

Cumbria Bumblebee Atlas

An Atlas and conservation guide Edited by: Ben Hargreaves and Moustafa Eweda



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Introduction

Ben Hargreaves

Historical bumblebee recording in Cumbria

Stephen Hewitt

Species Accounts

Vivian Russell, Amelia Bennett-Margrave, Ryan Clark, Phoebe Ney,
Alex Playford, Charlotte Rankin, and Carolyn Postlethwaite



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Preface

The “Get Cumbria Buzzing” project is funded by the National Lottery Heritage Fund, and is a multi-partnership project. The aims of the project are far ranging but include key objectives to: Identify priority habitat fragmentation areas in Cumbria, carry out a range of outreach and education activities, carry out a range of habitat management, creation and restoration and – crucially, in the context of this publication – to clarify the status and distribution of bumblebees in the county through training, systematic surveys and transects (with subsequent records providing a “state of the moment” overview with comparison to historical data and relevant changes in land use and management - regionally and nationally). To this end, the project has here produced an Atlas of Bumblebees for the county, for which the main aim is to represent all recorded species in Cumbria and their distribution - based on records. As such, this includes the 20-21 extant species – those with recent or relatively recent records – and the two historically present but presumed (almost certainly) extinct species. The species accounts – following the introduction – will describe the species (general morphology and distinguishing features) and detail biology and ecology (life cycle and associated habitats). The status, distribution and future outlook of the species has been thoroughly researched and will be reviewed.

Acknowledgements

The “Get Cumbria Buzzing” project would like to express sincere thanks to the authors of the species accounts: Vivian Russell, Ryan Clark, Alex Playford, Charlotte Rankin, Phoebe Ney, Amelia Bennett-Margrave and Carolyn Postlethwaite - all of whom worked tremendously hard in producing highly accurate and informative accounts of the species involved. Additional thanks to Vivian for proofing the introductory sections. El-Moustafa Eweda from CBDC has worked tirelessly and thoroughly to collate records, produce maps and charts, check accounts and liaise generally with all involved. Many thanks to Steven Falk for permission to use his images of some of the species which we did not have access to - and for records and advice. Also, deepest thanks to Matt Miles and Blooms for Bees for permission to use the bee artworks.

Many thanks to Mike Edwards, Stuart Roberts, Matt Smith and all involved at BWARS (Bees, Wasps and Ants Recording Society) for advice and information on many of the species involved and for suggested literature sources. And of course – last and by no means least – many thanks to all the recorders of bumblebees in Cumbria, past and present. The great efforts of many past and present entomologists and natural history enthusiasts has provided a comprehensive overview of the historical status of bumblebees in Cumbria, despite considerable challenges presented by the size and terrain of the county, taxonomic difficulties and the simple fact that - historically at least - many entomologists did not tackle bumblebees with any enthusiasm (the reasons for which will be discussed in the next section). In the north of Cumbria, George B. Routledge and Frank H. Day provided a baseline of early records, with additional records from Harry Britten (who went on to become a very well-known entomologist and Curator of Entomology at Manchester Museum), and James Murray. In the south, James Davis Ward was a source of accurate records around Grange and Albert Edward Wright covered the same area with considerable effort until 1950.

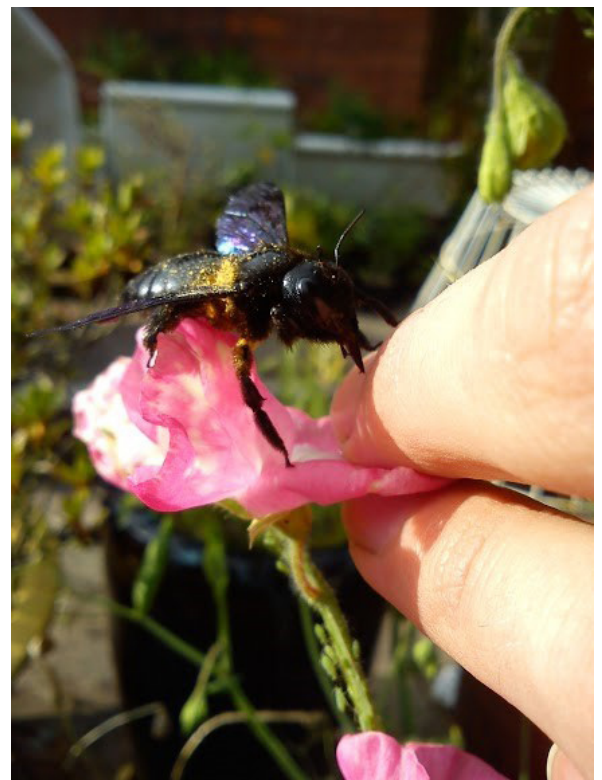
The late, great, Neil Robinson was an aculeate specialist and not only recorded avidly and widely but also summarised the status and distribution of bumblebees (in addition to all aculeate bees, wasps and ants) in his “List of the bees, wasps and ants of Cumbria. Records to the year 2005”, which was – effectively – a Checklist / Atlas hybrid, such was the detail of aculeate species described. In more modern times, Stephen Hewitt (previously, Keeper of Natural Sciences at Tullie House Museum) and Michael Archer must be commended for continued recording of bumblebees as resident and visiting entomologists respectively. Vivian Russell, Jane Orgee, Carolyn Postlethwaite, Charlotte Rankin, Tanya St. Pierre, Nick Franklin and Ryan Clark have – in addition to working directly on this project – provided a huge number of records which has greatly increased and clarified the known status and distribution of bumblebees in Cumbria to the present day. Also, a great thanks to many colleagues from Lancashire WT and Cumbria WT (plus affiliated folk) who have kindly granted permission to use several photos throughout the Atlas.

What are Bumblebees?

Bumblebees – as the common name encompassing all species of the *Bombus* genus – are some of the most familiar bees to entomologists, naturalists and people alike. That said – and although many species are readily identified when they conform to the typical, commonly occurring forms / types – some bumblebees are exceptionally variable in colour. It is notable that many of the early entomologists - of considerable standing and including dedicated Hymenopterist's - found this variability and a lack of easily distinguished structural features as a real barrier to bumblebee identification, with some avoiding identification of them altogether and with frequent errors made by those that tackled them. It is worth bearing in mind that most bumblebee identification / determination historically was undertaken using collected specimens and was not always easy or accurate. Despite modern advances in photography and validation of certain “hair characters” – this still remains the case! Edward Saunders (the country's leading Hymenopterist in the Victorian and Edwardian Period) was prompted to state ^[1] “*The species of Bombus are exceedingly difficult to distinguish apart, the colour of the pubescence varies so greatly in different specimens of some species that it is wise to rely only on structure as a character in the discrimination of species; these characters are often very obscure, and difficult to appreciate. There are several species which, as a rule, are quite easy to recognise, but of which rare varieties occur quite unlike the typical form. The most reliable character is the form of the male genital armature (- genitalia); this will always guide one rightly, but in the absence of the male it is sometimes impossible to say for certain what a queen or worker is*”. Similarly, John Curtis – at an earlier date ^[2] – stated “*Perhaps no genus presents more difficulties in determining the species than Bombus; there are males, females and neuters (workers) of two sizes, and the hairs with which they are clothed vary in colour with age; it is therefore only by examining their nests that the species can be ascertained, and perhaps not then with constant or unerring success*”. Without due caution (and experience) - anyone that states identification of these supposedly “easy” or more approachable of the insect fauna must be assured that this is simply not the case in many instances.

It is worth noting that both *Bombus terrestris* Buff-tailed Bumblebee and the *Bombus lucorum* agg. white-tailed bumblebee complex / aggregate were regarded as one and the same species historically (and are still v. difficult / impossible to distinguish visually in mainland Europe), whilst some (now) well defined species such as *Bombus bohemicus* Gypsy Cuckoo Bee and *Bombus vestalis* Vestal Cuckoo Bee were not separated until 1912. The bald - quite sad - truth is that identification of the UK fauna is simplified to an extent by our rather limited (and declining) range of species; identification of bumblebees in other parts of Europe and Asia is much more difficult and specialised and – correspondingly - there are few specialists in *Bombus* taxonomy, globally.

These difficulties aside, it has been often remarked that when children are asked to draw a bee – or specifically, a Honey Bee *Apis mellifera* – they often depict a bumblebee (often – it seems - one of the larger, banded species). They are the largest resident bees in Britain excluding the occasionally reported – usually accidentally imported and not yet established – “Carpenter Bees” of the *Xylocopa* genus (example to the right – from Preston) which are solitary bees that nest in wood (hence the propensity to importation) and not remotely related to bumblebees.



Xylocopa sp., Ashton-on-Ribble (Preston), Oct, 2014,
© David Mainwaring

Bumblebee biology and life cycle

Bumblebees are members of the order Hymenoptera which covers a vast range of insects - notably all bees, wasps, ants and sawflies. The vast majority of the Hymenoptera in the northern hemisphere comprises species of what has traditionally been termed the "Parasitica" - which unites several families of entirely parasitic wasps. Excluding the parasitic wasps and Symphyta (which includes all sawflies - including the "wood wasps" and "horntails") leaves the most advanced "sub-clade" of Hymenoptera - the Aculeata (aculeate meaning stinger - from a modified ovipositor - although many aculeates cannot or have lost the ability to sting larger mammals) of which bumblebees form a comparatively, very small number.

Aculeate bees have specialised, branched hairs which are an adaptation to collecting pollen (basically, more pollen is trapped on a branched hair than a simple, unbranched one).

Bumblebees are particularly hairy bees and are particularly well adapted to an existence in colder climates. Of the 250 species currently known and classified, most are found at higher latitudes and/or altitudes in the Northern Hemisphere and are most abundant in temperate parts of Europe, North America and Asia. They also naturally occur within the Arctic Circle, the Mediterranean (including the northern fringe of Africa - though absent otherwise) and South America and although they are virtually absent from the tropics, a few species are found in countries with truly tropical climates e.g. Brazil. Bumblebees are not indigenous to Australasia, though three species from Britain were introduced "successfully" to New Zealand in 1885 (principally for clover pollination) and more recently, Tasmania. "Successful" introductions have also been made to parts of the United States and Mexico, where the species in question was not resident originally in the Nearctic.

The most notorious / controversial introduced species is our familiar Buff-tailed Bumblebee (*Bombus terrestris*), which has been widely introduced in the Nearctic (both N. America and S. America), where it has spread to other areas (and other countries - in the case of S. America).

In Britain, the mainland European sub species of the Buff-tailed Bumblebee - *Bombus terrestris* ssp. *dalmatinus* (which, confusingly, has a white "tail" to the abdomen!) - has been introduced to act as a "hothouse pollinator" e.g. of tomatoes and it is highly likely that this species has escaped and inter-bred with the native UK sub species (ssp. *audax*) on occasions. In addition, bumblebees have been deliberately introduced - unsuccessfully - on other occasions and more rarely have been - presumably - accidentally introduced (e.g. White-tailed Bumblebee *Bombus lucorum* and Small Garden Bumblebee *B. hortorum* - to Iceland - the former more recently than the latter). There are many potential and positively detrimental issues to species introduction, including transfer of diseases and displacement of indigenous species.



Bumblebee nest © Vivian Russell

In addition to Honey Bees, bumblebees are the most specialised "social bees" of the Apidae family; the description of "social bees" relates to their biology and life cycle, which includes development of a colony and separation of "castes" (queens, workers and males).

Differences between workers and queens are subtle - relating to size (most obvious) and internal anatomy (ovaries) - workers can lay unfertilised (male) eggs, but cannot mate and produce females.

All female bumblebees have 12 antennal segments and 6 abdominal segments, plus the presence of a stinger / ovipositor and a (subtly) more pointed abdomen. The males have 13 antennal segments, 7 abdominal segments, a blunter abdominal tip and cannot sting – they have a genital capsule usually retracted inside the body (which – extracted and examined - is important for identification purposes). The queen (or foundress) initiates development of the colony following a period of “diapause” (dormancy) over winter in single brooded species, following the completion of the colony life cycle (with the workers and males generally dying off in autumn and winter).

However, in regularly “bivoltine” double brooded species (*Bombus pratorum* - Early Bumblebee, *Bombus jonellus* - Heath Bumblebee and *Bombus hypnorum* - Tree Bumblebee) two generations may be completed in one year. In the main winter-active species - Buff-tailed Bumblebee – queens may be produced during the active cycle of the colony in winter, which becomes almost perennial in nature. Specialisation in biology extends to the morphology in most of the bumblebees which again, in common with Honey Bees, are our only “corbiculate bees”. The Corbicula – commonly called the “pollen basket” or “pollen sac” – refers to a modification of the hind (rearmost) tibia of the leg, which in female bumblebees can hold moistened pollen.

The hind tibia is bevelled, with a small ledge at the truncate base (hairless and appearing shiny when free of pollen) and the pollen can build up to a compact ball that is quite conspicuous to the naked eye when the bee is foraging - or even in flight. This adaptation – in addition to the formation of a colony and “castes” – are the main features that distinguish bumblebees from most other wild, British species of bee.

An obvious exception to this is the parasitic “cuckoo” bumblebees, which have a different biology and morphology related to their life cycle; these bees have lost the ability to collect pollen and raise a colony themselves (without a founding host species / colony) and with such a unique biology, will be described subsequently - in the next section.



Bombus terrestris showing “pollen basket” (corbicula) on hind tibia © Vivian Russell



Bombus terrestris showing “pollen basket” (corbicula) on hind tibia © Vivian Russell

Most other wild bees are solitary, though there is development of a more limited “sociality” in one family of bees (Halictidae). However, the “halictid bees” (e.g. *Halictus rubicundus*, left) do not resemble bumblebees in other respects, being a fairly typical group of small to medium sized (much smaller than most bumblebees) “solitary bees”.

The ecology of bumblebees is varied, though to an extent there is similarity in the life cycles of related species. The classification of bumblebees can be quite complex and although it would not be especially helpful to detail the “sections” in which the British species are designated (as they contain both very different, unrelated bees and some long extinct – in the UK – species) it is more helpful to mention the various (eight) sub genera to which the extant UK species are placed within as these grouped species are more related - sharing more in terms of biology, ecology and life cycle.

Never the less, the sections to which the sub genera have traditionally been assigned to – Anodontobombus (which lack a spine or projection on the hind apex of the mid-basitarsus) and Odontobombus (which have this spine or projection – to a greater or lesser extent) - correspond to two different forms of how pollen is prepared in the nest (this is illustrated well in Alford ^[3] - a highly recommended text under general references).

Within Adonotobombus, the various species are often referred to as “pollen storers” – meaning they store their newly gathered pollen in waxen cells specifically for the purpose, or in old cocoons specifically set aside for the purpose - and there are three recorded sub genera of these in the UK. Odontobombus are “pocket or pouch makers” (three extant sub genera in the UK), with pollen deposited in wax pockets / pouches at the side of the growing larvae. Within the *Bombus* (Latreille) sub genus – which includes the three white-tailed bumblebees of the “lucorum complex” and Buff-tailed Bumblebee - the species generally initiate and complete their nest and colony in disused small mammal holes. All are relatively large, banded, short tongued and early emerging species.

The other “pollen storer” sub genera also include *Pyrobombus* (von Dalla Torre) – represented in the UK by Early, Heath, Tree and Bilberry Bumblebee *Bombus monticola*. Although these bees are quite distinct and differ in terms of their colour (hair) patterns they are very similar structurally and are short-tongued, relatively roundish, slightly “scruffy” bees – which is a result of a coat of uneven hairs (short and long hairs). Early, Heath and Tree Bumblebees show a propensity to be double brooded, producing workers – and complete colonies - rapidly and often raising two broods (and therefore two sets of reproductive castes – male and queens) in one year. In simple terms, the subsequent queen that goes into diapause (over winter) to start a new nest the following spring has been produced not by the first (foundress) queen, but by a queen of the second brood. Bilberry Bumblebee does not appear to show the same inclination to produce two broods (at least this has not been documented) and it may be that as a later emerging species, it simply does not have enough time to produce two broods in one season. Of these four species, Tree Bumblebee is an almost obligate aerial nesting species, with the greatest synanthropic tendency of bumblebees in Europe; the species often occupies aerial cavities (including disused bird-boxes, loft spaces etc) and one nest in Lancashire was found in a traffic cone that had become lodged in a hedge (D. Bentley, pers.comm.).

The remaining – extant – “pollen storer” species – Broken-banded Bumblebee *Bombus soroeensis* (*Kallobombus* sub genus) and Red-tailed Bumblebee *B. lapidarius* (*Melanobombus* sub genus) are the sole representatives of their sub genera in the UK. The scarce Broken-banded Bumblebee and the much more common and widespread Red-tailed Bumblebee both nest – often – in disused small mammal nests, although the latter tend to have larger colonies (with more workers) than the former and Red-tailed Bumblebees also nest in a wider type of location (not always subterranean and occasionally under stone). Both are single brooded species.

The only other species of “pollen storer” is the long (nationally) extinct *Bombus cullumanus* (*Cullumanobombus*), which was always very rare in England, never recorded in the north of England and has declined drastically throughout its entire European range (it is currently close to extinction). The northern (including UK) sub species was v. similar in appearance to other (extant and extinct) “mostly black, red-tailed” bumblebees and was associated with extensive, flower-rich grassland.

The extant “pocket maker” species belong to three sub genera – *Megabombus*, *Thoracobombus* and *Subterraneobombus*. *Megabombus* unites the very similar Small Garden Bumblebee and Large Garden Bumblebee – both of which are particularly long-faced bumblebees. This long face (see the species accounts) serves to house the tremendously long tongue which both species use to access long-tubed flowers. As with many bumblebee species, both often utilise small mammal holes / short burrows in the ground, though Small Garden Bumblebee will sometimes nest aerially and Large Garden Bumblebee has been observed to nest in a molehill (Else and Edwards, 2018). Both have “medium-sized” (occasionally larger) colonies with 30 – 150 workers produced.

The five extant UK “carder-bees” – all within the *Thoracobombus* sub genus – derive their common name from their habit of gathering (“carding”) vegetation e.g. moss, grass, which is used in the construction of the nest walls (often near or at the surface of the ground - i.e. not entirely subterranean). All the species but the Common Carder-bee *B. pascuorum* - Moss Carder-bee *B. muscorum*, Brown-banded Carder-bee *B. humilis* and Red-shanked Carder-bee *B. ruderarius* - are scarce and much declined species, showing an affinity (if not obligation) for the extensive, flower-rich habitats that have most severely declined in the UK as a whole. It might be said that that this group of bees have “medium-long faces”, as they are proportionally longer than the most of the other bumblebees other than those of the *Megabombus* and *Subterraneobombus* sub genera. As a result, they can access some of the longer flowers that are not accessed by the shorter tongued bumblebees but clearly, the less common species have some specific biological and or ecological / habitat requirements that are not provided throughout much of the UK. Little is known – biologically or ecologically - about the long extinct *Bombus pomorum* (known from only two records from the early 1800’s) though of the related, extant species, it most closely resembled the (related) Red-shanked Carder-bee and other black / red-tailed species.

The remaining pocket makers are represented by only one – much declined – extant UK species, the Great Yellow Bumblebee *B. distinguendus*. This distinctive species along with the very closely related - and extinct – Short-haired Bumblebee *B. subterraneus* is another species that has great demand for extensive, flower-rich habitats, often rich in legumes and including (almost exclusively in the UK, currently) coastal and Island areas in the north of Scotland, particularly with “machair” grasslands. These representatives of the *Subterraneobombus* genus (with only six other species worldwide) retracted to opposite corners of the UK over the course of the 19th and 20th centuries, though at one time the range of both species would have overlapped. They both prefer to nest underground, utilising disused small mammal holes - though sometimes nesting at shallow depth, or even at the ground surface.

It may seem over-complicated, out-dated and obscure to approach our native bumblebees within sub genera (which mostly follows that in Alford [3] – after Richards), but it is hoped that this gives some context to how related certain bees are, despite the fact that they may look very different and can include common, rare or extinct species. Some of these related species have fared differently in recent times, despite how related they are in morphology and biology. A common theme in this section has been “tongue length” and “extensive species rich grassland” and this is an important factor that will be expanded upon in the conservation of bumblebees, in the section following the next one.

Cuckoo Bumblebees

It has been mentioned that there are parasitic bumblebees – often called “Cuckoo Bumblebees” – which it is felt are sufficiently unique to be mentioned separately. Indeed, until the more recent decades the six UK species were assigned to a differently named genus – *Psithyrus*.

Psithyrus – meaning “quiet / low whispering” - derives from Ancient Greek and is apt for a group of bees that have a much lower pitched (quieter to the human ear) “buzz” in flight. This lower pitch is noticeably audible if one of these bees is netted in the field, though there are several other distinctive, visual features.

Although they are now united with the other bumblebees in the *Bombus* genus (as they are thought to have evolved from a common ancestor in the mists of time) the cuckoo bumblebees have nonetheless evolved to become completely parasitic and as a result have lost the ability to collect pollen and produce workers. This lack of ability to collect pollen means the hind leg of the female cuckoo bumblebees is very different to their hosts; the corbicula (pollen basket) is redundant and the hind tibia is convex and evenly haired (rather than concave, hairless and shiny in the middle) e.g. Red-tailed Cuckoo Bee *B. rupestris* – shown overleaf.

If it can be seen, this is a very useful diagnostic feature (in the field or from a clear photograph) – even the males have a different, more evenly haired hind tibia to the usual male bumblebees (although they lack a pollen basket, other male bumblebees do have a hind tibia which is bare and shiny, centrally). Other good clues to cuckoo bumblebees are darker wings, much thicker chitin (body surface) and a much sparser coat of hairs on the body generally – although the latter differs to an extent amongst the cuckoo species.

With experience, the cuckoo bumblebees (females in particular) can be recognised as being very different in appearance - in most cases - to the non-parasitic species, simply in how they are marked (colour / patterns of body hairs). However, the fact remains that male cuckoo bumblebees are often difficult - if not impossible - to identify with confidence in the field, with a range of colour forms found within the same species. This occurs in various species - adding to the complexity!



Bombus rupestris, (female) showing unmodified hind tibia (lacking pollen basket) © Vivian Russell

Although cuckoo bumblebees have been assigned to various sub genera previously, they are not (usually) currently split in the same fashion as the other bumblebees – or at least to the same extent. Despite this, they do have affinities to one or more species and that does “make sense” in relation to the species themselves, host species and in some cases the sub genera of multiple host species.

Two of the UK cuckoo species have only one host in the UK; Vestal Cuckoo Bee is the parasite of Buff-tailed Bumblebee and the Red-tailed Cuckoo Bee is the parasite of Red-tailed Bumblebees. Of these two, only Red-tailed Cuckoo Bee truly resembles the host species – at least in the female – being an all-black bee with a red tail and although males can be similarly coloured, they are much more variable. Of the remaining species, it is known that at least two of the species have “lower host specificity”, with Field Cuckoo Bee *B. campestris* targeting all five of the “carder-bee” species of the *Thoracobombus* sub genus and Forest Cuckoo Bumblebee *B. sylvestris* associated with at least two (and possibly all four) of the *Pyrobombus* genus - most certainly, at least, with Early and Heath Bumblebee. The most common host of Barbut’s Cuckoo Bee *B. barbutellus* in the UK is Small Garden Bumblebee, though in mainland Europe (Germany) it will also parasitise Large Garden Bumblebee and is likely to do so in the UK as well. A difficulty arises with Gypsy Cuckoo Bee; although associated with the complex of the three white-tailed bumblebee agg. species, it is not known whether there is a strong association with one or more of these three species or if – as with Field and Forest Cuckoo Bees – it can utilise all of the hosts.

The status, range and distribution of cuckoo bees is somewhat enigmatic, even though – intuitively - it would be thought to be intrinsically linked with the host species. Red-tailed Cuckoo Bee underwent a dramatic decline throughout much of the 20th century, for reasons that are unknown (not least as there was not a corresponding, dramatic decline in the single host species). Although the species was always much more southern in distribution – and rare in the north of England – it declined throughout its range. However, in recent decades this species has not only recolonised areas but considerably increased in many areas where it was previously very rare or absent.

Vestal Cuckoo Bee was also – historically – a southern biased species, but one which has expanded to occupy much of the range of Buff-tailed Bumblebee. In contrast, Gypsy Cuckoo Bee – historically most common in the west and north of the UK – is much declined in the south. Whether these contrasting changes in range and distribution are partly or directly related to climate change is unknown, but that has been suggested.

Of the remaining species there is a similar, enigmatic situation with regards to Field Cuckoo Bee which, although historically scarce in some areas, was widespread and locally common in the UK. This species has undergone a decline that is similar to the situation with Red-tailed Cuckoo Bee, but appears to be a more recent phenomenon.

Forest Cuckoo Bee does not seem to be declining and in fact in some areas of the UK is increasing, whilst Barbut's Cuckoo Bee appears to have declined in some areas and if not increased in others, certainly has not "disappeared". Clearly, there is a lot to learn about how and why cuckoo bumblebees fluctuate in abundance, range, distribution and even specific details of host association(s).

Why Bumblebees – and their conservation - are important?

This might seem like an unusual question – one which is perhaps exclusive, as it might imply that bumblebees are more important than other bees and/or other invertebrates / animals. Although by no means limited to bumblebees, the fact remains that these largest of our bee fauna are very sensitive indicators of the health of our environment and many have shown sharp declines historically and/or in recent decades. Bumblebees place great demands on a landscape; they require a place to nest (often in long / tussocky or rank grassland – which may often be removed by overzealous species-rich grassland management), areas of flower-rich habitat to forage throughout the flight season and places to overwinter (in most cases).

The greatest demand is in terms of floral resources; early spring emerging queens often require substantial amounts of plants that can provide pollen and nectar, which at that time of year can often be very limited. Willow's, dandelion's, Colt's-foot and Blackthorn are all important early flowering plants, though in the absence of these common **and** often abundant species forage may be extremely limited. Of course, in many upland areas – with habitats in good condition and where intensive farming practices are not a major limitation – there may be a progression from these early spring species to species such as gorse, Bilberry, tormentils, Broom, Marsh Thistle and – later in summer – heathers and such species as Devil's-bit Scabious.

Even in more intensively farmed areas there may be plentiful early spring species, whilst Hawthorn hedgerows / fruit trees, White Clover (as the more common legume in intensive farming systems) and even Spear / Creeping Thistle can be very important forage plants for bumblebees. In many environments there can often be a conspicuous "hungry gap" for resource demanding bumblebees, especially if there is a lack of woodland edge habitat (with woodland edge forbs and bramble), set aside land or grassland (ideally species rich hay meadows or less intensive pastures, but at least moderately species-rich grassland).

The continuation of forage – as we've mentioned – is vital, but in the absence of later forage, which can impact bumblebees substantially, where else can substantial floral resources be provided?

Declines in bumblebees – especially acute in some species – has been well documented and substantiated. As was alluded to in the last paragraph of "Bumblebee Biology and Life Cycle" the most severe impacts on bumblebees have been on those species that are associated – to a greater or lesser extent – with the traditional, less intensive, legume-rich farming systems, which have declined to a huge degree throughout the UK, Europe (and indeed at a global level).

The most important aspect of these farms was that they had comparatively low input of nutrients and were not grazed heavily / continually (by large numbers of the same animal), nor were frequent cuts of any fields (for silage or haylage) taken. This system allowed a greater proportion of wildflowers to be thrive and even though the flowering period may have been brief, there would have been enough alternative forage in these less intensive areas (fields left "fallow", extensive hedgerows, orchards, lack of wholesale "weed" removal by chemicals) to support extensive and diverse populations of bumblebees.

Even such – well intentioned - objectives such as large scale tree planting (when focused on broader environmental objectives such as control of soil erosion and/or expansion of fragmented woodlands) can create a hostile environment for many flower-dependent invertebrates, especially if trees are planted very densely on grassland or habitat mosaics that support a wide range of flowering plants and there are no glades or scalloped edges where woodland edge flowers, tall-herb and scrub may develop and thrive.

Main habitats and sites in Cumbria for conservation of bumblebees - and what we can all do to help

As has been outlined in the previous sections – and more specifically in the later species accounts – there are certain “key habitats” for bumblebees. Some of these habitats will essentially be “natural” – in the sense they have undergone little or no management by humans. However, such “pure” or primary habitats often include large areas of moss land / bog (below) and Ancient Woodland which – although of great, overall benefit to the environment and many invertebrates (and a limited number of bumblebee species if well protected and sensitively managed) do not tend to provide the continuity of forage required by bumblebees to maintain the colony through a long cycle / multiple seasons.



Mossland in S. Cumbria © Mark Champion

Many of the habitats heavily utilised by bumblebees in the past – and still of great importance – are secondary habitats i.e. they have been modified to a larger or greater extent by the activities of man or extreme / dramatic natural events (the former being more often the case in the UK).

Some of these habitats are particularly beneficial to some species e.g. species-rich heathland and moorland (Cumrew Fell and Place Fell - as shown overleaf) will benefit such species as Bilberry Bumblebee and Heath Bumblebee - especially if these habitats have a component of late spring / early summer forage to bridge the “hungry gap”. In these areas, other species such as Early Bumblebee and the white-tailed bumblebee complex will often maintain strong populations and even Broken-banded Bumblebee and Moss Carder Bee, though not moorland species per se, will often benefit from a diverse, species rich environment including species rich moss land habitats (though these may actually be more diverse – and more accessible to the recorder - in lowland areas, on page 14).



Lime Kiln (a) Cumrew Fell © Guy Broome



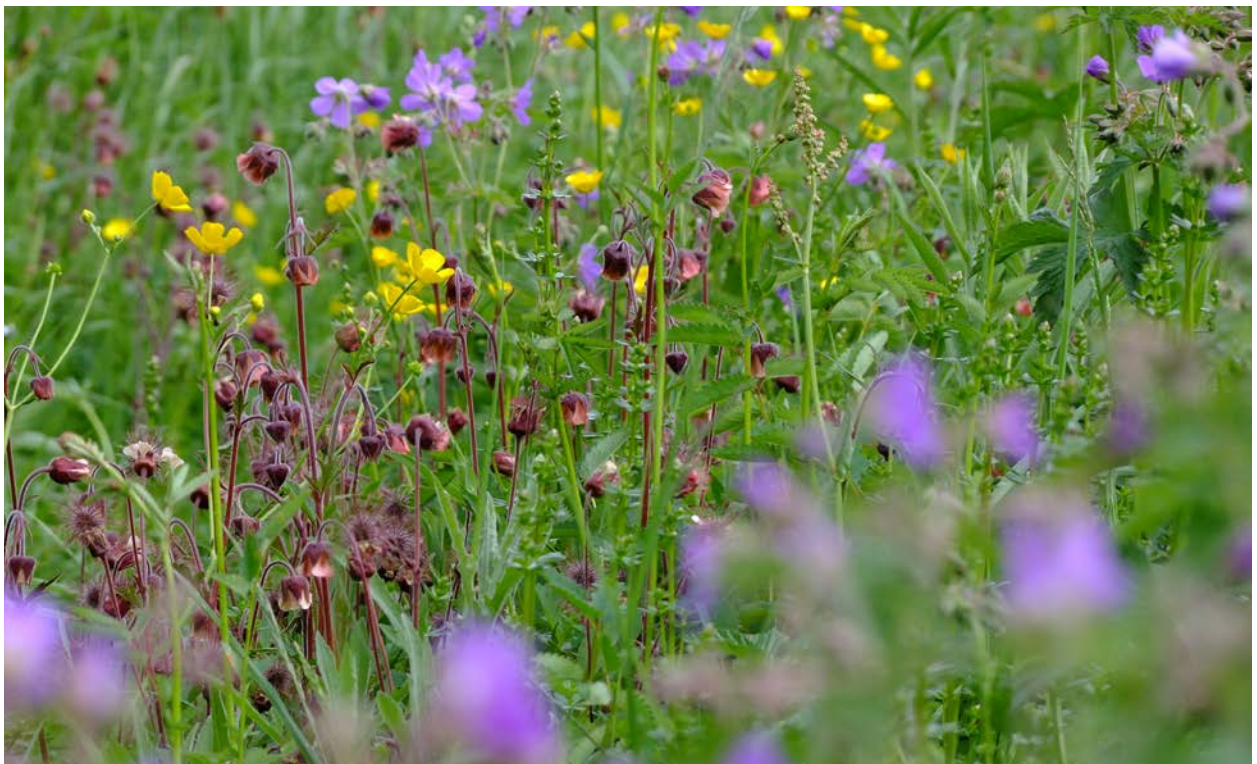
Good condition Heathland overlooking Bassenthwaite Lake © Charlotte Rankin and Ryan Clark



Solway Moss © Mark Champion

Species-rich grassland is favoured by most bumblebees and will benefit all species, though extensive, legume-rich grassland (with a large proportion of clovers and similarly long-tube flowers) will particularly favour / support the medium tongue length (carder-bee) species and the long-tongued species (e.g. Small Garden Bumblebee).

Various agencies and landowners / managers in Cumbria have managed to retain / manage / restore and create upland hay meadows in some areas - with examples below and overleaf:



Smardale Meadow © Andrew Walter



Bowber Head Upland Meadow © Andrew Walter

As such expanses of species-rich grassland are increasingly rare, small and fragmented in the rural / agricultural landscape, species-rich habitat mosaics, open woodlands, saltmarshes and dune systems really do excel in providing a much-needed resource of flowering plants.

Dune systems are some of the most aculeate-rich areas of the UK – not least in the north west – and great examples include Sandscale Haws (much visited by important aculeate workers like Neil Robinson and Michael Archer) – below - and Drigg Dunes (overleaf):



Sandscale Haws, © Steven Falk



Drigg Dunes © Vivian Russell

A complex of coastal grassland, saltmarsh and exposed intertidal areas along the Solway Estuary (below) and North Walney Island (overleaf) are also vital habitats for all bees – including many bumblebees (though inaccessibility may mean the diversity and status of bumblebees has not been fully defined for these superb areas:



Solway Estuary © Mark Champion



North Walney Island © Kirsty Taylor (an important site with the only modern Cumbrian record for the Brown-banded Carder Bee)

Similarly, hedgerows (especially well connected, species-rich and sensitively managed) are a great resource for bumblebees in late spring. At a similar time of year (May especially) the blossoms of fruit trees in orchards are a very useful adjunct to the larger habitat types mentioned. Flower-rich gardens, parks and open spaces – in of themselves and especially as part of a network of flower-rich habitats over the landscape – are also very important foraging areas for bumblebees (and also solitary bees). Of course, structure is particularly important for invertebrates in many areas and will be an important to an extent for bumblebees. However, it is the sheer abundance and continuity of forage in a formal or informal garden, park or other “green space” that is particularly valuable for bumblebees (and all flower-associated / dependent insects). A green space can often include verges along formal walking routes; Garrigill Village has some diverse, extensive and flower-rich verges which are managed sensitively and repay the bumblebees (and the bumblebee enthusiast) - with an abundance and diversity of species that are drawn in:



Garrigill Verges © Alex Playford



Obviously, the more urban a landscape is – with lack of opportunity to de-intensify farming or create, restore or manage habitats as on nature reserves and similar sites – the more important the more anthropogenic (human associated / orientated) areas become. Conservation of habitats and species – in all cases – depends on connections, often to other similar habitats, in order to extend the feeding, breeding and dispersal ranges for all fauna (not least bumblebees). There may be limitations as to what we can expect from gardens (e.g. below), parks (plus other green spaces) and the soft infrastructure associated with buildings, transport routes (esp. road, rail and canals) and watercourses – however, the vast potential is there and is – to a large extent – not fully realised or “linked up”.



Garden in North Cumbria © Vivian Russell

It may seem a dispiriting - and quite shocking – indictment of the wider “countryside” that the urban / urban fringe and “non-countryside” environment should be so important on a regional and national scale, but until the value of these resources is fully acknowledged and objectives are drawn up / enacted opportunities will be missed (and in some cases lost). Cumbria WT has taken a lead in the north of England, with extensive road verge habitat objectives to create and restore species rich grassland in areas where it is much more logistical and practically useful to have an open habitat (for maintenance purposes), whilst providing a boon to flower-associated insects in impoverished, habitat-poor landscapes (below).



Created / restored grassland habitat on Cumbria road verges © Tanya St. Pierre

Post-industrial land – recognised under the Biodiversity Action Plan (BAP) system as an (often important) habitat in its own right (“Open Mosaics on Previously Developed Land”) - can be a superb habitat for bumblebees, along with a whole range of insects / invertebrate orders. There are great, nationally important examples of this habitat and some of the premier UK sites for bumblebees (in terms of species numbers and diversity) are associated with an industrial / anthropogenic heritage. The most notable examples nationally include Salisbury Plain – possibly the most important single aculeate bee site in the UK – plus Canvey Wick / Thames Gateway and the S. Wales ex-colliery fields. More regionally / locally, the post-industrial edges of some habitats in the north west – especially the West and South Pennines, but also the North Pennines – are important.

Here (as has also occurred in many other areas of the uplands and lowlands in the UK) reservoir construction and quarrying has greatly, if sometimes inadvertently, resulted in a wide variety of habitats with subsequently greater heterogeneity. Varying management objectives / approaches can benefit bumblebees to a greater degree than “pure moorland objectives” (especially when the latter is degraded / intensified). Due to a comparative lack of heavy industry in rural areas of Cumbria (compared – particularly - with Lancashire) – such sites may be less commonly encountered, although good examples of such habitats are shown below:



Forest Head Quarry and adjacent grassland © Guy Broome



Old Quarry and Railway, Smardale Gill NR © Andrew Walter

As members of the public and as private landowners we can all do our bit, whether it is providing habitat for bumblebees (and other invertebrates) or lobbying for action from local and/or national government (cutting verges and parks / open spaces less often / incorporating parks, green spaces and other soft infrastructure into local and national plans, strategies etc.).

Parasites, predators, pests and diseases of bumblebees

It has been chosen to deliberately “split off” this section from threats. In theory – at least on a limited level – predators, pests and diseases could be perceived as a threat to bumblebees, but if a completely unfettered existence for insects was possible then these natural checks and balances would keep the natural elements (and natural world) in check. Plus, the aforementioned are not brood parasites (like the Cuckoo Bumblebees) – and some of the better known / studied parasites will be further described.

It would be an ecologically / biologically poor predator / pest / disease or parasite that completely wiped out the host / affected species and the same would apply for the truly parasitic bumblebee associates. We have covered cuckoo bees as a specific brood parasite, which as described is very much a bumblebee living at the expense of the (related) host, rather than in the more direct biological interruption of an individual life cycle. There are a great number of insects, mites and other fauna that are associated partly or specifically with bumblebees. Some are simply accidental visitors, some are harmless scavengers and some are useful associates and as such, these will not be mentioned.

Arachnids - mostly mites - are often seen on bumblebees (and other bees). Although a number of genera are associated with various (life) stages of bumblebees one of the most commonly observed – a large, brown mite / mites crawling on or clinging to the body (up to a hundred in some cases) – is *Parasitus fucorum* (the most common species in the UK).

These mites are not parasites, rather commensals (living without harm or benefit to the host species) - within the colony – living off detritus, faeces and other nest materials (other commensals include some Coleoptera – beetles and Lepidoptera – moths).

Of the Lepidoptera, several moth species are known to breed in bumblebee nests (without detriment) but one important pest species is the pyralid moth *Aphomia sociella* - sometimes known as the “bee moth” or the “bumblebee moth”.

This species attacks social aculeates – e.g. social wasps (Vespinae) and bumblebees, but has a most destructive effect on bumblebees, especially the surface-nesting species (e.g. *Thoracobombus* “carder-bees”) the nests of which are located by smell. The caterpillars feed on the bumblebee comb and infestation can lead to the total destruction of the colony. It should be noted that this species is distinct from the pyralid moth that affects Honey-bees – *Galleria mellonella*.

There are other moths that can scavenge on dead bees / nest materials - and are recorded as pests of bumblebees in other parts of the world - but these are not noted for the UK.

Several flies can attack bumblebee larvae with deleterious effects e.g. the sarcophid fly *Brachicoma devia* - though it does not appear that infestations of nests with this dipteran are as devastating as they can be for other insect species. Although the aforementioned flies are pests of the larvae, another group of dipteran parasites – the conopid or “big-headed” flies – are important as direct parasites of adult bumblebees (although historically it was thought – in error – that they also targeted the immature stages).



Mites on *Bombus terrestris* © Vivian Russell

The most frequently targeted bumblebees are foraging workers and males – usually occupied on flowers – as queens are usually active too early in the year to solicit the attention of the later flying conopid flies. Eggs are laid directly into the bumblebee abdomen, between the membrane of the adjoining abdominal tergites (segments), by a penetrating “theca”. The conopid fly egg develops in the body of the bumblebee and the larvae attaches itself to an air sac therein, progressively devouring the contents of the abdomen.

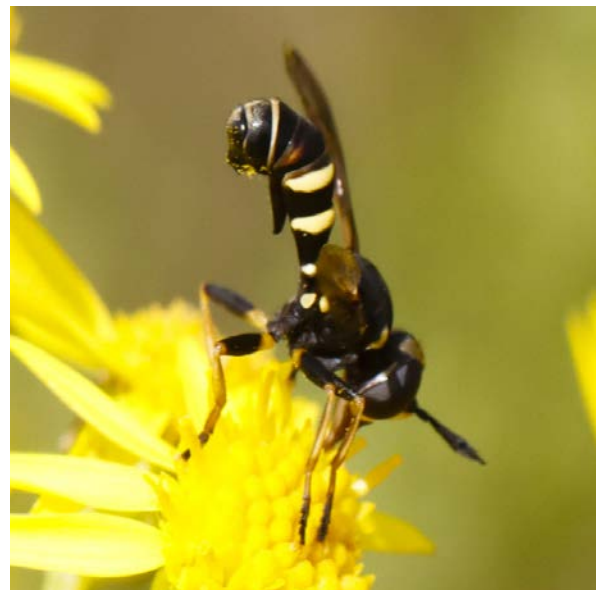
The larvae go through three “instars” (development stages – casting the skin after each stage) and shortly before pupation the final (instar) stage of the larvae thrusts the head-end of the body into the thorax of the bee, which then dies. After feeding on parts of the full-grown larvae, the conopid pupates within the abdominal “shell”, overwinters (in the nest) and the adult flies emerge the following summer to resume that particular life cycle. As with *Brachicoma*, surface nesting bumblebees seem to be particularly affected by conopid flies, though this may reflect recording / sampling bias as many bumblebee species (though not – apparently – cuckoo bees) are affected.

The most frequently observed conopid parasite of bumblebees is stated by Alford [3] to be *Physocephala rufipes*, though the various species of *Conops* (picture above right) and *Sicus ferrugineus* (picture below right) are also of the same Conopidae family and parasitise bumblebees regularly.

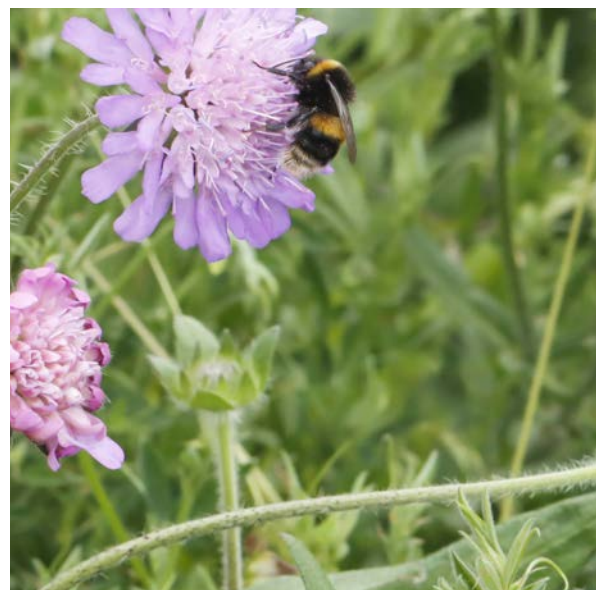
In terms of fellow Hymenoptera, the small braconid wasp *Syntretus splendidus* (and presumably, though less commonly, *S. elegans* – only recorded on the UK checklist for Ireland) can also develop in the bodies of all adult bumblebees (queens, workers and females – including cuckoo bees). Although infection has not been observed, as an endo-parasite (living inside the host animal) the wasps probably associate with the flowers that foraging bees visit and launch their attack at that stage.

Interestingly, over-wintered queens of the later nesting Common Carder bee are more likely to be attacked than earlier nesting species e.g. Buff-tailed and the white-tailed agg. – though workers of the latter species are more commonly affected, which probably reflects the flight period of the parasitic wasp. It is hypothesized that the lack of cases of parasitisation of the Small Garden Bumblebee (in particular) may be due to the faster foraging speed of this species – making it hard to attack [4].

There is another, devastating aculeate parasite of bumblebees represented by 1 notably scarce species in the UK (absent from Cumbria and north west England). *Mutilla europaea* – overleaf – sometimes called the “Velvet Ant” due to the appearance of the flightless female (males are winged) are actually solitary wasps. This “mutillid wasp” enters not only bumblebee nests but also – on occasion – Honey-bee hives, in addition to the nests / nesting areas of other aculeate bees and wasps (also attacking flies, beetles and Lepidoptera).



Conops flavipes © Vivian Russell



Sicus ferrugineus (below) stalking a potential bumble victim (above) © Vivian Russell

Although the biology of this species is incompletely known, the females enter the bumblebee nests and deposit their eggs directly into the bee cocoons containing larvae or pre-larval stages.

The *Mutilla* larvae eats – or partially eats – the bumblebee larva and spins a cocoon within the bumblebee cocoon. It then rapidly pupates and emerges, feeding on the host honey stores. As with their social hosts, the female wasps overwinter as adults (usually but not always in the host nest) and males do not survive beyond autumn.

There are few fellow-insect predators of bumblebees in the UK, though in many parts of the world Robber-flies (*Asilidae*) are large and powerful enough to include them as prey.

In the UK the largest asilid species are the “Hornet Robberfly” *Asilus crabroniformis* and another robber fly - *Laphria flava*; although both species are probably

capable of tackling a bumblebee - especially a smaller species / specimen – there are no prey records for these in the UK (though bumblebee predation is noted in literature for N. America).

The non-UK solitary wasp species *Philanthus bicinctus* (N. America) is noted to prey on bumblebees; however, such predation by the only UK recorded species of this genus, the “Bee-Wolf” (*P. triangulum*) – is not recorded, with this species seemingly limiting itself to Honey-bees and (solitary) halictid bees. Of the vertebrate animals, Brown Trout have been observed to swallow bees that land on water in Ireland and although adult bees are also occasionally eaten by amphibians and reptiles there is no UK literature on this (which is likely to be of rare occurrence).

Birds are more notorious bee-predators, from Great Tits and Blue Tits – which peck open the abdomens of drowsy bumblebees to feed on stored nectar in the crop of the abdomen as shown by the eviscerated bumblebee in the picture below - to shrikes. The Red-backed Shrike (*Lanius collurio*) – though dramatically declined (Red-listed) and endangered as a breeding species in the UK – often attacks adult bumblebees (including cuckoo bumblebees), which they impale on thorns or the spikes of barb wire (as part of their “larders”).



Mutilla europaea © Steven Falk



Bird predation (evisceration) of a bumblebee © Vivian Russell

Larger Queens are often stored in this manner (*B. muscorum* has been recorded impaled on barb wire on Fair Isle), though other studies have shown that smaller bumblebees (castes and species) are eaten immediately.

Mammal predators include – most notably – Badgers, which can destroy colonies by digging up the nests and eating the brood, the comb and the adult bees. It is also reported that foxes will eat bumblebees (presumably larvae) and Sladen – the great observer of bumblebees – noted that moles and weasels can destroy nests.

Although mice, shrews and voles are less destructive, they will nonetheless enter young nests (before the production of workers) and devour the brood at an early stage. Of course, the nesting niches provided by small mammals are vital for many bumblebees so there is certainly a question of balance in some cases.

Bumblebees are also affected by a smaller and more evasive / inconspicuous parasite - the worm-like nematode *Sphaerularia bombi* is a globally widespread parasite of bumblebees. These creatures dwell in the soil and attack *Bombus* queens and Cuckoo Bumblebee females in their subterranean, overwintering quarters. Eggs are released into the haemolymph (analogous to blood) of the insect which - following death of the insect - escape the body to develop into mature forms. Whilst the nematodes are within the bumblebee, damage is done to the ovaries (the development of which is prevented) and the post-hibernation behaviour of infected bees is altered - they do not initiate or (in the case of cuckoo species) invade nests, rather they return to hibernation sites, die and the adult nematodes are released into the soil to await other potential victims.

In terms of micro-organisms, bumblebees are often attacked by the protozoan *Nosema bombi* (a similar species of the same genus attacks Honey-bees but neither pathogen is cross compatible). The tissues of the gut are invaded and the affected bumblebee can become weak, incapable of flying and - ultimately - will often die. Young, pre-hibernating queens are most often affected with the pest -surviving more effectively in milder winters.

Finally, it has been shown that under natural circumstances bumblebees may be infected with acute bee-paralysis virus, but not chronic bee paralysis virus (which appears to be limited to Honey-bees).

Threats to bumblebees

The “natural” - or at least non-human - forces that bumblebees must reckon with are dwarfed by that most formidable enemy, namely humans. Of course, we may kill bumblebees when driving vehicles and nests may be destroyed through intensive agricultural practices (or in other situations through intolerance to the presence of nesting bees). The far more important - and dramatic, devastating - human impacts are represented by our wholesale alteration and/or destruction of habitats where bumblebees could overwinter, nest and - crucially - forage. The lack of forage must in many locations (especially in rural areas) be particularly acute, as overwintering and hibernating sites may not be limited. We also continue to drench the environment with a cocktail of chemicals - retarding and often excluding entirely the growth of many beneficial plants by direct and indirect (run-off and atmospheric precipitation) application of nitrogen and phosphate rich fertilisers, which favour only a limited range of plant species. We also continue to apply large amounts of herbicides and pesticides that not only kill large amounts of target plants and animals but also indirectly affect the “non-target flora and fauna”.

Just “laying the table” with plentiful flowers is not an unequivocal solution to the decline of bumblebees and any bumblebee (and indeed most invertebrate) conservation needs to be well considered, holistic and extensive if there is to be any human engineered / assisted support for our impoverished and much declined fauna. Plus - even with the best intentions - what effects will the inevitable long-term effects of climate change have on our bumblebee species and how can we predict and mitigate against them? The most likely - and intuitive - predictions and models show that upland / northerly and specialist species of bumblebee are likely to be affected most directly and immediately by any consistent rise in temperatures.

It has been shown in Europe ^[5] that some upland and specialist species (especially) are actively declining and showing changes in distribution and phenology related to climate change. With so much unknown about how climate change may impact on weather patterns consistently in future, it is futile to speculate with any confidence about what may happen.

However, current models and predictions show that some of the species that are likely to be *less* vulnerable to climate change in the UK are in the sub genera *Pyrobombus* and *Bombus* - which containing such species as Early Bumblebee (*Pyrobombus* sub genus) and Buff-tailed Bumblebee (*Bombus* sub genus), do have members that are fairly ubiquitous, non-specialist and thus - perhaps - more likely to “ride out” some of the early impacts of climate change at least (if momentary speculation can be indulged).

The Records

The record “dataset” used for the Atlas was drawn from the following key (non-exhaustive) sources, in no particular order:

- **BWARS**
- **CBDC**
- **iNaturalist**
- **iRecord**
- **NBN**
- **Neil Robinson’s aculeate records (published and unpublished)**

However, the robustness of the data does vary amongst the sources and it should (also) be noted that no dataset from any source is likely to be completely flawless. **BWARS (Bees, Wasps and Ants Recording Society)** are the most important organisation concerned specifically with aculeate bees, wasps and ants in the UK. Subsequently, their methods of data extraction and verification are particularly thorough and records that they hold (which contribute to the maps on their website - <https://www.bwars.com/home> -) are an essential source of data and records (as well as more general information on species and background literature) for any serious checklist or Atlas. Likewise, **CBDC (Cumbria Biodiversity Data Centre)** data has strong input / has drawn from the Tullie House Museum collection which – based primarily on specimens, from previous decades – is particularly useful to give context to subsequent records and can be used to chart the declines and increases in certain species in Cumbria. **iRecord** - <https://irecord.org.uk/> - is also quite robust as a data source, with records checked and verified by specialists (categorised as to the accuracy of the record – based usually on images but to an extent on recorder / observer experience). **iNaturalist** – <https://www.inaturalist.org/> - is a much-improved data repository, with records appraised by a community which includes enthusiasts and specialists. This is an interesting approach to recording / data repositories – certainly inclusive and commendably egalitarian – but it can be difficult to verify a record if there is a lack of consensus amongst those that choose to comment. A major, arduous task for this Atlas was the review of several hundred unverified records on i-naturalist that due to lack of comment or consensus had been left in limbo as a potential data resource for this Atlas. Likewise, **NBN (National Biodiversity Network)** - though very impressive in the scope and ability to extract data, lists sources and produce distribution maps – has suffered from “quality control” in the past, with some unverified or inaccurate data represented on maps (and some important data entirely lacking).

The most important – progressive, encouraging – aspect of all the aforementioned data sources is that although all are effectively individual concerns (with some differing objectives), they are increasingly sharing data / records which should lead to more accurate, cross-referenced data across the board in future.

Last – but by no means least – we have the published and unpublished records of **Neil Robinson**, who not only reviewed much of the historical data for the county of Cumbria (both in terms of written and specimen data), but also added considerable data (especially) throughout the 1990’s and 2000’s – which clarified changes in the status and distribution of bumblebees (and indeed all aculeate Hymenoptera) from the time of the older, important records / recorders to the modern day.

The important contributions of other individuals have been noted earlier, in acknowledgements – many of these people channelled their records into one of the above data sources. The crucial thing is to record; with the increased sharing of records and resources it may matter less where records are lodged, just as long as they are.

Analysis of the record data (kindly undertaken by El- Moustafa Eweda from CBDC) shows some interesting trends that focus on the records we have used and give a real insight into any changes / trends in status and distribution of the species covered in the Atlas. The first chart (**Fig 1**) shows the density of recording in Cumbria, per tetrad.

Obviously, **Fig 2.** shows density as “heat” – which gives a steer on which areas are particularly well recorded. **Fig 2.** shows more clearly where record density is high and where recording levels are low (to very low), and shows that there is a widespread occurrence of these tetrads throughout Cumbria. What is most surprising here is that despite the considerable increase in interest of bumblebees (and other bees) to naturalists, entomologists and recorders throughout the UK in more recent years, that the considerable previous effort in the south west of Cumbria (particularly by Neil Robinson) has not continued to the same degree (post 2007), despite the fact that the area is still well (and often better) recorded in terms of other aculeate Hymenoptera (especially solitary bees and wasps). Should there be a concentration of effort in the extreme south west of the country it is expected that the diversity of bumblebees around Arnside Knott and Morecambe Bay would be shown to be high, if not higher than most of the county – up there with some previously referenced “hot spots”.

Obviously, much of Cumbria is upland and of that upland much will be very difficult to access for most people. Not only is this lack of coverage difficult to address it leaves a large question mark of species status – not only of the truly upland species but also of the essentially lowland species (or at least historically lowland / biased species) which may be extending their range in an upland direction in some cases.

The following graphic - **Fig 3.** - shows the number of bumblebee records in Cumbria between 1890 and the present day. It is interesting to see certain spikes but shows the huge spike in records post 2000 and – particularly – post 2015. The reasons for this are probably multi-faceted, but strong influencing factors will have been the increased interest in bees (as “pollinators” / flower-associated insects), the subsequent (related) increase in bee / insect related projects in Cumbria (which have more often than not included considerable amounts of training and targeted surveys / transects) and the publication of several bumblebee field guides from the late 90’s onwards (one of the most important being Edwards and Jenner) and Steven Falk’s **Field Guide to the Bees of Great Britain and Ireland in 2017** – which covered bumblebees. Prior to the publication of these books there was a dearth of literature that could be used as a Field Guide for those that wanted to identify bumblebees visually, in the field (i.e. without killing them for laboratory / microscopic identification). As thorough and as revolutionary as Alford’s great book (first published in 1975) was at the time - and much as it was appreciated by specialists - it is, nonetheless, a technical book that was never intended as a Field Guide for the non-specialist / non-entomologist and the lack of a genuine spike of records (bar the minor 1970’s spike – which probably does correspond to Alford’s pre-book mapping scheme at that time, when data was extracted from museums, data sources and individuals) reflects that this did not stimulate a wider interest from naturalists in these insects.

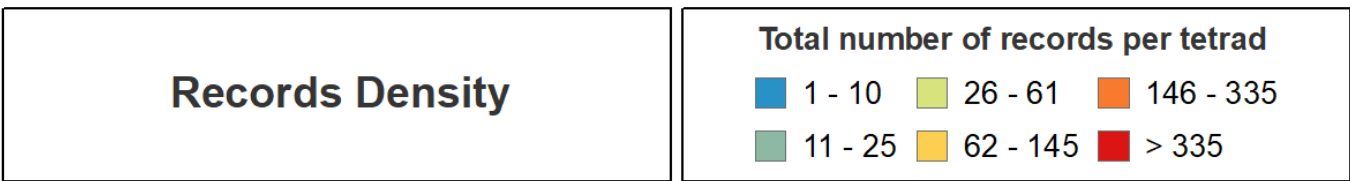
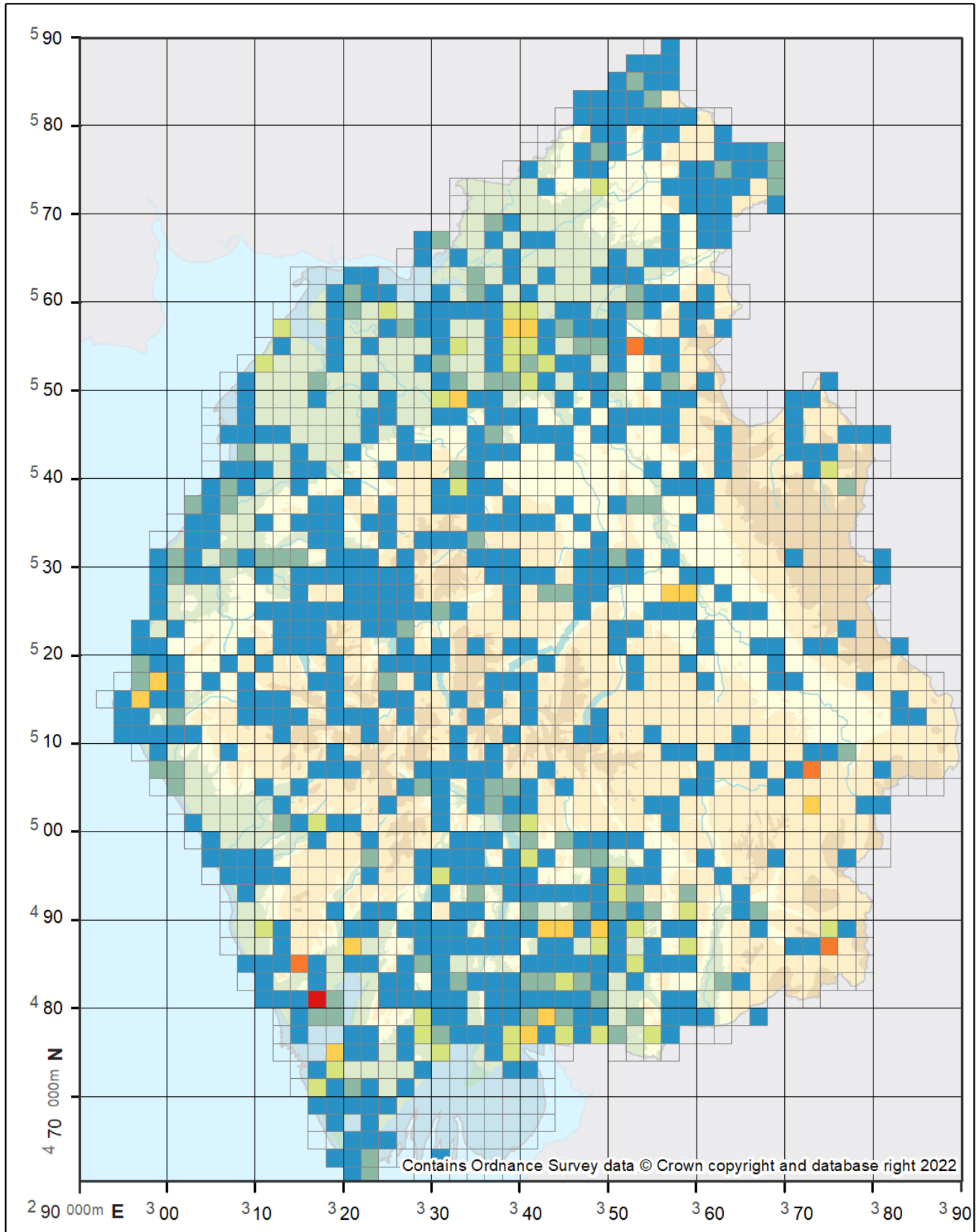


Fig 1: Records density per tetrad in Cumbria

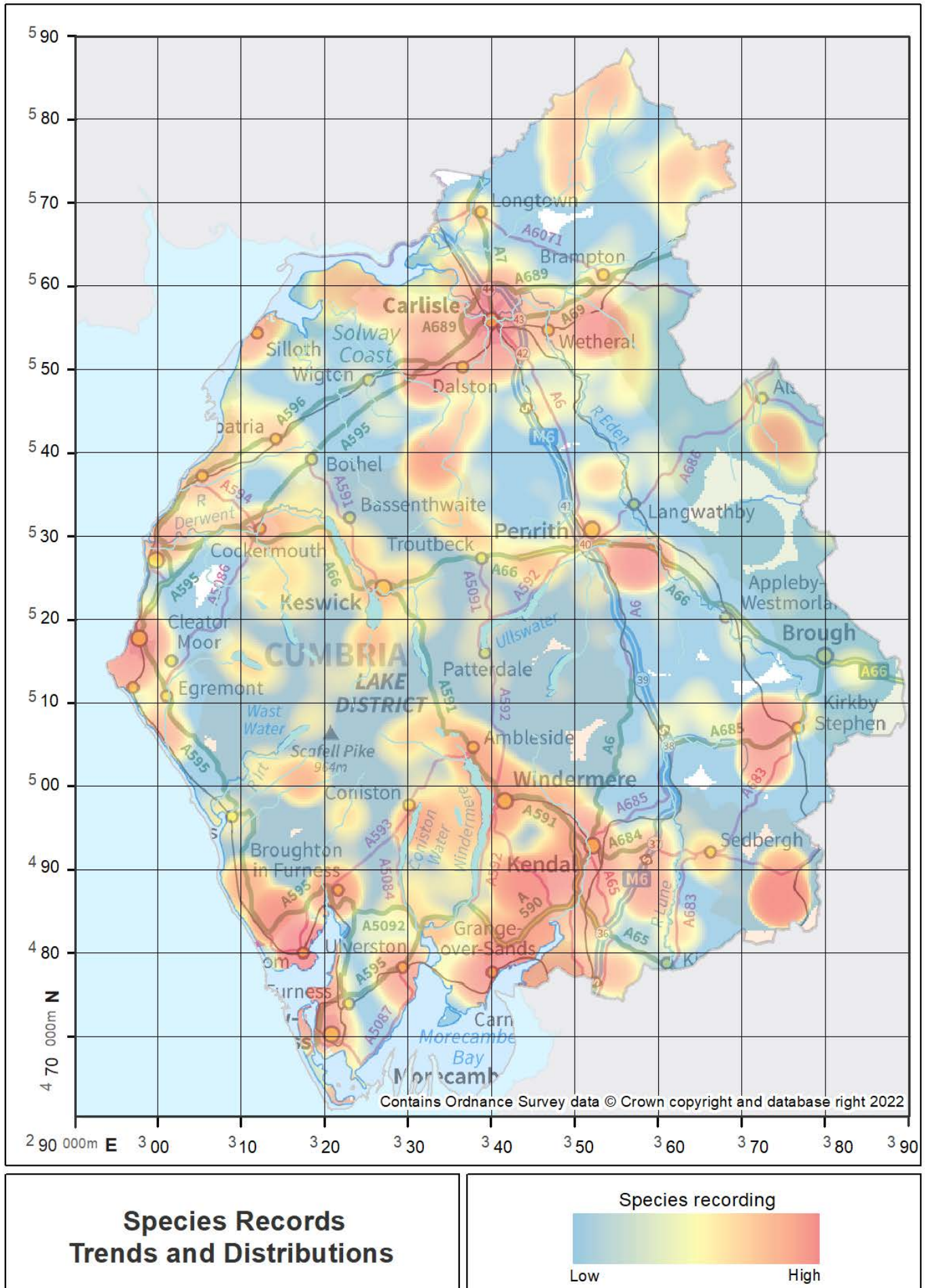


Fig 2: Species records heat map

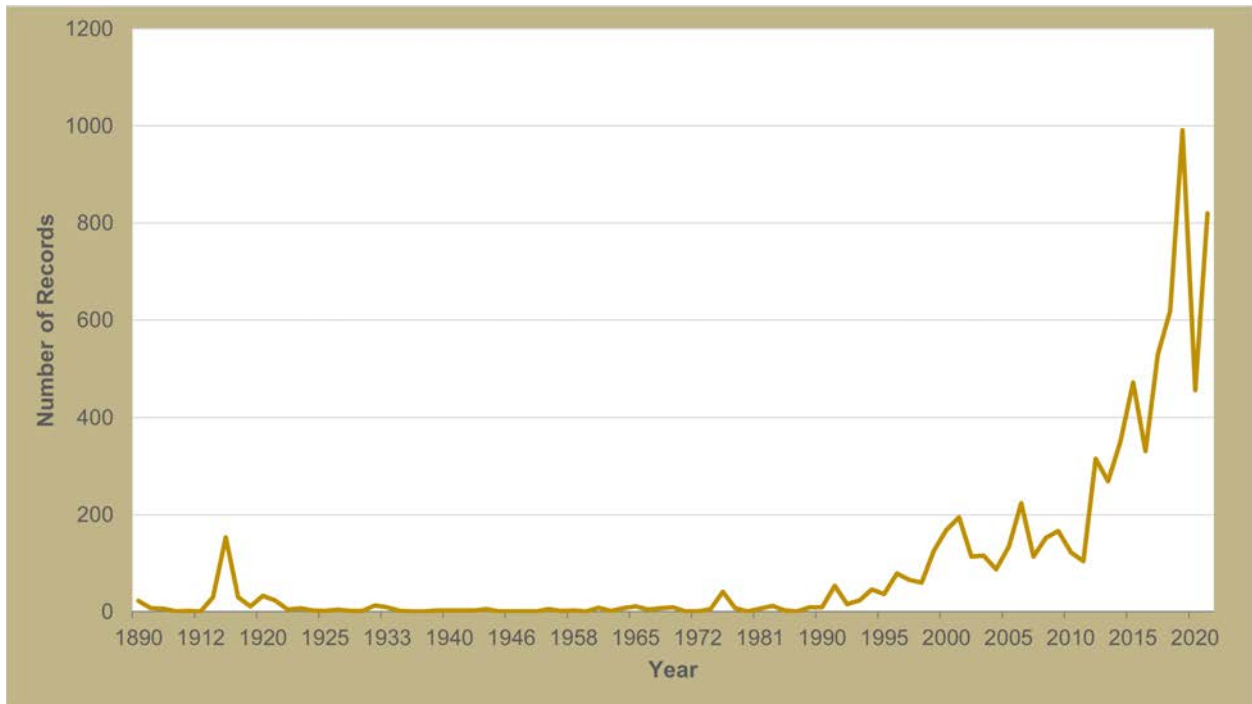


Fig 3: Number of records between 1890 - 2022

Fig 4. shows numbers of records for species throughout Cumbria and is largely intuitive. Common Carder Bee is obviously a common, widespread, very versatile and well recorded species and it would be no surprise if the species remained one of – if not the most – common species in Cumbria in the near future. Red-tailed Bumblebee is readily recognised as an all-black bee with a red tail, though it is undoubtedly a species that has become much more common and widespread in more recent decades (compared to Common Carder Bee – which has always been considered very common). The white-tailed bumblebee agg. was regarded as very common historically - the fact that it has been less well recorded in recent decades probably indicates the difficulty in distinguishing many individuals from Buff-tailed Bumblebee, though may also suggest evidence of some decline (as has been noted for Lancashire and Cheshire in recent decades – pers. obs and Tony Parker pers. comm). Buff-tailed Bumblebee, historically not very common in Cumbria, is clearly catching up with the white-tailed agg. of bees, something reflected in the national picture. Clearly the biggest leap is in the “wildfire” spread of Tree Bumblebee – not only a very distinctive species, but one which is often associated with human environments / gardens / buildings etc. Therefore, such an increase is not a great surprise (though the speed of spread is quite astonishing).

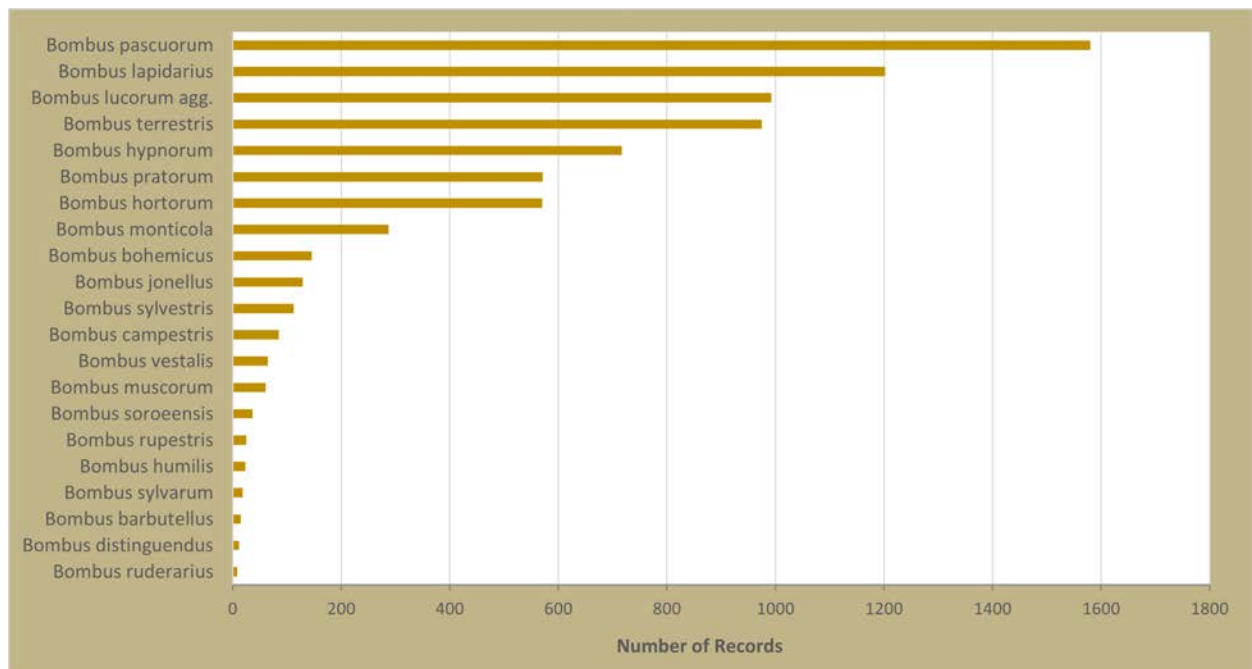


Fig 4: Number of records of species in Cumbria

Equal levels of Early and Small Garden Bumblebee seems a reasonable proxy of a real situation, though if true levels of upland distributions for species were established, this could be clarified (Small Garden Bumblebee – though not absent from upland areas, certainly seems more common in lowland areas, at least at present, though an ability to survive as an introduced species in Iceland indicates it may well be able to exploit upland areas more extensively in future). Bilberry Bumblebee is an interesting species - there has been some targeted surveying of this species in likely habitats but conversely, Heath Bumblebee has not been subject to the same targeted survey effort and as a much more difficult bee to identify / easy species to overlook, it must be considered that there is an under-representation in records of that species, both in favoured upland locations and less typical lowland habitats (it certainly seems more able to establish populations in lowland areas than Bilberry Bumblebee and in that regard, seems almost an “ecological intermediate” between the similar and related Early Bumblebee and Bilberry Bumblebee).

The lack of records for rare species and cuckoo bees is probably a reasonable representation, though it can be suggested that cuckoo bees are more easily overlooked than other bumblebees and that they are likely more common and widespread than records suggest – at least for some of the species.

That Forest Cuckoo Bee comes out as the most common cuckoo species is no surprise (given the host range and location of Cumbria), but the reasonable number of records for Field Cuckoo Bee – a species that is showing rapid decline in many areas of the UK – is notable. It might be expected that Vestal Cuckoo Bee becomes more common and widespread in Cumbria in future, in line with trends for Lancashire and other more northerly areas of the UK.

Of the remaining cuckoo and rare species, only time will tell as to how these species will fare in the longer term. It seems inconceivable – sadly - that Great Yellow Bumblebee will ever (re)colonise England from it's extreme, retracted north west (Scotland) distribution at present and the same would seem likely to apply to Shril Carder Bee, from an opposite direction of range retraction. However, recent records for Red-shanked Carder Bee and Brown Banded Carder Bee are encouraging and it may be – hopefully – that these species establish populations in Cumbria in future and can exploit restored, well managed and well-connected habitats.

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Historical bumblebee recording in Cumbria

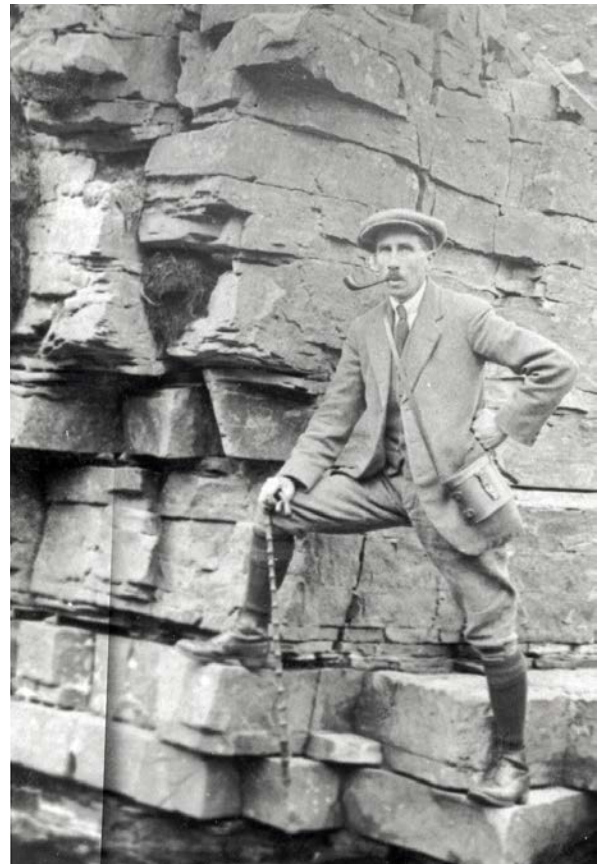
Cumbria is fortunate to have a historical picture of its bumblebee fauna, which - when compared with the present day situation - can provide an insight into changes that have occurred over the last 100 years. Historical data in Cumbria is largely the result of diligent work by local entomologists.

In north Cumbria - other than a few 19th century reports from the north-east corner of the county supplied by Thomas Bold of Newcastle - early bumblebee studies were largely conducted through the co-ordinated efforts of a few expert entomologists within Carlisle Natural History Society (CNHS). Their collections, now preserved in Tullie House Museum, are of great value in understanding the past and present insect fauna of the county. CNHS was formed in 1893 and its members quickly set about documenting the natural history of the county. An early account of bumblebees was included within a review of the Aculeate Hymenoptera of Cumberland ^[1]. That publication provides baseline evidence for the subsequent decline in bumblebee populations, with only 8 of the 14 species recorded around Carlisle at that time, surviving in 2005 ^[2]. George Bell Routledge (1864-1934) lived at Heads Nook, east of Carlisle. His estate at Tarn Lodge included the "large tract of waste land known as Hayton Moss", and (the now scarce, rare or presumed extinct) Great Yellow, Bilberry, Moss-carder, Red-shanked Carder and Broken-belted Bumblebees are among the many insects that he collected at 'Tarn Lodge'.



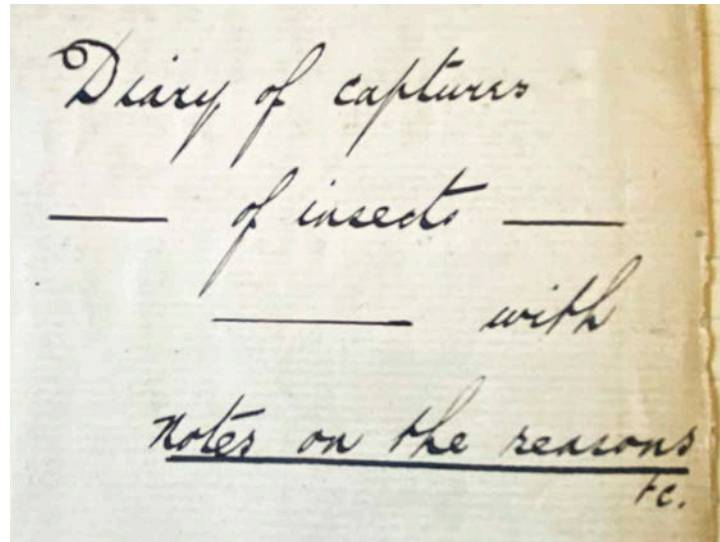
Routledge

Chief among the contributors to Routledge's account was Frank Henry Day (1875-1963), a founding member and long-time officer of CNHS. Working as secretary to a timber merchant in Carlisle, he pursued a life-long interest in insects, particularly beetles and bugs. As early as 1901, he included bees in his account of the insects of the county in the Victoria History of Cumberland. Day was assiduous in recording the occurrence of insects across the county, walking and cycling many miles to visit local sites and also taking the train to meet up with his entomologist friend, Harry Britten (who was to become well known regionally and nationally as Curator of Entomology at Manchester Museum), in the Eden Valley or to visit more distant locations such as Keswick, Silloth and Seascale. Records from his garden at Blackwell in Carlisle include (the now regionally extinct) Great Yellow Bumblebee and Shrill Carder Bees - in addition to the seemingly v. rare Brown-banded Carder-bee - and indicate how widespread - and more easily encountered - these species once were.



Frank Henry Day

In the south of Cumbria, James Davis Ward (1876 - 1935) lived in Grange-over-Sands, where he worked as director of the family quarrying company ^[3]. Ward was a member of the Lancashire and Cheshire Entomological Society and of Kendal Entomological Society. He published the first list of the Diptera and Hymenoptera of North Lancashire ^[4], including 'Lancashire north of the Sands' (now part of Cumbria). His collection of 680 bees and wasps is in the Natural History Museum, London. Notably, he collected the Red-shanked Carder Bee at Grange in the 1920s and the Moss Carder Bee on Foulshaw Moss ^[2].



J.D. Ward handwriting

Albert Edward Wright (1878 - 1950) was born and lived in Burnley, where he was a director in the cotton industry until he retired to Grange-over-Sands in 1921. He became close friends with his fellow townsman and entomologist, J.D. Ward. An enthusiastic lepidopterist from an early age, Wright was an active member of both the Manchester and the Lancashire and Cheshire Entomological Societies. On retirement he had the opportunity to develop his interest and extend it to other insect groups ^[5]. During the 1940s he turned his attention to bees and wasps and 2,200 of his specimens are now preserved in the Natural History Museum, London ^[2]. Wright compiled a list of his records of bees, wasps and ants in a ledger which, along with his diaries, is now held at Tullie House Museum. Among his bumblebee reports are records of the Brown-banded Carder Bee at Grange and Witherslack.

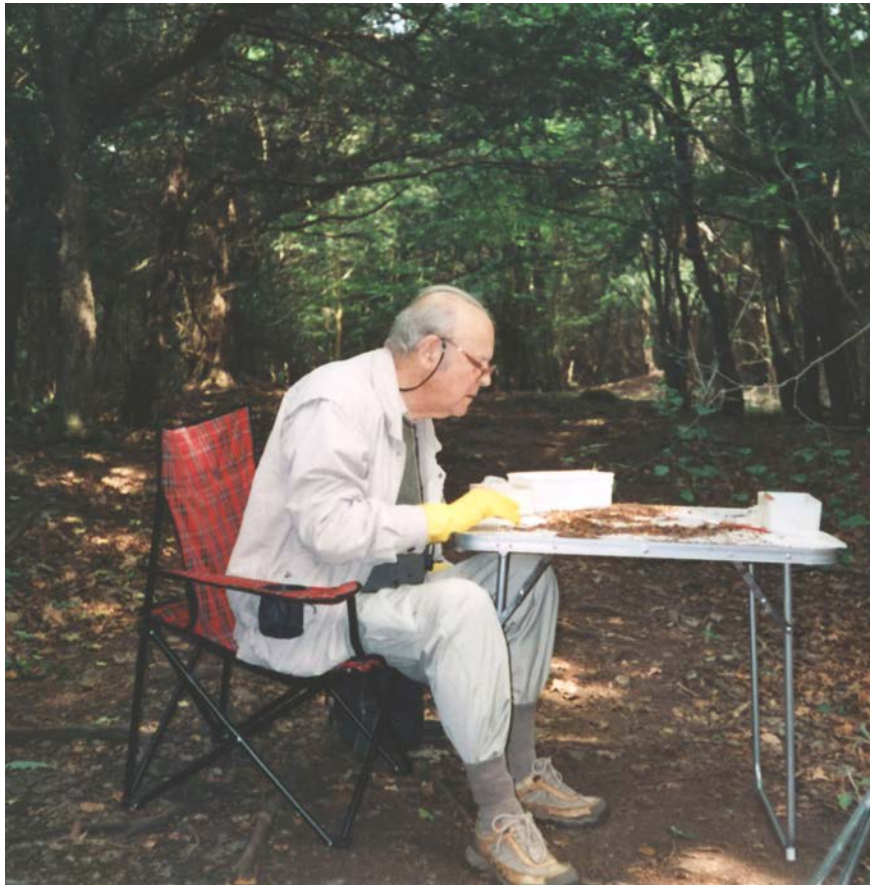


A.E. Wright

From around 1950, there was a hiatus in the study of bees in Cumbria until recording picked up again in the 1990s, when individual site surveys by the staff at Liverpool Museum - and visits by Michael Archer to sand dunes around the Duddon Estuary (plus odd records from other visiting Hymenopterist's) - yielded some notable aculeate records.

On retirement in 1995, Neil Arthur Robinson (1935 - 2008) took up the study of bees, wasps and ants around Natland near Kendal where he lived - and across south Cumbria generally. His studies provide the most significant individual contribution to the study of Cumbrian aculeates to date. Neil grew up in Newcastle before attending Kings College, Cambridge. After graduating, he taught biology at Lancaster Royal Grammar School before his interest in natural history and nature conservation led him to take a post as Naturalist Warden at Ainsdale Dunes National Nature Reserve (owned then by the Nature Conservancy Council - N.C.C. - Natural England as is now). He later moved to Cumbria to work from the regional office of the N.C.C. at Merlewood, Grange-over-Sands. He was made Assistant Regional Officer for Lancashire and later led the Site Monitoring Team, evaluating the condition of NNRs and SSSIs. His broad ecological interests and attention to detail gave Neil a holistic grasp of the ecology and behaviour of aculeates and he was soon making a significant contribution to these little studied insects, both regionally and nationally ^[6]. He curated the bee collection at Tullie House Museum and transcribed the records from A.E. Wright's notebooks as well as identifying specimens collected by other entomologists and collating county records. He drew on all this information to publish a list of the Aculeate Hymenoptera of Cumbria ^[2].

Whilst lamenting the loss of several bumblebees: "*B. distinguendus*, *B. humilis*, *B. muscorum*, *B. ruderarius*, *B. soroensis* and *B. sylvarum*, have become greatly reduced nationwide, and, except for *B. muscorum* and *B. soroensis*, have not been recorded recently in Cumbria at all", he also noted that the Buff-tailed Bumblebee (*B. terrestris*) had become much more common than previously and also that its nest parasite, the Southern Cuckoo Bee (*B. vestalis*) had also recently arrived in the county.



Neil Robinson - In Grubins Wood searching a wood ant nest.

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- 1- Routledge, G.B. 1933. Cumberland Aculeate Hymenoptera. Transactions of Carlisle Natural History Society 5: 83-103.
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Description and Life Cycle:

Description

Barbut's Cuckoo Bee (*Bombus barbutellus*) is a member of the fascinating group of brood parasites, that depend entirely on other bumblebees to rear their offspring. The Small Garden Bumblebee (*Bombus hortorum*) is their main host and possibly where present, (as in Europe) the much rarer Large Garden Bumblebee (*Bombus ruderatus*) [1].

Cuckoo bumblebees require no workers of their own and therefore have no caste system. Only reproductively active females and males are present. In Europe, cuckoo bees tend to resemble the colour patterns of their host [2] and Barbut's Cuckoo Bee is no exception.

Females are variable in size measuring 17-19mm [3]. The colouration is a banded pattern of two yellow stripes on the thorax, one on the abdomen and a white tail. However, its face is not as long as its typical host, the Small Garden bumblebee. No pollen baskets are present (although interestingly females have retained functioning wax glands) [4].

Males are smaller at 15-17mm [3]. They have a similar colouration to the females but males are also more variable / less distinctive. The midriff band is often stronger, more closely resembling the host. Males can also become highly sun bleached in late summer making identification even more difficult [1]. Barbut's Cuckoo Bee also exhibits several features associated with its parasitic lifecycle. These include a thickened, sparsely haired cuticle, more robust mandibles and a more incurved abdomen [5]. Flight behaviour gives an additional cue out in the field with cuckoo bees having a slower, low frequency flight compared to other bumblebees [3].

For a relatively little-known bee, Barbut's Cuckoo Bee has illustrious associations. First described in 1802 by famous entomologist William Kirby it is named after the English naturalist and painter James Barbut (ca 1711 -1791).



Male

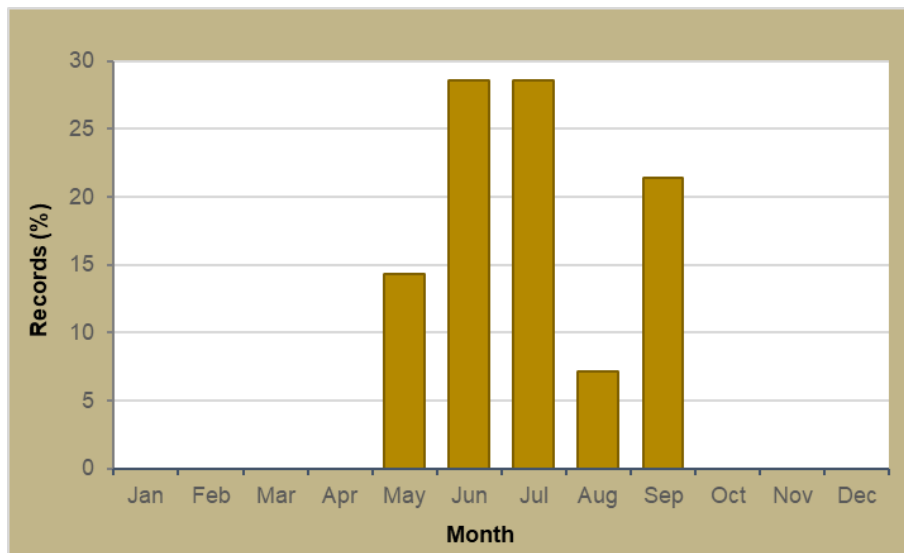


Male

Life cycle

The life cycle of Barbut's Cuckoo Bee is shorter than that of its host but is closely entwined with it. On emerging from hibernation, the female cuckoo bee must locate a nest of suitable size and infiltrate it. Too large and the female may be unable to break through defences, too small and the host nest may not be able to support the invasion ^[6].

Timing is everything, and Barbut's Cuckoo Bee emerges in late April, after its host. Cuckoo species vary in the timing of nest usurpation, and Barbut's is thought to take-over the host nest early in its cycle ^[7], (although this is hard to estimate).



Habitat and Distribution:

Habitat

Barbut's Cuckoo Bee is found in the habitats of its host the Small Garden Bumblebee (and likely also the Large Garden Bumblebee as recorded for Europe [8]). These host habitats are wide ranging and include not only gardens and parkland but also, less commonly moors, heaths, woodland edges and mountain locations ^[8].

A wide range of flowers and visited for consumption of nectar and pollen. Favoured flowers include blackberry (*Rubus fruticosus* agg), dead-nettles (*Lamium*), vetches (*Vicia*) such and Devils-bit Scabious (*Succisa pratensis*) ^[8]. Males in particular are often found on thistles (*Cirsium*) and knapweeds (*Centaurea*) ^[11].

Distribution

Barbut's Cuckoo Bee is generally, uncommonly recorded. This is partly explained by the absence of a worker caste [6] but also due to their brood parasitic nature and a genuine scarcity / absence of records in some places.

The species is seen on occasion across the UK but is most widespread in the south. It is scarce and mostly coastal in Scotland and Wales. There are no records from the Channel Islands [8].

Globally Barbut's Cuckoo Bee has a palearctic distribution where it is generally rare but widespread [8]. Some authors conclude the even rarer European *Bombus maxillosus* should be classed as the same species, which would extend the range of Barbut's Cuckoo Bee down into the Mediterranean [9].



NBN and CBDC records

Status in Cumbria:

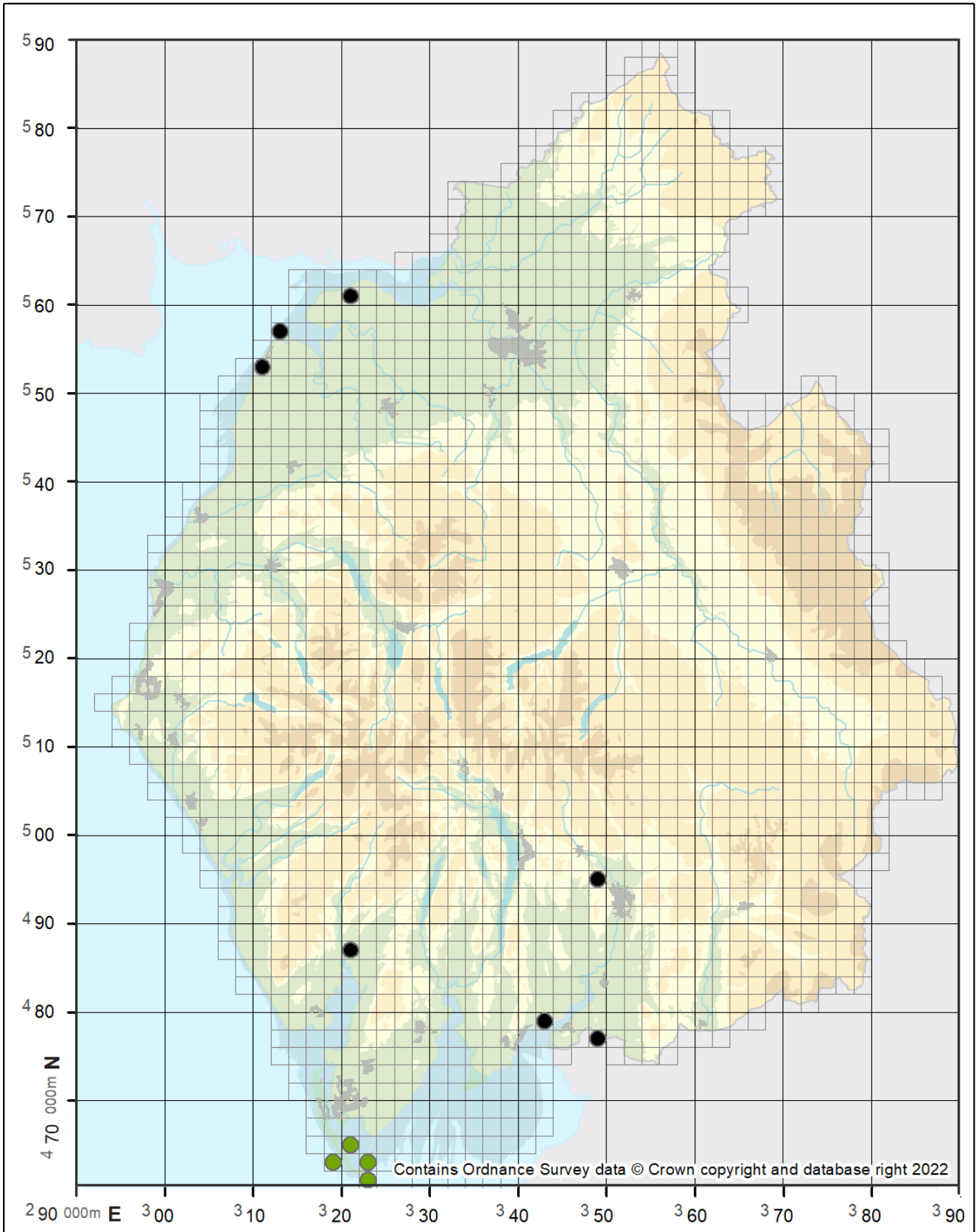
Barbut's Cuckoo Bee has only rarely been observed in Cumbria and early historical records are lacking. This makes evaluation of its status and distribution highly speculative.

In 1933 Routledge stated that "*P. barbutellus...*, has not been found in the county, although its host, *Bombus hortorum*, is very common here." For comparison, Routledge confirmed the presence of all other five UK cuckoo species in Cumberland with both the Red-tailed Cuckoo Bee (*Bombus rupestris*) and the Vestal Cuckoo Bee (*Bombus vestalis*) noted as 'common' [10].

The first, likely (though unconfirmed) recording of Barbut's Cuckoo Bee in Cumbria was in the winter of 1984, in the far south of the county (outside of Routledge's historic Cumberland range). A further three recordings are confirmed from 1986 also on the South Coast.

After a pause in the records, observations started again at the turn of the century, perhaps in line with greater interest and support in identification. Since then Barbut's Cuckoo Bee has been recorded, albeit very infrequently, at locations in the north and south of the county. As would be predicted, all sightings fall within the range of its host the Garden Bumblebee.

Barbut's Cuckoo Bee currently has the lowest number of records of any of the cuckoo species considered present in Cumbria. The most recent recording was in 2020 in garden habitat. Given the widespread distribution and abundance of its host, it is perhaps surprising that Barbut's Cuckoo Bee has not been seen more regularly. Difficulties in identification may play a role here, but other factors are possibly involved. This is certainly an elusive species in many areas.



Barbut's Cuckoo Bee
Bombus barbutellus

Recorded (First: 1984 Most Recent: 2020)

Elevation (m)	
	< 0
	0 - 100
	100 - 200
	200 - 500
	> 500

Time Periods	No. Records
Post 2000	<input type="text" value="11"/>
1950 - 1999	<input type="text" value="4"/>
1900 - 1949	<input type="text" value="0"/>
Pre 1900	<input type="text" value="0"/>

Future Outlook:

Barbut's Cuckoo Bee is not as well studied as the Vestal, Gypsy or Forest (*Bombus sylvestris*) Cuckoo Bee ^[6], and a better understanding of habitat requirements and relationship with host's would aid conservation efforts.

What is known is that cuckoo bumblebees in general face the same threats as all bees, including habitat loss, pesticide use and climate change. In addition, they are totally dependent on their host species for survival. The extinction risk to a cuckoo bee is higher if that host is also threatened ^[11]. For Barbut's Cuckoo Bee in Cumbria that host is the Small Garden Bumble Bee, and conservation efforts aimed at protecting this species will also directly benefit Barbut's Cuckoo Bumblebee.

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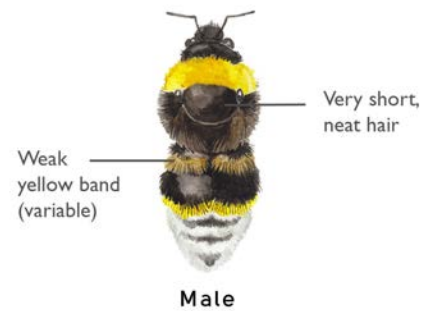
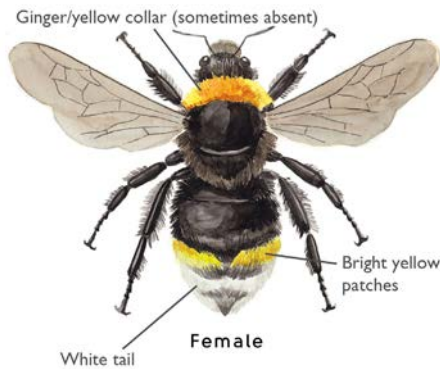
Main photo:

Female - Vivian Russell

Side photos:

- 1- Male - Vivian Russell
- 2- Male - Vivian Russell





Description and Life Cycle:

Description

The Gypsy Cuckoo Bee *Bombus bohemicus* searches for nests of bumblebees in the white-tailed bumblebee complex or aggregate / agg. (*B. lucorum*, *B. magnus* and *B. cryptarum*) – sometimes referred to as the “lucorum group” (page 84) - in which to take over and lay its eggs. In Britain, this species has a northern and western bias in its distribution, which may suggest that *magnus* and *cryptarum* are significant hosts, especially as *bohemicus* is absent from many strong *lucorum* populations in the south and east ^[1].

The female Gypsy Cuckoo Bee can look very similar in appearance to the Vestal Cuckoo Bee (*Bombus vestalis*) (page 142). When fresh - and with experience - *bohemicus* is usually identified with reference to the wide, pale yellow collar and small, sometimes indistinct yellow flashes at the base of the abdomen - above the white tail. Care is however needed to separate worn individuals from Vestal Cuckoo – and some individuals cannot be reliably separated in the field. Females have entirely black hair on their heads and the broad yellow collar often extends to the wing bases. Compared with Vestal Cuckoo Bee, the females average slightly smaller, there is often yellow on the lower thorax (scutellum) and the yellow is usually – where present - paler.

Male Gypsy Cuckoo Bees have a similar pattern of colouration to females, but are smaller and possess longer antennae. They have yellow hairs on the back of the head, a more extensive yellow collar and yellow hair on the abdomen. Males also have more sparse and uneven length hair, compared with the denser and more neatly coated females. Compared with the Vestal Cuckoo Bee, Gypsy Cuckoo Bee males usually have longer hair on their bodies and less intense yellow flashes on the tail, but this is rarely a reliable feature for identification. Relative length of antennal segments is the most reliable feature but requires specimen identification or skilful photography to capture the salient features. In the Vestal, the antennal segment 3 is shorter than 5, whereas in the Gypsy segment 3 and 5 are of similar lengths.



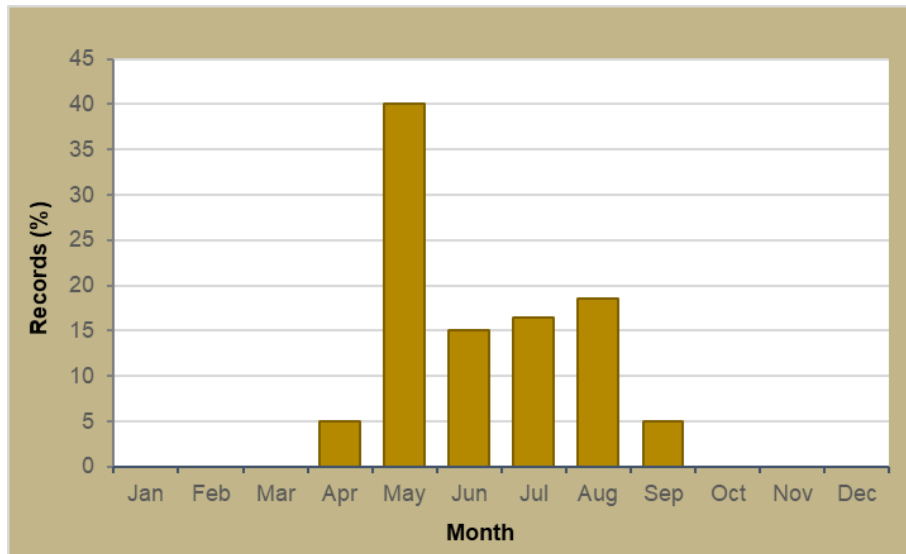
Male on Scabious



Male on Scabious

Life cycle

Females of this species emerge from hibernation from April/May with new females and males emerging from June onwards - usually July/August in the north. Both sexes feed on a wide variety of different flowers and males can often be seen in groups, lazing around on species such as thistles and knapweeds.



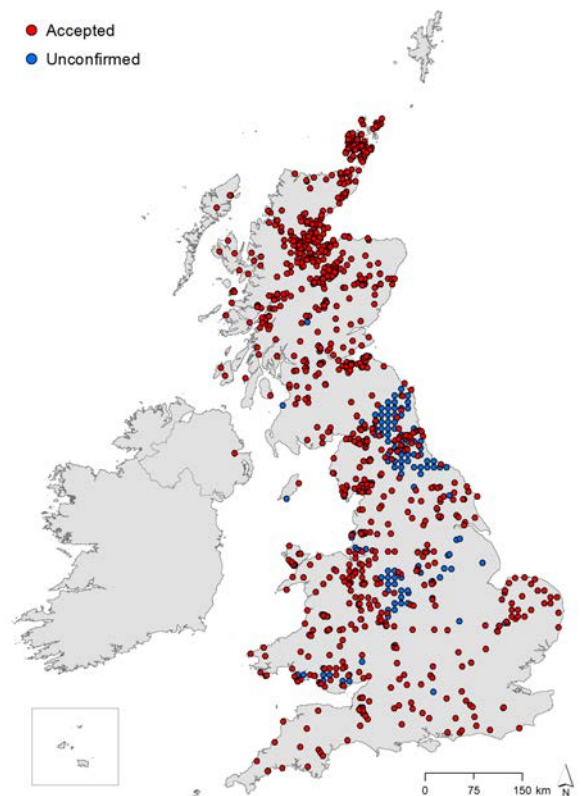
Habitat and Distribution:

Habitat

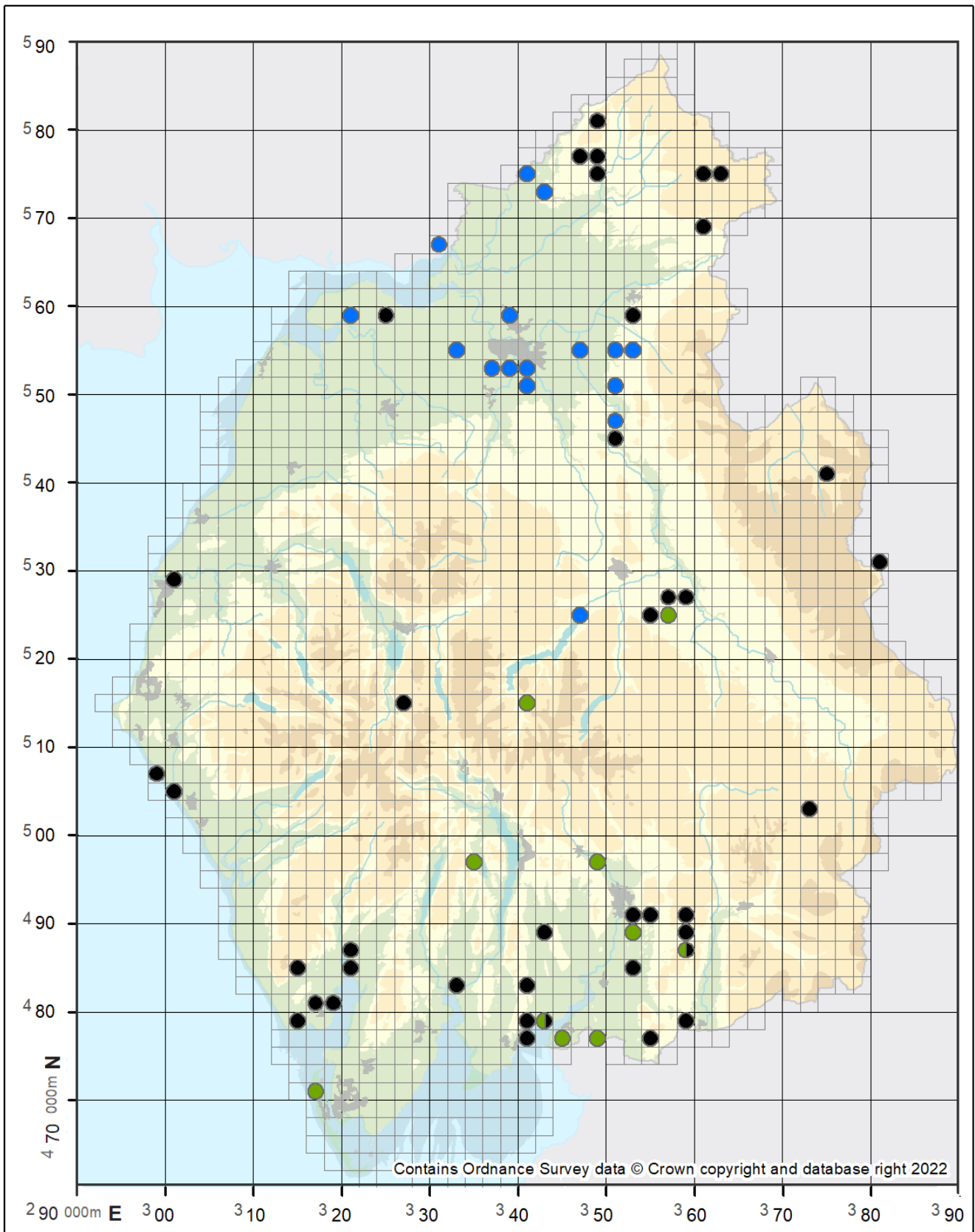
The Gypsy Cuckoo Bee is reasonably widely distributed in Britain. It is common – locally - in parts of western and northern Britain, but scarce in central and southern England. In southern England this species is thought to be declining, with most recent records from heathland [1]. In northern England this species is found in a wide range of semi-natural habitats but has a particular preference for heathland, moorland and upland areas, aligning with the often-preferred habitats of the three potential host species [1].

Distribution

This species is likely to be under-recorded due to its similarity with other bumblebee species. The species was not separated from the Vestal Cuckoo Bee until 1912, therefore any records before this time cannot be assigned to either species.



NBN and CBDC records



Gypsy Cuckoo Bee <i>Bombus bohemicus</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 78 25 43 0
	Recorded (First: 1904 Most Recent: 2022)		

Status in Cumbria:

The Gypsy Cuckoo Bee is widespread across Cumbria but there are relatively few records of this species compared with other bumblebees, complicated by the difficulty in identification. Although there is limited data, the Gypsy Cuckoo Bee currently appears to be more common than the Vestal Cuckoo Bee with significantly more records in Cumbria to date. However, their distributions overlap, both species can be found on the same site and records of the species have markedly declined in Lancashire and Cheshire (particularly in recent years).

Although not split from the Vestal Cuckoo Bee until 1912, the first record for this species in Cumbria is represented by a specimen collected in 1904 which is housed in the Tullie House Museum ^[2]. Routledge's 1933 account lists the species as common with widespread, known localities; Tarn Lodge, Cairn Bridge, Blackwell, Cummersdale, Durdar, Orton, Anthorn, Cumwhitton Moss, Pooley Bridge and Easton ^[3]. Similarly - in 2005 - Robinson's article describes this species as common and often more frequently encountered than the host ^[2].

Future Outlook:

The future outlook for this species is heavily reliant on that of its hosts. Species in the white-tailed bumblebee complex are not currently thought to be under threat - therefore, it is likely that this species will continue to do well in Britain. Further research focusing on which specific species host the Gypsy Cuckoo Bee is associated with (if - for example - it has higher host specificity for one or more of the three species of the white-tailed bumblebee complex) will give us a better picture of the likely future status of this species.

References:

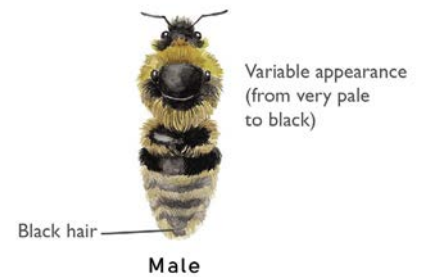
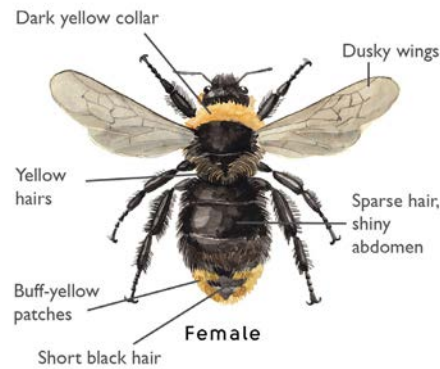
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- 3- Routledge, G., 1933. Cumberland Aculeate Hymenoptera. Transactions of the Carlisle Natural History Society, 5.

Main photo:

Female - Steven Falk

Side photos:

- 1- Male on Scabious - Vivian Russell
- 2- Male on Scabious - Vivian Russell



Description and Life Cycle:

Description

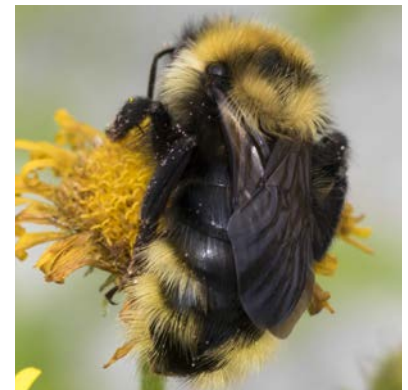
The Field Cuckoo Bee (*Bombus campestris*) is one of our six UK cuckoo bumblebee species and regularly usurps the nests of the Common Carder bumblebee (*Bombus pascuorum*). It is also thought to parasitise the nests of the other, much rarer carder bumblebees and was recorded in Britain from the nest of the Brown-banded Carder (*Bombus humilis*) on Dartmoor in 1945 [1].

A relatively small sized bumblebee, the Field Cuckoo is known for being extremely variable in both sexes, though particularly in males, producing dark and light colour morphs as well as many intermediate types. It is one of the few bumblebee species in which melanic individuals occur. A contrasting form (*var. swynnertoni*) with a predominately pale-yellow thorax has been recorded in Scotland [2].

Within this wide spectrum of variability though there does seem to be an extensively yellow form (shown in the 2nd picture - right) that is seen more often in Cumbria than its many variations. In common with all carder bumblebees whose tails run the gamut of pale to dark ginger, the hues are different in the Field Cuckoo, golden yellow in fresh males, buffish gold in females. The rest of the abdominal coat is always black, and the contrasting black and gold, never white or red, is striking.

Freshly emerged females (1st and 3rd pictures - right) are distinctive in that the pattern on their abdomen isn't conventionally banded. An extensive area of black - roughly shaped like a wedge - narrows towards the tail where it is flanked on each side by golden hairs. The black hairs on this 'wedge' are sparsely distributed, and the exoskeleton, known as chitin, shines through. Bald patches and generally thinner hair are typical of cuckoo bumblebees; Sladen noted that the coat of the Field Cuckoo was thinner, and the hairs coarser and stiffer, than in any other bumblebee [3].

The female has a broad, buff-gold collar just behind her head and a weaker, thinner, and more crescent shaped one near the midriff. When her dark chocolate wings are folded and at their most opaque, the combination of black, brown, and gold is quite beautiful.



Female



Male



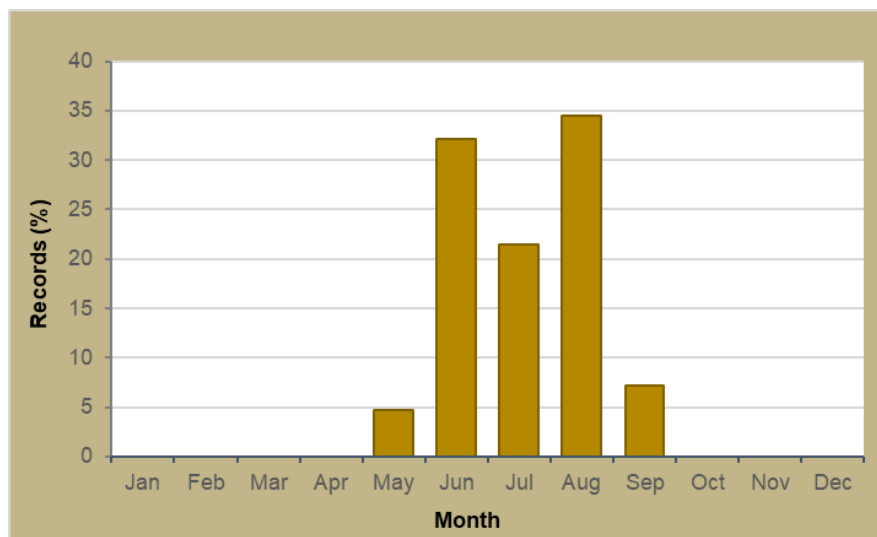
Female

The 'typical' Cumbrian male form also has a black and gold coat. He has two jet black bands, one on his thorax between the wing bases, and one near the base of the abdomen, but the rest of the hairs are light golden yellow, fading to buff. Seen from the back, he is the only bumblebee that is as extensively gold or buff haired from the tip of his tail all the way up to the black band near his midriff. The less distinctive, intermediate form worth noting is much darker, but always has a buff tail.

As with all bumblebees, problems arise when the weather and wear and tear alter their appearance. They fade, they age, and they lose hairs from abrasion until they can only be reliably identified by the genitalia. With Field Cuckoo bees, it is often the overall impression - the 'jizz' of this bee with its strange, almost metallic gold colour cast - that helps place it.

Life cycle

In Cumbria, cuckoo females usually emerge from hibernation a month or so later than their hosts and the female Field Cuckoo is very rarely seen before June. In fact, it has been noted that Field Cuckoo females are seldom seen at all in spring ^[4]. They replenish depleted energy reserves with nectar and ingest protein rich pollen to develop their ovaries while waiting for their hosts to found nests and raise the first batch of workers before they make their move.



The dynamics of cuckoo, queen and worker behaviour inside a usurped nest has been studied from the 1880's onwards. Field Cuckoo and Forest Cuckoo (*Bombus sylvestris*) bumblebees have been singled out as mild tempered species - as have their similarly mild tempered main hosts, and are less aggressive than other, more pugnacious species ^[5a]. Instead, the Field Cuckoo females can employ passive dominance tactics and allowing for some skirmishing, cooperative behaviour has been observed within the colony ^[6].

Once they leave the nest, Field Cuckoo males locate the nearest woodland edge, hedgerow, or areas of tall vegetation to scent mark and attract females. Peak season for male cuckoo bees in Cumbria is usually in August, and they can often be seen foraging in a slow and leisurely manner on cirsiiums, knapweed and various garden cultivars like hebes, cosmos and dahlias. They like teasels whose many tiny nectar-filled florets keep them busy for hours. The females are always less numerous and less conspicuous, but will be filling themselves up with nectar somewhere, in preparation for their long winter diapause.

Habitat and Distribution:

Habitat

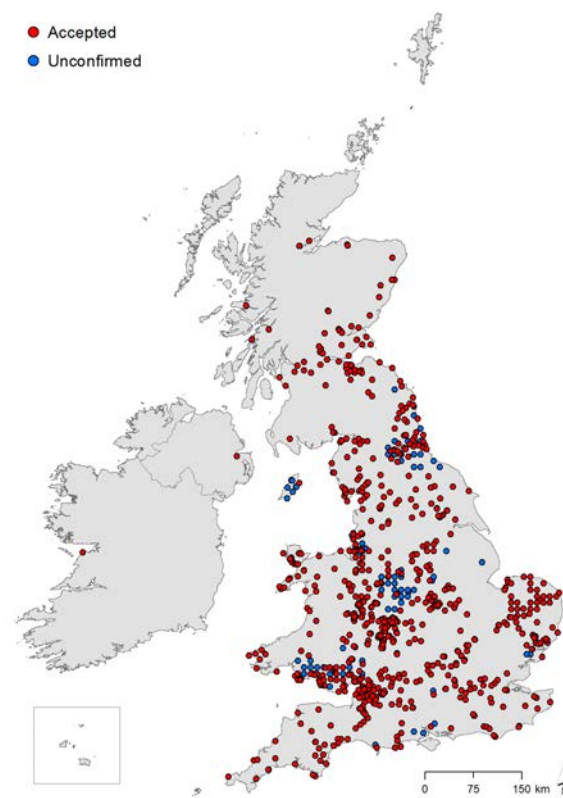
Cuckoo bumblebees are wanderers of no fixed abode, housed and fed by their hosts for much of their lives, providing they can find established nests and successfully finagle their way in. As the ubiquitous host Common Carder is known to prefer sheltered rather than exposed situations ^[5b] it is less likely that the Field Cuckoo will turn up on the high fells or on exposed moorland. They are found in a wide variety of lowland habitats frequented by their hosts: gardens, urban greenspace, open woodland, woodland edges and rural settings. The hosts have a medium length tongue and can exploit both deep and shallow blooms while the short-tongued Field Cuckoo forages from a wide range of shallow flowers.

Distribution

Looking at D. V. Alford's landmark Bumblebee Atlas of 1980 ^[7] - covering gains and losses for the whole of the UK since recording began - we see that the Field Cuckoo was fairly common and certainly widespread over most of England, strongest in the south, but did not follow the Common Carder bumblebee as it spread through Scotland and onto Orkney. The Field Cuckoo, having reached the north of England, branched off onto the coastlines as it entered Scotland, reaching Dundee in the east and just north of Mull in the west, with only half a dozen inland records in the Borders for the whole of Scotland.

In Ireland, the handful of pre-1960 inland records disappeared almost completely after 1960 leaving less than a dozen dotted on the west coast. The Common Carder on the other hand, gained inland records and established a significant presence in the southwestern coastal counties of Kerry and Cork, where the Field Cuckoo was barely represented.

Although the Field Cuckoo has made further inroads into Scotland since Alford's 1980 Atlas was published and is also more widespread in Ireland today, the same trajectory of decline seen in Ireland in the 1980 Atlas has been repeated in mainland England since 1990 ^[8]. The most dramatic decline has occurred between 2016 and 2021 when nationwide records plunged by nearly 75%. ^[9] The fortunes of cuckoo bumblebees are strongly tied to those of their main host, and as the Common Carder is overwhelmingly the most recorded bumblebee species in the UK ^[8], the significant decline of the Field Cuckoo in its former strongholds in the southwest and southeast of England is baffling experts. More broadly across England, it is no longer recorded from many of its previous locations where the Common Carder is abundant.



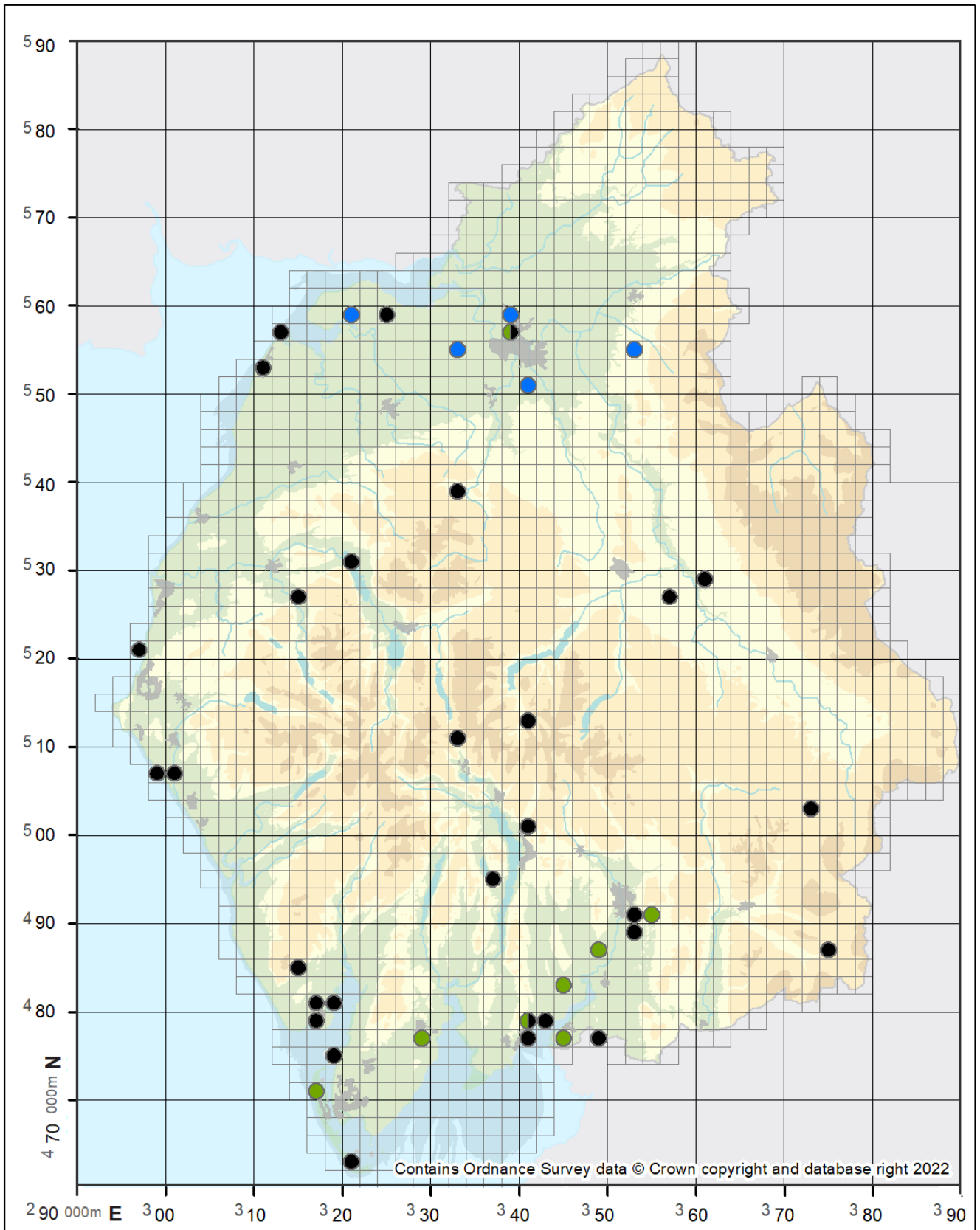
NBN and CBDC records

Status in Cumbria:

Interestingly, while Field Cuckoo numbers have declined in many parts of the UK, there has been no falling back of records in Cumbria.

The records have built up slowly over time and reflect the ebb and flow of recording history here. We have a small series of a dozen records between 1917 and 1944 - with none in the 1930's - from F. H. Day monitoring bees close to home on the north Cumbria plain and George Routledge on his Tarn Lodge estate near Brampton, east of Carlisle.

F.H. Day deemed it 'rather scarce' and A.E. Wright too, recording concurrently - but mostly between 1940-1943 - in the south of the county around Grange-over-Sands, noted it was 'not common' ^[10].



Field Cuckoo Bee		Elevation (m)	Time Periods	No. Records
<i>Bombus campestris</i>		< 0	Post 2000	<input type="text" value="58"/>
Recorded (First: 1917 Most Recent: 2022)		0 - 100	1950 - 1999	<input type="text" value="16"/>
		100 - 200	1900 - 1949	<input type="text" value="11"/>
		200 - 500	Pre 1900	<input type="text" value="0"/>
		> 500		

Only two records were logged over the next half century, one in 1970 from the Kendal area, the second in 1987 from North Walney. This is an extraordinary gap even by Cumbrian standards.

When recording resumed in the early 1990's, we picked up a few more entries, and these nearly trebled after the millennium and haven't lost their momentum. By 2005, the Field Cuckoo was regarded by Neil Robinson as a "fairly common social parasite of *Bombus pascuorum*" [10].

At the time of writing, our total number of Common Carder records for Cumbria far outnumber those of the three other potential hosts we have or have had here, by 1579 to 92. Although rare, the Moss Carder (*Bombus muscorum*) is a far more likely candidate than either the Brown-banded (*Bombus humilis*) or the Red-Shanked (*Bombus ruderarius*) who only have 31 records between them. It is almost certain that the Common Carder is the principal host for the Field Cuckoo in Cumbria, as it is elsewhere in the UK.

Cuckoo bumblebees are far less numerous than their hosts and represent a small fraction of total bumblebee abundance. According to our post 2000 data, again at the time of writing, the ratio of Common Carders to Field Cuckoos is 1579 to 85 in Cumbria.

The Field Cuckoo will be found in the same habitats as its very widespread host since it is entirely reliant on the host to raise the next generation. Woodland and woodland edges form a sizeable portion of our records, and these are dotted mainly across lowland Cumbria, from a small wood in the middle of urban Carlisle to Brown Robin near Grange over Sands and the woodlands at Arnside in the far south.

We have several records from public gardens: Sizergh Castle in the south, Holehird and Hill Top (Beatrix Potter's Garden) both in the heart of the Lakes, Acorn Bank near Penrith, and the Bee Garden in Silloth on the north coast - as well as various private gardens across the county, including Neil Robinson's own.

The Field Cuckoo is well represented along the coasts, with records from Sandscale Haws, Grange over Sands, Millom, Foulshaw Moss, the north and south ends of Walney Island, Parton Beach, Silloth and north to Anthorn.

We have records from open, flowery areas across the county, by tarns and lakes and in a location not often cited, just south of Dunmail Raise. The most notable and unprecedented of all our Field Cuckoo records comes from Neil Robinson who recorded a very early male on 23 June 1993 foraging on hebe at Sizergh Castle. He had it verified by the highly respected Lancashire aculeate specialist Carl Clee, and Liverpool Museum (where the specimen now resides) has confirmed that the date is indeed 23 June. Bumblebees will never cease to surprise us.

Future Outlook:

We don't know what factor, or factors from 1990 onwards precipitated the decline of the Field Cuckoo, and no one can predict what the future holds for this bumblebee. It has been identified as having a "seemingly low dispersal ability" and "would suffer significantly from global warming" [11].

Cumbria has a cooler climate than the south where it is declining most rapidly and can offer many areas of flower rich habitats and a host that is widespread. It is possible that the dynamics within usurped nests are changing and there could be other environmental and biological factors at play.

If recorders could make a special effort to look out for the Field Cuckoo and revisit their sites year on year, this would be of great help to the experts monitoring its progress and trying to identify the reasons for its decline. Comprehensive data will indicate whether there is any change to its status in Cumbria.

References:

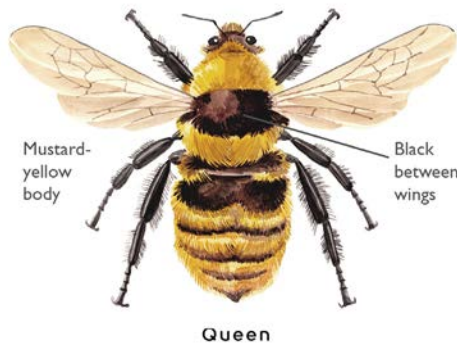
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Main photo:

Male on teasel - Vivian Russell

Side photos:

- 1- Female - Vivian Russell In flight - Vivian Russell
- 2- Male - Vivian Russell
- 3- Female - Vivian Russell In flight - Vivian Russell



Worker



Male

Description and Life Cycle:

Description

The Great Yellow Bumblebee (*Bombus distinguendus*) is a magnificent bee and one of the most iconic species in Britain. Easily recognisable ^[1] queens are large at 19-22mm ^[2] with a dense, predominantly sandy-golden coloured coat. The strong black band across the thorax, between the wing bases, is a clear defining feature and avoids confusion with other, predominantly "single coloured" bees such as the Common Carder Bee (*Bombus pascuorum*).

Worker bees and males show similar colouration but are more sparsely haired ^[3] with a smaller size as befits their caste. Although the females are readily distinguished from other bees due to their unique colour pattern, males are stated to be indistinguishable from the closely related Short-haired Bumblebee (*Bombus subterraneus*) (now extinct in the UK). As with other species of bumblebee fading can occur over the summer.

Life cycle

Described as a late-emerging species ^[4], queens are first seen in mid-late June after they have finished hibernation. The queen will then set up an underground nest, usually in an old rodent burrow or grass tussock. Worker bees begin to appear in late June to early July followed by the males from the start of August onwards. New season queens are rarely observed and much remains to be discovered about their behaviour.

The colony size of the Great Yellow Bumblebee is relatively small in comparison to other British bumblebees with approximately 40 individuals present at any one time. The resulting offspring of the foundress Queen is only likely to be 100 bees - over the entire breeding season ^[5].



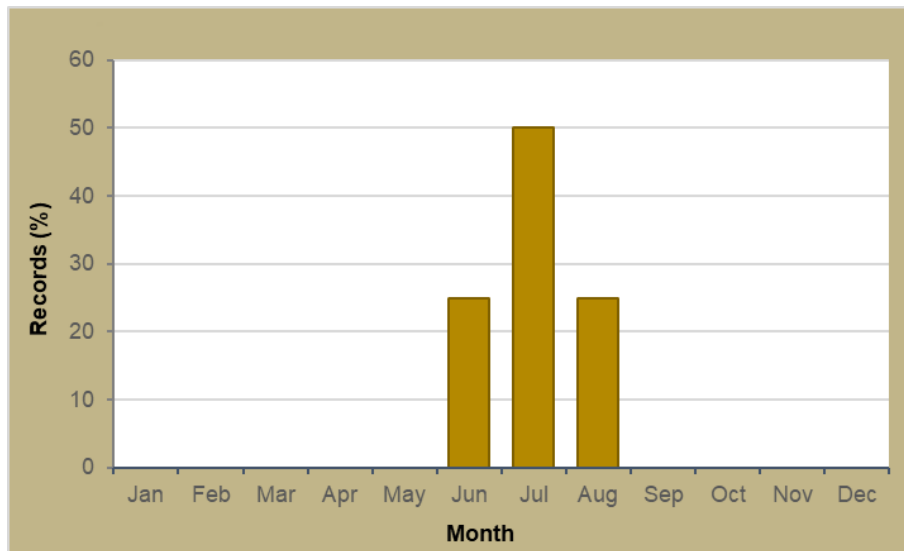
Queen



Queen foraging on kidney fetch



Typical habitat



Habitat and Distribution:

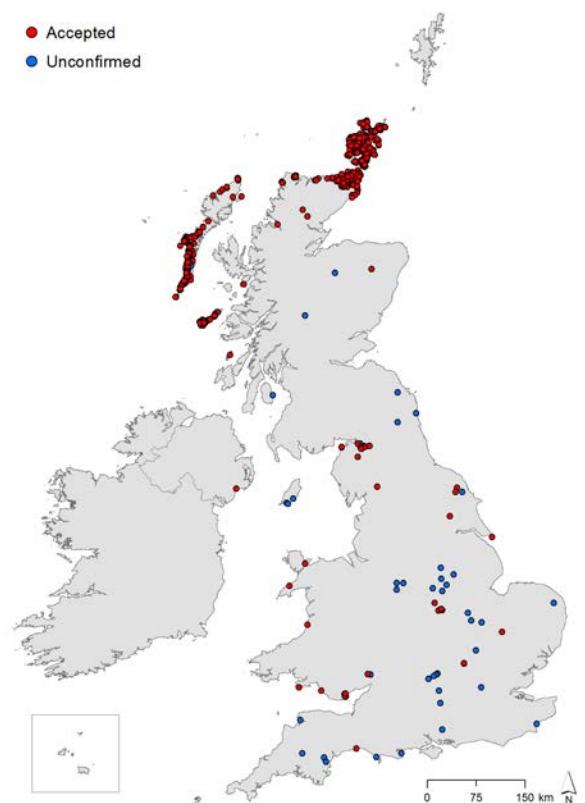
Habitat

The current strongholds for the Great Yellow Bumblebee in the UK are found in machair and other flower rich grasslands [4] which support a high density of flowering legumes [6]. Machair is a rare and distinctive habitat formed by a combination of shell rich calcareous dunes and traditional crofting. The resulting floral diversity provides suitable habitat for the Great Yellow Bumblebee, although this depends on the nature and level of intensity of the crofting [7].

As a later emerging species with a comparatively medium length colony cycle, a succession of flowering plants are required to sustain the bees throughout their lifecycle. It is a relatively long-tongued bumblebee (amongst the UK species), although not as long-tongued as Small and Large Garden Bumblebees.

The Great Yellow Bumblebee shows clear feeding preferences and has been found to forage on a low number of plant species compared to most other bumblebees [5].

Long associated with Red Clover (*Trifolium pratense*) the Great Yellow Bumblebee's name in Danish (klöverhumla) means 'clover bee'. Kidney Vetch (*Anthyllis vulneraria*) and Bird's-foot Trefoil (*Lotus corniculatus*) are important as are – later in the season - Common Knapweed (*Centaurea nigra*) and thistles such as Spear Thistle (*Cirsium vulgare*) and Marsh Thistle (*Cirsium palustre*).



NBN and CBDC records

It is worth noting that although current distributions in the UK and Ireland might suggest the Great Yellow Bumblebee is a habitat specialist, historically it has occupied a much wider range of environments. When considered globally, the Great Yellow Bumblebee is one of only a handful of bees to have a north Holarctic distribution. First recorded in the taiga/tundra habitat of the Aleutian Islands in 2002, it has since been found in mainland Alaska ^[8], truly cementing its reputation as a bumblebee with northern inclinations.

Distribution

The Great Yellow Bumblebee is one of the most severely declining bees in Britain. Listed as 'Vulnerable' at European level, it is a priority species within the UK Biodiversity Action Plan.

Prior to the 1960's the bee was widespread across the UK, although it has never been regarded as common. Agricultural intensification is generally agreed to be the key reason for its changing fortune in combination with other factors, such as climate change. Today, the population has retreated northwards and is to be found exclusively in the Western Isles, Orkney and a small number of sites along the North Coast of Scotland ^[6].

Status in Cumbria:

Only a handful of records exist for the Great Yellow Bumblebee in Cumbria, and as such it is difficult to draw any firm conclusions about its historical distribution. First recorded in 1890, by 1933 it was described as scarce by Routledge. Several of the records from 1900-1949 are from the north of Cumbria leading to the suggestion it may have been fairly common in this area ^[9].

Given the scarce but widespread distribution of the Great Yellow Bumblebee across the rest of the UK prior to its decline, it is likely to have been more widespread in Cumbria than records imply. The last known recording was in 1946 in Blackwell, Carlisle, by entomologist Frank Henry Day in his garden.

Future Outlook:

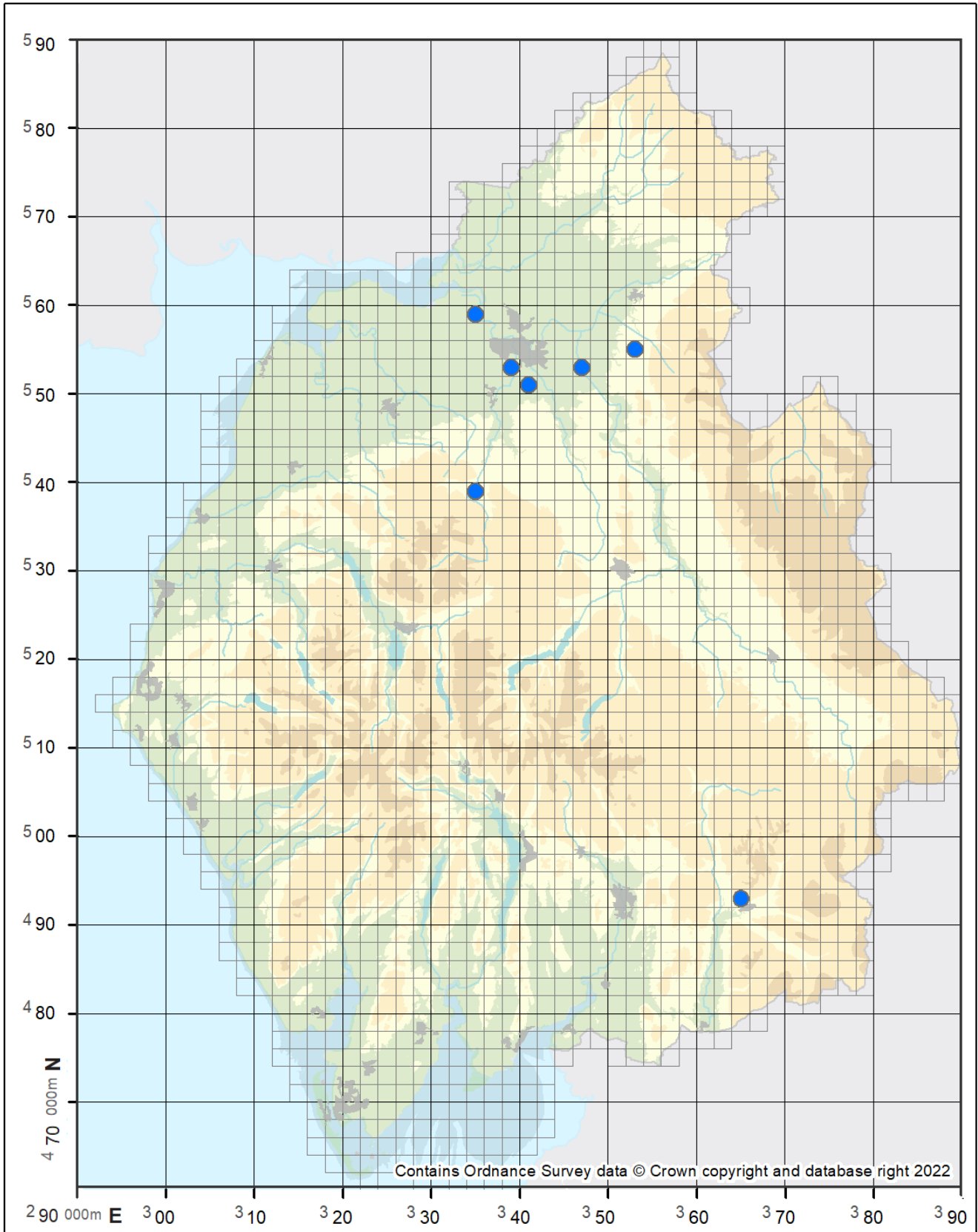
The Great Yellow Bumblebee has a number of characteristics - including habitat preferences, colony size and lifecycle - which make it particularly susceptible to the threats all bumblebees face.

Due to the late start to the breeding season, the Great Yellow Bumblebee has been highlighted as a species particularly at risk from climate change. It is suggested the increasing chance of heatwaves during July and August may have a greater impact on those bumblebees which have not completed their breeding cycle by this time ^[10]. The small colony size, potentially low production of queens [11] and low density of nests, even in high quality habitats ^[12], means that populations may have difficulty 'bouncing back' from a poor season.

Current efforts surrounding the conservation of the Great Yellow Bumblebee in the UK focus on strengthening existing populations. Low intensity crofting practices need to be supported against increased pressures such as the use of artificial fertilisers ^[7]. With any small population there is always a danger of inbreeding and whilst there is no evidence of this in the Great Yellow Bumblebee ^[13], maintaining connections between areas of suitable habitat will continue to be important.

As with all species, suitable flowers are not in themselves sufficient to complete the life cycle. Nesting and hibernation sites are also critical and knowledge of these requirements for the Great Yellow Bumblebee needs to be improved ^[14].

The Great Yellow Bumblebee has been extinct for a long time in Cumbria, and it is unlikely that habitats and climate would be favourable for sustainable recolonization of the species. More positively it is a charismatic species which has generated high levels of public interest and support ^[15,16]. Efforts towards maintaining and strengthening its current distribution continue.



<h3>Great Yellow Bumblebee</h3> <p><i>Bombus distinguendus</i></p>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 0 0 12 0

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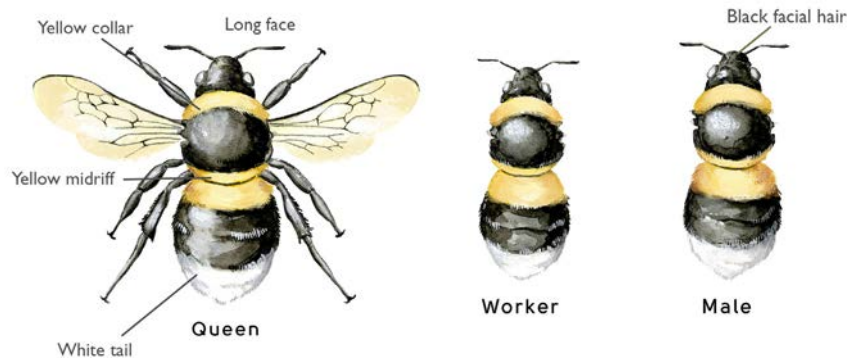
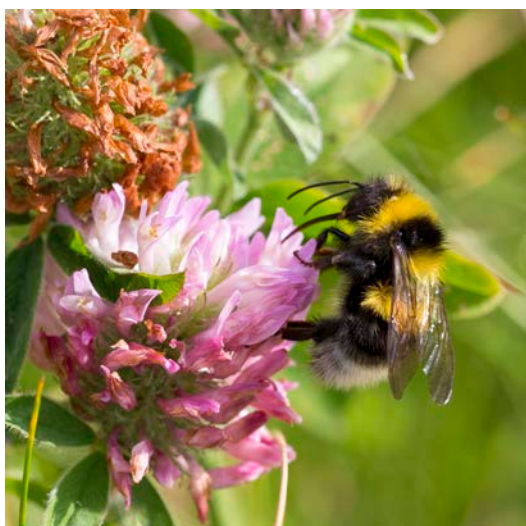
Main photo:

Queen - Vivian Russell

Side photos:

- 1- Queen - Alex Playford
- 2- Queen, foraging on Kidney Vetch - Alex Playford
- 3- Typical habitat - Alex Playford





Description and Life Cycle:

Description

What distinguishes the Small Garden Bumblebee (*Bombus hortorum*) from all the other common species is its elongated face and exceptionally long tongue. This allows the bee to enter narrow flowers with long tubular corollas other bumblebees cannot access. In flight this species is easy to spot, with its pendulous tongue suspended in mid-air. When approaching a flower for nectar, the tongue is fully and impressively extended, but tucked up out of the way when collecting pollen.

The Small Garden Bumblebee is a medium size bee with three bright yellow bands and a white tail. Size can be variable though, and workers can be larger than a small queen depending on how much food they received as larvae ^[1]. A quick way to identify it is to look at the midriff where two of the yellow bands sit side by side like double yellow parking lines. The only other bumblebee we have in Cumbria with this distinctive midriff is the Heath Bumblebee (*Bombus jonellus*), but this is a much smaller species, with a chubby face and short tongue.

The queens, workers and males all share the same uneven coat and colour pattern. Variations do sometimes occur, including a dark, melanistic form, but this bee will always have its signature long face and tongue.

Life cycle

Small Garden Bumblebee queens are quite late to emerge from their over wintering sites but are often seen here with full pollen baskets by mid-April before the other species. They are known to choose unusual nesting sites both above and below ground, and this versatility may give them an advantage.

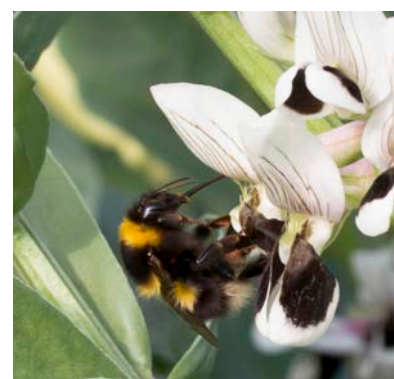
Nests are established under the cover of trees, plant roots, leaf litter or dried grass exposed to sunlight, or 50cm or so below the soil surface in spent mouse burrows for example. They also exploit a variety of cavities, including compost bins, dedicated nests for bumblebees filled with kapok, bird boxes, and have been found under sheds, sheets of tin and even in a sparrow's nest 20 feet above ground as recounted by Frederick Sladen in his landmark 1912 book *The Humble-Bee*.



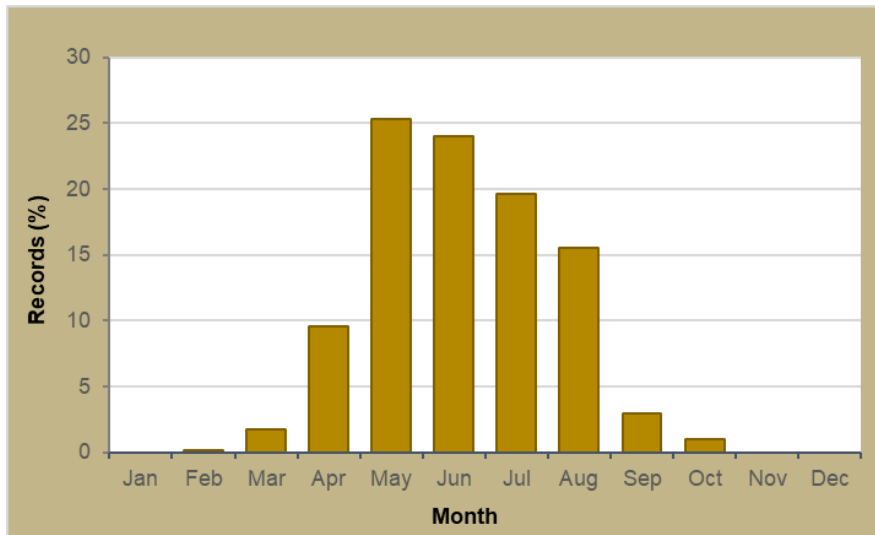
Long face and v. long tongue



In flight



Pollinating Broad Beans



Colonies are small varying from 30-80 workers, seldom more than 100, and the colony cycle is short, lasting around 14 weeks. This species sometimes completes a second cycle, with new queens seen in early autumn. The Small Garden Bumblebee is parasitised by Barbut's Cuckoo Bumblebee (*Bombus barbutellus*) which infiltrates their nests.

Habitat and Distribution:

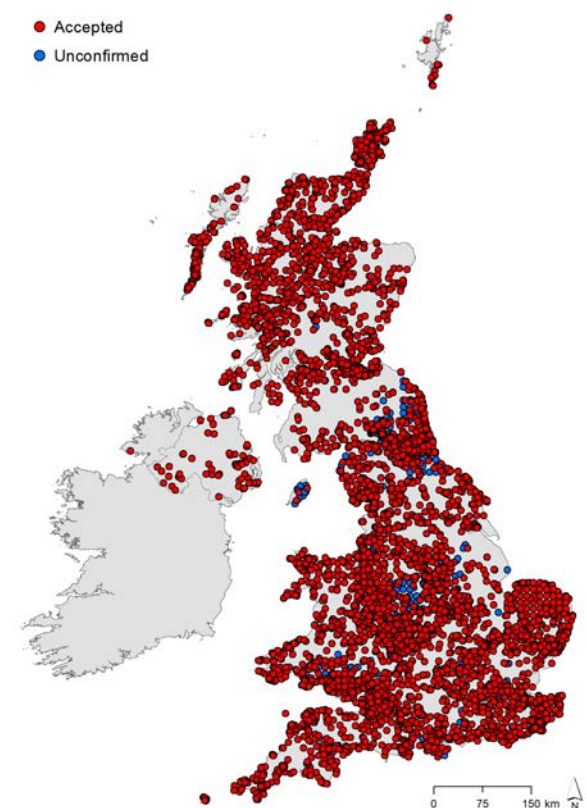
Habitat

The Small Garden Bumblebee was named *Bombus hortorum* in 1761 by Carl Linnaeus, derived from the Latin *hortus* - 'of the garden' [2]. Even then, this bumblebee was seen to frequent 18thc gardens for the flowers and vegetables they invariably grew. Today it also finds much of its forage and nesting opportunities in and around villages and urban and suburban areas where gardens and allotments provide pollen and nectar from early spring to autumn.

In the open countryside, this species forages along coastlines and in flower rich, unimproved grassland. Example habitats include road verges, riverbanks, the margins of arable farmland, pasture, hedgerows, and it is often found along woodland edges and glades where foxgloves grow. It is less often seen in the uplands and is probably rare on extensive moorland and bog.

Distribution

The Small Garden Bumblebee was once the most widely distributed bumblebee in Britain, whose geographical reach into the Outer Hebrides, Shetland Islands and Orkney, was unmatched by any of the common species found on the mainland [3]. An expert and prolific pollinator of red clover and field beans this bumblebee declined dramatically in the post-war agricultural heartlands when cover crops and herbal leys were replaced by nitrogen fertilisers, although it remains widespread throughout the UK and Ireland.



NBN and CBDC records

Status in Cumbria:

The Small Garden Bumblebee was first recorded in 1917 in Brampton by the Cumbrian naturalist George Routledge who went on to compile a comprehensive list of Cumberland's Aculeate Hymenoptera in the 1933 *Transactions of the Carlisle Natural History Society*. Routledge noted that it was 'common, rather local'. His assessment was echoed nearly a century later by the entomologist Neil Robinson in a second list compiled in 2005 which now covered the greatly expanded county of Cumbria created in 1974^[4]. Robinson noted it was "still common but in the author's experience, the least numerous of the 'common' species".

The Small Garden Bumblebee is almost always going to be less abundant than any of the most common 'Big Seven' group of bumblebees because of its small colony size, short colony cycle and forage preferences. Nests are often overlooked with so few workers going in and out.

This bumblebee visits deep flowers for nectar and though more unusual than shallow ones, are quite frequent in Cumbria where they occur, particularly later in the season^[5]. The females favour pollen from the Fabaceae (Pea family) which includes gorse, clovers, vetches, trefoils, and pulses. These pollens are rich in protein and amino acids, a kind of superfood which promotes rapid colony growth. Gorse is a firm spring favourite, and we have plenty of that in Cumbria. They will also collect pollen from, amongst others: White Dead Nettle, *aquilegia* sp., Viper's Bugloss, Honeysuckle, Foxglove and comfrey sp., all belonging to a variety of families.

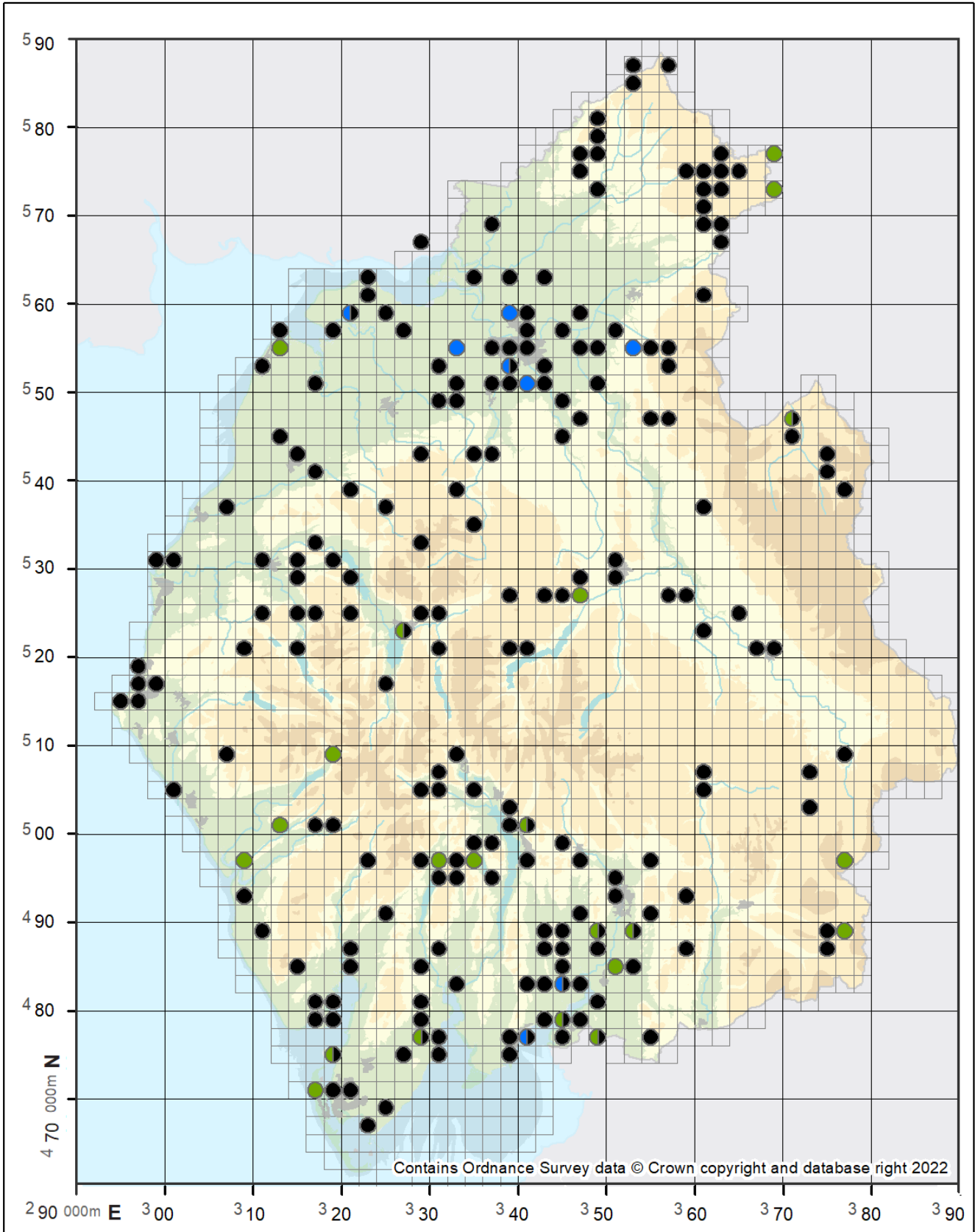
The species is evenly distributed across the lowland areas of Cumbria, in the valleys near rivers and lakes, along the coast, with clusters of records around villages and towns. As expected, there are a few records from the low fells to 500 metres, and none from the high fells.

The overwhelming number of Cumbria records stem from 'gardens and parks', partly because observations are easier from the doorstep but also because gardens, green spaces, and road verges in and around villages and towns blend into a mosaic of wild and cottage garden flowers, pollen rich pulses grown on allotments and nesting sites. With a foraging range of 1-1.5 km, this bee has everything it needs to successfully raise its young.

Less than half of the non-garden records are recorded from Cumbria's grasslands, where meadow species still flourish on verges and other flower rich marginal habitats, with the remaining records evenly divided between hedgerows and deciduous woodland.

Cumbria is a large and still relatively unpopulated county with an immensely diverse terrain, so there are few entries from remote or truly wild areas. No doubt records would increase if these places were explored.

Year on year records may fluctuate with the sustained periods of poor weather we often get, though these are more likely to ground recorders than the famously intrepid bumblebees. There has been a marked rise in entries since 2016 and the glorious spring and early summer of 2020 - again in 2021 - produced the highest number of Small Garden Bumblebee records in Cumbria's history. Coinciding with Covid restrictions, recorders were out and about in their local patches, and this may give the most accurate picture yet of the status of this important species.



<h3>Small Garden Bumblebee</h3> <p><i>Bombus hortorum</i></p>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 491
			Recorded (First: 1917 Most Recent: 2022)
			49
			0

Future Outlook:

While the future of the Small Garden Bumblebee seems stable, we need to pay attention as this is the only common, long tongued, narrow faced bumblebee we have, and any future decline will have a knock-on effect on the flowers and crops it pollinates and the species that depend upon them.

Along with conservation schemes and wildflower corridor projects that are underway, Cumbrian farmers are already mitigating the rise in fertiliser costs by reinstating green manures (clovers, vetches, lupins), and Defra's new 2022 Sustainable Farming Incentive will encourage farmers to plant up to 90% of their arable land with cover crops and reinstate herbal leys, combining wildflowers and legumes for pollinators. Given that Cumbria lost nearly 50,000 hectares of its post-war cover crops ^[6], these measures will do much to help secure the future of this bumblebee.

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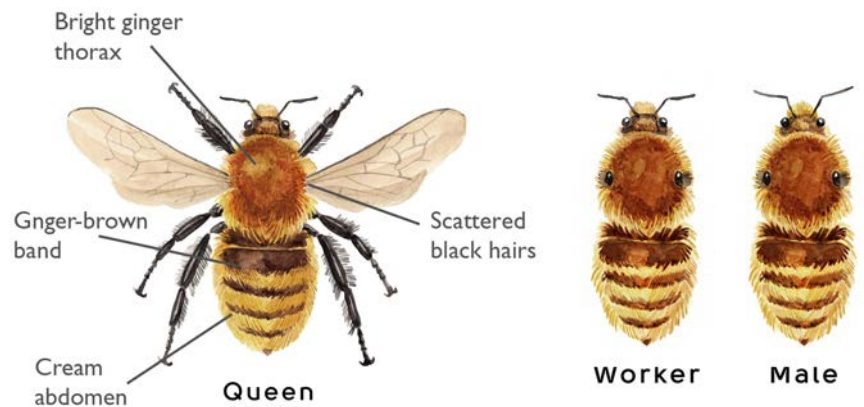
Main photo:

Small Garden Bumblebee at Red Clover. - Vivian Russell

Side photos:

- 1- Long face, very long tongue - Vivian Russell
- 2- In flight - Vivian Russell
- 3- Pollinating Broad Beans - Vivian Russell





Description and Life Cycle:

Description

The Brown-banded Carder Bee *Bombus humilis* closely resembles the two other “all- ginger carder bumblebees” in Britain - the Moss Carder Bee and paler, faded examples of the Common Carder Bee (paler examples of the latter being more frequent in more northern areas of Britain). The brown abdominal band that provides the basis of the common, English name can be variable in appearance and is not a wholly reliable feature to split *B. humilis* from these species in all cases.

B. humilis has no black hairs present on the abdomen (unlike most *B. pascuorum*), and does have a thin scattering of black hairs – or at least some black hairs - around and above the wing bases. In contrast, *B. muscorum* – the most similar species - has no black hairs on the abdomen or the thorax [1]. *B. humilis* has a much “neater appearance” than *B. pascuorum* – due to a shorter, less uneven haired coat of hairs on the abdomen and thorax [2].

Life cycle

B. humilis is generally a late emerging species: Queens typically emerge in May or early June, workers appear from June and males fly during August and September [2].

Nests of this species generally produce small colonies - compared to the other, related carder-bee’s of the *Thoracobombus* sub genus – at various depths in tall, open grassland (these may be on the surface of the ground or underground) [1]. If the nest is located on the surface of the ground the queen - and later, workers - usually gather fragments of dead grass and moss to cover the nest [1].



Worker

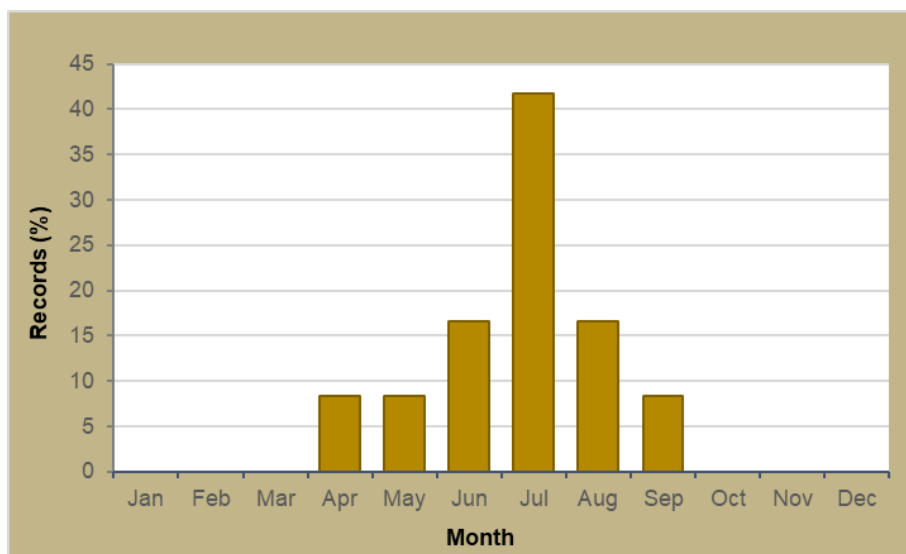


Worker

Habitat and Distribution:

Habitat

A range of habitats are used by this species – for nesting and foraging purposes - including heathland, chalk downland, brownfield, coastal levels, coastal dunes/shingle and – occasionally - arable settings. Tall, open grasslands are often the most favoured areas though all the aforementioned habitats

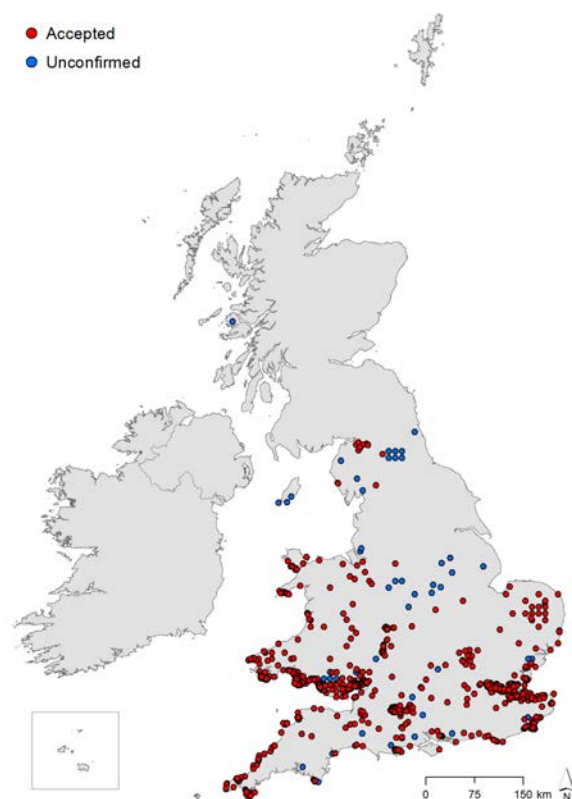


tend to be characterised by large and well-connected flower-rich habitat mosaics with plentiful late-season floral resources (there is a strong preference for pollen from plants from the families Fabaceae, Lamiaceae and Scrophulariaceae [3]).

Distribution

The Brown-banded Carder Bee is one of the more scarce, UK BAP listed carder bumblebees found in Britain and a rarely recorded carder-bee in Cumbria (in terms of total records, historically and more recently). This species is very closely related to *B. muscorum* but is generally more southerly in its distribution - and usually preferring drier habitats [1].

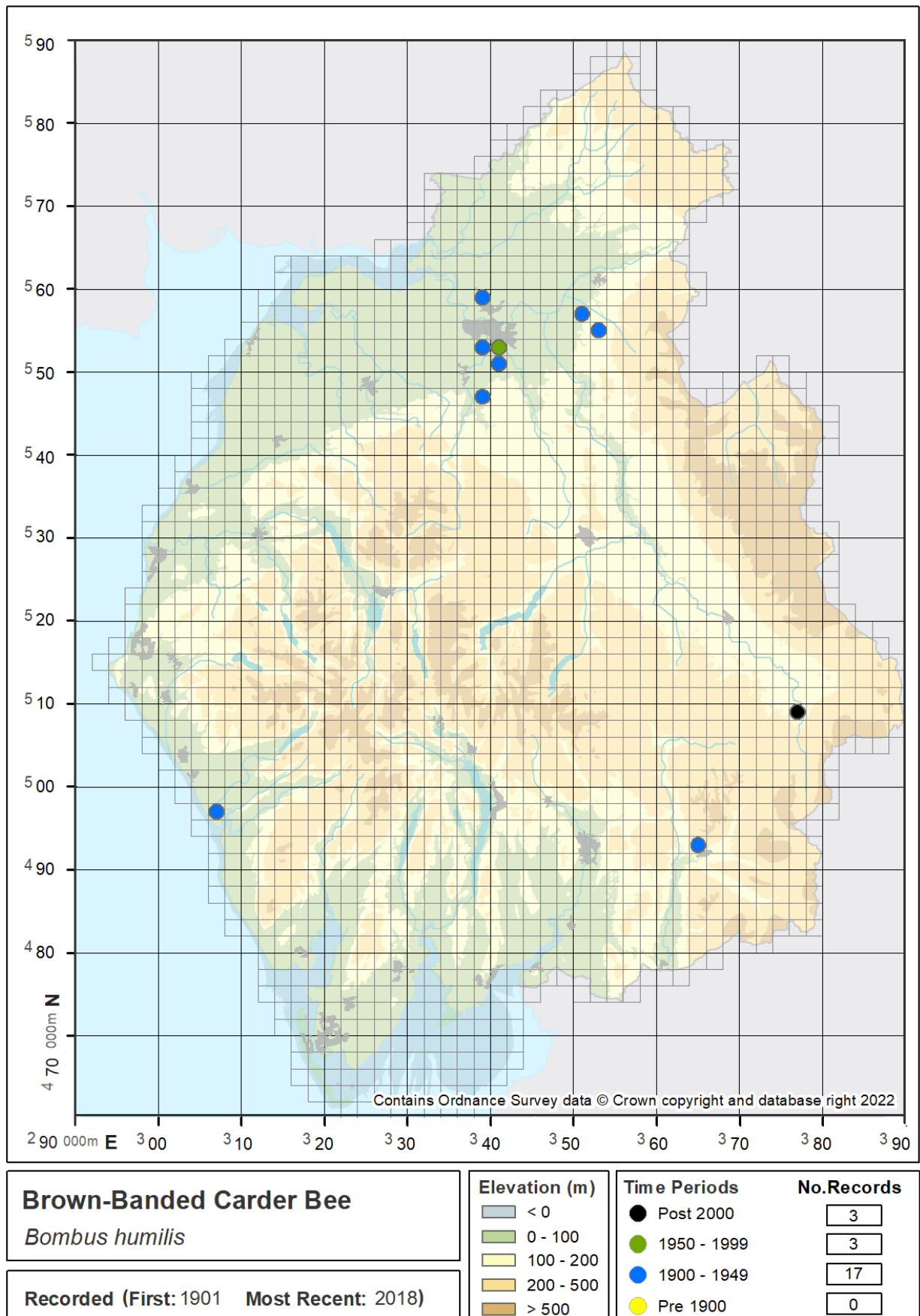
B. humilis used to be widespread in much of lowland Britain – reaching northern limits in Cumbria and Northumberland historically [1] - but experienced a severe decline in its distribution during the 20th Century, with the strongest remaining populations being on sites with extensive areas of flower-rich grassland (and – occasionally – heathland [1]). The decline of this species in Britain seems to be closely linked to agricultural intensification and the subsequent decline of the extensive flower-rich habitats associated with such land historically. However, the species seems to now be showing signs of localised recovery in some areas - notably the Midlands [2] and also in SW England, Kent and South Wales.



NBN and CBDC records

Status in Cumbria:

There are limited historical records for Brown-banded Carder Bee in Cumbria. The first and last of the 13 records from 1901 (Durdar) to 1953 (Blackwell) were made by F.H. Day, who also found it at Cummersdale in 1935 (CBDC data set). The remaining records from this period included sites such as



Tarn Lodge and Fenton ^[4]. It is probable that the sparse records in this period reflected a very restricted historical distribution in Cumbria – due, in part, to its more southern distribution in Britain - though due to taxonomic uncertainty relating to the identification of related carder- bee species historically, it is difficult to gauge a completely accurate impression of the historical distribution of scarce carder bee species in northern England (Carl Clee, pers.comm.). The species has been very recently recorded in Cumbria post-2000 (North Walney – in 2018). This record, plus post 2000 records from Wirral (Ness Botanic Gardens and Thurstaston Common) indicate tentative signs of a “northern rebound recovery” and further recording efforts targeted at likely, lowland habitats may help elucidate the status of *B. humilis* in Cumbria.

Future Outlook:

The decline of this species in Britain seems to be closely linked to agricultural intensification and loss of extensive flower-rich habitat generally.

Cumbria is at the northernmost mainland extent of the historical range of this species, therefore re-establishment of this species over a wide area of Cumbria is not assured and it may remain a rare and very localised species, should it re-establish successfully in future.

Conservation and restoration of flower-rich grassland - to support, strengthen and connect remaining populations of this species - is needed to help continue to reverse declines and improve the status of this species from a national perspective.

References:

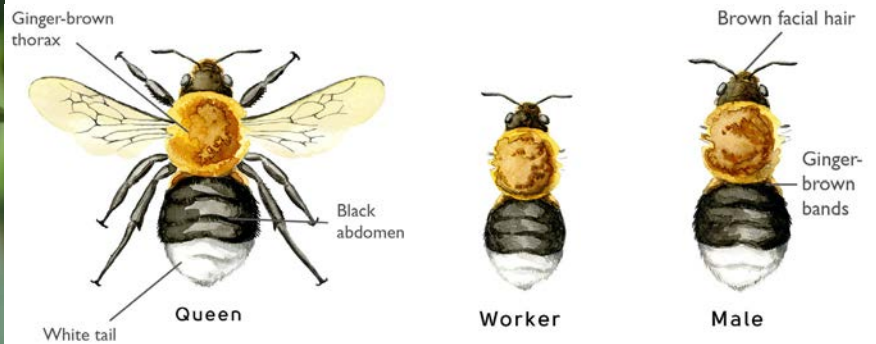
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- 2- Falk, S., Field Guide to the Bees of Great Britain and Ireland, Bloomsbury.
- 3- <https://www.bwars.com/bee/apidae/bombus-humilis>.
- 4- Robinson, N., 2005. Bees, Wasps and Ants Society Newsletter, Autumn, pp. 52-56.

Main photo:

Queen - Steven Falk

Side photos:

- 1- Worker - Steven Falk
- 2- Worker - Steven Falk



Description and Life Cycle:

Description

A newcomer to Britain and Ireland, the Tree Bumblebee was first recorded in Britain in 2001 and Ireland in 2014. It has since spread rapidly to become one of the most common bumblebees and in 2011 arrived in Cumbria. With a unique colour pattern among British bumblebees, the Tree Bumblebee has a ginger-brown thorax when fresh and a black-haired abdomen, ending with a white tail.

The ginger-brown can be dark, or replaced with black hair in melanistic forms ^[1]. It can look particularly similar to darker forms of the Common Carder Bee *Bombus pascuorum* (page 98), but the Common Carder lacks the conspicuous white tail.

Life cycle

Invariably an aerial-nester, Tree Bumblebees are unusual among British bumblebees which typically nest at or below ground level. While nesting areas would naturally be in tree holes and cavities, queen Tree Bumblebees readily use bird boxes and artificial structures such as roof eaves and walls. Queens use the nest material left over from previous nesting birds, but may even evict small birds, such as Blue Tits, from their bird box nests ^[2]. Nests can contain around 150 workers and there can be two generations in a year ^[3].

An early-emerging bumblebee, queens can be observed on the wing from February, with workers from April through to autumn and new queens and males from June. In the course of behaviour known as 'nest surveillance', males fly in large numbers outside nests awaiting emerging queens ^[4]. This often causes concern but as male bumblebees cannot sting, it should not be alarming.

Visiting a large variety of plant species, the Tree Bumblebee shows a particular preference for rosaceous species such as brambles, Raspberry and cotoneaster species^[1] - indeed, the first ever individual recorded in Britain was found on bramble ^[5].



Worker

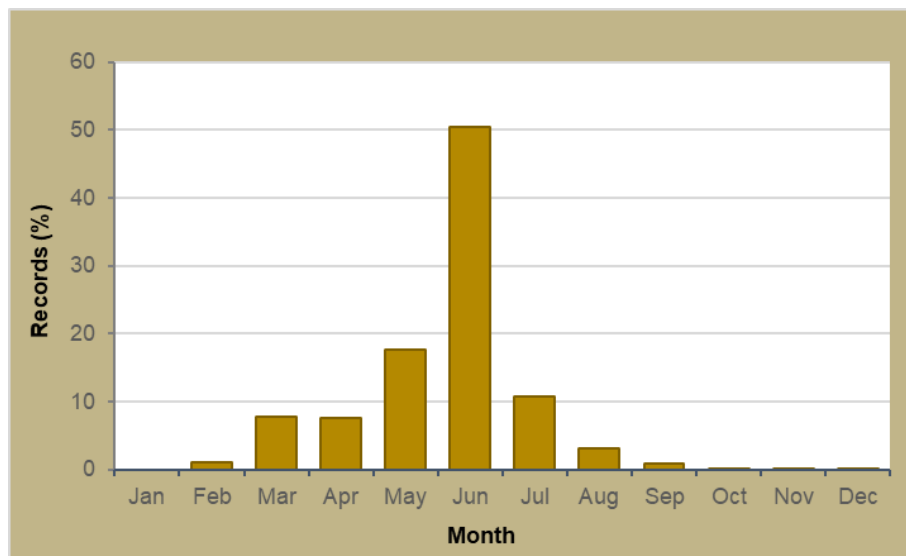


Male



Female (caste not determined)

A short-tongued bumblebee, it sometimes 'nectar robs' from tubular flowers such as comfrey's, using holes created by other short-tongued bumblebees. There are no known cuckoo bumblebees that parasitise the Tree Bumblebee in Britain and Ireland. In mainland Europe, nests are usurped by *Bombus norvegicus*.



Habitat and Distribution:

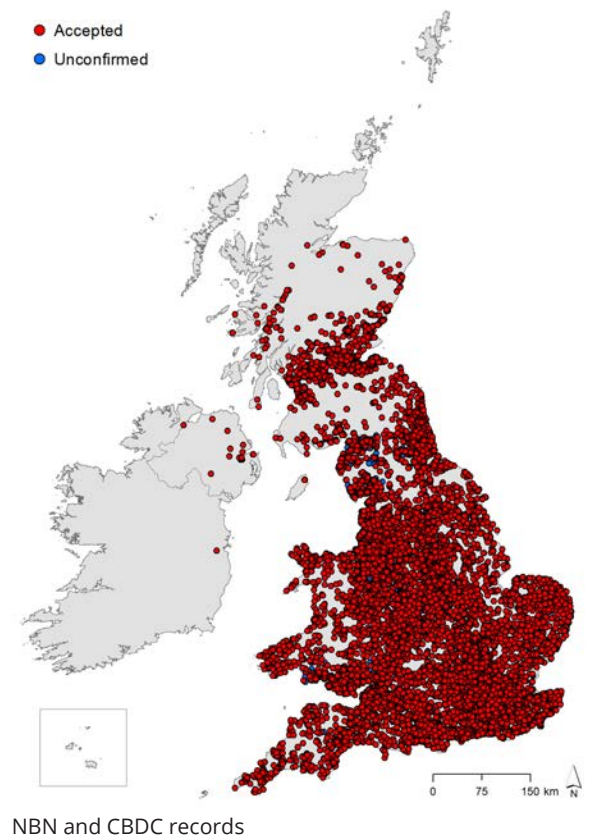
Habitat

Throughout its range in mainland Europe and Asia, the Tree Bumblebee is associated with temperate and upper montane forest [5], as well as urban settings [6, 7].

While found in a variety of habitats in Britain and Ireland, the Tree Bumblebee does show a particular preference for suburban settings, such as gardens and allotments [8]. Being strongly synanthropic amongst our common bumblebees [9], this species readily utilises artificial, aerial nesting locations in urban areas such as bird boxes and roof eaves. This may in part explain its rapid expansion since its arrival to Britain. It doesn't appear to favour very open landscapes, possibly due to lack of aerial nesting opportunities [1].

Distribution

Arriving from mainland Europe in 2001, the Tree Bumblebee has rapidly spread across Britain and Ireland, and is now among the most common and widespread UK bumblebees. Since its discovery, the Bees, Wasps and Ants Recording Society (BWARS) have mapped its spread across Britain and Ireland. First found in Wiltshire in south west England, it reached Northumberland in 2007, Cumbria in 2011, Scotland in 2013 and Ireland in 2014. How it arrived in Britain is uncertain, though natural colonisation is likely - with genetics research suggesting continued immigration from mainland Europe [10].



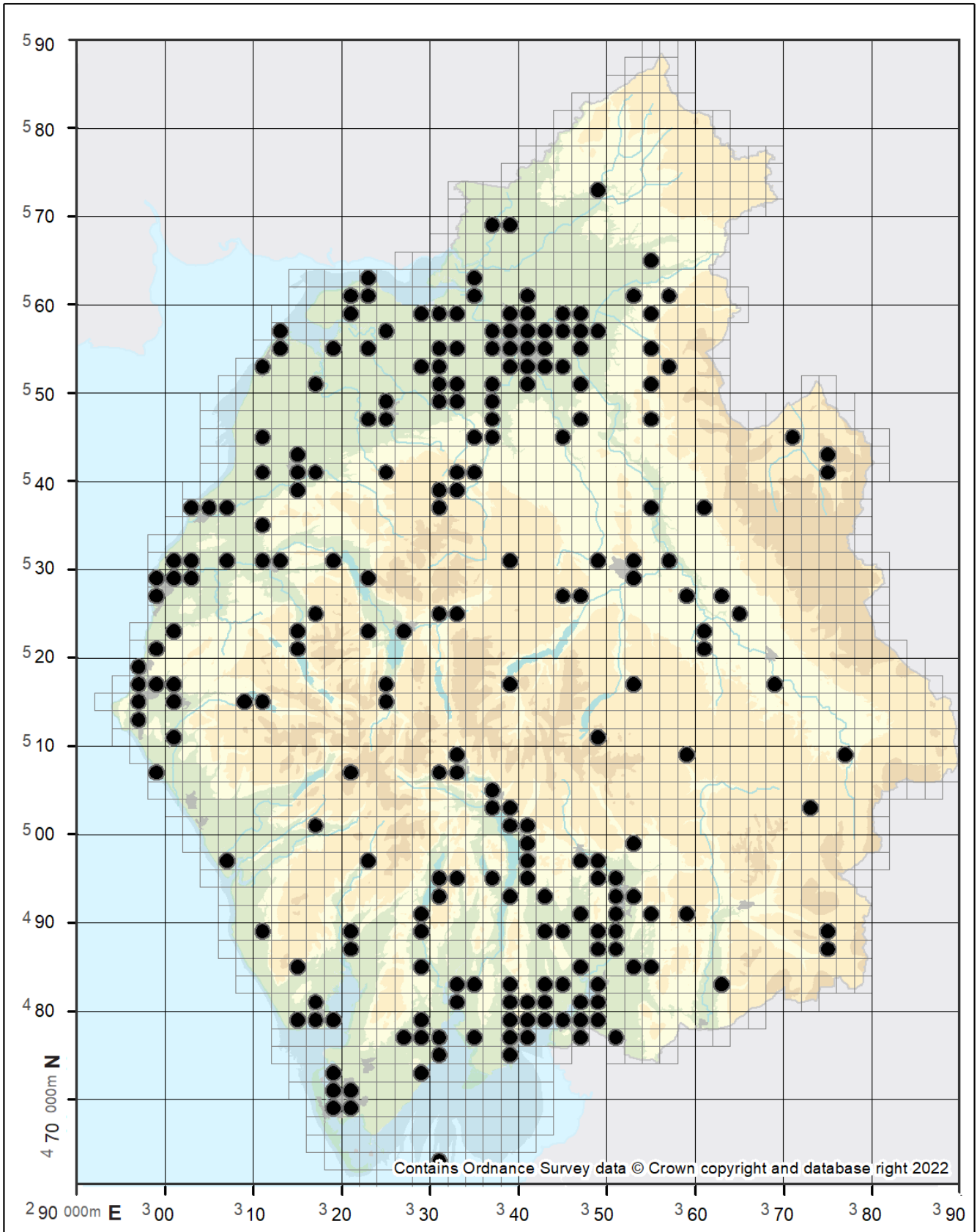
Status in Cumbria:

First recorded in Cumbria in 2011, the Tree Bumblebee is now among the most frequently recorded bumblebees in Cumbria, and considered a common and widespread bumblebee.

Following a north Lancashire-Cumbria border record in 2010, a worker Tree Bumblebee was observed in 2011 along the River Eden in Carlisle, foraging on a patch of raspberry ^[11]. In the same year, this was followed by a cluster of Carlisle records, and a record from Millom in the south. Within two years, the Tree Bumblebee was recorded in new locations along the coast and in the Lake District. Records have since increased steadily each year, with records from towns and villages, along the coast, to the valleys and low fells of the Lake District, such that its distribution closely matches that of other widespread and common bumblebees in Cumbria.

Future Outlook:

A recent colonist with rapid and extensive range expansion, the Tree Bumblebee provides an interesting study in bumblebee ecology and conservation, also demonstrating the versatility of the species. It is likely to continue expanding into suitable habitat across Cumbria and Britain & Ireland. Given the noted preference for suburban habitat and its aerial-nesting habit, the conservation of flower-rich gardens, parks and woodland edge is important for this bumblebee. There is no evidence that the Tree Bumblebee is negatively impacting our other bumblebee species at present.



Tree Bumblebee <i>Bombus hypnorum</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 717 0 0 0
	Recorded (First: 2010 Most Recent: 2022)		

References:

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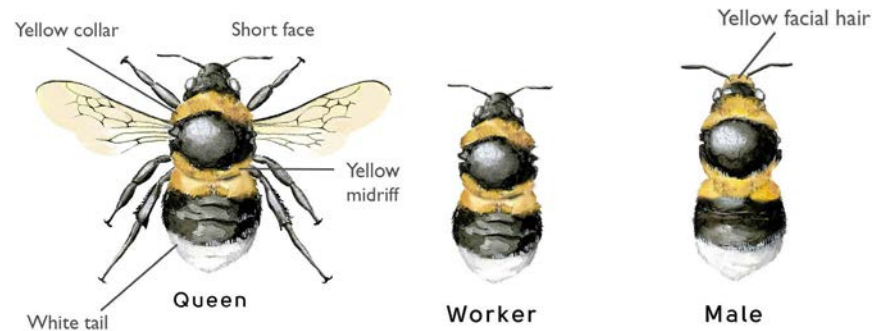
Main photo:

Queen - Charlotte Rankin

Side photos:

- 1- Worker - Charlotte Rankin
- 2- Male - Charlotte Rankin
- 3- Female (caste not determined) - Vivian Russell





Description and Life Cycle:

Description

Compared with all our other bumblebee species the Heath Bumblebee (*Bombus jonellus*) has always been somewhat of an outlier. It isn't rare, or a cuckoo, and although widespread, not common enough to be included in the pantheon of the 'Big 7' most prolific bumblebees in Britain.

The Heath Bumblebee was named *Bombus jonellus* in 1802 by the parson-naturalist William Kirby who was the first to break with the established Linnaean tradition of naming bumblebees after traits that best described them. Instead, Kirby named this bumblebee in honour of his friend William Jones ^[1]. Jones was a fellow entomologist, so renowned for his exquisite paintings of butterflies and moths that the Danish zoologist Claudius Fabricius was able to describe 231 species simply by referencing his monograph ^[2].



Male

While having a bumblebee named after him was a great accolade for William Jones, it revealed nothing about its namesake who has further been deprived of an identity by being endlessly compared in many species accounts to the similar looking Small Garden Bumblebee (*Bombus hortorum*).

Heath Bumblebees are noted for their short face and tongue and along with the related Early Bumblebee are often the smallest UK species. Their abdomens are rounder than those of more elongate bees, depicted by D.V. Alford as 'more bulbous' ^[3].

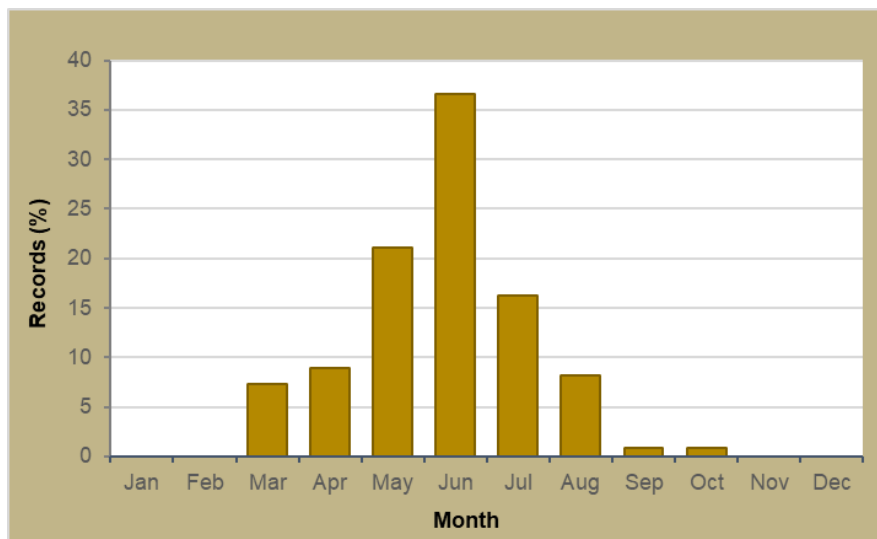
Queens and workers have a yellow band behind the collar, a pair of double yellow bands around the midriff and a white tail. The colour of the bands is a muted yellow and queens can be very dark (in some cases almost melanic).

In contrast, a typical male is as bright and fluffy as mimosa when freshly emerged. For a small bee he has an extensive pile of bright yellow hair on his collar behind the head, extending down both sides of his thorax and conspicuously spread out, making him look a bit punk. A prominent, yellow "moustache" or "nose" of hairs on the face adds to his charm. The double bands around his midriff are the same yellow colour and the tail is usually white, but sometimes a bit of red or yellow creeps in.

Identifying bumblebees is always complicated by their variability and the Heath Bumblebee is no exception. Colour forms that differ from the norm occur on mainland Britain which can be confusing. In addition, there are several distinctively marked races on the Scottish Isles.

Life cycle

Cumbrian records show that in common with the south of England our queens emerge from early March onwards (but later in the north of Scotland). Heath Bumblebee nests have been discovered in an eclectic mixture of places; underground in disused mammal burrows and above ground - in the bases of bushes, fallen bird nests, the rafters of an old workshop and way above ground as Frederick Sladen discovered when he found a colony nesting in a squirrel's dray at the top of a fir tree.



Colony sizes are usually small, often less than 50 workers and sometimes far fewer. They are double brooded in the south but less frequently so in Cumbria, with few sightings of them on the wing into September and October. As this is a trans - Palearctic species a short colony cycle is a good strategy as it may reflect the brief duration of summers in the cooler regions it frequents (such as Iceland - where they are known to be widespread). Heath Bumblebees are thought to be one of the hosts of the Forest Cuckoo Bumblebee (*Bombus sylvestris*).

Habitat and Distribution:

Habitat

True bumblebees were given their common names by Frederick Sladen in his book *The Humble Bee* published in 1912. He named *Bombus jonellus* the Heath Bumblebee because, he explained, it 'frequents heaths and is very partial to the flowers of Erica' [4].

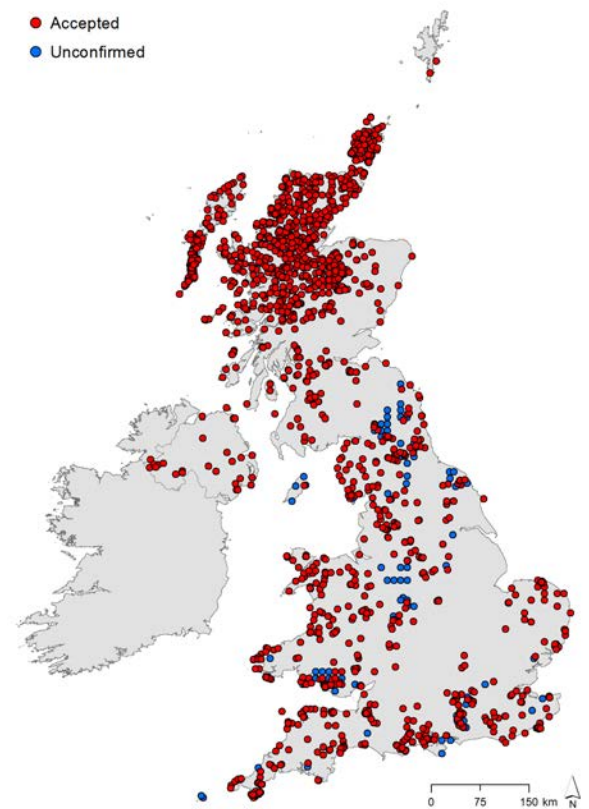
While the Heath Bumblebee is most reliably found in heather-rich habitat, records show it is dispersed in many other habitats away from dry heaths, the Mosses and heather moorland. Coastal dunes and grazing marsh, cliffs, meadows, riverbanks, road verges and gardens are popular choices, but it is also an infrequent visitor on chalk grassland and open deciduous woodland. The Heath Bumblebee belongs to the *Pyrobombus* sub genus of bumblebees, which frequently turn up in unexpected locations. What tendencies prompt them to do this, whether vagrancy or dispersal, is impossible to prove.

These bumblebees are versatile in many other aspects of their lives. They are certainly not fussy about nesting sites - or habitat - and while winter heather (from gardens) and summer heather and bilberry are important sources of pollen, they will seek the nutritious Fabaceae (Pea family) pollen as a larval food source - as do many other bumblebee and aculeate species. Otherwise, they are polylectic, their short tongues allowing them to exploit a wide range of flowers from a broad church of families. Height is no obstacle either, with the species having been recorded at 935m [5].

Distribution

The Heath Bumblebee is well distributed throughout most of Britain although more sparsely from the 'central impoverished zone' where all bumblebees are scarce. Strongholds in England and Scotland are in upland habitats, extensive areas of lowland heath in the south of England and on the brecks and heaths of East Anglia, with an even greater presence on heather moorland in the north of Scotland.

Studies by Ben Darvill ^[6] have shown this bee to exhibit strong dispersal tendencies and it has colonised the Scottish Isles, producing a distinct race in the Western Isles, and another in the Shetland Isles. In Ireland, Alford's 1980 Atlas shows it was dotted around much of the coastline up to that point – but it has now spread inland throughout the country ^[7].



NBN and CBDC records

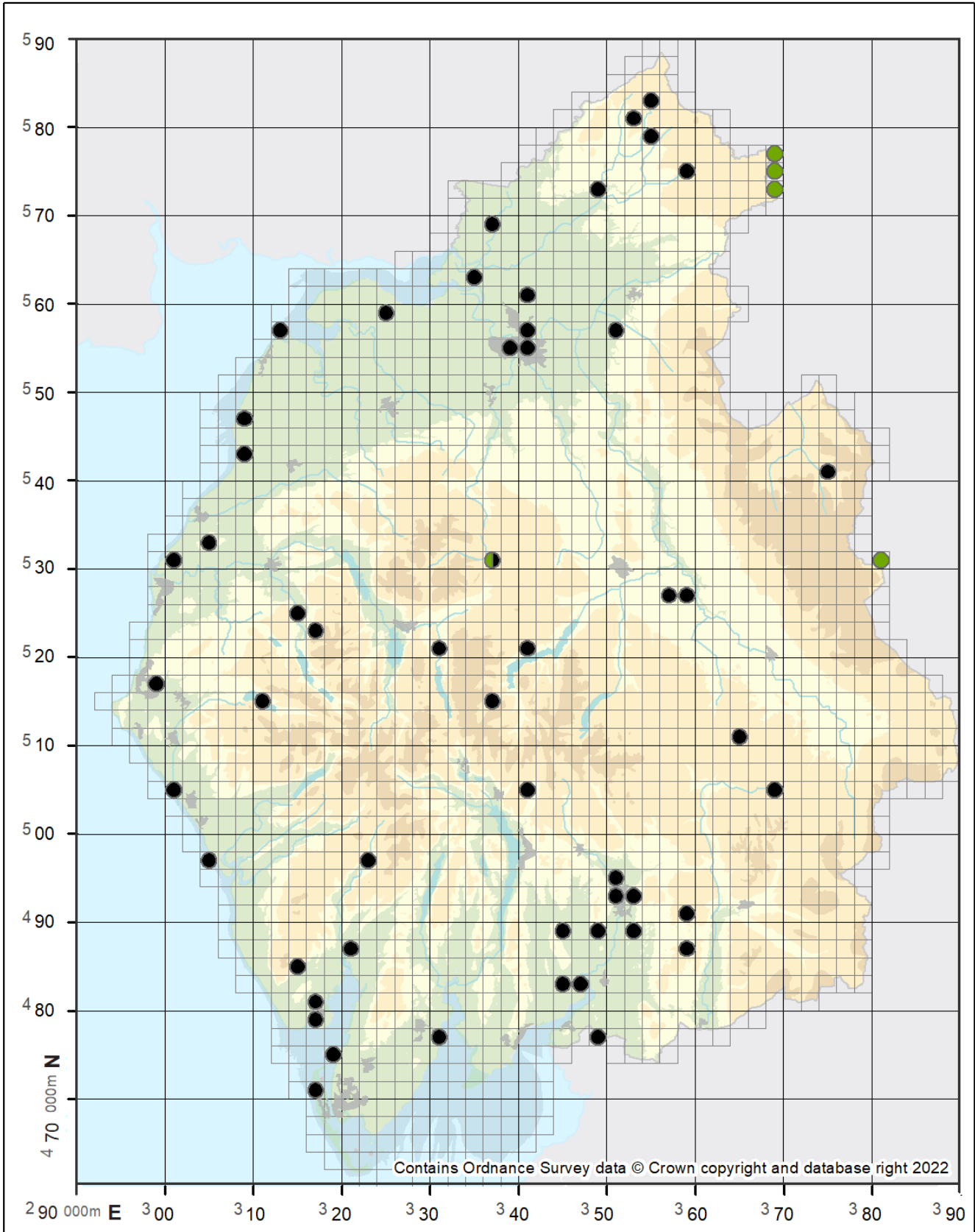
Status in Cumbria:

Despite a promising early find in 1899 near Carlisle from naturalist F. H. Day, the specimen he provided to Tullie House Museum would prove to be the only one in their collection for over a century. And even though Day recorded assiduously across all north Cumbria into the late 1950's, he never came across the Heath Bumblebee again.

The entomologist A. E. Wright - prolifically collecting specimens and generating data in south Cumbria, mostly between 1940 and 1943 - had better luck. An entry in his ledger dated 1940 read "Holker and Witherslack, common on the mosses" ^[8]. The first referred to Holker Moss, the second – as Neil Robinson later clarified - were "the coastal raised bogs which provided heather and other moss land habitats within easy reach of Grange, collectively referred to as 'Witherslack' in Wright's ledger ^[9].

Although recording came to a virtual standstill in the areas frequented by George Routledge, F. H. Day, and A. E. Wright after their deaths in 1934, 1963 and 1950 respectively, there was recording activity going on in the varied and largely unexplored landscapes of Cumbria east of what is now the M6 motorway. This vast overlooked area includes outlying fells in the south and a portion of the Pennine hills in the north, with extensive heather moorland, blanket bog, upland rivers, hay meadows and large tracts of conifer forest near the Scotland and Northumberland borders. The Heath Bumblebee has been found in all these habitats.

In 1963 and 1976 this bee was recorded on the heather peatland of England's highest nature reserve, Moor House (where the mean annual temperature is 5.9 degrees) and in the enclosures and alluvial grassland below. In 1988 it was present on the Moorthwaite and Cliburn Mosses and 1992 brought 18 records from a mixed habitat of heaths and woods along a six mile stretch of the river Irthing in June and July. This river forms the boundary with Northumberland.



Heath Bumblebee <i>Bombus jonellus</i>		Elevation (m)	Time Periods	No. Records
Recorded (First: 1976 Most Recent: 2022)		< 0	Post 2000	<input type="text" value="108"/>
		0 - 100	1950 - 1999	<input type="text" value="21"/>
		100 - 200	1900 - 1949	<input type="text" value="0"/>
		200 - 500	Pre 1900	<input type="text" value="0"/>
		> 500		

Other notable records of the Heath Bumblebee in this remote eastern flank of Cumbria are from tracks of the Kershope, Bewcastle and Spadeadam forests near Northumberland in 1996 and an October 2015 sighting on Great Asby Scar - where the heather comes into flower in September. Recording resumed in and around the Lake District National Park in the early 1990's when Stephen Hewitt (Keeper of Natural Sciences at Tullie House Museum) and Neil Robinson took up the baton from the pioneering early naturalists. In 1994 the Heath Bumblebee was finally recorded in the Lake District by Hewitt at White Moss, Mungrisdale, near Keswick and the millennium year gifted a surprise when Robinson found it in his garden near Kendal, foraging on escallonia. Had the Heath Bumblebee been widespread in Cumbria all along, just under the radar for want of looking? Or had it declined periodically and was now rebounding?

Interest in bumblebees has greatly increased over the past twenty years providing Cumbria with 108 records (and counting) of the 129 in total we hold for the Heath Bumblebee at the time of writing. They range from intermittent points all along the coastline to as high as heather will grow and include many habitats like road verges and flower rich grasslands in between. Heath Bumblebees are numerous on many low-lying Mosses during August when the heather is in flower and recorded as late as October on some upland heaths. The Heath Bumblebee regularly visits gardens in the urban centres of Carlisle in the north, Kendal in the southeast and Millom and Broughton in Furness in the southwest.

The relatively recent influx of verified records from iNaturalist is adding valuable detailed data that the old two square kilometre grid references never did. We have a record from a garage in Holmrook, the cycle pathway by Dunmail Park shopping mall near Workington, observations of workers foraging on winter heather in gardens in April, a male foraging on Green Alkanet and a worker on a dandelion in May. With so many new entries coming in from such a wide range of habitats, Robinson's 2005 assessment that the Heath Bumblebee was "widespread but very local" needs updating ^[8].

Future Outlook:

The Heath Bumblebee is an extremely resourceful, versatile, and free roaming species, largely unconstrained by forage preferences or nesting sites. It is at home on upland and lowland heaths, but not dependant for its existence on either, exploiting many other habitats as the breadth of records show us. There is no sign of any decline in Cumbria, and this small, adaptable bumblebee may well be amongst the species that is best equipped to cope with the changes in climate that are already underway.

References:

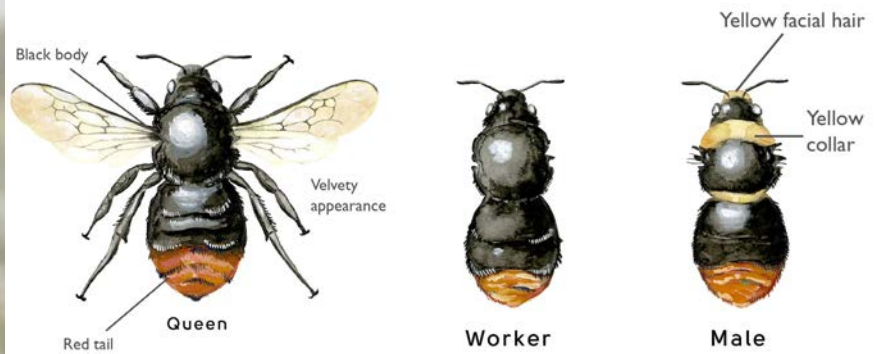
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Main photo:

Queen - Steven Falk

Side photos:

- 1- Male - Charlotte RankinMale - Vivian Russell



Description and Life Cycle:

Description

Found in a wide variety of habitats, the Red-tailed Bumblebee is a widespread and common bumblebee across much of Britain and Ireland.

Queens are large bumblebees, with a crimson-red tail, covering a quarter of the abdomen - and velvet-like jet black hair. Although not as variable as other bumblebees, queens with yellow-grey collars occur on occasion [1].

Workers simply resemble small versions of queens, while males have additional yellow banding behind the head and at the bottom of the thorax, as well as yellow hair on their face. This short-tongued bumblebee visits a wide variety of plants and is a common garden visitor.

Life cycle

Queens typically emerge in March, sometimes as early as February, with workers on the wing from May and new queens and males from late June. In search of new queens, males can be observed scent-marking and patrolling along grass or higher at tree-top level. Colonies can persist through to early autumn.

The scientific name '*lapidarius*', meaning 'of or relating to stone', was given to this bumblebee due to its habit of nesting under large stones, amongst rubble or in walls, but it can also commonly be found nesting in underground burrows [1, 2]. Producing up to 300 workers, Red-tailed Bumblebee nests are particularly large for bumblebees and have entrance tunnels up to two feet long [2]. Nests are attacked by the Red-tailed Cuckoo Bee *Bombus rupestris*, a bumblebee also found in Cumbria (page 114).

A regular visitor to gardens and grasslands, Red-tailed Bumblebees feed on a wide variety of plants, both native and cultivated. Early-flowering blossoms and willows are important for the early-emerging queens.



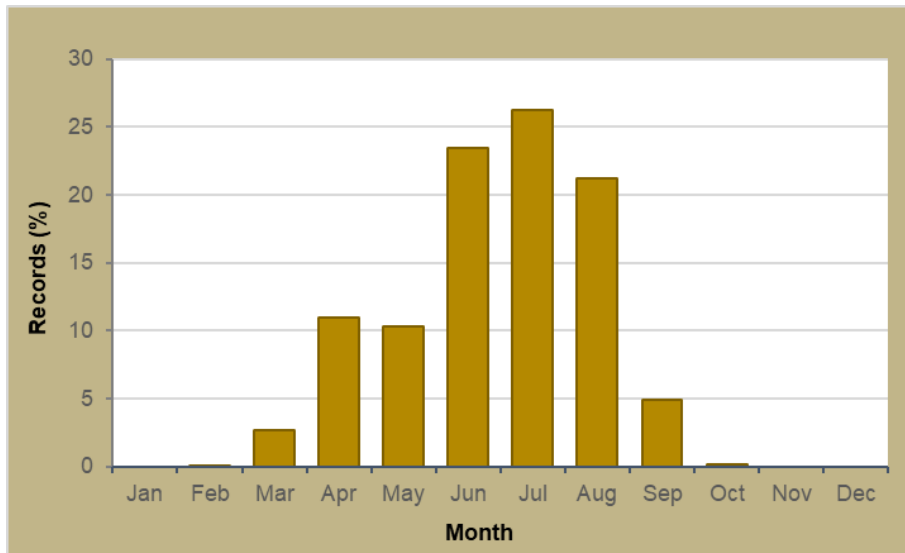
Queen on Chives



Worker on thistle



Male on Creeping Thistle



Workers have a particular preference for legumes - especially clovers and Common Bird's-foot Trefoil *Lotus corniculatus* - and yellow composites (such as hawkbits and hawkweeds). In late summer males can often be observed nectaring on knapweeds and thistles. In arable settings, it can be a common visitor to Oilseed Rape *Brassica napus* [3, 4], as well as to other economically important crops such as Field Bean and Strawberry [4].

Habitat and Distribution:

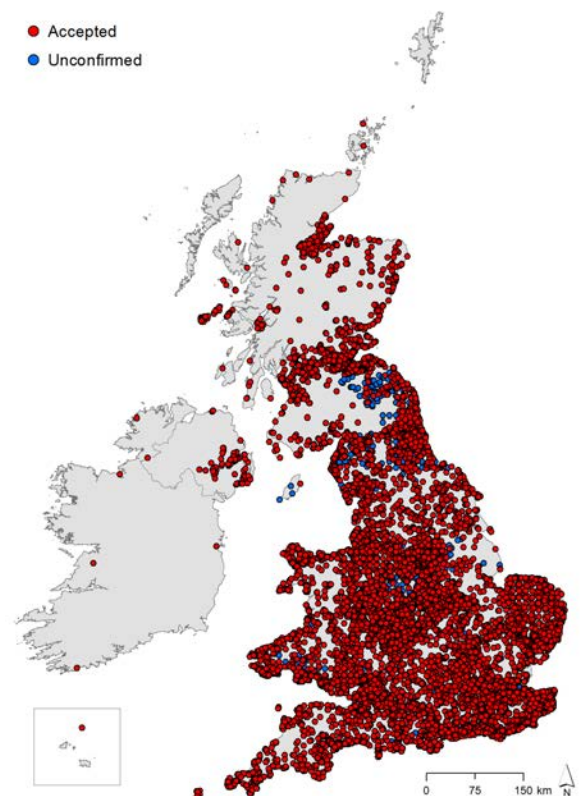
Habitat

This bumblebee is found in a wide range of habitats including open and wooded settings. It is commonly observed in gardens and grassland sites, particularly those that are legume-rich [1].

Nests can be common in arable landscapes, with one study estimating 117 nests / km² [5]. Linear features such as hedgerows provide particularly suitable nesting habitat [6].

Distribution

The Red-tailed Bumblebee is a widespread and common bumblebee in Britain and Ireland, becoming scarcer in the far north [1]. However, since the 1990s, it has expanded its range northwards into the north of Scotland, including the Highlands [7].



NBN and CBDC records

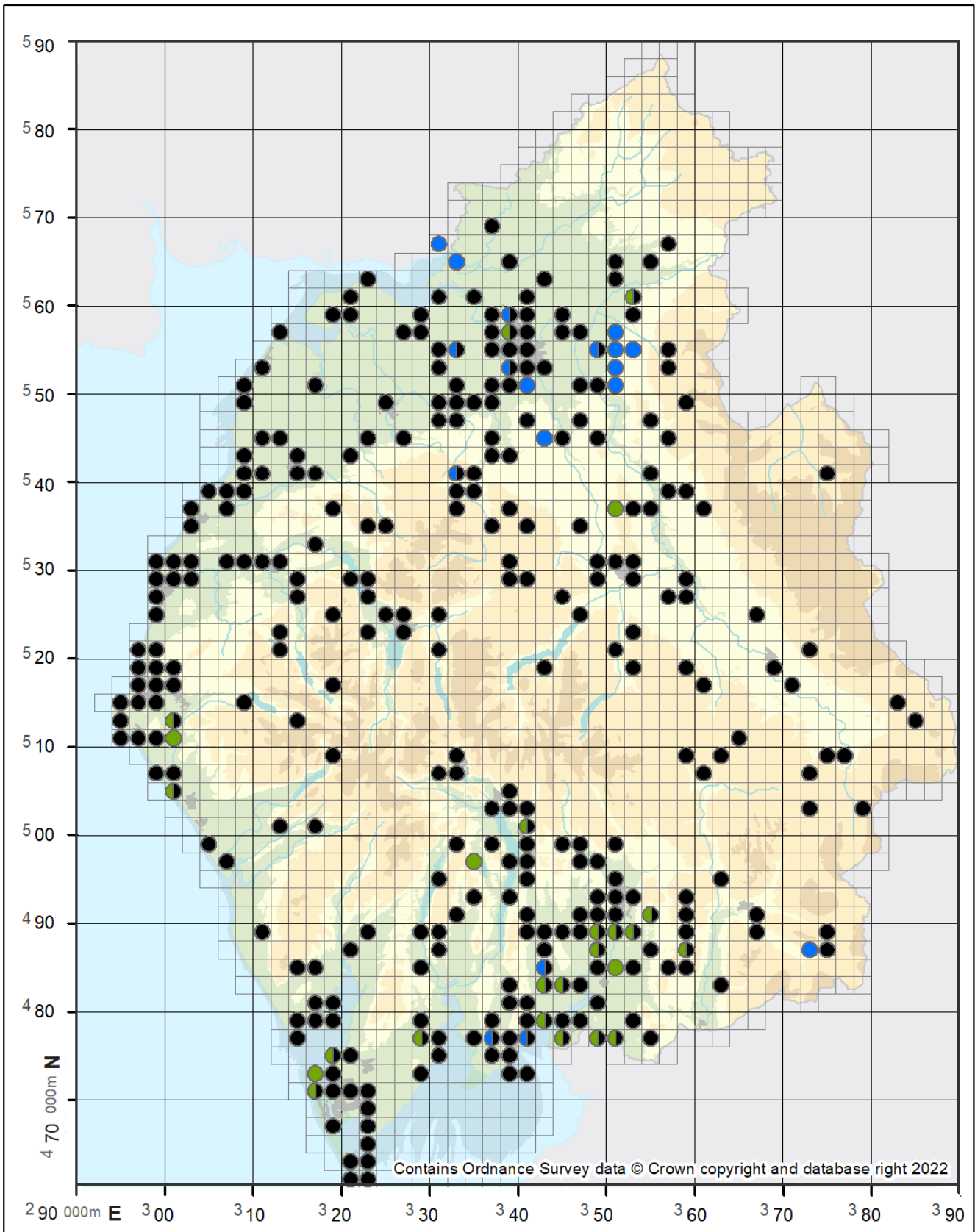
Status in Cumbria:

A widespread and common bumblebee in Cumbria. The Red-tailed Bumblebee is found in a wide range of habitats across Cumbria, from gardens and urban settings, to coastal, wetland, woodland and grassland sites. Records stretch along the coast - including towns and villages - and along the valleys, with few records from upland areas. In the Lake District it is seemingly largely restricted to the low-lying valleys between the fells, with few records from the higher fells.

Since records began, the Red-tailed Bumblebee has been considered a widespread and common bumblebee in Cumbria. The earliest Cumbrian accounts by entomologists describe the Red-tailed Bumblebee as a common species. Frank H. Day in 1900 listed it as 'very common' and in 1933, George B. Routledge described it as 'common' in his experience ^[7, 8]. This was echoed over 70 years later in 2005, when Neil Robinson described it as 'common in a wide range of habitats, from the coast to gardens' ^[9]. It is among the most recorded bumblebees in Cumbria.

Future Outlook:

A widespread and common bumblebee, the Red-tailed Bumblebee is found in a wide range of habitats and has experienced a northwards expansion nationally in recent decades. In grassland sites - both improved and unimproved - legumes seem to be important in supporting populations of this bumblebee, and populations have responded positively to legumes sown in agri-environment schemes ^[10]. The succession of nectar- and pollen-rich resources throughout its flight period and undisturbed nesting habitat - both in urban and rural areas - is important for the conservation of this bumblebee.



Red-tailed Bumblebee <i>Bombus lapidarius</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 1093
			64
Recorded (First: 1900 Most Recent: 2022)			45
			0

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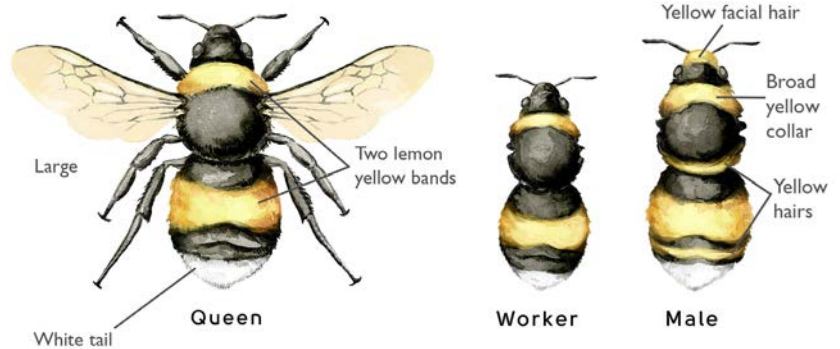
Main photo:

Queen on willow - Charlotte Rankin

Side photos:

- 1- Queen on Chives - Vivian Russell
- 2- Worker on thistle - Vivian Russell
- 3- Male on Creeping Thistle - Vivian Russell





Description and Life Cycle:

Description

One of the first bumblebees to emerge each spring, the three white-tailed bumblebee agg. (aggregate – agg. – or “complex”) are large and robust species. The queens usually have a pure white tail and always have a single band on the upper part of the thorax, usually lemon-yellow, with another yellow band at the top of the abdomen. Their faces are as long as wide and they have a short tongue. Males are very variable in colouration with some individuals almost entirely covered in lemon-yellow hair, yellow facial hair and white tails, to other individuals looking much similar to females in colouration (which may relate to different species within the agg.). Worker white-tailed bumblebees are very difficult to separate from those of the Buff-tailed Bumblebee so they are often recorded as Buff-tailed/White-tailed Bumblebee workers.



Male on hebe



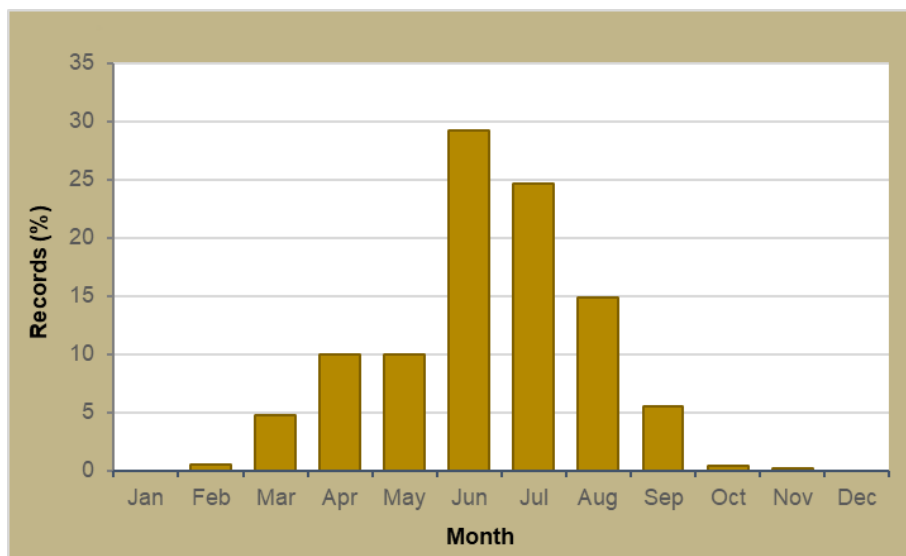
Male on scabious

DNA testing has shown that the “White-tailed Bumblebee” is actually a group of three very closely related species ^[1]. A paper in 2007 showed that all three species are present in the British Isles but that they cannot be identified unequivocally on structural and colour patterns alone ^[2]. The complex is made up of *Bombus lucorum* s.s. (White-tailed Bumblebee), *Bombus magnus* (Northern Bumblebee – which has been recognised as a distinct species for some time) and *Bombus cryptarum* (Cryptic Bumblebee – which is a species that has been treated less distinctly, historically). These species are most reliably / accurately recorded as an aggregate. Further research is being carried out to see if it is possible to reliably separate these species on morphology, (though putative, distinctive – and promising - morphological characters relating to colour and banding have not proved wholly reliable to date).

Life cycle

Queen white-tailed bumblebees awake from hibernation and start to nest search in March or April. These nests are often in old rodent burrows underground. Around late-April, the first workers emerge with the next generation of queens and workers being produced from late-May onwards. The nests are large - with up to 200 workers at any one time. This species usually has one generation a year, with the nests dying off in August, but can occasionally have two generations in the warmer parts of Britain ^[3].

Due to their short tongues, white-tailed bumblebees usually feed on flowers with a short corolla such as willows, Blackthorn and heather's. However, some females carry out nectar-robbing where they bite into long tubular flowers to access the nectar without having to enter the flower. The white-tailed bumblebee agg. are parasitised by the Gypsy Cuckoo Bee *Bombus bohemicus* (Page 40) who infiltrates their nests to lay their own eggs.



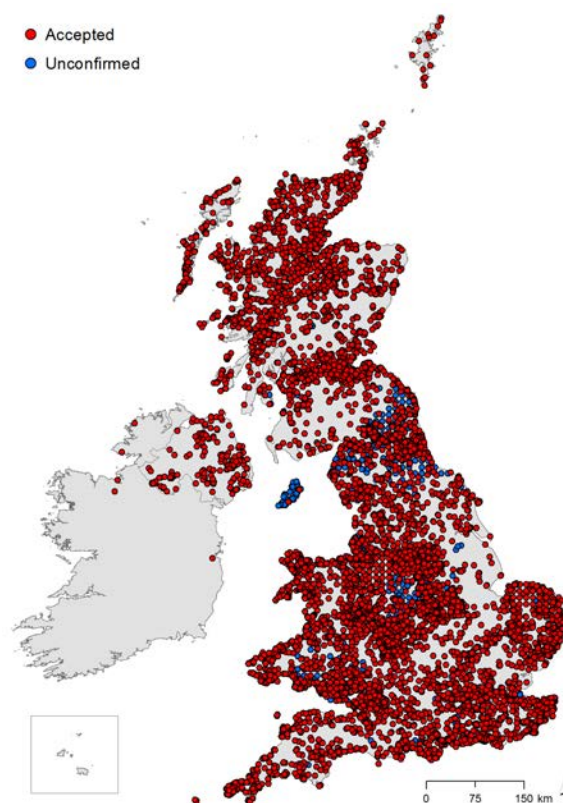
Habitat and Distribution:

Habitat

The white-tailed bumblebee agg. is found in a wide variety of different habitats - from the coast, right up into mountainous areas. Moreover, personal observations have shown that species in this group can often be the most common bumblebee in upland areas.

Distribution

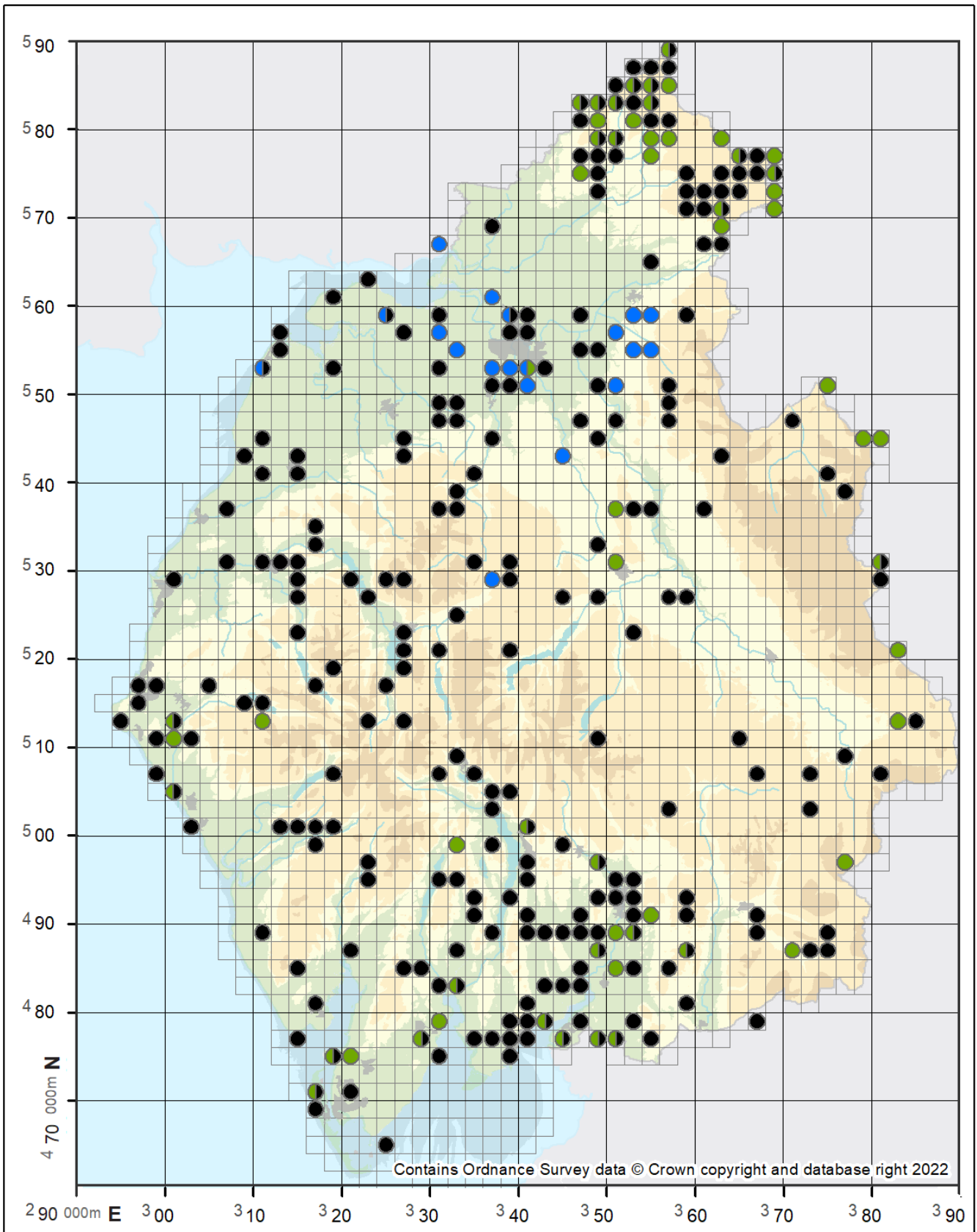
As an aggregate, this group of three species are widespread in Great Britain. *Bombus lucorum* s.s. (sensu strictu - in the strict sense) is thought to generally be more of a lowland species with *cryptarum* and *magnus* having a more upland, northern and western distribution in Britain [4]. This is also supported by research in the Czech Republic [5]. Further research is, however, needed in this area when (or if) morphological differences between the three species are established.



NBN and CBDC records

Status in Cumbria:

Within the white-tailed bumblebee complex, due to the difficulty in identification, there are few records in Cumbria which have been identified to individual species. Therefore, for the purpose of this atlas, all



White-tailed Bumblebee complex <i>Bombus lucorum</i> agg.	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 826
			123
Recorded (First: 1900 Most Recent: 2022)			42
			0

three species are mapped together. The white-tailed bumblebee aggregate is common and widespread in Cumbria, and it is one of the 'big 8' most common species.

The first white-tailed bumblebee record in Cumbria was of an individual collected from Grange Common in 1933 ^[6]. Historically *Bombus lucorum* (no aggregate being recognised at the time) was thought to be a variety of the Buff-tailed Bumblebee *Bombus terrestris* ^[7], so early accounts do not give much of an indication of the status of this species. However, in 1900 Day describes *Bombus terrestris* race *lucorum* as "very common" ^[8]. This is backed up by Routledge's 1933 report ^[9] which states again that the species is "very common", mentioning records made by FH Day at Orton, Kingmoor, Durdar, Wetheral, Warwick, Drumbrugh, Drigg, Seascale, St Bees, Thurstonfield, Keswick and Great Salkeld (Routledge 1933). In 2005, Robinson described this species as "still very common in a wide range of habitats, from the coast to gardens" ^[6]. It is therefore clear that this species group has always been common in Cumbria - since recording began and to date.

Future Outlook:

The future outlook for this group of species currently seems promising as they inhabit a wide variety of habitats, utilising a diverse array of flowers. If it is found to be possible to separate the species on morphology, further research and recording should allow us to move closer to being able to determine the exact status and conservation needs of each individual species.

References:

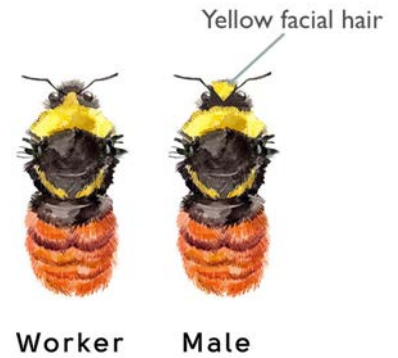
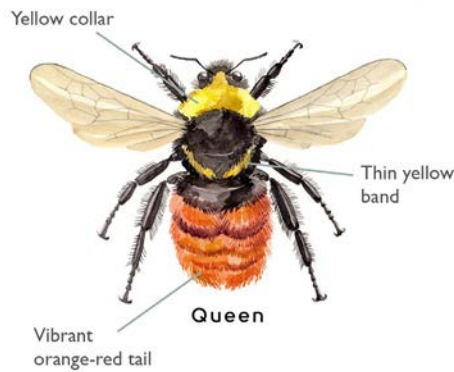
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Main photo:

Queen of the "Lucorum complex" - Vivian Russell

Side photos:

- 1- Male on hebe - Vivian Russell
- 2- Male on scabious - Vivian Russell



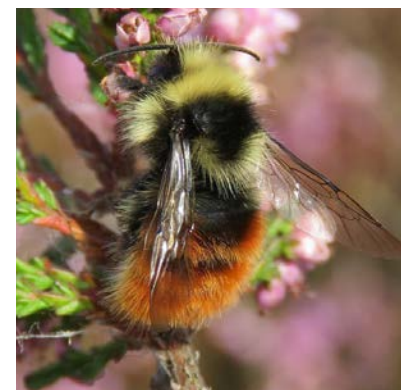
Description and Life Cycle:

Description

Alternative names: Blaeberry bumblebee in Scotland, or Mountain bumblebee. The Bilberry Bumblebee is a particularly distinctive and attractive species. Queen *B. monticola* have two defined yellow bands on the thorax - a yellow collar and yellow-fringed scutellum - and an extensive orange-red tail, covering at least half of the abdomen. Workers are similarly marked, though smaller and less robust. Males - again - are similar, though the yellow bands are less well defined and the head and face have conspicuous yellow hairs; the males are also longer haired generally and appear very fluffy (and similar in that sense to male Early Bumblebee). The striking extent of this orange-red tail - occupying most of the abdomen in all castes - distinguishes the species from other social red-tailed bumblebee species with yellow banding, such as the related Early Bumblebee (*Bombus pratorum*), male Red-tailed Bumblebee's (*Bombus lapidarius*) and - to a lesser extent - the Scottish, orange-tailed form of Heath Bumblebee (*Bombus jonellus*).



Worker



Male

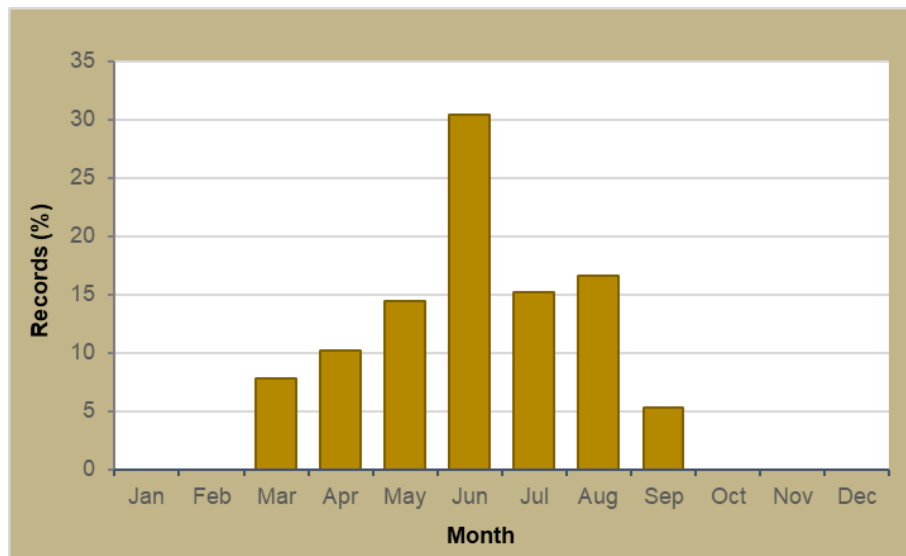
Life cycle

The first queens generally emerge from hibernation in late April or early May - slightly later than some of the earlier emerging bumblebees - though there have been early sightings in March for this species in Cumbria and the colony can be long-lived, with both workers and males still be seen in mid-September on occasion. The nests are often underground - founded in the old nests of small mammals - and the colony is often small, with fewer than 100 individuals (often averaging far fewer). The species is single brooded in Britain, not having the same tendency to produce double broods as other members of the *Pyrobombus* sub genus - Heath, Early and Tree Bumblebee.

Habitat and Distribution:

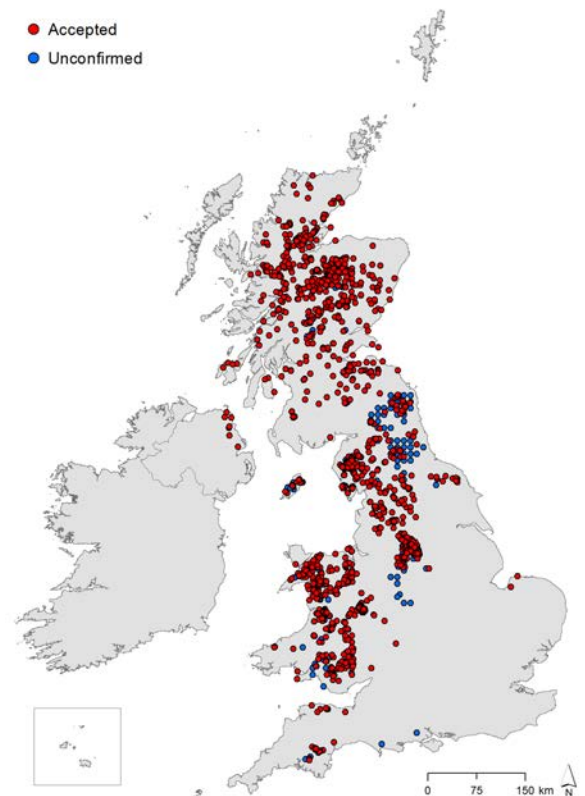
Habitat

With the strongest populations associated with upland areas of northern and western Britain, the Bilberry Bumblebee is most often encountered on heath or moorland where Bilberry (*Vaccinium myrtillus*), is abundant. Bilberry makes up an important, although not exclusive, part of the diet of queens (alongside willows). Habitat diversity is also required, with blossoming willow (*Salix* spp.) at an early stage. Heathers (*Calluna*, *Erica* spp.) and floristically rich upland hay meadows and vegetation associated with scrub - later in the season - also appear to be important for this species [1].



Distribution

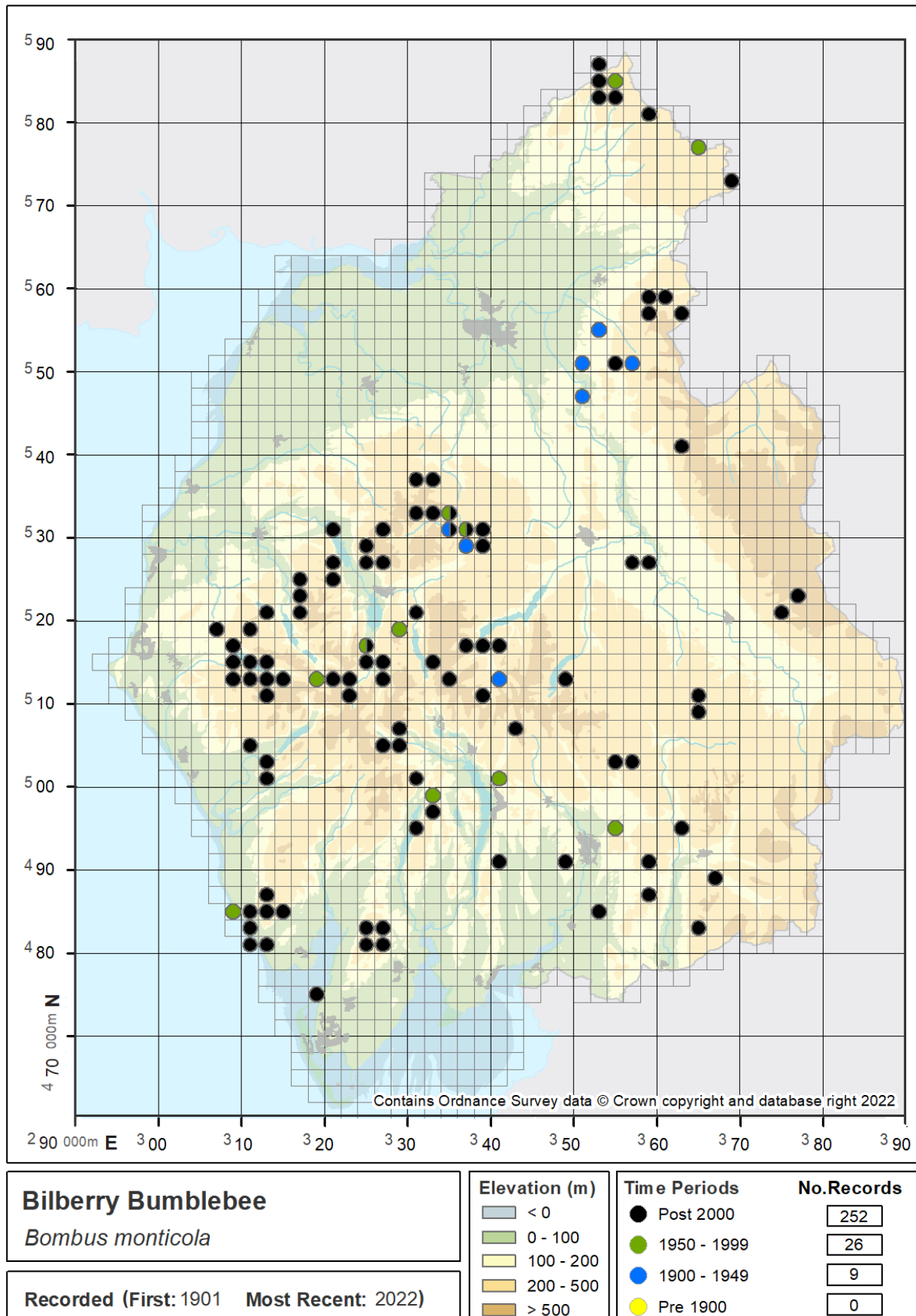
Historically, this species has very few records in the south and east of England, apart from almost certain vagrant records of males in Norfolk [2]. However, there is modern evidence of serious decline of this species in much of Britain throughout its range [3].



NBN and CBDC records

Status in Cumbria:

Historical data on the species would suggest that this species was not rare in Cumbria in the earlier part of the 20th century, with Routledge stating "Locally common in high districts" [3] with reference to Castle Carrock Fell, Tarn Lodge, High Pike, Cumrew Fell, Cumwhitton Moss, Saddleback, Geltsdale and Armathwaite. Current data showcases the Bilberry Bumblebee's association with upland habitats



in Cumbria. It is thought this species may be under-recorded in Cumbria and could have a wider distribution across Cumbria's uplands than current data indicates. However, comments by the earliest recorders of aculeates in Cumbria would seem to mirror similar, anecdotal comments in Lancashire and indicate that this species was - possibly - more commonly seen in the past. Neil Robinson gave the status as "widespread but local" with a complete lack of records between 1920 and 1971 (possibly due to under-recording); only 3 upland sites were specifically listed post-1990 (Blaeberry Fell, West Brownrigg, Irton Fell), with occurrences of workers at 2 coastal sites (Silecroft and Gutterby) in 2001 [4]. Over the course of the Get Cumbria Buzzing project, the species has been recorded at several sites lacking previous records, indicating that further recording effort may more accurately ascertain the true distribution and status of the Bilberry Bumblebee in Cumbria.

Future Outlook:

As the Bilberry Bumblebee requires a landscape mosaic with bilberry-rich areas as just one of the components, this has likely made the species vulnerable to over-grazing of moorland with plentiful flowering bilberry (*Vaccinium myrtillus*) - which has reduced the coverage of flowering plants. Agricultural intensification of grasslands adjacent to moorland - and large-scale removal of scrub - is likely to have reduced later forage and contributed to the decline and localisation of this species.

The species is quite possibly vulnerable to climate change (more so than other species), given the north / west bias to distribution and strongest populations being present in diverse, upland habitats. In mainland Europe, the species has several, regional colour forms and is essentially montane (distribution in Europe is given in [5]).

As Cumbria has significant upland habitat, the recording of Bilberry Bumblebee and the effective management of moorland habitat should be considered a priority for Cumbria bumblebee conservation.

References:

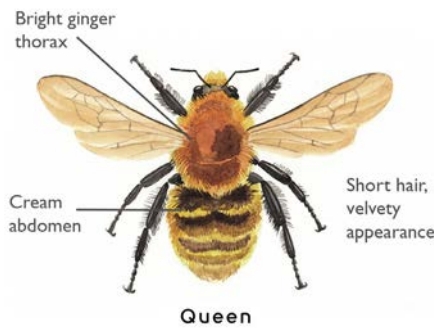
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Main photo:

Queen - Steven Falk

Side photos:

- 1- Worker - Steven Falk
- 2- Male - Steven Falk



Worker



Male

Description and Life Cycle:

Description

The Moss Carder Bumblebee queen (*Bombus muscorum*) is the largest of the British carder bee species. When newly emerged, she is arguably our most gorgeous bumblebee, her only rival, perhaps, the large Red-tailed Bumblebee queen (*Bombus lapidarius*) with her sumptuous red and black velvet coat.

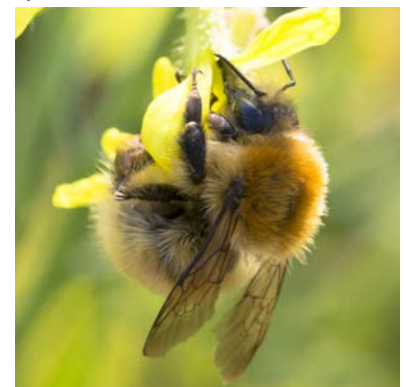
Although Moss Carder bumblebees are noted for their variability within the UK, with seven distinct races, (six of which occur on British islands), one of these seven is the nominate or 'typical' form on mainland Britain, including Cumbria [1].

A Moss Carder queen has a uniformly pale coat, the colour of wheat, crowned by a striking burnt-orange pile on top of her thorax. This creates what Steven Falk calls a 'halo effect' and is a good identifying feature in the field. Another, even more precise diagnostic hallmark by which she is reliably separated from other carder species is the complete absence of black hairs - not even one - on her thorax and abdomen until the very last segment abutting her tail. Fresh specimens of the Common Carder Bee (*Bombus pascuorum*) can also have that vivid orange brush on the thorax, but there is usually some shading from black hairs on the abdomen, and they will always have at least a few black hairs sprouting amongst the ginger ones.

The Moss Carder coat is characteristically even, as if shorn, and her hairs are shorter, neater, and denser than those of the Common Carder. She has a relatively long tongue, and her head is longer than it is wide. Workers and males are coloured like the queen and more easily confused with the Common Carder as they fade and bald with age. There are pale examples of the Common Carder - with very few black hairs on any part of the body, especially in the more northerly parts of England - and these too can cause confusion. But the uneven hair length and scruffy appearance of the Common Carder is a good separating character in most cases.



Queen



Worker

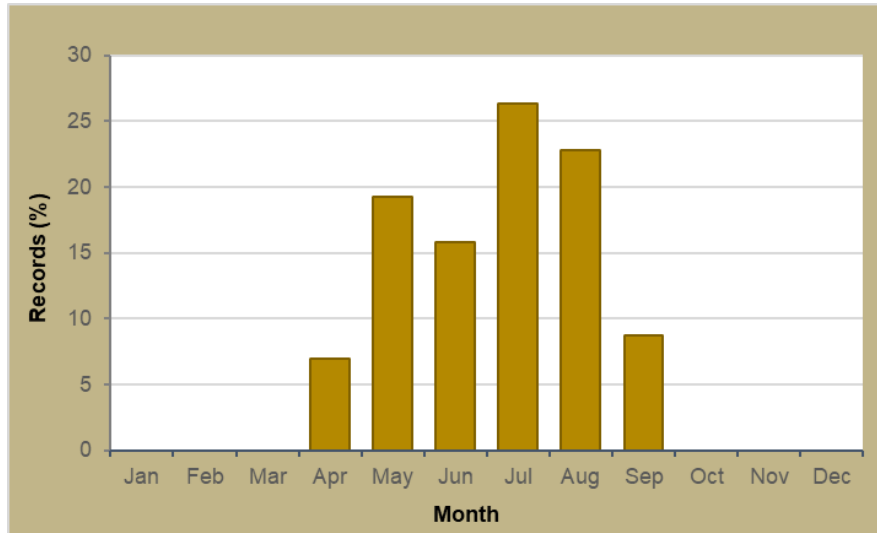


Queen

Life cycle

Queens are usually seen from late May to mid-June, timing their emergence with the flowering of clovers, Bird's-foot Trefoil and Tufted Vetch, all members of the Fabaceae (Pea family), valued for the superior quality of the protein in their pollen.

They nest on or near the surface of the soil, in loose or tussocky grasses, deep in moss or in sparse vegetation on shingle.



Habitat and Distribution:

Habitat

The story of this beautiful bee, is unfortunately, one of decline. Although always one of the rarer bumblebee species, it was nevertheless sparsely distributed throughout mainland Britain, its islands and Ireland in the first half of the 20th century. From 1960 onwards it disappeared from most of its inland sites, becoming confined mainly to the coastline, with strongholds in northern Scotland and its islands. Recent maps show little has changed. Agricultural intensification (which began significantly in the mid to late 1800's and accelerated greatly in the post-war period), and sudden urban expansion affected various bumblebee species in different ways according to their ability to adapt.

Those bumblebee species whose ancestral homes were in woodland or woodland edge habitats – and less tied to unimproved, species-rich grassland - proved to be the most resilient because they could use leafy green spaces such as parks and gardens, cemeteries, and even hedgerows with diverse structure and floral resources as a substitute for woodland edge

Distribution

The Moss Carder, however, belongs to the *Thoracobombus* group and these bumblebees are usually creatures of the meadow (open grasslands) in the UK. Despite this, they are the only bumblebee species to thrive in lowland tropical wet forest [7]. The Moss Carder bumblebee is often found in damp, cool conditions similar to a potential, ancestral 'wet forest' habitat. It was once equally at home in the dry species-rich grasslands of inland Britain, but here is much declined.

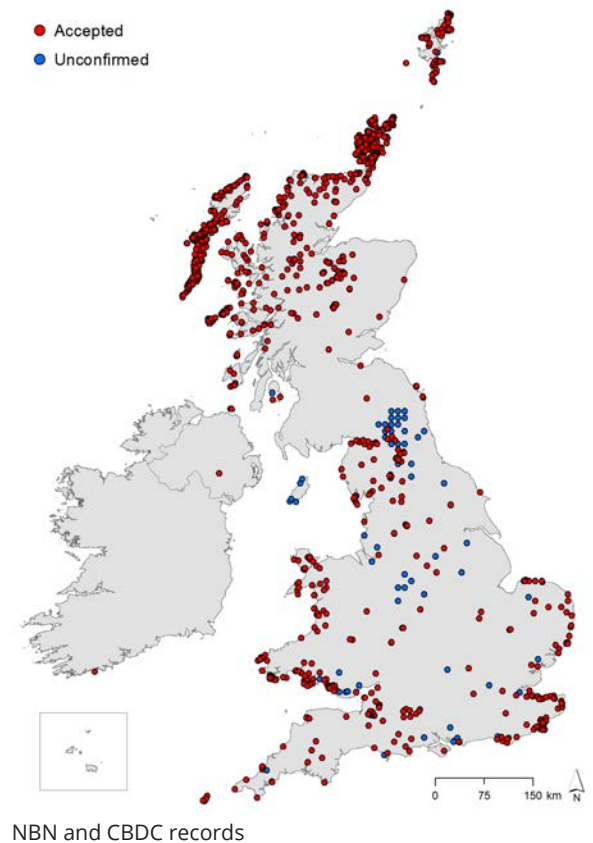
In a lengthy description of their nests by the parson-naturalist from Norfolk, William Kirby, in 1867, he noted that they were "generally found in meadows and pastures, and sometimes hedge-rows where the soil is entangled with roots" [8]. This was still the case in 1906 when the Reverend J.G. Wood advised that the "best time to search for these bees is in the hay-making season, when the scythe men often come upon them during their work" [9].

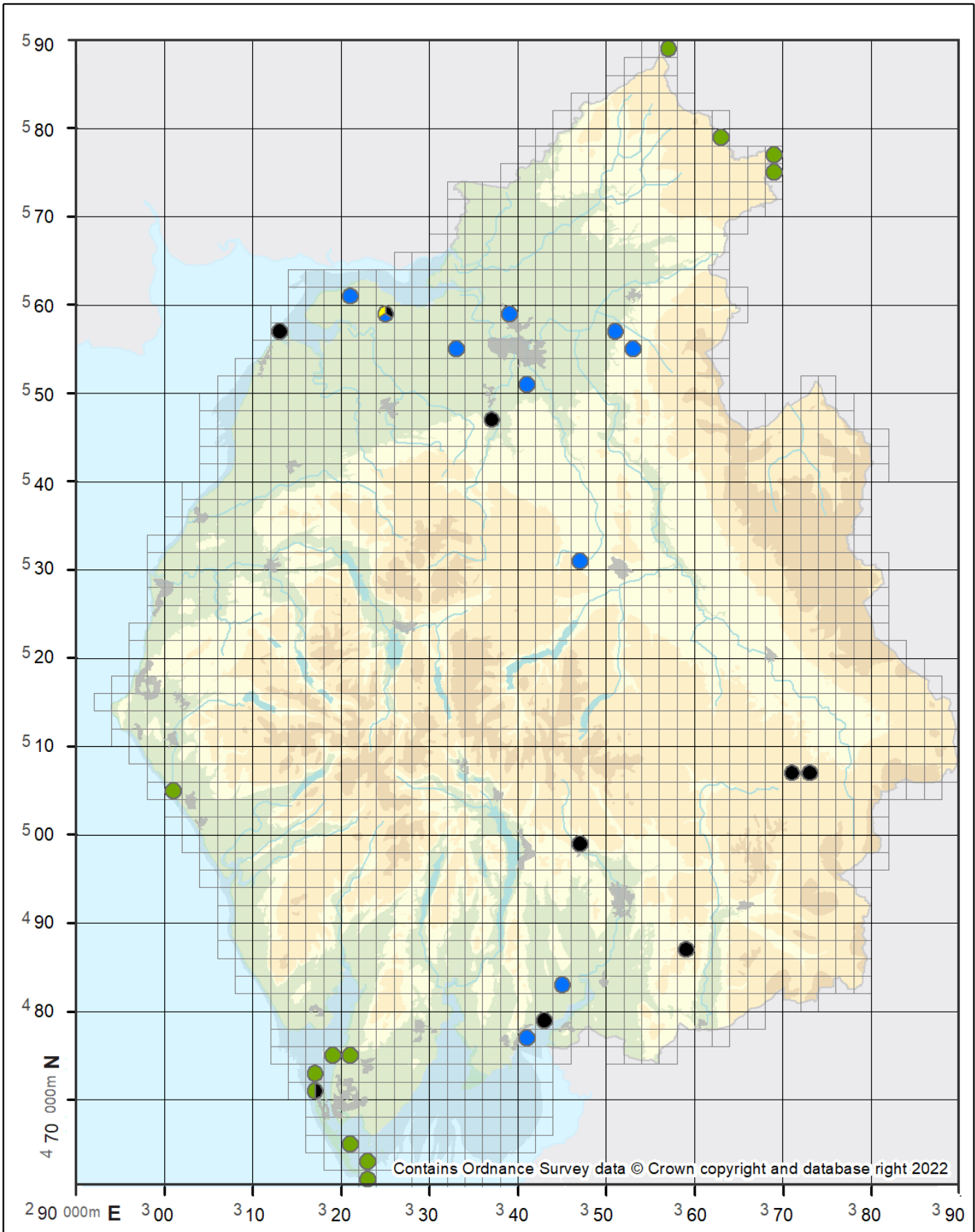
Many inland populations were decimated when most of the meadows and unimproved grassland they inhabited were destroyed, whereas the Moss Carders who had chosen to live in wetter habitats on the edge of saltmarshes, along sea walls and large areas of coastal grazing marshes with extensive floral resources, fared better [10].

This bumblebee is very rarely seen in gardens, usually nesting and foraging in wild habitats that meet their needs and where they won't be disturbed. The Moss Carder thrives on the coastal dunes and machair grassland of the Highlands and islands of Scotland, and on the moorland there, especially wet heath, favouring the Fabaceae where they grow on road verges [4]. The Moss Carder is poor at dispersing and the absence of the typical or nominate British mainland form on Scottish islands amongst others (as regular vagrants or colonists), has allowed the distinct geographical island races to flourish [4].

Status in Cumbria:

There are five carder bumblebee species in Britain, but only two of these species occur with any frequency in Cumbria. One is the ubiquitous Common Carder and the second is the far rarer Moss Carder. We only hold one 2018 record from North Walney Island for the Brown-banded Carder another single 2014 record for the Red-shanked Carder Bee (*Bombus ruderarius*) from Windermere, and none of the Shrill Carder Bee (*Bombus sylvarum*).





Moss Carder Bee <i>Bombus muscorum</i>		Elevation (m)	Time Periods	No. Records
Recorded (First: 1890 Most Recent: 2021)		< 0	Post 2000	<input type="text" value="21"/>
		0 - 100	1950 - 1999	<input type="text" value="21"/>
		100 - 200	1900 - 1949	<input type="text" value="18"/>
		200 - 500	Pre 1900	<input type="text" value="1"/>
		> 500		

At the time of writing, Cumbria holds 61 records (and counting) of the Moss Carder since recording began 130 years ago, but as Neil Robinson pointed out in 2005, it “may be under-recorded due to the difficulty of distinguishing it in the field from the very common and variable *B pascuorum*” [11]. This similarity also makes it very difficult to identify from photographs submitted for verification and a specimen is usually required for determination (especially with males), limiting records even further.

There were only two notable entomologists studying Hymenoptera in the south of the county during the early years of recording, one of them was James Davis Ward - made famous for his discovery of what is now, one of the rarest of UK bees, *Osmia xanthomelana* - who lived in Grange-over-Sands all his life, and the other was A.E. Wright who moved to Grange after his retirement. From J.D. Ward we have a 1920 record of a Moss Carder near Foulshaw Moss, and another in 1925, from the salt marsh edge of Grange over Sands. Wright gave us one record in 1923, also from Grange.

Apart from one anonymous 1890 record from Drumburgh Moss in the far north of the county, the rest were provided by our two stalwart naturalists, F.H. Day, and George Routledge between 1900 and 1924. F.H. Day found the Moss Carder in the species-rich grasslands around the villages of Durdar, Kingmoor and Orton that weren't far from his home in Blackwell, next to the Carlisle racecourse, supplementing these with a couple of records from Drumburgh and Newton Reigny Moss.

George Routledge wasn't physically robust and mainly collected in and around his large estate, Tarn Lodge, about ten miles east of Carlisle. His estate of mosaic habitats included a large garden, extensive woodland, Hayton Moss and presumably some open fields as well, but as he simply entered 'Tarn Lodge' for all his records, we are always left wondering from which of the habitats his bumblebees were recorded. Routledge did provide one entry for the nearby village of Fenton and both Day and Routledge concluded that the Moss Carder was “fairly common” [11].

Except for one isolated 1933 record nearly ten years later from George Routledge at Drumburgh Moss, there were no more records from the north of the county at all until 2001 on Drumburgh Moss, by which time the effect of a marked increase in intensively farmed arable land and improved pasture became evident. Gone were all the records from the north Cumbrian plain where grass dominated monocultures replaced flower-rich hay meadows. The Moss Carders - having found themselves isolated, trapped in an increasingly fragmented landscape, weakened by pesticide use and inbreeding - were wiped out. Farm machinery uprooted their nests in grassy tussocks or sliced through them when cutting for silage, or ploughed up their hibernation sites in open ground. “Lowland mosslands and coastal sites seem the most likely places to find this bee,” wrote Robinson in his 2005 assessment [11].

It should be mentioned that in June and July between 1992 and 1997 there was surveying work going on in or near Newcastleton, Spadeadam and Kielder Forests in the far north-eastern flank of Cumbria, providing eight records of the Moss Carder bee. With five figure grid references covering two square kilometres of mixed habitat, they seem to be either in exposed grassland or in open woodland.

Records resumed elsewhere in Cumbria in 1963 with a couple of entries from Roanhead near Barrow-in-Furness and then increased after 1986 where records are mostly divided between the managed peatlands of Drumburgh Moss by the Solway and Burns Beck Moss, near Kendal where a team from Liverpool Museum found queens and workers foraging on willow catkins on the 10th of May 2001 [12], and the coast. Familiar names include Walney Island, Sandscale Haws, Braystones beach, and Skinburness near Silloth on the north Solway Firth.

Inland records are few and far between, mostly from the unimproved grassland at Smardale Gill SSSI near Kirby Stephen between 2004 and 2007 where Robinson noticed a Moss Carder foraging on Melancholy Thistle.

The Smardale reserve would be worth surveying for the Moss Carder as well as Spadeadam. The latter is a 9600-acre remote RAF military outpost near Northumberland, similar in some ways to Salisbury Plain in that it has escaped intensive cultivation. If access were granted it might yield many interesting species of Hymenoptera as does its counterpart in the south [13].

Future Outlook:

Our records for the Moss Carder may be sporadic and limited but there are enough to chart the same trajectory of decline in Cumbria as elsewhere.

Over time, the Moss Carder Bumblebee has found sanctuary on its namesake, the Mosses, assigned to it by Linnaeus in 1758 as *Bombus muscorum*, from the Latin *musci* or moss ^[14]. The records tell us that lowland raised peat mosses seem to be their preferred habitat in Cumbria. They allow queens to nest undisturbed in sphagnum moss, forage on ling, heather, and other flowers, collecting pollen from the Fabaceae and nectaring on thistles, scabious and knapweed in summer.

As Cumbria has wet heaths on the moors, salt marshes, sand dunes, sea walls, and meadows grazed late in the year (still to be explored), there will surely be more Moss Carder bumblebees amongst them than records would have us believe. But it seems that this lovely bumblebee is doing its best not to be found.

References:

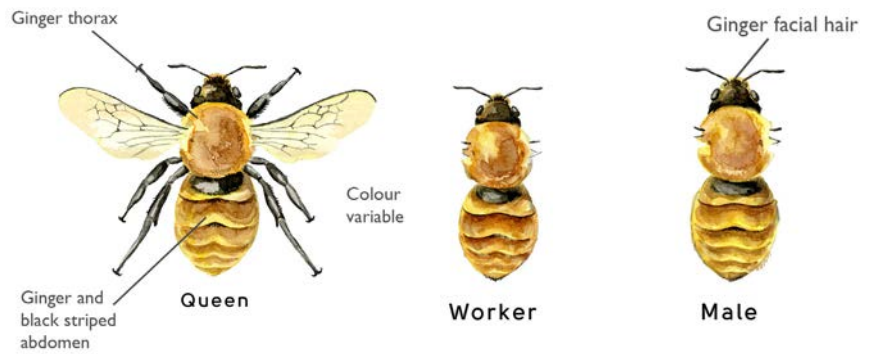
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Main photo:

Female on Sea Radish in September - Vivian Russell

Side photos:

- 1- Queen - Vivian Russell
- 2- Worker - Vivian Russell
- 3- Queen - Vivian Russell



Description and Life Cycle:

Description

A beautiful, medium sized and fluffy, ginger-orange bumblebee with a slightly tufty, uneven coat (caused by hairs of different lengths); the Common Carder Bee is one of our commonest species in the 'Big seven' common bumblebees of the UK, and of these seven, the only one to have a ginger tail ^[1]. Paler individuals are more frequently found towards the north, but the common carder bee is a highly variable species throughout its range ^[2, 3].

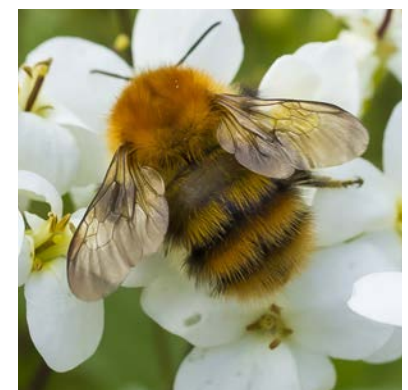
All castes are similar in their colouration and patterning. Common Carder Bee have ginger-yellow hair on their face and head, a ginger-brown thorax which may be darker in the middle and ginger abdomen with cream-yellow sides. There are usually black hairs at the edge, which can give the impression of darker bands across the sections (from some angles and especially when lighter hairs have been lost), however, some individuals are very pale. Variation in the amount of black hairs present across all castes is high, but they should be found at least on tergite 5 (especially in pale individuals) if not on tergites 2, 3 and 4 ^[3, 4]. Male specimens that are pale can be confirmed as *Bombus pascuorum* by microscopic examination, using diagnostic features of the genitalia ^[4].

As the season progresses, individuals may begin to look more grey in colour as they become worn and bleached by the sun ^[4]. Queen common carders are about 17mm in length and often have tufty ginger hair on their face and head ^[4]. Workers are very similar to queens in appearance, being smaller in size, from 15mm to 10mm or less ^[4]. Males are usually around 13-14mm in length, with longer antennae and often more black hair on the abdomen and more yellow hair generally, especially on the face ^[4, 5, 6, 7]. On the Channel Islands (and north western parts of France), the Common Carder Bee is referred to as subspecies *flavidus*, which is much brighter and paler in appearance - it is thus often similar to the Moss Carder Bee (typical mainland UK form) ^[4].

The 2 most similar species in Britain are the related Moss Carder Bee *B. muscorum* and the Brown-banded Carder Bee *Bombus humilis*. On some occasions - in darker variations of Common Carder Bees where the black hairs in the abdomen dominate - they can look similar to the tree bumblebee *B. hypnorum* ^[4].



Queen on thistle



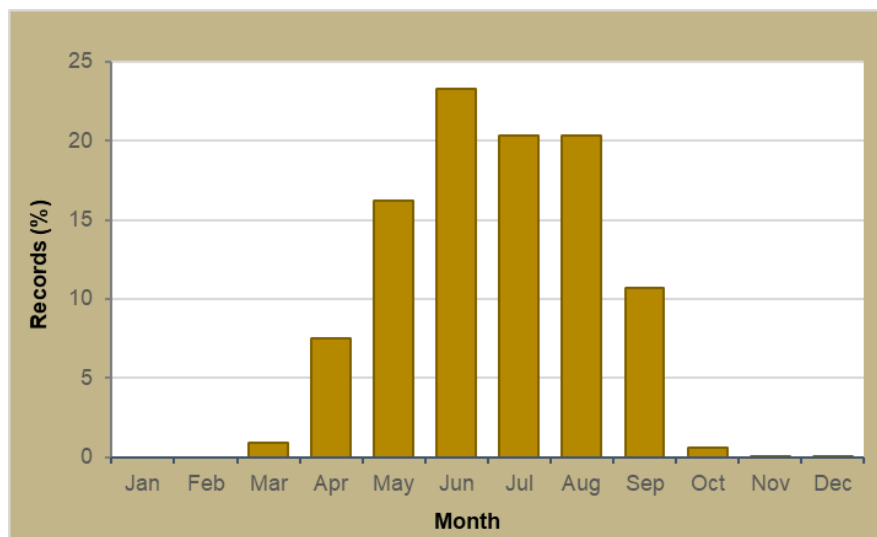
Worker on *Arabis* sp.

However, Tree Bumblebees have a white tail while the Common Carder will always have a ginger-brown tail. Moss Carder Bees are generally much scarcer in the north (and throughout most of the UK) than the Common Carder Bee and the typical mainland form of the species has paler sides with a strongly contrasting bright orange-brown thorax and a much more even coat [4]. Brown-banded carder bees also have a neater appearance due to more even hair length, a more or less well-defined brown band across tergite 2 and they are (now) mainly a southern species - the only recent Cumbria record being from North Walney Island in 2018 [2, 4].

Life cycle

The “carder bumblebees” (which all belong to the *Thoracobombus* sub genus) are named due to the wonderful way in which they create their nests. Collecting small pieces of grass, vegetation and moss, they “card” (comb) the material together using their legs and mandibles to create a ball around the nest and also cover the larval cells [2, 8, 9]. This provides protection and insulation for the eggs and developing larvae. Workers apparently gather and card material and pass it along towards the nest to help with construction [5]. Common Carder Bees are a surface nesting species and they usually nest just above ground level, in tussocks of grass or among thick, rank vegetation [4, 9, 10]. Nest sites can be beneath hedges, in woodland edge areas, under shrubs and in tussocky open grassland - as suggested by the species’ Latin name *pascuorum* - “of the pasture” [9]. Overwintered queens emerging in spring begin to look for nests after feeding. Nest searching behaviour involves flying low in search of a suitable area, often landing and exploring the potential site on the ground.

Common Carder Bees are a species of “pocket-making bee”, as described by Sladen [8], so they place pollen beneath the brood clump in little pockets where the larvae can reach and feed upon the stores [11]. They are a typical social species of bumblebee, building medium-sized colonies that most frequently have around 100-150 workers, but can have as low as 60 or as high as 200 (or more). In the north it is likely that Common Carder Bees are mainly univoltine - only rearing one brood per year. Common Carder Bee has the longest nest life cycle of the British bumblebees (NHSN, 2019; NBN), with workers still present in late autumn [9, 12]. Of the socially parasitic cuckoo bees, Field Cuckoo Bee is most frequently found with Common Carder Bee as the host [4, 5, 12].



The foraging range has been estimated to be shorter for Common Carder Bee than some of the larger and shorter-tongued common bumblebee species – with it being described as a “doorstep forager” [13, 14]. Estimates of altitude tolerance vary, from around 272m – 449m [13, 15, 16, 17]. The foraging range depends on several factors including the habitat type and quality, the nesting location, and the abundance and distribution of forage throughout the habitat [13]. Common Carder Bees are a medium to long-tongued species and so prefer to visit deep throated/tubular flowers which have long corollae – for example White Dead Nettle. However, they are widely polylectic, visiting a wide range of flower species including those in the following families: Fabaceae, Boraginaceae, Lamiaceae, Orobanchaceae, Scrophulariaceae and Veronicaceae [4, 5].

Overwintered queens will forage at many of the early flowering species such as dandelion's, Colt's-foot, comfrey's, dead-nettle's, bluebell's, Lungwort, willows and Prunus species. Later in the season workers, new queens and males visit thistles, Ivy, brambles, Foxglove, Yarrow, clover's, knapweed's, Devil's-bit Scabious, legumes, Oil-seed Rape, and a variety of garden flowers such as ice-plants, buddleia's, Lavender and Red Jasmine.

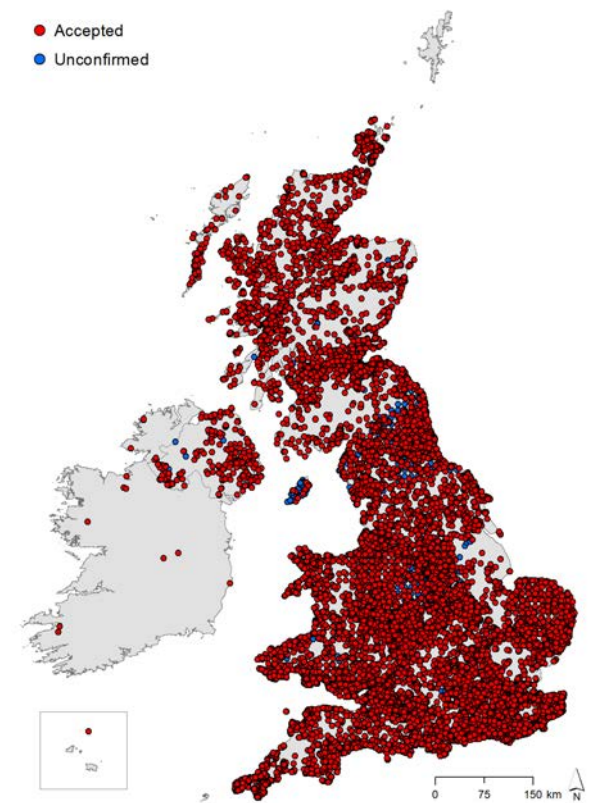
Habitat and Distribution:

Habitat

Common Carder Bees use a wide range of habitats across our landscape, often selecting dry, rank or tussocky vegetation to nest in. Records are often concentrated around urban conurbations. They are very common in gardens and grasslands and stated to be the most common of our bumblebee species on agricultural land according to some sources [4, 12]. They also frequently use woodland edge, hedgerow, moorland, urban greenspaces and heathland areas.

Distribution

The Common Carder Bee is frequently seen in gardens across the UK – and is widespread throughout Britain and Ireland. It has been observed to have increased its range northwards [2], with its arrival on the Scottish island of Orkney [4, 5, 6] and recently the Outer Hebrides [6]. The Common Carder Bee does not seem to have suffered drastic declines in the UK, as have many of our other bumblebee species. Common Carder Bees are less often found in wetter habitat such as mires [12] and not often found at great height on hills and mountains, preferring lowland areas. A couple of studies note that it in some areas of the UK it could be “replacing” Moss Carder Bee, which is much less common now [18, 19].

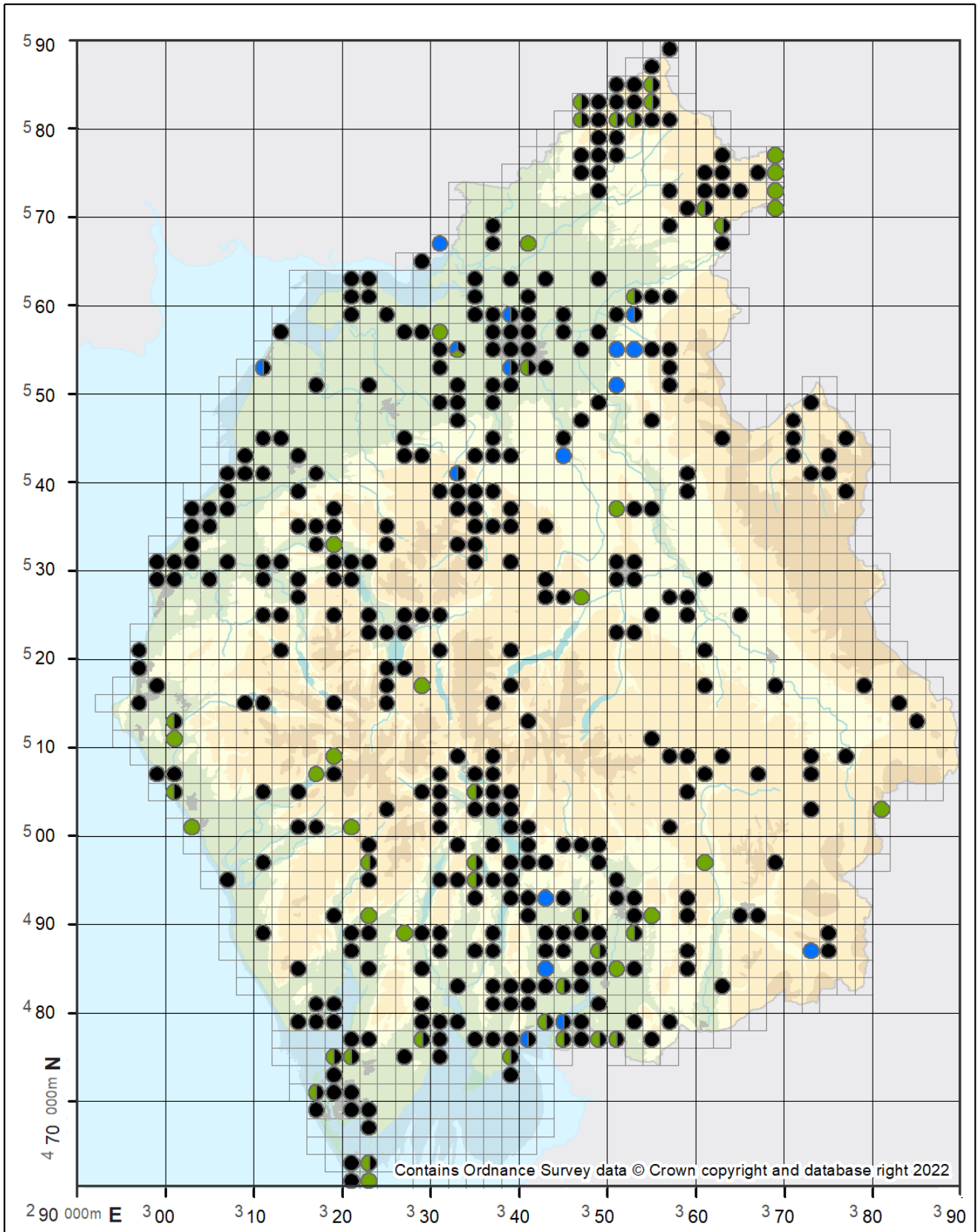


NBN and CBDC records

Status in Cumbria:

The first record of a Common Carder Bee in Cumbria is by George Routledge on the 22nd of April 1900 at Tarn Lodge, Castle Carrock, when it was noted to be a very common species [20]. Today they are still one of our commonest species and widespread throughout Cumbria [21]. The species has the most records of any bumblebee species found in Cumbria, with 799 verified records presently - just above the Red-tailed bumblebee at 745 records. There are records in each decade during the 1900's and annually after 1990 to the present day. In the Lake District, there are few records above 500m - here Common Carder Bees are mostly found in lowland areas and valleys between the fells. They are also common around lake edges, such as Glenridding, Derwent Water and Bassenthwaite, with a high number of records around Lake Windermere. River edges are also highlighted by records - for example along the rivers Eden, Derwent and Caldew.

This bee is common in gardens, reflected by the number of records concentrated around towns and surrounding villages - including Carlisle, Kendal, Workington, Maryport and Barrow - though of course observations are more easily and readily made in gardens. In surrounding rural areas there may be a good mix of edge habitat such as field margins, woodland edge and smaller villages with gardens, providing a variety of garden flowers, natural forage and nesting habitat.



Common Carder Bee <i>Bombus pascuorum</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 1423
			108
Recorded (First: 1900 Most Recent: 2022)			48
			0

Records are also well distributed along the coastline of Cumbria where a mix of habitats are present, including grassland (of various types), several nature reserves (and designated sites) and farmland. Several records are around Orton and Ravenstonedale, where traditional hay meadows and good flower-rich roadside verges are still present or being restored. There are clusters in the north around Kershope Forest and Blackpool Gate, Butterburn and Spadeadam, and in the south around Windermere, Kendal, Cartmel, Crooklands and Barrow.

A large amount of the land use in Cumbria is agricultural, which may be well used by the adaptable Common Carder Bee, if it is not too intensive. It has been suggested that the Common Carder Bee could be replacing the Moss Carder Bee. In Cumbria the Moss Carder Bee has sharply decreased in range, and several of its former sites do have Common Carder Bee – however, they may of course have already been present before ^[18, 19] and the species may have co-existed.

Common Carder Bees are the first of the carder bee species to emerge in spring, with queens emerging slightly later from hibernation than many other early spring bumblebee species. It is often the last of the bumblebee species to be seen active in autumn, having the longest, continuous flight period (excluding winter active Buff-tailed Bumblebees) ^[3, 4, 12]. In Cumbria, queens can be seen from late March - or more frequently early April. Workers fly from Late April/early May and can be seen throughout summer and into autumn, with a few observations into October and November and 1 in December. Males and new queens fly from June – July, with new queens seen into the autumn while they gather resources for hibernation ^[2].

Future Outlook:

The greatest threats to Common Carder Bees presently – in Cumbria and more generally in Britain - may be the intensification of agriculture, loss of hedgerows and edge habitat, and loss of flower-rich areas such as verges, meadows and field margins. Due to their surface nesting habit, Common Carder bees are particularly vulnerable to changes in agriculture (intensification, land-use change, higher stocking numbers, more frequent cuts, and ploughing). More frequently, fields used for silage are improved with fertiliser and often cut earlier and twice (or multiple times) in one year. This means the Common Carder Bee may not have enough time to complete its nesting cycle - or enough forage to do so - as the fertiliser reduces the abundance of flowers due to increased competition from grasses ^[9]. Cutting later in the year would be beneficial for Common Carder Bees and other ground nesting species. In urban areas, increased cutting of rank vegetation may decrease potential nest site availability or disrupt nests in progress.

Several bumblebee species have been found to have a lower number of nests in open habitat or wooded areas, and more in gardens and linear structures such as hedges and fences ^[22]. Managing hedgerows using a rotational cutting regime and reducing trimming and herbicide use beneath would be a positive action for bumblebee conservation. Hedgerow management and planting has been included in Agri-Environment Schemes and some schemes can be beneficial for bumblebee conservation ^[17]. Traditional hay meadows are still maintained in some areas of the county and many are now being restored in parts of Cumbria, here and in flower-rich areas such as verges, woodland edge, paths and other boundaries, it is important to leave forage un-cut for as long as possible, as cutting removes vital nectar sources and may increase the foraging distance from the nest.

References:

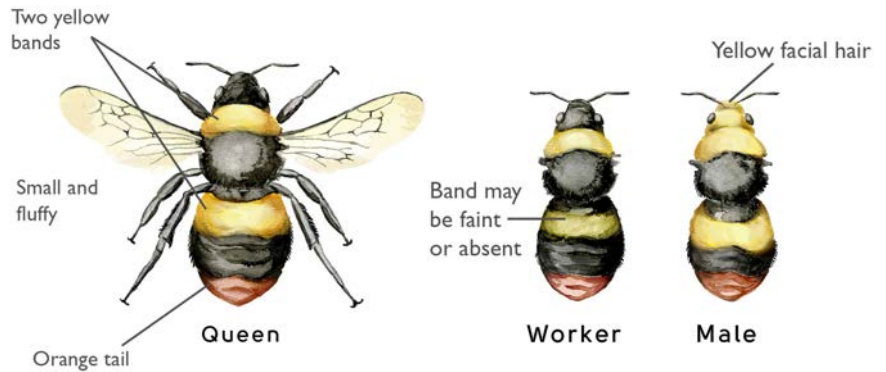
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Main photo:

Worker - Amelia Bennett-Margrave

Side photos:

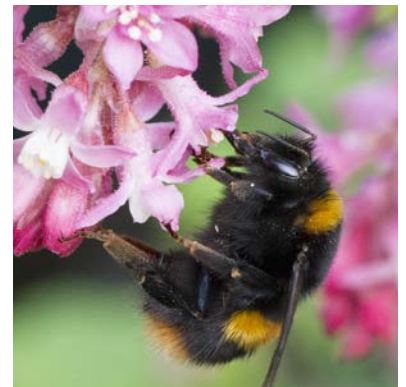
- 1- Queen on thistle - Vivian Russell
- 2- Worker on *Arabis* sp. - Vivian Russell



Description and Life Cycle:

Description

The Early Bumblebee (*Bombus pratorum* Linnaeus 1761) ^[1] is one of the 'Big 7' of the Bumblebee world, being widespread across the UK. Early Bumblebee Queens are relatively small for bumblebees (averaging 15-17mm) with a single lemon-yellow band across the top of the thorax and usually a single lemon-yellow band of variable width across the upper abdomen (which can be reduced or lacking). Workers are smaller (10- 14mm) and the abdominal yellow band is often greatly reduced or entirely indistinguishable. Males have extensive, rather ill-defined yellow bands around both the thorax and abdomen (with yellow hairs variously distributed in other areas) and have very distinctive yellow facial hairs, being small at only 11- 13mm in size. The Early Bumblebees hair is greatly uneven, especially compared to other Bumblebee species such as *Bombus terrestris* making it a notable trait of the species ^[2].



Queen on *Ribes* sp

All castes have a red tail and thus they can be confused with the related Bilberry Bumblebee (*Bombus monticola*), though in that species the colour is more orange-red and much more extensive on the abdomen. They can also be confused (especially in males) with the Red-tailed Bumblebee (*Bombus lapidarius*) however, the red tail of the Early Bumblebee is much duller in colour than the vivid, crimson red of the Red-tailed Bumblebee – in fresh individuals of the latter species – with the yellow of male Red-tailed Bumblebee usually “neater” and more defined.



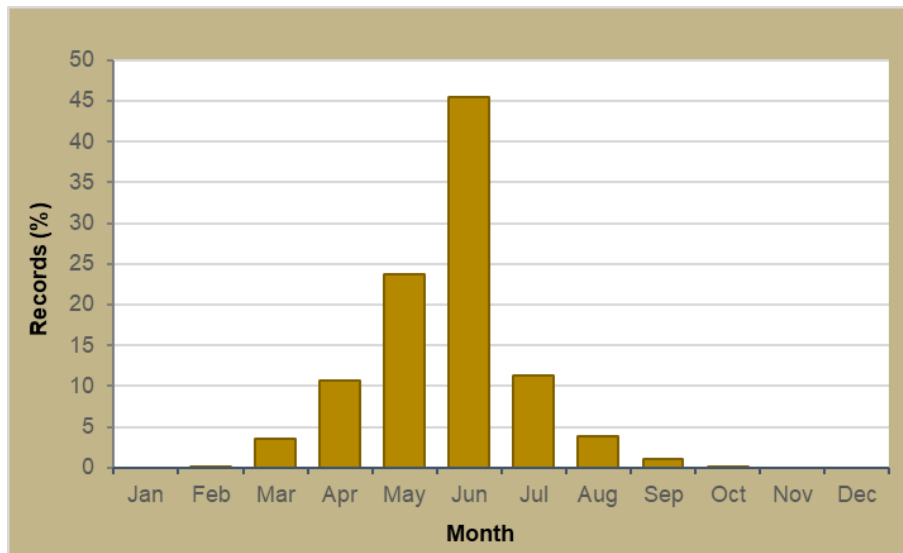
Foraging worker

Life cycle

The Early Bumblebee is aptly named as it one of the earliest Bumblebees to emerge and begin its life cycle (the true derivation of the common name linked to colonies initiated / workers produced at an earlier stage than in other early emerging species). Queens can be seen in March with workers and males emerging around April. New Queens emerge as early as May in the south, therefore southern populations can be bivoltine while northern populations tend to be univoltine. Colonies consist of around 50 – 150 individuals and all castes can be seen as late as September - depending on latitude.



Male on *Astrantia*



Habitat and Distribution:

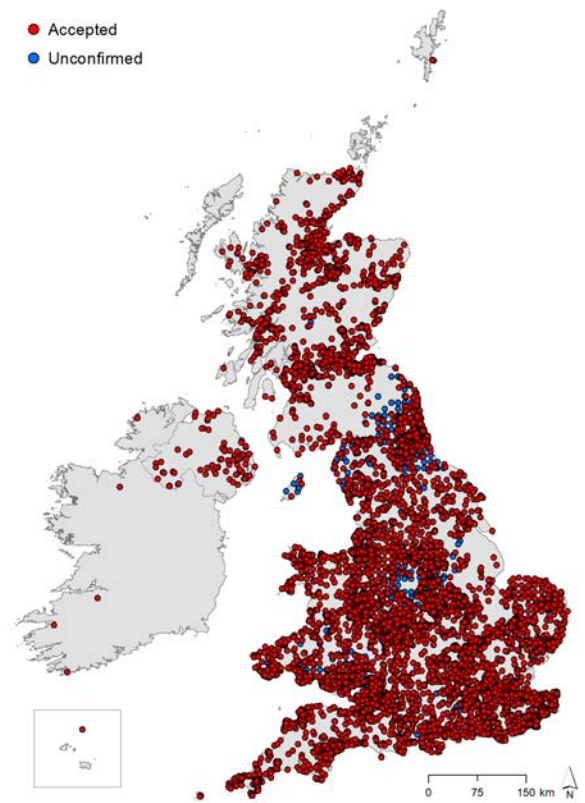
Habitat

Lye *et al.* cited Early Bumblebee as one of the most variable for nest sites of the 'Big 7' Bumblebees in the UK; Early Bumblebees will often nest underground in old small mammal nests - as with other Bumblebees species - but are also known to frequently use old bird's nests, bird boxes and tree holes as nest site choices [3].

The Early Bumblebee is abundant in woodlands and urban areas such as gardens and parks, particularly in areas where brambles are found in abundance. They are a short-tongued, polylectic species - foraging from a wide variety of plant species in addition to brambles and being specifically noted as an important pollinator for fruiting plants such as *Prunus* species and (later in the season) Raspberry [4].

Distribution

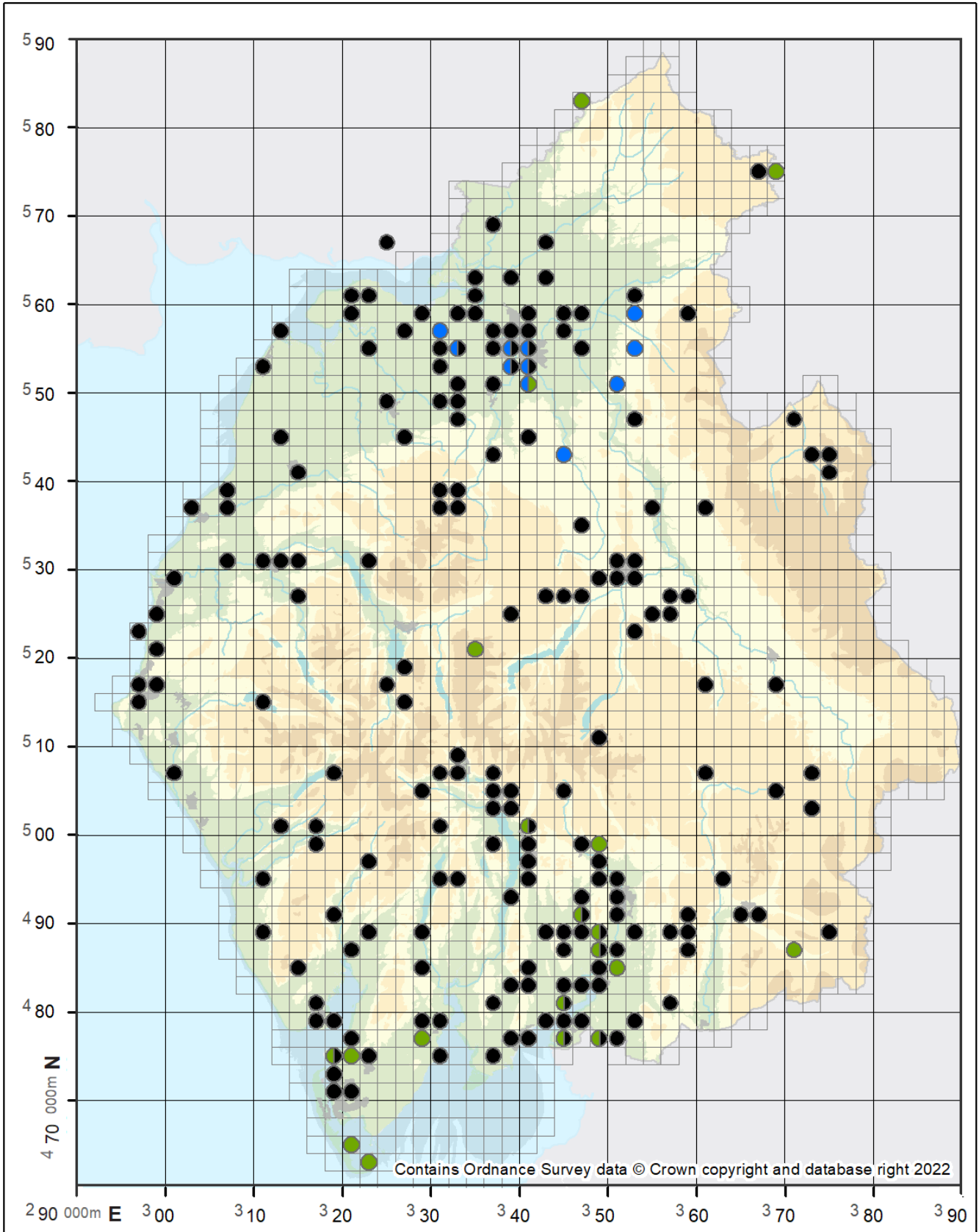
The Early Bumblebee is a very common bumblebee across Britain, and its population is not considered to be threatened or declining. They range from the most northern point of Scotland to the most southerly areas of the UK (including Isles of Scilly and Channel Islands) and have a dense abundance of records noted in Northern Ireland (with their first recording there being as recent as 1947).



NBN and CBDC records

Status in Cumbria:

While the Early Bumblebee is widely spread across the UK, it does not have a dense number of records in Cumbria, being - most likely - vastly under recorded (in most habitats) with recent records only reaching 190 after 2000.



Early Bumblebee <i>Bombus pratorum</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 502 33 35 0
	Recorded (First: 1900 Most Recent: 2022)		

Early records in Cumbria show a cluster of records around lowland areas in the north of Cumbria, mainly surrounding areas with urban settlements containing gardens and greenspace. The Early Bumblebee, however, is not specifically a lowland species, with records showing sightings in areas of 200 – 500m elevation as record numbers increased between 1950- 1999 and again post 2000; it is most likely – and especially - under- recorded in the vast upland areas of the county, where recording efforts are lower, accounting for reduced upland records.

The population in Cumbria increased by approximately 9.13% between 1901 and 1961 ^[5] with an increase in records for urban areas, gardens and urban green spaces – where the species would have been seen and increasingly recorded (the vast majority of records representing collected specimens) by entomologists of that time.

Across the county, Cumbria contains large areas of broadleaved woodland, with woodland covering 12% (roughly 28,500 hectares) of the Lake District National Park alone ^[6]. With wooded (and woodland edge) habitats a key association for the species, it is easy to see how it has been able to spread across the county, with an abundance of suitable habitats and nest sites.

Plans for a “community forest” to be planted along the western coast of Cumbria were announced by DEFRA in 2021, beginning with 150 hectares of plantation - with the ultimate aim of 5000 hectares to be planted in total. Areas were chosen with only 9.9% woodland cover (3% below national average) as well as being close to urban areas in order to increase public access to “green space” ^[7]. Close proximity of woodland and urban gardens may benefit Early Bumblebee populations in Cumbria - creating a corridor with a combination of foraging and nesting areas. Recent records show an increase in distribution in lowland areas along the western coastline.

Future Outlook:

The Early Bumblebee population is considered of “least concern” status (<https://www.iucn.org/>) both in the UK and across Europe. This small, widespread species is likely to continue to be a frequent visitor to gardens and wooded areas throughout the UK – and Cumbria – amongst other suitable habitats with a range of favoured forage plant species.

Promoting an increase in tree cover in areas that are lacking wooded habitat e.g., the coastal community forest project in Cumbria, alongside appropriate management and an increase in additional complimentary flower- rich habitats in these areas will create a mosaic of habitats and resources. This should lead to an increase in available resources for pollinators such as the Early Bumblebee. Well connected, appropriately managed and diverse habitats - with a continued increase in gardens with diverse structure and a wide range of flowering plants - across the UK will hopefully give better opportunities for abundance of both Early Bumblebee and other bumblebees on our back doorstep.

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- 6- Lake District National Park. n.d. Lake District facts and figures. [online] Available at: <https://www.lakedistrict.gov.uk/learning/factsandfigures#:~:text=Woodland%20covers%2012%20percent%20of%20the%20Lake%20District,the%20Forestry%20Commission%2012%2C000%20hectares%20is%20broadleaf%20woodland> [Accessed 25 May 2022].
- 7- DEFRA; Forest Commission; The Rt Hon Lord Goldsmith, 2021. New Community Forest for Cumbria will see thousands of trees planted along Cumbria's west coast. [online] Available at: <https://www.gov.uk/government/news/new-community-forest-for-cumbria-will-see-thousands-of-trees-planted-along-cumbrias-west-coast> [Accessed 25 May 2022].
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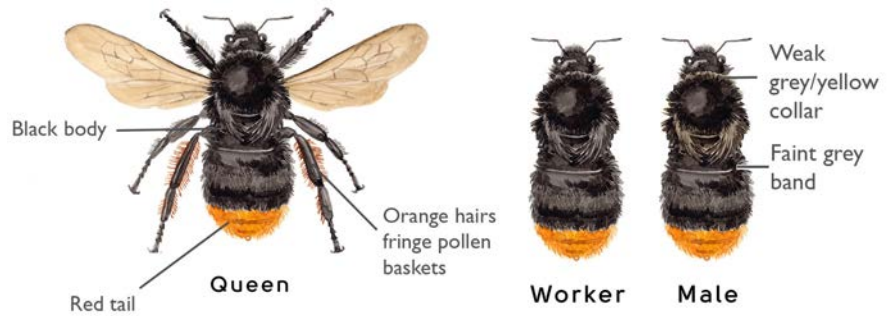
Main photo:

Female - Vivian Russell

Side photos:

- 1- Queen on *Ribes* sp. - Vivian Russell
- 2- Foraging worker - Vivian Russell
- 3- Male on *Astrantia* - Vivian Russell





Description and Life Cycle:

Description

The Red-shanked Carder Bee is much the scarcer of Britain's two extant social bumblebees with females that are black with red tails.

The key feature that distinguishes the Red-shanked Carder Bee from the much more common (and unrelated) Red-tailed Bumblebee is the colour of the corbicula (the long hairs fringing the pollen basket of the hind leg) which are red-orange in *B. ruderarius* and black in *B. lapidarius*. However, this feature can be compromised in sun-bleached workers, or obscured by (gathered) pollen. Queens of *B. ruderarius* are much smaller than of *B. lapidarius*; *B. ruderarius* queens and workers have an overall rounder, fluffier and more dusky appearance in comparison to the longer build and more vivid colours of *B. lapidarius* (*B. ruderarius* also have a longer malar space – between the bottom of the eye and the mandible – though this is difficult to appreciate in the field).

Males often have greyish-yellow banding, though somewhat resembling males of *B. rupestris* rather than *B. lapidarius* (though easily distinguished due to the structure of the hind tibia) [1].

Life cycle

Queens emerge relatively early, in April. Nests are typically at ground level, amongst tall grasses and under a cover of vegetation (grass, moss and plant debris) [2]. Colonies are thought to have between 50 and 100 individuals at maturity, and die off in August or early September.



Worker

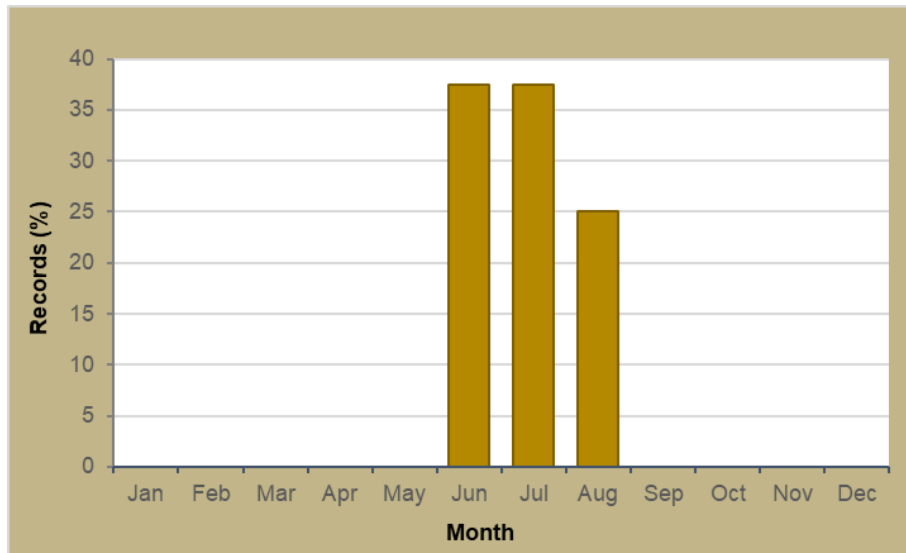


Male

Habitat and Distribution:

Habitat

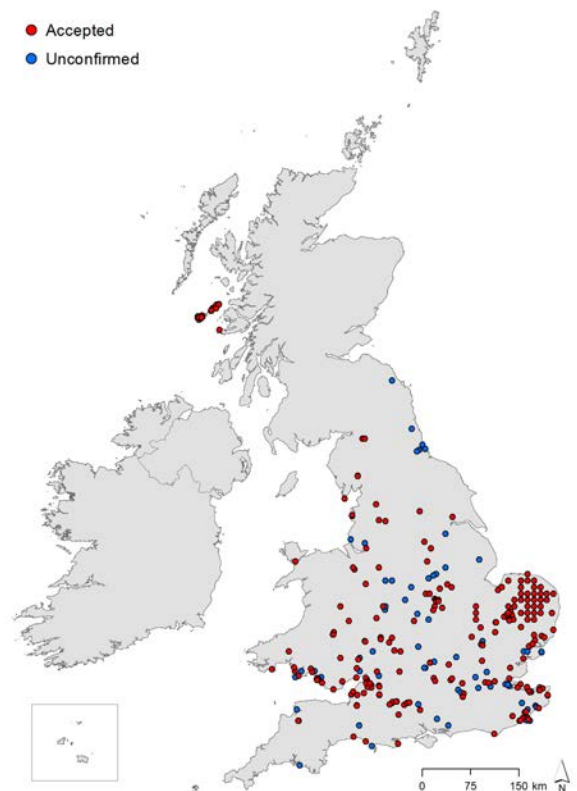
The Red-shanked Carder bee is present in a wide range of habitats, and it is thought that the species survives best in the complex habitat mosaic formed by later stages of succession from grassland to scrub [3].



Distribution

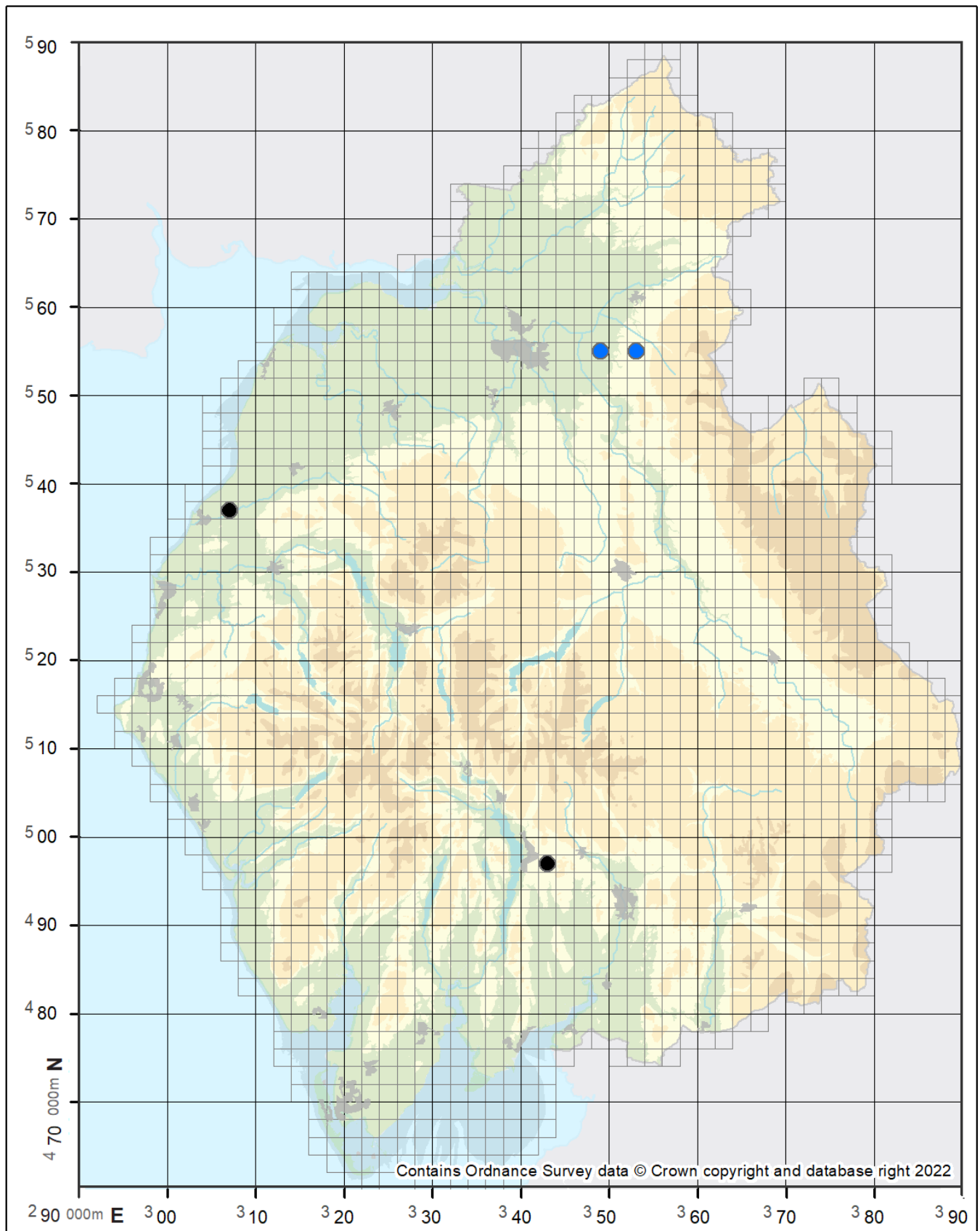
The Red-shanked Carder Bee is (alongside all the British “carder bumblebees” other than the common and widespread *B. pascuorum*) is a UK BAP priority species [4] that has been widely recorded - especially in southern England - but has shown a striking decline in its abundance and distribution since the first half of the 20th century, with this decline continuing into the 21st century.

The strongest modern populations are associated with larger areas of unimproved grasslands, e.g. the Hebridean Isle of Tiree and flower-rich coastal areas, although the species may survive in areas of less intensified farmland with flower-rich habitats.



Status in Cumbria:

There are few historical records for Red-shanked Carder Bee in Cumbria, with historical records (1900 – 1929) limited to Tarn Lodge, Head’s Nook, Orton and Grange [5] – the latter being the source of all the 1920’s records and possibly the last historical toehold for the species in Cumbria.



Red-shanked Carder Bee		Elevation (m)	Time Periods	No. Records
<i>Bombus ruderarius</i>		< 0	Post 2000	<input type="text" value="4"/>
Recorded (First: 1900 Most Recent: 2020)		0 - 100	1950 - 1999	<input type="text" value="0"/>
		100 - 200	1900 - 1949	<input type="text" value="4"/>
		200 - 500	Pre 1900	<input type="text" value="0"/>
		> 500		

The species since has been recorded once in Cumbria (2014, Windermere, Peter Brash – NBN and pers. comm.), indicating that further recording effort – especially in that area - may help to assess the status of *B. ruderarius* in Cumbria, though it is impossible to know whether that record represents a viable population or a vagrant individual at the present time.

Future Outlook:

With the recent record from Windermere, Cumbria is at the northernmost mainland range of this species in England. Establishment of this species in Cumbria may be localised (if it indeed does gain a foothold in the county in the future) – however, given the presence of the populations in Scotland and modern records from the west coast of Ireland ^[2], climate would not appear to be an obvious reason for scarcity and restricted distribution of this species in northern areas of Britain at present.

Conservation and restoration of tall flower-rich and diverse grassland habitats at relevant localities are needed to help conserve this species nationally. Further research and survey work are also needed, to inform and establish clearer conservation requirements for this species.

References:

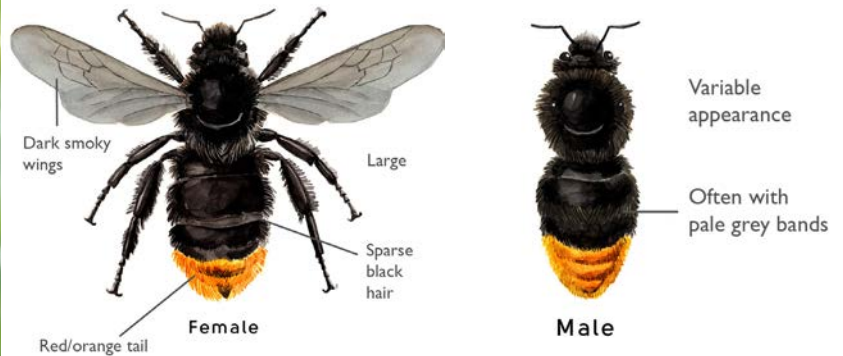
- 1- Falk, S., 2015. Field Guide to the Bees of Great Britain and Ireland, Bloomsbury.
- 2- Edwards, M. and Else, G., 2018. The Bees of the British Isles, Volume 2, The Ray Society.
- 3- Benton T 2008. Hymettus report: *Bombus ruderarius* (Müller, 1776): Current knowledge of its autecology and reasons for decline. Available at <http://hymettus.org.uk/downloads/B.%20ruderarius%20report08.pdf>.
- 4- <https://data.jncc.gov.uk/data/98fb6dab-13ae-470d-884b-7816afce42d4/UKBAP-priority-terrestrial-invertebrates.pdf>.
- 5- Robinson, N., 2005. Bees, Wasps and Ants Society Newsletter, Autumn, pp. 52-56.

Main photo:

Queen - Steven Falk

Side photos:

- 1- Worker - Steven Falk
- 2- Male - Steven Falk



Description and Life Cycle:

Description

A specific parasite of the Red-tailed Bumblebee *Bombus lapidarius*, this bumblebee looks remarkably similar to its host, with a red tail and black body. With the largest average wingspan of any UK bumblebee, females are striking bees with darkened, almost black wings and a low-pitched hornet-like buzz ^[1].

Characteristic of cuckoo bumblebees, females often have sparser hair on the body, revealing the shiny chitin underneath and have evenly haired hind tibia, lacking the shiny pollen baskets of its host. The much more variable males have the same general colour pattern, but are smaller and often have pale, diffuse yellow bands across the abdomen and top of the thorax, or these pale hairs can be more extensive.

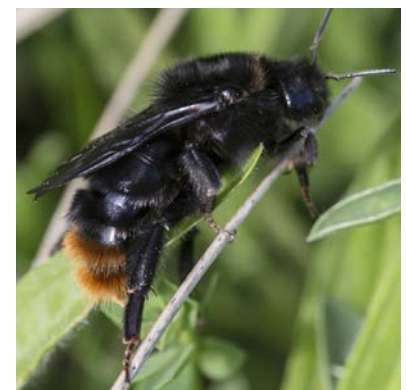
The close resemblance of this species to its host possibly reduces recognition upon entering a host nest, but is likely an example of Müllerian mimicry, whereby a group of harmful species look like each other to avoid predation ^[2].

Life cycle

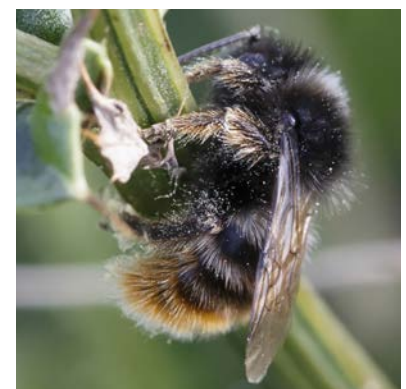
Often the latest cuckoo bumblebee to emerge, females typically emerge in late May to June. Through nest-searching flights and scent, females locate Red-tailed Bumblebee nests. When the host's scent has been detected, females are noted to become 'excited', vibrating their wings and pointing their antennae down onto the scent marks ^[3]. The female will take over the nest and establish herself - usually by killing the host queen ^[4] - and proceeds to lay her own eggs for the host workers to rear.

Red-tailed Cuckoo Bees do not produce workers, rather their eggs become reproductive females and males. Males form 'leks' on grassy hillsides to attract females, which possibly gave rise to this species' older name of 'Hill Cuckoo Bee' ^[1].

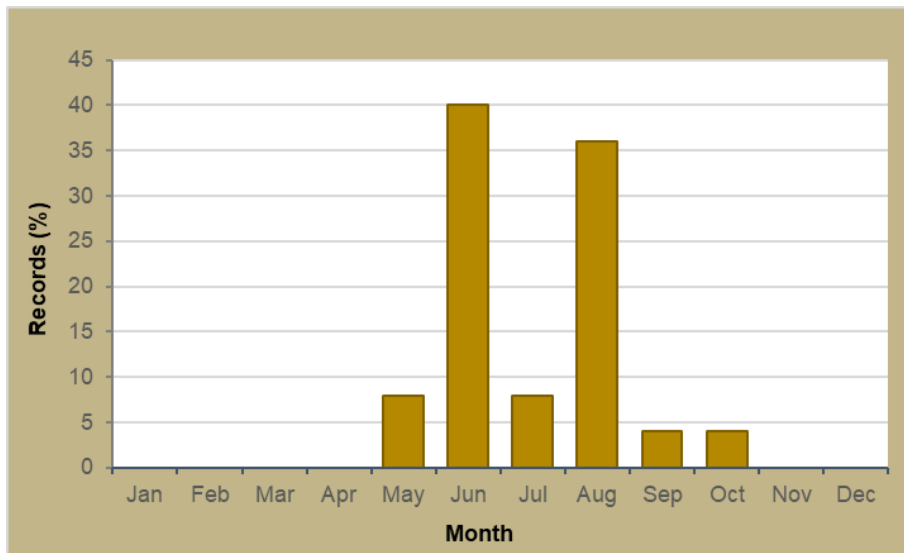
As a short-tongued bumblebee, the species visits composite flowers where nectar can be easily accessed, including such species as dandelions, Ox-eye Daisy and thistles, as well as brambles.



Female



Male



Habitat and Distribution:

Habitat

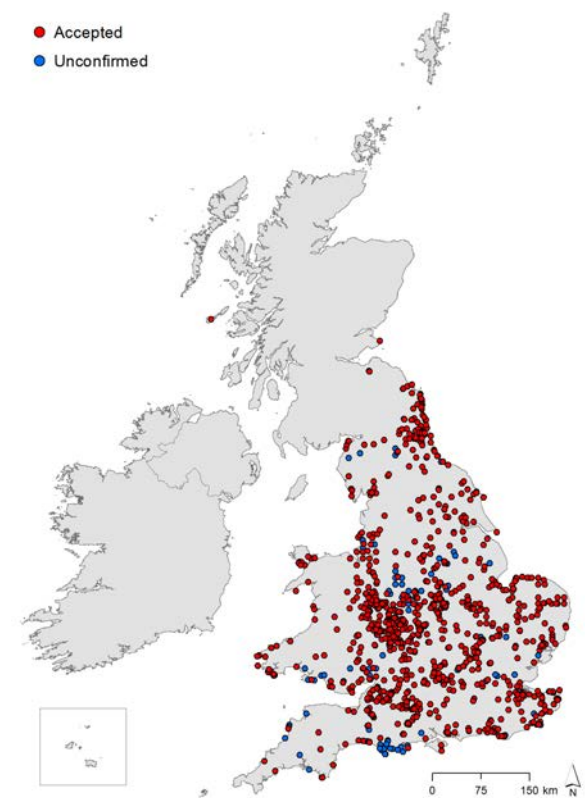
While the Red-tailed Bumblebee is a frequent garden visitor, most records of Red-tailed Cuckoo Bees are from areas of unimproved grassland [5]. However, it can be found in a variety of habitats and in highly urbanised locations [1]. In Cumbria, most modern sightings of this species are coastal.

Distribution

Of the six British cuckoo bumblebee species, the Red-tailed Cuckoo Bee is considered the least widespread and abundant, though it has undergone an extensive increase in distribution nationally in more recent decades.

The Red-tailed Cuckoo Bee was considered common in many parts of southern England historically, but suffered declines in the latter half of the 20th century over much of its range and was provisionally listed as nationally scarce [6]. From the late 20th century, it started to show a recovery from previous declines.

Today, it is still mainly a southern-biased species, but records are showing a general increase in distribution and a northwards expansion, with the first Scottish record in 2013. This change in distribution is as yet unexplained, but could possibly be climate-related [7].

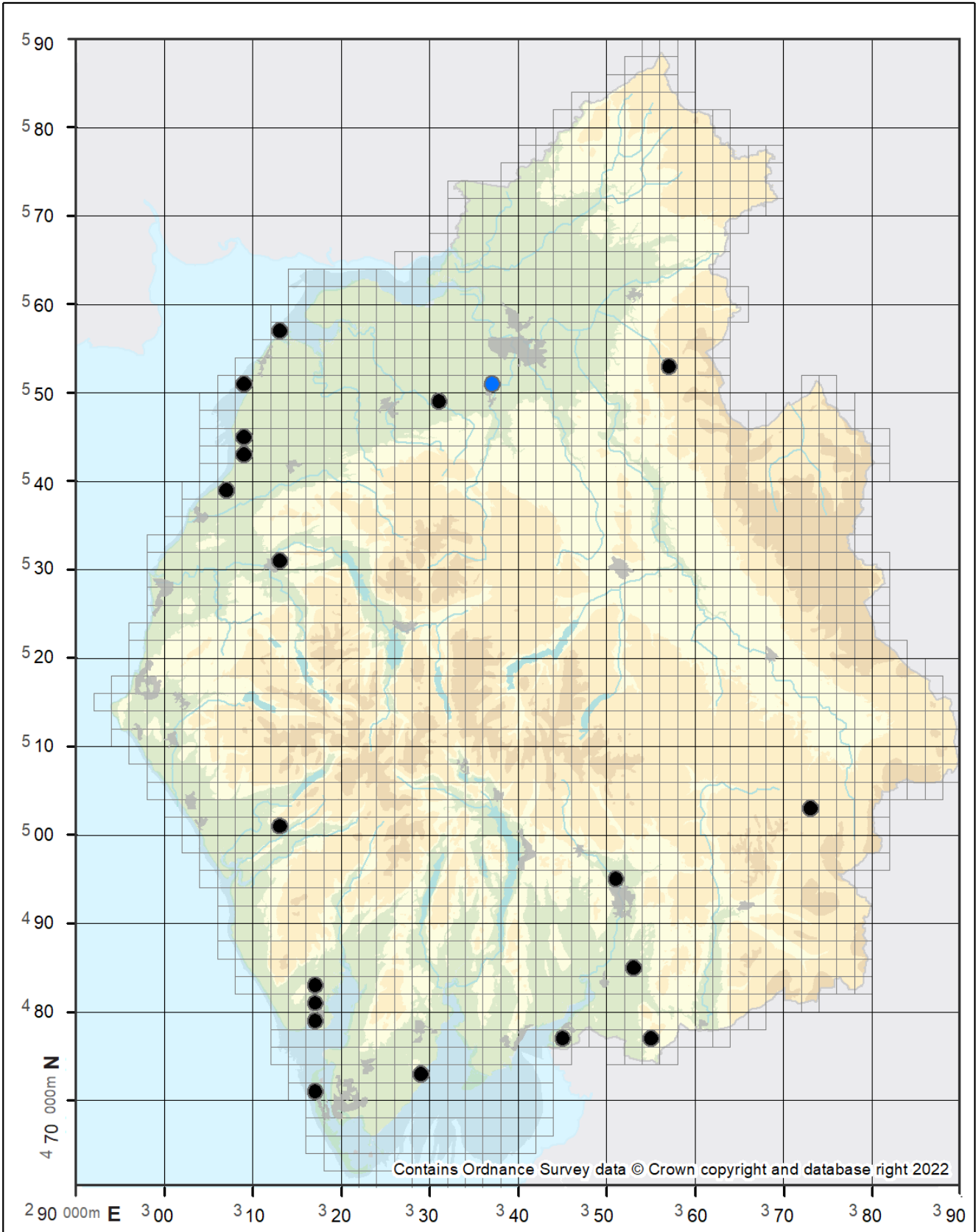


NBN and CBDC records

Status in Cumbria:

The Red-tailed Cuckoo Bee is a scarce bumblebee in Cumbria, and the least common and widespread of the six cuckoo bumblebee species found here at present.

Whilst the host is one of the most commonly and widely recorded bumblebees in Cumbria, the Red-tailed Cuckoo Bee's distribution does not reflect this. This species is a sparsely recorded bumblebee in Cumbria, though records since 2013 are showing an increase in number after an apparent absence of 40 years.



Red-tailed Cuckoo Bee
Bombus rupestris

Recorded (First: 1936 Most Recent: 2022)

Elevation (m)	
	< 0
	0 - 100
	100 - 200
	200 - 500
	> 500

Time Periods	
	Post 2000
	1950 - 1999
	1900 - 1949
	Pre 1900

No. Records	
	24
	0
	1
	0

The first known Cumbrian record was from 1900 in Orton by Carlisle entomologist Frank H. Day ^[8], ^[9]. Aside from a second Orton record in 1913, early 20th century records thereafter were from north Cumbria and clustered around Carlisle; Easton (1907), Cumwhitton Moss (1919), and in Robinson's 2005 list, a record from Dalston in 1936.

According to Neil Robinson's 2005 list, there was an absence of records until 1971, where it was found in Smardale ^[9]. In line with declines nationally, following this was another period of apparent absence until 2013 - with a sighting from the north Solway coast. Whether these are periods of local extinction or absence of recording remains uncertain, but records suggest it has likely to always have been a scarcer bee in Cumbria historically, with a scarce status remaining at present.

Future Outlook:

Whilst still a scarce bumblebee in Cumbria and other northern localities, its increase in distribution nationally - and increase in records regionally since 2013 - is encouraging. Further recording efforts for this bumblebee will increase our understanding of its distribution in Cumbria.

Providing open, flower-rich habitats will support high densities of its host, the Red-tailed Bumblebee, which is a widespread and common bumblebee in Cumbria and Britain & Ireland. However, given its enigmatic and more erratic / restricted distribution compared to its host, there are likely other factors concerned in the Red-tailed Cuckoo Bee's distribution and conservation.

References:

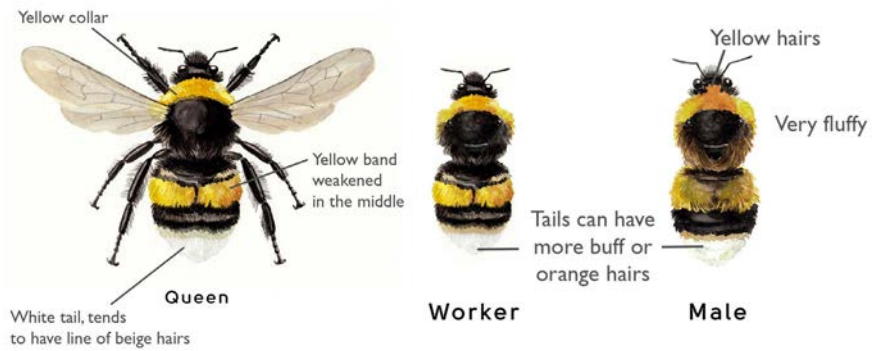
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Main photo:

Female - Charlotte Rankin

Side photos:

- 1- Female -Vivian Russell
- 2- Male -Vivian Russell



Description and Life Cycle:

Description

The Broken-belted Bumblebee (*Bombus soroensis*) has been described as an 'overlooked' species [1], [2]. This is due in part to the fact it is also one of our most easily misidentified bees [3], and no reflection on its importance.

Queens are relatively small - measuring 15-17mm [4]. They have a clear striped pattern with a yellow band on the thorax behind the head, another on the abdomen and a white tail. Bands are bright lemon yellow with a notch of black hairs on the middle of the abdominal band, hence the name 'broken-belted'; this band extends higher on each side of the abdomen which can be useful from a side on perspective. Workers resemble the queen but are smaller again at just 10-14 mm [4]. In reality, the broken band is not always an easily observed or reliable field sign - this is particularly true late in the season when bees become worn and females are often confused with both White-tailed agg. (*lucorum* s.l. species) and Buff-tailed (*Bombus terrestris*) bumblebees.

The males (12-14mm [4]) are often patterned similarly to the females but with a wider, unbroken abdominal band. Facial hair can vary from black through to yellow. The slim hind leg is one of the most diagnostic, structural features distinguishing the male Broken-belted Bumblebee from other white-tailed *Bombus* males.

However, variation occurs - mainly in the tail colour of workers and males which can range from pure white, or white with a peachy orange base, right through to an orange-hued buff [5]. Males with peachy tails are one of the easiest combinations of caste and colour to confirm as a Broken-belted Bumblebee. Given the difficulties of field identification, additional examination of mandibles in the female and distinct genitalia in the male are sometimes required and used to confirm the bee's identity [1].



Male



Male



Male

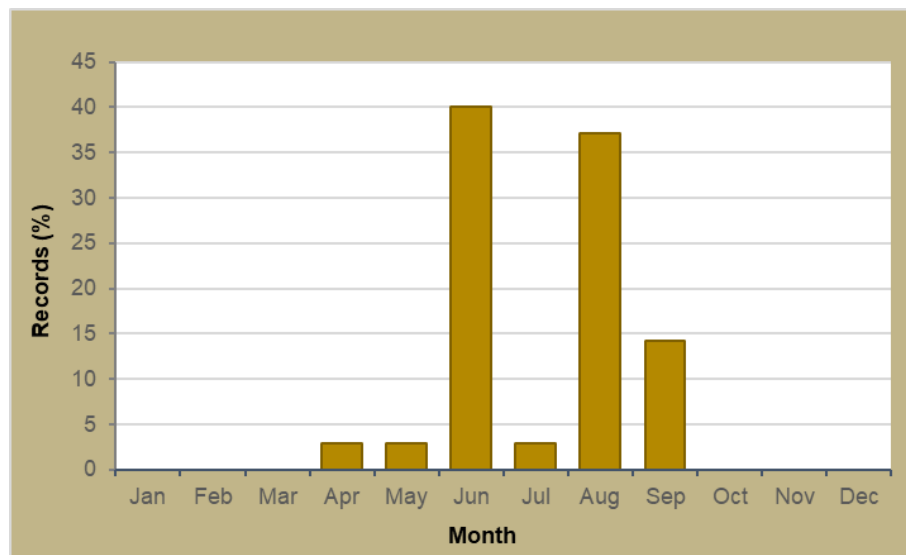
The scientific name for the bee - 'soroensis' - comes from 'Soro' in Denmark where the species was first collected and formally described. In the UK the bee was first described in error as *Bombus collinus*, from a specimen collected at Westow in Yorkshire in the early 1800's (subsequently collinus was synonymised with soroensis).

'Broken-belted' is well established as a common name but historically this bumblebee has also been known as the Ilfracombe Humblebee. [6]

Life cycle

The queen Broken-belted bumblebee emerges relatively late from hibernation, typically towards the end of May or early June. She will then seek an underground nest site in which to lay her eggs. Newly emerged workers start to appear from July onwards into September, in line with the abundance of their preferred flowers. Males and the new season queens follow on in later July, peaking in September but can still be found flying as late as November [2].

Colonies are thought to vary in size from 80 to 120 bees with numbers at their maximum in July and August. Details of the nesting behaviour are little known, but the Broken-belted bumblebee has been described as one of the pollen-storing species [1].



Habitat and Distribution:

Habitat

The Broken-belted Bumblebee is a short-tongued species and is polylectic, able to collect pollen from a wide range of flowers in different habitats [7]. Preferences also depend on the time of emergence of the different castes but key flowers include clovers (*Trifolium* species), brambles (*Rubus* species) and knapweeds (*Centaurea* species). In late summer and early autumn Devil's-bit Scabious (*Succisa pratensis*) appears to be a particularly favoured flower for this species (and a good place to search for males).

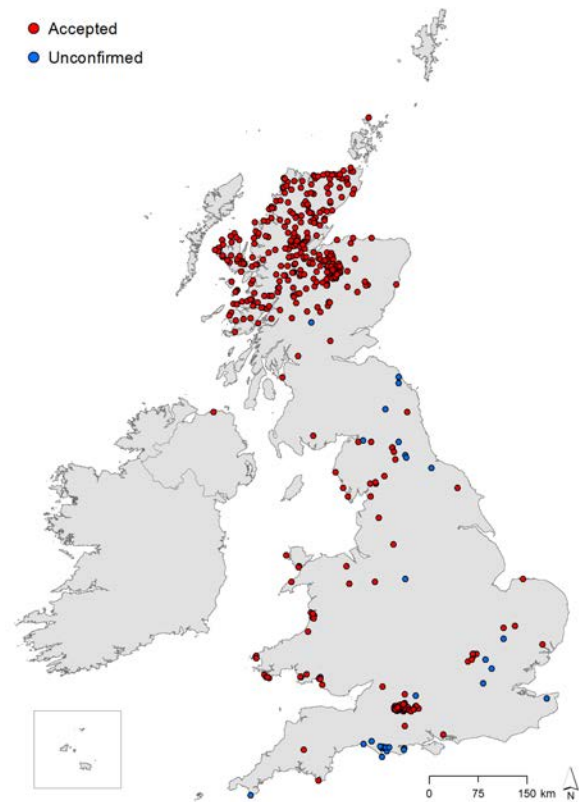
Goulson [8] describes the Broken-belted bumblebee as one of the 'circling' species that will fly around a human in the vicinity. Not all bumblebees do this and the suggestion is they are learning landmarks as a navigational aid in long distance foraging. Quite how far this species travels within its habitat has yet to be fully investigated.

Recent surveys from Wales, where the bee has a stronghold, suggest core habitats are mainly coastal areas and include 'dune slack, coastal grassland and open dune' [9]. It is possible, as suggested for other bumblebees [8], that this is a case of the species being 'pushed back' to the coast as inland habitat becomes unsuitable. In other parts of its range the Broken-belted Bumblebee is associated with a variety of habitats including calcareous grassland, heather moorland, forest edges and gardens [2].

Distribution

Though always scarce, The Broken-belted Bumblebee used to be widespread in the UK but has sadly disappeared from large parts of its historic range. It is now found mainly in the north-west of Scotland, where strong populations are established in some areas. Elsewhere, its appearance is much more fragmented. The best-known resident populations are along the Welsh coast and Salisbury Plain ^[1,2], where the large expanses of suitable habitat seems to favour it.

In Eurasia the species is widespread, locally common and in some areas quite well studied ^[10].



NBN and CBDC records

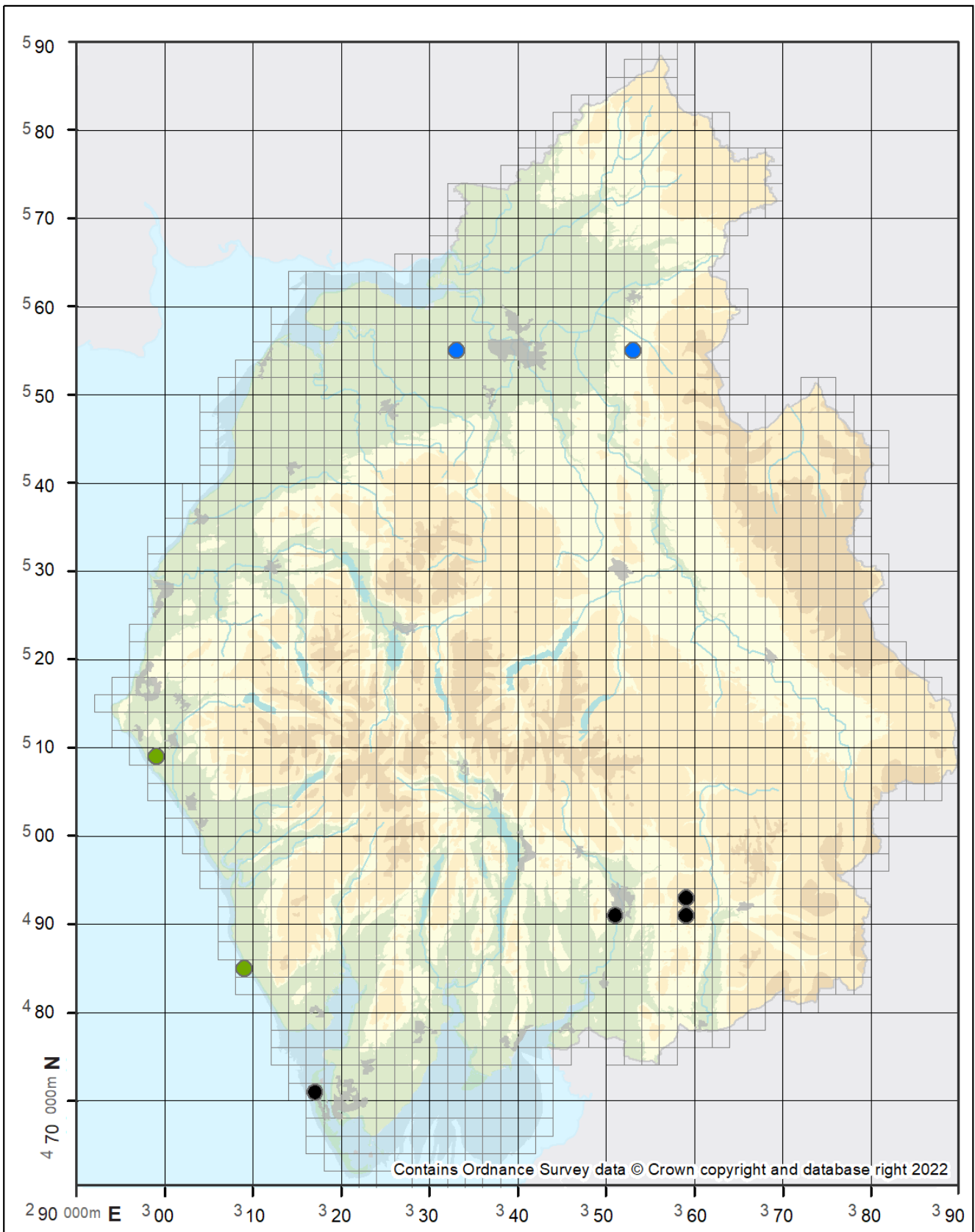
Status in Cumbria:

Records of the Broken-belted Bumblebee in Cumbria are patchy, both in time and distribution. It was first recorded in early August, 1917 by George Bell Routledge on his estate of Tarn Lodge, with two further sightings that month. The following year Routledge continued to make occasional recordings of the species at the estate, from May 19th through until 4th September 1918. Only one further record exists from the early 20th century, that made by Frank Henry Day on 21st April 1919 and also in the north of the county at Orton, Carlisle District.

Perhaps due to the difficulties in field identification, or the paucity of recorders, the Broken-belted Bumblebee remained unrecorded in Cumbria for over fifty years. The next occurrence in the records is in 1971 in mid-August with a small number of observations on the west coast, near Couderton. It was to be another 28 years before further sightings of the Broken-belted were reported again, this time (again, coastally) at Gutterby Cliffs.

There was a short-lived spate of recordings at the turn of the century (2001 to 2003), but sightings were still rare and scattered in line with national observations. The records place the Broken-belted Bumblebee to the South and Southwest of the county.

The current status of the Broken-belted Bumblebee in Cumbria remains unclear. Populations of the species are known over the border in the Allendale area of Northumberland and a single female bee was recently recorded in Lancashire (2019, Longridge Fell). It is possible that this species also exists in Cumbrian regions of the North Pennines, along with other areas of suitable habitat.



Broken-belted Bumblebee <i>Bombus soroensis</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 16
			Recorded (First: 1917 Most Recent: 2003)
			14
			0

Future Outlook:

Compared to other species in decline the Broken-belted Bumblebee appears to have received little attention in the UK. The difficulties of confirming population trends for easily confused species, is well recognised as a conservation issue ^[11] and is likely to have impacts for assessment in this case.

It could also be argued that the Broken-belted Bumblebee lacks the charismatic features of some of our other rare bumblebees, such as the distinctive colouration of the Great Yellow Bumblebee or the unusual sound of the Shrill Carder. This may be another reason why, aside from dedicated recorders, it has yet to capture the public interest.

There is thus a need to increase knowledge in Cumbria and elsewhere, so that appropriate management plans can be put in place. It is possible that the Broken-belted Bumblebee has been under-reported and is in a better position than currently believed. An increase in awareness amongst general public, entomologists and the wider “naturalist” community of fragmented northern populations - and the potential presence of this species in poorly recorded areas - could, potentially, stimulate interest and lead to more records.

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- 11- Scriven J.J., Woodall L.C., Tinsley M.C., Knight M.E., Williams P.H., Carolan J.C., Brown M.J.F and Goulson D. (2015) Revealing the hidden niches of cryptic bumblebees in Great Britain: Implications for Conservation. Biological Conservation 182: 126-133.

Main photo:

Queen - Steven Falk

Side photos:

- 1- Male - Louise Hislop
- 2- Male - Louise Hislop
- 3- Male - Louise Hislop

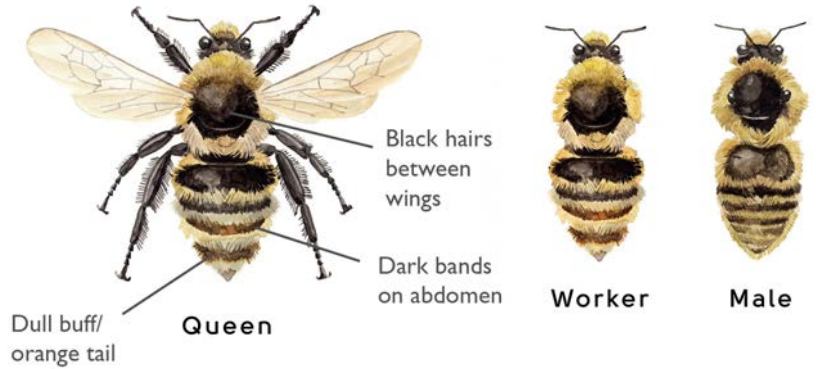


Shrill Carder Bee

Bombus sylvarum, (Linnaeus,1761)



Grey appearance



Description and Life Cycle:

Description

The Shrill Carder Bee is a distinctive bumblebee amongst our fauna and the related “carder bumblebees”, which can be identified - in good condition - by its general straw-coloured appearance in combination with a defined black band between the wing bases and reddish-orange tail. As its common, English name would suggest, this bee has a characteristic and noticeably high-pitched, shrill buzz (in comparison to other species).

Life cycle

B. sylvarum is a late emerging species: queens typically come out of hibernation in late May or June, workers appear from late June, males appear in late summer and often peak numbers are only reached in August.

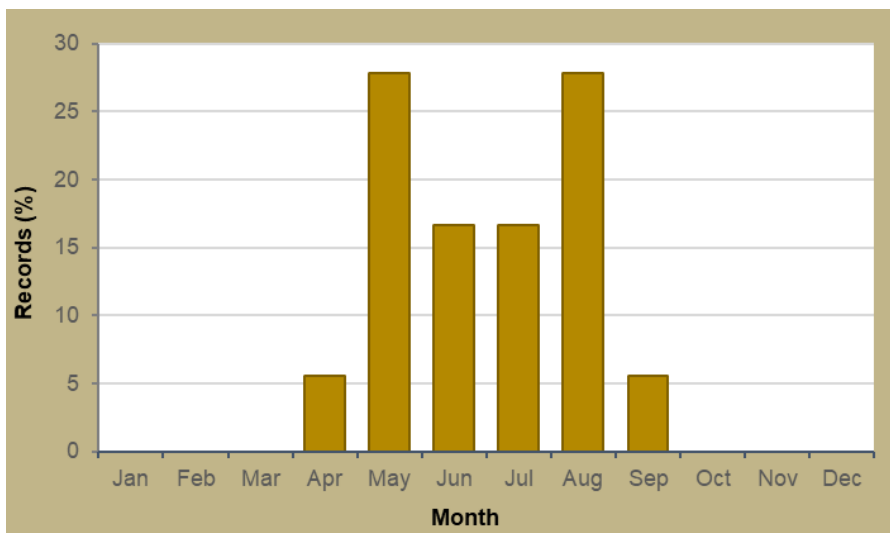
This species creates nests amongst rough vegetation e.g., leaf litter – in a slight hollow in the ground, at the end of short burrows in the soil ^[1], or in old rodent burrows ^[2].



Worker



Male



Habitat and Distribution:

Habitat

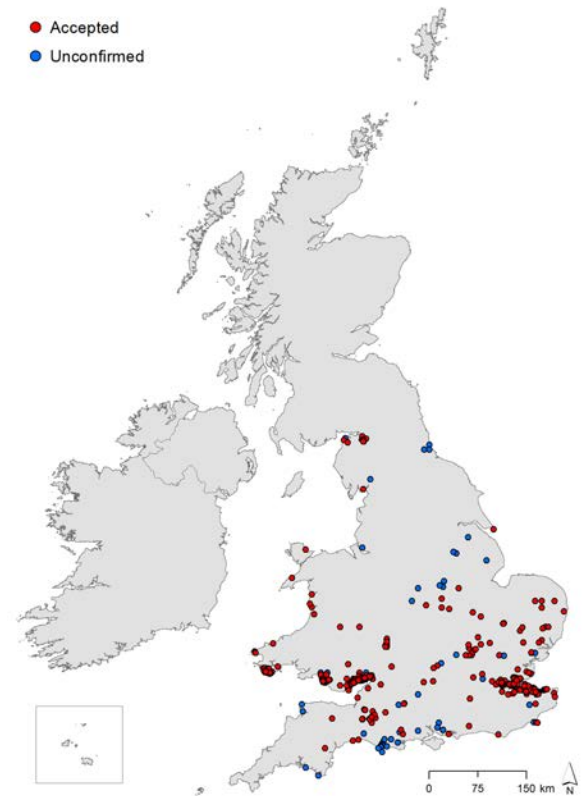
A relatively long-tongued species, it is particularly associated with flower-rich grassland consisting of forage plants such as Red Clover (*Trifolium pratense*), Red Bartsia (*Odontites verna*), Tufted Vetch (*Vicia cracca*) and Common Comfrey (*Symphytum officinale*).

Distribution

The Shrill Carder Bee was – historically - relatively widespread in lowland Britain. However, the species has suffered a striking decline during the 20th century and now is one of Britain’s scarcest bumblebee species.

The modern strongholds for this species are now restricted to the Kent/Essex Thames gateway, the Somerset levels, Salisbury Plain (Wiltshire), and the South Wales coastline (Gwent, Glamorgan and Pembrokeshire). However, the species even appears to be doing poorly in these “strongholds” and remaining populations are increasingly fragmented.

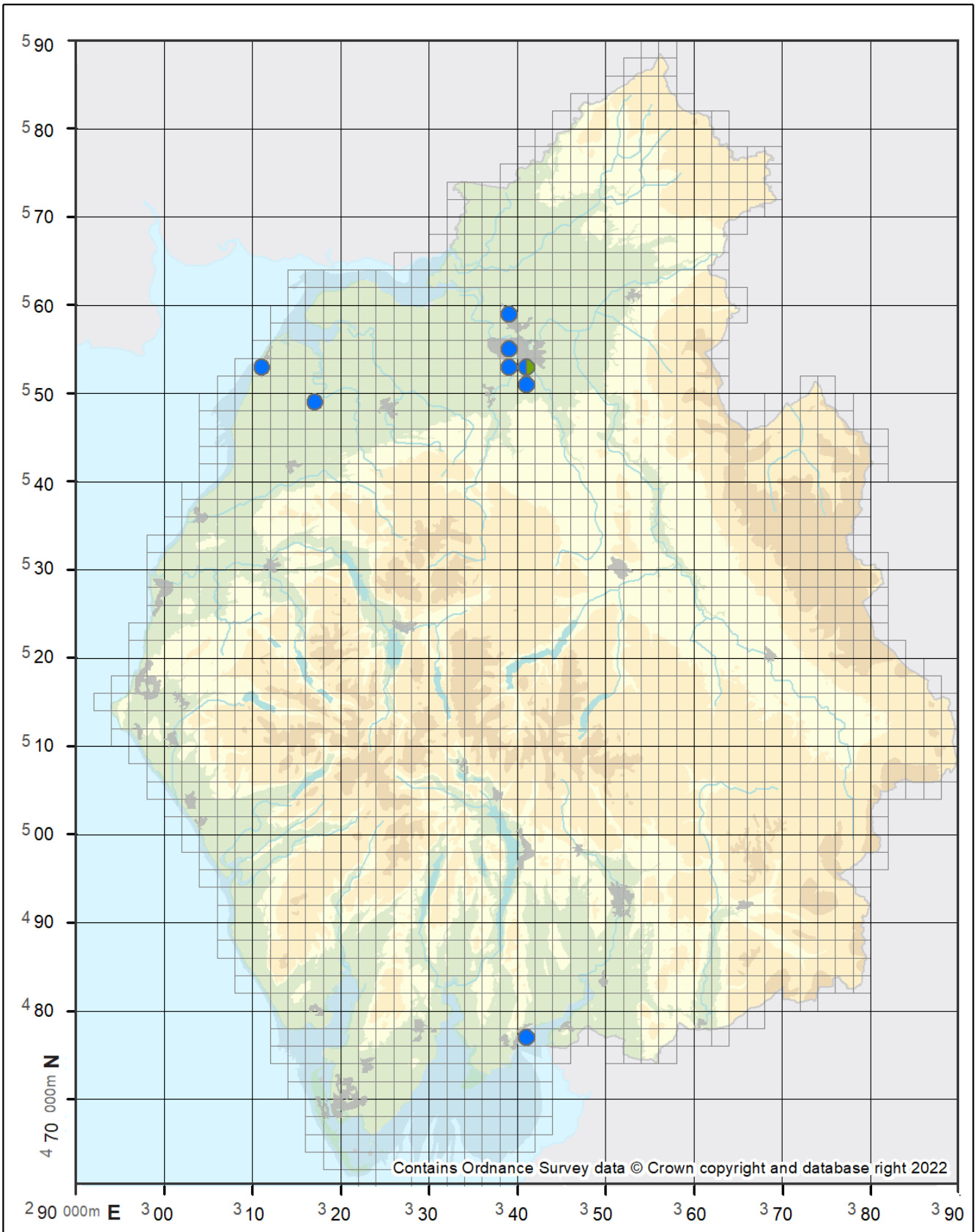
It is a UK BAP priority species for conservation in England and Wales [3]. The main causes for decline are thought most likely to be associated with the loss of flower-rich meadows – largely due to agricultural intensification.



NBN and CBDC records

Status in Cumbria:

There are limited historical records for Shrill Carder bee in Cumbria with 17 records between 1918 (Durdar) and 1953 (Blackwell); as with many rare bees it was the great F.H. Day that made both the first and last records and other than a 1924 record for Grange – by J.D. Ward – he also recorded the bee at Kingmoor, Cummersdale and Silloth [4]. The number of records outstrips those for Lancashire and Cheshire (over a similar period) – though pre-1900 it was described as “widespread” in Lancashire and Cheshire [6] and was recorded as late as 1970 in the Liverpool area. The Cumbria records also exceed the 10 and 11 (pre-1960) records for Yorkshire and Northumberland respectively, which seems strange for such a southern biased species. It is probable that the species may have had a restricted historical distribution in Cumbria, likely due to its more southern distribution and association with lowland habitat.



<h3>Shrill Carder Bee</h3> <p><i>Bombus sylvarum</i></p>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records <input type="text" value="0"/>
			Recorded (First: 1918 Most Recent: 1953)
			<input type="text" value="17"/>
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Future Outlook:

Because the Shrill Carder Bee is a late emerging species ^[2] this species relies heavily upon late season forage availability to feed up and ensure the rearing of new queens in late August and September.

Cumbria represents some of the most northerly mainland records representing the historical range of this species in England and given the lack of recent records – and rapid retraction of distribution throughout Britain - re-establishment seems unlikely.

Conservation and restoration of tall flower-rich grassland, to support and increase remaining fragmented populations are needed to help conserve this species from a national perspective.

References:

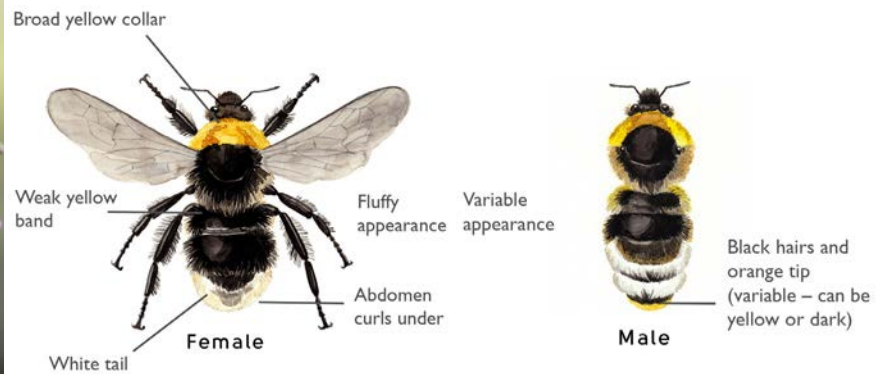
- 1- Sladen, F.W.L., 1912. The humble-bee: its life-history and how to domesticate it, with descriptions of all the British species of *Bombus*. London: Macmillan.
- 2- Edwards, M. and Else, G., 2018 The Bees of the British Isles, Volume 2, The Ray Society.
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Main photo:

Queen - Steven Falk

Side photos:

- 1- Worker - Steven Falk
- 2- Male - Steven Falk



Description and Life Cycle:

Description

While her dark smoky wings may place the female Forest Cuckoo (*Bombus sylvestris*) among the cuckoo bumblebees it is not immediately obvious which of the six British species she is.

She doesn't have the commanding presence of the large Red-tail Cuckoo (*Bombus rupestris*), or the yellow side flashes on the tails of the Vestal (*Bombus vestalis*) or Gypsy (*Bombus bohemicus*) cuckoos, or the unique abdominal pattern on the Field Cuckoo (*Bombus campestris*). This only leaves Barbut's Cuckoo (*Bombus barbutellus*) but this is a larger and longer faced bumblebee rarely seen in Cumbria whereas the Forest Cuckoo is now our most recorded cuckoo species.

The female is a relatively small, fluffy bee with a round head and short tongue. She has a pronounced yellow collar behind her head, a much paler and thinner yellow abdominal band (sometimes absent) just below her midriff, and a white tail. Occasionally the females are more extensively yellow (as in the main picture).

As female cuckoo bumblebees do not collect pollen, their most obvious feature is the lack of corbiculae (or "pollen baskets") on their back legs. Instead of being concave, smooth, and bare on the outer side, they are convex and covered in hair.

All cuckoo bumblebees have thick exoskeletons which can often be seen shining through thinner, more sparsely distributed hairs, but this is not as obvious in the Forest Cuckoo female since she is one of few cuckoo species to have a thicker, fluffier coat.

She is most readily identified by the tip of her abdomen which is very strongly incurved. When under attack by the smaller workers whose nest she is trying to usurp, the cuckoo counter attacks by seizing one and rolling it under her abdomen, trapping the bee between her legs and the tip of her tail which has a powerful sting at the end of it ^[1a].



Male on Scabious



Male showing red-tipped tail



Female

An incurved abdomen is, to a lesser extent, a feature of all British cuckoo bumblebee females but is most strongly pronounced in the Forest female.

The Forest Cuckoo was known as the Four-coloured Cuckoo Bee for a long time, named after the four colours that appear in a sequence of yellow, black, white, and red on the coat of a typical male.

The one feature Forest Cuckoo males nearly always share is a whiskery tuft of reddish hairs at the very tip of the tail that looks like it's been lightly dipped in paprika. When spotting a slim, slightly scruffy, dark winged male, check the tail first as this is often a useful diagnostic character.

As a caste, males are amongst the most variable of bumblebees. Some are nearly melanic, while others have a bright yellow tail. In Cumbria, males with white tails are often seen foraging alongside males with yellow tails, especially when they gather on their favourite thistles. In other variations, there is scarcely a whisper of red hairs at the tip of the tail, and they can also be entirely absent, where the tail is fully black (in the latter case, identification can only be determined by examination of genitalia).

Life cycle

All cuckoo females emerge later from diapause than true bumblebee queens, allowing foundress queens time to establish a nest and raise their first batch of workers. If the cuckoo is successful in finding and then usurping a host nest, these workers will be deployed to rear the cuckoo's young.

The Forest Cuckoo's preferred host is the smallest of the true bumblebees, the Early Bumblebee (*Bombus pratorum*) but she is also known to parasitise the nests of the Heath Bumblebee (*Bombus jonellus*) and possibly those of the Bilberry Bumblebee (*Bombus monticola*) as well ^[2]. These closely related host species belong to the Pyrobombus group of bumblebees who originate from open environments such as mountain meadow, grassland, and forest ^[3].

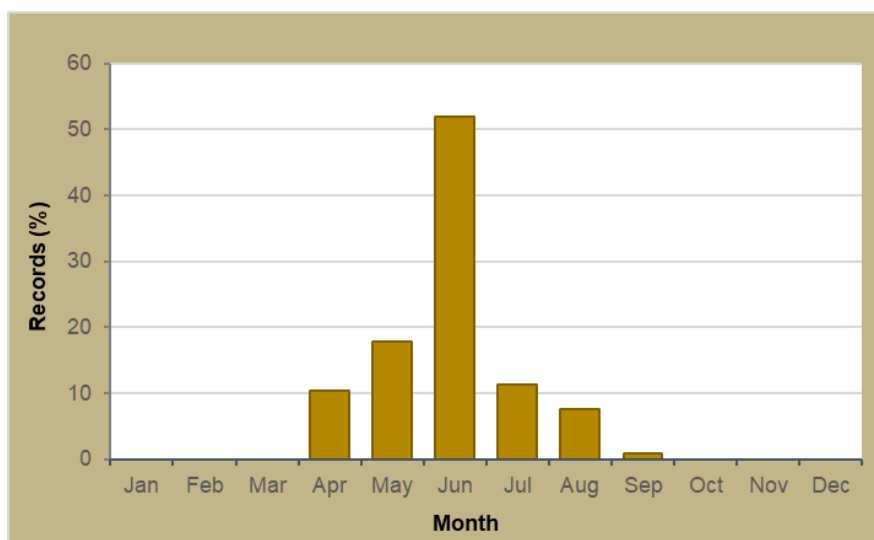
Cuckoo bumblebees search their host's known habitats and locate them by the odour trails they leave as they enter and exit the nest. Each bumblebee species has a distinctive scent which emanates from strong chemical hydrocarbon compounds on their feet. These are transferred among the queen and workers inside the nest creating a strong colony odour ^[4]. As the inside of a nest is dark, individual bees recognize each other through smell and this allows them to identify intruders, but these species-specific odours also help cuckoos find the nests of their dedicated host. The American entomologist Otto Emil Plath (father of Sylvia Plath) discovered that a cuckoo had found its way into the nest of a true bumblebee colony he had placed by the third story window of his lab at Harvard University ^[1b]. It is also likely that the cuckoo finds her hosts out foraging, and simply follows them back to their nest.

Once the host nest is identified, the cuckoo must try and infiltrate it, but how each cuckoo species goes about this is far more nuanced than the ruthless 'kill or subdue to dominate' approach adamantly promoted by Frederick Sladen ^[5] and repeated in many accounts thereafter.

Landmark studies on cuckoo behaviour inside the nest conducted by the Czech entomologist Eduard Hoffer throughout the 1880's singled out the Forest Cuckoo and the Field Cuckoo (*Bombus campestris*) as the most conflict shy of the cuckoo bumblebee clan and observed both cuckoo species living relatively harmoniously inside the nest alongside their host, with both host and cuckoo producing new males and females ^[6].

Prompted by further similar observations, other entomologists confirmed this unusual cooperative (or at least tolerant) dynamic, with two major studies conducted in 1975 and 2013, using a combined total of 17 Early Bumblebee nests parasitised by the Forest Cuckoo ^[7].

In each of the 17 nests, the Forest cuckoo females used evasion as a strategy and avoided any contact with the hosts by hiding under the nest comb. As the Forest cuckoo produces negligible amounts of scented hydrocarbons on her feet, she remains virtually undetectable. Females were swiftly accepted by the Early bumblebees, rarely incited aggressive behaviour from the queen and workers and never tried to sting their hosts. Each of the foundress queens was allowed to tend the larvae from eggs she had laid prior to the arrival of the cuckoo, and host queens and female cuckoos both spent an equal amount of time incubating cocoons and building egg cups with the workers. During the later stages of some nests, the queen and the cuckoo were forced to defend themselves when they were both attacked by frisky workers wanting to lay their own eggs [8]. In each of the studied nests both host and cuckoo succeeded in producing males and females of their own.



Since the Early Bumblebee has a short colony cycle, Forest Cuckoo males are among the first to appear in June, and as they outnumber the females, are seen and thus more often recorded. While the Early Bumblebee is double brooded in the south, our records show that less than 20% of the Early Bumblebees go on to found second nests, with records for both species dropping sharply by July and rising by a small amount in August when new reproductives are out and about. Records are virtually non-existent by September.

Habitat and Distribution:

Habitat

When Frederick Sladen assigned common names to the British *Bombus* (true bumblebees) in his book *The Humble-Bee* in 1912, he did not include the cuckoo species which fell under the genus *Psithyrus*. Edward Step was the first to give them common names in 1932, and he named *Psithyrus sylvestris* the Four-coloured Cuckoo bee [9]. As this description applies to most - but not all - forms of the male, the name was changed in 2003 by Murdo Macdonald to the Forest Cuckoo, a direct translation of the original Latin "sylvan" - of the woods - assigned by the French entomologist, Lepeletier in 1832 [9].

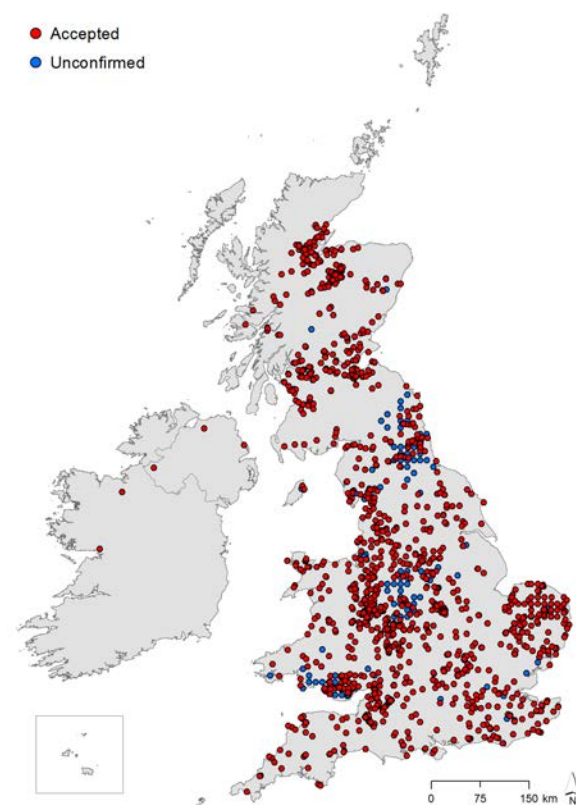
Since no cuckoo has a fixed habitat of its own, this narrow appellation is somewhat misleading as the errant cuckoo will track her hosts wherever they go. Her main host, the ubiquitous Early Bumblebee, (whose Latin name *Bombus pratorum* comes from the Latin *partum*, 'of the meadow') [10] occurs in many habitats including - but not exclusively - woodland. It is abundant in gardens but also frequents coasts, meadows, pastures, verges, banks, and rough ground. We have Cumbrian records of the Forest Cuckoo from all these habitats. To parasitize the Heath Bumblebee, she will turn up on heathland and if she also, as is suspected, usurps the nests of the Bilberry Bumblebee (*Bombus monticola*) she will be found on Bilberry rich moorland where that species tends to establish nests.

That being said, Steven Falk tells us that the Forest Cuckoo occurs more frequently in wooded habitats than any other cuckoo bumblebee and describes the strong mousy smell detectable in the males as they patrol sunny woodland edges depositing their unique scent mark on fences or vegetation along their flight paths to attract females. They have also been observed 'hill topping' on Scottish mountains, appearing in good numbers with females wishing to mate flying up there to join them [11].

When not doing their circuits looking for females, the males can often be spotted fastened onto various species of thistle or knapweed sipping nectar and sheltering underneath the flowers at night. The females, meanwhile, nectar on a variety of shallow flowers at lower densities.

Distribution

The Forest Cuckoo bumblebee is widespread across Britain and Ireland but seems reluctant to follow the Early Bumblebee across chilly northern waters to the Scottish isles. Although Alford's 1980 Bumblebee Atlas showed no more than a smattering of records on the east coast of Ireland, it is widely distributed across the whole of Ireland today.



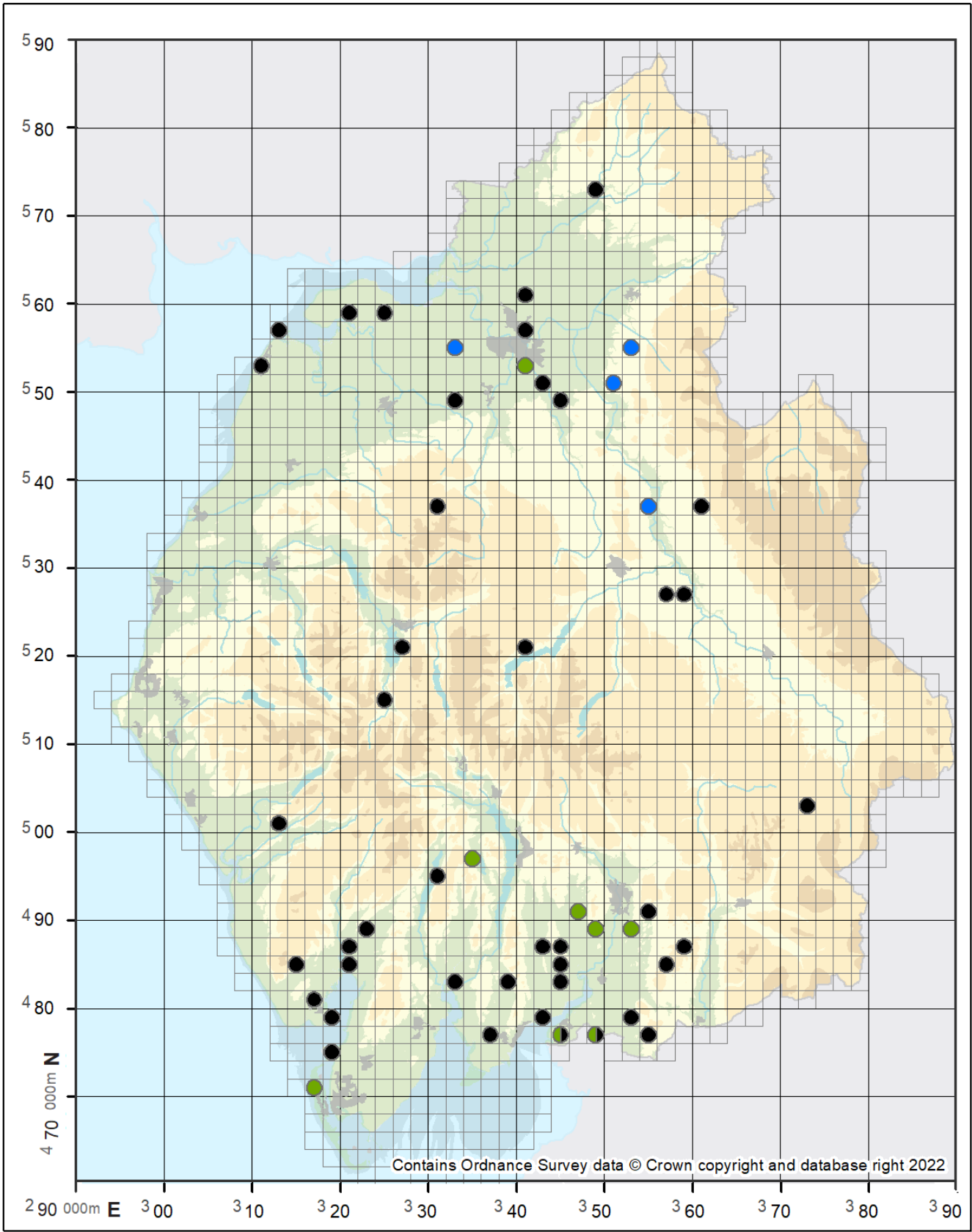
NBN and CBDC records

Status in Cumbria:

In his overview of the abundance and distribution of Cumbrian bumblebees from 1890 onwards, George Routledge's 1933 Transactions sums up the Forest Cuckoo as 'scarce' despite Early Bumblebees being 'very common', and scarcer by comparison to other 'common' cuckoo species [12].

None were recorded from the northwest of the county until F.H. Day located one in 1923 from Orton, near Carlisle, but thirty years would pass before his second record, from Blackwell, the village just south of Carlisle where he lived. The Forest Cuckoo does seem to have been sparsely distributed on the far east side of the county, east of what is now the M6 motorway. George Routledge provided the first record in 1900 from his Tarn Lodge Estate, near Brampton, with two more sightings in 1904 and 1918 from nearby Hayton and Cumwhitton Mosses. An accepted entry from an unknown recorder was filed in 1904 from the village of Great Salkeld in the Eden Valley.

Following F.H. Day's last entry of this bee in 1953, it wasn't recorded again until 1963 in the far east of Cumbria, at nearly 600 metres on a heather moor on the Moor House Nature Reserve and also down below in the enclosed fields. J.M. Nelson was recording for the Nature Conservancy Council in Edinburgh and recorded the Forest Cuckoo in the same year and location as the Heath Bumblebee (*Bombus jonellus*) which suggests the Forest Cuckoo might have been usurping the nests of the Heath Bumblebee.



Forest Cuckoo Bee <i>Bombus sylvestris</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 88
			Recorded (First: 1900 Most Recent: 2022)
			8
			0

After a 15-year hiatus, the 1970's delivered a clutch of records solely concentrated around the Lyth Valley and Hawkshead, but these five figure grid references covered mixed habitats.

Recording resumed in earnest in the 1990's with entries from Michael Archer at North Walney in 1993, Neil Robinson from his garden near Kendal in 1996, and several records from Heathwaite and Gaitbarrow in and around the woodlands at Arnside in the late 1990s.

The Forest Cuckoo may simply have been overlooked and thus unrecorded during much of the 20th century, but the records we do have suggest possible spread into central and coastal Cumbria from the east and the south.

After 2000, entries for the Early Bumblebee increased seven-fold and although cuckoos are proportionately far less numerous than their hosts, especially as there are no workers, Forest Cuckoo records correlate with the increase in Early Bumblebee numbers. We have jumped from 24 records pre-2000 to 88 records and counting post-2000.

Allowing for recorder bias, entries have come in from garden and parks, heathland, scrub and hedgerow, various mosses, coastal sites, broadleaved deciduous woodland, mixed deciduous and coniferous woodland, verges, moors and fellsides.

As an interesting aside, mention should be made of some of the notable recorders of the Forest Cuckoo in Cumbria which include some of the top entomologists outside the county and abroad. In addition to Michael Archer, we have had entries from Leopoldo Castro, Carl Clee, Guy T Knight, Mike Edwards, Steven Falk and George Else.

Future Outlook:

Populations of the versatile Early Bumblebee are stable at present and given the frequency with which the Forest Cuckoo is now recorded, there does not seem to be any immediate cause for concern. But with unpredictable weather patterns on the increase, efforts must continue to be made to improve habitats with nesting sites and forage opportunities along with a reduction in pesticide use. As the Forest Cuckoo is almost entirely dependent on the Early Bumblebee for its existence, attention needs to be paid to the needs and preferences of this valuable host and every other species of true bumblebee which support bumblebee species in addition to its own.

References:

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- 1b- Plath, O.E., 1934. *Bumblebees and their Ways*, Macmillan, New York. p38.
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- 7- Küpper G., Schwammberger K.H., 1995. Social parasitism in bumble bees (Hymenoptera, Apidae): observations of *Psithyrus sylvestris* in *Bombus pratorum* nests, *Apidologie* 26, 245–254. and Lhomme, P., Sramkova, A., Kreuter, K., Lecocq, T., Rasmont, P., & Ayasse, M., 2013. A method for year-round rearing of cuckoo bumblebees (Hymenoptera: Apoidea: *Bombus* subgenus *Psithyrus*), *Annales de la Société entomologique de France (N.S.): International Journal of Entomology*, 49:1, 117-125.
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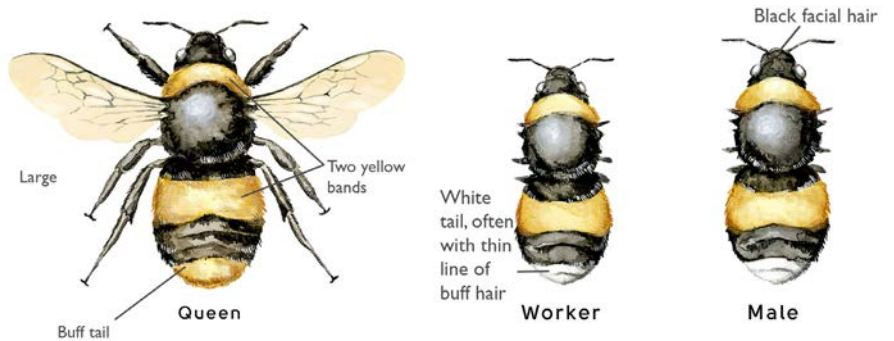
Main photo:

Female, on 'Erysimum Bowles's Mauve' - Vivian Russell

Side photos:

- 1- Male on Scabious - Vivian Russell
- 2- Male showing red-tipped tail - Vivian Russell
- 3- Female - Vivian Russell





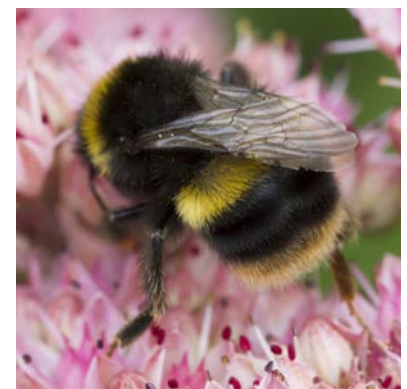
Description and Life Cycle:

Description

Buff- tailed Bumblebees - *Bombus (Bombus) Terrestris* (Linnaeus 1758) ^[1] are a familiar face in the great Cumbrian outdoors as one of the most common bumblebees and named as one of the 'Big 7' native bumblebee species of Britain. There are currently seven named subspecies across Europe that are widely distributed and vary in colour forms (see Rasmont et al. 2008 for description of specific subspecies colour forms) ^[2]. Subspecies (spp.) *audax* (Harris, 1776, Apis) is the nominate UK subspecies described in this account and is the endemic subspecies within the UK. It is important to note that the non- native spp. *dalmatinus* was imported to the UK in 1989 for commercial pollination in greenhouses and polytunnels and its use was only restricted in 2013. Therefore, spp. *dalmatinus* queens may have able to interbreed with spp. *audax* in this time ^[3] which would mean an input of "foreign DNA" into an endemic gene pool, with unknown consequences. Buff-tailed Bumblebees are well known for the large, zeppelin like queens emerging and foraging in earnest during early spring.



Approaching flower



Male

Buff- tailed Bumblebees are typically 10- 25mm in length (depending on caste) with a single, dark yellow band across the pronotum (thorax) and a single yellow band on the upper section of the abdomen. Queens are the most distinctive caste, being the largest in that size range and usually having buff or brownish-white coloured tails. Queen colouration can vary as some Queens tend to be very dark, resulting in a reduced yellow band on the thorax - or this band can become entirely indiscernible.

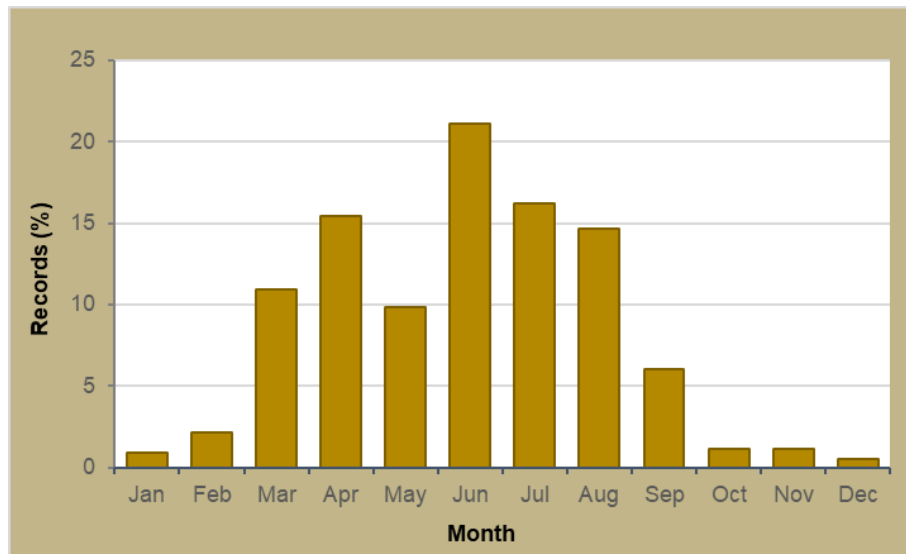
Workers are slightly smaller and often confused with the white- tailed bumblebee complex (*Bombus lucorum* agg.), the only truly reliable distinguishing feature – in fresh individuals - being a very narrow, yellow- buff band between the uppermost part of the white "tail" and the black hairs of the abdomen above the top of the tail, which is almost always noticeably whiter than in the Queens. Males are slightly larger than workers and have an off-white tail; they appear fluffier, with a black face, longer antenna and rounded abdominal tip.

Buff- tailed Bumblebees are a short-tongued species, favouring flowers with a shorter opening length for pollen collection. Despite this, they hold a shared trait with several other bumblebee species and are known to bite holes in the base of plants with longer corolla's in order to loot the nectar reserves without pollinating, earning them a title of 'nectar robbers' amongst bumblebee enthusiasts.

Life cycle

Synonymous of springtime, Buff- tailed Bumblebee queens are often the first bees to emerge from hibernation, signifying the beginning of the new season. Queens can emerge as early as February through to the beginning of April as temperatures rise and will immediately begin foraging for nectar to restore energy after hibernation.

Queens are often noted flying low to the ground in order to identify (which is at least partly located by scent) suitable ground- nesting sites in which to establish a colony. Examples of sites often used by Buff- tailed Bumblebees - as with most UK bumblebee species - are usually at or below ground level and include old small- mammal nests or beneath cover - including man- made structures such as garden sheds. Their nesting behaviour is typical of the *Bombus* sub- genus to which they belong, and the species are 'pollen storers' - meaning the foragers use pollen storage pots built from wax to deposit pollen.



Workers emerge in late spring - early summer once the queen has established a nest and laid her first brood. Buff- tailed Bumblebees establish large underground colonies of 200 to several hundred workers (more than 500 is not unusual). Males emerge in mid to late summer (June onwards) and search for new queens to mate with - before dying off soon after. New queens also emerge in late summer and leave the colony between June - October in order to mate before hibernation, ready to emerge the following spring to begin the life cycle again.

Buff- tailed Bumblebees are partially bivoltine (sometimes producing two broods per season), though in a further development, may produce winter- active nests (these have been observed in southern regions of the UK since the 1990's and the phenomenon is spreading). It is believed new queens of the summer season establish nests around October and continue foraging on winter flowering plants such as *Mahonia* through to January. The emergence of new queens and males from winter - active nests converges with typical univoltine nests, emerging from February onwards to begin the next cycle ^[4] - if these nests survive any prolonged cold spells.

Habitat and Distribution:

Habitat

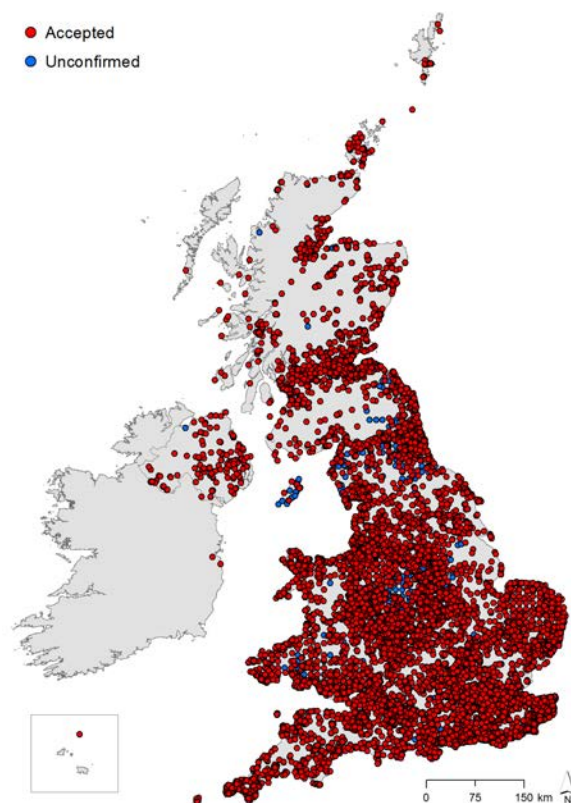
The wide recognition of the Buff-tailed Bumblebee can - in part - be accredited to versatility in use of habitats, including an affinity for gardens, parks and green spaces. They are a predominantly lowland species, appearing in both rural and urban locations.

Buff-tailed Bumblebees are a polylectic species, often thought to have the widest range of forage resources of any of the bumblebees, especially when considering their cunning ability to utilise long flowering plants (despite their short tongues) and their larger size - allowing increased tolerance to colder temperatures compared to other pollinating species [5].

Distribution

The Buff-tailed Bumblebee is one of the most widely distributed Bumblebees across the UK, ranging from the most southern regions of Cornwall right the way to the Orkney Islands. Sightings are notably higher in England compared to Scotland and are particularly high in large southern cities such as London, Birmingham and Bristol.

In recent years, the range of Buff-tailed Bumblebee has been increasing, with greater reports of sightings in Northern England and Scotland as well as an increase in aforementioned nesting behaviours being witnessed further north / more frequently.



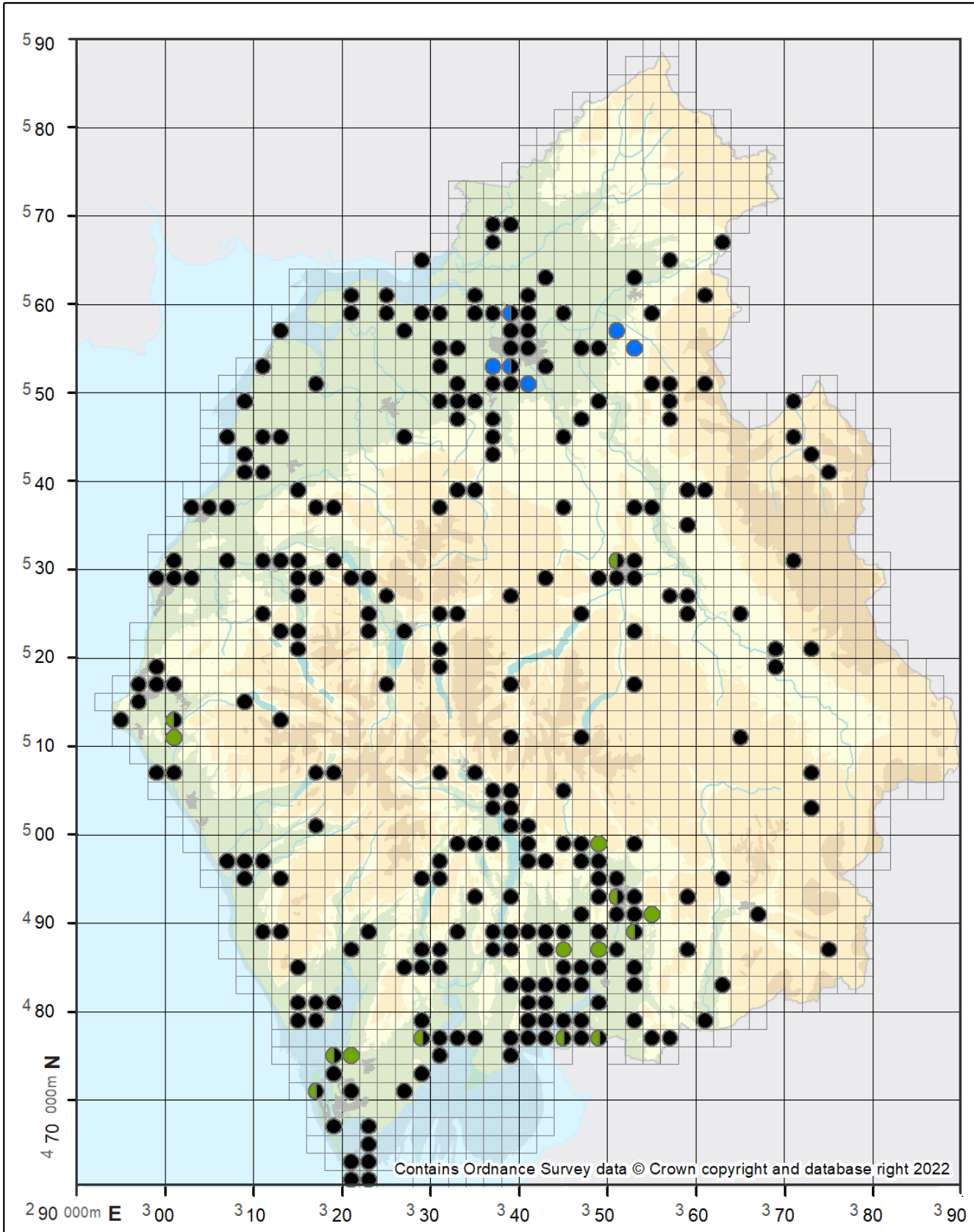
NBN and CBDC records

Status in Cumbria:

Despite being a common British species, Buff-tailed Bumblebee sightings become less common in the far north of England with most of the recent cumbrian records appearing from along the southern border of Cumbria.

Buff-tailed Bumblebees were first recorded in Cumbria in 1900 with the first sightings surrounding the city of Carlisle, north Cumbria - most likely due to their affiliation with urban locations - making lowland cities ideal foraging ranges. Early records are situated in areas of 0 - 100m of elevation and in areas which contained both lowland meadows and a high density of urban settlements with greenspace.

Between 1950 and 1999, the Buff-tailed Bumblebees became more widely distributed across Cumbria with more sightings recorded along the west coastline and Morecambe Bay.



Buff-tailed Bumblebee <i>Bombus terrestris</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 923 36 16 0
	Recorded (First: 1900 Most Recent: 2022)		

A mosaic of improved grassland, unimproved grassland and suburban areas cover the coastline - alongside Coastal and Floodplain Grazing Marsh, A UK BAP Priority Habitat that is found in lowland areas around water bodies such as rivers or coastlines. Neutral grassland is usually in the form of permanent pasture with a low diversity of forage plants. Habitats such as this often involve intense management and this - combined with a low diversity of forage plants - does not produce ideal habitats for any flower visiting insects. However, Buff- tail Bumblebees are often noted using intensively managed grasslands as secondary or 'tolerated' habitats - in combination with their aforementioned affinity to urban landscapes. This diverse mix of resource utilisation makes it easy to see why the Buff-tailed Bumblebee was able to expand and thrive in the latter half of the 20th century.

The ability of Buff- tailed Bumblebees to utilise a wide range of habitats outside of rural and agricultural areas means that this species has avoided some of the impacts from the loss of certain, key habitats usually required by bumblebees. The UK has lost 97% of its wildflower meadows since the second- world war causing a dramatic reduction in the resources available for many pollinator species ^[6]. However, the 21st century saw records of Buff-tailed Bumblebees increase by over 1100% and its distribution spreading to most lowland areas between 0- 200m elevation, with a few sightings from 200 – 500m (though these are mainly clustered around urban areas such as Keswick).

Despite the large areas of Cumbria that are at an increased elevation - compared to much of the rest of England - this predominantly lowland species has still been able to thrive and propagate, becoming an easily recognised species all year round. Winter- active nests are more frequent in northern regions such as Cumbria, with sightings in Cumbria being recorded as late as December in recent years.

Future Outlook:

The Buff- tailed Bumblebee demonstrates itself as an adaptable, versatile and hardy bee, increasing its distribution and population levels across the UK and frequenting the gardens, parks and green spaces of Cumbria – which will hopefully continue in the future.

In recent years, the restoration of species- rich grassland and flower- rich habitats has been promoted in order to increase pollinator resources. Increase of such diverse habitats is encouraged in rural areas, through funding schemes made available to farms who use wildlife friendly practices and encourage wildflower growth, as well as in urban areas (e.g. through encouragement of everyday gardens to increase the diversity of flower species in their gardens and lawns). Restoration of such habitats should benefit all bumblebee species present in the UK including the Buff- tailed Bumblebee, with a continuing legacy as an everyday sight in Britain's gardens and countryside.

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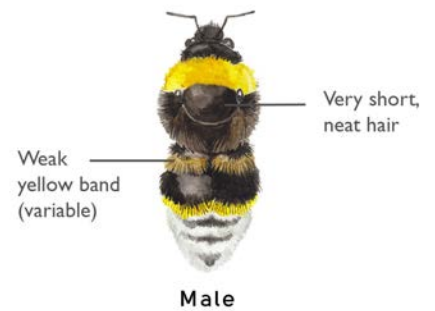
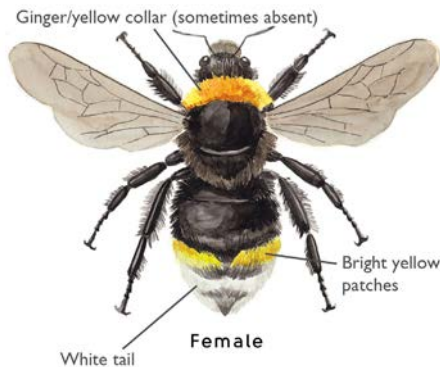
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Main photo:

Queen - Vivian Russell

Side photos:

- 1- Approaching flower - Vivian Russell
- 2- Male - Vivian Russell



Description and Life Cycle:

Description

The Vestal Cuckoo Bee *Bombus vestalis* can look very similar in appearance to the Gypsy Cuckoo Bee *Bombus bohemicus* (page 40). When fresh, it is (usually) relatively easy to identify as both sexes have a more prominent, deep yellow flash at the base on the white tail. This colouration can fade quickly though and care is then needed to separate worn individuals from *Bombus bohemicus*. *Bombus vestalis* females can be very large and have black hair on their heads. They possess a broad, dark yellow collar with variable amounts of black hairs mixed in. Compared with *bohemicus*, *vestalis* females are usually larger, have a darker yellow collar at the front of the thorax and the yellow flash on the tail is also darker, more distinct and more extensive. Female *vestalis* have a much neater pile of hairs generally, giving an almost “crew-cut” appearance in contrast to *bohemicus*.



Queen on sedum

Male Vestal Cuckoo Bees have a similar pattern of colouration to females, but are smaller, slimmer and possess longer antennae. They usually have some (additional) yellow hairs on the back of the head, the rear of the thorax and variable amounts of yellow on the first segment of the abdomen. Compared with the Gypsy Cuckoo Bee, Vestal Cuckoo Bee males usually have more intense yellow flashes on the tail, but this is not a reliable feature for identification (especially in older / faded specimens). Relative length of antennal segments is a more reliable feature but requires either specimen identification or skilful photography to capture the salient features. In *vestalis*, antennal segment 3 is shorter than 5, whereas in *bohemicus*, segment 3 and 5 are of similar lengths.

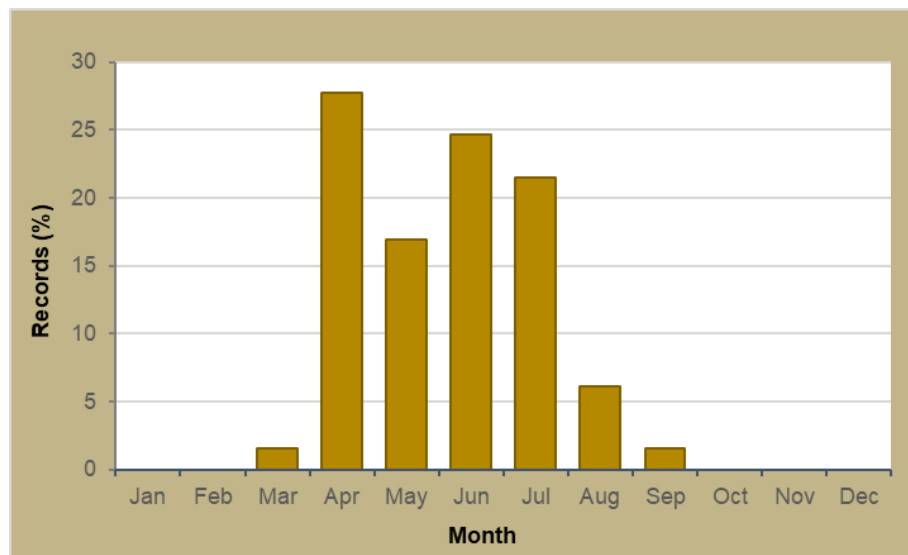


Female on dandelion

Life cycle

The sneaky, female Vestal Cuckoo Bee takes over a nest of the familiar Buff-tailed Bumblebee (page 6) before laying her own eggs. Females emerge from hibernation from March (usually April in the north), and search out the nests of their host, attempting to kill the queen or drive her out of the nest once inside. Nests with fewer workers seem to be particularly targeted - as larger nests with more workers often succeed in stinging the cuckoo bee to death [1].

The female cuckoo then takes over the nest, with the host's workers continuing to collect pollen and nectar to provision the colony. New females and males then emerge from May (June/July in the north). The timings of the production of different castes links in closely with the life cycle of its host, the Buff-tailed Bumblebee. The high degree of specificity between the Vestal Cuckoo Bee and Buff-tailed Bumblebee is highlighted in the fact that where there are lower densities of the host, there are lower densities of the cuckoo bee [2].



Females feed on a variety of flowers and considering they have short tongues, still seem keen to nectar at flowers that have relatively long corollas - such as Ground-ivy and Bugle - early in the year. As the season progresses, males can be abundant on species such as brambles, thistles and knapweeds.

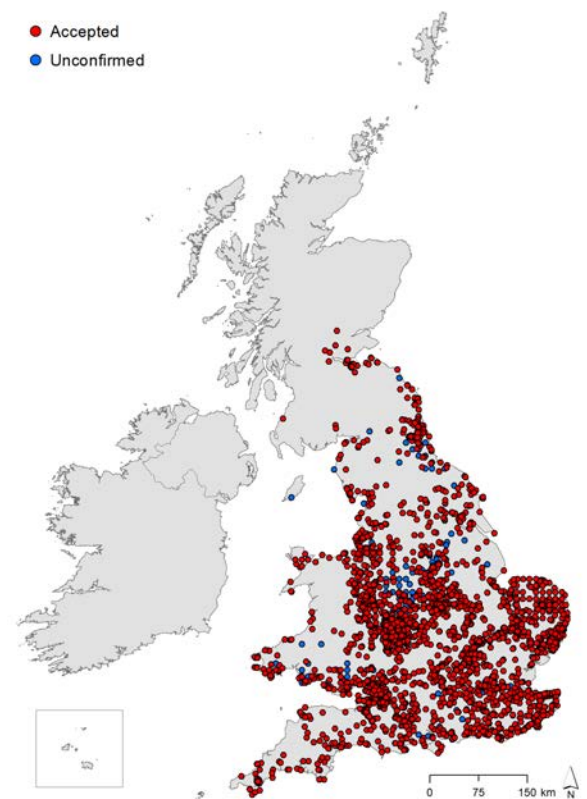
Habitat and Distribution:

Habitat

The habitat of this species aligns with its only known host, the Buff-tailed Bumblebee and it is therefore found in a very wide range of habitats, including both wooded and open habitats and in urban and rural areas. As the species can be difficult to separate from other bumblebee species - especially Gypsy Cuckoo Bee - the species is likely to be under-recorded.

Distribution

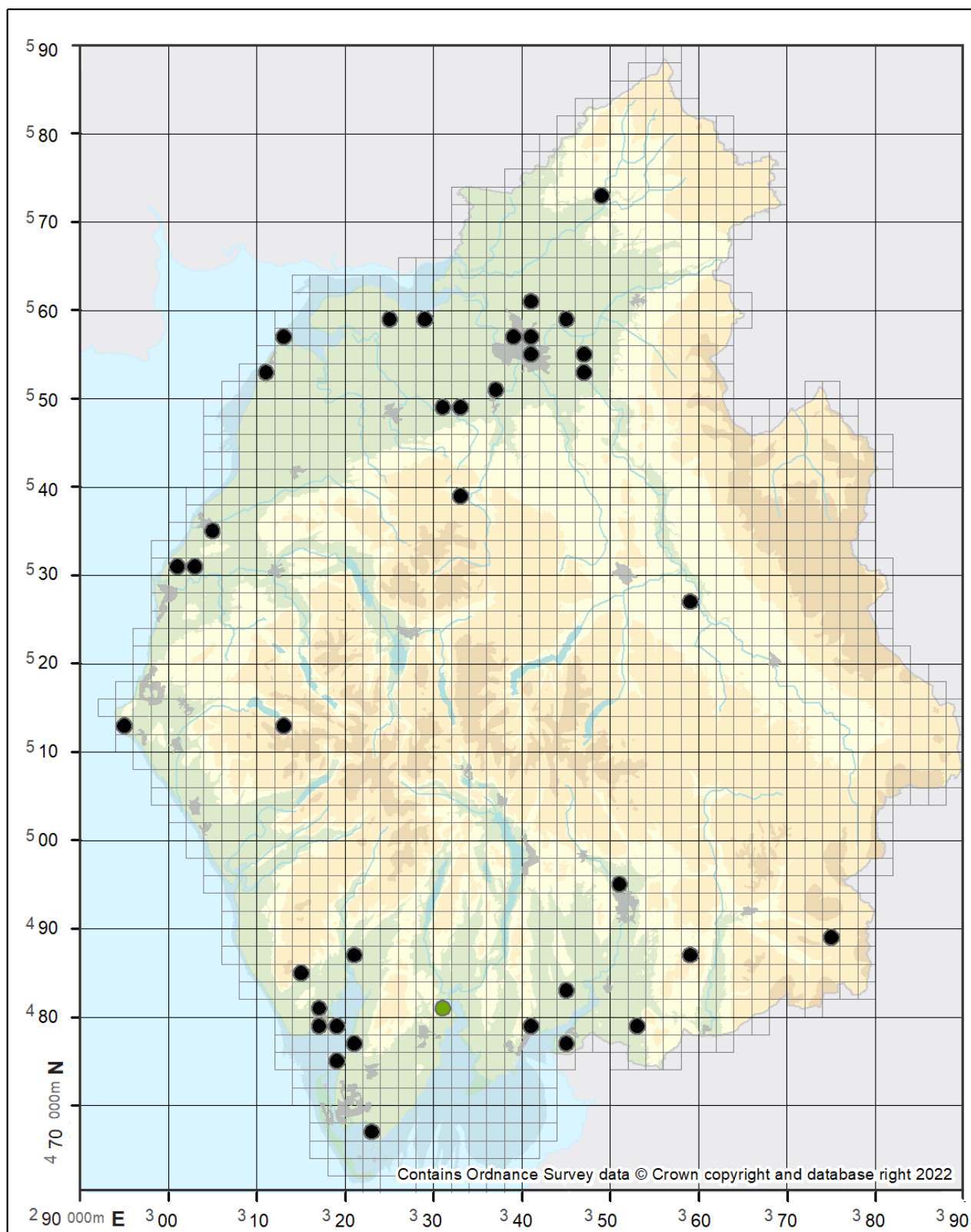
This species is now widespread in Britain but is more frequent in the south where it is often the most common species of cuckoo bumblebee. This species has a strong, historic southern-bias to its distribution and until recently, Cumbria and Northumberland formed the northern extent of its range. The species was recorded from Scotland for the first time in 2009 and in 2014 was re-found in Ireland after an absence of records for over 80 years [3].



NBN and CBDC records

Status and distribution in Cumbria:

This species is widely distributed in Cumbria but doesn't appear to have been recorded within the higher areas of the Lake District.



Vestal Cuckoo Bee <i>Bombus vestalis</i>	Elevation (m) < 0 0 - 100 100 - 200 200 - 500 > 500	Time Periods ● Post 2000 ● 1950 - 1999 ● 1900 - 1949 ● Pre 1900	No. Records 63 2 0 0
	Recorded (First: 1997 Most Recent: 2022)		

In more lowland areas this species overlaps in distribution with the Gypsy Cuckoo Bee but appears to be much less common in Cumbria, with considerably fewer records overall. This aligns with Robinson's 2005 article ^[4] which states that this species is common in the south of the county and uncommon in the north of the county.

The first record of this species in Cumbria was from 1997, a female taken at Plumpton ^[4]. The species is most likely to have colonised South Cumbria and expanded northwards from there.

Future Outlook:

The future outlook for this species seems promising as its host is common, widespread and faring well. The spread of this species northwards may indicate that it is taking advantage of a warming climate.

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Main photo:

Queen on agastache sp. - Vivian Russell

Side photos:

- 1- Queen on sedum sp. - Vivian Russell
- 2- Female on dandelion - Vivian Russell



This Bee Atlas has been produced by the Cumbria Biodiversity Data Centre and the 'Get Cumbria Buzzing' project, a Cumbria Local Nature Partnership project. Get Cumbria Buzzing was funded by the National Heritage Lottery Fund and National Highways.



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