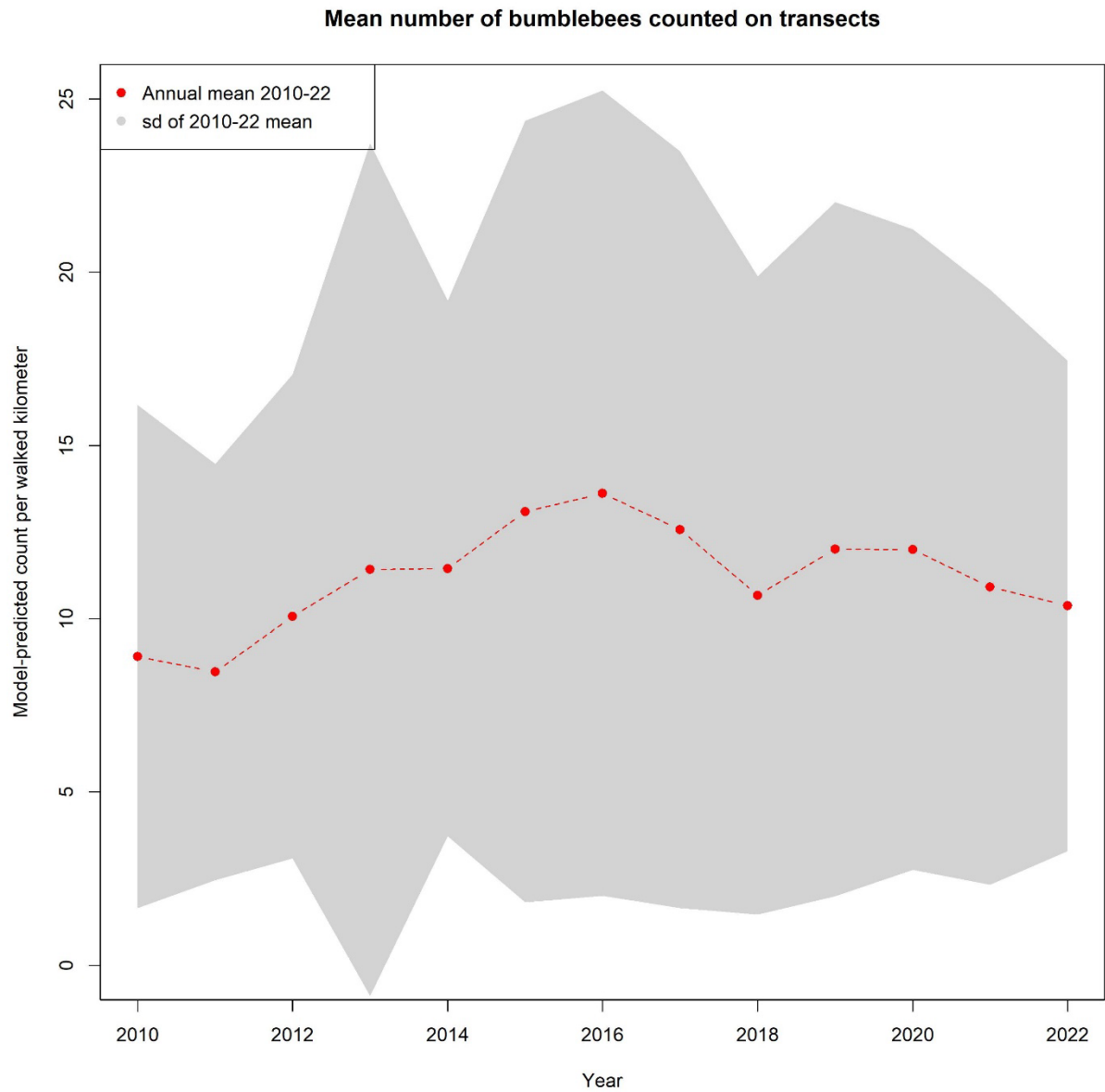
## Long-term trends

Overall then, this was a year of contrasts. Many of the rarer bumblebee species have a preference for warmer conditions, and several of these showed an increase in the long-term time series analysis. The Ruderal bumblebee *B. ruderatus* and Shrill carder bumblebee *B. sylvarum* are warmth-loving species which both showed large increases in 2022 compared to previous years, despite flying relatively late,

while the Brown-banded carder bumblebee *B. humilis* showed a smaller increase. The Ruderal bumblebee *B. ruderatus* actually had its best year on record in BeeWalk, while the Shrill carder's *B. sylvarum* year was only bettered by 2018, 2019, and 2020 – all of which had summers which also had heatwaves, but of a shorter duration, possibly suggesting that drought became more of a limiting factor during 2022.

The Early bumblebee *B. pratorum* also showed a reasonable increase over 2021 numbers, but overall was close to the long-term average, probably because although the species did not seem to be affected by the heatwave, the cool spring period is likely to have restricted numbers. Similarly, the Garden and Red-tailed bumblebees *B. hortorum* & *B. lapidarius* both increased somewhat from a poor 2021, but only returning towards the long-term average.

Several other species – including some of our most widespread and abundant bumblebees – had a poor year compared to the long-term averages. The two most abundant species in the BeeWalk dataset are the Common carder bumblebee and Buff-tailed bumblebee *B. pascuorum* and *B. terrestris*, and both showed a downturn in 2022 compared to 2021, although neither were far from their long-term averages. The White-tailed bumblebee complex *B. lucorum* agg. had its worst year in BeeWalk, although analysis of this species is complicated by confusion between the three species which make up the aggregate (*B. magnus*, *B. cryptarum*, and *B. lucorum sensu stricto*), as well as with workers of Buff-tailed bumblebee *B. terrestris*.



The abundance trend of all bumblebees recorded on BeeWalk transects, 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)



## Research and collaborations – how BeeWalk data is used

BeeWalk was established with the aims of collecting abundance and distribution data on all Britain's bumblebee species and using this data as widely as possible (particularly to analyse population trends). The Trust carry out some of this research in-house, but also collaborate widely with other researchers on shared projects. The BeeWalk dataset has grown over the past decade into one of the largest bumblebee datasets in the world. Because it includes abundance as well as distribution, it can be used for estimation of population trends, as well as range change analysis. This lets us see what's happening with bumblebee populations now, or over the past few years, much more clearly than looking at range changes over the same period. This means that BeeWalk can function as an early warning for bumblebee declines, detecting declines in the abundance of populations, before the species is lost from large enough areas that declines can be seen in their inhabited range sizes.

The data are made widely available: once it's cleaned, validated, and verified, the dataset is added to the online data-sharing platform Figshare, where it is available for anyone to use as the scheme is credited as the source. The dataset is also added to the National Biodiversity Network (NBN) Atlas and the Global Biodiversity Information Facility (GBIF), where they are displayed alongside similar data from other sources.

### BeeWalk data use

Over the past year the BeeWalk dataset has been downloaded 2,923 times from the NBN Atlas and GBIF data-sharing platforms. It has been used worldwide for a range of purposes, principally research, and these downloads have been cited in 52 research papers so far. As well as this general use, the data has been key in the following:

- BeeWalk Annual Report population analysis.
- Whitehorn, P.R., *et al.* (2022). [\*The effects of climate and land use on British bumblebees: Findings from a decade of citizen-science observations.\*](#) Journal of Applied Ecology.
- The Office for National Statistics. [\*Extent and Condition of Natural Capital\*](#) publications.
- Monitoring of multiple conservation sites across Britain, by a variety of environmental organisations, including Wildfowl and Wetlands Trust, RSPB, National Trust and numerous local Wildlife Trusts.

- Included as part of a measure of wildlife abundance for monitoring the progress of the Environment Act (2021).
- Flower visitation data included in the [Database of Pollinator Interactions](#) (University of Sussex)

### Ongoing collaborations

The BeeWalk Team collaborate with a wide range of colleagues both inside and outside the Trust. Internally, the data guides our strategic planning – which species should we be prioritising? – while our external collaborations tend to focus on extracting more information from the dataset. In particular we have a long-running collaboration with the Durrell Institute for Conservation and Ecology to develop better methods of modelling the dataset.

### In-progress PhDs

This work currently includes two PhD students at the University of Cambridge who are using the BeeWalk dataset: Sofia Dartnell, to examine how bumblebees use the landscape and interactions between social and cuckoo bumblebees, and Nynke Blömer, examining the interplay between bumblebees and honeybees.

## UK Pollinator Monitoring Scheme (PoMS)



PoMS was set up in 2017 to generate systematic data on the abundance of bees, hoverflies and other flower visiting insects at a national scale, the first of its kind.

The Trust continues to supply BeeWalk data to PoMS as part of an analysis project which aims to pull together all the data that is currently collected separately and thus get a better picture of pollinators as a whole.

There are several ways to get involved;

### FIT Counts (Flower-Insect Timed Counts)

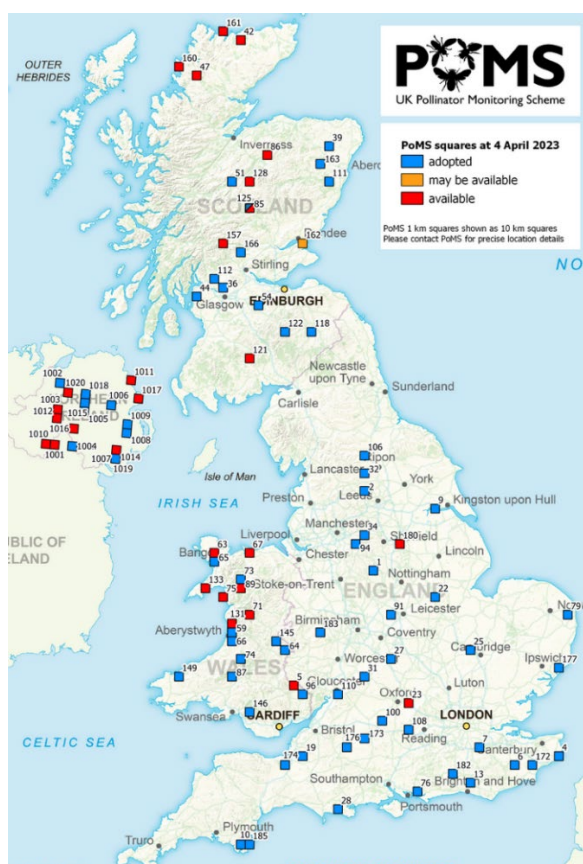
FIT counts involve watching a small patch of flowers (from the PoMS species list) for 10 minutes and recording the insects that visit the

flowers themselves, identifying them to broad groups (butterfly, beetle, bumblebee, etc.)

### 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 and pan trapping to get a full understanding of the pollinator species present.

For full details of how to join in with either survey, please visit: <https://ukpoms.org.uk/>. The National Pollinator Monitoring Scheme is funded by JNCC and the UK, Northern Irish, Welsh & Scottish Governments.

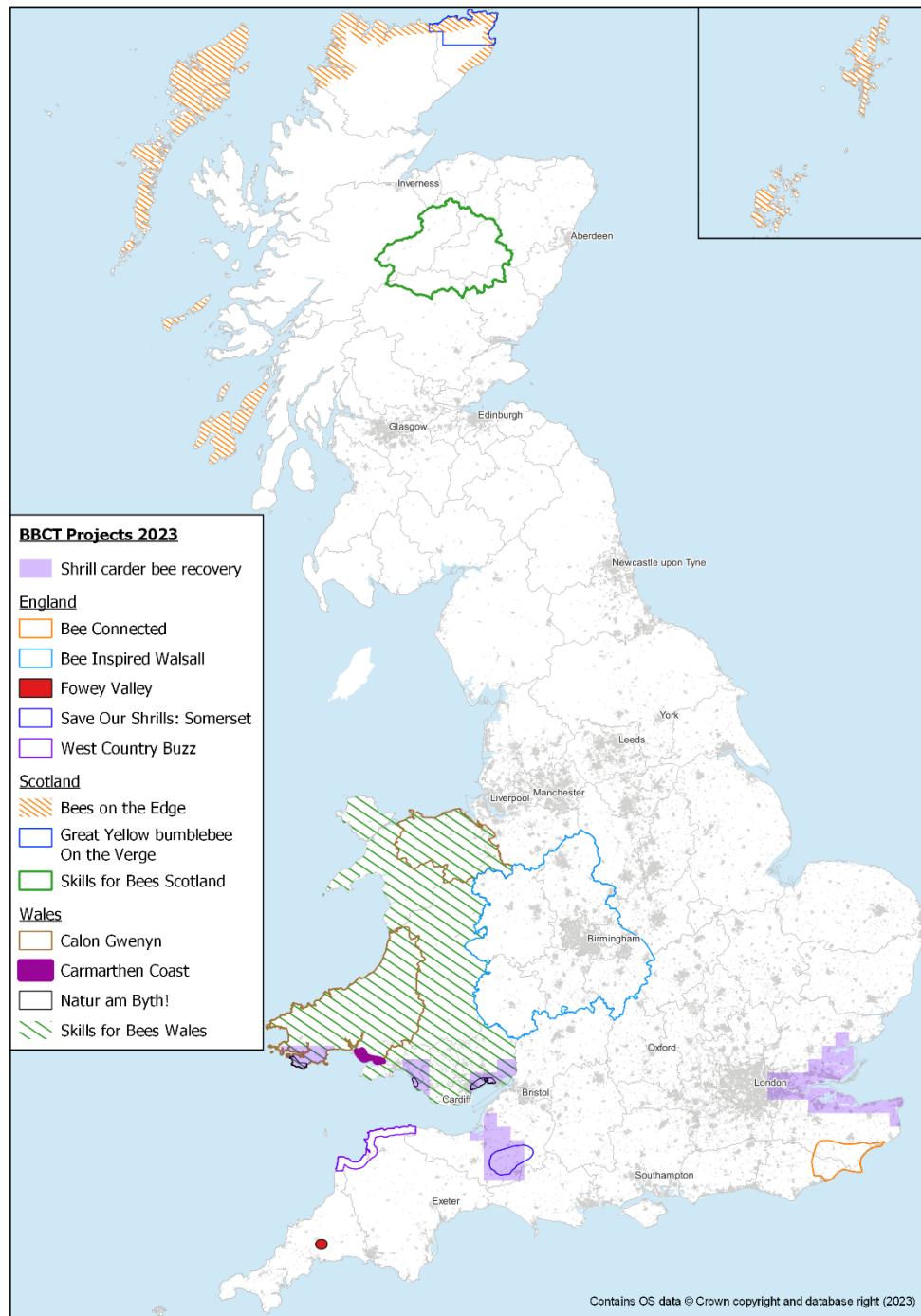


Map of the network of PoMS 1km squares – red are available for adoption



## Our projects

The Trust have a range of conservation and science projects across Britain, and monitoring bumblebees using BeeWalk is built into every one of them. Please have a look at the Projects page on the main Trust website for more details, at <https://www.bumblebeeconservation.org/our-projects/>.



Bumblebee Conservation Trust local project locations, 2023 (some subject to funding).

## Skills for Bees

Our Skills for Bees projects continue in Wales and Scotland, working to increase bumblebee recording, both BeeWalk and ad hoc, through training and mentoring in under recorded areas. Both projects offer a range of virtual and field-based sessions within their target areas, open to all, whilst working with local landowners and partner organisations to increase BeeWalk transects.

**Skills for Bees: Scotland**, focusing on the Cairngorms in the Scottish Highlands, is now in its second year continuing to build and support a network of new bumblebee recorders and BeeWalk transects. With a greater focus on the western and southern areas of the National Park this year Project Officer Annie Ives hope to continue to grow the BeeWalk network in the area.



Annie Ives leading a Moss carder bee survey day at Glenbeg, Granton-on-Spey (Photo © Annie Ives)

The project also includes target survey days to look for some of rare species associated with the area. These include the Bilberry, Broken-belted, and Moss Carder bumblebees (*Bombus monticola*, *B. soroensis*, & *B. muscorum* respectively).

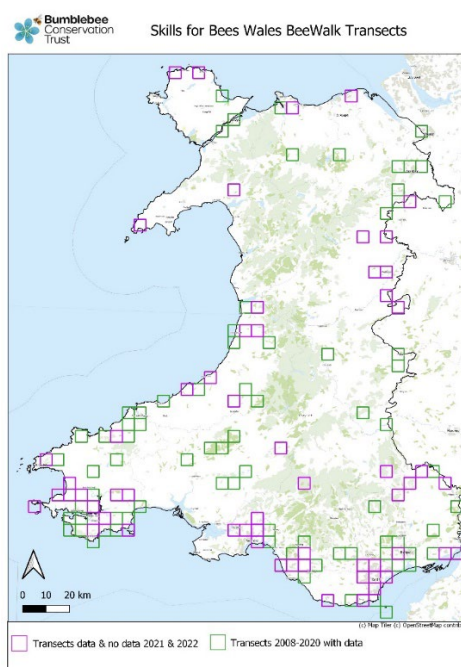
If you are within the Cairngorms and would like to help monitor bumblebees as part of a small group rota on new transects please email [annie.ives@bumblebeeconservation.org](mailto:annie.ives@bumblebeeconservation.org)

Project webpage

<https://www.bumblebeeconservation.org/skills-for-bees-scotland/>

**Skills for Bees: Cymru**, covering the whole of Wales, is now in its final year. Continuing to reach under recorded areas across the country, the project is focusing on Snowdonia, Carmarthenshire and the Vale of Glamorgan for its final field season. The project continues to offer in person and online bumblebee ID and survey training, reaching new bumblebee recorders whilst supporting and upskilling current BeeWalkers.

Since the beginning of the project 56 new transects have been established across Wales.



BeeWalk transect increase across Wales (purple squares indicate transects established in 2021 and 2022).

There is still time to get involved if you are within one of this year's target areas. See the project page for more information and to get in touch.

Project webpage

<https://www.bumblebeeconservation.org/skills-for-bees-cymru/>

**Bee Connected** is a landscape scale restoration project, based on the South Kent and East Sussex coast, built on the legacy of the Short-haired bumblebee reintroduction project. A large part of the project is maintaining the skill of a group of core volunteers, and training up new volunteers who undertake a huge number of BeeWalk surveys (as well as bumblebee “blitz” recording days) to monitor the impacts of the project’s habitat restoration. Project Manager Nikki Gammans and her team are currently working on developing a new range of identification support materials, which will benefit all our BeeWalkers.

Project webpage

<https://www.bumblebeeconservation.org/bee-connected/>

### Species (bees) on the Edge

Working across Scotland’s coastal and island landscape, this project led by NatureScot through the Rethink Nature partnership, is working to safeguard the future of 37 threatened species associated with coastal habitats in northern Scotland, including the Great Yellow bumblebee (*B. distinguendus*) the island form of Moss carder bee (*B. muscorum agricolae*) and the Northern Colletes mining bee (*Colletes floralis*).



Island form of Moss carder bee *B. muscorum agricolae* (photo © Richard Comont)

The Trust is leading on delivery of the project in the Outer Hebrides, recruiting and training volunteers and land managers to take steps to protect these vulnerable species. An extremely underrepresented area in terms of bumblebee

records and BeeWalks, we are very keen to hear from anyone within the Outer Hebrides who would like to get involved. See the project page for more details and to get in touch.

Project webpage

<https://www.bumblebeeconservation.org/partner-led-projects/species-on-the-edge/>

### West Country Buzz

Now in year 5 of the project, West Country Buzz is focused on the recovery of populations of three priority species on the North Devon coast, the Brown-banded carder bee (*B. humilis*), Moss carder bee (*B. muscorum*), and the Ruderal bumblebee (*B. ruderatus*). Survey and monitoring and habitat management advice and creation are key objectives of this project. The project is piloting an approach for a Nature Recovery Network, aiming to create, restore and link up pollinator habitats along a 5km stretch of the North Devon coast.

In person training and survey days are integral to the project, recruiting, training and upskilling bumblebee recorders in the area. If you would like to get involved please see the project page for more details and to get in touch.

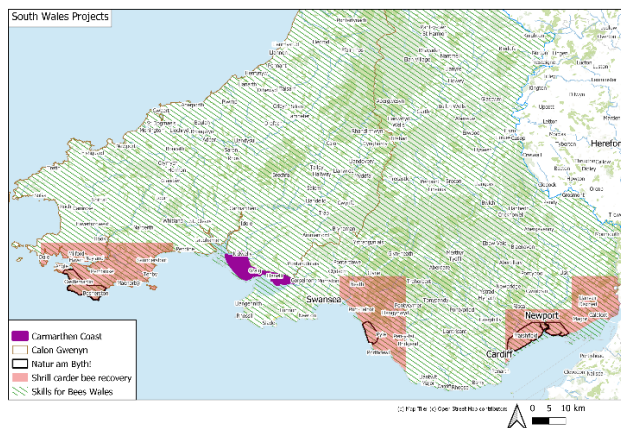
Project webpages:

<https://www.bumblebeeconservation.org/west-country-buzz/>

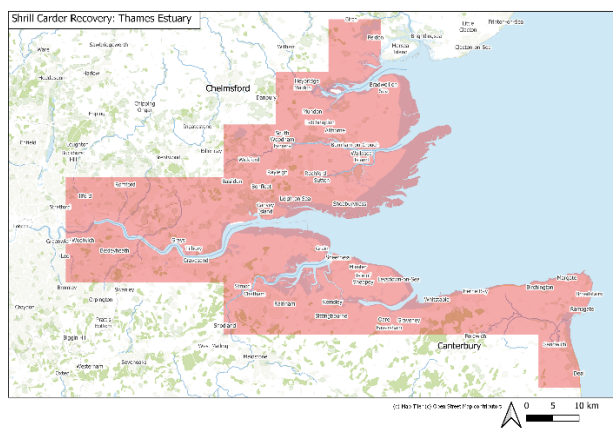
### Conservation Strategy for the Shrill carder bee and Save our Shrills Somerset (S.O.S Somerset)

The Trust is pushing forward with a Shrill carder bee (*B. sylvarum*) recovery strategy this year and the project staff are keen to work with more BeeWalkers to increase surveying and monitoring, with the aim of increasing the number and frequency of BeeWalks across Shrill carder bee population areas in England and Wales.

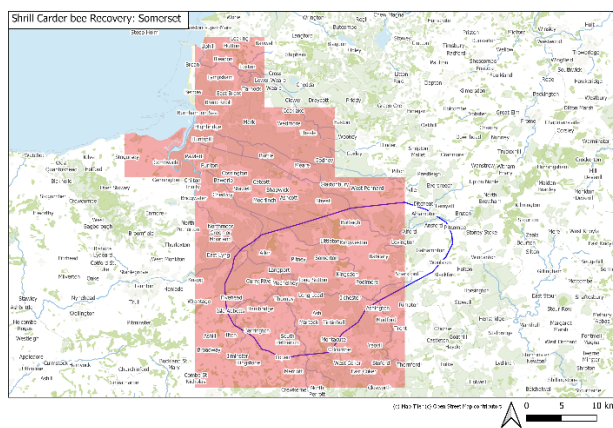




South Wales key Shril carder bee areas



Thames key Shril carder bee areas



Somerset key Shril carder bee areas

A number of events are planned across all these areas over the course of the summer, running bumblebee blitz events in key sites, and survey days to test our new survey methods for Shril carder bees.

If you are interested in attending any of these events, or simply want to keep up to date on Shril carder bee conservation in the UK then please subscribe to our e-newsletter using the following form:

<https://forms.office.com/e/OGrvLSEJvz>

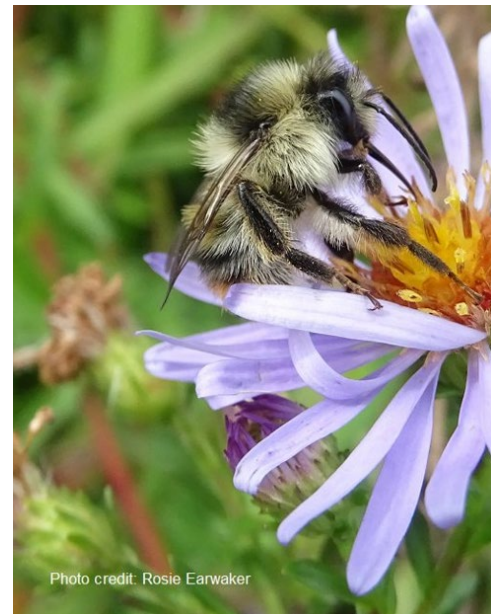
We are particularly keen to recruit BeeWalkers in South Somerset; to get involved in Somerset please email

[io.chesworth@bumblebeeconservation.org](mailto:io.chesworth@bumblebeeconservation.org)

Project webpages:

<https://www.bumblebeeconservation.org/sos-save-our-shrills-somerset/>

<https://www.bumblebeeconservation.org/a-conservation-strategy-for-the-shril-carder-bee/>



Shril carder bee *B. sylvarum* (photo © Rosie Earwaker)





Field cuckoo bee *B. campestris* (photo © Nick Owens)

This report should be cited as Comont, R., S., & Dickinson, H. (2023). BeeWalk Annual Report 2023. Bumblebee Conservation Trust.

It can be downloaded from [www.bumblebeeconservation.org](http://www.bumblebeeconservation.org) and further information can be found on the BeeWalk website, [www.beewalk.org.uk](http://www.beewalk.org.uk).

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The Bumblebee Conservation Trust is a registered charity (England & Wales 1115634 / Scotland SC042830). Company registration number 05618710 (England and Wales). 06.23. BBCT227.

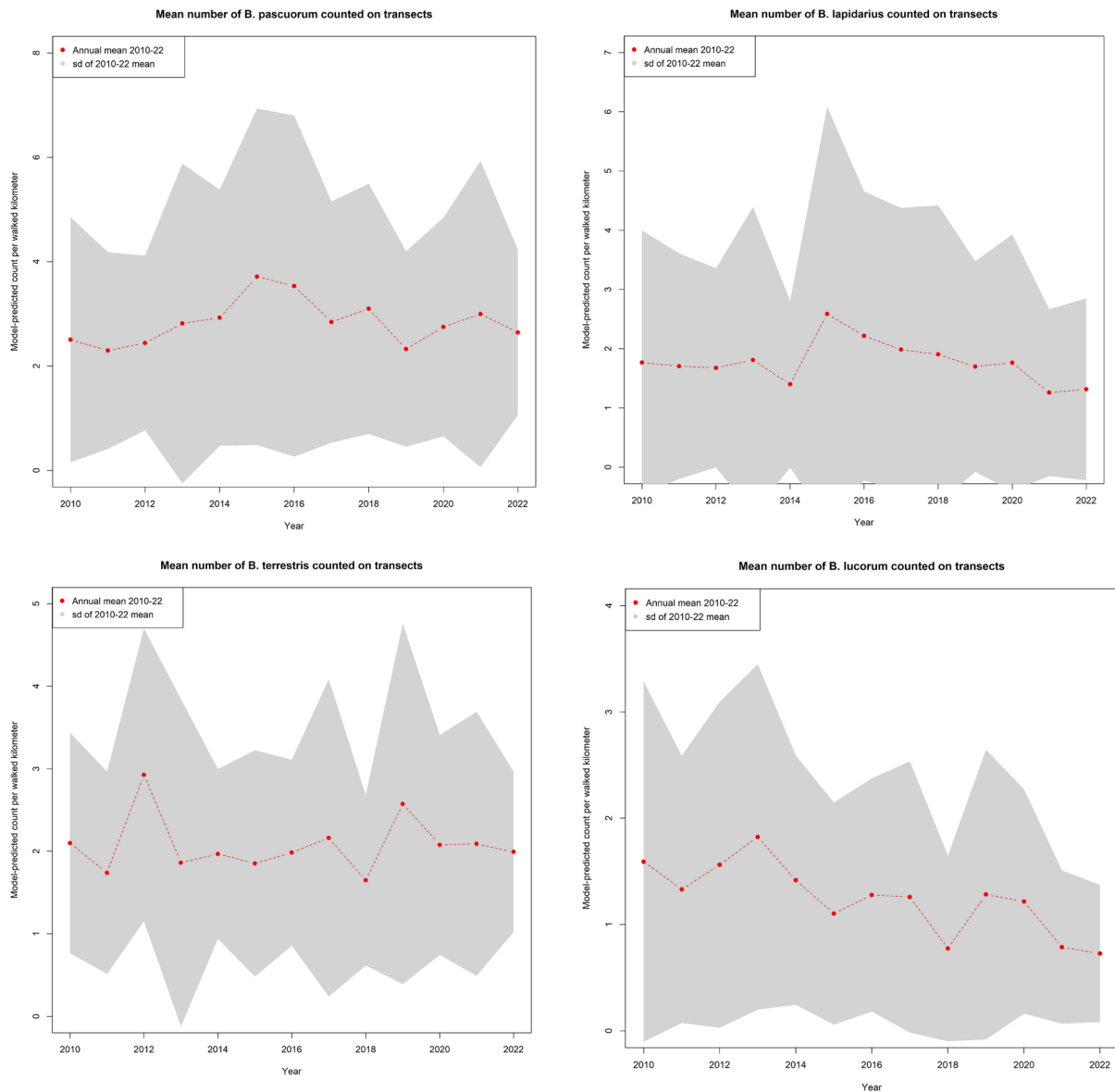
**Correspondence address:** Bumblebee Conservation Trust, Beta Centre, Stirling University Innovation Park, Stirling, FK9 4NF

**Registered address:** International House, 109-111 Fulham Palace Road, London, W6 8JA.

# Appendix

## Abundance trends

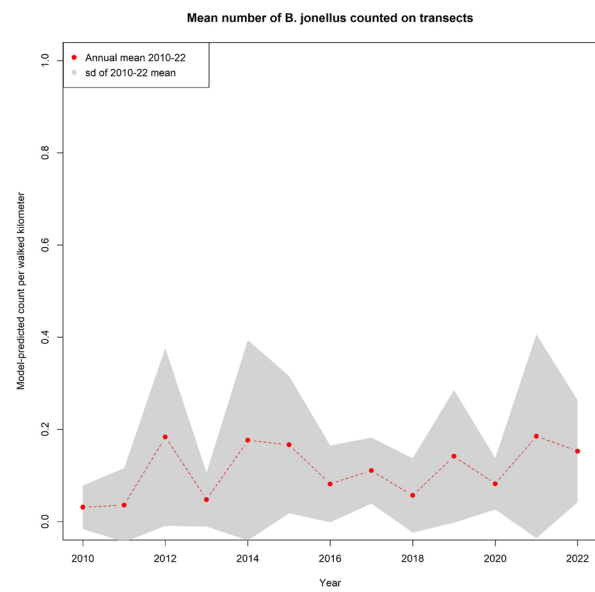
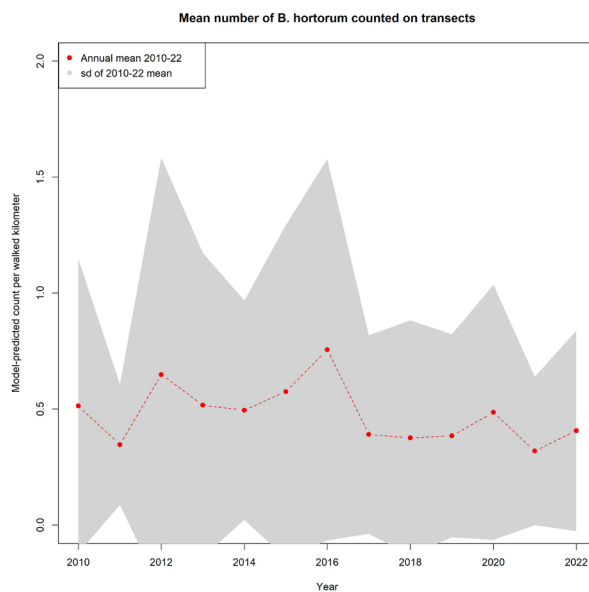
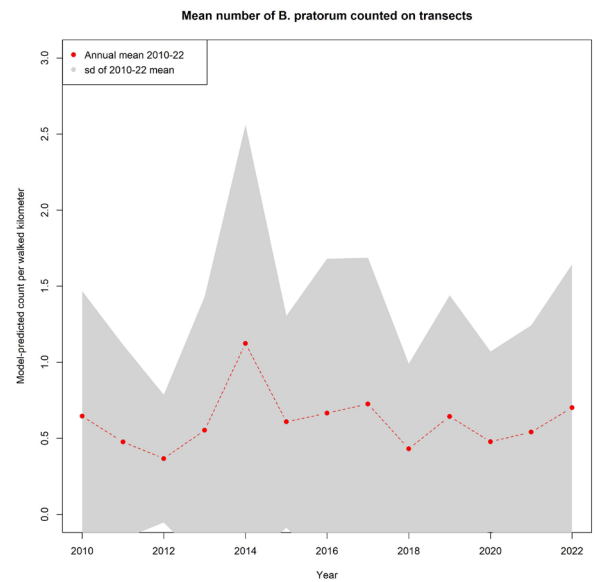
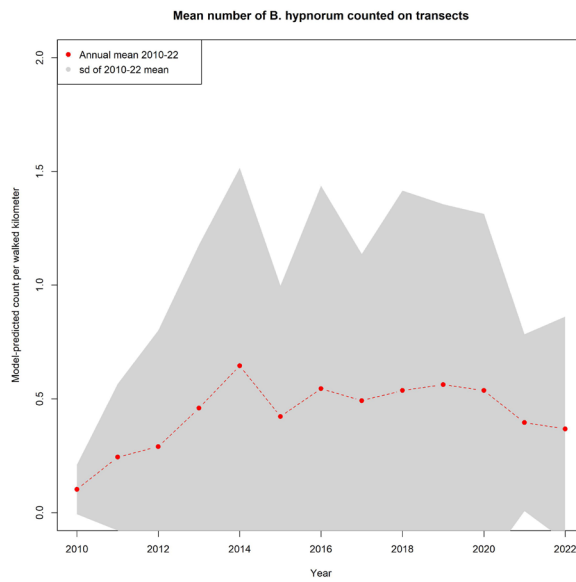
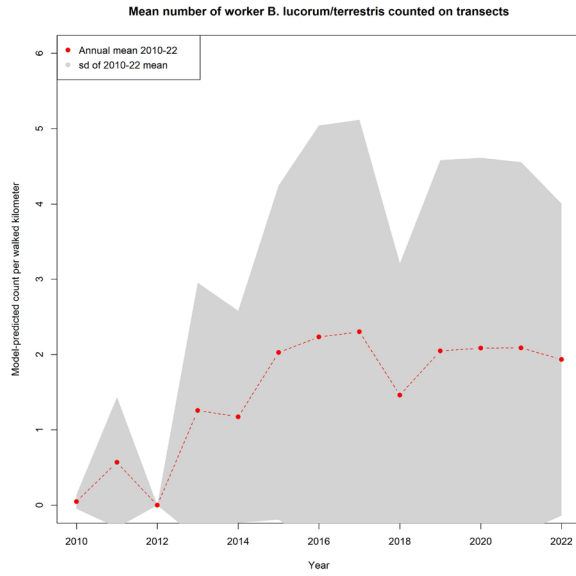
### Widespread bumblebees



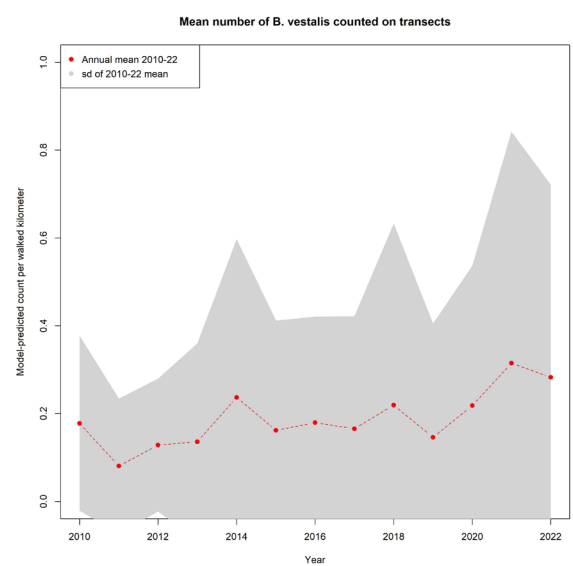
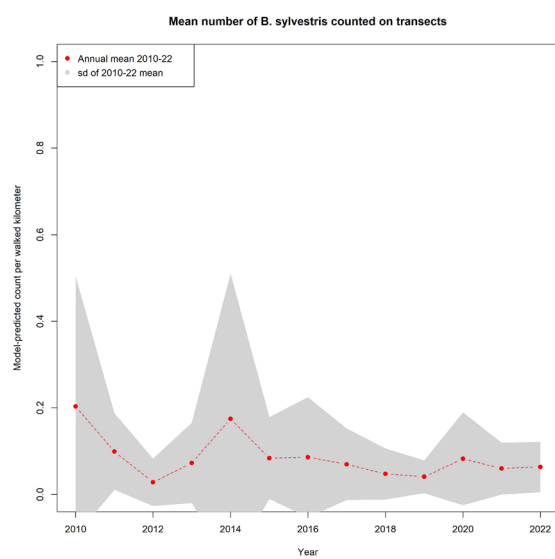
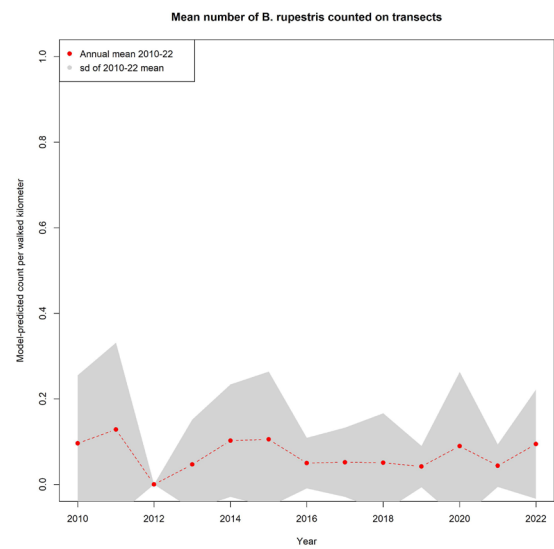
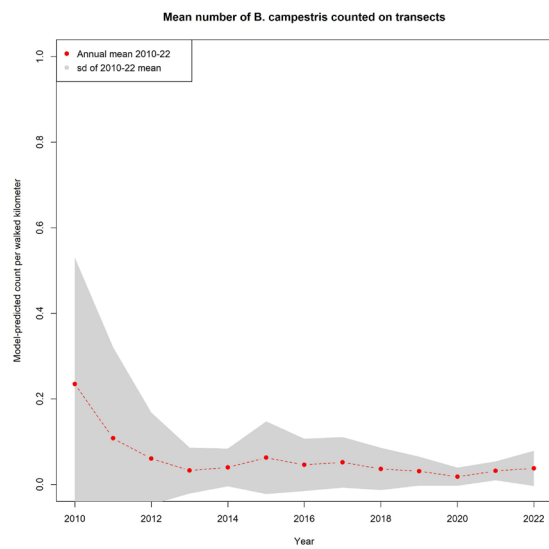
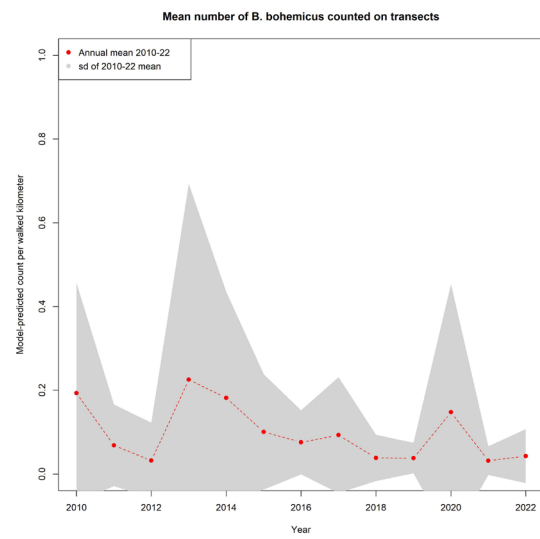
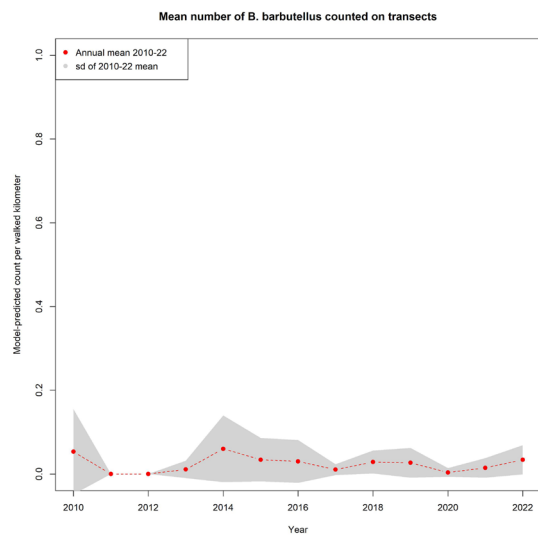
Per-year abundance trends for British bumblebee species 2010-22, shown as the mean number of bumblebees of that species counted per kilometre walked each year on transects where the species has ever been recorded (red line). The grey cloud is a measure of variability (standard deviation).

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.

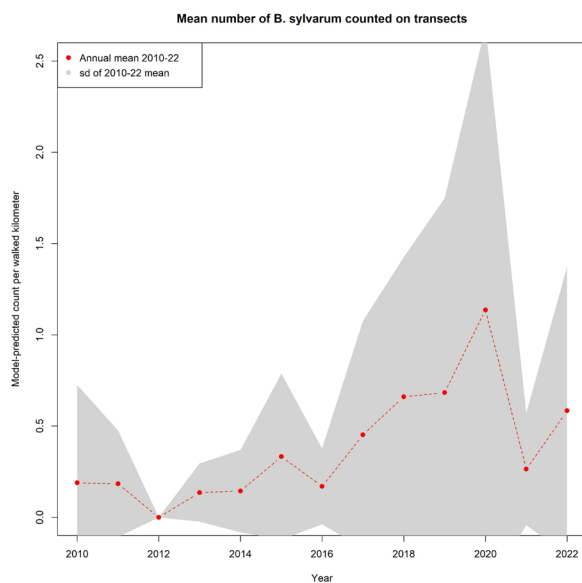
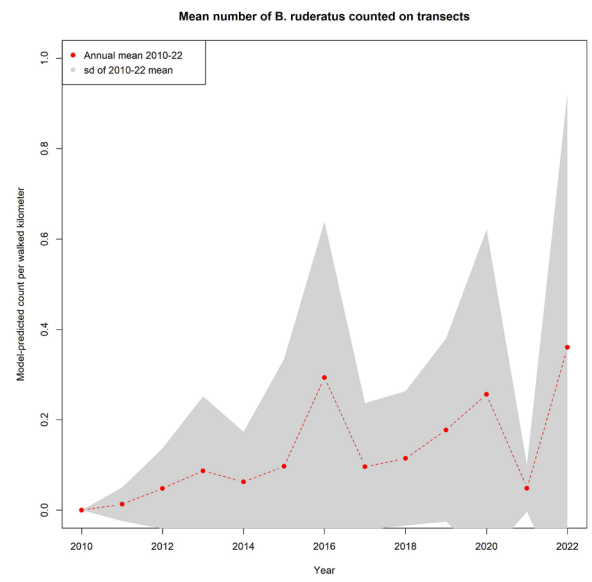
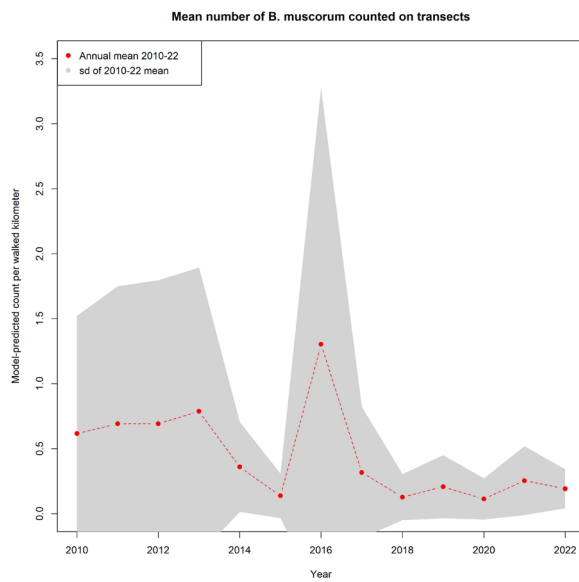
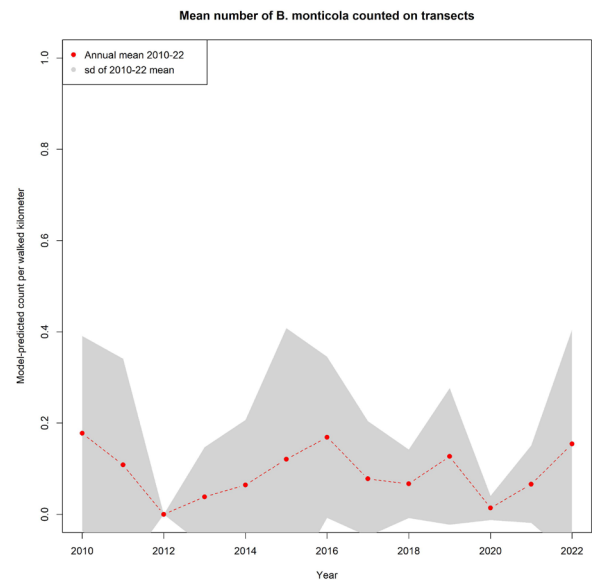
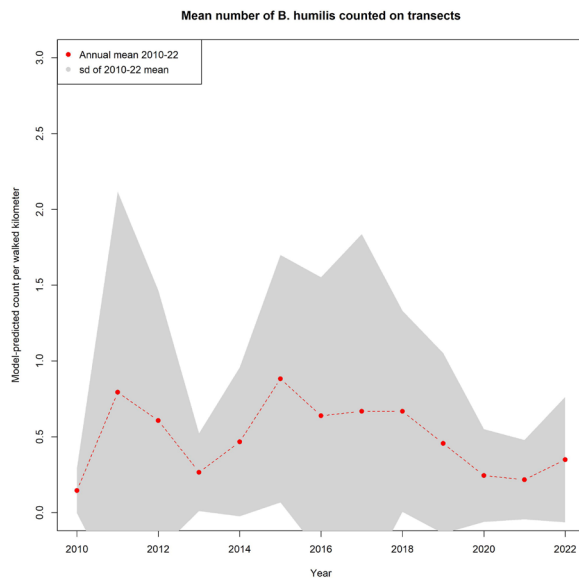


## Cuckoo bumblebees



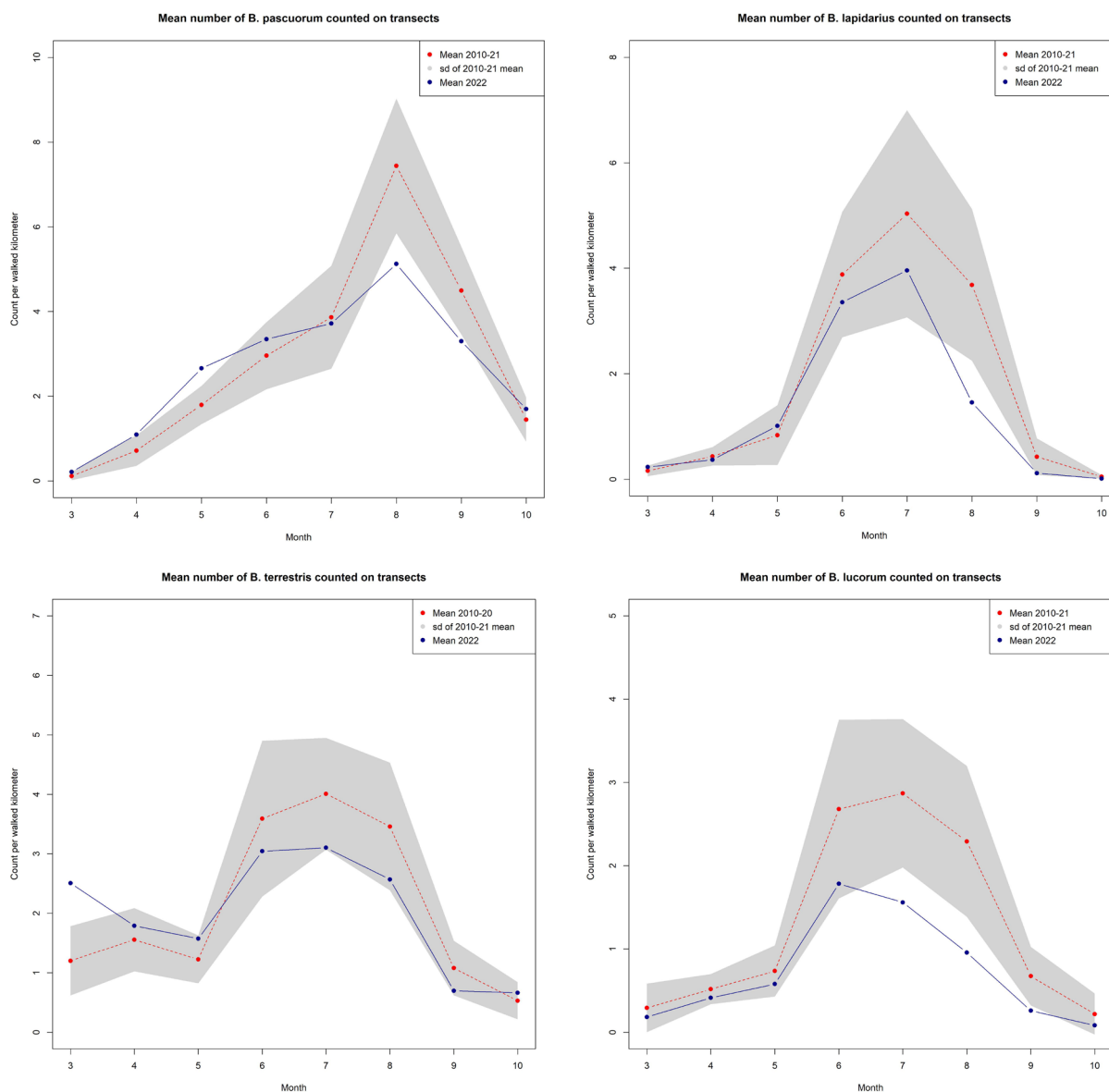


## Conservation priority bumblebee species



# Phenology trends

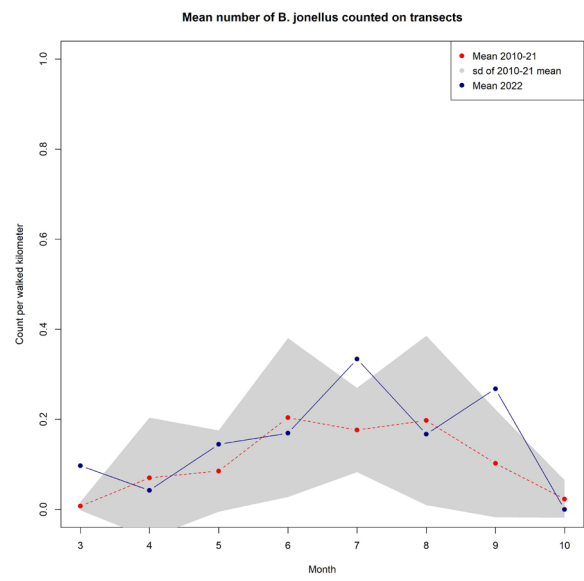
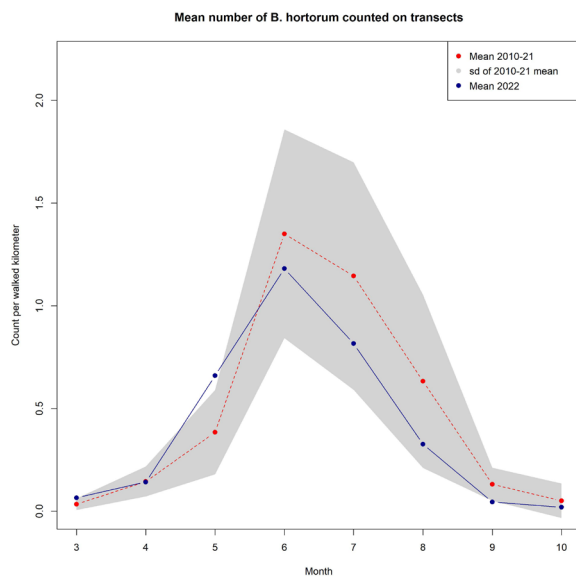
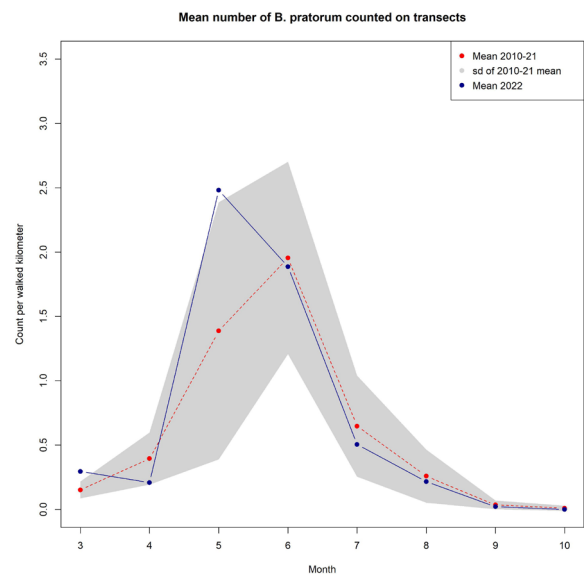
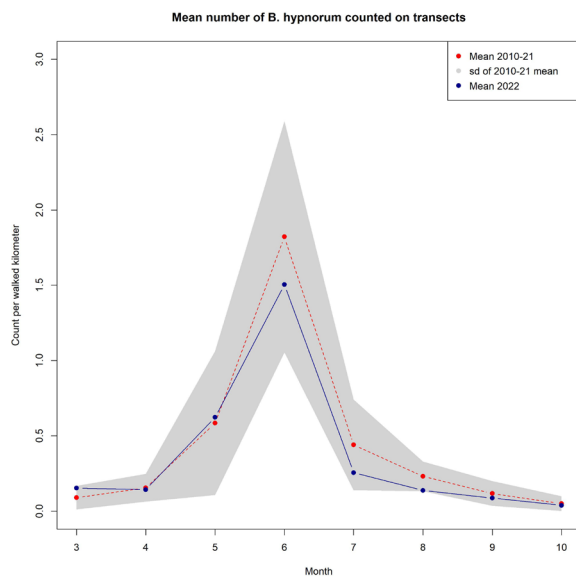
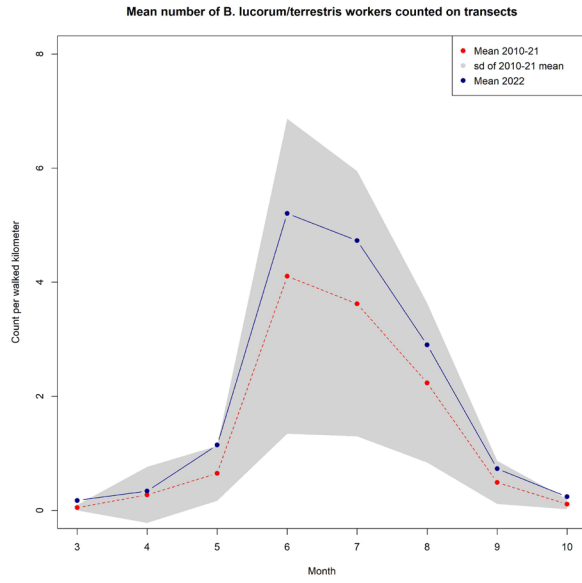
## Widespread bumblebee species



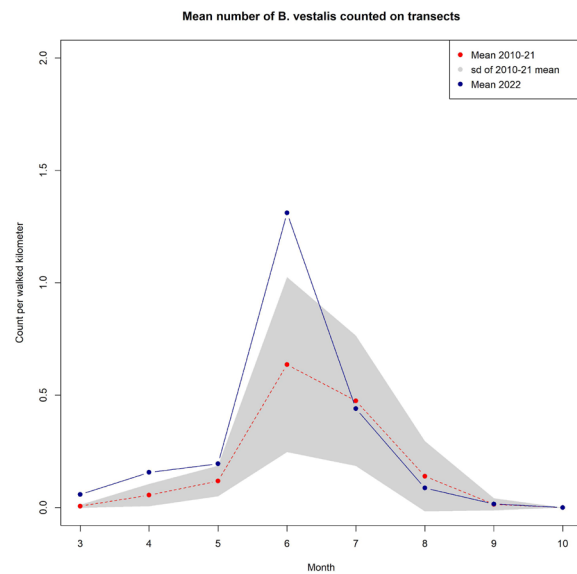
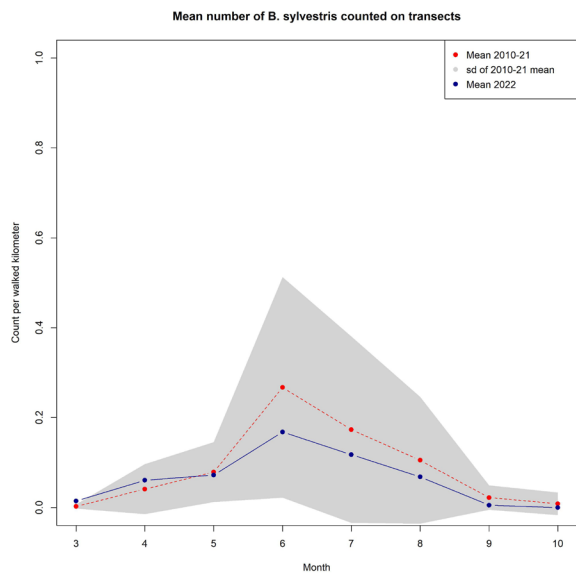
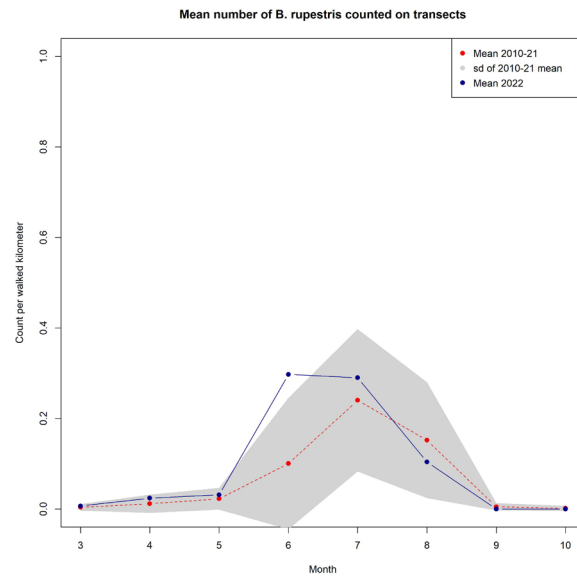
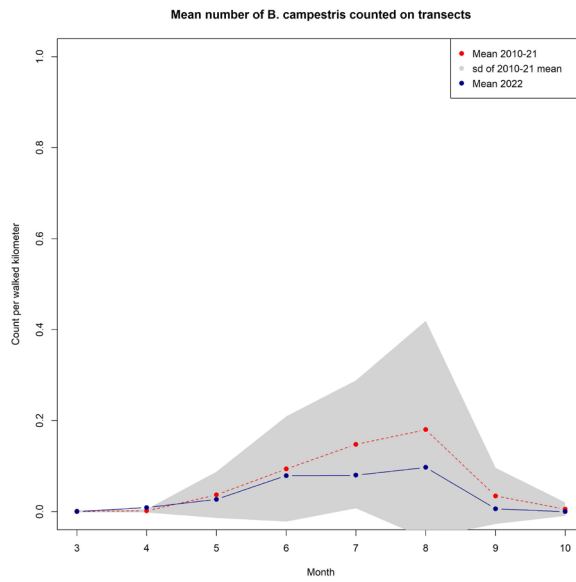
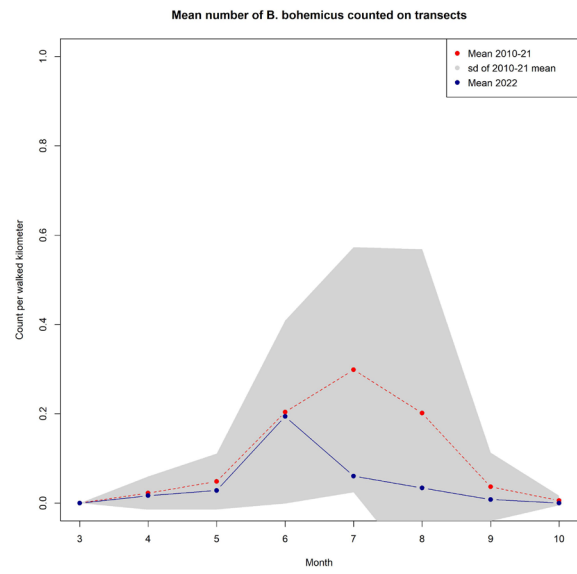
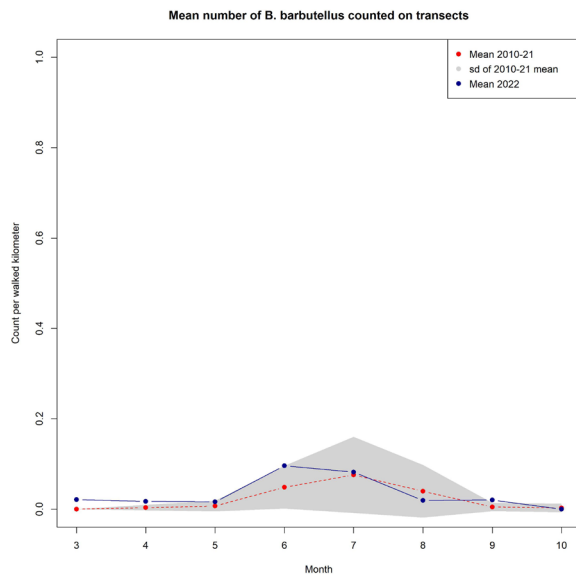
Bumblebee phenology, shown as the mean number of bumblebees per kilometre per month between March and October 2022 (blue line), plotted against the average monthly abundance for the nine-year period 2010-21 (red line). The grey cloud indicates the variability of the 2010-21 average (standard deviation).

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.



## Cuckoo bumblebees





## Conservation priority bumblebee species

