

Butterflies of the Ridgeway

By

Dr A.J.P. Spragg

Contents

Acknowledgements	4
Purpose of the report	4
Brief notes on key concepts.....	5
Butterflies	5
Records	5
The Ridgeway.....	6
A brief glossary	6
The basis of this report	8
Key questions answered	8
How the information is presented	9
The “heat map”	9
The “scatterplot”	10
What butterflies can be seen on the Ridgeway?	11
Record counts	11
Record coverage	12
Occupancy	12
“Green flag”  and “red flag”  species	14
Peak “on the wing” time	15
Species diversity peak time.....	16
Record count hot spots.....	17
Species diversity hot spots.....	18
Ridgeway butterfly calendar	19
The hibernators awaken	20
Brimstone	20
Small Tortoiseshell.....	21
Peacock.....	21
Comma	22
Harbingers of spring	23
Orange-tip.....	23
Small White.....	24
Green-veined White	24
Holly Blue.....	25
The April avant garde.....	26
Large White	26
Red Admiral	26

Speckled Wood 	27
Grizzled Skipper	28
Green Hairstreak	28
Dingy Skipper	29
Small Copper	29
Duke of Burgundy	30
Small Blue	30
Brown Argus	31
Small Heath	31
May mayhem	32
Common Blue	32
Painted Lady	33
Adonis Blue	33
Large Skipper	34
Meadow Brown	34
Dark Green Fritillary 	35
Small Skipper	36
Ringlet	36
June onwards	37
Marbled White	37
Silver-washed Fritillary 	38
Gatekeeper	39
Chalk Hill Blue 	39
Silver-spotted Skipper	40
Clouded Yellow	40
Ridgeway butterfly “jewels in the crown”	41
Wall	41
White Admiral	42
Purple Emperor	42
Purple Hairstreak	43
White-letter Hairstreak	43
Marsh Fritillary	44

Acknowledgements

Grateful thanks to:

- Sarah Wright, Ridgeway National Trail Project Officer
- Dr Jim Asher, Butterfly Conservation County Butterfly Recorder for Upper Thames Branch (Berkshire, Buckinghamshire and Oxfordshire).
- Michael Fuller, Butterfly Conservation County Butterfly Recorder for Wiltshire Branch.
- Grahame Hawker, Chairman of Butterfly Conservation and Recording Team for Upper Thames Branch (Berkshire, Buckinghamshire and Oxfordshire).

Sarah catalysed the writing of this report by her offhand remark “It’s not all about the Small Blue!”. Jim pulled together nearly 200,000 records into a complete inaugural Ridgeway data set, on which this report is completely based, after Michael had supplied him with an update of Wiltshire branch records. Jim, Grahame and Michael all read the first draft of this report and helped to improve it for the final version. Any residual errors or inaccuracies are entirely the responsibility of the author.

Purpose of the report

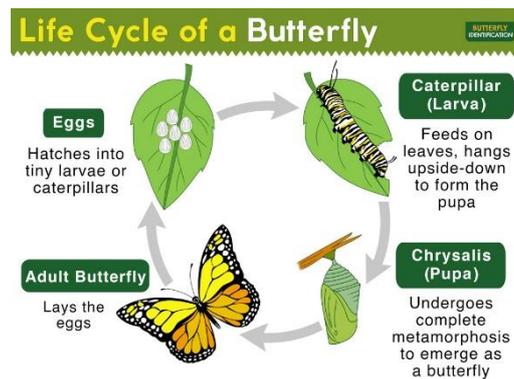
This report has been prepared for use by the Ridgeway National Trail Project. The purpose of the report is to discuss the butterflies that can be seen along the Ridgeway, and when and where best to see them, for the benefit of Ridgeway walkers who would not previously have been looking out for butterflies, and who (it is hoped) will be inspired to do so, and ideally to record their sightings. The report was developed in late 2022 to inform the Ridgeway 50th anniversary celebrations, following the author’s visit to a Ridgeway conservation day to learn more about how the Small Blue had reappeared at Bury Down after trials of different habitat management strategies.

The report assumes no prior knowledge of either butterflies or recording.

Brief notes on key concepts

Butterflies

Technically, what is commonly referred to as a “butterfly” should really be called an “adult butterfly” or “imago butterfly”, because it is only the final stage of a four-stage lifecycle (illustrated¹ below) which starts with an egg, which hatches into a caterpillar (larva), which turns into a chrysalis (pupa), from which an adult butterfly emerges.



This report is focussed on when and where to see adult butterflies, which require warm weather, but it is important to realise that every species of butterfly is alive all year round, in one form or another and, in particular, has to survive the winter. Some species pass the winter as eggs, some as larvae, some as pupae, and some long-lived species even hibernate as adults! One species, the Speckled Wood, can pass the winter as either larva *or* pupa.

Records

Most people will have heard of records in the sense of recorded information, even if only via the phrase “since records began”. In general terms, a record should be thought of as a “line item”: a (horizontal) list of named items of information, known as “fields”, so that a collection of records forms a table in which each column specifies the name of each field in the first row. Records are most valuable when they are aggregated into a large collection, when they are known as a *database*, or *data set* if the collection is part of a database restricted in some way. A database will have records provided by many people, and relating to many places and times; millions of records would not be unusual for a mature database.

Where wildlife is concerned, a useful record consists of a minimum of four pieces of information: what species was seen, where it was seen (ideally as an Ordnance Survey grid reference), when it was seen (ideally as a date) and who it was seen by. So for example, someone might keep records of the species of butterflies they see in their garden over the course of the year, in which case “who” and “where” do not change. Someone else might be devoted to a specific species wherever and whenever they see it, in which case “who” and “what” do not change. Someone else might visit many different places in the course of a year and record what species they see, in which case only “who” does not change.

The nice thing about these essential four pieces of information is that they are objective, and not a matter of definition. It is of course possible for a recorder to get any or even all of them wrong, except (hopefully) their name ... but in principle, there is no ambiguity about what the true values should be, although a grid reference might specify a square with side measuring anything from 100 kilometres to 10 metres, depending on how many figures are provided, and some recorders might provide only a month and a year, or even just a year, rather than a date.

Another item of information that is nearly always provided in wildlife records is how many individuals were seen in the specified location at the specified time, and here we run squarely up against ambiguity, when we try to define not only what it is we are really interested in (population size), but also what has actually been counted that relates to it. For butterflies, eight fields are devoted to this information, to cover the four lifecycle stages individually and collectively. As well as egg and pupa counts, larva counts can refer either to individuals or (for some species) to larval nests, and adult insect counts can refer to unsexed, male or female individuals, or mating pairs. Ideally these fields

¹ <https://www.butterflyidentification.com/butterfly-facts/life-cycle-of-a-butterfly>

specify a number, but could also be a range, and five standard categorical ranges are available (for example, the letter B, standing for 2-9 individuals). Superficial thought would suggest that this information is surely valuable, but in fact the data can only be used for meaningful analysis if the record is based on careful control of external factors. Clearly, for example, a recorder who spends twice as much time as another recorder, on the same date and in the same place, is likely to record higher numbers of individuals, even though the population size is the same. As another example, a recorder who records location less precisely, in order to represent a larger area, is likely to record higher numbers of individuals. The use of “transects” (see Glossary) is intended to control such differences, in order to provide records that can be used to assess whether, for example, a species population is growing or shrinking at a particular site. Records that are not transect records are known, rather disparagingly, as “casual” records.

For the purposes of this report, analysis has been confined to the record count of adult butterflies i.e. how many records refer to each species, in adult form, in each 1k square in each calendar month, regardless of how many individuals were seen on each occasion. Most of the records in the Ridgeway data set, and the Butterfly Conservation database from which it was extracted, relate to adult butterflies, and it is only adult butterflies that Ridgeway walkers are likely to see. Similarly, the majority of the Ridgeway data set consists of casual records; transect records contribute only about 15% of the total number of records.

The Ridgeway

The Ridgeway is an ancient public right of way running from Avebury in Wiltshire to Ivinghoe in Buckinghamshire. As such, it has length but no well-defined width. For the purposes of this report, the Ridgeway has been defined as the 170 Ordnance Survey 1 km x 1 km squares that cover the Ridgeway from end to end, referred to as the “covering” squares. A 1 km x 1 km square, or 1k square for simplicity, corresponds to a 4-figure Ordnance Survey grid reference, and in recent years has become the minimum resolution unit of area for recording butterflies, with a recommendation to record at higher resolution where appropriate. (Older records were typically collated by “tetrad” which is a 2 km x 2 km square.)

The analysis has defined an additional 321 Ordnance Survey 1k squares, referred to as the “neighbouring” squares, which are adjacent to the covering squares. The neighbouring squares were introduced and included in the analysis for three reasons:

- To increase the robustness of the analysis by using an increased 1k square sample size.
- To compensate for a small number of covering squares that barely include any of the Ridgeway at all.
- To inform butterfly conservation and management purposes, by indicating where species that do not fly far have been recorded adjacent to the Ridgeway.

A brief glossary

- **Butterfly record coverage:** A percentage measure of how thoroughly the Ridgeway is represented in terms of butterfly records. It is calculated, for a specific year or aggregated for a number of consecutive years, as the number of Ridgeway 1k squares in which butterflies of any species have been recorded, as a percentage of the number of Ridgeway 1k squares. It is of interest because there are still many Ridgeway 1k squares with few or no records for any species of butterfly.
- **Species record coverage:** Similar to butterfly record coverage, but for a particular species, species record coverage is calculated as the number of Ridgeway 1k squares in which a species has been recorded, as a percentage of the number of Ridgeway 1k squares. Like butterfly record coverage, species record coverage is of interest because it is far from the case that every Ridgeway 1k square has been adequately surveyed.
- **Occupancy:** Occupancy is a standard measure used by Butterfly Conservation to indicate how widespread a species is. Defined for a particular species as species record coverage divided by butterfly record coverage, it measures how widespread a particular species is when we confine attention to squares where butterflies have been recorded. Some species are common and widespread, and we would expect them to be found in every Ridgeway 1k square, given sufficient effort to find them. For such species, occupancy values much below 100% reflect lack of recording effort rather than lack of species presence. Other species, known as “habitat specialists” (see next bullet), are confined to relatively few sites, with occupancy closer to 0%. Such

species tend to be of more interest to butterfly enthusiasts, and their occupancy values close to 0% really are an accurate reflection of the strictly limited territory in which a species is to be found.

- **Habitat specialist:** A species whose potential occupancy is strictly limited by specific habitat requirements of one or more lifecycle stages: some examples of such requirements are a specific food plant that is limited in distribution, or a mosaic of different types of vegetation, or grass that is neither too long nor too short.
- **Abundance:** An indication of the population size for a species, where it occurs. This is a much harder thing both to define and to measure than occupancy, but the concept is easy enough to understand: in a specific location at a specific time, in what sort of numbers can a species be seen, given conducive weather? As discussed in the Records section, only butterfly records of “transect” provenance (see next bullet) can be used to say anything meaningful about abundance, and even then only in relative rather than absolute terms. This report only makes passing reference to abundance.
- **Transect:** A defined route that is walked at a standard pace several times a year, with attention confined to a surrounding conceptual corridor of defined height and width, in order to record the total number of each species seen. This approach to recording allows changes in species abundance over time to be identified for that specific location.
- **Brood:** In the simplest lifecycle case, a species of butterfly has one generation per year. The adult butterflies hatch out and breed, and the next generation does not appear until the following year, earlier or later depending whether the species overwinters as a pupa, a larva or an egg (or an adult; a few species hibernate as adult butterflies). But many species typically or occasionally have a second or even a third “brood”; in this case, the duration of the lifecycle is greatly compressed for the subsequent generations, which appear later in the same year as the first generation.
- **Sexual dimorphism:** In some species, there is little or no difference between the male and the female, save perhaps in the plumpness of the abdomen which serves to tell the difference for the experienced observer. In many species, however, notably most of the blue species, the male and female are “sexually dimorphic”, meaning characteristically different in appearance, sufficiently so that they would be taken to be different species by an uninformed observer.
- **Sex brand:** The males of some species of butterfly, for example the Meadow Brown, have “sex brands” on the upper surface of their forewings. So-called presumably because they look like the butterfly has been branded with a (very small!) hot iron, these are dark patches or stripes composed of special scales called “androconial” scales. These androconial scales emit pheromones, thus advertising the male’s presence.
- **BeBuOx:** An abbreviation for Berkshire, Buckinghamshire and Oxfordshire. These three counties cover the majority of the Ridgeway, and are the region covered by the Upper Thames Branch of Butterfly Conservation and by the Berks, Bucks and Oxon Wildlife Trust.
- **Wilts:** An abbreviation for Wiltshire, the county that covers the minority of the Ridgeway not covered by BeBuOx.

The basis of this report

All the technical information in this report was developed by analysis of a data set of nearly 200,000 records, itself only a small part of Butterfly Conservation's complete database. All the analysis is based on the twenty year time period from 2001 to 2020. The key features of the data set can be summarised as follows:

- **What:** the 43 UK butterfly species that have been recorded along the Ridgeway.
- **Where:** 491 km² of BeBuOx and Wilts, divided up into 1k squares. 170 of those squares cover the Ridgeway from end to end; the other 321 are their "neighbours" (all the 1k squares adjacent to the covering squares).
- **When:** from 1983 to 2021 for BeBuOx, and from 1993 to 2020 for Wilts.
- **Who:** Between 2,000 and 3,000 individuals who have, directly or indirectly, submitted their records to Butterfly Conservation. It is not readily possible to give a more exact number. 2,748 different recorder names are represented in the dataset. However, in many cases, one recorder's actual name has been represented in several slightly different ways. In other cases, the recorder name may be generic, for example "TVERC records"; in such a case, records have come from another organisation, and many individuals are represented by a single name in the data set.

Key questions answered

Three key questions are answered in this report:

1. What butterfly species can be seen on the Ridgeway?
2. When is the best time to see butterflies, the widest range of species, or a particular species?
3. Where are the best places to see butterflies, the widest range of species, or a particular species?

Some people may just want to see lots of butterflies and not be unduly worried about what species they are. Others may aspire to see as many species as possible. Still others may be keen to see one particular species.

For the benefit of the Ridgeway Project, the report also reports on any evidence for trends over time, because any such evidence can be used to inform longer-term conservation strategy. Here are two examples of important trends:

- Species whose occupancy has been declining or growing over recent years. The Silver-washed Fritillary is a good example of a species whose star has been in the ascendant in recent years; its occupancy of BeBuOx was shown in 2016 to have increased approximately fivefold in the preceding 20 years². The analysis in this report demonstrates that the Silver-washed Fritillary has increased its occupancy of the Ridgeway just as dramatically. The Dark Green Fritillary has also been found to be increasing its Ridgeway occupancy significantly, a trend that was scarcely apparent in 2016 for BeBuOx generally. Conversely, this report also demonstrates that the Speckled Wood and the Chalk Hill Blue appear to be in slow steady decline along the Ridgeway; neither of these species was flagged in 2016 as being in decline in BeBuOx generally.
- Species for which the adult insects appear to have been emerging sooner, or later, over recent years. The presumption is that species are likely, if anything, to emerge sooner in response to climate change. This report has looked for, but not found, any convincing evidence of such trends for specific species. This is not altogether surprising, as any such changes would need to be quite dramatic to be identifiable against a backdrop of emergence dates that can vary considerably from year to year for a given species. The analysis is further complicated by most species having more than one peak flight time. On the other hand, the report *has* found evidence that in recent years the main peak flight time for butterflies collectively seems to have been occurring sooner in the year.

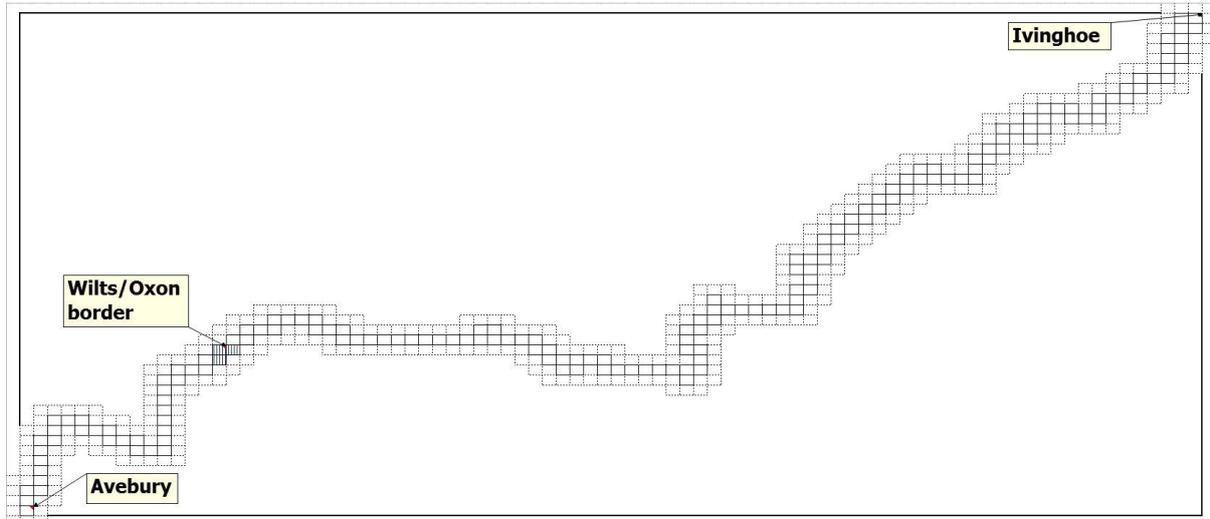
² "Atlas of Butterflies in Berkshire, Buckinghamshire & Oxfordshire" (2016), Jim Asher, Nick Bowles et al.

How the information is presented

Two standard graphics are used to present the information that has been derived from the Ridgeway data set, so it is worth explaining them conceptually before the reader encounters real examples.

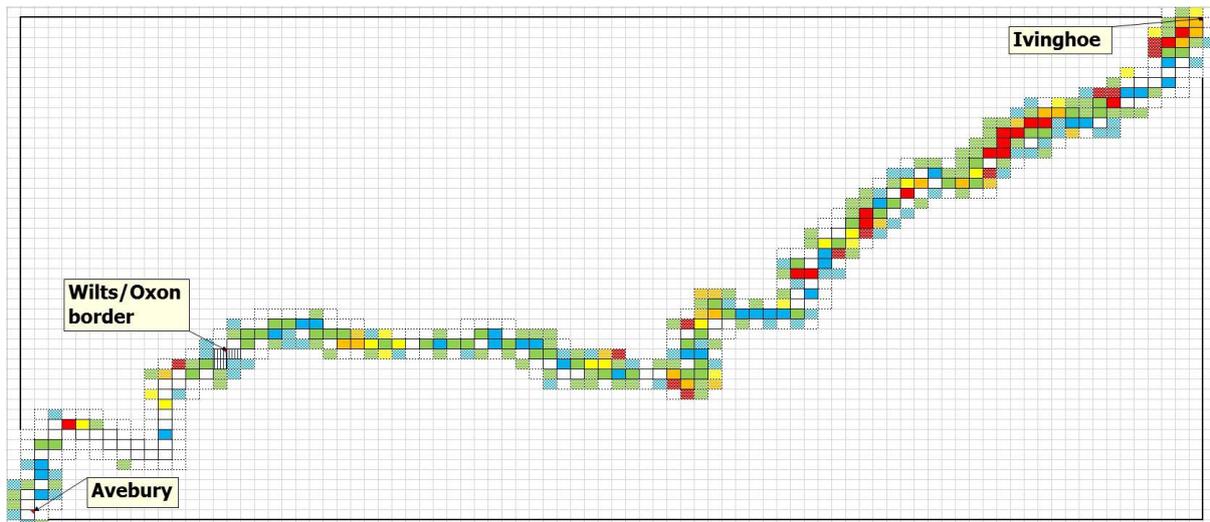
The “heat map”

The first standard graphic is a “heat map”. It represents the Ridgeway visually, as a sequence of connected squares. Here is an empty version of the graphic:

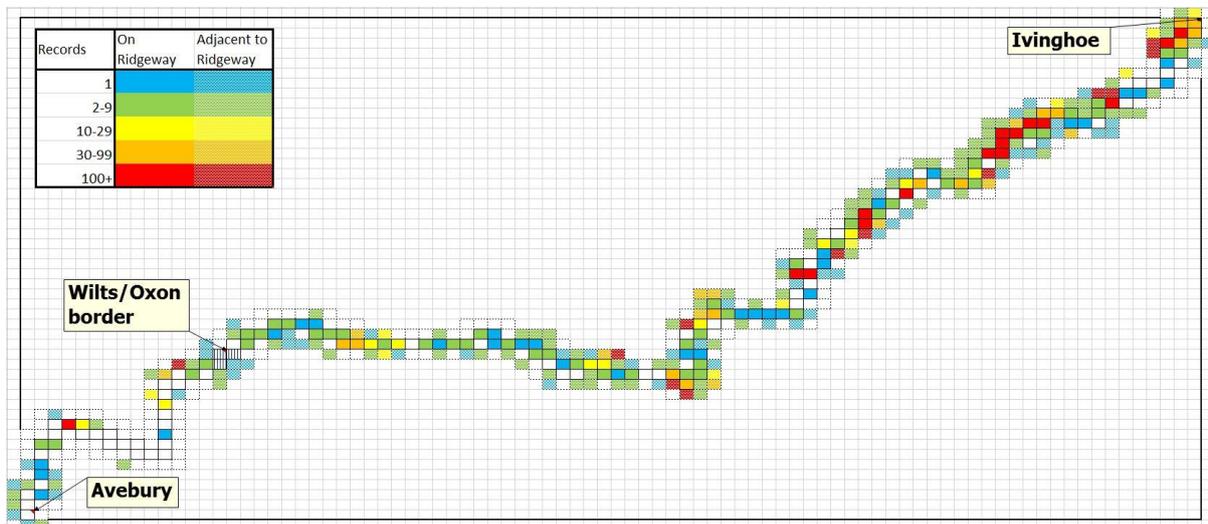


The Ridgeway runs from bottom left (the Avebury end) to top right (the Ivinghoe end), and is wholly contained within the rectangle outlined in bold. Covering squares are outlined in dark grey, and neighbouring squares are outlined in light grey (including a few at either end that are outside the containing rectangle but are adjacent to covering squares at either end).

The data is illustrated by filling each of those squares with one of five colours, or leaving it white if there is nothing to illustrate. The five different colours run from “cold” (blue) to “hot” (red), to illustrate a feature of the data that varies from square to square, ranging from low to high values. Here is an example:



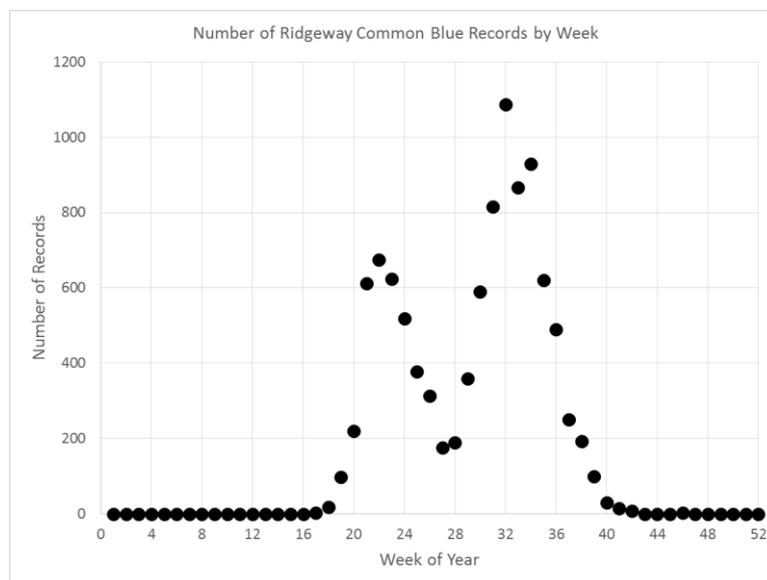
Generally, each colour will need to represent a range of values, so we need to decide what those ranges will be, and communicate it on the heat map. Generally, we are interested in “hotspots” (or sometimes “cold spots”) i.e. places where the data takes an unusually high or low value, so we will usually define the ranges so that only small percentages of data are coloured “hot” or “cold”, with the bulk of the data represented by the three intermediate colours. Here is the previous example, completed with the key that specifies what is being plotted on the heat map, and what each colour represents:



This heat map illustrates the number of records in the data set for the Common Blue (this final detail is omitted from the key, for brevity) for each 1k square.

The “scatterplot”

Here we simply plot pairs of numbers (“data points”) that measure a particular feature of the data set. The first number is measured along the “x-axis”; the second number is the distance along the “y axis”. The second number (the “dependent variable”) is supposed to depend upon the first one (the “independent variable”), and the purpose of the graph is to illustrate the nature of that relationship. Here is an example:



Let’s briefly discuss each of the key component parts of the graph:

- **The x-axis:** The horizontal line with equally-spaced numbers running along the bottom of the graph. Think of this as a ruler that measures x, the independent variable. On this graph, the label tells us that x is a number that counts weeks through the year, so it runs from 1 to 52.
- **The y-axis:** The vertical line with equally-spaced numbers running along the left-hand side of the graph. Think of this as a second ruler that measures y, the dependent variable. On this graph, y is a number that counts the number of records in the data set for each week of the year. It runs from 0 to a maximum of nearly 1,200.
- **The title:** Located at the top of the graph, it summarises what the graph represents, and it may provide information not provided on the y axis label. On this graph, we see that the number of records in the data set is for a specific species, the Common Blue.

- **The actual data:** The filled circles, optionally connected by a line (the graphs in this report do not use this option). The actual data points are the filled circles; a connecting line, if present, is just to help the eye appreciate the shape of the relationship. We see that the shape of the plot resembles a cross section through two adjacent mountains, with a deep valley in between, from which we can deduce that the Common Blue is a twin-brooded species. The number of Common Blue records in the database is 0 early in the year, starts to increase after week 18 (early in May), rises to a maximum in weeks 22-23 (mid-June), then falls away to a minimum around week 28 (late July), before starting to increase again, reaching a second maximum in week 32 (late August), and then falling away to 0 after about week 41 (early October).

This report will include many scatterplots, all looking like this, although the shape of the scatterplot will be different depending on what is being plotted. Sometimes a scatterplot will include more than one set of data points, in which case each set will be illustrated with a different symbol and colour.

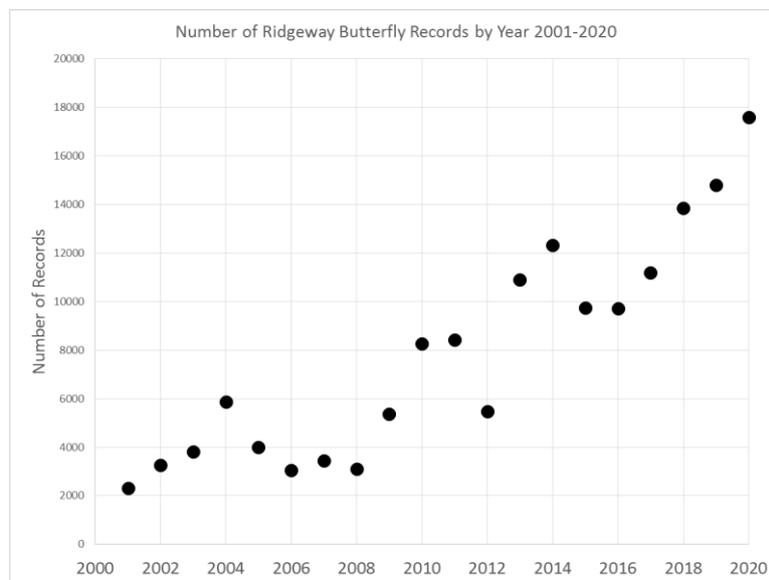
What butterflies can be seen on the Ridgeway?

43 species of butterfly have been recorded on the Ridgeway in the period 2001 to 2020, albeit three of them (Grayling, Brown Hairstreak and Black Hairstreak) only once or twice, so that we can exclude them from consideration for the purposes of this report. Of the remaining 40, six “jewel in the crown” species have fewer than one hundred records each: the Wall is the species most sparsely represented in the Ridgeway data set, with just 38 records, followed by the White Admiral (59 records), the Purple Emperor (64 records), the Purple Hairstreak (67 records), the White-letter Hairstreak (71 records), and the Marsh Fritillary (77 records). After them are four species with record counts in the hundreds: Clouded Yellow (430 records), Duke of Burgundy (487 records), Silver-washed Fritillary (977 records) and Essex Skipper (999 records). That still leaves the majority of species with more than a thousand records, and at the top end of the scale are three species with more than ten thousand records each: Common Blue (10,254 records), Brimstone (12,070 records) and Meadow Brown (17,584 records).

Before we get to know the Ridgeway butterfly species individually, let’s take a look at Ridgeway butterflies overall.

Record counts

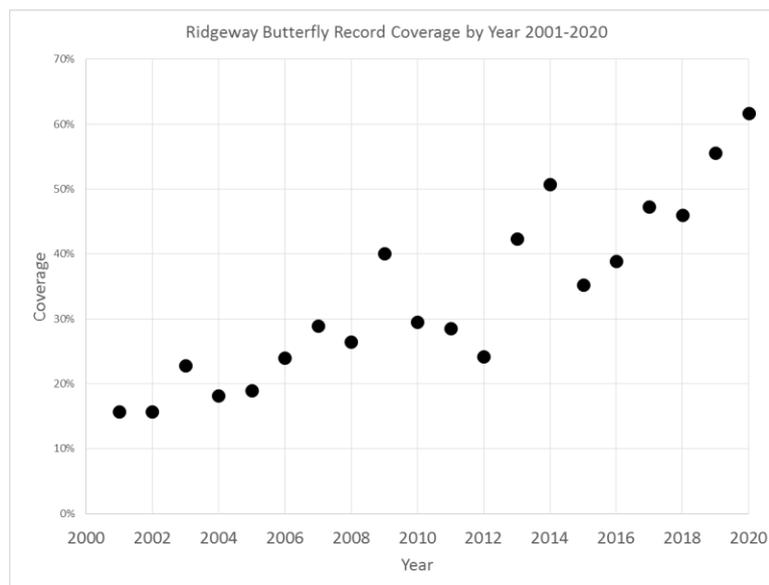
The data set created for this report has records back to 1984 for BeBuOx, and 1993 for Wilts, but the majority have been added in the last 20 years; butterfly recording is a “growth industry”, on the Ridgeway just as it is elsewhere. The number of Ridgeway records per year has grown from just over 2,000 in 2001 to nearly 18,000 in 2020.



N.B. this *doesn't* mean that butterflies are more common than they were 20 years ago – the converse is the case – it simply means that more people are recording what they see and submitting their records, for which we should be very thankful.

Record coverage

As we might expect, we see a similar story if we look at a graph of butterfly record coverage (the number of Ridgeway 1k squares in which any butterflies have been recorded, as a percentage of all Ridgeway 1k squares).



In 2001, butterflies were recorded in only about 15% of Ridgeway squares. By 2020, that percentage had risen to just over 60%. N.B. these percentages are year-specific, so they do not take account of the reality that only a minority of well-visited squares will have records for every year, and most 1k squares will have at least some records for some years. In fact, only 3% (5/170) of covering 1k squares and 9% (29/321) of neighbouring squares have no butterfly records at all in the period 2001 to 2020.

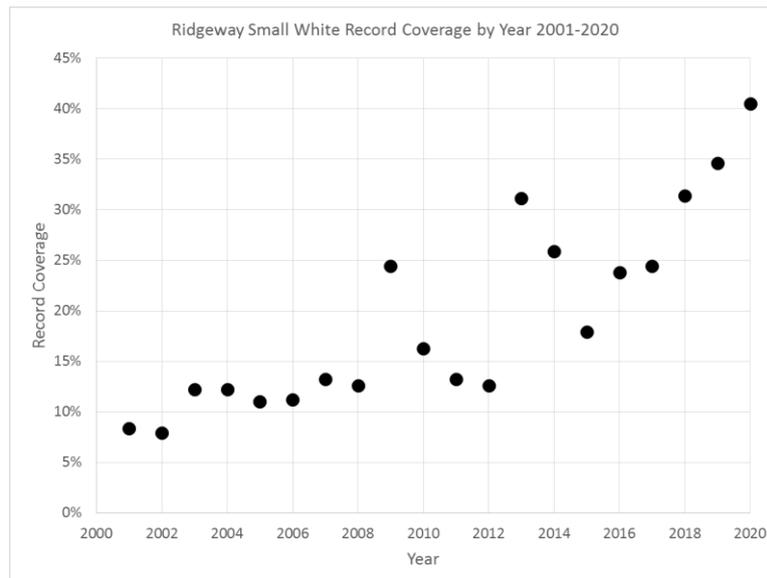
The data show that, for most species, the growth in species record coverage over time mirrors the growth in butterfly record coverage. The provisional conclusion is that most species are under-recorded; as more recording effort has been expended from 2001 to 2020, most species have been found to occupy more 1k squares than earlier data indicated. As with the increase in records, this is not generally because they are actually expanding their range, but just because they are being recorded for the first time in places where they were already present.

Occupancy

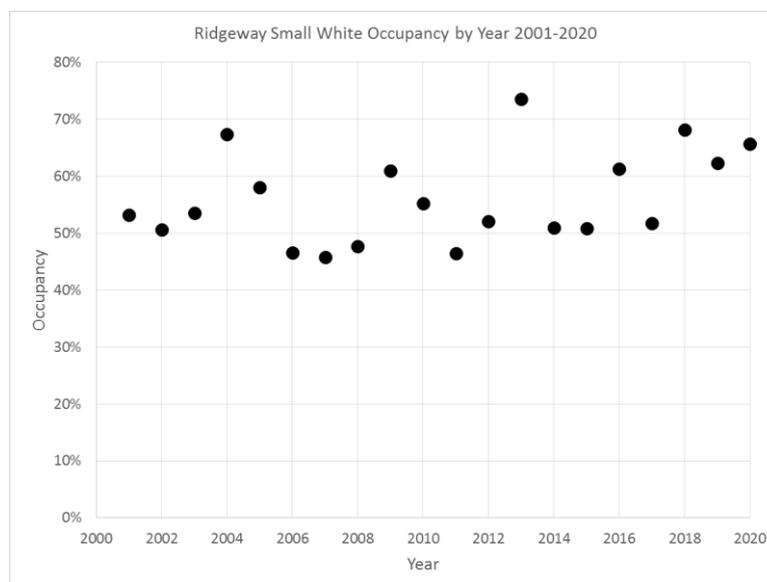
The similarity between butterfly record coverage and species record coverage, for most species, suggests that a more informative measurement, called *occupancy*, can be obtained by dividing species record coverage by butterfly record coverage. This is a ratio of two ratios, both of which have the same denominator which cancels out; the net result is that for each species, occupancy is the number of Ridgeway 1k squares with records for that species, divided by the number of Ridgeway 1k squares with records for *any* butterfly species.

Occupancy thus measures what percentage of squares known to be occupied by butterflies is occupied by a particular species. For most species, we find that although occupancy fluctuates from year to year, it does not show any trend with time. For most species, then, occupancy adjusts for the increasing trend in both butterfly record coverage and species record coverage. The first consequence is that we can condense all the data for a species down to a single value for occupancy, the average over the years from 2001 to 2020, which is a meaningful indication of how widespread a particular species is along the Ridgeway. (We do also need to take some account of how much the individual values vary from year to year, of course.) Furthermore, we can reasonably anticipate that as more butterfly records are added, for squares with no previous records, most species will be found to occupy a fraction of those squares in proportion to their occupancy.

A worked example for that most mundane of species, the Small White, will illustrate the point. Here is the record coverage scatterplot for the Small White, increasing steadily from 2001 to 2020, just like the record coverage graph for butterflies overall:



In 2001, record coverage for Small White was 8%, increasing to about 40% in 2020 (for comparison, butterfly record coverage increased from about 15% to about 60% over the same period). However, when we divide Small White record coverage by butterfly record coverage to get Small White occupancy, the value in individual years fluctuates between about 50% and about 70%, but there is no strong evidence³ that Small White occupancy is increasing or decreasing over time, despite the visual impression of a slight increasing trend.



Thus, the average occupancy (in this case, 56%) is a useful summary of all the data: on the Ridgeway, the Small White is typically recorded in just over half of all the squares where any butterflies are recorded. Accordingly, this report will present occupancy as a single number for most species, along with some indication of the extent to which it varies. There are a few cases, however, discussed briefly in the next section, where the data do not permit this simplification.

³ Technically, the evidence, with a p value of 0.12, would be considered borderline statistically significant.

“Green flag”  and “red flag”  species

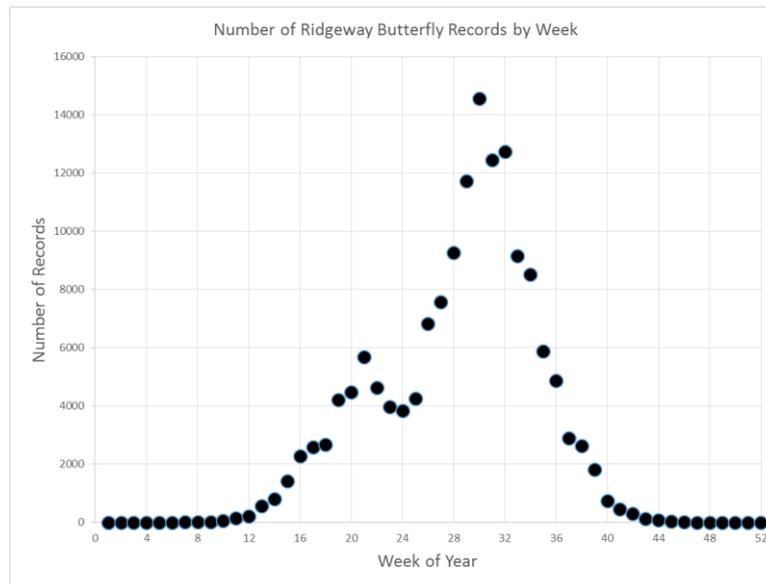
Any species for which there *is* a trend in occupancy are of especial interest. There are three ways in which occupancy can show a trend:

- The species record coverage has increased faster or slower than butterfly record coverage has increased, in which case the occupancy will respectively show an increasing or decreasing trend with time. The former case is interesting because such species are apparently becoming more widespread. The latter case is potentially concerning because such species may be in slow long-term decline.
- Another important case is when the species record coverage has not changed despite increasing butterfly record coverage, a scenario that occurs for a few scarce habitat specialist species for which all sites are already known. In such a case, the apparent decrease in occupancy is only as a result of the increase in butterfly record coverage. No amount of additional recording effort will increase the species record coverage in line with butterfly record coverage.
- The most concerning possibility would be a decreasing trend in species record coverage, despite the increasing trend in butterfly record coverage. In such a case, occupancy would show a particularly dramatic decreasing trend, because the decreasing trend in species record coverage would be accentuated by the increasing trend in butterfly record coverage. Fortunately, this report has not identified any species that fall into this last category.

This report identifies four species with a trend in occupancy: two whose species record coverage has grown faster than butterfly record coverage, and two whose species record coverage has grown more slowly. One of these latter two is particularly noteworthy, because it is generally perceived as a common and widespread species, and thus of least concern. Two species for which species record coverage has not changed are also identified. Each case will be flagged appropriately and discussed properly in the section devoted to the species in question.

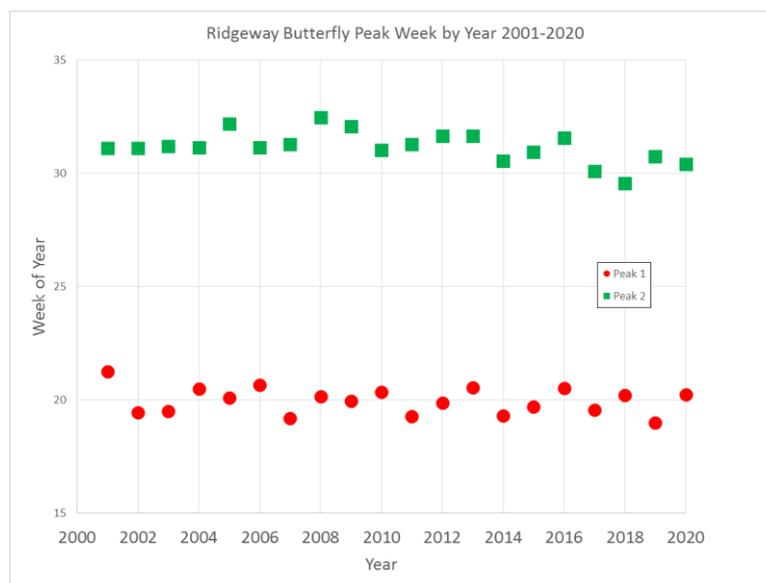
Peak “on the wing” time

The majority of the records in the data set specify the actual date that the record relates to (a small fraction of older records specify only the month, or in some cases just the year). Hence we can count how many records there are for each week of the year, and present the data as another scatterplot, shown below.



The main peak in the graph occurs at week 30 (the last week of July), with a secondary peak at around week 21 (the last week of May). The valley between the two peaks occurs at around week 24. This graph aggregates the data for all 20 years from 2001 to 2020, so any variability in the two peak weeks and the valley week is averaged out.

However, the valley week can be used as the basis for a more granular analysis, to partition the data and identify approximately when the two peaks occurred in each individual year.

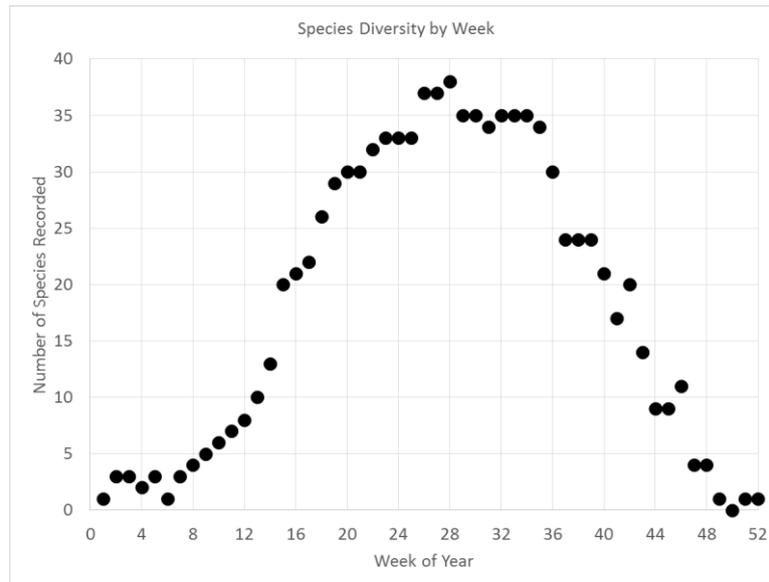


Based on linear regression, there is no statistical evidence for a trend in the first peak, shown by red circles, but there is strong statistical evidence⁴ that the second peak, shown by green squares, is occurring progressively earlier in the year (although inspection suggests, and detailed analytical scrutiny confirms, that it does not appear to be a linear trend). It seems that in aggregate, the butterflies of the Ridgeway are modifying their primary flight time according to external factors (presumably climate change). It would be of great interest to know which specific species are implicated in this trend, but a rigorous treatment of this topic is beyond the scope of this report.

⁴ $p = 0.027$, for the technically-minded reader.

Species diversity peak time

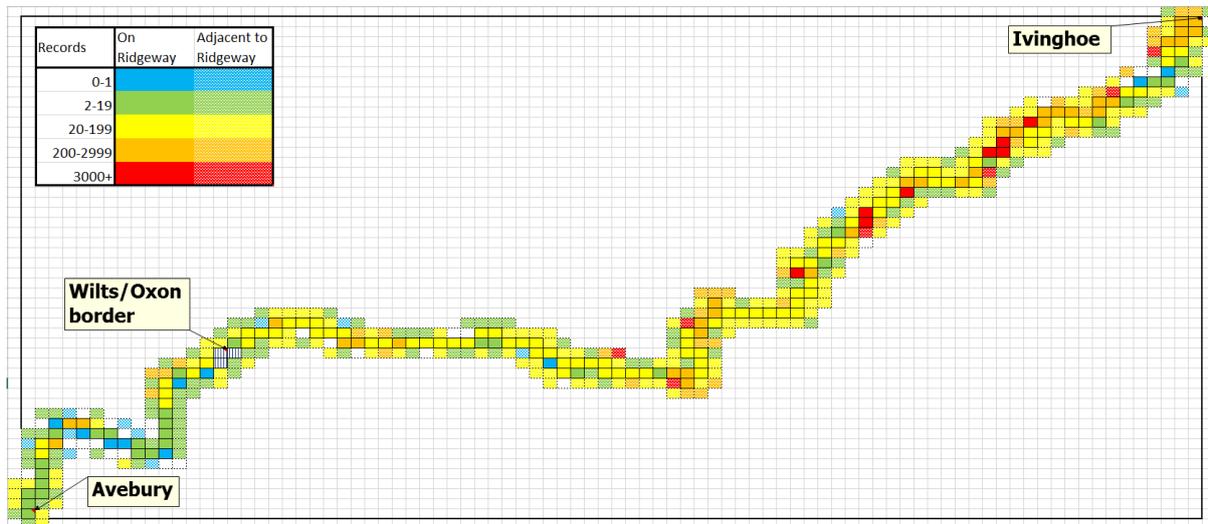
We have established that 43 species of butterfly have been recorded along the Ridgeway, 40 of them sufficiently often to be considered butterflies of the Ridgeway. The question naturally arises: how many of these can be seen on the wing at the same time of year? When is the best time to visit the Ridgeway to maximise the potential number of species seen? The next graph provides the answer.



Weeks 26 to 28 are the best time, when either 37 or 38 species have been recorded somewhere on the Ridgeway in the period 2001 to 2020. This does not mean that they can all be seen in the same place - very few sites support such a diverse range of species - but it does mean that someone with sufficient determination over the course of a few days would at least have the potential to see that many species. In order to identify where they would need to be to pursue that quest, we must turn to the next two graphics: heat maps of total record count and species diversity. We would expect them to be correlated but not identical; it is possible that one square's high record count is dominated by only a few common species, whereas another square's low record count is contributed to by many less common species. Generally, though, there will be more species where there are more records.

Record count hot spots

In this heat map we are looking at how many records each 1k square has in the data set for the period 2001 to 2020. Approximately 50% of all 1k squares are coloured yellow, the ones with a record count in the so-called inter-quartile range. Green and orange each account for another 20% or so of squares, leaving red and blue to represent approximately 5% of squares each: the hotspots and cold spots. As a final finesse, covering and neighbouring squares have been distinguished by respective use of solid and patterned versions of the same colour.



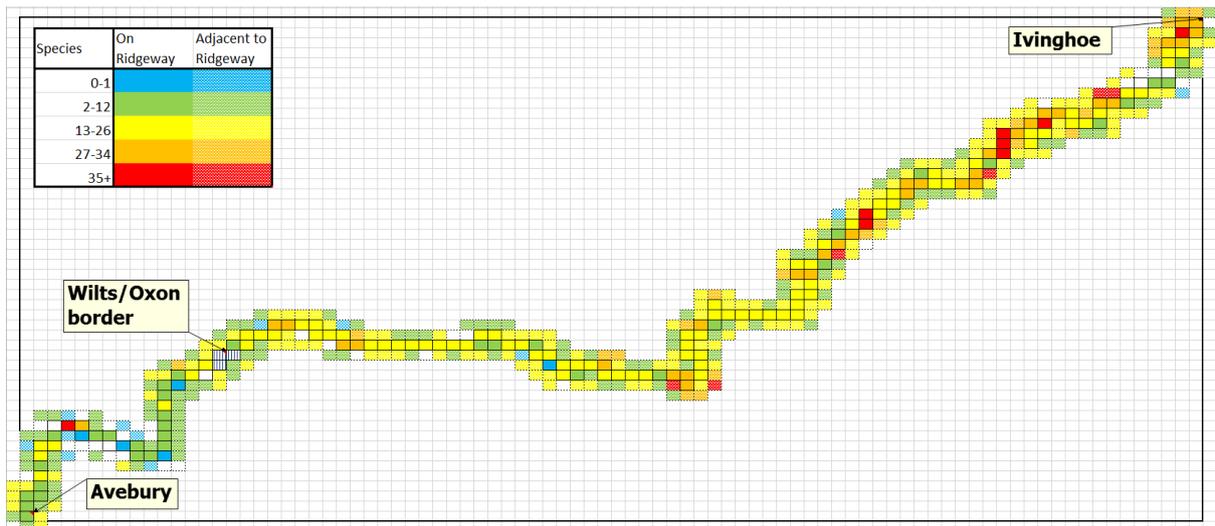
Eight 1k squares make the cut for butterfly record count hotspots. They are listed in the table below, in “walk order” (i.e. the order in which they would be encountered, walking the Ridgeway from Avebury to Ivinghoe):

1kID	Nearest Named OS Feature(s)
SU6791	Swyncombe Downs
SU7296	Hill Farm; Aston Rowant NNR
SU7297	Cuckoo Pen; Beacon Hill
SU7599	Oakley Hill
SP8103	Princes Risborough
SP8203	Brush Hill; Whiteleaf Hill (PARKING)
SP8204	Lower Cadsden; Grangelands and Pulpit Hill NR
SP8406	Coombe; Coombe Hill

It is evident from the heat map that the record count hotspots and cold spots are not distributed randomly along the Ridgeway. All the hotspots are in the eastern half of the Ridgeway, and conversely, the cold spots are concentrated west of the Wilts/Oxon border. Attention has only been drawn to this feature in order to emphasise that it should be interpreted with caution. Recorder effort and known butterfly abundance tend to be correlated i.e. people who record butterflies tend to visit locations where there are many butterfly records, and not to visit locations where there are few butterfly records! Hence, there is only one reason why hotspots have a lot of records: there are lots of butterflies to be seen there. However, there are two possible reasons why a cold spot has few or no records: it could be that there are few or no butterflies to be seen there, or it could just be that few or no people have made a point of looking there.

Species diversity hot spots

In this heat map we are looking at how many species have been recorded in each 1k square for the period 2001 to 2020. The colour scheme is the same as in the previous heat map, representing approximately 5%, 20%, 50%, 20% and 5% of the data, starting from blue.



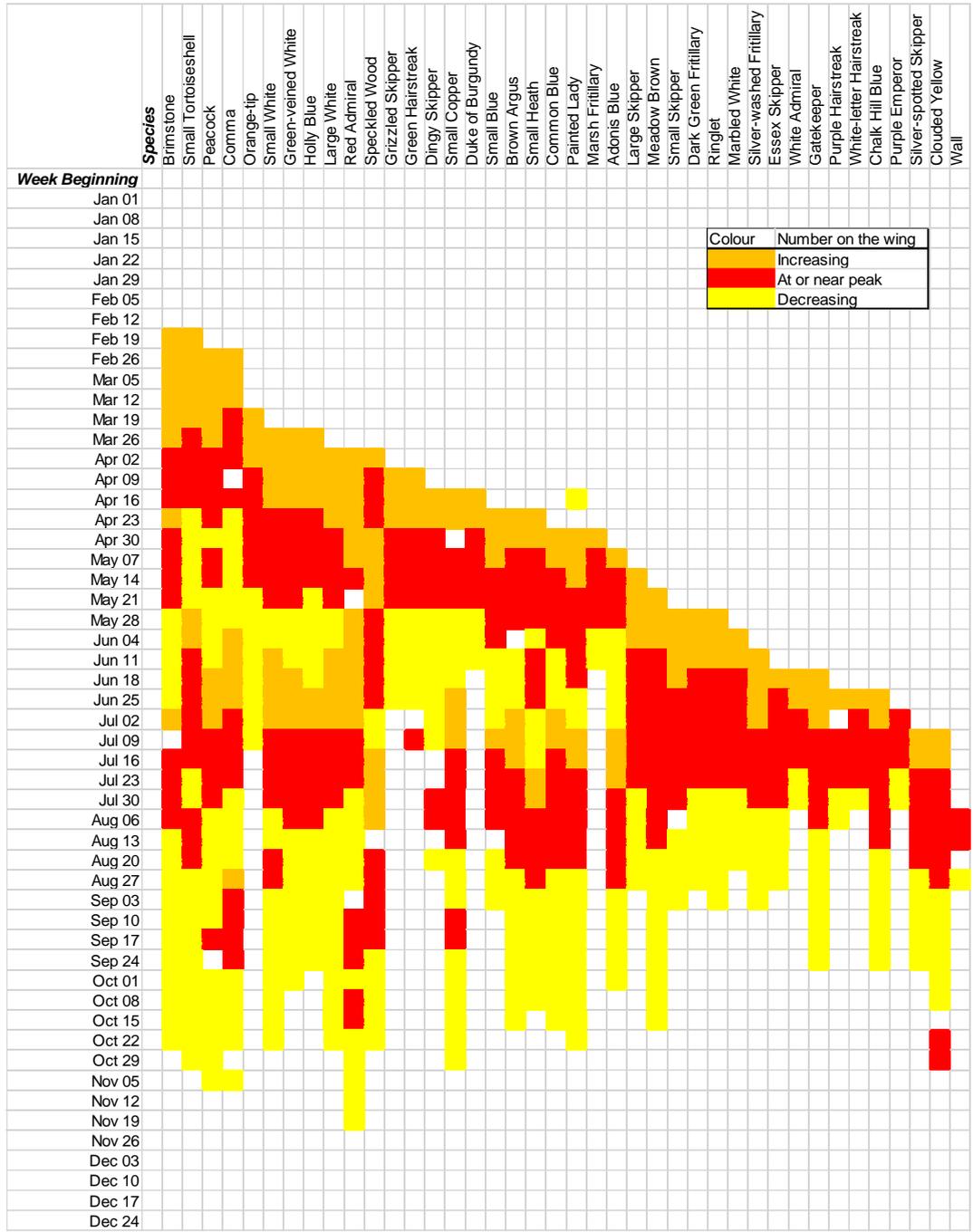
Again, eight 1k squares make the cut, listed in “walk order” in the table below. Five of them are also in the butterfly hotspot list, three are different:

1kID	Nearest Named OS Feature(s)
SU1476	Barbury Castle
SU7296	Hill Farm; Aston Rowant NNR
SU7297	Cuckoo Pen; Beacon Hill
SP8203	Brush Hill; Whiteleaf Hill (PARKING)
SP8204	Lower Cadsden; Grangelands and Pulpit Hill NR
SP8205	Chequers Knap
SP8506	Coombe Hill
SP9515	Incombe Hole; Steps Hill

Similar to the record count heat map, a west-to-east gradient is apparent in the species diversity heat map, and it should be interpreted with similar caution.

Ridgeway butterfly calendar

In the following graphic, all the records from 2001 to 2020 have been aggregated and analysed to produce a calendar for the butterflies of the Ridgeway. The species have been sorted from left to right by first appearance on the wing. Weeks of the year run from top to bottom. "At or near peak" starts in the week when pre-peak numbers are increasing at the fastest rate, and ends in the week when post-peak numbers are decreasing at the fastest rate.



The remainder of the report will be devoted to a brief discussion of each individual species, in order of first emergence per the calendar above. The goal is simply to present a pen picture of each species, with (for all but the scarcest species⁵) a photograph or photographs taken by the author, so that Ridgeway walkers will hopefully begin to view these miraculous creatures as "friends they haven't met yet". There are many excellent online resources that the reader can, and should, turn to for more complete and detailed technical information.

⁵ The author's personal possession or non-possession of half-decent photographs turned out to be a legitimate dividing line between the majority of butterfly species that a Ridgeway walker might reasonably set out intentionally to see, possibly with a little luck, and the "jewel in the crown" species that he or she is only going to see with a great deal of luck.

The hibernators awaken

First to appear in a new year are the four species that routinely overwinter as adult insects, and begin to emerge from hibernation as the weather warms up. Any of these may be seen on a sunny day starting any time from mid-February to mid-March. They will breed and produce a fresh brood, or fresh broods, later in the year.

Brimstone



The Brimstone can be seen any time from early February through to early October, most usually in flight. When at rest, it is almost never seen with its wings open; it is one of the species that invariably folds its wings as soon as it alights.

With occupancy of 54%, varying relatively little between 38% and 63% from year to year, it has been found in just over half of all Ridgeway 1k squares occupied by butterflies.

One of three species with more than 10,000 records in the Ridgeway data set, the Brimstone is a large and handsome butterfly, the Ridgeway's only native yellow species; the Clouded Yellow has now become native further south in the UK, but not (yet) in BeBuOx or Wilts. Only the male is bright yellow; the female is typically more greenish-white. The Brimstone is the longest-lived UK species; lucky individuals may still be on the wing up to a year after hatching out in July (albeit looking very tattered, like the photo below which was taken in late June of 2019).



Small Tortoiseshell

A stunningly beautiful butterfly that used perhaps to be taken somewhat for granted because it was both widespread and abundant. Although still widespread, these days its abundance seems to be rather location-dependent. The distribution picture is further complicated by the species having good years and bad years, as evidenced by its occupancy of 47%, which has fluctuated anywhere from 20% to 70% in individual years.

The Small Tortoiseshell is the first of the hibernators to complete its life cycle, with fresh adults starting to appear in late May, and a broad on-the-wing peak which runs from early June right through to late August.



Peacock



The Peacock has an occupancy of 50%, varying relatively little between 40% and 60%, with an occasional outlier.

Like the Small Tortoiseshell, the Peacock's larval food plant is the Stinging Nettle. The two species of caterpillars are not easy to tell apart when small, but they become increasingly different as they grow; a mature Peacock caterpillar (pictured right) is black with small white spots and fearsome-looking spines.

Large and spectacularly beautiful, the Peacock is a common species that never fails to quicken the pulse of even a seasoned butterfly enthusiast.

The Peacock's on-the-wing peak in the spring typically starts a week or so later than the Small Tortoiseshell, but lasts longer. In contrast, the ensuing breeding seems to produce a more synchronous summer peak than the Small Tortoiseshell, with more butterflies around but for a shorter period of time.



Comma

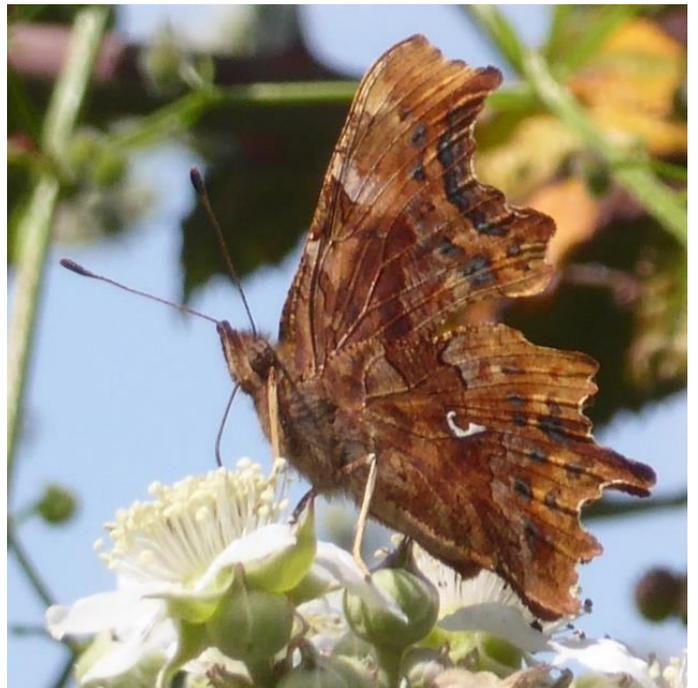


form, after Emma Hutchinson who discovered this feature of the Comma's life cycle. Individuals of *hutchinsoni* form do not hibernate, but some breed and produce a second brood with peak numbers seen in September. Despite being produced by *hutchinsoni* parents, second brood individuals are exclusively of the darker form and also go on to hibernate.

The picture to the right shows the Comma with its wings folded, revealing the white mark that gives the Comma its name.

The Comma's jagged wing outline makes it unique amongst British species, looking like it has been "in the wars" even when freshly hatched. Its combination of unique wing shape and beautiful palette of brown and orange colours make it difficult to confuse with other species, except when it is in flight and can be mistaken for a fritillary species. It has an occupancy of 34%, varying between 25% and 45% from year to year.

The Comma is a double-brooded species, which comes in two distinct colour variations, related to the double-brooded life cycle. The specimens that emerge from hibernation in March and April breed and produce the first brood with peak numbers seen in July. Most of the first brood are darker in colour and, if they survive to hibernate, do not breed again. However, a minority of the first brood are lighter in colour, known as the *hutchinsoni*



Harbingers of spring

The next four species to emerge, this time from over-wintering as pupae, typically begin to do so in the second half of March; the exact timing depends somewhat on the weather. The Orange Tip is single-brooded, and its numbers are already starting to decline from the second half of May onwards. The other three species are double-brooded; fresh adults start to appear from the second week in June, and all three species start their second peak around the second week of July.

Orange-tip



The Orange-tip is widespread along the Ridgeway, with an occupancy of 34%, ranging from 23% to 51% in individual years.

With a relatively sharp on-the-wing peak from early April to mid-May, the Orange-tip is most likely to be seen around the end of April.

Possibly the most iconic of spring species, even more so than the Brimstone, because of the bright orange splash of colour it brings when the countryside is just starting to re-awaken. The Orange-tip is actually sexually dimorphic, and only the male has the benefit of bright orange livery; both sexes, however, display the splendid dark green marbling on the underside of the hind wings. The male is pictured left, and a courting pair is pictured below.



Small White



The smaller of two species that are collectively and colloquially known as “Cabbage Whites”, the Small White is the earlier of the two to emerge in a new year, typically in late March with peak numbers beginning in late April. The species is twin-brooded and the spring brood is small in comparison to the second brood which begins to peak in July and lasts for several weeks.

The Small White has an occupancy of 56%, ranging from 46% to 74% in any given year. These values are almost certainly underestimated because the Small White’s springtime emergence broadly coincides with two other species, all three effectively impossible to tell apart on the wing: the (female) Orange-tip and the Green-veined White (discussed next).

The female differs from the male (pictured) by having more than one black spot in the middle of the forewings.

Green-veined White

The picture shows clearly how this species acquired its name: the striking dark green borders around the veins on the underside of the wings. If only the upper side of the wings can be seen, the Green-veined White is not so easy to tell apart from the Small White, although there are subtleties of the black markings that are clear to the experienced eye.

Despite its superficial on-the-wing similarity to the Small White, the Green-veined White is not a “Cabbage White”, in terms either of its preferred larval food plant or its preferred habitat.

The Green-veined White has an occupancy of 44%, ranging approximately from 35% to 55% in any given year.



Holly Blue



The Holly Blue is unusually prone to boom and bust cycling in its abundance from year to year, as evidenced by its occupancy. The average of 27% is not especially meaningful, because the value in any one year has ranged anywhere from 9% to 44%.

A charming little butterfly and the earliest blue species to emerge in the year, the Holly Blue is at home in gardens as much as it is in the open countryside. One may be confident that a blue butterfly seen any time up until the end of April is a Holly Blue, simply on grounds of time of year.



The April avant garde

The butterfly year really starts getting into gear in April, when another eleven species begin to be seen. Most of them are small species, four of which - the Green Hairstreak, the Dingy Skipper, the Grizzled Skipper and the Duke of Burgundy - are of particular interest at this time of year because they are nominally single-brooded and thus offer only a single window of opportunity to be seen in any given year. However, the data for the first two show evidence of the potential for a second brood in at least some years.

Large White



The larger of the two “Cabbage Whites”, the Large White typically lags a week or two behind its smaller cousin, both in starting to emerge and peak numbers being seen. It has an occupancy of 53%, which has ranged from 34% to 72% in individual years (a wide range because although a native species, its numbers are supplemented to a variable degree by migration from mainland Europe).

Size is not a reliable way to tell it apart from the Small White, as both species vary somewhat in size. The best way to tell them apart is the black tip on the forewings, which is more of a dainty dab on the Small White, compared to a hearty boomerang shape, more intense in colour, extending a considerable distance around both top and side edges on the Large White. Like the Small White, the female has more than one black spot on each forewing, whereas the male has none or one.

Red Admiral

Arguably more recognisable by the general public than any other UK species, a freshly-emerged Red Admiral is a stunning sight to behold. It is a bold, feisty species and will fearlessly defend its territory against transgression by invaders, be they other butterflies or humans.

Technically the Red Admiral should be considered a migrant that arrives afresh every year in spring and early summer, although in recent years it has become increasingly common to consider the species as native. It appears that small numbers are now able to over-winter each year, although not by hibernation in the strict technical sense (the adult’s metabolism does not support hibernation).

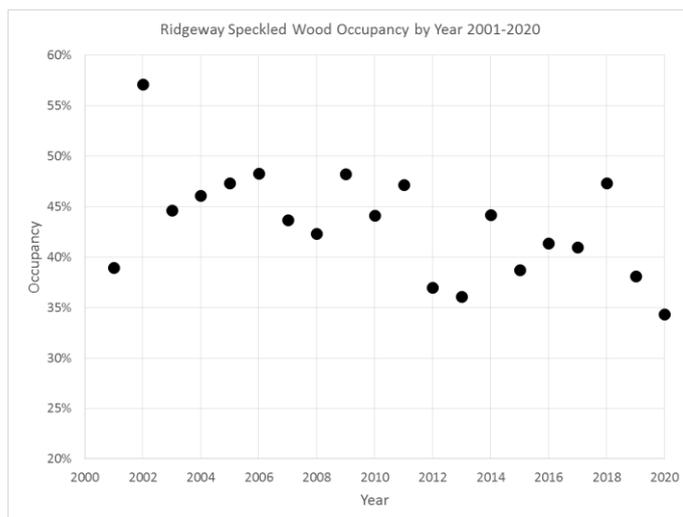
The Red Admiral has an occupancy of 43%, but values in individual years range from 28% to 58%, indicating the unpredictability of the numbers that will arrive in any given year.



Speckled Wood

A charming species whose delicate brown and buff beauty is often under-rated by hard-core butterfly enthusiasts, presumably because it has historically been widespread and abundant. In behaviour, it is probably the closest UK species to the robin, for at the risk of being unduly anthropomorphic, it is inquisitive and friendly, and will frequently accompany walkers for quite long distances, repeatedly flying ahead before pausing to allow them to catch up.

As its name suggests, it is a species whose preferred habitat is around trees, although like all butterflies, it does need sunlight and so sun-dappled glades are the best places to find it.



The Speckled Wood is the first species to be flagged in this report because of an apparent trend in its occupancy. What the eye perceives is confirmed by a test for statistical significance⁶; occupancy has decreased from around 50% in 2001 to around 40% in 2020. Extrapolating trends is always risky, but extrapolating this one indicates Ridgeway extinction for the Speckled Wood in about 60 years. This is an especially noteworthy finding given that the Speckled Wood is generally perceived to be a species of least concern.

⁶ $p = 0.005$

Grizzled Skipper



The image shows a Grizzled Skipper nectaring on a bramble flower, a clear indication of the small size of this species. With an occupancy of only 12%, ranging between 6% and 21% from year to year, the Grizzled Skipper has more exacting habitat requirements (all of warmth, shelter and sparse vegetation) than any of the species discussed so far. The next two species to be discussed will typically be found where the Grizzled Skipper is found, but not necessarily vice versa.

Even more so than the other skipper species, all of which fly at high speed with frequent and rapid changes of direction, the Grizzled Skipper requires some practice to spot!

Green Hairstreak

Comparable in size to, but a little easier to find than, the Grizzled Skipper, the Green Hairstreak has an occupancy of 16%, ranging from 9% to 25% from year to year.

It is the only predominantly green UK species, although the green colour is confined to the undersides of the wings; it is never seen with wings open. Look for it on scrubby sites with hedgerows, particularly hawthorn in which it is particularly fond of perching (as illustrated).

The green colouration relies on light diffraction and is frustratingly difficult to photograph well!



Dingy Skipper



Afflicted with a name that does not do justice to its subtle prettiness, the Dingy Skipper displays wide variation around the same basic theme of colour and patterning.

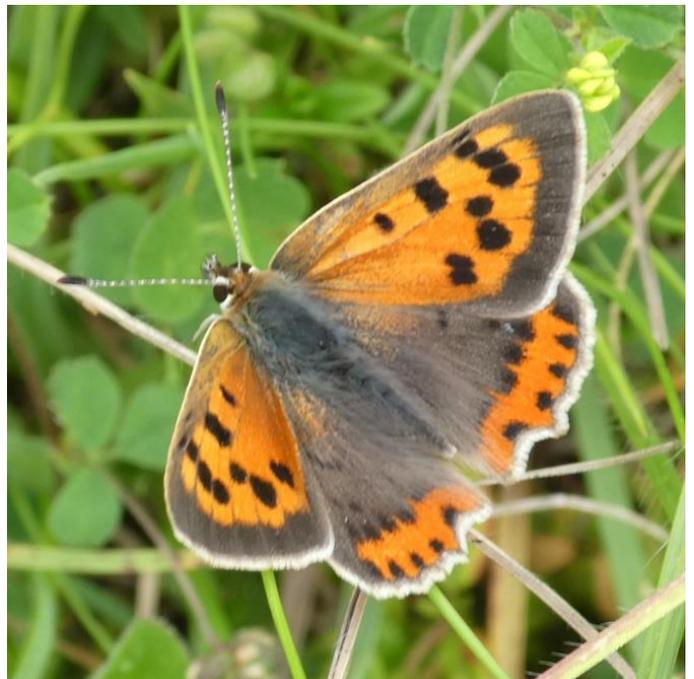
Rather easier to find on the Ridgeway than either the Grizzled Skipper or the Green Hairstreak, it has an occupancy of 20%, with the annual value ranging from 10% to 29%.

The Dingy Skipper likes to bask in a sunny spot with wings fully open, but if you disturb it in the process of trying to get a closer look, you are likely to have difficulty in following it to its next destination!

Small Copper

“Once seen, never forgotten” is perhaps more true of the Small Copper than any other species likely to be encountered by anyone not on a mission to seek out the most challenging UK species. For such a small species, it punches well above its weight with its bright orange and dark brown colour and patterning.

With an occupancy of 25%, ranging from 16% to 43% in any given year, it is reasonably widespread along the Ridgeway. It is also a fecund species, reliably managing to pack three broods into the year, and can usually be seen on the wing well into October.



Duke of Burgundy



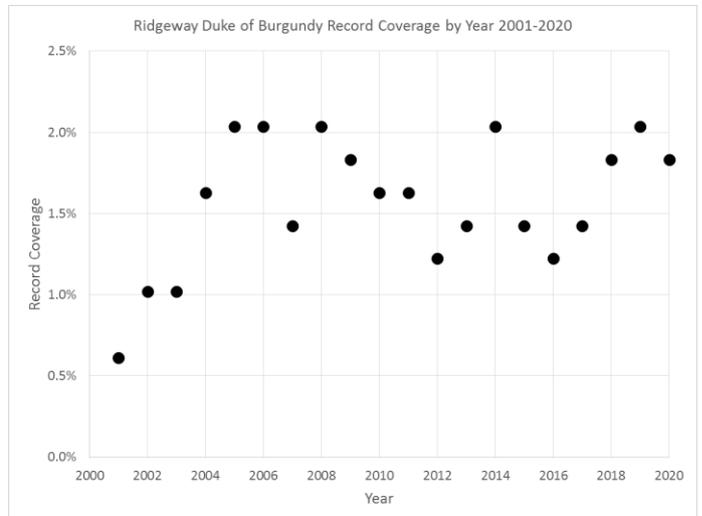
Ivinghoe Hills (SP9516), the only 1k square with more than 100 records, is clearly the place to be to maximise your chances of seeing His Grace. The adjacent 1k square, Beacon Hill (SP9616), and Saunderton Tunnel (SP8001) are in second and third place.

Because of its exacting habitat requirements, the Duke of Burgundy falls into the category of constant species record coverage; it is to be found in just 1.6% of all Ridgeway 1k squares. It is one of very few Ridgeway species whose species record coverage has *not* increased as butterfly record coverage has increased; it occurs at a small number of known sites and increased recording effort is very unlikely to uncover any more.

Small Blue



Finally we come to the first true habitat specialist to be found on the Ridgeway; the enigmatically-named Duke of Burgundy. For many years the species was named the Duke of Burgundy Fritillary, but the word Fritillary was excised from the name when it was found to be taxonomically incorrect. These days, the name is typically abbreviated further to simply “The Duke” by butterfly enthusiasts; “His Grace” is the appellation preferred by true devotees.



The smallest UK species, the Small Blue has to be seen for real to truly appreciate just how diminutive it is! Its name is a little misleading, because the upper wing surfaces are actually a slate grey in colour, with at best a light sprinkling of blue scales to either side of the body, as in the photograph. Only the undersides of the wings are blue in colour, a pale blue that is similar to the Holly Blue.

The Small Blue is what might be called a habitat specialist by proxy, because of its intimate relationship with its larval food plant, the Kidney Vetch. Despite being so small and (in theory) limited in range, the Small Blue seems to have an unerring ability to find and colonise Kidney Vetch, at distances well beyond what official studies indicate as typical⁷.

The Small Blue has an occupancy of 9%, ranging from 4% to 16% with no trend over the last 20 years, suggesting that it is still to be discovered and recorded in many Ridgeway squares. Swyncombe Downs (SU6791) and Pitstone Hill (SP9414) are the two clear hotspots for this species, both with more than 100 records.

⁷ “Species Action Plan: Small Blue *Cupido minimus*” (2000), Bourn N.A.D. and Warren M.S.

Brown Argus

The Brown Argus is a small species that varies somewhat in size, with the smallest specimens comparable in size to the Small Blue. It is similar in appearance to the female Common Blue, from which it can be reliably distinguished by the dark spot in the middle of each forewing and the generally more “spick and span” appearance of the orange scalloping around the wing edges (the female Common Blue usually has a blueish/white ring around the row of black spots on the edge of the hindwing).

The Brown Argus has an occupancy of 26%, ranging from 18% to 40% in any given year.



Small Heath



Another small species that is rarely and only fleetingly seen with wings open. The underside of the wings is superficially similar to two summer species (Gatekeeper and Meadow Brown) but the Small Heath is much smaller.

The Small Heath reliably manages three broods per year. From the first emerging individuals to the first on-the-wing peak in mid-May takes only a couple of weeks, with subsequent second and third peaks to be seen in mid-June and early August, and the latest individuals being seen until early October.

The Small Heath has an occupancy of 31%, ranging from 23% to 43% in any given year.

May mayhem

May typically ushers in another ten species, which with one exception can be seen on the wing throughout the summer and into July, August or even September, either because they are small and short-lived but twin-brooded species, or because they are larger single-brooded species with a broad emergence peak.

Common Blue



With an occupancy of 44% (annual values ranging from 30% to 60%), the twin-brooded Common Blue is one of three species with more than 10,000 records in the Ridgeway data set; a truly iconic UK summer species. The two images illustrate the male to the left and the female to the right, because the difference is sufficient to lead the unwary, having seen both, into believing they are two different species.

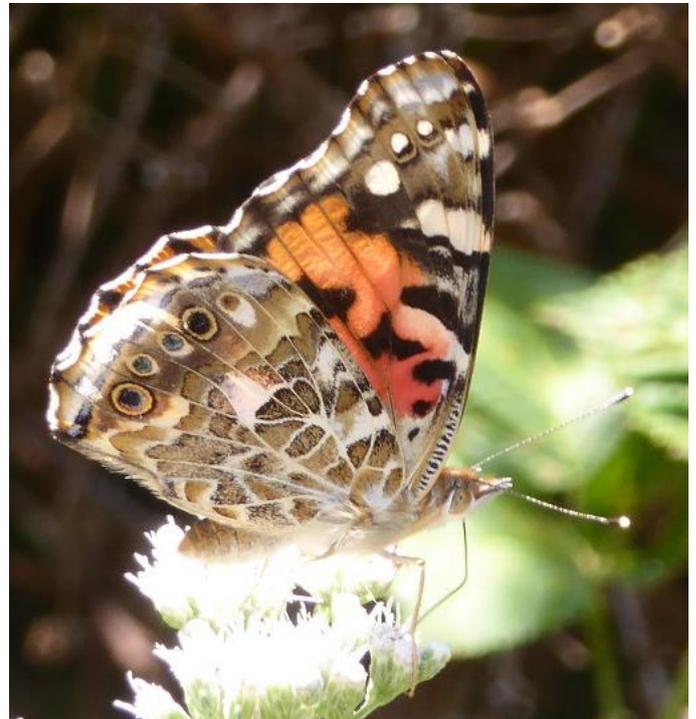
Painted Lady



year in which this happened was 2009, and this is clearly identifiable in the Ridgeway data set, although 2019 stands out equally strongly.

Comparable in size to its migrant friend the Red Admiral, it is a spectacular species, whose hind wings look completely different on topside and underside. As we would expect for a species that migrates a long distance, it is a strong flyer and could in principle be found anywhere on the Ridgeway, although it has still not been recorded everywhere. It has an occupancy of 23%, but the annual value has varied widely from 6% to 60%.

The Painted Lady is not a native species, in the sense that it does not overwinter in the UK, although it can and does breed (Thistle is the larval food plant). However, it is a reliable visitor to the UK, migrating northwards every year from North Africa and Southern Europe. The only unknown at the start of any given year is whether it will arrive “mob-handed” in the UK, as it does every so often. According to the UK Butterflies website⁸, the most recent



Adonis Blue



With an occupancy of 6%, ranging from 3% to 9%, the Adonis Blue is considerably more restricted in distribution than the Common Blue, sufficiently so to be considered a priority species by Butterfly Conservation. The male is superficially similar to the male Common Blue, although a much more vivid and iridescent blue, so whilst someone who has previously seen both might mistake a male Common Blue for a male Adonis Blue, they are unlikely to make the mistake in reverse. To make matters worse, however, the female is very similar to the female Chalk Hill Blue, a species with which the Adonis Blue shares both habitat and larval food plant (Horseshoe Vetch).

The Adonis Blue is a twin-brooded species. The second brood begins to peak in late July and extends throughout August.

⁸ <https://www.ukbutterflies.co.uk>

Large Skipper



A delightful species that in some ways appears more akin to a moth than a butterfly (note for example the hooked tips of its antennae and the unusual “jet fighter” way of holding its wings when at rest). Like all skippers, its flight is difficult to follow, the more so as the temperature rises.

It typically begins to emerge two or three weeks sooner than its smaller close relative, the Small Skipper, but their times on the wing overlap considerably. They can be told apart because the Large Skipper has an attractive orange and light brown variegation on its wings (both upper side and underside) that is absent from the Small Skipper (and Essex Skipper). Male and female can be distinguished by a sex brand line on the male (the picture shows a female).

The Large Skipper has an occupancy of 28%, which has been relatively stable in recent years, but ranged from 16% to 44% when records were less numerous.

Meadow Brown

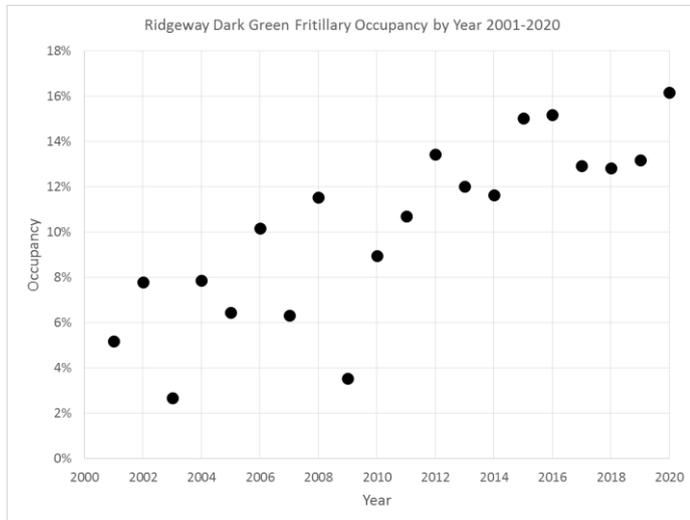
Nearly 9% of all the records in the Ridgeway data set are accounted for by this species alone. It is arguably the most iconic species of the English summer countryside, when seen flip-flopping its way around on a hot sunny day. Single-brooded but with a broad on-the-wing peak, it can be seen in profusion from mid-June through to the end of August, pretty well wherever there is untended grassland. The species has an occupancy of 61%, which has ranged from 51% to 73% in any given year.



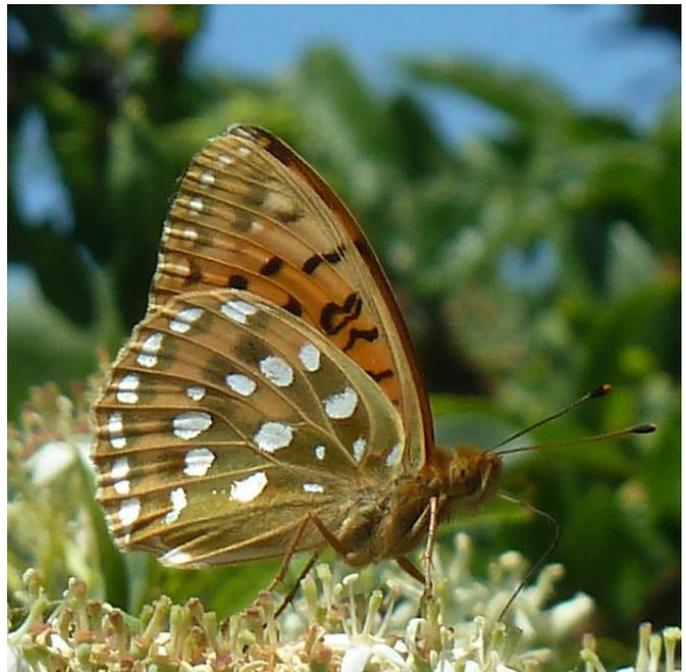
The photo above shows a male of the species, which is fond of basking. It attracts the ladies by releasing pheromones from the sex brands on its forewings (the diffuse small dark strip on either side of its body). On the left is the view of a Meadow Brown with wings folded; the superficial resemblance to the Small Heath is clear, although the size difference is considerable.

Dark Green Fritillary

Now we come to the first of two large fritillary species that can be seen on the Ridgeway, both of which appear to be steadily gaining territory. Although the Dark Green Fritillary is by no means widespread, the occupancy data shows a clear upward trend, starting from around 5% in 2001, and increasing to around 15% in recent years. We can thus be confident that there are plenty of Ridgeway squares already occupied by the Dark Green Fritillary, waiting for a lucky walker to record it there for the first time.



Eight 1k squares merit the orange order of merit on the Dark Green Fritillary heat map, but there's only one place to be to maximise your chances of seeing this magnificent species, and that's SU7296, where the Ridgeway intersects Aston Rowant NNR. This single 1k square has more than three times as many records as its nearest rival (which is the adjacent 1k square SU7297).



Small Skipper

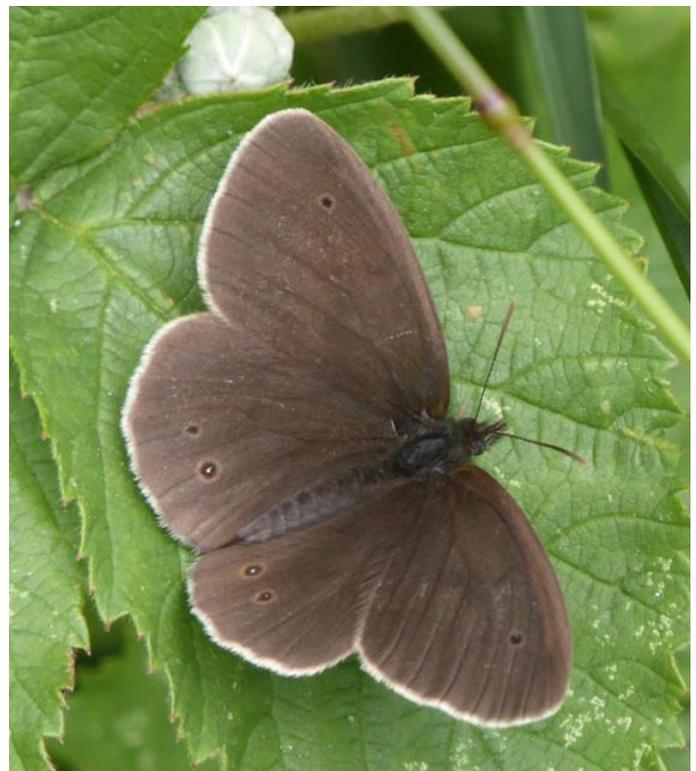


The close resemblance to its larger close relative, the Large Skipper, is clearly apparent. The two species share similar habitat and have effectively the same occupancy (28%, with annual values ranging from 18% to 44%). Other than size, the main difference from the Large Skipper is the Small Skipper's absence of variegated patterning.

The Essex Skipper, which typically begins to emerge two or three weeks later than the Small Skipper, is otherwise so similar that the two species are often jokingly referred to by butterfly enthusiasts as "Smessex Skippers". Even experts can only reliably tell them apart if they are lucky enough to get to see the underside of the tips of the antennae. Hence the two species are considered as synonymous in this report; the distinction is immaterial to the lay Ridgeway walker!

Ringlet

Seen basking with wings open, the unfamiliar observer could be forgiven for thinking that the Ringlet was a drab dark brown species, with usually only a faint suggestion of eye spots to be seen. Chance to observe the same butterfly with wings folded, however, and the Ringlet's signature "target" eye spots will become startlingly apparent.



A widespread species, though not as much so as the Meadow Brown with which it shares territory, it has an occupancy of 40%, varying from 21% to 53% in any given year. Some of the apparent difference in occupancy could

possibly be attributed to mis-reporting, because the Ringlet is not easy to distinguish from the (male) Meadow Brown when on the wing.

June onwards

By the time June rolls around, most of the species that can be seen in any given year have already emerged, although the multi-brooded ones will come around again for a second or even a third time. The species that are still to emerge are all single-brooded because there is insufficient warm weather remaining to support a second brood.

Marbled White



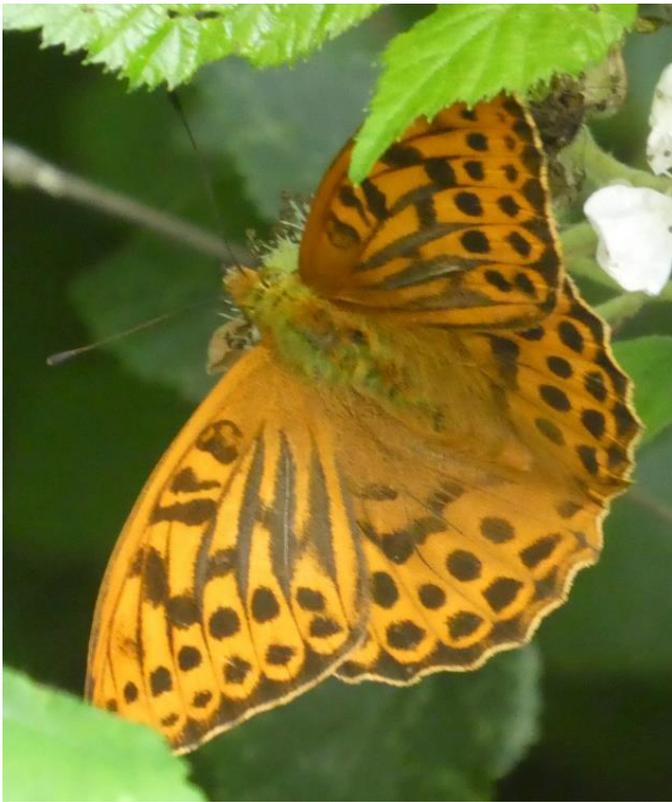
A single-brooded species, the Marbled White typically starts to emerge early in June, and quickly reaches peak abundance by the middle of the month and remains there into July. However, it is relatively short-lived for one of the larger species, and is unlikely to be seen after mid-August.

The Marbled White has an occupancy of 38%, which has varied little (from 36% to 46%) in the last 10 years.

The Marbled White leaves a lasting impression on those who have not previously encountered it. It is a truly iconic Ridgeway species because of its historical association with chalk grassland habitat, although in recent years it has become common away from the chalk. Visual impression (and name) notwithstanding, taxonomically it is not a “White” species at all, but is in fact a “Brown”.



Silver-washed Fritillary



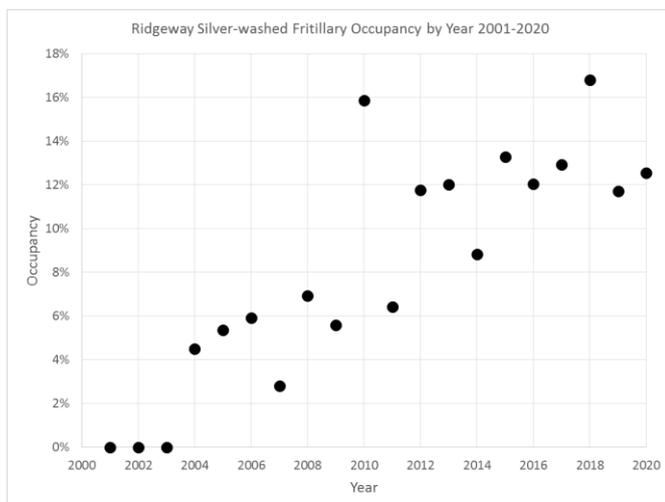
The picture to the left shows a male of the species, which can be distinguished from the female, shown below, by the sex brands (the three prominent dark stripes) on each of its forewings.

The Silver-washed Fritillary has broad green and silver stripes on the undersides of its wings and is found in sunny woodland habitat, whereas the Dark Green Fritillary has large white dots or spots on the undersides of its wings and is found on open grassland. Knowing these key facts gives a handy mnemonic way to tell the two superficially similar species apart if the underside of the wings can be seen:

- Silver-washed > SW > Stripy, Woodland
- Dark Green > DG > Dotted, Grassland



The Ridgeway data set confirms that the Silver-washed Fritillary's steady territorial expansion in BeBuOx, already noted earlier in the report, is also true for the Ridgeway specifically, and is even more meteoric than that of the Dark Green Fritillary. On the Ridgeway, the Silver-washed Fritillary was completely unrecorded from 2001-2003, since when the number of records has increased steadily, slowly at first and then much faster



from about 2010 onwards. The result is that its occupancy has increased steadily to around 15% in recent years.

Despite the species' increasing occupancy of the Ridgeway, there are only three Ridgeway 1k squares with enough Silver-washed Fritillary records to merit orange on the heat map, and only one (SP8204, where the Ridgeway intersects Grangelands and Pulpit Hill NR) with more than 100 records.

Gatekeeper



Different species prompt different instinctive reactions and descriptions in the observer: “magnificent”, “pretty”, “charming”, and so on. The word that comes unbidden to the author’s mind to describe the Gatekeeper is “friendly”. Something about the combination of its colour scheme and its on-the-wing manner just suggests that it is a “salt of the earth” species.

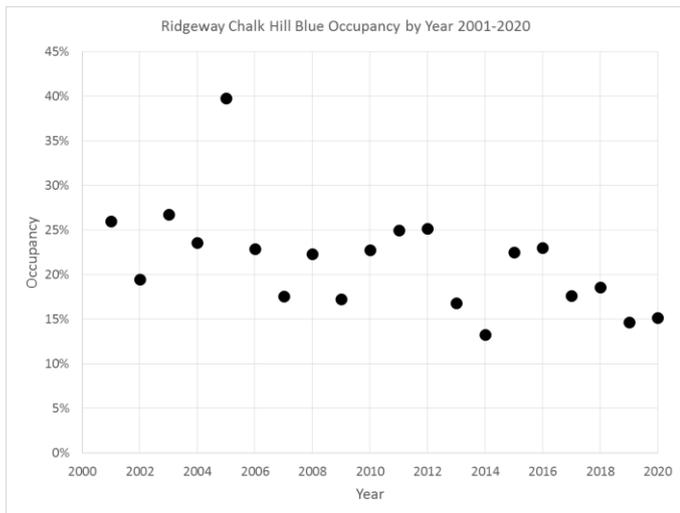
The photograph shows a male that is particularly well-endowed with sex branding (the dark patches in the central orange regions of the forewings and, unusually, also the hind wings).

The Gatekeeper is widespread along the Ridgeway, with an occupancy of 47% which has varied relatively little from year to year; it has been between 40% and 50% for 15 of the last 20 years.

Chalk Hill Blue

The Chalk Hill Blue has a relatively long on-the-wing period, lasting from early July to mid-August, anticipating by a couple of weeks the second brood of the Adonis Blue with which it shares habitat and larval food plant (Horseshoe Vetch).

One of two species to earn a red flag on the basis of the analysis carried out for this report, the Chalk Hill Blue appears to be in slow decline on the Ridgeway. Although



its record coverage has been increasing steadily year on year, its occupancy shows a statistically significant⁹ slow

and steady decrease, from about 25% in 2001 to about 15% in 2020: increased recording effort is finding the Chalk Hill Blue in a steadily decreasing percentage of the new squares that butterflies are being recorded in.

With the same extrapolation caveat as was noted for the Speckled Wood, the Chalk Hill Blue’s extrapolated Ridgeway extinction year is well within the Ridgeway Project’s 50-year look-ahead window (either 2067 or 2051, depending whether or not the anomalously high value in 2005 is excluded from the analysis).

⁹ p = 0.021

Silver-spotted Skipper

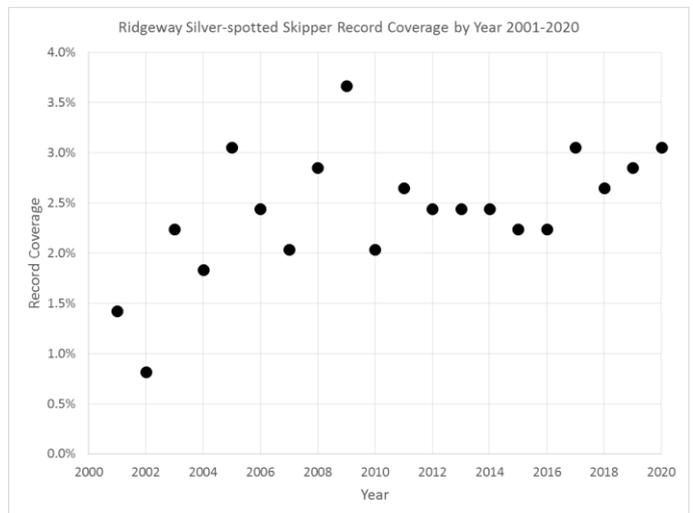


upward trend, because of the extreme values at either end of the range, but with the two earliest values excluded, statistical analysis identifies no significant trend. The Silver-spotted Skipper appears to be another example of a species whose Ridgeway occupancy is already fully documented; increasing recording effort is unlikely to discover it anywhere else.

Four 1k squares have more than 100 records for this species: Swyncombe Downs (SU6791), Aston Rowant NNR (SU7296 & SU7297), and Grangelands and Pulpit Hill NR (SP8204).

Judged by the heat map, the Silver-spotted Skipper is about as specialist a habitat specialist as they come: prolific in the relatively few places where it occurs, and completely absent elsewhere. It is not an easy species to spot even where it *is* present, so even a targeted visit to a known site requires some luck.

Its record coverage has averaged 2.6% from 2003 to 2020 (there were very few records in 2001 and 2002), ranging between 1.8% and 3.1%. The eye perceives a slight



Clouded Yellow

Like the Painted Lady, the Clouded Yellow is a migrant species that is seen in the UK most years, but in numbers that vary considerably from year to year. Because its initial arrival location is subject to the vagaries of the weather, and because it is a strong flyer that has no specific habitat requirements, like the Painted Lady it can in principle turn up almost anywhere.

The data show a Clouded Yellow occupancy of 7%, based on values that have ranged anywhere from 0% to 17% in any given year.

The Clouded Yellow is a strong, avid flier, preferring to spend its time on the wing. When it does settle, it is always with wings folded. The picture on the left took the author approximately 20 minutes of chasing around a Dorset clifftop before the individual finally decided it needed to refuel.



The Clouded Yellow can only be confused with the other yellow UK species, the Brimstone. Telling the difference is easy on the wing, because despite its name, the upper surfaces of the Clouded Yellow's wings are a deeper orange-yellow in hue than the Brimstone.

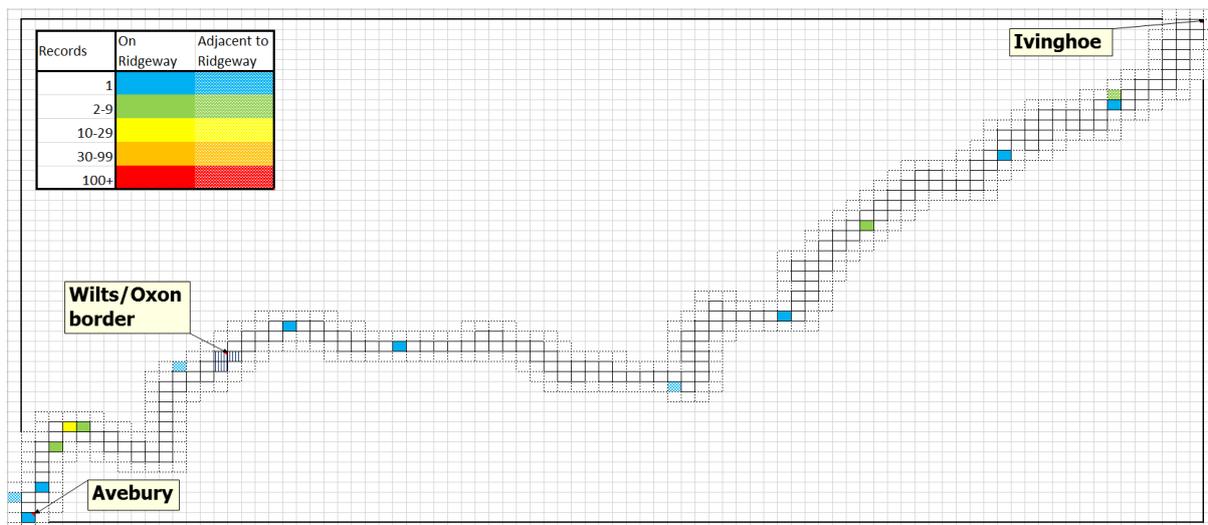
Ridgeway butterfly “jewels in the crown”

This final section, without photographs, is devoted to the six scarcest Ridgeway species that nonetheless have sufficient records to justify being included as Ridgeway butterflies. Five of them are also late-emerging species; none of them are likely to be seen by Ridgeway walkers.

Wall

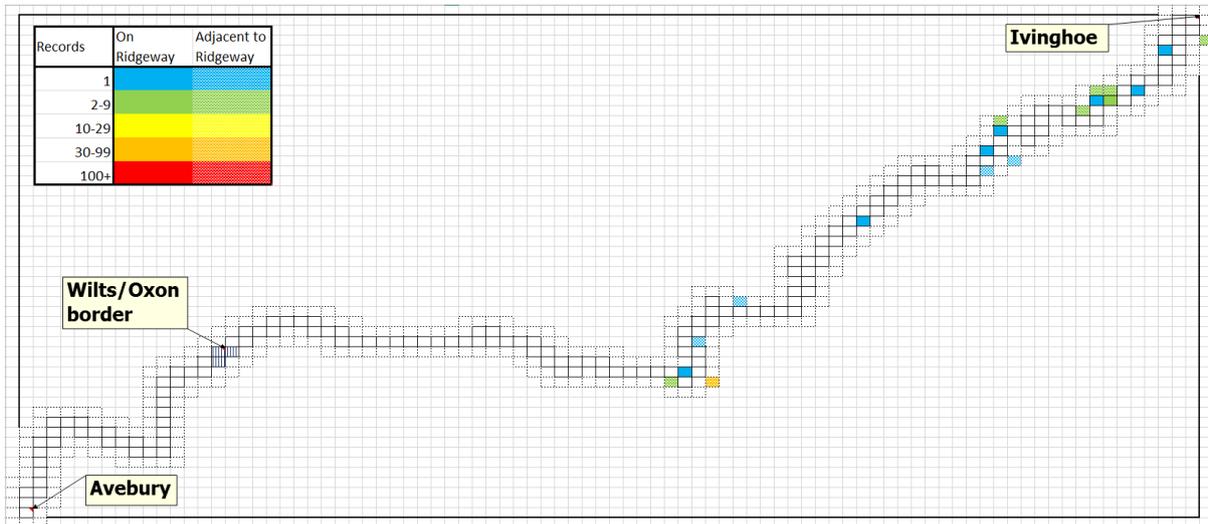
This species has been effectively extinct in BeBuOx for the last few decades. The Wall was once widespread in the UK, but over the last fifty years or so, its occupancy of the UK has become effectively confined to coastal areas. The reason why is not known for sure. Where the Wall is still established, it has two or even three broods per year, and overwinters as larvae hatched from eggs laid by the final brood of the year. It seems likely that where the Wall has died out, it is because the adult insects were emerging, and creating the next generation, progressively sooner from year to year, and the lifecycle was broken because the last generation was laying its eggs too late in the year for the larvae to get big enough to survive the winter.

The Wall is certainly not a Ridgeway species to set out to find! Its 38 records are distributed sparsely along the whole of the Ridgeway, with no more than three records in any one 1k square ... with one notable exception. Nearly half of all the Ridgeway Wall records are from just one 1k square, namely SU1476 (Barbury Castle), which is also in the species diversity hotspot list.



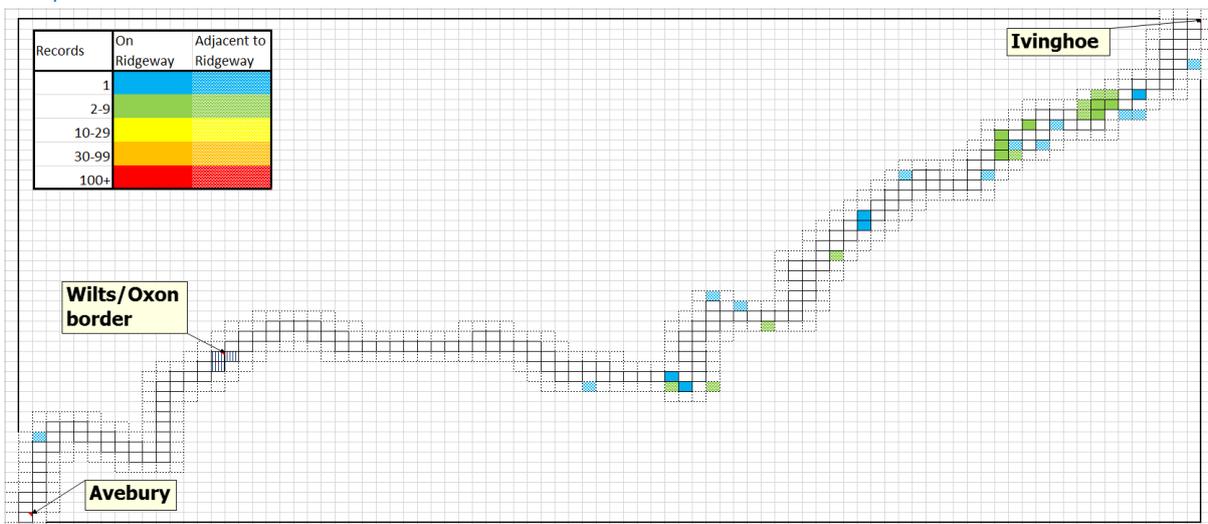
The Wall has been recorded there in 13 out of the last 20 years. Unfortunately, more than half of those records do not specify a date or even a month; of the eight records that do specify a month, six were in August or September. Based on all the records that do specify a date, August is the best time to try your luck!

White Admiral



A similar story to the Wall, in that records are distributed sparsely along the whole of the Ridgeway, with no more than 2 records in any 1k square ... again with one exception, which alone accounts for more than half of all Ridgeway White Admiral records. In this case, it is a neighbouring square (SU6180) rather than a covering square. It is publicly accessible from the Ridgeway, via the Chiltern Way which passes through SU6180 and into Great Chalk Wood which is where all the records are from.

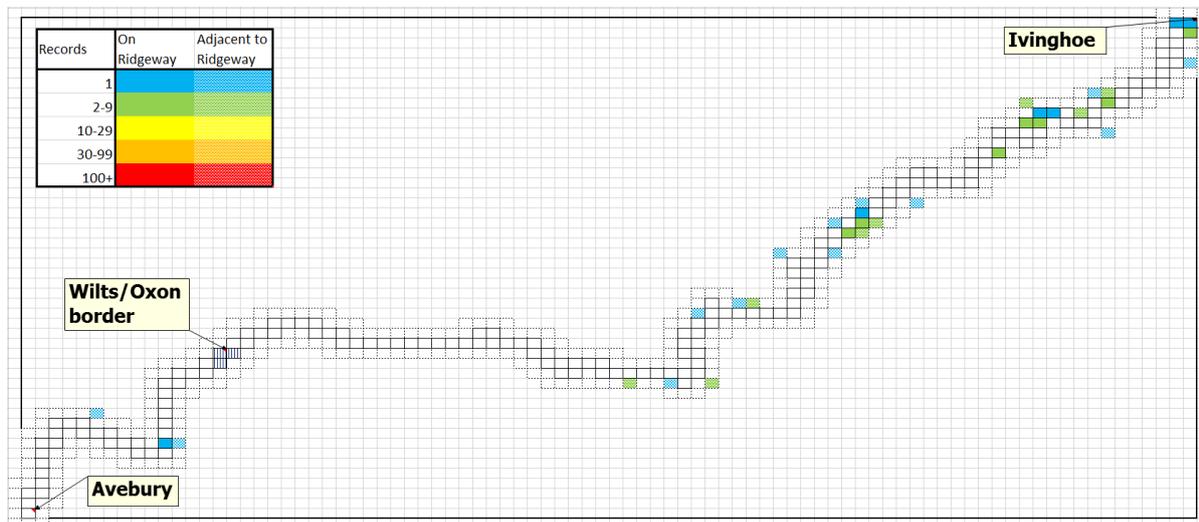
Purple Emperor



Unlike the Wall and the White Admiral, there is no single 1k hotspot for this magnificent species, and records are effectively confined to BeBuOx (there is one record in the Wiltshire part of the Ridgeway). No 1k square has more than 5 records; however, the occupancy map shows two Ridgeway locations where there are three contiguous covering 1k squares with 2-9 records:

- SP8203/SP8204/SP8205. Three squares to the east of Princes Risborough, all in the species diversity hotspot list.
- SP8907/SP8908/SP9008. Three squares to the east of Wendover, including the eastern half of Wendover Woods. Four neighbouring squares also have 2-9 records.

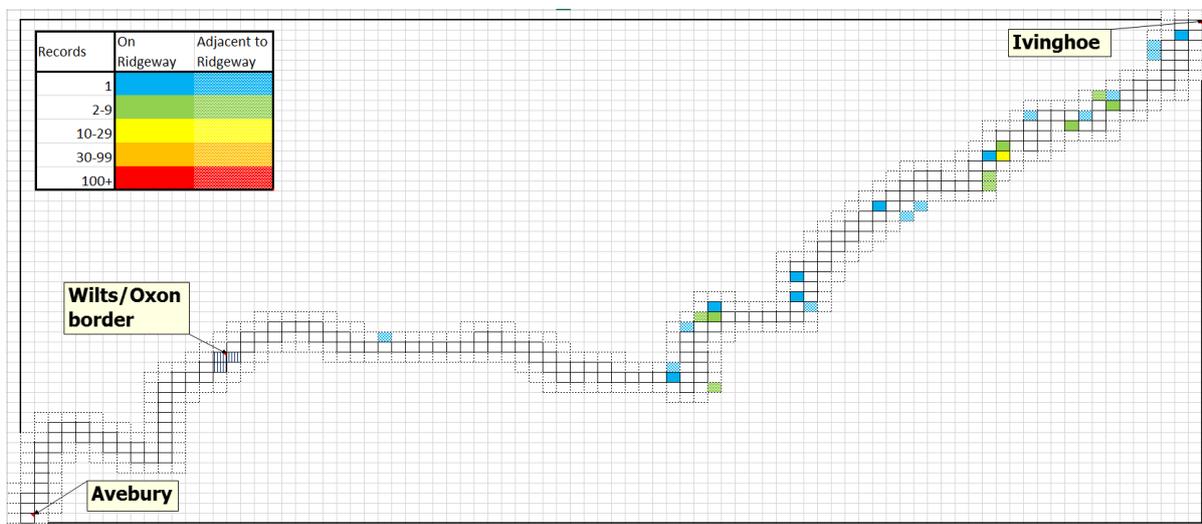
Purple Hairstreak



A similar story to the Purple Emperor. There are two Ridgeway locations with two contiguous 1k squares that have 2-9 records:

- SU7195/SU7296. Shirburn Hill and Aston Rowant NNR. Two neighbouring squares also have 2-9 records.
- SU8406/SU8506. Two squares that jointly accommodate Coombe Hill near Ellesborough. The first square is in the butterfly records hotspot list, and the second is in the species diversity hotspot list.

White-letter Hairstreak



One single 1k square is the place to go to maximise your chances of seeing this elusive species: SP8203. This square, on both the butterfly records hotspot list and the species diversity hotspot, includes Brush Hill and Whiteleaf Hill.

Marsh Fritillary

This endangered species is a true habitat specialist. The occupancy map makes it look as though it occurs in a small number of isolated locations along the Ridgeway, but the waters are muddied for this particular species because of a recent minor and ill-advised vogue for breeding and releasing it in inappropriate locations. It has a very low species occupancy, ranging from 0% to 0.6%, excepting an anomalously high value of 1.8% in 2020. Like the Duke of Burgundy, this species has exacting habitat requirements, and it is very unlikely that there are previously undiscovered sites waiting to be revealed by more recording effort.

One single 1k square is the place to go to try and spot the Marsh Fritillary: SU1476 (Barbury Castle), which has nearly two-thirds of all the Ridgeway records for this species.

