Thirty years of Butterflies in

TRADITIONAL

Lancashire and Cheshire

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PREFACE AND ACKNOWLEDGEMENTS

Regional butterfly atlases proliferate, and new ones keep appearing. One was produced for Lancashire only last year (post-1974 "Lancashire", that is, and also including "North Merseyside"): a beautifully presented little book, which also included some day-flying moths (Marsh & White, 2019). For Cheshire, the last major publication was over twenty years ago (Shaw, 1998).

These regional atlases vary in quality and content, but on the whole they mostly tend to follow the same format. I wanted to try to make this one just that little bit different.

One criticism that has been justly levelled at this kind of work is that it is out-of-date as soon as it is published. Yes, but when a work covers a *specific* past period (or periods) perhaps it is not quite so appropriate to say that it is "out-of-date"?

I started with some basic ideas: first, the Liverpool region did not seem as well surveyed as "my" area around Manchester, and I felt that I could contribute towards redressing this; second, being a staunch supporter of the concept of "Traditional" counties, I wished to rekindle more support for this concept as against the variously interpreted 1974 (and subsequent) entities. I may not have succeeded in bringing this out as well as I envisaged: the entities of "Greater Manchester" and "Merseyside" still insisted on intruding themselves on to my notice.

My original idea was to show the changes in distribution over the first two decades of the 21st century: separate maps for each decade, rather than trying to show the two periods by different-coloured dots on the same map as has been tried in some publications but which unavoidably superimposes one period on the other. As the project developed I felt that the changes were not as apparent as I had expected and that I needed to go back another decade.

A further aim was to show the extent to which the butterflies were able to adapt to changes in the environment: as well as bringing out which were the best sites, I wanted to give some insight into their origins, and what had *made* them the best sites – whether they had evolved naturally, or as a result of man's activities (either intentionally or unintentionally) or abandonment thereof.

I feel that my first-and-foremost acknowledgement must be to the British government, for introducing the concessionary transport pass, which since 2009 has enabled me to travel anywhere in England by bus, and in Greater Manchester also by train and metro, free of charge, from 9.30 a.m. on weekdays and all day at weekends and bank holidays. I am a non-car-owner, very much a supporter of public transport, in spite of its vagaries, and the pass has been an absolute boon – enabling me to reach no end of places to record butterflies and check and photograph sites. Almost all my travel to and around Liverpool and Manchester has been at no cost, using the pass, and indeed I have made quite a number of trips further afield with it including to the Morecambe Bay limestones. (To get to Barrow, however, I had to pay a train fare – it wasn't possible to get quite that far and back in a day by local bus services.)

My thanks go to the other regional co-ordinators for the Butterflies for the New Millennium who supplied records: Laura Sivell for Lancashire excluding the Furness, Stuart Colgate for the Furness and Rupert Adams, also his predecessor Barry Shaw, for Cheshire. Thanks also go to the myriad of individual recorders – far too many to name – who contributed their sightings to the database.

Roger Dennis, although not directly involved in this work, has been my mentor throughout the thirty years covered by this book, from the start introducing me to a whole new world of benign butterfly study, eternities removed from the Victorian "collector" mentality, constantly suggesting new projects, encouraging and assisting me to write short papers for journals, all helping to sustain an impetus for me to see this project through.

I also acknowledge the help given by my son Limmuel Hardy, especially during the final very busy year of recording, 2019, in entering the records on to "MapMate".

The maps in this book have been produced by the DMAP system, designed and marketed by Alan Morton. The photographs in the section on the White-letter Hairstreak in Oldham are by S.B. Smith, all the rest are my own.

P.B.H. 2020

INTRODUCTION

Exactly what constitutes Lancashire and Cheshire? After centuries of uniformity, the position is by no means clear, especially since 1974. Granted there had been some changes prior to that date – indeed since 1888 when the concept of "administrative county" was introduced – such as regarding the spread of Stockport north-west of the river Tame/Mersey as coming into Cheshire or the spread of Manchester southwards through Northenden and Wythenshawe as coming into Lancashire, but these were very minor compared to 1974's shake-up. In that year, Cheshire was distorted by the removal of most of the Wirral peninsula into "Merseyside", the removal of what became parts of "Trafford" and "Stockport" into "Greater Manchester", the removal of the "panhandle" in the extreme north-east of the county into "Derbyshire", and the taking away from Lancashire of the northern parts of what became "Halton" and "Warrington". The post-1974 administrative entity of "Lancashire" bore scant resemblance to the historic county, having lost huge areas around Liverpool and Manchester to "Merseyside" and "Greater Manchester", as well as the above-mentioned "Halton" and "Warrington", an area around Todmorden and the whole of the Furness, and acquired a substantial part of Yorkshire north of Clitheroe. (In this paragraph, the names in inverted commas are the 1974 entities, those without are the historic ones.)

The different interpretations by biological recording organisations as to what should be regarded as "Cheshire" and "Lancashire" are many and varied. One might be forgiven for expecting that the Watsonian Vice-county system introduced in 1852 would be generally adopted, but sadly this does not seem to be the case with Lepidoptera recording. To explain the system briefly: Cheshire equates to VC58; Lancashire covers the whole of two vice-counties, VC59 (South Lancashire) and VC60 (West Lancashire), and also part of VC69 (Westmorland and North Lancashire). The boundary between VC58 and VC59 is the **old** course of the river Mersey, before the construction of the Manchester Ship Canal in 1894; granted this can sometimes cause difficulties in determining which vice-county a record near the ship canal should come under, but there are maps available, such as www.cucaera.co.uk, and the difficulties are certainly not insurmountable. Instead of using the vice-county, however, the "Cheshire" branch of Butterfly Conservation (originally named the "East Cheshire and Peak District" branch, and latterly the "Cheshire and Peak District" branch), currently (2020) purports to cover "Cheshire, Wirral, South Manchester and part of the Peak District", yet treats as its recording area the post-1974 entity of "Cheshire", including the whole of "Warrington" and "Halton", *plus* the Wirral, which since 1974 has come under "Merseyside", but *none* of the post-1974 entity of "greater Manchester"; this interpretation was followed by Shaw (1998). The Cheshire **moth** recorders, however, have always adopted as their area VC58, which is virtually identical to the historic (traditional) county of Cheshire. The "Lancashire" branch of Butterfly Conservation currently (2020) purports to cover "the counties of Lancashire, Northern Greater Manchester and Liverpool", and the maps in the butterfly section of their annual reports show coverage of the post-1974 entities of "Lancashire", "Greater Manchester" and "Merseyside" (though only a few records show in the Wirral portion of "Merseyside"); thus including the parts of VCs 57, 63 and 64 which fall within the

first two of those entities; the moth sections of the same reports, however, are based solely on VCs 59 and 60. Marsh & White (2019) treat "Lancashire" as being the post 1974 entity plus "north Merseyside" – i.e. Merseyside excluding the Wirral.

Hancock (2019), who mentions that recording of Lepidoptera in the UK is usually based on Vice County boundaries as these are stable and unaffected by local government reorganisation, nevertheless maps the Pug-moths of north-west England within a boundary which apparently includes every permutation of "Lancashire" and "Cheshire", including the small bits of VCs 57, 63 (one such part erroneously labelled as "VC64"), 64 and 65, also the whole of VC69 and VC70. In his text he repeatedly refers to "the three counties", though if by this he means historic (traditional) counties the book actually covers four (Cheshire, Lancashire, Westmorland and Cumberland) in their entirety, plus small sections of Derbyshire and Yorkshire; and if he means post-1974 entities, then his book covers five ("Cheshire", "Greater Manchester", "Merseyside", "Lancashire" and "Cumbria"), plus a small section of a sixth ("Derbyshire"), being the Cheshire "panhandle" in the extreme north-east of VC58.

There is a growing body of supporters who believe that the historic counties are an important part of the culture, geography and heritage of the United Kingdom and contend that Britain needs a fixed popular geography, one divorced from the ever-changing names and areas of local government but instead rooted in history, public understanding and commonly held notions of community and identity. "Essentially the Real County is a creation of nature; hills, rivers, mountains, streams provided its boundaries because geography shaped it and history defined it" (Grant, 1996). The traditional (historic) counties of Cheshire and Lancashire date from the time of the Normans; Lancashire has been precisely dated to 1182 ["Wikishire" says "first recorded in 1168 under King Henry II"]; Cheshire may have been created as long ago as the year 920, although its western border was unsettled into the Middle Ages. *"The new county boundaries are solely for the purpose of defining areas of … local government. They are administrative areas, and will not alter the traditional boundaries of counties, nor is it intended that the loyalties of people living in them will change."* (DoE Statement, 1st April 1974, quoted by the Association of British Counties, http://www.gazetteer.org.uk/notes.php, viewed 30.6.2019). The author of the present work is wholly in agreement with these statements and **therefore for the main parts of the book the historic/traditional counties of Cheshire and Lancashire are used.**

The area of traditional Cheshire is 2,678.75 square kilometres (1034.27 square miles), of traditional Lancashire 4,873.75 square kilometres (1,881.76 square miles) (2,977.50 (1,149.62) in VC59, 1,311.50 (506.37) in VC60 and 584.75 (225.77) in VC69).

At the southernmost point of traditional Lancashire is a board explaining how no legislation has ever changed the boundaries of Britain's traditional counties.

The river Mersey is the historic boundary of Lancashire and Cheshire, as this sign on Chester Road/Cross Street at the Sale/Stretford boundary reminds us.

RECORDING

It has become customary for atlases of the butterflies of the whole country to provide maps at 10 km scale, and for regional atlases to be at 2 km (tetrad) level. Scales such as 10 km or 2 km give a good idea of a species's overall distribution within a wide area such as a county which is too large for an intensive analysis, but they have their limitations. Mapping to even 1 km scale has disadvantages as it does not define accurately what percentage of a given area could provide suitable habitat for a species: a number of adjacent squares bearing a presence symbol can give the entirely false impression that the species occurs continuously all though the area. On the other hand, if using a smaller scale, say 100 m, there is the problem that unless one has a great deal of time to monitor the whole of the area very regularly and intensively, many of the squares will show blanks, and it will not be obvious whether this is due to there being no butterflies in them, or to their not having been visited sufficiently to produce an accurate record. Three scales have been tried in this book: the popular tetrad scale for the traditional counties of Lancashire and Cheshire, the 1 km scale for the post-1974 entities of Merseyside and Greater Manchester, and 100 m scale for maps of 6 x 5 km zones around the city centres of Manchester & Salford and Liverpool.

As an example of what an even finer scale of mapping can show, the results of a detailed survey of the Speckled Wood *Pararge aegeria* in 2008 (period 2) have been included: such a scale of mapping is only feasible in a small area (in this case, a woodland of 14 hectares in Sale, SJ7992), and even in a site of this size it can be unclear whether the density (or absence) of records at any specific location is due to the relative abundance of the butterfly or to the frequency of visits by the recorder.

This book covers three ten-year periods: 1990 to 1999 (period 1), 2000 to 2009 (period 2) and 2010 to 2019 (period 3). Each period is mapped separately, so that changes in distribution of any given species are apparent – though here perhaps there should be a word of caution: each map covers ten years, and so the maps of period 3 do not necessarily give an accurate picture of any species's distribution at the end of the recording period. That actual end distribution is unlikely to be more extensive than shown on the map, but it could well be less: the High Brown Fritillary *Argynnis adippe* is, sadly, a case in point.

During the whole of this time the author has acted as regional record co-ordinator for Greater Manchester in the Butterfly Conservation society's "Butterflies for the New Millennium" recording scheme, which accepts records of all butterflies and since 2001 has periodically published nationwide distribution atlases. Regarding survey methods, the aim in the present book has been to move away from the "transect" mentality with its rigid rules and to encourage recorders to note all the butterflies seen wherever they go. The author well remembers an occasion in 2009 when a well-meaning retired butterfly-conservationist was trying to set a transect up in the Mersey Valley; noticing that the intended participants, having been given a slide-show depicting far too many butterfly species including many that do not occur anywhere near the Valley, and having listened to the conservationist's detailed explanation of exactly what stipulations were involved in the transect scheme, were

rather flagging in their attention and clearly suffering from what might be described as an "information overload", the author made a suggestion that it might be better to break the rules and get at least some records from potential observers rather daunted by too much rigidity; this suggestion met with a resounding NO from the conservationist. It was not too much of a surprise that the intended transect did not get established. Under the scheme, a walk is only supposed to be made when the ambient temperature, insolation and wind speed are within specified limits, and the transect-walker is supposed to stick rigidly to the fixed route, not divert to the side to investigate any adjacent potentially good nearby locations, to keep moving, and only to note butterflies within 2½ metres either side or 5 metres in front of him.

A transect, however well planned, will often miss nearby sites that are as good if not better. Over the season, the locations where most butterflies will be seen vary immensely: a site very good for spring species such as the Orange-tip *Anthocharis cardamines* may well not have suitable grassland for the Satyrines and Hesperiids of high summer, nor the nectar sources (buddleias for instance) which attract the Nymphalines in late summer/early autumn. Very often, stopping for a closer look in a likely location will reveal far more butterflies than would be noticed by just walking through; and often on a day of intermittent sunshine and cloud waiting a few minutes in a likely spot for a cloud to pass can make quite a difference. To stand any chance of seeing the tree-dwelling Hairstreaks, it is essential to stop by suitable trees and scan them thoroughly. A much wider approach to recording than just the transect system is required for the production of a work such as this book.

Other butterfly recording schemes which currently have their place in our country include the "wider countryside" scheme, under which observers select a set route, rather similar to a transect but in a less potentially productive location, and walk it twice during the peak butterfly season, and also the "big butterfly count", under which members of the general public, often with very little entomological experience, attempt to record butterflies in a place of their choice – often a garden – in July and August. No doubt these schemes have their value, but they also have limitations: for example, *A. cardamines*, which has one annual brood in April and May, misses being recorded at all in either of them. Large numbers of records of easily visible butterflies in gardens and similar places in a small section of the year will distort the apparent distribution of the species, implying that it occurs more in unnatural gardens than in its natural breeding habitats. Although some gardens (especially overgrown neglected ones) certainly are of some value as butterfly habitats, most gardens frankly are not; most if not all butterflies seen in any garden will be just passing through; occasionally some may breed in a garden but such usually will be very much in a minority compared with those that breed elsewhere and a garden is unlikely to maintain a significant proportion of a population for any length of time. The author accepts that when making a recording walk through any given area and aiming to cover a cross-section of habitats, the recording in suburbs is not as easy as in open countryside and a large proportion of a suburban area may comprise back gardens in which there may be overlooked habitat; the larger the gardens, the greater the proportion of the area which it is impossible to survey, but even so he feels that the vast majority of the butterflies seen in gardens have been drawn into them seeking nectar sources or are on passage, and have bred elsewhere,

and his observations in this survey bear this out. Year-round records from an individual garden give the false impression that those butterfly species which frequently come into gardens, especially the large Nymphalids, are much commoner than they actually are in relation to other species which tend to remain in the breeding habitat.

An idea was once propounded to the author (by R.I. Brown of the Manchester Wildlife group, in 1993) that butterflies which are obviously not in their breeding habitat should not be recorded at all; this also of course referred to those records in city centres and other densely built-up areas which were clearly wanderers out of breeding habitat. The author can understand the reasoning behind this argument, but without agreeing with it, and it has not been followed in this work; all reported butterfly sightings have been included unless it is felt likely that they were misidentifications. In the opinion of the author, a location where adult butterflies obtain nutrition is just as much a part of the resource-based habitat of the species as the location where its caterpillars fed, even though it may be nowhere near the latter and in quite a different environment – for example, self-seeded buddleias growing wild in an industrial area close to a city centre. Brown's argument could be seen as relevant to individual butterflies which are obviously "on passage", flying through somewhere with no obvious resources for either larval or adult feeding; such records however may yet be of value as they can give an idea of the species's mobility. The Small White *Pieris rapae* is an example of a species very frequently seen moving through districts which do not appear to be suitable habitat.

Regarding the accuracy of records: butterfly recorders are normally asked to give six-figure grid references if possible, or four-figure if not. This is, however, interpreted in different ways by different recorders. If giving a six-figure reference, logically it should surely be the reference of the actual hectare in which the butterfly was seen. With readily available GPS machines, or "apps" such as "Irecord", that should not be difficult; yet quite a few observers submit whole long lists of sightings all at exactly the same six-figure reference – and even, yes, some observers at Martin Mere have submitted long lists all at the same TEN-figure reference! These references are usually "centroids" – implying that the butterflies were somewhere within the clearly delineated site – nature reserve, park, site-of-biological-importance or whatever, of which the quoted reference is the mid-point. There is even one natural-history society which insists, even when a recorder gives the exact grid reference where the butterfly was seen, on "snapping" the record to the nearest point – nature reserve or whatever – already on their database. Records of these types are unlikely to have caused much effect on the tetrad and 1 km scale maps, but they will clearly affect maps at 100 m scale. It is appreciated that not all recorders are able to concentrate on butterfly recording to the extent that the present author does. Quite a number of contributing recorders are primarily bird-watchers, to whom butterflies are a sideline: whilst looking with binoculars for birds, identifying them and recording them, it probably can not reasonably be expected that a recorder will be able to note down the exact six-figure reference for any butterfly seen in passing. In such cases, however, one would hope for a record giving the correct four-figure reference. The idea of using "centroid" grid references appears to have arisen from bird-watching organisations, but is far from ideal when recording butterflies. At the

other extreme, some recorders, probably using systems such as "Irecord Butterflies", have in recent years been giving references to eight or even ten figures; these however tend to make the database too bulky and are best simplified to six figures.

A point has been made that GPS machines are heavy on batteries. Even so, the author very strongly recommends them, and always uses rechargeable batteries. On occasions when the batteries have run out during a recording walk, his contingency method is to note down in his recording notebook an indication of the site – for example, a street name, or approximate distance from nearest readily identifiable landmark – to enable him to pin-point the location on an Ordnance Survey map and obtain a six-figure reference that way. A very good web-site for doing this "on-line" is www.cucaera.co.uk, mentioned above in connection with the vice-counties.

Annual published reports, for both Lancashire and Cheshire, have regularly mentioned "high counts" of particular species. To quote an extreme example, on 19th July 2006, 1,638 (one thousand six hundred and thirty-eight) Gatekeepers *Pyronia tithonus* were allegedly recorded at the grid reference SJ652881. This reference is in Woolston Eyes, in the section known as "no. 3 bed", which is accessible only to permit-holders in possession of a key to a locked gate on a footbridge leading over a section of the old course of the Mersey. The Lancashire and Cheshire database contains 271 records of 200 or more of a given species at a six-figure reference in periods 2 and 3; 16 of these are of 1,000 or more. Suffice it to say here that the highest number of any given butterfly species that the author has **ever** recorded in a given 100 m square in Lancashire/Cheshire was 119 (*Vanessa cardui*, during the exceptional abundance of that species in 2019, at SJ353924 in a woodland containing Buddleia near Everton Park in Liverpool on 1st August), and after that his largest count was 68 (*Maniola jurtina* at SJ378904 in the "Innovation Park", Liverpool in 2019). The references given by other recorders for high counts presumably must be centroids, and it is clearly rather subjective as to where the boundaries of the site of which the grid reference is the centroid come. Turning again to the above extreme example of SJ652881, Woolston Eyes, including the contiguous site of Butchersfield, covers approximately three hundred and fifty hectares, not just one. On the 3rd of August 2019, a reliable recorder who follows our recommended method of recording exact six-figure references visited the site; he was unable to enter no. 3 bed, but did manage to work around most of nos. 1, 2 and 4 beds; the total number of *P. tithonus* which he noted at the entire site was 70, and the highest in any individual 100 m square was 6. It should also be borne in mind that it is exceedingly difficult to give an accurate total of numbers at a site, owing to the difficulty in knowing whether the butterfly which the observer has just seen is one which has already been counted or a different one.

When recording numbers of butterflies seen at a site, there are different levels of accuracy. The "Levana" recording system used only to allow for one of a range of values to be entered: "A" for a single butterfly, "B" for 2-9, "C" for 10-29, "D" for 30-99 and "E" for 100 of more; fortunately, the system was enhanced after a few years so that it became possible to enter the actual number, but some users preferred to carry on using the letter codes; in converting these to figures the usual approach was to assume the lowest value in the range, but this could considerably understate

the true number. A feature in the "MapMate" recording programme is to enter "Present" instead of a number, but when this is done and the record is exported, the value comes out as "0"; even worse is when one of the other alternative categories, referred to as "DAFOR" (dominant, abundant, frequent, occasional, rare) is entered, the export comes out with a NEGATIVE value!

Some recorders stick to exactly the same site or "transect" year after year; others try to cover different locations; others are somewhere in between. There is, and no doubt will be as long as recording is practised, a tendency to gravitate to well-known "good" butterfly sites, with a view to seeing or photographing as many "good" species as possible – yes the author has been guilty of this – but when making an intensive survey of any given area, such as the 6 X 5 km inner-city regions, it is preferable that as complete a coverage as practicable is achieved, of unlikely as well as likely biotopes. There is a lot to be said for looking at a map, deciding from it which areas do not seem to have been covered very well, and making a point of visiting just those areas.

Clearly there will be some difficulties. As already stated, many big gardens in housing areas, especially in affluent districts, present a considerable amount of space which it is impracticable to survey completely and the best that can be taken is a sample, when recorders live in the area, or from such of the gardens as are visible from the roads. Some large tracts of open countryside in private ownership are inaccessible or of very limited access; the vast expanse of Knowsley Park is a prime example. On the whole, however, we are very fortunate in so far as there are so many public footpaths and open spaces with public access.

Sometimes there is a problem in deciding whether an unusual record is really genuine, as when a single example of an unusual species is seen in a location where it has never been recorded before and where it does not seem to belong. It is possible that someone may have been breeding the species and releasing the butterflies, or they might have escaped from captivity; the occurrence of the Milkweed butterfly *Danaus plexippus* in Rochdale cemetery in 2017 is a case in point. In this book, we have tended to include such records, but mention in the text that they might not be genuine vagrants.

Newman (1967), discussing rare migrants, remarked: "One is apt to overlook that these official records, although so painstakingly collected, can never give a precise picture of the magnitude of any migration, as for every insect recorded by an entomologist there must be hundreds, if not thousands, which are never noticed". Not everyone seems to realise this, though upon a moment's reflection it clearly makes sense. The maxim is also true when recording resident species: the most detailed and thorough recording can only note a very small percentage of the whole; when one is busy recording in any particular location, just think how many butterflies there are which one does not see simply because they are in other locations, and with the best will in the world there is a limit to how many locations one can manage to visit during the brief flight period of any given butterfly species. Much can also depend on the suitability of the weather and other conditions on the day when one visits a particular site. Calm, warm, sunny days are generally thought of as ideal; however,

there are exceptions. Sometimes a day when a spell of bright sunshine, even of fairly short duration, follows rain can give excellent results, as the butterflies emerge from shelter and take wing as they warm up to the threshold temperature for flight activity. Conversely, a seemingly favourable day can be unexpectedly disappointing: on the 12th of May 2018, the author visited Warton Crag, arguably the optimum butterfly site in the whole of the two counties, in seemingly suitable weather, sunny and calm although not that hot, and recorded the grand total of FIVE butterflies – two Green-veined Whites *Pieris napi*, one Orange-tip *Anthocharis cardamines* and two Speckled Woods *Pararge aegeria*; this was perhaps exceptional but it does show that results are not always as expected and lack of records at a site on a particular day does not mean that butterflies do not occur there. Even the direction in which one walks can make a difference: it is appreciably easier to see butterflies when the sun is behind the observer and the vegetation ahead and to the sides is in full illumination than when proceeding in the reverse direction, into the sun.

Once in the 1990s, a new recorder (a bird-watcher starting to take an interest in butterflies as a sideline) explained when submitting his first records that he had not included any "Whites" (Pierids) because he felt sure that they were found everywhere. In reply, it was gently impressed upon him the need to record ALL species – it is clearly impossible to state whether a species is or is not ubiquitous if there are no records for it.

The "Butterflies for the New Millennium" recording scheme was intended as a single central point to which ALL British butterfly records should go, and the regional co-ordinators were appointed to ensure that every available source was contacted and all records checked and collated before submission to the scheme's headquarters. Initially this worked very well. The Butterflies for the New Millennium also started passing records to the National Biodiversity Network, "a collaborative partnership created to exchange biodiversity information. It is a charity, with a membership including many UK wildlife conservation organisations, government, country agencies, environmental agencies, local environmental records centres and many voluntary groups". With time, however, the inevitable changes occurred; more and more different recording organisations started up; recorders came and went – the majority only submitted records for a few years and extremely few recorded during all three periods; new recorders submitted records to different places; sometimes records submitted to one local centre did not correspond with what were supposedly the same records submitted to another such centre; systems were introduced such as "Irecord", where records went straight to the Butterfly Conservation society's headquarters without going through the local co-ordinator (the idea was that such records would eventually be "repatriated" to the local co-ordinator, but that did not happen until quite some time later); there were delays in entering records ... for this book, in addition to the Lancashire, Cheshire and Lake District "Butterflies for the New Millennium" co-ordinators, we acknowledge records held by the Greater Manchester Local Record Centre, Merseyside BioBank, Lancashire Environment Record Network, Lancashire Wildlife Trust Dataset, and even some bird-watching societies.

The following table lists, as far as can be determined, the actual number of records of each species in each year in Lancashire and Cheshire (not in VC57 or 63) during the period covered by this book. The second column gives the actual number of recorder days: any day on which any recorder noted one or more butterflies counts as 1.

YEAR	REC/ DAYS	1526	1527	1531	1532	1534	1539	1539a	1541	1545
1990	***1063***	749	0	835	204	0	0	0	0	1
1991	***1278***	566	0	752	38	0	0	0	0	0
1992	***2693***	1302	0	2145	302	0	0	0	0	774
1993	***3034***	1211	0	1738	188	0	0	0	0	10
1994	***5204***	3642	0	3471	245	0	0	0	0	69
1995	***6343***	4427	0	3706	83	0	0	0	0	11
1996	***6501***	4965	0	1588	209	0	0	0	0	64
1997	***6473***	2636	0	1469	370	18	0	0	0	1
1998	***6166***	2335	0	832	679	24	0	0	2	182
1999	***7052***	2718	0	912	332	5	0	0	0	3
2000	***7387***	4166	0	1244	348	0	1	0	0	515
2001	***6805***	2980	0	1066	258	0	0	0	0	8
2002	***7890***	2939	0	1749	391	2	0	0	0	19
2003	***9360***	2910	0	1917	365	0	0	0	0	22
2004	***6951***	2328	0	1429	385	0	1	0	0	12
2005	***6477***	3072	0	1782	204	0	0	0	0	62
2006	***8247***	3452	0	2644	222	0	0	0	0	503
2007	***6833***	1173	0	1453	224	0	0	0	0	1
2008	***5645***	1248	0	878	254	0	0	0	0	2
2009	***7426***	2918	0	1627	396	0	0	0	0	47
2010	***7281***	2865	0	3261	528	0	0	0	0	5
2011	***8981***	2683	0	3109	474	0	0	0	0	12
2012	***7309***	3061	0	1487	304	0	0	0	0	1
2013	***9287***	9934	0	4323	423	0	1	0	0	9
2014	***10841***	8119	0	5030	491	0	0	1	0	89
2015	***9473***	6282	0	4267	331	0	0	0	0	12
2016	***7750***	2780	0	2926	721	0	0	0	0	1
2017	***8900***	3108	0	1679	325	0	0	0	0	4
2018	***11407***	4103	5	2405	701	0	0	0	0	4
2019	***12813***	5529	11	1910	557	0	0	0	0	16

1526 *Thymelicus sylvestris*
1527 *Thymelicus lineola*
1531 *Ochlodes sylvanus*
1532 *Erynnis tages*
1534 *Pyrgus malvae*
1539 *Papilio machaon*
1539a *Papilio glaucus*
1541 *Leptidea sinapis*
1545 *Colias croceus*

YEAR	REC/ DAYS	1546	1549	1550	1551	1553	1555	1556	1557	1558
1990	***1063***	75	1112	1034	2343	1106	269	0	35	12
1991	***1278***	41	1208	1162	1238	819	266	0	22	4
1992	***2693***	323	4082	3058	3483	1613	354	0	211	6
1993	***3034***	326	2511	2192	2773	2807	857	0	89	5
1994	***5204***	320	5187	5861	4321	4278	502	0	211	14
1995	***6343***	258	7088	14580	7195	3090	594	0	151	61
1996	***6501***	613	4632	7340	5741	3470	372	0	451	68
1997	***6473***	1012	5978	6867	6701	2746	1215	0	197	61
1998	***6166***	929	5838	4116	5649	2287	556	0	139	42
1999	***7052***	783	5628	4746	5155	2193	313	0	164	30
2000	***7387***	1226	5945	4962	5408	2331	758	0	156	101
2001	***6805***	810	4710	4395	3604	1579	203	0	111	122
2002	***7890***	1126	6138	4675	4140	2551	823	0	187	113
2003	***9360***	1347	10939	11490	10936	2658	1098	0	160	134
2004	***6951***	1419	5668	5294	6273	3116	630	0	178	105
2005	***6477***	1299	7739	6986	6187	2314	532	0	297	340
2006	***8247***	1351	5337	8596	4378	2763	1311	0	628	494
2007	***6833***	1492	3730	6094	4284	2873	941	0	101	132
2008	***5645***	781	6117	5363	6861	1576	506	0	246	66
2009	***7426***	1223	13494	8337	10925	2974	815	0	335	135
2010	***7281***	1317	5083	6091	9630	2524	1268	0	378	193
2011	***8981***	1400	6839	8058	11558	4038	1956	0	685	189
2012	***7309***	604	3364	4430	8204	2132	477	0	236	121
2013	***9287***	1446	14651	27452	16594	2315	344	0	483	319
2014	***10841***	2539	4968	7599	11644	4051	1287	0	547	377
2015	***9473***	2329	4044	4842	4906	2671	475	1	326	392
2016	***7750***	1671	5245	6508	5656	2782	498	20	280	203
2017	***8900***	1327	5676	7431	6792	3247	384	15	367	409
2018	***11407***	1467	17502	28705	11253	4066	542	12	1337	1010
2019	***12813***	1951	10395	22137	6017	5702	1303	26	441	357

1546 *Gonepteryx rhamni*
1549 *Pieris brassicae*
1550 *Pieris rapae*
1551 *Pieris napi*
1553 *Anthocharis cardamines*
1555 *Callophrys rubi*
1556 *Thecla betulae*
1557 *Favonius quercus*
1558 *Satyrium w-album*

Records from the early years of the "Levana" system, where they were entered as "A", "B", "C", "D" or "E", have been counted as the minimum quantity in each category, i.e. as 1, 2, 10, 30 or 100 individuals respectively; this will understate the true total, but is unavoidable. Records on "MapMate" shown as "Present", or any other records with no quantity given, have been counted as 1.

YEAR	REC/ DAYS	1561	1567	1567a	1569	1571	1572	1573	1574	1580
1990	***1063***	468	0	0	2	0	0	739	1017	145
1991	***1278***	593	0	0	3	0	0	30	1217	146
1992	***2693***	1359	0	0	0	0	0	1220	3831	702
1993	***3034***	772	0	0	0	0	0	812	3267	496
1994	***5204***	1550	0	0	0	2	0	1446	4171	283
1995	***6343***	2714	1	0	0	360	0	506	4709	154
1996	***6501***	2880	0	0	0	461	0	325	5442	439
1997	***6473***	1784	0	0	0	740	0	762	5003	779
1998	***6166***	743	0	0	0	92	0	450	2863	2292
1999	***7052***	702	0	0	0	74	0	491	3293	1406
2000	***7387***	775	0	0	0	77	0	629	3771	672
2001	***6805***	539	0	0	0	444	0	299	3506	535
2002	***7890***	420	0	0	0	214	0	542	3805	798
2003	***9360***	1774	0	0	0	162	0	662	7034	809
2004	***6951***	1245	0	0	0	5	0	170	5081	1255
2005	***6477***	1057	0	0	0	0	0	287	4492	987
2006	***8247***	1832	1	0	0	0	0	254	5863	1641
2007	***6833***	815	0	0	0	0	0	69	2339	1417
2008	***5645***	638	0	0	0	0	0	201	2106	1358
2009	***7426***	1350	0	0	0	0	0	400	5448	603
2010	***7281***	2490	0	1	0	0	0	446	6313	726
2011	***8981***	1973	0	0	0	0	0	384	3871	1242
2012	***7309***	1320	0	0	0	0	0	90	3228	975
2013	***9287***	2226	0	0	0	0	0	494	6488	341
2014	***10841***	1607	0	0	0	0	0	366	4732	813
2015	***9473***	1164	0	0	0	0	0	542	3872	1009
2016	***7750***	876	0	0	144	0	0	318	2542	845
2017	***8900***	856	0	0	101	0	0	125	3377	1408
2018	***11407***	3870	1	0	297	0	1	191	7752	2787
2019	***12813***	1389	0	0	290	0	0	228	5952	1514

1561 *Lycaena phlaeas*
1567 *Lampides boeticus*
1567a *Cacyreus marshalli*
1569 *Cupido minimus*
1571 *Plebejus argus*
1572 *Aricia agestis*
1573 *Aricia artaxerxes*
1574 *Polyommatus icarus*
1580 *Celastrina argiolus*

Records of eggs, larvae and pupae count as just one record regardless of how many were seen.

YEAR	REC/ DAYS	1582	1584	1590	1591	1593	1594	1596	1597	1598
1990	***1063***	3	0	787	278	3830	0	0	1542	346
1991	***1278***	0	0	489	200	2236	0	0	665	402
1992	***2693***	18	0	2712	846	5147	0	0	2881	764
1993	***3034***	38	0	1165	64	3821	0	0	2188	376
1994	***5204***	49	0	4803	824	3805	0	0	3232	557
1995	***6343***	37	0	10393	889	14078	0	18	3872	1128
1996	***6501***	25	0	6056	29276	15815	0	2	8123	1104
1997	***6473***	50	0	2735	152	18760	0	0	9769	1486
1998	***6166***	50	0	2254	280	5587	0	0	6490	884
1999	***7052***	23	0	3656	147	2921	0	0	5381	1329
2000	***7387***	48	0	5984	1834	4247	0	1	7876	2435
2001	***6805***	2	0	3895	337	5721	0	0	9909	1794
2002	***7890***	25	0	2881	1138	10236	1	1	10214	1844
2003	***9360***	31	0	10746	7836	21844	0	1	7766	3665
2004	***6951***	48	1	2155	1962	7867	0	0	6332	1712
2005	***6477***	22	0	3521	185	4403	0	3	6725	1377
2006	***8247***	16	5	10602	4253	17204	0	2	12292	3941
2007	***6833***	57	0	3238	822	7504	0	0	10755	2207
2008	***5645***	55	0	3230	68	1975	0	0	5022	1674
2009	***7426***	21	0	5244	17599	4012	0	0	9085	2885
2010	***7281***	57	0	3121	310	10885	0	1	10186	2466
2011	***8981***	59	0	6707	307	12185	0	0	8644	2492
2012	***7309***	25	0	1790	119	12615	0	0	8233	1702
2013	***9287***	51	0	2935	347	20342	0	0	19328	2751
2014	***10841***	45	0	7207	485	13169	0	1	14856	2737
2015	***9473***	57	0	5989	1079	10312	0	1	9928	2876
2016	***7750***	70	0	4349	1445	5343	0	2	4196	2022
2017	***8900***	36	0	14432	863	4135	0	0	4405	4055
2018	***11407***	95	0	4356	1419	4268	0	1	7466	3550
2019	***12813***	35	0	18863	69130	13997	0	0	31163	5190

1582 *Hamearis lucina*
1584 *Limenitis camilla*
1590 *Vanessa atalanta*
1591 *Vanessa cardui*
1593 *Aglais urticae*
1594 *Nymphalis polychloros*
1596 *Nymphalis antiopa*
1597 *Aglais io*
1598 *Polygonia c-album*

YEAR	REC/ DAYS	1600	1601	1606	1607	1608	1610	1614	1615	1617
1990	***1063***	587	708	458	12	0	0	620	1458	0
1991	***1278***	233	100	109	20	0	0	961	997	0
1992	***2693***	909	907	1452	160	1	0	1304	2837	0
1993	***3034***	787	1155	665	121	0	0	936	1683	0
1994	***5204***	999	1017	1524	158	0	0	2853	2121	2
1995	***6343***	496	736	598	145	2	0	4208	1467	0
1996	***6501***	571	790	821	333	1	0	3075	1871	0
1997	***6473***	326	1396	1765	168	9	0	3729	1358	0
1998	***6166***	178	909	678	27	5	0	4266	2269	0
1999	***7052***	222	308	455	24	2	0	9959	1881	0
2000	***7387***	274	309	341	59	66	0	9902	1876	0
2001	***6805***	117	83	189	33	29	0	7437	1219	0
2002	***7890***	268	629	447	33	36	1	9755	1069	0
2003	***9360***	247	646	1163	201	141	0	18322	1314	0
2004	***6951***	334	771	778	147	18	0	10392	1424	0
2005	***6477***	256	416	552	164	12	0	14594	1256	21
2006	***8247***	120	213	877	256	44	0	12209	849	0
2007	***6833***	161	153	419	259	18	0	9707	232	2
2008	***5645***	190	263	356	248	2	0	10044	329	1
2009	***7426***	429	188	815	367	15	0	13991	542	0
2010	***7281***	488	243	899	634	7	0	9989	416	0
2011	***8981***	385	227	433	248	7	0	11719	202	0
2012	***7309***	84	50	54	161	8	0	5979	158	0
2013	***9287***	345	72	262	421	91	0	10751	462	0
2014	***10841***	489	102	70	288	111	0	17717	745	0
2015	***9473***	320	76	50	255	147	0	12537	421	0
2016	***7750***	388	181	22	239	14	0	12164	416	0
2017	***8900***	373	104	9	305	9	0	9098	409	0
2018	***11407***	1030	111	2	259	17	0	13558	604	6
2019	***12813***	629	123	3	281	37	0	13927	339	0

1600 *Boloria selene*
1601 *Boloria euphrosyne*
1606 *Argynnis adippe*
1607 *Argynnis aglaja*
1608 *Argynnis paphia*
1610 *Euphydryas aurinia*
1614 *Pararge aegeria*
1615 *Lasiommata megera*
1617 *Erebia epiphron*

YEAR	REC/ DAYS	1618	1620	1621	1625	1626	1627	1628	1629	1630
1990	***1063***	0	0	355	827	5395	949	2	1	0
1991	***1278***	0	0	260	1193	3364	556	8	0	0
1992	***2693***	0	1	1558	3442	14224	1587	48	1	0
1993	***3034***	2	0	511	2085	9000	1229	58	1	0
1994	***5204***	0	1	709	5074	17884	1738	8	0	0
1995	***6343***	0	0	1266	6999	22253	1133	90	0	4
1996	***6501***	0	0	377	13181	20891	1322	82	0	0
1997	***6473***	0	0	249	5289	11983	1199	53	8	0
1998	***6166***	0	0	253	4600	11172	1068	1	39	0
1999	***7052***	0	0	620	7646	19106	966	53	37	0
2000	***7387***	2	0	641	9383	20710	1290	149	38	0
2001	***6805***	2	0	612	10338	20703	2795	28	2	0
2002	***7890***	0	0	597	9858	18760	1066	216	387	0
2003	***9360***	0	1	564	18730	30686	1403	263	47	0
2004	***6951***	1	0	187	14252	19347	1142	180	558	0
2005	***6477***	6	2	214	14371	21650	926	43	227	0
2006	***8247***	0	0	611	18678	27345	896	238	320	0
2007	***6833***	0	0	113	6139	10079	677	30	326	0
2008	***5645***	0	0	161	8674	17114	675	6	340	0
2009	***7426***	1	0	531	14605	29961	1746	66	901	0
2010	***7281***	0	0	657	11608	22183	2361	232	723	0
2011	***8981***	0	0	708	12651	19307	1730	51	1803	0
2012	***7309***	0	1	309	11127	19636	692	12	1256	0
2013	***9287***	0	0	806	19366	39776	2095	83	4013	1
2014	***10841***	0	0	338	15539	35227	2101	76	5878	0
2015	***9473***	0	0	203	17397	33056	1631	63	6890	0
2016	***7750***	0	0	758	7874	14187	1445	144	5797	3
2017	***8900***	0	0	403	7913	14377	1592	158	4919	5
2018	***11407***	0	0	306	10344	18638	2975	402	7715	0
2019	***12813***	0	0	390	16326	31586	2072	217	9292	0

1618 *Erebia aethiops*
1620 *Melanargia galathea*
1621 *Hipparchia semele*
1625 *Pyronia tithonus*
1626 *Maniola jurtina*
1627 *Coenonympha pamphilus*
1628 *Coenonympha tullia*
1629 *Aphantopus hyperantus*
1630 *Danaus plexippus*

The following table is an attempt to even out the recorder bias and approach nearer to true figures of abundance changes. The actual records for each year have been multiplied by 7000 (the average number of recorder-days per year) and divided by the actual number of recorder-days, then the results have been rounded to one significant figure. The table thus aims to show the *relative abundances* of the species, *not* the actual numbers seen.

YEAR	1526	1527	1531	1532	1534	1539	1539a	1541	1545	1546	1549
1990	5000	0	5000	1000	0	0	0	0	7	500	7000
1991	3000	0	4000	200	0	0	0	0	0	200	7000
1992	3000	0	6000	800	0	0	0	0	2000	800	10000
1993	3000	0	4000	400	0	0	0	0	20	800	6000
1994	5000	0	5000	300	0	0	0	0	90	400	7000
1995	5000	0	4000	90	0	0	0	0	10	300	8000
1996	5000	0	2000	200	0	0	0	0	70	700	5000
1997	3000	0	2000	400	20	0	0	0	1	1000	6000
1998	3000	0	1000	800	30	0	0	2	200	1000	7000
1999	3000	0	1000	300	5	0	0	0	3	800	6000
2000	4000	0	1000	300	0	1	0	0	500	1000	6000
2001	3000	0	1000	300	0	0	0	0	8	800	5000
2002	3000	0	2000	300	2	0	0	0	20	1000	5000
2003	2000	0	1000	300	0	0	0	0	20	1000	8000
2004	2000	0	1000	400	0	1	0	0	10	1000	6000
2005	3000	0	2000	200	0	0	0	0	70	1000	8000
2006	3000	0	2000	200	0	0	0	0	400	1000	5000
2007	1000	0	1000	200	0	0	0	0	1	2000	4000
2008	2000	0	1000	300	0	0	0	0	2	1000	8000
2009	3000	0	2000	400	0	0	0	0	40	1200	10000
2010	3000	0	3000	500	0	0	0	0	5	1300	5000
2011	2000	0	2000	400	0	0	0	0	9	1100	5000
2012	3000	0	1000	300	0	0	0	0	1	600	3000
2013	7000	0	3000	300	0	1	0	0	7	1000	10000
2014	5000	0	3000	300	0	0	1	0	60	2000	3000
2015	5000	0	3000	200	0	0	0	0	9	2000	3000
2016	3000	0	3000	700	0	0	0	0	1	2000	5000
2017	2000	0	1000	300	0	0	0	0	3	1000	4000
2018	3000	3	1000	400	0	0	0	0	2	900	10000
2019	3000	6	1000	300	0	0	0	0	9	1000	6000

1526 *Thymelicus sylvestris*, 1527 *Thymelicus lineola*, 1531 *Ochlodes sylvanus*, 1532 *Erynnis tages*, 1534 *Pyrgus malvae*, 1539 *Papilio machaon*, 1539a *Papilio glaucus*, 1541 *Leptidea sinapis*, 1545 *Colias croceus*, 1546 *Gonepteryx rhamni*, 1549 *Pieris brassicae*

YEAR	1550	1551	1553	1555	1556	1557	1558	1561	1567	1567a	1569
1990	7000	20000	7000	2000	0	200	80	3000	0	0	10
1991	6000	7000	4000	2000	0	100	20	3000	0	0	20
1992	8000	9000	4000	900	0	500	20	4000	0	0	0
1993	5000	6000	6000	2000	0	200	10	2000	0	0	0
1994	8000	6000	6000	700	0	300	20	2000	0	0	0
1995	20000	8000	3000	700	0	200	70	3000	1	0	0
1996	8000	6000	4000	400	0	500	70	3000	0	0	0
1997	7000	7000	3000	1000	0	200	70	2000	0	0	0
1998	5000	6000	3000	600	0	200	50	800	0	0	0
1999	5000	5000	2000	300	0	200	30	700	0	0	0
2000	5000	5000	2000	700	0	100	100	700	0	0	0
2001	5000	4000	2000	200	0	100	100	600	0	0	0
2002	4000	4000	2000	700	0	200	100	400	0	0	0
2003	9000	8000	2000	800	0	100	100	1000	0	0	0
2004	5000	6000	3000	600	0	200	100	1000	0	0	0
2005	8000	7000	3000	600	0	300	400	1000	0	0	0
2006	7000	4000	2000	1000	0	500	400	2000	1	0	0
2007	6000	4000	3000	1000	0	100	100	800	0	0	0
2008	7000	9000	2000	600	0	300	80	800	0	0	0
2009	8000	10000	3000	800	0	300	100	1000	0	0	0
2010	6000	9000	2000	1000	0	400	200	2000	0	1	0
2011	6000	9000	3000	2000	0	500	200	2000	0	0	0
2012	4000	8000	2000	500	0	200	100	1000	0	0	0
2013	20000	10000	2000	300	0	400	200	2000	0	0	0
2014	5000	8000	3000	800	0	400	200	1000	0	0	0
2015	4000	4000	2000	400	1	200	300	900	0	0	0
2016	6000	5000	3000	400	20	300	200	800	0	0	100
2017	6000	5000	3000	300	10	300	300	700	0	0	80
2018	20000	7000	2000	300	7	800	600	2000	1	0	200
2019	10000	3000	3000	700	10	200	200	800	0	0	200

1550 *Pieris rapae*, 1551 *Pieris napi*, 1553 *Anthocharis cardamines*, 1555 *Callophrys rubi*, 1556 *Thecla betulae*, 1557 *Favonius quercus*, 1558 *Satyrium w-album*, 1561 *Lycaena phlaeas*, 1567 *Lampides boeticus*, 1567a *Cacyreus marshalli*, 1569 *Cupido minimus*

YEAR	1571	1572	1573	1574	1580	1582	1584	1590	1591	1593	1594
1990	0	0	5000	7000	1000	20	0	5000	2000	30000	0
1991	0	0	200	7000	800	0	0	3000	1000	10000	0
1992	0	0	3000	10000	2000	50	0	7000	2000	10000	0
1993	0	0	2000	8000	1000	90	0	3000	100	9000	0
1994	3	0	2000	6000	400	70	0	6000	1000	5000	0
1995	400	0	600	5000	200	40	0	10000	1000	20000	0
1996	500	0	300	6000	500	30	0	7000	30000	20000	0
1997	800	0	800	5000	800	50	0	3000	200	20000	0
1998	100	0	500	3000	3000	60	0	3000	300	6000	0
1999	70	0	500	3000	1000	20	0	4000	100	3000	0
2000	70	0	600	4000	600	50	0	6000	2000	4000	0
2001	500	0	300	4000	600	2	0	4000	300	6000	0
2002	200	0	500	3000	700	20	0	3000	1000	9000	1
2003	100	0	500	5000	600	20	0	8000	6000	20000	0
2004	5	0	200	5000	1000	50	1	2000	2000	8000	0
2005	0	0	300	5000	1000	20	0	4000	200	5000	0
2006	0	0	200	5000	1000	10	4	9000	4000	20000	0
2007	0	0	70	2000	2000	60	0	3000	800	8000	0
2008	0	0	200	3000	2000	70	0	4000	80	2000	0
2009	0	0	400	5000	600	20	0	5000	20000	4000	0
2010	0	0	400	6000	700	50	0	3000	300	10000	0
2011	0	0	300	3000	1000	50	0	5000	200	9000	0
2012	0	0	90	3000	900	20	0	2000	100	10000	0
2013	0	0	400	5000	300	40	0	2000	300	20000	0
2014	0	0	200	3000	500	30	0	5000	300	9000	0
2015	0	0	400	3000	700	40	0	4000	800	8000	0
2016	0	0	300	2000	800	60	0	4000	1000	5000	0
2017	0	0	100	3000	1000	30	0	10000	700	3000	0
2018	0	1	100	5000	2000	60	0	3000	900	3000	0
2019	0	0	100	3000	800	20	0	10000	40000	8000	0

1571 *Plebejus argus,* 1572 *Aricia agestis*, 1573 *Aricia artaxerxes*, 1574 *Polyommatus icarus*, 1580 *Celastrina argiolus*, 1582 *Hamearis lucina*, 1584 *Limenitis camilla*, 1590 *Vanessa atalanta*, 1591 *Vanessa cardui*, 1593 *Aglais urticae*, 1594 *Nymphalis polychloros*

YEAR	1596	1597	1598	1600	1601	1606	1607	1608	1610	1614	1615
1990	0	10000	2000	4000	5000	3000	80	0	0	4000	10000
1991	0	4000	2000	1000	500	600	100	0	0	5000	5000
1992	0	7000	2000	2000	2000	3800	400	3	0	3000	7000
1993	0	5000	900	2000	3000	1500	300	0	0	2000	4000
1994	0	4000	700	1000	1000	2000	200	0	0	4000	3000
1995	20	4000	1000	500	800	700	200	2	0	5000	2000
1996	2	9000	1000	600	900	900	400	1	0	3000	2000
1997	0	10000	2000	400	2000	1900	200	10	0	4000	1000
1998	0	7000	1000	200	1000	800	30	6	0	5000	3000
1999	0	5000	1000	200	300	500	20	2	0	10000	2000
2000	1	7000	2000	300	300	300	60	60	0	9000	2000
2001	0	10000	2000	100	90	200	30	30	0	8000	1000
2002	1	9000	2000	200	600	400	30	30	1	9000	900
2003	1	6000	3000	200	500	900	200	100	0	14000	1000
2004	0	6000	2000	300	800	800	100	20	0	10000	1000
2005	3	7000	1000	300	400	600	200	10	0	20000	1000
2006	2	10000	3000	100	200	700	200	40	0	10000	700
2007	0	10000	2000	200	200	400	300	20	0	10000	200
2008	0	6000	2000	200	300	400	300	2	0	12000	400
2009	0	9000	3000	400	200	800	300	10	0	13000	500
2010	1	10000	2000	500	200	900	600	7	0	10000	400
2011	0	7000	2000	300	200	300	200	5	0	9000	200
2012	0	8000	2000	80	50	100	200	8	0	6000	200
2013	0	10000	2000	300	50	200	300	70	0	8000	300
2014	1	10000	2000	300	70	50	200	70	0	11000	500
2015	1	7000	2000	200	60	40	200	100	0	9000	300
2016	2	4000	2000	400	200	20	200	10	0	11000	400
2017	0	3000	3000	300	80	7	200	7	0	7000	300
2018	1	5000	2000	600	70	1	200	10	0	8000	400
2019	0	20000	3000	400	70	2	200	20	0	8000	200

1596 *Nymphalis antiopa*, 1597 *Aglais io*, 1598 *Polygonia c-album*, 1600 *Boloria selene*, 1601 *Boloria euphrosyne*, 1606 *Argynnis adippe*, 1607 *Argynnis aglaja*, 1608 *Argynnis paphia*, 1610 *Euphydryas aurinia*, 1614 *Pararge aegeria*, 1615 *Lasiommata megera*

YEAR	1617	1618	1620	1621	1625	1626	1627	1628	1629	1630
1990	0	0	0	2000	5000	40000	6000	10	7	0
1991	0	0	0	1000	7000	20000	3000	40	0	0
1992	0	0	3	4000	9000	40000	4000	100	3	0
1993	0	5	0	1000	5000	20000	3000	100	2	0
1994	3	0	1	1000	7000	20000	2000	10	0	0
1995	0	0	0	1000	8000	20000	1000	100	0	4
1996	0	0	0	400	10000	20000	1000	90	0	0
1997	0	0	0	300	6000	10000	1000	60	9	0
1998	0	0	0	300	5000	10000	1000	0	40	0
1999	0	0	0	600	8000	20000	1000	50	40	0
2000	0	2	0	600	9000	20000	1000	100	40	0
2001	0	2	0	600	10000	20000	3000	30	2	0
2002	0	0	0	500	9000	20000	900	200	300	0
2003	0	0	1	400	10000	20000	1000	200	0	0
2004	0	1	0	200	10000	20000	1000	200	600	0
2005	20	6	2	200	20000	20000	1000	50	200	0
2006	0	0	0	500	20000	20000	800	200	300	0
2007	2	0	0	100	6000	10000	700	30	300	0
2008	1	0	0	200	10000	20000	800	10	400	0
2009	0	1	0	500	10000	30000	2000	60	800	0
2010	0	0	0	600	10000	20000	2000	200	700	0
2011	0	0	0	600	10000	20000	1000	40	1000	0
2012	0	0	1	300	10000	20000	700	10	1000	0
2013	0	0	0	600	10000	30000	2000	60	3000	1
2014	0	0	0	200	10000	20000	1000	50	4000	0
2015	0	0	0	200	10000	20000	1000	50	5000	0
2016	0	0	0	700	7000	10000	1000	100	5000	3
2017	0	0	0	300	6000	10000	1000	100	4000	4
2018	4	0	0	200	6000	10000	2000	200	5000	0
2019	0	0	0	200	9000	20000	1000	100	5000	0

1617 *Erebia epiphron*, 1618 *Erebia aethiops*, 1620 *Melanargia galathea*, 1621 *Hipparchia semele*, 1625 *Pyronia tithonus*, 1626 *Maniola jurtina*, 1627 *Coenonympha pamphilus*, 1628 *Coenonympha tullia*, 1629 *Aphantopus hyperantus*, 1630 *Danaus plexippus*

WEATHER AND CLIMATE

It can sometimes be frustrating that butterfly recording is very much a seasonal activity and weather-dependent, and in this aspect very different from, say, bird-watching. We do hold some records on our database for the months of November, December, January and February but they are few and far between. It seems to have become the custom to regard the peak months of the butterfly season as July and August, but there is also usually a great deal to see in the months of April, May, June and September; March and October are variable: in some years they also can be quite good and in others provide next to nothing. Our region probably does not have so long a season as the south and east of the country: so often on the weather forecast there is a mention of a "north-west/south-east divide", where the first gets the rain and wind and the second the sunshine.

Usually, most butterflies will be seen on warm, dry, sunny days, these providing the optimum conditions for flight. In a hot, dry season, therefore, it may well seem that butterflies are at their highest abundance. This may however not necessarily be the case. There will be just as many butterflies on other days; it is simply that they are not flying so much (or perhaps not at all) and are therefore less apparent. Indeed, on a day of less settled weather, it often happens that when the clouds part to reveal the sun numbers of butterflies will appear as though by magic in a location where just a few minutes previously the recorder felt certain that there were none.

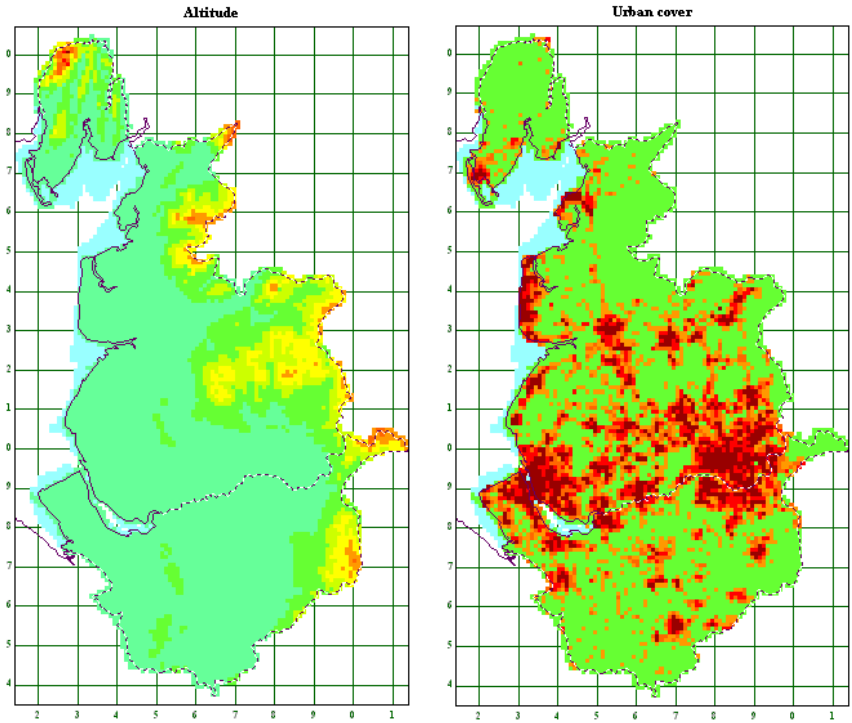
Hot dry summers may not be as ideal for butterflies as they at first superficially seem. The hostplants will probably be desiccated and breeding therefore impaired. The butterflies do not live as long in the heat. In a wetter season, the vegetation will be far lusher. The weather can also affect the timing of the broods, and not always advantageously.

Within our region, there are differences in climate and weather. The extreme north of historic Lancashire is a hundred and sixty-five kilometres north of the southernmost point of historic Cheshire; also altitudes are very different between the mountainous north and the level plain of the south, and indeed between the sea-level west and the hilly east. At higher altitudes, the flight period of some species is significantly later than in the lowlands, for example the Orange-tip *Anthocharis cardamines* (Hardy *et al*, 2010), the Small Tortoiseshell *Aglais urticae* (Hardy, 2014) and the Peacock *Aglais io* (R.L.H. Dennis, personal observations). Further, in a study of butterfly distributions in Lancashire and Cheshire over three periods (1940–1994, 1995–2001, 2001–2007 – note that these are different from the periods being studied in the present work) it was found that since the first of those periods many more species had shifted their centres of gravity significantly northwards and uphill than had increased in population abundance (density) and distribution cover. At the same time, far fewer species had effectively shifted southwards and downhill than had decreased in density and distribution cover. Usually losses at lower altitudes are ascribed to loss of biotopes, but, declines in some species, such as the Wall *Lasiommata megera*, were found to be occurring at a much faster rate than physical changes to the landscape and in land uses. The findings of that study indicated that

changes in populations, distributions and ranges were a great deal more complex than hitherto considered (Hardy, Sparks & Dennis, 2014).

Weather and climatic conditions which seem to assist, or actually do assist, a particular butterfly species may also assist its parasitoids, pathogens and/or predators to a higher degree, so that a population boom in the butterfly may be followed by scarcity or even absence the following season. Also, circumstances which may benefit one species may have the opposite effect on another. A myriad factors interact in ever-changing different ways, leading to changes in butterfly abundance and distribution. We are here discussing mainly natural factors rather than man-induced ones such as habitat destruction (or creation, or management) though such may well have an influence on their effect.

LANCASHIRE AND CHESHIRE GEOGRAPHY



Maps showing (left) altitudes, (right) urban cover

From the Wirral in the west, the ancient boundary of Cheshire leads up the river Mersey into a corner of the Peak District, some 60 miles to the east, and southwards towards the Midlands, taking in rich farming land, manor houses and churches, mill towns and moors. The historic county of Cheshire is mainly low-lying and agricultural, with high ground only in the east, bordering on Yorkshire and Derbyshire: the “panhandle” in the extreme north-east where altitude reaches 580

metres/1,908 feet at Black Hill, the highest point, and further south, to the east of Macclesfield, where peaks include Shining Tor at 559 metres/1,834 feet. The county is drained by the rivers Mersey and Dee and their tributaries, the left-hand tributaries of the Mersey, which include the Bollin, Weaver (and its tributary the Dane) and Gowy, providing perhaps seven-eighths of the drainage.

The geology of Cheshire consists mainly of Triassic sandstones and mudstones. In the west of the county, the Wirral peninsula is a wedge of siltstone, mudstone and sandstone between the estuaries of the Dee and Mersey. Two approximately parallel Triassic sandstone ridges run down the length of the peninsula: the western ridge is made up of Grange and Caldy Hills, then Thurstaston Hill, Poll Hill in Heswall (108 metres/350 feet, the highest point in the Wirral) and Burton; the less continuous eastern ridge consists of Bidston Hill, Prenton and Storeton Hill. The shallow Fender Valley, between these ridges, was carved out by a large glacier. The sandstone rocks to the south of the Wirral are heavily faulted and the underlying Carboniferous Coal Measures are thrown up, especially at Neston. In the north-west the islands of Hilbre, Little Eye and Middle Eye, off the Wirral, are quiet havens for birdlife, and are also of some butterfly interest.

The morphology of both the Dee and Mersey estuaries is in large part owed to the passage of Irish Sea Ice south and south-eastwards during the last ice age over the relatively soft sandstones of the area; these features have been termed “iceways”. Subsequently coastal and estuarine sands, silts and muds have been deposited widely throughout the Mersey and Dee estuaries The floodplains of the majority of the other river and stream valleys in the county are composed of alluvium which has accumulated in the post-glacial period.

The Cheshire Basin is a major sedimentary basin which covers a large part of the county, bounded to the east and south-east by a series of faults of which the most significant is the Red Rock Fault. Numerous faults trend north-south through the basin, some of which help to define the series of hills which are known collectively as the Mid Cheshire Ridge: this is a range of low sandstone hills which stretch north to south through Cheshire. The ridge is discontinuous, with the hills forming two main blocks, north and south of the Beeston Gap; the main mass of those to the south is known as the Peckforton Hills, the larger group of hills to the north does not have a collective name. The Cheshire Basin was flooded on several occasions in the Permian and early Triassic periods, resulting in the laying down of massive halite (salt) beds. These beds have been mined both by cavern working and hot water brine extraction for over 200 years, mainly in the area around Northwich. The collapse of some of these worked-out halite beds has given rise to some of Cheshire's noted features, the Cheshire Meres. The Cheshire meres form a part of the internationally important North West Midland Meres, occupying hollows in the glacial drift surface of the Cheshire Plain. The most important of the meres/pools which lie within the Cheshire region are: Alsager Mere, Betley Mere, Budworth Mere, Comber Mere, Hatch Mere, Norbury Mere, Oak Mere, Pick Mere, Radnor Mere, Redes Mere, Rostherne Mere, Shakerley Mere, Tabley Mere and Tatton Mere. The Cheshire meres vary in their character and origin: for instance, Rostherne Mere is a fine example of a natural lake that lies on thick sedimentary deposits of glacial origin

above marl and salt-beds, whilst others, such as Redesmere, are man-made. Pick Mere used to be noted as the most commercialised of the Cheshire meres.

A large part of the Cheshire Plain is covered by a thick mantle of glacial till and sands and gravels of glacio-fluvial origin. These deposits are the legacy of the overriding of the area on several occasions by glacial ice during the past 2 million years. The present distribution of deposits and the landforms to which they give rise are largely the result of the last ice age, the Devensian which peaked around 22,000 to 20,000 years ago. "Kettle-holes" caused by the in-situ melting of ice-blocks during deglaciation are a notable feature of the landscape; many are now dry though others such as Hatchmere and Pettypool remain as locally significant water bodies. Peat deposits have accumulated in some of the kettle-holes, not least within Delamere Forest, and on parts of the high ground of the east of the county where thin soils and high rainfall have contributed to their formation.

Delamere, which means "Forest of the Lakes", is all that remains of the great Forests of Mara and Mondrem which covered over 60 square miles (160 km^2) of this part of Cheshire. The original forest was a predominantly Oak-mixed woodland, but other species included Elm, Lime, Yew, Chestnut, Fir, Larch, Beech, Ash, Birch, Hazel, Willow and Alder, but latterly it has been mainly planted with Pine. The forest area also encompassed heath and wetland, as well as pasture, arable land and even small settlements. Around Delamere forest there are examples of quaking bogs: these occur when plants such as *Sphagnum* mosses and Cotton Grass *Eriophorum* sp. colonise the surface of a water body and form a floating mat of vegetation; at Black Lake, a small remnant of the ancient bog, the *Sphagnum* raft covers around half the lake surface. Some parts of the forest, especially Blakemere, which had been drained in the nineteenth century, have recently been artificially re-wetted and restored as mosses.

Other important mosses in Cheshire include Abbots Moss, Wybunbury Moss, Danes Moss (Congleton), Lindow/Saltersley Moss (Wilmslow); the Green Hairstreak *Callophrys rubi* is a butterfly which continues to thrive on some of them. The mosses have however been extensively damaged by peat extraction and the remaining moss land is but a tiny fraction of what was historically present, and butterfly species that once favoured such biotopes, such as the Large Heath *Coenonympha tullia*, the Silver-studded Blue *Plebejus argus*, and more recently the Small Pearl-bordered Fritillary *Boloria selene*, have been lost.

In the south of the county is rich red marl on which grows some of the best pasture in Britain, so this is good dairy farming country. Cheshire has more ponds than any other county in England; the majority are flooded marl pits, dug out originally by gangs of wandering contractors. Marl pits are especially common along the Sandstone Trail on the low-lying, heavier, clayey soils. Marling is an ancient technique first practised by the Celts; it is a laborious process that involves digging out and spreading the naturally occurring lime-rich subsoils, or marls, that underlie much of Cheshire.

Around the areas of Poynton and Macclesfield, in the east, coal is close to the surface and was easily mined. Below the Coal Measures is the Millstone Grit, a hard, coarse-grained, siliceous sandstone, which appears towards the Derbyshire border on the flanks of the Peak District dome. In this region is Macclesfield Forest, a wild hilly area some 1,800 feet above sea level. In the north-east the 18-mile Gritstone Trail passes hills of Millstone Grits on its route from Lyme Park to the Staffordshire border.

Cheshire has some 4% of its area under woodland, around half the national average. Since 1994 the Mersey Community Forest has been promoting new woodland planting within the Merseyside and Cheshire region to alleviate this deficit, and also better to manage the existing woodland to secure its future. Some of the principal ancient woodlands (defined as areas which have had continuous woodland cover since at least 1600 and have been relatively undisturbed by human activity) in Cheshire are: Peckforton Woods (SJ523577, 54 hectares), Roe Park Woods (SJ860585, 34.6 hectares), Wettenhall and Darnhall Woods (SJ640624, 52.6 hectares), Wimboldsley Wood (SJ675642, 19 hectares) and Dibbinsdale (SJ339819, 30 hectares). Many of the ancient woodlands survive in steep valleys or "cloughs", of small extent: Taylor's Rough, Wellmeadow Wood, Warburton's Wood and Well Wood are examples of clough woodland. Most of the ancient woodland in the county is in units smaller than 10 hectares and 65% of the area is in woods smaller than 5 hectares. Also worth mention are remnant woodlands in the south of the city of Manchester: in Wythenshawe Park is the remarkable Nan Nook Wood (SJ809900), which retains much of the character of the primary forest which once dominated Cheshire; further south in Wythenshawe the 1930s-built housing is interspersed with several more small woodlands, not quite as ancient in character but nevertheless containing some very fine mature trees especially Oaks: these include Big Wood, Little Wood, Hatchett's Wood, Ash Wood, Gorse Covert and Park Wood, and indeed many of the Oaks lining some of the roads in the older parts of the housing estate are of such size as to suggest that they considerably pre-date its construction.

Indicative of Cheshire's wealth are deer parks around stately homes in the lowlands such as Tatton and Dunham (the latter rather incongruously in "Greater Manchester") and at higher altitude at Lyme. (It might be added here that Trafford Park, in Lancashire and long since smothered by a vast industrial area, was a deer park in the nineteenth century.)

Although Cheshire is thought of as primarily agricultural, industrial uses have affected some parts of its landscape. Crewe, for instance, was a centre of heavy industry in the shape of railway building, steam locomotive construction and overhaul from the mid-nineteenth century until the 1960s. In the south-west of the county the river Weaver and its tributaries run through what were once the largest salt fields in the kingdom. Salt mining has centred on Northwich; this town, Nantwich and Middlewich have been referred to as the "Salt Wiches". Some hollows caused by subsidence from salt mining subsequently filled with water and formed "flashes", especially around Northwich, Winsford and Sandbach. Some of the flashes around Northwich have also been used as lime beds, storing industrial waste from the chemical factories in the area, which has resulted in their developing a limestone

flora and fauna, and becoming good habitat for some butterfly species including the Dingy Skipper *Erynnis tages*. Quarrying of sand has taken place in many sites on the mid-Cheshire sandstone ridge; here again some former quarries have developed into wildlife habitats, an example being Moore, which has since become a high quality nature reserve.

Heavy industry dominates the south bank of the Mersey estuary from Ellesmere Port to Runcorn, including the vast refineries around Stanlow; however some of the estuarine marshes, although very different in form from their original condition, continue to have some value as wildlife habitats, notably for birds. Wigg Island, near Runcorn (which is only an "island" by virtue of the construction of the Manchester Ship Canal) is an example of a former industrial site – an alkali works, primarily extracting copper from its ore – which has been turned into a nature reserve. Higher up the Mersey, on the Cheshire/Lancashire border is Woolston Eyes, a series of marshes and sludge beds, some filled with water and still used for the deposition of dredgings from the ship canal under a waste management licence issued by the Environment Agency; this site is much favoured by bird-watchers but also has produced many of the "high counts" in butterfly recording, albeit for common species. The word "Eyes", which is analogous to "Ees" applied to some sites close to the Mersey south of Manchester, is Saxon for land near a looping watercourse.

Turning now to Lancashire, this is probably the most varied of the north-western counties. Although larger in area, it is not as affluent as Cheshire, and its more northerly latitude is noticeable. It has clearly defined geographical boundaries: to the north, the high fells of the Lake District; to the east the Pennines; to the south the river Mersey, which forms the boundary between this county and Cheshire for some distance; and to the west a long and irregular coastline on the Irish Sea, broken into two unequal parts by Morecambe Bay. The right-hand tributaries of the Mersey, which include its northern source-stream the Tame, and the Irwell and its significant tributaries the Croal, Roch, Irk and Medlock, drain almost the whole of the part now regarded as in Greater Manchester and much of the remainder of the southern part of VC59; then northwards there are the other significant river basins of the Ribble (the boundary between VCs59 and 60), the Wyre and the Lune. In the extreme north-west, the boundary with Cumberland, VC70, is provided by the river Duddon.

The geology of Lancashire consists in the main of Carboniferous age rocks but with Triassic sandstones and mudstones at or near the surface of the lowlands bordering the Irish Sea, though these are largely obscured by Quaternary deposits. In Merseyside, a faulted sequence of Carboniferous Coal Measures rocks is overlain in the west by younger Triassic and Permian age sandstones and mudstones. Glaciation during the present Quaternary Period has left widespread glacial till as well as erosional landforms. Other post-glacial superficial deposits such as river and estuarine alluvium, peat and blown sand are abundant in this area. Carboniferous rocks underlie all of Merseyside but are only exposed to the east of the north-south Boundary Fault. The oldest rocks to appear at or near the surface within the county are alternate units of sandstone ("flags" and "grits") and mudstone with occasional coal seams (known locally as "mines") forming a part of the Millstone Grit Group. These are brought to the surface on the eastern side of the Upholland Fault and dip

eastwards beneath Billinge Hill. Overlying the Millstone Grit sequence is the thick Westphalian sequence of sandstones, mudstones and coal seams collectively referred to as the Pennine Coal Measures Group and which forms the Lancashire Coalfield.

Most of Manchester is also located on Permian sandstones and red Triassic sandstones and mudstones, mantled by thick deposits of till and pockets of sand and gravel deposited by glaciers at the end of the last glacial period, some 15,000 years ago. The oldest rocks, from the Upper Carboniferous period, are sandstones and shales of Millstone Grit present as outcrops and uplands in the north-east of Greater Manchester, such as the upland moors of the Dark Peak and South Pennines to the east and north-east of Rochdale, Oldham and Stalybridge. These rocks are overlain by shales, mudstones and thin coals of Coal Measures upon which the towns of Oldham, Rochdale, Bolton and Wigan are located. An outcrop of Coal Measures extends southwards down through Tameside and into Hazel Grove.

Much of the county is occupied by the Craven Basin, a depositional basin active during the Carboniferous period; this basin is bounded to the north by the Lake District block and to the south-east by the Central Lancashire High, including the West Pennine Moors, a large expanse of high moorland on Millstone Grit and Lower Coal Measures extending westwards from the Pennines proper to the longitude of Bolton and Blackburn. To the north-east the Craven Fault System marks the edge of the Askrigg Block. Within the basin a couple of sub-basins are recognised: the Lancaster Fells sub-basin and the Bowland sub-basin (or "Bowland Trough"). Rocks in the area, especially within the latter sub-basin, form the Ribblesdale Fold Belt, which is aligned broadly south-west to north-east. Further south is the Rossendale Basin.

In the west of the county, the West Lancashire basin is in effect a landward extension of the East Irish Sea Basin. The area is threaded by numerous broadly north-south-aligned normal faults thought to have been active during Permo-Triassic times and perhaps later, in association with early rifting of the Atlantic Ocean.

The larger part of lowland Lancashire, i.e. the West Lancashire Coastal Plain, the Fylde and adjoining areas, is covered by a thick mantle of glacial till. These deposits are the legacy of the over-riding of the area on several occasions by glacial ice during the past 2 million years. There is a good deal of low-lying fertile farmland, particularly in the Fylde and in the south-west of the county, where much of it is former marshland reclaimed in the 17th and 18th centuries. Martin Mere is a remnant of a huge lake that once covered much of west Lancashire, the largest body of fresh water in England. Effective drainage was only achieved in the mid-19th century with the introduction of steam pumping. Farms and market gardens were established on the rich soils of the reclaimed land. Between 1974 and 1982 sand from the former lake bed was quarried for use in glass-making at Mere Sands Wood, which is now a nature reserve.

Significant areas of marine and estuarine alluvium, typically silt and clay, extend around the Ribble estuary northwards from Southport and also around the southern shores of Morecambe Bay from Cleveleys and Fleetwood east through Preesall then

northwards via Glasson to Morecambe. Narrower bands of these deposits fringe the coast between Hest Bank and Carnforth. River alluvium is characteristic of the flood plains of the river Wyre and its major tributary, the river Brock.

Extensive areas of blown sand occur along the coastal zone southwards from Blackpool through Lytham St Annes, around Southport and southwards to Formby, where it is referred to as the Shirdley Hill Sand; also narrower belts of these deposits characterise the north coast of the Fylde at Fleetwood and Preesall and a rather smaller area west of Sunderland Point. The Lancashire coast as a whole is renowned for its sand dunes, especially the Ainsdale national nature reserve but ranging intermittently northwards from Crosby to Southport, then interrupted by the salt marshes of the Ribble estuary, then resuming through Blackpool and Fleetwood, then past the rivers Wyre and Lune to Heysham. The sandy soils make the area suitable for links golf courses. Less obviously, considerable inland areas in the south of the county from Liverpool up to Ormskirk are characterised by blown sand. After the ice sheets had melted away from the Irish Sea but before vegetation had taken hold and before the sea re-flooded that basin, blowing sand drifted across the area to form a sheet-like deposit up to 2.5 metres thick in places. The presence of this sand was responsible for the establishment of the glass-making industry in St. Helens, although nowadays the raw materials are obtained from sand quarries in Cheshire.

Peat deposits are common in parts of the county and can be divided into areas of "lowland moss" and "hill peat". Large swathes of the Forest of Bowland are covered in peat and there are smaller patches elsewhere as at Pendle Hill. Lowland examples include Stalmine Moss, Rawcliffe Moss, and Winmarleigh and Cockerham Mosses west of Garstang, and Holland Moss and Sefton Meadows further south. As with Cheshire, the one-time mosses to the west of Manchester, including Chat Moss, famed for George Stephenson's contriving to lay the Liverpool & Manchester Railway across it, are no longer suitable for such butterflies as the "Manchester Argus" (the Large Heath, *Coenonympha tullia*), although this species does still occur on mosses further north in Lancashire. Latterly, much work has been done by conservationists to restore a section of Chat Moss/Woolden Moss (which comes under Greater Manchester) to an approximation of its pre-industrial configuration, but this is only a miniscule fragment of the one-time whole. There is even a proposal to try to reintroduce *C. tullia* to this site, from captive stock bred at Chester Zoo. The nearby Risley Moss, which contains a country park and a nature reserve, is aptly described in Wikipedia as "one of the last remaining fragments of the raised bogs that once covered large areas of South Lancashire and North Cheshire".

The limestones around Morecambe Bay in the north of the county are well-known and include the famous limestone pavement of Gait Barrows; this is an "Area of outstanding natural beauty" and is also the region of greatest butterfly diversity in the whole of the two counties.

Further north still, the Furness is the peninsula jutting southwards in the north-west, separated from the rest of Lancashire by the sands of Morecambe Bay. It is bordered by Westmorland and Cumberland to its north and west. Further limestone occurs near the coast in the Furness, though the inland hills here are primarily of Silurian

rocks including sandstone, siltstone and mudstone. The Furness Fells are formed of Ordovician volcanic rocks, and Silurian shales and slates to the south. They are cut through by Windermere, Coniston Water, and numerous valleys which drain into the Esk, the Duddon and Morecambe Bay. The higher ground is rocky heathland, with frequent tarns (small mountain lakes formed by glaciation), while the lower ground supports pasture and woodland. In the east there are two main chains of hills: one overlooking Windermere, with Latterbarrow (245 metres, 804 feet) as its highest point, and the other, which reaches 300 metres, 984 feet, overlooking Coniston Water. Between them is flat country and Esthwaite Water. West of Coniston Water is the highest mountain range, the Coniston Fells, with the Old Man of Coniston (803 metres, 2,635 feet) as the highest point in Lancashire. A lesser range extends from Torver to just north of Dalton, but south of that the landscape is flat; this area is also called Plain Furness. The low rolling hills of Low Furness are formed of glacial deposits, mainly boulder clay, above Triassic sandstone and Carboniferous limestone. There are large deposits of iron ore here, of very pure quality. Off the coast at Barrow are Walney Island and other smaller islands including Barrow Island, Roa and Piel.

Lancashire's woodland cover is estimated at 4.6% of the total area, which, as with Cheshire's, is quite a bit less than the figure of 7% for England as a whole. Over 60% of Lancashire's woodland area is in the districts of Lancaster and Ribble Valley, whilst the least amounts of woodland are in Fylde, Pendle and Rossendale. Ancient woodland in Lancashire includes the complex of Boilton, Nab, Red Scar & Tun Brook woods near Preston (SD592327, 55.35 hectares).

Lancashire is, or has been, much more an industrial county than Cheshire. The industrial centres of Lancashire lie in an arc reaching up to 25 miles north of Manchester including cotton-spinning/weaving towns such as Bolton, Blackburn, Oldham and Rochdale and their once "dark satanic mills". In the south is the coalfield; the last deep mine closed in 1993. Coal mining has left areas of derelict land and slag heaps across the coalfield; when left alone such sites will soon start turning back to nature; developing a low-fertility species-rich flora and forming prime butterfly habitat during their early stages of natural succession. Some have been turned into "country-parks", such as Clock Face and Sutton Manor; and have been subjected to much "management", such as capping with topsoil, or planting of trees in an attempt to accelerate the process of natural succession to climax woodland. Especially around Wigan and Leigh, subsidence from coal-mining resulted in "flashes", some of which have been landscaped for recreational use such as the Three Sisters at Ashton-in-Makerfield and Pennington Flash near Leigh. Other industries which have shaped parts of Lancashire include chemical works in Widnes, glass in St. Helens and brickmaking in several places including Stadt Moers and Rixton, both now country-parks. Former iron and steel works at Barrow led to the deposition of huge amounts of industrial waste, which again have developed into first-class habitat for butterflies including the very localised Small Blue *Cupido minimus*.

References relative to the above section include Grant (1996), and numerous articles in "Wikipedia" and the references contained in them.

BUTTERFLY SITES IN LANCASHIRE AND CHESHIRE

The following National Nature Reserves are in the two historic counties: Rostherne Mere (glacial lake) and Wybunbury Moss (raised bog) in VC58, Ainsdale Sand Dunes and Cabin Hill in VC59, Gait Barrows (limestone pavement) in VC60, North Walney, Roudsea Wood & Mosses, Rusland Moss, Sandscale Haws and Duddon Mosses in VC69.

In addition there are numerous sites designated variously as Local Nature Reserves, Sites of Special Scientific Interest, and Sites of Biological Importance. The table on pages 40 to 52, whilst not claiming to list every location which can be regarded as a nature reserve or a country park, includes all the major ones and as many of the lesser ones as are believed to be worth visiting for their butterfly fauna. The table gives brief indications of the character and where appropriate the origin of each site; it will be noted that a considerable number of the best sites have a history of past industrial use.

The illustrations show a selection of the most productive and most interesting sites.

A point worth emphasising is that wildlife, especially the most mobile forms such as butterflies, does not always respect the bounds of nature reserves. A look at the table of species per tetrad on pages 53 to 66 will show that in many instances there are just as many species in tetrads in which there are no designated reserves as in ones where there are, sometimes even more. As well as designated reserves there are many other habitats, less obvious but every bit as important, especially those which have not been intentionally created by man but which have evolved, through natural succession, largely as a result of abandonment of former environmentally destructive activities and subsequent benign neglect. Rough ground, so-called “waste” land is far richer in invertebrate life than formal parkland. This is enlarged on more fully in the section *Along the Mersey – The 1974 Entities of “Greater Manchester” and “Merseyside”*.

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Ashton's Flash, SJ6674, 11.2.2019: lake from salt-mining subsidence, largely filled in with lime waste

Neumann's Flash, SJ6675, 11.2.2019: lake from salt-mining subsidence, lime surrounds

Carey Park, SJ6574/6674, 11.2.2019: former tip for lime waste

Moore, SJ5785/5885, 1.12.2018: former sand quarry

Delamere Forest, SJ5271, 5370-2, 5470-2, 5570-2, 20.4.2019: forest, largely pine, with bogs

Delamere (Black Lake), SJ5370, 20.4.2019: early floating bog in forest

Woolston Eyes, SJ6388/6488/6588/6688, 15.2.2019 (no. 4 bed): dump for dredgings from ship canal

Butchersfield, SJ6788, 3.8.2019: former tip, contiguous site to Woolston Eyes

Lyme Park, SJ9682/3, 5.11.2019: mid-altitude deer park

Tatton Park, SJ7480-2, 7579-82, 7680-2, 22.10.1983: large deer park with lake & gardens

Wybunbury Moss, SJ6950, 5.6.1988: raised lowland bog

Hatchmere, SJ5572, 4.7.1987: lake/wetland near Delamere Forest

Rostherne Mere, SJ7483/4, 17.10.2019: glacial lake with woodland fringe

Goyt Valley, SK1071-4, 22.10.2019: high moorland valley, boundary of VC58 and VC57

Macclesfield Forest, SJ9571/9671, 23.10.2019: mid-altitude mainly coniferous forest

Alderley Edge, SJ8577/8677, 24.10.2019: north-facing wooded sandstone hill

Gait Barrows, SD4777/4877, 13.8.2019: wood on limestone pavement, ex-quarry; prime site (38 spp.)

Warton Crag, SD4872/3, 4972/3, 13.8.2019: limestone hill, former quarry; good site

Hawes Water, SD4776, 13.8.2019: small lake and surrounds (managed), close to Gait Barrows

Trowbarrow Quarry, SD4875, 13.8.2019: former limestone quarry

Leighton Moss, SD4874/5, 13.8.2019: re-flooded drained moss; mainly birds but also butterflies

Ormsgill slag banks, Barrow, SD1871, 28.5.2019: waste heap from steel works, capped, species-rich

Walney, SD1771/2, 23.6.1985: coastal grassland

Boilton Wood, SD5731/5831, 14.2.2019: ancient woodland, hill above lake from gravel extraction

Brockholes, SD5730/5830, 14.2.2019: wetland, lake resulting from motorway construction

Yarrow Valley, SD5715, 12.2.2019: country park in river valley

Cuerden Park, SD5623/4, 5723/4, 13.2.2019: country park/hall estate in wide valley

Martin Mere, SD4214, 19.4.2019: re-flooded remnant of former vast wetland, long drained

Rixton Claypits, SJ6890, 15.2.2019: former brick works

Sankey Valley (Warrington), SJ5988, 17.11.2018: long linear park, canal/river valley, many biotopes

Belmont, SD6716, 25.11.2019: mid-altitude reservoir and surrounding moorland

Heysham nature reserve, SD4059/60, 7.12.2019: reserve adjacent to nuclear power station

NATURE RESERVES AND OTHER NOTABLE SITES IN LANCASHIRE AND CHESHIRE

Site	VC	Tetrad	Type	GM/MS	Description
Birk Fell Hawse Mine	69	NY20V	SSSI		Former copper mine
Tilberthwaite Gill	69	NY30A	SSSI		Montane habitat
Tarn Hows	69	NY30F	SSSI		Small mountain lake
Brathay Quarries	69	NY30K	SSSI (G only)		Active slate quarry
Blelham Tarn & Bog	69	NY30Q	SSSI, NNR		Small mountain lake and bog
Skelghyll Beck	69	NY30W	SSSI (G only)		Brook and associated rocks
Walney	69	SD17Q, SD17R	NNR		Island (with bridge), glacial till deposit, salt-marsh, shingle, sand dunes and brackish ponds
Duddon Estuary	69	SD17T	SSSI		Sandy, gritty estuary
Ormsgill	69	SD17V			Slag bank, waste from steel works
Sandscale Haws	69	SD17X	NNR		Sand dunes; former iron-ore mine
Ravenmeols Hills	59	SD20S	LNR	MS	Sand dunes
Cabin Hill	59	SD20X	NNR		Sand dunes
Freshfield Dune Heath	59	SD20Z	WT (LMM)	MS	Woodland, acidic grassland, lowland dune heath
Ainsdale Sand Dunes	59	SD21V	SSSI, NNR	MS	Sand dunes
South Walney	69	SD26G	WT (Cum)	SSSI	Vegetated shingle, former gravel extraction
Foulney Island	69	SD26M	WT (Cum)		Island (with causeway), grass/shingle
Elliscales Quarry	69	SD27H	SSSI (G only)		Former limestone quarry
Sea Wood	69	SD27W	SSSI		Woodland
Duddon Mosses	69	SD28H	SSSI, NNR		Peatland
Kirkby Moor	69	SD28L	SSSI		Heather-covered moor
Lowick Common	69	SD28X	WT (Cum)		Lowland heath, grassland and fen
Coniston Mines and Quarries	69	SD28Z	SSSI (G only)		Former copper mine
Duddon Valley Woodlands	69	SD29I	SSSI		Wooded river valley
Subberthwaite, Blawith and Torver Low Commons	69	SD29Q	SSSI		Grassland with bog and heath
Ashgill Quarry	69	SD29S	SSSI (G only)		Former stone quarry on moorland
Seathwaite Copper Mines	69	SD29U	SSSI (G only)		Long-disused copper mine
Downholland Moss	59	SD30I	SSSI (G only)		Arable field and small wood, moss long since drained
Sefton Meadows	59	SD30K	Forestry England	MS	Planted woodland on former tip
Lunt Meadows	59	SD30L	WT (LMM)	MS	Flood storage reservoir on former arable land
Haskayne Cutting	59	SD30P	WT (LMM)		Disused railway cutting

Ainsdale and Birkdale Hills	59	SD31B	LNR	MS	Sand dunes
Queen's Jubilee Nature Trail	59	SD31I	LNR	MS	Former sand quarry
Kew Woods	59	SD31M	Forestry England	MS	Planted woodland on drained moss
Hesketh Golf Links	59	SD31P	SSSI	MS	Sand dunes by golf course
Marshside	59	SD32K	RSPB		Salt marsh
Ribble Estuary	59	SD32M	SSSI, NNR		Salt marsh and mud flats
Lytham Coastal Changes	60	SD32U	SSSI (G only)		Soil/sand dunes (4 locations in town)
Lytham St. Anne's Dunes	60	SD33A	SSSI, LNR		Sand dunes
Marton Mere	60	SD33M	SSSI, LNR		Small remnant of glacial lake and reed bed by holiday resort
Fleetwood Marsh	60	SD34H	WT (LMM)		Former power station; grass/wetland
Wyre Estuary	60	SD34L	SSSI, country park		Public park beside estuary
Barnaby's Sands and Burrows Marsh	60	SD34M	WT (LMM)		Ungrazed saltmarsh
Lune Estuary	60	SD35X	SSSI		Sand/silt flats and saltmarsh
Morecambe Bay	69	SD36U	SSSI		Intertidal estuarine flats
Iron Pit Spring Quarry	69	SD37E	SSSI (G only)		Former stone quarry
Next Ness	69	SD37E	WT (Cum)		Wet woodland on former railway yard
Barker Scar	69	SD37N	SSSI (G only)		Cliff-top limestone grassland
Humphrey Head	69	SD37W, SD37X	SSSI, WT (Cum)		Limestone promontory, cliff, woodland
Wart Barrow	69	SD37Y	SSSI		Limestone grassland, woodland
Hampsfell	69	SD37Z			Limestone hill
Skelwith Hill	69	SD38F	SSSI (G only)		Limestone hill
Roudsea Wood & Mosses	69	SD38F, G, K	SSSI, NNR		Woodland on limestone; moss
Rusland Valley Mosses	69	SD38J	SSSI, NNR		Mossland, raised mire
Yewbarrow Woods	69	SD38N	SSSI		Woodland on limestone
Outley Mosses	69	SD38Q	SSSI		Valley mire systems
Dodgson Wood	69	SD39B	SSSI		Higher-altitude wooded valley
Yewdale Beck	69	SD39E	SSSI		Short stream section with rock exposures
Esthwaite Water	69	SD39T	SSSI		Small nutrient-rich lake
Claife Tarns and Mires	69	SD39T	SSSI		Small artificial lakes, basin mires
Siding Lane Woodland	59	SD40R	LNR	MS	Woodland on former coal mine
Holiday Moss	59	SD40V	WT (LMM)	MS	Former tip, fragment of exploited raised bog
Martin Mere	59	SD41H	SSSI, WWT		Small fragment of former vast wetland
Mere Sands Wood	59	SD41M	SSSI, WT (LMM)		Woodland and heath on former sand quarry

Hesketh Out Marsh	59	SD42H	RSPB		Restored saltmarsh, former arable land
Newton Marsh	60	SD42P	SSSI		Grazed pasture, former saltmarsh
Longton Brickcroft	59	SD42S	LNR		Lake/ponds, former brickworks
Winmarleigh & Cockerham Moss	60	SD44N	SSSI, WT (LMM)		Remnant of largely drained lowland peat bog
Middleton	60	SD45E	WT (LMM)		Wetland and grassland, former industrial site
Heysham	60	SD45E, SD46A	WT (LMM)		Reedbed, grassland and wetland
Cockerham Marsh	60	SD45K	SSSI		Marshy grassland, formerly tidal saltmarsh
Heysham Moss	60	SD46F	SSSI, WT (LMM)		Remnant of raised bog
Freeman's Pools	60	SD46K	WT (LMM)		Ponds formed by digging of borrow pits
Hest Bank	60	SD46T	RSPB		Sand flats and saltmarsh
Crag Bank	60	SD46Z	SSSI		Boulder clay ridges and marshy grassland
Thwaite House Moss	60	SD46Z	SSSI		Fen woodland
Brown Robin	69	SD47E	WT (Cum)		Limestone woodland
Jack Scout	60	SD47L	SSSI		Limestone grassland
Silverdale Golf Course	60	SD47S	SSSI		Limestone ridge by golf course
Leighton Moss	60	SD47S, SD47X	SSSI, RSPB		Moss/reedbed; drained 1822, re-flooded 1918
Eaves Wood	60	SD47T	SSSI		Woodland on limestone pavement
Hawes Water	60	SD47T	SSSI		Marl lake of natural origin
Coldwell Farm Pasture	60	SD47U	SSSI		Lowland limestone grassland
Warton Crag	60	SD47W	SSSI, LNR, WT (LMM)		Limestone hill
Warton Crag Quarry	60	SD47W	LNR		Former quarry on limestone hill
Cringlebarrow and Deepdale	60	SD47X	SSSI		Woodland on limestone ridge
Trowbarrow Quarry	60	SD47X, SD47Y	SSSI, LNR		Former limestone quarry
Gait Barrows	60	SD47Y	SSSI, NNR		Woodland on limestone pavement; former quarry
Thrang End and Yealand Hall Allotment	60	SD47Y	SSSI		Woodland/grassland on limestone pavement
Thrang Wood	60	SD47Y	SSSI		Woodland on limestone pavement
Ludderburn and Candlestick Mires	69	SD49B	SSSI		Various mires, partly damaged by peat extraction
Ravenhead Brickworks	59	SD50C	SSSI (G only)		Active quarry, geological interest
Beacon (Skelmersdale)	59	SD50D	Country park		Rural country park, woodland, meadows
Greenslate Water Meadows	59	SD50G	LNR	GM	Wetland/woodland adjacent to former reservoir

Viridor Wood	59	SD50V	Forestry England	GM	Planted woodland, former coal mine and dairy farm
Three Sisters	59	SD50V	LNR	GM	Artificial lake, planted woodland, former spoil heaps
Wigan Flashes	59	SD50W	WT (LMM)	MS	Lakes resulting from coal-mining subsidence
Haigh Hall	59	SD50Z	Country park	GM	Stately home, long-established planted woodland over former coal mines
Wrightington Bar Pasture	59	SD51G	SSSI		Unimproved flushed grassland
Hic Bibi	59	SD51R	LNR		Former clay pit
Charnock Richard (Freeman's) Pasture	59	SD51S	SSSI, WT (LMM)		Small unimproved grassland
Yarrow Valley	59	SD51S	Country park		Woodland/grassland, former printing/bleaching/dyeing works
Preston Junction	59	SD52I	LNR		Disused railway line
Cop Lane	59	SD52I	WT (LMM)		Disused railway line
Fishwick Bottoms	60	SD52P	LNR		Woodland/grassland, partly reclaimed tip
Cuerden Valley	59	SD52R	Country park		Stately home, woodlands, meadows
Willow Farm Wood	59	SD52X	WT (LMM)		Small mixed-age woodland
Beeston Brook Pasture	59	SD52Y	SSSI		Unimproved pasture on boulder clay
Haslam Park, Preston	60	SD53A	LNR		Small reserve in municipal park
Grange Valley	60	SD53K	LNR		Woodland/meadows, close to suburbs
Pope Lane Field	60	SD53K	LNR		Grassland, former recreation ground
Hills and Hollows	60	SD53R	LNR		Brook valley between suburbs
Boilton Wood	60	SD53V	LNR		Ancient woodland on slope
Brockholes	60	SD53V	WT (LMM)		Artificial lakes/wetland, former quarry
Red Scar and Tun Brook Woods	60	SD53W	SSSI, WT (LMM)		Woods on steep-sided river valley
Rough Hey Wood	60	SD54G	SSSI		Planted mixed woodland
Beacon Fell (Goosnargh)	60	SD54R	Country park		Woodland, moorland, farmland
Tarnbrook Meadows	60	SD55X	SSSI		Unimproved meadow grassland
Calf Hill and Cragg Woods	60	SD56K	SSSI		Upland wooded valley
Artle Dale	60	SD56L	SSSI		Wooded gorge
Over Kellet Pond	60	SD56P	WT (LMM)		Small remnant wetland
Burton Wood	60	SD56T	SSSI		Wood on steep-sided river valley
Aughton Woods	60	SD56T	WT (LMM)		Woodland on slope above valley
Lord's Lot Bog	60	SD57K	WT (LMM)		Small floating bog
Abram Flash	59	SD60A	WT (LMM)	GM	Lake formed after coal-mining subsidence
Low Hall Park	59	SD60B	LNR	GM	Lake from coal mining subsidence, planted woodland

Cunningham Clough	59	SD60M	LNR	GM	Wooded brook valley, close to housing/fields
Eatock Lodge	59	SD60M	LNR	GM	Artificial lake and spoil heaps, former colliery
Hall Lee Bank Park	59	SD60S	LNR	GM	Wooded brook valley, close to housing/fields
Colliers Wood	59	SD60V	Forestry England	GM	Woodland/grassland, former coal mine
Borsdane Wood	59	SD60Y	LNR	GM	Ancient semi-natural woodland
Haslam Park, Bolton	59	SD60Y	LNR	GM	Small wood in park, river valley
Dean Wood	59	SD61H	WT (LMM)		Deep wooded clough
White Coppice Flush	59	SD61J	SSSI		Rough grazed land below moor
Bridge Street	59	SD61K	LNR	GM	Woodland on former bleach works
Doffcocker Lodge	59	SD61V	LNR	GM	Former mill pond, reedbed
Horrocks Fold	59	SD61W	Forestry England	GM	Newly planted woodland near disused quarry
Brownstones Quarry	59	SD61W	LNR	GM	Former stone quarry
Longworth Clough	59	SD61X	SSSI, WT (LMM)	GM	Woodland by brook, former mill site
Oak Field	59	SD61X	SSSI		Grazing land with wet flushes
Withnell Fold	59	SD62B	LNR		Former sludge lagoons and filter beds of paper mill
Darwen River Section	59	SD62E	SSSI (G only)		River through rock strata
Withnell	59	SD62G	LNR		Disused railway cutting
Pleasington Old Hall Wood and Wildlife Garden	59	SD62N	WT (LMM)		Woodland/grassland in grounds of historic house
Sunnyhurst Woods	59	SD62R	LNR		Wooded brook valley, close to housing/fields
River Darwen Parkway	59	SD62X	LNR		Wooded river valley
Roeburndale Woods	60	SD66C	SSSI		Wooded river valley
Clear Beck Meadow	60	SD66D	SSSI		Upland grassland
Robert Hall Moor	60	SD66J	SSSI		Wet grassland with flushes
Far Holme Meadow	60	SD66M	SSSI		Lowland grassland
Leck Beck Head Catchment Area	60	SD67U	SSSI (G only)		High altitude grassland with caves
Cutacre	59	SD70B	WT (LMM)	GM	Grazing meadow
Leverhulme Park	59	SD70J	LNR	GM	Woodland/grassland in public park, river valley
Seven Acres	59	SD70J	LNR	GM	Woodland/grassland in river valley
Worsley Woods	59	SD70K	LNR	GM	Woodland/plantation in brook valley
Blackleach	59	SD70L, SD70M	LNR	GM	Woodland around reservoir, former chemical works
Moses Gate	59	SD70N	LNR, country park	GM	Woodland, former paper mill, bleach works
Nob End	59	SD70N	LNR	GM	Former alkaline waste tip
Clifton	59	SD70S	LNR, country park	GM	Artificial lake from motorway construction, former coal mine

Outwood	59	SD70T	Country park	GM	Woodland, former coal mine and disused railway
Hurst Wood	59	SD70X	Country park	GM	Recent woodland above steep wooded valley
Philips Park	59	SD70X	LNR	GM	Woodland/grassland in public park
Chapelfield	59	SD70Y	LNR	GM	Woodland, former reservoir/paper mill
Smithills	59	SD71A	Country park	GM	Former stately home, woodland, moorland
Gale Clough and Shooterslee Wood	59	SD71C	SSSI		Wooded ravine, heath/grassland
Upper Bradshaw Valley	59	SD71G	LNR	GM	Wooded valley, former bleach works
Redisher Wood	59	SD71S	LNR	GM	Steep-sided wooded valley
Kirklees Valley	59	SD71W	LNR	GM	Woodland with ponds, former bleach and print works
Summerseat	59	SD71X	WT (LMM)	GM	Woodland/wetland in river valley, former industry
Lower Red Lees Pasture	59	SD71Y	SSSI		Unimproved pasture on valley slope
Hodge Clough	59	SD71Z	SSSI (G only)		Stream through shales
Arran Trail	59	SD72D	LNR		Grassland, woodland and man-made ponds
Foxhill Bank	59	SD72I	WT (LMM)		Former dyeing and printing works
Hodder River Section	60	SD73E	SSSI (G only)		River through rock strata
Harper Clough and Smalley Delph Quarries	59	SD73F	SSSI (G only)		Former quarries
Cock Wood Gorge	59	SD73M	SSSI (G only)		River through shales/sandstones
Light Clough	59	SD73N	SSSI (G only)		Stream through rock strata
Salthill and Bellmanpark Quarries	59	SD74L	SSSI, WT (LMM)		Disused limestone quarries
Coplow Quarry	59	SD74L	SSSI (G only)		Disused limestone quarry
Cross Hill Quarry	59	SD74L	WT (LMM)		Long-disused quarry
Clitheroe Knoll Reefs	59	SD74R	SSSI (G only)		Road cutting/small hills
Little Mearley Clough	59	SD74V	SSSI (G only)		Stream through rock on steep hill
Drinkwater Park	59	SD80B	Forestry England	GM	Planted woodland, former bleach works, sewage farm, hospital
Kersal Moor	59	SD80B	LNR	GM	Remnant moor, former racecourse/golf course
Mere Clough	59	SD80C	LNR	GM	Steep-sided brook valley
Hollins Vale	59	SD80E	LNR	GM	Farmland, planted woodland
The Cliff (Kersal Dale)	59	SD80F	LNR	GM	Woodland on steep river bank
Heaton Park	59	SD80H	Country park	GM	Municipal park with woodland, former stately home
Blackley Forest	59	SD80L	LNR	GM	Planted woodland in river valley
Boggart Hole Clough	59	SD80R	LNR	GM	Municipal park with woodland/grassland
Alkrington Woods	59	SD80S	LNR	GM	Mature woodland, formerly part of hall estate

Hopwood Woodlands	59	SD80U	LNR	GM	Woodland, formerly part of hall estate
Moston Fairway	59	SD80V	WT (LMM)	GM	Remnant grassland amidst housing
Chesham Woods	59	SD81B	LNR	GM	Pasture and woodland
Roch/Heywood	59	SD81K		GM	River valley/woodlands, former sewage works
Greenbooth	59	SD81M		GM	Former stone quarry
Healey Dell	59	SD81Y	LNR	GM	Wooded river valley, disused railway
Lee Quarry	59	SD82Q	SSSI (G only)		Former stone quarry
Lowerhouse Lodges	59	SD83B	LNR		Former cotton mill and reservoir
Lomeshaye Marsh	59	SD83N	LNR		Former sewage works
Deer Pond	59	SD83Q	LNR		Grassland, woodland, wetland
Greenfield	59	SD83U	LNR		Woodland, wetland, former mill pond
Alkincoats Woodland	59	SD84V	LNR		Planted woodland
Hollinwood Branch Canal	59	SD90A	LNR	GM	Disused canal
Tandle Hill	59	SD90E	Country park	GM	Mature woodland on hill, grassland, former hunting park
Daisy Nook	59	SD90F	Country park	GM	Woodland/grassland in river valley
Bardsley	59	SD90F		GM	Former coal mine
Knott Hill Reservoir	59	SD90K	LNR	GM	Disused reservoir
Glodwick Lows	59	SD90L	LNR	GM	Disused quarry
Rocher Vale	59	SD90L	LNR	GM	Former iron works
Castle Clough	58	SD90V	LNR	GM	Woodland in valley near industry
Cowbury Dale	58	SD90V	LNR	GM	Woodland /heather hill near industry
Rochdale Woodlands	59	SD91C	Forestry England	GM	Woodland by river near industry/housing
Upper Coldwell Reservoir	59	SD93D	WT (LMM)		Reservoir in moorland
Wycoller	59	SD93J	Country park		Moorland round ruined hall
Upper Ball Grove Lodge	59	SD94A	LNR		Former leather factory
Dove Stone	63	SE00B	RSPB	GM	Active reservoir and surrounds
Hilbre Island	58	SJ18Y, SJ18Z	LNR	MS	Bunter sandstone island
Parkgate	58	SJ27U	RSPB		Saltmarsh
Cubbins Green	58	SJ28C		MS	Woodland by Wirral Way
Red Rocks	58	SJ28D, SJ28E	SSSI, WT (C)	MS	Sand dunes, reed beds, marsh
Wirral Country Park	58	SJ28G	Country park	MS	Former railway line
Dee Estuary	58	SJ28G, SJ28K	SSSI	MS	Mud flats and saltmarsh
The Dungeon	58	SJ28L	SSSI (G only)	MS	Woodland, geological features
Cleaver Heath	58	SJ28L	WT (C)	MS	Lowland heath

Heswall Dales	58	SJ28L, SJ28R	SSSI, LNR	MS	Lowland heath
Thurstaston Common	58	SJ28M	SSSI, LNR	MS	Parkland, wood and heath
Meols Meadows	58	SJ29K	SSSI	MS	Coastal grassland
North Wirral Foreshore	58	SJ29L	SSSI	MS	Sand and mud flats
Bidston Moss	58	SJ29V	LNR	MS	Woodland on reclaimed tip
Burton Mere/Inner Marsh Farm	58	SJ37B	SSSI, RSPB		Reclaimed mudflat, wetland, woodland and arable fields
Burton Mill Wood	58	SJ37C	LNR		Woodland on hill
Hallwood Farm Marl Pit	58	SJ37M	SSSI		Farm with Black Poplar trees
Rivacre Valley	58	SJ37T, SJ37Y	LNR		Woodland and meadows: location of former outdoor swimming pool
Stanney Wood	58	SJ37X	LNR		Woodland amidst housing
Whitby Park	58	SJ37X	LNR		Municipal park, former hall estate
Foxes Wood	58	SJ38F	WT (C)	MS	Wooded brook valley
Thornton Wood	58	SJ38F	WT (C)	MS	Wooded brook valley
Intake Wood	58	SJ38F	WT (C)	MS	Wooded brook valley
Dibbinsdale	58	SJ38G, SJ38L	SSSI, LNR	MS	Woodland valley, ancient woodland
New Ferry Butterfly Park	58	SJ38H	WT (C)	MS	Former railway yard
Patrick's Wood	58	SJ38L	WT (C)	MS	Wooded brook valley
New Ferry	58	SJ38N	SSSI	MS	Sand and mud flats
Eastham	58	SJ38Q	Country park		Woodland/farm land around former ferry terminal
Mersey Estuary	58	SJ38V	SSSI		Sand and mud flats, saltmarsh
Seaforth	59	SJ39D	WT (LMM)	MS	Artificial lake on reclaimed land by coast
Brookvale (Rimrose Valley)	59	SJ39I	LNR	MS	Reedbed, meadow, woodland; former tip
Well Rough and Long Plantation	58	SJ44M	SSSI		Wooded river valley
Taylor's Rough & Wellmeadow Wood	58	SJ44X	SSSI		Wooded river valley
Dee Cliffs, Farndon	58	SJ45C	SSSI (G only)		Riverside by housing
Bickerton Hill	58	SJ45W, SJ55B	SSSI		Sandstone hill, woodland and lowland heath
River Dee	58	SJ46C	SSSI		River valley
Caldy Nature Park	58	SJ46H			Artificially created wetland in suburban brook valley
Hockenhull Platts	58	SJ46S	WT (C)		Wetland/meadows
Moston Community	58	SJ47A	WT (C)		Small reserve on farmland
Chester Zoo	58	SJ47A	Zoo		Meadows and reedbed, former agricultural land, close to zoo
Gowy Meadows	58	SJ47G	WT (C)		Lowland grazing marsh
Helsby Quarry	58	SJ47X	LNR		Former sandstone quarry

Speke Hall	59	SJ48B	Country park, NT	MS	Stately home, woodlands, meadows
Allerton (Eric Hardy)	59	SJ48C	LNR	MS	Woodland (former tip?)
Childwall Woods and Fields	59	SJ48E	LNR	MS	Woodland and grassland
Halewood Triangle	59	SJ48I	Country park		Former railway yard
Millwood and Alder Wood	59	SJ48L	LNR	MS	Remnant ancient woodland near industry/housing
Pickering's Pasture	59	SJ48W	LNR		Reclaimed tip
Pickering's Scrape [Pasture]	59	SJ48W	WT (C)		Artificially created lake/wetland
Hale Road Woods	58	SJ48X	LNR		Planted woodland near industry
Clincton Wood	59	SJ48X	LNR		Woodland/ponds near housing
Croxteth	59	SJ49C	LNR, country park	MS	Stately home, woodland, pastures
Acornfield Plantation	59	SJ49I	LNR	MS	Remnant estate woodland
Knowsley Safari	59	SJ49L	Zoo	MS	Paddock, some woodland
Stadt Moers	59	SJ49Q	Country park	MS	Woodland/grassland, former brick works, reclaimed tip
Bar Mere	58	SJ54I	SSSI		Nutrient-rich lake
Quoisley Meres	58	SJ54M	SSSI		Nutrient-rich glacial lakes
Norbury Meres	58	SJ54P	SSSI		Nutrient-rich lakes
Comber Mere	58	SJ54X	SSSI		Nutrient-rich lake
Raw Head	58	SJ55C	SSSI (G only)		Sandstone escarpment
Peckforton Woods	58	SJ55I	SSSI		Woodland on sandstone ridge
Chapel Mere	58	SJ55K	SSSI		Nutrient-rich lake
Oak Mere	58	SJ56T	SSSI		Shallow acidic lake
Little Budworth Common	58	SJ56X	SSSI		Lowland heath
Abbots Moss	58	SJ56Z	SSSI, WT (C)		Quaking bog
Dunsdale Hollow	58	SJ57D	SSSI		Acidic lowland wood
Frodsham Marshes	58	SJ57E			Estuarine marsh with industrial/chemical use
Black Lake	58	SJ57F	SSSI, WT (C)		Early-stage quaking bog
Bickley Hall Farm	58	SJ57H	WT (C)		Organic working farm
Frodsham Railway and Road Cuttings	58	SJ57J	SSSI (G only)		Cuttings through sandstone sequence
Delamere Forest	58	SJ57K	Forestry England		Forest/quaking bogs
Linmer Moss	58	SJ57K	SSSI		Steep-sided basin within forest
Hatch Mere	58	SJ57L	SSSI, WT (C)		Lake on acidic heath/bog
Flaxmere Moss	58	SJ57L	SSSI		Peatland in lake basin
Warburton's Wood and Well Wood	58	SJ57N	SSSI, WT (C)		Clough woodland
Beechmill Wood and Pasture	58	SJ57N	SSSI		Small clough woodland
Hunter's Wood	58	SJ57N	WT (C)		Planted woodland on former pasture
Crown Farm	58	SJ57Q	WT (C)		Former sand quarry

Hatton's Hey Wood, Whittle's Corner and Bank Rough	58	SJ57T	SSSI		Clough woodland
Dutton Farm Park	58	SJ57Y	WT (C)		Woodlands and ponds from old course of river
Runcorn Hill	58	SJ58A	LNR		Former sandstone quarry
Flood Brook Clough	58	SJ58F	SSSI		Deep wooded valley
Wigg Island	58	SJ58G	LNR		Former chemical works
Murdishaw Wood and Valley	58	SJ58K	LNR		Woodland/grassland near housing/industry
Dorchester Park	58	SJ58L	LNR		Remnant woodland by housing
Oxmoor Wood	58	SJ58M	LNR		Remnant woodland near industry
Fiddler's Ferry	59	SJ58N			Educational nature reserve in power station
Red Brow Cutting	58	SJ58Q	SSSI (G only)		Lane through siltstone
Daresbury Firs	58	SJ58R	LNR		Planted coniferous woodland
Moore	58	SJ58S, SJ58X	FCC Environment		Former sand quarry
Sankey Valley	59	SJ58Z	Country park		Long river valley/canal
Sutton Manor	59	SJ59A, SJ59F	Country park, Forestry England	MS	Woodland, former coal mine
Thatto Heath Meadows	59	SJ59B	LNR	MS	Remnant meadow/woodland near housing/industry
Clinkham Wood Community Woodland	59	SJ59E	LNR	MS	Remnant wood near housing
Clock Face	59	SJ59F	Country park	MS	Woodland, former coal mine
Stanley Bank Meadow	59	SJ59I	SSSI, LNR	MS	Damp unimproved grassland
Parr Hall Millennium Green	59	SJ59I	LNR	MS	Former farmland, near housing
Colliers Moss	59	SJ59L	LNR	MS	Former industrial waste site
Sound Heath/Common	58	SJ64I	SSSI, LNR		Lowland heath
Hatherton Flush	58	SJ64Z	SSSI		Steep river bank with seepage flushes
Wybunbury Moss	58	SJ65V	SSSI, NNR		Raised lowland bog
Wettenhall and Darnhall Woods	58	SJ66L	SSSI		Woodland and grassland in brook valley
Wimboldsley Wood	58	SJ66S	SSSI		Woodland in steep-sided river valley
Pettypool Brook Valley	58	SJ67A	SSSI		Valley mire systems
Owley Wood	58	SJ67H	WT (C)		Woodland in steep-sided river valley
Pumphouse Wood	58	SJ67H	WT (C)		Small wood near farmland/housing
Poors Wood	58	SJ67K	WT (C)		Woodland in steep-sided river valley
Marshall's Arm	58	SJ67L	LNR		Woodlands and meadows by old course of river
Anderton Nature Park	58	SJ67M	Country park		Restored industrial land

Marbury	58	SJ67N	Country park		Former hall estate
Marbury Reedbed	58	SJ67N	WT (C)		Reed bed adjoining lake (Budworth Mere)
Witton Lime Beds/Carey Park	58	SJ67S	SSSI		Lime bed
Ashton's & Neumann's Flashes	58	SJ67S			Lakes from salt-mining subsidence
Paddington Meadows	59	SJ68J	LNR		Meadow grassland
Woolston Eyes	58/59	SJ68P, SJ68U	SSSI		Dredgings from ship canal
Lightshaw Meadows	59	SJ69E	WT (LMM)	GM	Lake/wetland from mining subsidence
Pennington Flash	59	SJ69P	Country park	GM	Lake from mining subsidence, planted woodland
Risley Moss	59	SJ69Q, SJ69R	SSSI, LNR		Peat bog/country park
Rixton Clay Pits	59	SJ69V	SSSI, LNR		Former clay extraction site/brickworks
Holcroft Moss	59	SJ69W	SSSI, WT (C)		Uncut lowland peat bog
Cadishead and Little Woolden Moss	59	SJ69X	WT (LMM)	GM	Partly restored damaged peat mossland
Astley Moss	59	SJ69Y	WT (LMM)	GM	Partly restored damaged peat mossland
Betley Mere	58	SJ74P	SSSI		Nutrient-rich lake
Quaker's Coppice	58	SJ75H			Woodland by industry
Sandbach Flashes	58	SJ75J, SJ76F	SSSI		Lakes from salt-mining subsidence
Oakhanger Moss	58	SJ75S	SSSI		Raised peat bog
Cranberry Moss	58	SJ75X	LNR		Remnant of former moss, amidst housing
Bagmere	58	SJ76X	SSSI, WT (C)		Wetland/former lake filled with peat
Brereton Heath	58	SJ76X	LNR		Former sand quarry; heath, woodland
Quinta	58	SJ76Y	WT (C)		Small reserve adjacent to arboretum
Swettenham Meadows	58	SJ76Y, SJ86D	WT (C)		Grassland/meadow in brook valley
Plumley Lime Beds	58	SJ77C	SSSI		Former soda ash and calcium nitrate works
Tabley Mere	58	SJ77I	SSSI		Nutrient-rich lake, marsh, former hall estate
Rudheath	58	SJ77K	WT (C)		Woodland by artificial lake
Tatton Meres	58	SJ77P	SSSI		Lakes in deer-park
Knutsford Heath	58	SJ77P	WT (C)		Remnant lowland heath
Knutsford Moor	58	SJ77P	WT (C)		Reed beds at end of lake
Lower Moss Wood	58	SJ77X			Educational woodland
The Mere, Mere	58	SJ78F	SSSI		Moderately nutrient-rich lake
Sean Hawkins Meadow	58	SJ78H	WT (C)		Wet meadow, woodland
Dunham Park	58	SJ78I	Country park, NT	GM	Deer park, stately home
Tatton Park	58	SJ78K	Country park, NT		Deer park, stately home

Rostherne Mere	58	SJ78L, SJ78M	SSSI, NNR		Natural lake on glacial deposits
Black Moss Covert	58	SJ78P	WT (C)	GM	Remnant woodland in former moss
Sinderland Green Woods	58	SJ79F	WT (C)	GM	Remnant woodland in former moss
Brookheys Covert	58	SJ79K	WT (C)	GM	Remnant woodland in former moss
Hogswood Covert	58	SJ79K	WT (C)	GM	Remnant woodland in former moss
Birch Moss Covert	58	SJ79K	WT (C)	GM	Remnant woodland in former moss
Broad Ees Dole	58	SJ79W	LNR	GM	Artificial wetland from motorway construction
Trafford Ecology Park	59	SJ79Y	LNR	GM	Artificial lake, remnant of hall estate, close to industry
Roe Park Woods	58	SJ85P	SSSI		Ancient woodland on Millstone Grit
Gannister Quarry	58	SJ85U	SSSI (G only)		Stone quarry with fossils
Limekiln Wood	58	SJ85U	WT (C)		Ancient woodland, wet flushes
Brookhouse Moss	58	SJ86A	SSSI		Moss/open bog
Daneside	58	SJ86C	Country park		Grassland by caravan park
Holly Banks	58	SJ86C	SSSI		Woodland in steep-sided river valley
River Dane	58	SJ86D	SSSI (G only)		River features
Black Firs Wood	58	SJ86G	WT (C)		Woodland on peat/sand
Gleads Moss	58	SJ86J	SSSI		Moss/fen and alder carr
Astbury Mere	58	SJ86L	Country park		Lake in former sand quarry
Dane-in-Shaw Pasture	58	SJ86R	SSSI		Unimproved pasture in brook valley
Madams Wood	58	SJ86S	SSSI		Woodland in steep-sided river valley
Alderley Park	58	SJ87M			Science centre
Alderley Edge	58	SJ87N	SSSI (G only), NT		Wooded hill, former copper mine
Cotterill Clough	58	SJ88C	WT (C)	GM	Clough woodland
Wythenshawe Park	58	SJ88E	LNR	GM	Municipal park with remnant ancient woodlands
Lindow Common	58	SJ88F	SSSI, LNR		Lowland heath
Saltersley Moss	58	SJ88F	WT (C)		Remnant of lowland raised bog, largely dried out
Styal	58	SJ88G	Country park, NT		Woodland in river valley
Gatley Carrs	58	SJ88P	LNR	GM	Woodland/grassland on reclaimed tip
Stenner Woods and Millgate Fields, Didsbury	59	SJ88P	LNR	GM	Woodland/grassland
Abney Hall	58	SJ88U	LNR	GM	Woodland/wet meadow grassland, former stately home
Carr Wood	58	SJ88X	Country park	GM	Wooded brook valley
Chorlton Water Park	59	SJ89A	LNR	GM	Artificial lake from motorway construction

Chorlton Ees and Ivy Green	59	SJ89B	LNR	GM	Woodland/grassland, former sewage works
Heaton Mersey Common	59	SJ89Q	LNR	GM	Former brickworks
Mersey Vale Nature Park	59	SJ89Q	LNR	GM	Former bleach works and railway sidings
Highfield	59	SJ89W	LNR, country park	GM	Former clay pit, brickworks, bleach works, tip
Clayton Vale	59	SJ89Z	LNR	GM	Woodland/grassland, former ash tip
Bosley Cloud	58	SJ96B			Heather-covered hill
Danes Moss	58	SJ97A	SSSI, WT (C)		Lowland raised bog
Riverside Park, Macclesfield	58	SJ97C	LNR		Planted woodland on former farmland
Macclesfield Forest	58	SJ97K, SJ97R	UU		Woodland on hills; once-extensive ancient hunting reserve
Tegg's Nose	58	SJ97L	Country park		Hill, former Millstone grit quarry
Kerridge Hill	58	SJ97M	WT (C)		Hillside grassland
Trentabank Reservoir	58	SJ97Q	WT (C)		Coniferous plantation by reservoir
Happy Valley	58	SJ98C	LNR	GM	Woodland/marshy grassland in river valley
Poynton Coppice	58	SJ98G	LNR		Remnant coppiced woodland
Poise Brook	58	SJ98J	LNR	GM	Wooded brook valley
Jackson's Brickworks	58	SJ98M	LNR		Former brickworks
Chadkirk Country Estate	58	SJ98P	LNR	GM	Woodland and meadow grassland
Lyme Park	58	SJ98R	Country park, NT		Stately home with deer park
Millennium Wood, Disley	58	SJ98W	LNR		Planted woodland
Woodbank Park	58	SJ99A	LNR	GM	Woodland in municipal park
Reddish Vale	59	SJ99B	LNR, country park	GM	Former calico printing works
Hulmes and Hardy Wood and Lower Haughton Meadows	59	SJ99G	LNR	GM	Wooded brook valley near housing
Haughton Dale	59	SJ99G	LNR	GM	Woodland/grassland in river valley
Etherow Country Park	58	SJ99Q	LNR, country park	GM	Woodland/artificial lakes, former cotton mill
Compstall	58	SJ99Q	SSSI, WT (C)	GM	Woodland/wetland in river valley, former industry
Werneth Low	58	SJ99R	Country park	GM	Dry heathland on hillside
Eastwood	58	SJ99U	WT (C)	GM	Clough woodland
Great Wood	58	SJ99W	LNR	GM	Woodland above river valley
Hurst Clough	58	SJ99X	LNR	GM	Wooded brook valley
Goyt Valley	58	SK07B, C, D	SSSI, Forestry England		Acidic grassland, shrub heath, woodland

ABBREVIATIONS
GM- Greater Manchester
MS – Merseyside
LNR – Local Nature Reserve

NNR – National Nature Reserve
NT – National Trust
RSPB – Royal Society for the Protection of Birds
SSSI – Site of Special Scientific Interest
SSSI (G only) – Site of Special Scientific Interest (geological only)
UU- United Utilities
WT (C) – Wildlife Trust (Cheshire)
WT (Cum) – Wildlife Trust (Cumbria)
WT (LMM) – Wildlife Trust (Lancashire, Manchester & north Merseyside)

TABLE SHOWING THE NUMBER OF BUTTERFLY SPECIES RECORDED IN EACH TETRAD WHOLLY OR PARTLY WITHIN LANCASHIRE AND CHESHIRE.

An asterisk indicates that the tetrad includes one or more of the sites listed in the above table of nature reserves and other notable sites.

NY20K	3	SD19V	0	SD26U	17	SD28A	3
NY20Q	1	SD20S *	21	SD27A	18	SD28B	0
NY20R	2	SD20T	23	SD27B	13	SD28C	19
NY20V *	5	SD20U	20	SD27C	21	SD28D *	18
NY20W	2	SD20V	23	SD27D	23	SD28E	15
NY30A *	19	SD20W	23	SD27E	10	SD28F	7
NY30B	11	SD20X *	24	SD27F	15	SD28G	14
NY30F *	19	SD20Y	21	SD27G	15	SD28H *	20
NY30G	15	SD20Z	23	SD27H *	13	SD28I	14
NY30K *	14	SD21Q	0	SD27I	13	SD28J	19
NY30L	13	SD21V *	26	SD27J	15	SD28K	11
NY30Q *	18	SD21W	17	SD27K	13	SD28L *	6
NY30R	12	SD26A	17	SD27L	18	SD28M	12
SD16T	12	SD26B	20	SD27M	13	SD28N	16
SD16U	14	SD26C	10	SD27N	13	SD28P	14
SD16W	1	SD26D	9	SD27P	12	SD28Q	11
SD16X	15	SD26E	23	SD27Q	12	SD28R	11
SD16Y	20	SD26F	16	SD27R	12	SD28S	12
SD16Z	17	SD26G *	17	SD27S	17	SD28T	16
SD17Q	25	SD26H	10	SD27T	15	SD28U	13
SD17R *	23	SD26I	14	SD27U	11	SD28V	15
SD17S	8	SD26J	17	SD27V	17	SD28W	15
SD17V	26	SD26L	8	SD27W	18	SD28X *	24
SD17W	21	SD26M *	13	SD27X	22	SD28Y	12
SD17X *	27	SD26N	15	SD27Y	22	SD28Z *	23
SD18Z	0	SD26P	9	SD27Z	22	SD29A	15

SD29B	5
SD29C	9
SD29D	0
SD29F	13
SD29G	15
SD29H	9
SD29I *	12
SD29J	7
SD29K	13
SD29L	16
SD29M	7
SD29N	5
SD29P	1
SD29Q *	13
SD29R	13
SD29S *	0
SD29T	5
SD29U *	5
SD29V	22
SD29W	15
SD29X	14
SD29Y	11
SD29Z	12
SD30A	22
SD30B	19
SD30C	5
SD30D	18
SD30E	18
SD30F	21
SD30G	17
SD30H	4
SD30I *	12
SD30J	19
SD30K *	19
SD30L *	20
SD30M	17
SD30N	17
SD30P *	21
SD30Q	21
SD30R	22
SD30S	20

SD30T	9
SD30U	18
SD30V	20
SD30W	19
SD30X	18
SD30Y	20
SD30Z	11
SD31A	26
SD31B *	22
SD31C	20
SD31D	14
SD31F	14
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SD31H	22
SD31I *	22
SD31J	13
SD31K	11
SD31L	9
SD31M *	14
SD31N	18
SD31P *	23
SD31Q	15
SD31R	11
SD31S	17
SD31T	18
SD31U	13
SD31V	15
SD31W	13
SD31X	12
SD31Y	8
SD31Z	9
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SD32J	21
SD32K *	23
SD32L	2
SD32N	24
SD32P	22
SD32Q	21
SD32R	2
SD32S	4

SD32T	23
SD32U *	15
SD32V	13
SD32W	11
SD32X	0
SD32Y	13
SD32Z	13
SD33A *	24
SD33B	20
SD33C	14
SD33D	15
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SD33F	17
SD33G	18
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SD33V	16
SD33W	16
SD33X	12
SD33Y	3
SD33Z	16
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SD34B	13
SD34C	19
SD34D	20
SD34E	11
SD34F	19
SD34G	18
SD34H	21
SD34I	22

SD34J	17
SD34K	20
SD34L	21
SD34M	20
SD34N	21
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SD34S	11
SD34T	19
SD34U	17
SD34V	11
SD34W	10
SD34X	16
SD34Y	15
SD34Z	19
SD35V	20
SD35Z	10
SD36V	5
SD37C	23
SD37D	29
SD37E *	20
SD37I	20
SD37J	26
SD37M	16
SD37N *	13
SD37P	20
SD37R	7
SD37S	16
SD37T	19
SD37U	22
SD37W *	26
SD37X *	28
SD37Y *	33
SD37Z	29
SD38A	13
SD38B	15
SD38C	15
SD38D	24
SD38E	17
SD38F *	28

SD38G	33
SD38H	23
SD38I	26
SD38J *	28
SD38K *	28
SD38L	24
SD38M	25
SD38N *	18
SD38P	22
SD38Q *	26
SD38R	23
SD38S	20
SD38T	20
SD38U	21
SD38V	29
SD38W	13
SD38X	20
SD38Y	13
SD38Z	9
SD39A	14
SD39B *	8
SD39C	17
SD39D	10
SD39E *	6
SD39F	22
SD39G	19
SD39H	15
SD39I	22
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SD39K	24
SD39L	11
SD39M	12
SD39N	17
SD39P	12
SD39Q	11
SD39R	8
SD39S	10
SD39T *	14
SD39U	23
SD39V	4
SD39W	12

SD39X	13
SD39Y	16
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SD40A	11
SD40B	11
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SD40E	20
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SD41C	3
SD41D	20
SD41E	5
SD41F	17
SD41G	16
SD41H *	24
SD41I	17
SD41J	3
SD41K	20
SD41L	13
SD41M *	21

SD41N	17
SD41P	12
SD41Q	19
SD41R	8
SD41S	18
SD41T	17
SD41U	12
SD41V	19
SD41W	1
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SD41Z	20
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SD42N	12
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SD42Q	17
SD42R	14
SD42S *	20
SD42T	11
SD42U	8
SD42V	12
SD42W	9
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SD42Y	19
SD42Z	19
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SD43D	17

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SD43S	13
SD43T	19
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SD43W	18
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SD43Z	15
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SD44J	15
SD44K	15
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SD44U	14

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SD45U	24
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SD45W	16
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SD45Z	21
SD46A *	24
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SD46F *	25
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SD46H	15
SD46K *	23
SD46L	23
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SD46Q	22
SD46R	22
SD46S	16

SD46T *	15
SD46U	14
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SD46W	22
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SD46Y	13
SD46Z *	23
SD47D	22
SD47E *	32
SD47I	1
SD47J	14
SD47L *	31
SD47M	26
SD47N	27
SD47P	1
SD47Q	7
SD47R	31
SD47S *	32
SD47T *	38
SD47U *	19
SD47V	25
SD47W *	34
SD47X *	34
SD47Y *	36
SD47Z	0
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SD48C	18
SD48D	22
SD48E	19
SD48F	5
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SD48H	1
SD48I	3
SD48J	0
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SD49B *	12
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SD50B	14
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SD50D *	21

SD50E	20
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SD50G *	21
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SD50P	19
SD50Q	18
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SD50T	21
SD50U	21
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SD50Y	21
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SD51L	16
SD51M	14
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SD51U	17

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SD51Y	20
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SD52F	15
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SD52T	11
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SD52W	15
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SD52Y *	18
SD52Z	7
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SD53B	22
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SD53D	17
SD53E	19
SD53F	20
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SD53H	12
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SD53K *	13

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SD53U	6
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SD54B	18
SD54C	19
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SD54L	16
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SD54R *	21
SD54S	13
SD54T	6
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SD54W	5
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SD54Y	8
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SD55K	10
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SD55S	9
SD55T	9
SD55U	2
SD55V	1
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SD55Z	5
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SD56L *	11
SD56M	13
SD56N	15
SD56P *	6
SD56Q	4
SD56R	13
SD56S	14

SD56T *	22
SD56U	15
SD56V	4
SD56W	9
SD56X	10
SD56Y	8
SD56Z	22
SD57A	22
SD57B	23
SD57C	20
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SD57Y	13
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SD60B *	22
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SD60M *	21

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SD60Q	20
SD60R	21
SD60S *	17
SD60T	19
SD60U	21
SD60V *	19
SD60W	18
SD60X	19
SD60Y *	18
SD60Z	22
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SD61G	23
SD61H *	25
SD61I	21
SD61J *	21
SD61K *	22
SD61L	23
SD61M	11
SD61N	11
SD61P	16
SD61Q	21
SD61R	19
SD61S	18
SD61T	25
SD61U	16
SD61V *	24
SD61W *	20
SD61X *	22
SD61Y	16
SD61Z	15
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SD62B *	21
SD62C	15
SD62D	12

SD62E *	4
SD62F	23
SD62G *	19
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SD62I	17
SD62J	11
SD62K	14
SD62L	18
SD62M	15
SD62N *	20
SD62P	12
SD62Q	17
SD62R *	19
SD62S	9
SD62T	7
SD62U	15
SD62V	13
SD62W	13
SD62X *	18
SD62Y	12
SD62Z	7
SD63A	4
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SD63C	6
SD63D	21
SD63E	16
SD63F	13
SD63G	9
SD63H	18
SD63I	9
SD63J	11
SD63K	9
SD63L	14
SD63M	20
SD63N	14
SD63P	18
SD63Q	14
SD63R	6
SD63S	22
SD63T	16
SD63U	18

SD63V	15
SD63W	10
SD63X	11
SD63Y	15
SD63Z	19
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SD64B	6
SD64C	12
SD64D	6
SD64F	12
SD64G	12
SD64H	14
SD64I	7
SD64J	0
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SD64L	15
SD64M	4
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SD64P	7
SD64Q	17
SD64R	1
SD64V	13
SD64W	1
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SD65B	10
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SD65D	8
SD65E	2
SD65G	5
SD65H	2
SD65I	0
SD65J	6
SD65N	0
SD65P	5
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SD66A	10
SD66B	16
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SD66D *	19
SD66E	13
SD66F	3

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SD66H	7
SD66I	15
SD66J *	14
SD66K	15
SD66L	19
SD66M *	16
SD66N	13
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SD71Y *	21
SD71Z *	21
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SD74X	13
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SD80D	18
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SD80N	21
SD80P	19

SD80Q	21
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SD80U *	18
SD80V *	23
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SD80Y	21
SD80Z	18
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SD81D	15
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SD81R	22
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SD81X	19
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SD83S	21
SD83T	17
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SD83V	24
SD83W	23

SD83X	22
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SD83Z	15
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SD90H	21
SD90I	20
SD90J	19
SD90K *	18
SD90L *	21
SD90M	20
SD90N	20
SD90P	19
SD90Q	16
SD90R	19
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SD90T	18
SD90U	18
SD90V *	20
SD90W	20
SD90X (GM)	22
SD90Y (GM)	20
SD90Z (GM)	21
SD91A	20
SD91B	18

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SD91M	18
SD91N	23
SD91P	21
SD91Q	20
SD91R	20
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SD91T	5
SD91U	14
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SD91W	11
SD91X	1
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SD92B	1
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SD92G	18
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SD92K	5
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SD92Q	0
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SD93D *	17
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SD93I	4

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SD93M	0
SD93N	0
SD93P	0
SD93T	0
SD93U	0
SD94A *	20
SD94B	10
SD94F	12
SD94G	3
SD94K	0
SD94L	0
SD94Q	0
SE00A	11
SE00B *	22
SE00C (GM)	20
SE00D (GM)	21
SE00E (GM)	19
SE00F	9
SE00G (GM)	15
SE00H (GM)	22
SE00I (GM)	5
SE00J (GM)	1
SE00K	5
SE00L	1
SE00M	1
SE00N (GM)	5
SE00Q	6
SE00R	3
SE00S	1
SE00V	9
SE00W	11
SE00X	7
SE01A (GM)	7
SE01B (GM)	7
SE10A	10
SE10B	3
SE10F	9
SE10F (GM)	0
SE10G (GM)	0
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SJ27X	21
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SJ27Z	21
SJ28C	24
SJ28D	25
SJ28E *	24
SJ28G *	24
SJ28H	26
SJ28I	21
SJ28J	16
SJ28K *	21
SJ28L *	27
SJ28M *	28
SJ28N	22
SJ28P	23
SJ28Q	23
SJ28R *	22
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SJ28T	21
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SJ28V	19
SJ28W	22
SJ28X	20
SJ28Y	18
SJ28Z	25
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SJ29Q	23
SJ29R	23
SJ29V *	22
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SJ35U	15

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SJ36T	21
SJ36U	21
SJ36V	9
SJ36W	20
SJ36X	23
SJ36Y	23
SJ36Z	23
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SJ37C *	28
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SJ37H	14
SJ37I	22
SJ37J	18
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SJ37S	20
SJ37T	25
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SJ37Y *	23
SJ37Z	22
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SJ38B	21
SJ38C	21

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SJ38G *	24
SJ38H *	26
SJ38I	14
SJ38J	15
SJ38K	23
SJ38L *	25
SJ38M	22
SJ38N *	13
SJ38P	19
SJ38Q *	24
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SJ38S	16
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SJ38U	22
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SJ38Y	19
SJ38Z	19
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SJ39B	17
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SJ39E	25
SJ39F	16
SJ39G	10
SJ39H	9
SJ39I *	22
SJ39J	22
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SJ45K	20
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SJ46M	20
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SJ46P	18
SJ46Q	18
SJ46R	17
SJ46S *	24
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SJ46U	19
SJ46V	23
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SJ46X	19
SJ46Y	19
SJ46Z	16
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SJ47C	21
SJ47D	20
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SJ47H	21
SJ47I	13
SJ47K	23
SJ47L	19
SJ47M	20
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SJ47P	0

SJ47Q	17
SJ47R	17
SJ47S	16
SJ47T	14
SJ47U	0
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SJ47Y	17
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SJ48C *	17
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SJ48E *	19
SJ48F	20
SJ48G	19
SJ48H	19
SJ48I *	19
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SJ48K	20
SJ48L *	21
SJ48M	20
SJ48N	19
SJ48P	18
SJ48Q	21
SJ48R	23
SJ48S	18
SJ48T	14
SJ48U	20
SJ48V	16
SJ48W *	22
SJ48X *	21
SJ48Y	16
SJ48Z	14
SJ49A	18
SJ49B	14
SJ49C *	21
SJ49D	8
SJ49E	8
SJ49F	11
SJ49G	11

SJ49H	16
SJ49I *	20
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SJ54R	0
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SJ55B	23
SJ55C *	17

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SJ57L *	23
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SJ57T *	17
SJ57U	14
SJ57V	18
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SJ97F	20
SJ97G	20
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SJ97K	25
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SJ97P	22
SJ97Q *	24
SJ97R *	19
SJ97S	22
SJ97T	20
SJ97U	18
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SJ97X	17
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SJ98H	23

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SJ98P *	23
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SJ98U	24
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SJ98X	25
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SJ98Z (GM)	17
SJ99A *	22
SJ99B *	22
SJ99C	17
SJ99D	19
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SJ99Y	21
SJ99Z	21
SK06D	15
SK06E	18
SK07A	17
SK07B	21
SK07C	22
SK07D *	19

SK07E	17
SK08A	10
SK08B	5
SK08C	0
SK09A	5
SK09C	7
SK09D	20
SK09E	20
SK09I	0
SK09J	0
SK09P	1
SK09U	11
SK09Z	0
SK19E	1
SK19J	1

SPECIES ACCOUNTS AND DISTRIBUTION MAPS

Family HESPERIIDAE

CHEQUERED SKIPPER, *Carterocephalus palaemon* (Pallas, 1771)

Spean Bridge 7.6.1992

Whitehead (1986) stated: "In 1854, Byerley wrote that the Chequered Skipper was 'said to be found beyond New Ferry'. As this species has never been recorded nearer than sixty miles from this location, this record must rank as unproven."

SMALL SKIPPER, *Thymelicus sylvestris* (Poda, 1761)

Male, Flixton 8.7.2011

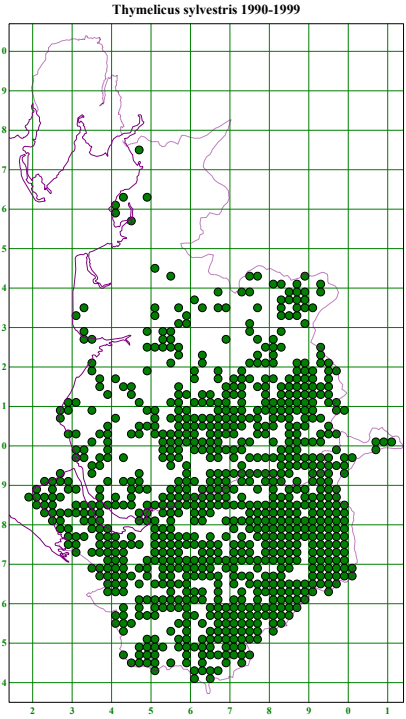
Female, Sale 6.7.2006

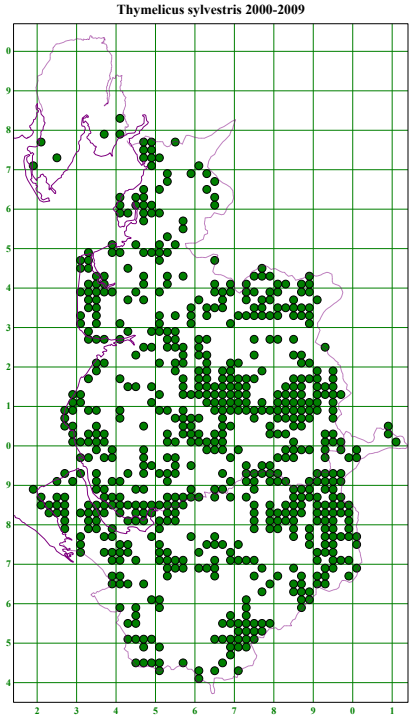
Male and female, Heaton Park 21.7.2015

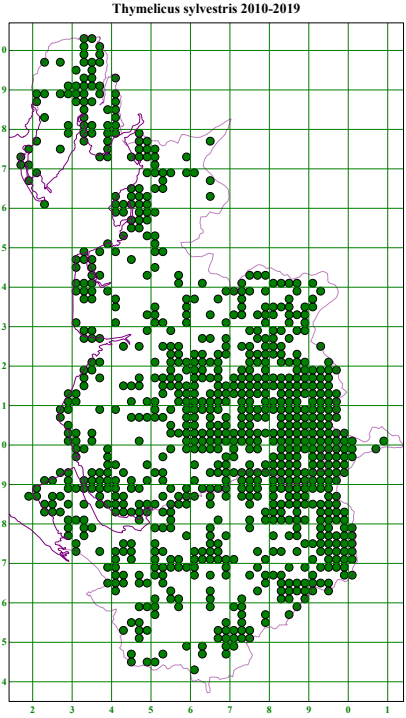
Male, Irwell bank, Salford 2.7.2019

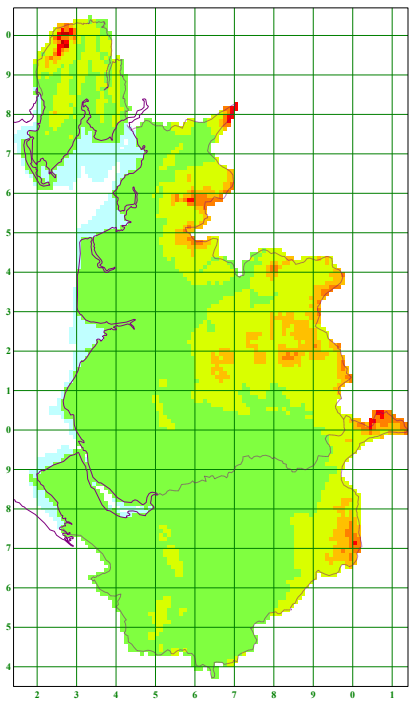
Distribution. Historically, this species was virtually unknown in Lancashire, and in Cheshire was only to be found in the south. Whitehead (1986), referring to the Wirral, stated: "One specimen was recorded at Gill Brook, Birkenhead in 1841, and in 1854 it was described as very rare at Eastham and near Bidston; another was recorded at Raby Mere in 1854. The species appears then to have disappeared from the [area] and it was not recorded again until rediscovered at Dibbinsdale ... in July 1983 ... A further small colony was located at Brimstage in 1985". Shaw (1998) added: "Its resurgence can be traced back to 1976 when it was found to be well established around Malpas".

In the 1990s, the butterfly underwent a spectacular range extension and colonised the whole of Cheshire and much of Lancashire. It was clear that fecund females must have flown over very large areas of completely unsuitable terrain, both rural and urban, to locate some of the small isolated patches of habitat (Dennis, 1992). In 1995


Thymelicus sylvestris 1990-1999


Thymelicus sylvestris 2000-2009


Thymelicus sylvestris 2010-2019


Altitude

and 1996, when more parts of the Mersey Valley were surveyed in greater detail, the species was found on virtually every marginal site checked including scraps of waste land in built-up areas. Since then, the butterfly continued to spread northwards, reaching the Furness in period 2 and by the end of period 3 being fairly widely distributed in suitable habitats over most of the area. In some localities in the south where it became established and abundant in the 1990s, numbers have since declined and/or fluctuated. For instance, in 2014 it reached a spectacular abundance in a grassland in Wythenshawe Park (SJ8189/8287) (Hardy & Kinder, 2014); there were lesser numbers at this site in 2015, 2016 and 2017, but in 2018, although the nature of the biotope did not appear to have significantly changed, there were none.

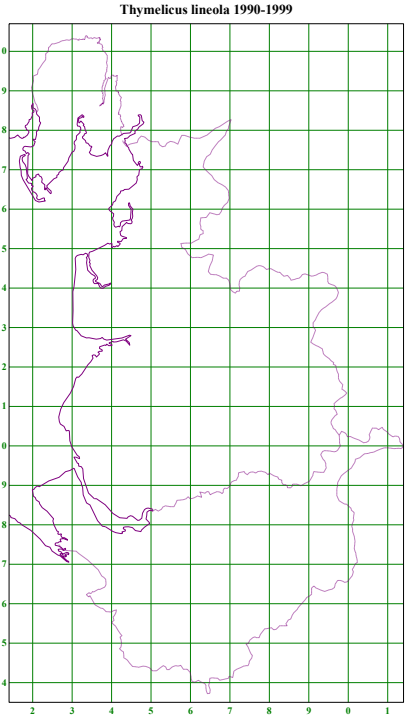
The unmown section of grassland in Wythenshawe Park, Manchester, SJ8189/8289, 21.7.2014: *T. sylvestris* was very abundant here on the Ragwort flowers in 2014, present but less numerous in the following three years and absent in 2018.

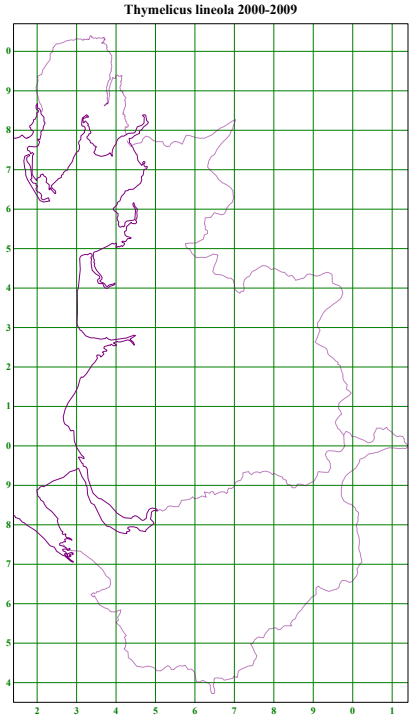
Habitats. Warm sites with rough grass, abundant nectar flowers and, usually, some scrub. In the 1990s around Manchester many suitable sites were on road and railway verges, abandoned railway yards and other regenerating patches of waste ground including those close to the city centre and industrial areas. The species is less ecologically tolerant than the Large Skipper *Ochlodes sylvanus*, requiring warmer, more sheltered habitats, though it is sometimes found co-occurring with that species. At a site near Bolton in 1995, the vegetation where *T. sylvestris* was densest comprised sedge, Bird's-foot Trefoil and some *Holcus* grass; smaller numbers were on adjacent more recently disturbed ground dominated by Buttercups, Great Willow-herb and Ragwort. In nearby longer grass with Thistles, *O. sylvanus* dominated. Sections in parks and the like where mowing is relaxed and there is some *Holcus* in the grass are sometimes colonised.

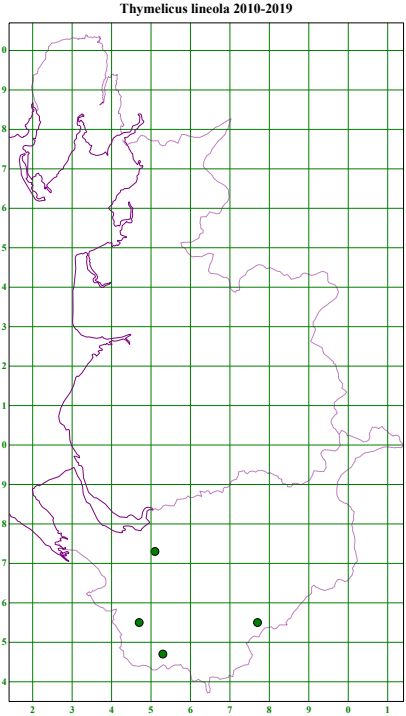
Hostplants. Grasses, particularly Yorkshire Fog *Holcus lanatus*.

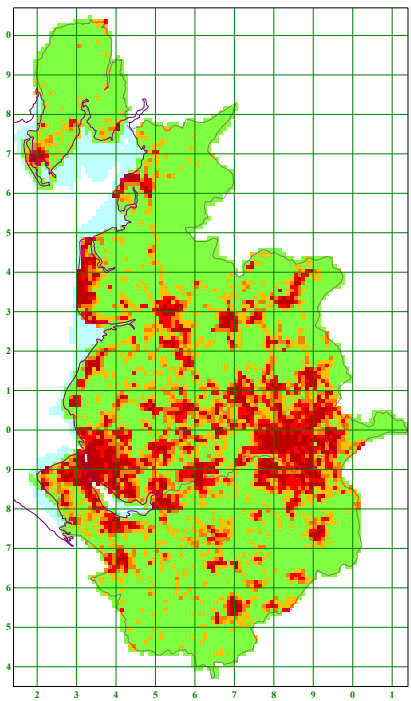
Broods. Single-brooded; the species has a short flight period, which starts in early July, or late June in favourable years. In 1994 it did not appear until 12th July. Numbers usually build up very quickly to a peak when it is sometimes very abundant, but the species always emerges later than *O. sylvanus* although there is an overlap so that the two species are sometimes seen together for a short period.

Behaviour. This butterfly sometimes builds up very large populations which give the impression of being confined to a small space, but in fact the species must be very mobile to have colonised so many new areas so quickly. Several individuals are often seen taking nectar from flowers together, especially Ragwort *Senecio jacobaea*, on which over eighty were noted in Wythenshawe Park in July 2014, and sometimes Knapweed, a number being noted on this plant in a herb-rich grassland at the edge of the Littleton Road playing fields, Salford in 2019. Creeping Thistle *Cirsium arvense* is also popular as a nectar source. They do not appear to be as aggressive to other butterflies as *Ochlodes sylvanus*; they also fly and perch at a lower level. In most


Thymelicus lineola 1990-1999


Thymelicus lineola 2000-2009


Thymelicus lineola 2010-2019


Urban cover

summers it has been apparent that *T. sylvestris* favoured sites which were noticeably warmer and more sheltered than surrounding land. In 1995, however, when June and early July were much hotter than usual, numbers in some of the previously favoured sites were much reduced, probably because the grass had become too desiccated; but the butterfly spread to other sites nearby. For example, although much less numerous on the slope beside the road north of the airport tunnel (SJ8083) than in 1994 when it had been very abundant, it was present in numbers on some field edges about a mile to the north of this site (SJ8086); parallel instances were noted in the Mersey Valley where it was less numerous in the original sheltered site (SJ7893) but much more abundant elsewhere.

ESSEX SKIPPER, *Thymelicus lineola* (Ochsenheimer, 1808)


Male, Chiddingfold, Surrey 22.7.1991


Female, Chiddingfold 12.7.2003


Underside, Chiddingfold 22.7.1991

Two sightings were reported from near Alsager in 2018, of five individuals in total. In 2019 there were a few further records, notably at Alvanley by three observers.

LARGE SKIPPER, *Ochlodes sylvanus* (Esper, 1777)

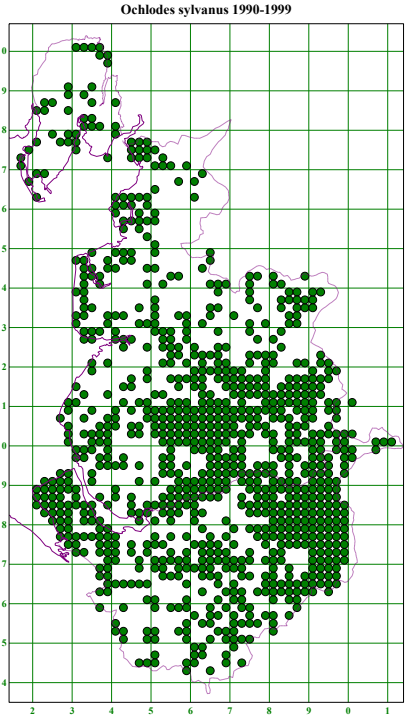

Male, Sale 19.6.2007

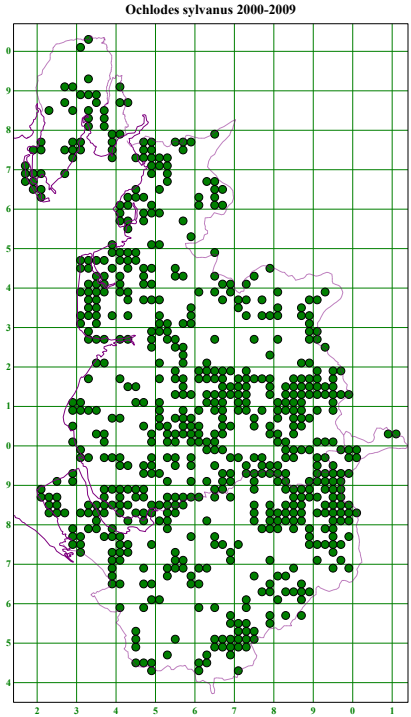

Female, Stretford 9.6.2011

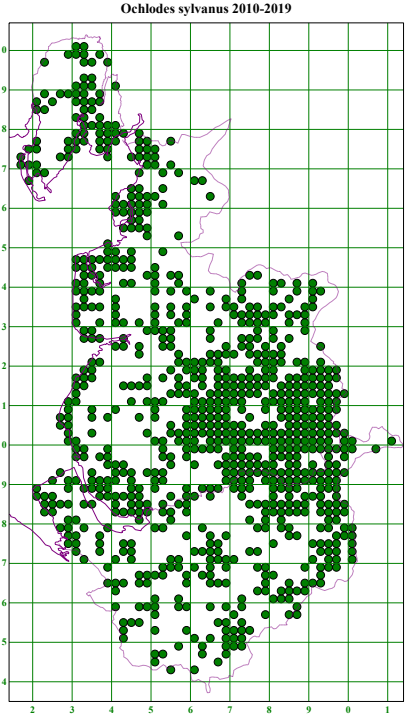

Mating pair, Horwich 3.8.2011

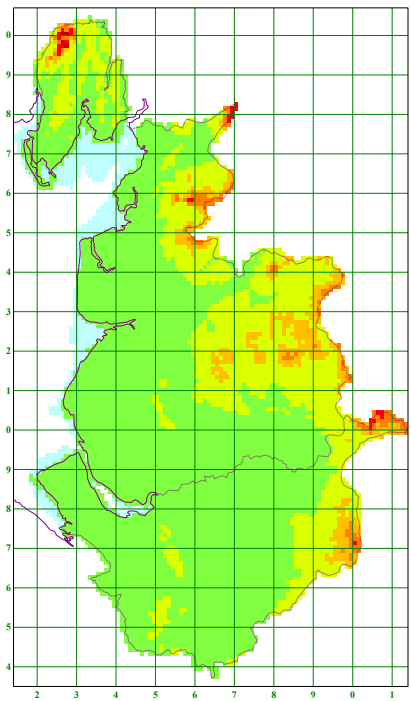
Distribution. Whitehead (1986) stated "In 1890, it was found 'throughout Wirral'. By 1913, numbers had dwindled, and it was said to be generally common on rough uncultivated ground ... but not in any numbers ... The species has made a legendary increase recently and has been common again on Merseyside for many years." This probably reflects the position over the whole of Lancashire and Cheshire, and the maps for all three periods indicate a fairly even distribution over the whole area except the highest ground in the north and east. It has certainly been much longer established than *T. sylvestris*. Numbers are subject to much fluctuation from year to year, probably mainly due to weather conditions.

Habitats. A species of rough grassland and scrub, including river valleys, grassy places in woodlands, scrub areas, railway verges, waste land, even sheltered spots on moorlands (for example, Holcombe Moor (SD7716), where it was noted at an altitude of 350m on 2.8.1995). The main requirements are grassy areas with nectar sources plus taller vegetation for shelter and on which to perch. The habitat requirements often coincide with those of the Meadow Brown *Maniola jurtina* and


Ochlodes sylvanus 1990-1999


Ochlodes sylvanus 2000-2009


Ochlodes sylvanus 2010-2019


Altitude

very often the two species are found together, although their behaviour is very different. *O. sylvanus* is not usually as abundant as *M. jurtina*, although if anything it tolerates a slightly greater range of biotopes. It also sometimes occurs along with the Small Skipper *Thymelicus sylvestris*; where this happens the present species is usually less numerous and prefers a different part of the site with more shelter and taller vegetation.

Hostplants. Grasses. The precise species used in the area have not been identified.

Broods. The single annual brood is from late May or early June until early July. There is a short peak when the species may be quite numerous, then a rapid decline and very few are seen after mid-July. The timing of the flight period is usually 2-3 weeks earlier than *T. sylvestris*. The flight period is sometimes a little later at higher altitudes and latitudes: for example, on 3.8.2011 several fresh examples were seen around George's Lane, Horwich (SD6512), which was four weeks after the last sightings in the Mersey Valley in Sale (SJ7992) that year.

Behaviour. This is a very active, territorial and aggressive species. It is fond of basking on bushes and other taller vegetation in corners or sheltered spots in hedgerows. R.L.H. Dennis (pers. comm.) remarks that he has seen, and even heard, these butterflies strike each other in territorial disputes. They also successfully drive off much larger butterflies which invade their territories; examples noted during the early years of the survey included a Comma *Polygonia c-album* (Partington, SJ7291, 21.6.1995) and a Small Tortoiseshell *Aglais urticae* (Ladybrook Valley, SJ9085, 2.7.1995). They have also been seen to chase off bees. The few observations of this species during the 1996/7 nectar survey showed Creeping Thistle *Cirsium arvense* as the most popular nectar source, and Tufted Vetch *Vicia cracca* second. From observations in subsequent years, Tufted Vetch would seem to be a widely used source, and in many of the butterfly's haunts in a good season almost every patch of the plant will have several feeding on it. Brambles *Rubus fruticosus* agg. are however the most popular source and serve as perching sites as well as providing nutrition (Dennis & Williams, 1987). An unusual nectar source being used on the Mersey bank (SJ788929) on 7.7.1994 was Hedge Bindweed *Calystegia sepium*; this plant was also noted in period 3.

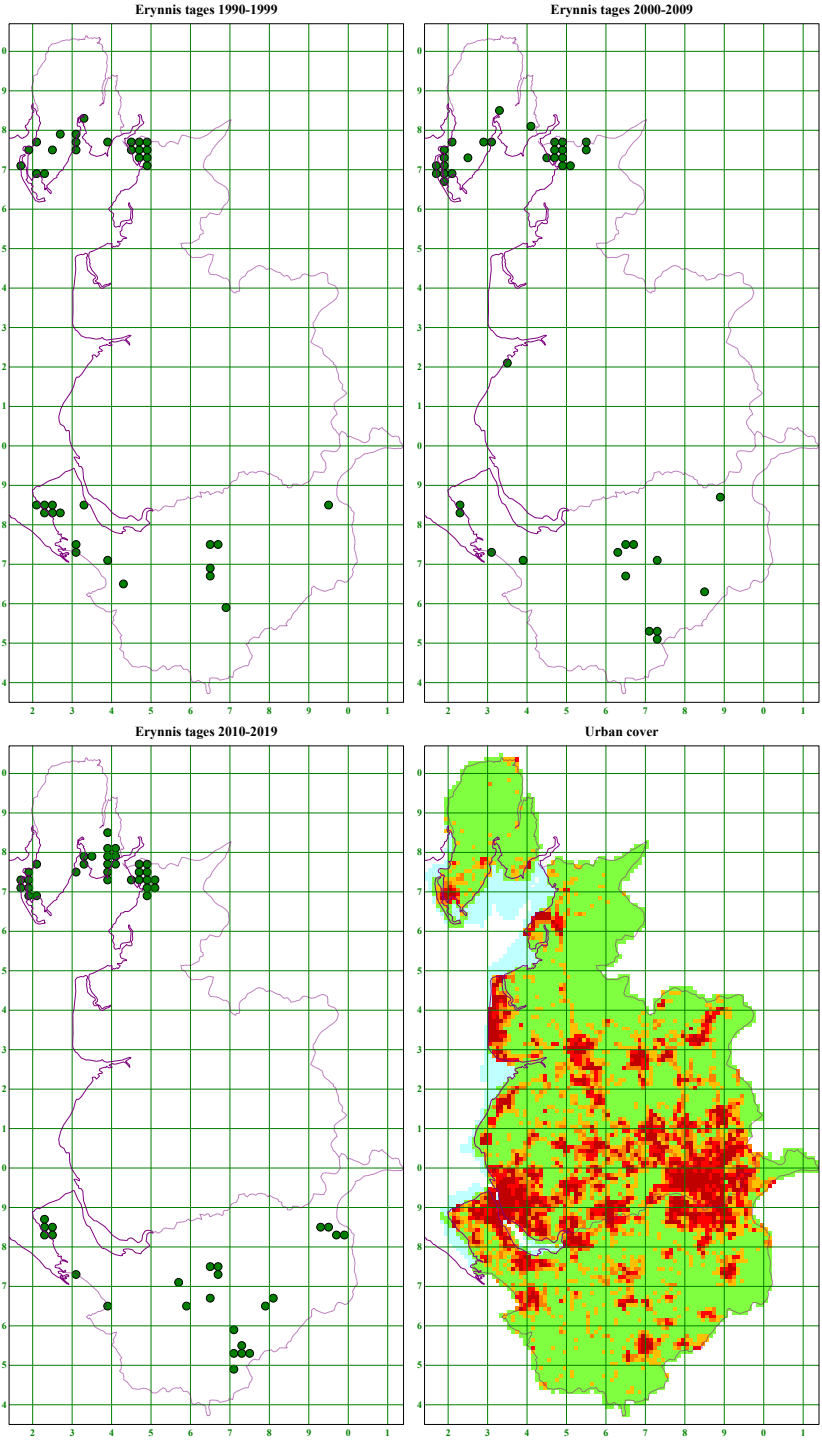
DINGY SKIPPER, *Erynnis tages* (Linnaeus, 1758)


Gait Barrows 23.5.2010


Cunningdale, Derbyshire 31.5.2018


Anglesey 1.5.1999

Distribution. Currently, the main strongholds are the Morecambe Bay limestones in Lancashire (SD47) and a number of localities in the Furness, especially near Barrow (SD17), and around Northwich in Cheshire (SJ67). In the 1960s it was abundant at


Erynnis tages 1990-1999
Erynnis tages 2000-2009
Erynnis tages 2010-2019
Urban cover

Delamere forest (SJ57), where the geology is sandstone not limestone. There appear to have been some losses in the south of Cheshire, but possibly also some gains; and in 2011 it was discovered at previously unknown sites around Disley (SJ9882) and Poynton (SJ9484), on the Pennine foothills, and there are scattered populations in other parts of south and mid-Cheshire. The only known recent record in Greater Manchester was on the Adswood tip, Stockport (SJ8887) on 23.5.2004, by the late S.A. Burnet. This former tip had become fully revegetated after several years of disuse and had developed into open grassland edged on the south side by a line of trees bordering a lane. Some parts of the former tip had large patches of Bird's-foot Trefoil, though none was noted at the location where the butterfly was seen. The site was visited by several recorders in subsequent years but no further *E. tages* were seen. The question therefore arises: was the 2004 butterfly a "stray" which had migrated into the area from, presumably, a colony in Derbyshire, or was there a resident colony at the Adswood tip, but in such low numbers as normally to escape detection? Sadly, during period 3 the tip was reopened and the site extensively damaged, so that any overlooked colony would almost certainly have been extirpated.

There are old records from SJ79 (Chat Moss, 1905), SJ88 (Cottrell Wood, 1905) and SJ89 ("Manchester" 1857+), and a more recent record from SJ98 (site unspecified, 1978).

Whitehead (1986) wrote: "In 1856, the Dingy Skipper was found in profusion on Simmonswood [sic] Moss and the Crosby sandhills, and could be seen at Rock Ferry and Prenton. In 1864, it was scarce at Prenton, and was described as formerly common at Gill Brook, Birkenhead. In 1890, it was still common on railway banks on the Wirral, as between Spital and Bromborough, but by 1913 it merited the note that it had become scarce in recent years. There was an Eastham record in 1949, and one in Spital in 1950 ... Recent records, what few there are, include Storeton in 1977 and the Thurstaston/Caldy area of the Wirral."

The records from near Southport (SD3520) in period 2 are by a recorder who was active from 1998 to 2014; they were on two dates in June 2000. As there have been no other reports from this locality it is possible that they are erroneous.

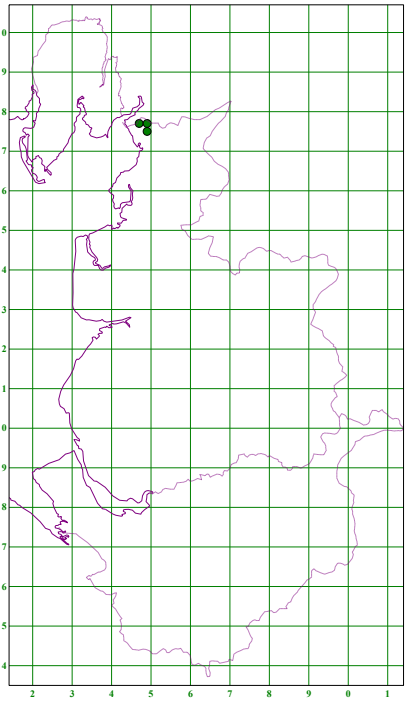
Habitats. It favours warm low-fertility species-rich locations on limestone or sometimes sandstone with abundant low growth of Bird's-foot Trefoil and usually with some scrub for shelter.

Hostplants. Bird's-foot Trefoil *Lotus corniculatus*.

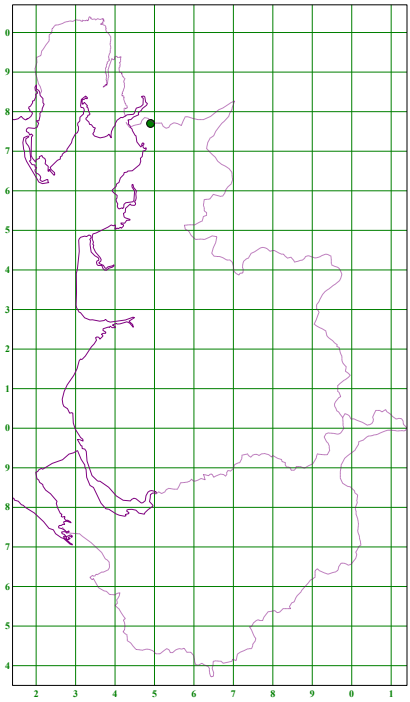
Broods. The normal pattern is a univoltine emergence in May and early June, sometimes continuing until early July.

Behaviour. The butterflies fly low and quite fast, and being dark brown are not very conspicuous and are difficult to follow. They do however quite frequently alight on the ground, usually with wings wide open though occasionally with wings in something of a "V" position. A favoured nectar source in some places is Bugle *Ajuga reptans*; one was observed using this plant at a short-lived colony close to the former Moorside Hotel near Higher Disley in 2011. The hostplant Bird's-foot Trefoil is also often used as a nectar source.

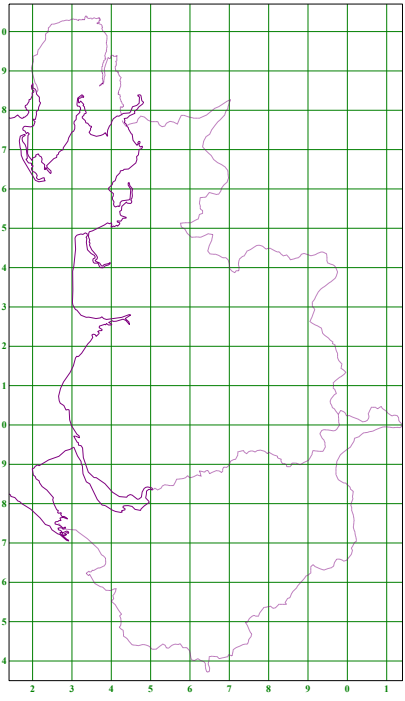
Pyrgus malvae 1990-1999



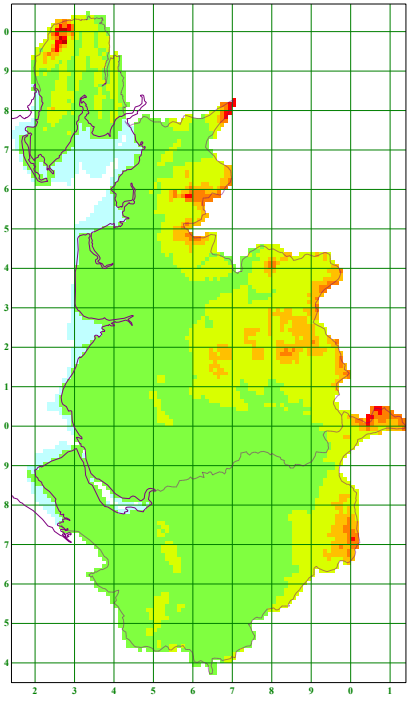
Pyrgus malvae 2000-2009



Pyrgus malvae 2010-2019



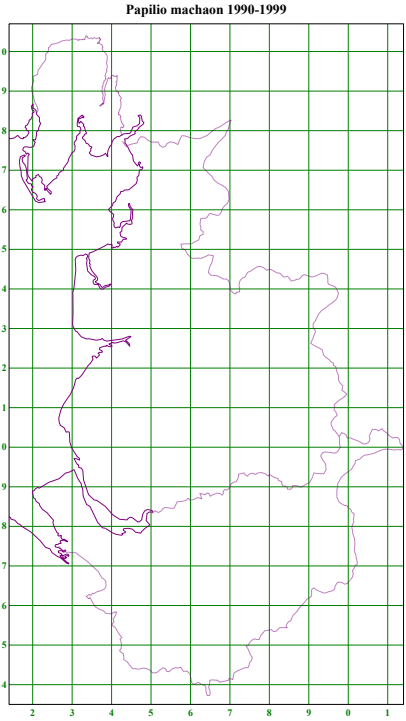
Altitude

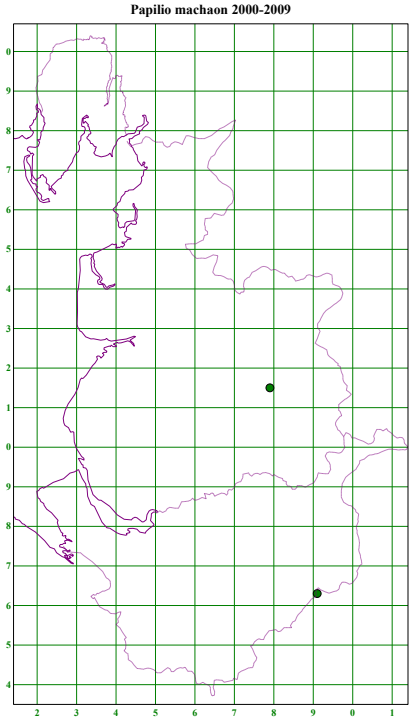


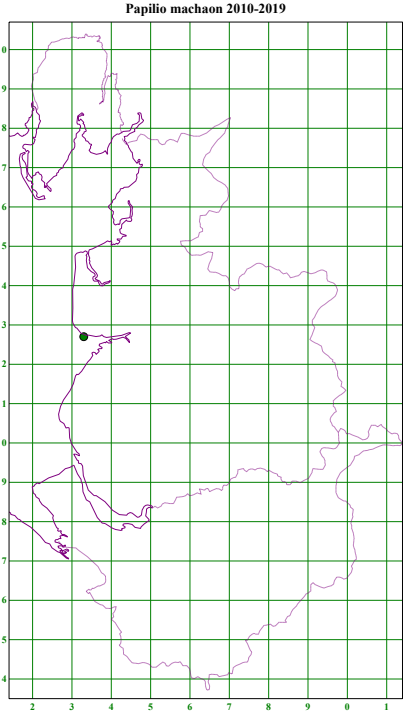
GRIZZLED SKIPPER, *Pyrgus malvae* (Linnaeus, 1758)

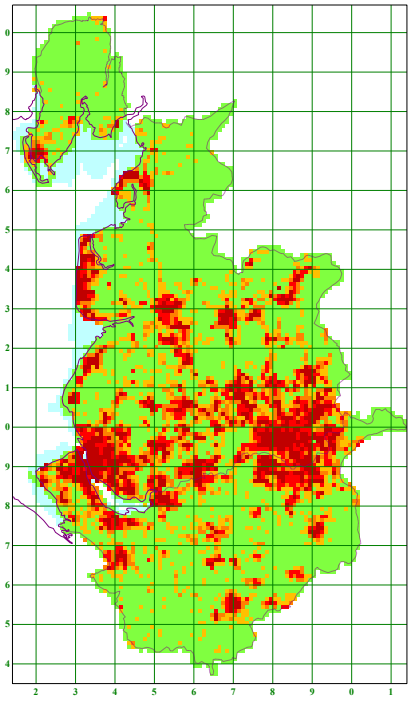
Compton, Isle of Wight 24.5.1992

Historically, this species occurred in west Cheshire including the Wirral. Whitehead (1986) wrote: "There are no nineteenth century records of this species, but in 1950 it could be found at Eastham. It was recorded in the early 1970s between Eastham and Childer Thornton, but has not been found more recently". Shaw (1998) quoted breeding records from the 1940s and early 1950s from Bickerton, Billinge Green, Delamere, Eastham, Eaton Park, Hartford, Mickle Trafford, Waverton, Wheelock and Wrenbury. All colonies in Cheshire have long since died out, the last sighting being at Hooton in 1971 (Shaw, 1998). In Lancashire, the only locality where the species has been seen in recent years is the Morecambe Bay limestones (SD47), including Gait Barrows. It only exists there at very low density (if indeed it survives at all; there were no records in period 3) and there is some doubt as to whether the population there is of natural origin or the result of an introduction. It should perhaps be added here that to the uninitiated the moth *Euclidia mi*, the "Mother Shipton", which occurs at Gait Barrows and neighbouring sites, could be mistaken for *P. malvae*.


Papilio machaon 1990-1999


Papilio machaon 2000-2009


Papilio machaon 2010-2019


Urban cover

Family PAPILIONIDAE

SWALLOWTAIL, *Papilio machaon* Linnaeus, 1758

How Hill, Norfolk 18.6.1988

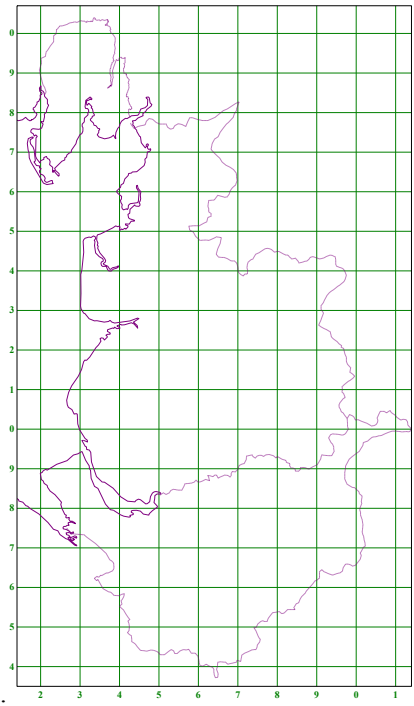
One was sighted on the Cloud, Bosley in May 2000 (Shaw, 2001); in July 2004 one was reliably reported as flying along the bank of the river Irwell in Summerseat (D.G. Green, pers. comm.); in October 2013 one was seen in Fairhaven (Sivell & Palmer, 2014). It is impossible to say whether these were genuine migrants or escapes/releases of captive-bred insects.

TIGER SWALLOWTAIL, *Papilio glaucus* Linnaeus, 1758

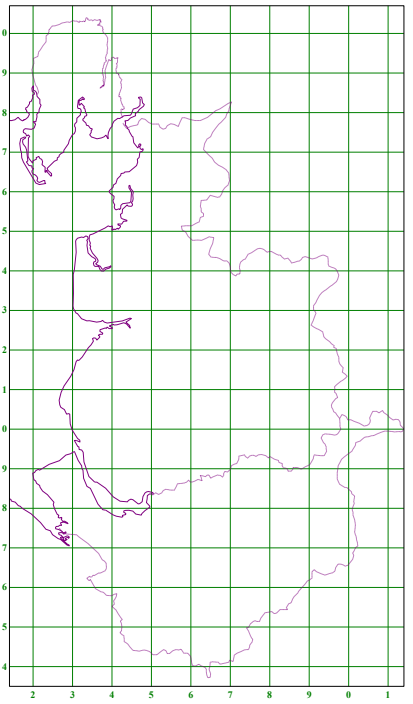
New Forest butterfly farm 7.5.1987

This American species is on the "British list" and is included in Emmet & Heath (1989 & 1991), *The Moths and Butterflies of Great Britain and Ireland*, on the strength of one captured in Co. Wicklow in 1932. In 2014 one was seen and photographed in Darwen by A. Caress, and illustrated on the front cover of the Lancashire butterfly recording report (Sivell et al, 2015). L. Sivell writes: "It's likely to have been captive-bred and either escaped or released ... only the second confirmed British record for this American species".

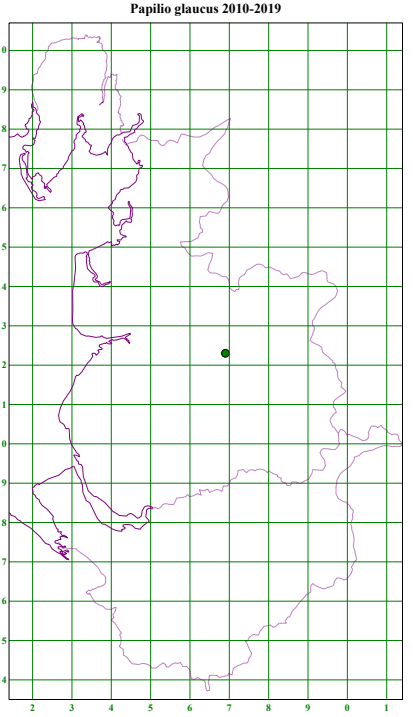
Papilio glaucus 1990-1999



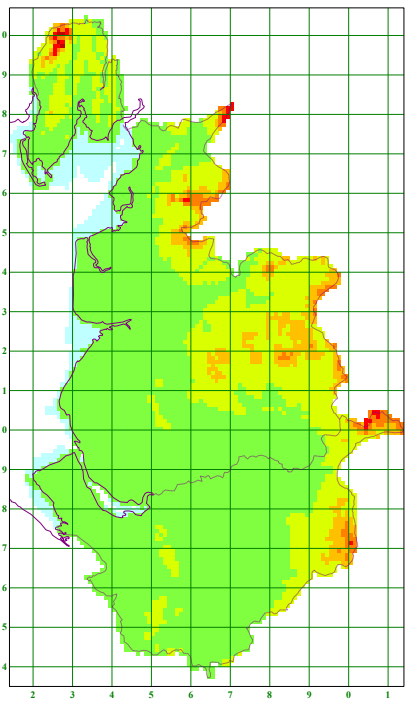
Papilio glaucus 2000-2009



Papilio glaucus 2010-2019



Altitude



Family PIERIDAE

WOOD WHITE, *Leptidea sinapis* (Linnaeus, 1758)

Chiddingfold, Surrey 12.7.2003

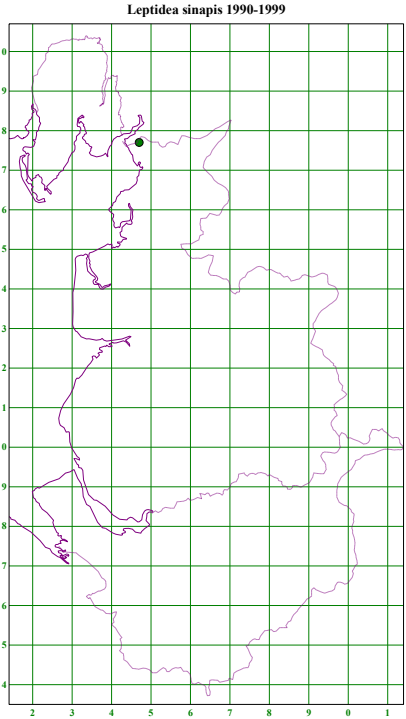
There seem to have been two sightings in Eaves Wood (SD47) in 1998. The species did occur in the vicinity of Morecambe Bay in the past, so the 1998 sightings may have been the last vestiges of a dying population, or, more likely, releases of captive-bred stock. There have not been any later reports. Regarding the Wirral, Whitehead (1986) noted: "In the 1850s it was said to occur near Parkgate and was recorded in a rough plantation between Hooton station and Mollington. No other records [Wirral] exist". There is some ambiguity here, as there are records from another "Parkgate" in 1903; this site is near Disley, SJ9684; it is outside present-day Greater Manchester, and, being quite hilly, not the sort of place where one would anticipate finding *L. sinapis*. Mansbridge (1940) also referred to Dunham Park in 1859. Another historic Cheshire record is from SJ78 (site unspecified) around 1939.

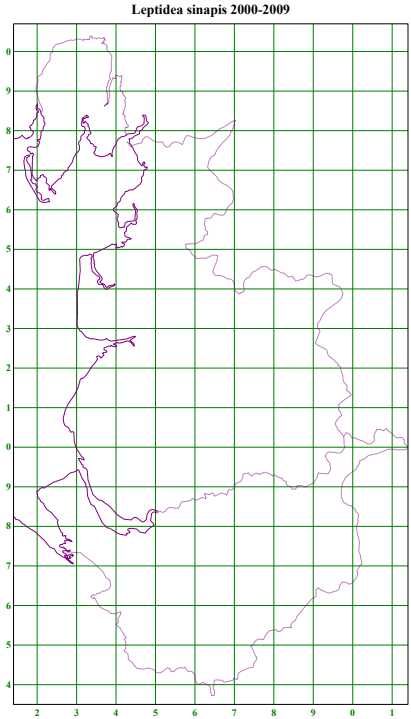
CLOUDED YELLOW, *Colias croceus* (Geoffroy *in* Fourcroy, 1785)

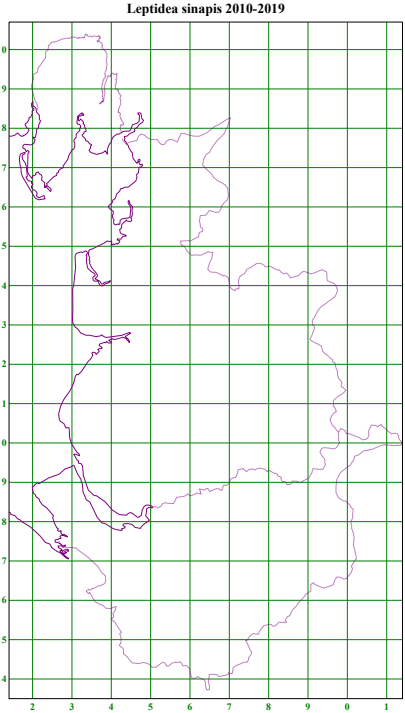
Mersey bank, Stretford 17.7.1992

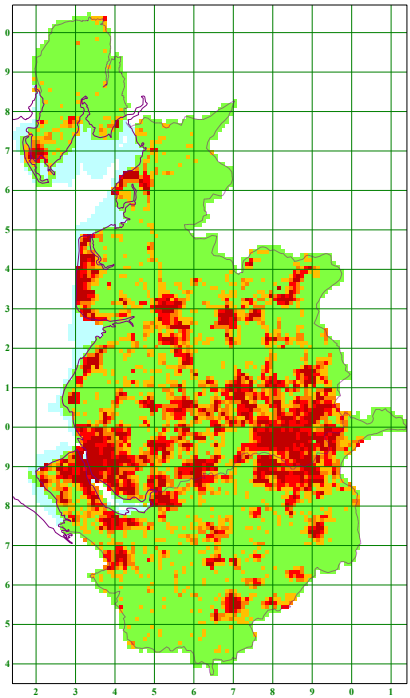
Distribution. A migrant species which does not normally survive the British winter in any stage, and is therefore unpredictable as to where it may be found in any year. The maps show a general distribution throughout the two counties but with noticeably fewer sightings during period 3. Most of the records from period 1 were from 1992 which was an unusually favourable year for this species.

Habitats. In the rare years when this migrant has reached the Manchester area, the river valleys, notably the Mersey and Bollin, have proved attractive to it. At the time of the butterfly's abundance in 1992, the weather conditions had provided ideal breeding conditions on the north bank of the river Mersey in Stretford, a section of the author's regularly surveyed route, with abundant hostplant, nectar sources (primarily Ragwort and Knapweed) and taller vegetation for shelter. This is not by any means the only biotope where this species could occur, and in 2006 there were several sightings in Manchester around a recently disturbed section of a former tip, with abundant leguminous plants.


Leptidea sinapis 1990-1999


Leptidea sinapis 2000-2009


Leptidea sinapis 2010-2019


Urban cover

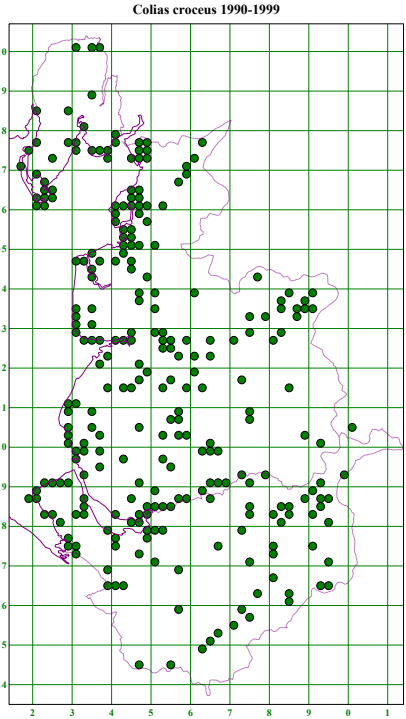
Hostplants. Clovers. It will use them when they occur on almost bare ground (R.L.H. Dennis, pers. comm.)

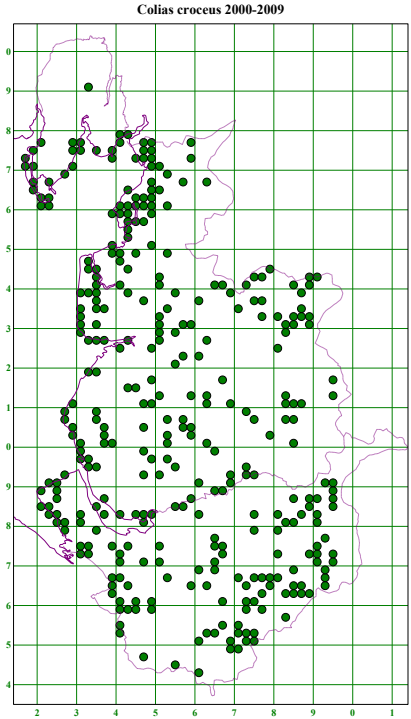
Broods. From the observations in 1992 (and also in the previous year when there was a sizeable influx, 1983) it seems likely that the butterflies seen in July and August were British-bred descendants of immigrants which arrived unnoticed in May or June. In 1992, from the number of sightings along the Mersey bank (SJ7892/3) in July there is strong evidence that the species was breeding there; unfortunately there was a change in the weather, which following a warm spell became cold and wet at the end of July, and a mowing of the river bank by the water authority destroyed most of the available hostplant and nectar sources and there were no further sightings along the bank that year. Reports from elsewhere, including the Stockport area, however suggested that breeding continued in suitable sites, including the revegetated Adswood tip (SJ8887), until October. The butterflies occasionally seen in September, in years when there have not been any earlier sightings in the vicinity, could either indicate local breeding at such a low density as to escape notice in spite of the butterfly being a very conspicuous one, or more likely migration.

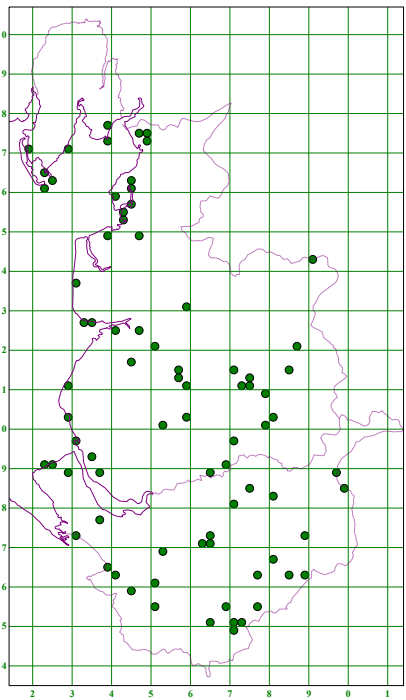
Barney's Tip, Great Horrocks 24.8.2006 - site since destroyed

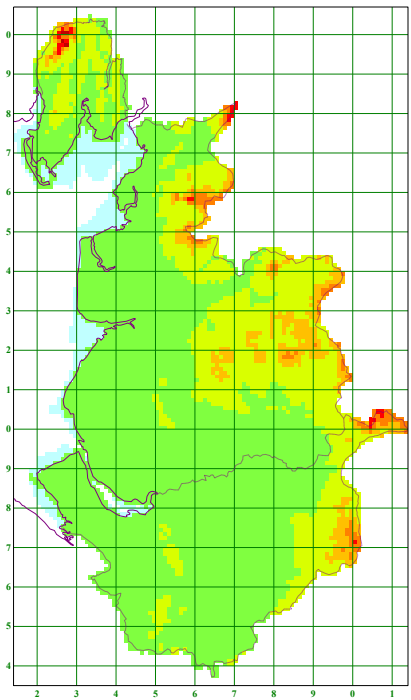
Behaviour. In the Mersey Valley (SJ7892/3) in 1992, the butterflies were seen actively patrolling to and fro along the berm on the warm south-facing slope of the north bank of the river. This is built up in the form of a levee for flood defence and has regularly served as a flyway for a number of patrolling butterflies; it was ideally suited to this species. The butterflies regularly paused for nectar – one incidentally was disturbed by a Gatekeeper *Pyronia tithonus* whilst taking nectar from Knapweed on 16.7.1992, this being the first ever confirmed sighting of the latter species in this section of the Valley! Even that controversial non-indigenous plant Himalayan Balsam, which has taken over so much of the river valleys, had its place in this butterfly's ecology during the brief 1992 abundance, as on two separate occasions one was observed to select the plant as a resting-place, the butterfly's greenish-yellow underside and red antennae being remarkably well camouflaged when under the balsam leaf.

On three days in August 2006 (17.8, 22.8 & 24.8.2006) one was seen at the former Great Horrocks tip, Manchester, also known as "Barney's Tip" (SD846000), a large expanse of species-rich grassland with a limestone element, the western half of which had been most unfortunately destroyed in 2004 to build the "Manchester fort" shopping centre (and of which the remainder was totally destroyed by 2019). On each occasion the butterfly – believed to be the same individual – was seen in the extreme south-west corner of the tip, a patch of disturbed ground with pioneering


Colias croceus 1990-1999


Colias croceus 2000-2009


Colias croceus 2010-2019


Altitude

vegetation and nectar flowers including Buddleia and Michaelmas Daisy, both of which it was observed using, close to a large patch of potential hostplant-habitat. It appeared to keep leaving and returning to the location. At that time, observers in southern England, including Kent, were similarly noting sightings of what appeared to be the same individuals over a period of days, whereas others in Devon and Cornwall were noting what appeared to be southerly migration. In 2003, a year not exactly favoured by the species, a single individual was seen taking nectar from Purple Loosestrife by the Huddersfield Narrow Canal adjacent to the Brownhill visitor centre (SD9906) on 13.9. On 3.8.2006, during a national influx of the species when many observers in the south of the country were reporting numerous sightings, an observer in Romiley (SJ9390) reported one briefly on a garden Buddleia.

BRIMSTONE, *Gonepteryx rhamni* (Linnaeus, 1758)


Stretford 15.7.2006


Stretford 25.5.2007


Feeding on Bindweed flower, Stretford 31.8. 2012

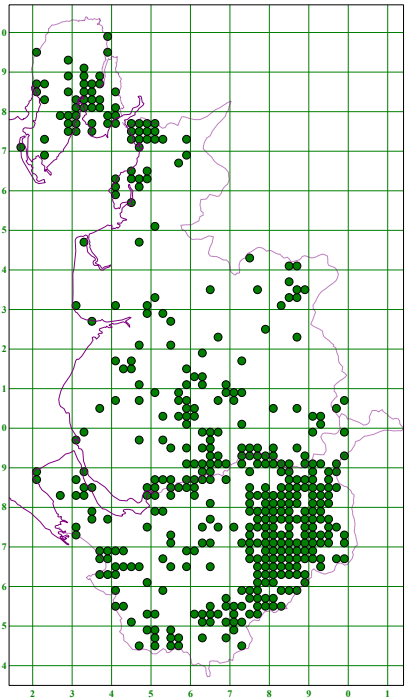

Caterpillars, Sale 29.6.1994


Pre-pupal caterpillar, Sale 7.1994

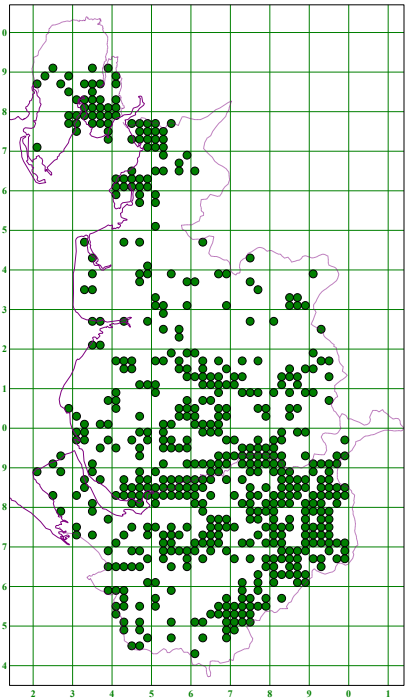

Chrysalis, Sale 7.1994

Distribution. Maps prior to 1990, notably Heath, Pollard & Thomas (1984) suggest that this species was abundant around Morecambe Bay and in the Furness, but very scarce or absent in the rest of Lancashire, and that in Cheshire it was fairly common in the south but scarcer northwards. Whitehead (1986) remarked: "There have been infrequent records of single specimens over the years. Its larval foodplants are purging and alder buckthorn, neither of which grows in [Merseyside], its nearest breeding grounds being beyond Chester." Shaw (1998) stated that "as recently as the mid-1970s there were no known breeding colonies in the county [Cheshire]". Regarding the Manchester area, prior to the early 1990s there were very few records of this butterfly and it was assumed to be an occasional wanderer from further south in Cheshire. There followed a slight but noticeable increase, and it was confirmed in 1994/5 that the species was breeding in parts of the Mersey Valley. The impression gained over the subsequent years is that the species has increased in numbers and extended its range; but the maps do not seem to show quite such a general increase as this would seem to have implied. One wonders whether the apparent concentration of records all along the line of the Manchester Ship Canal in all three periods is genuine or merely a result of recorder bias.

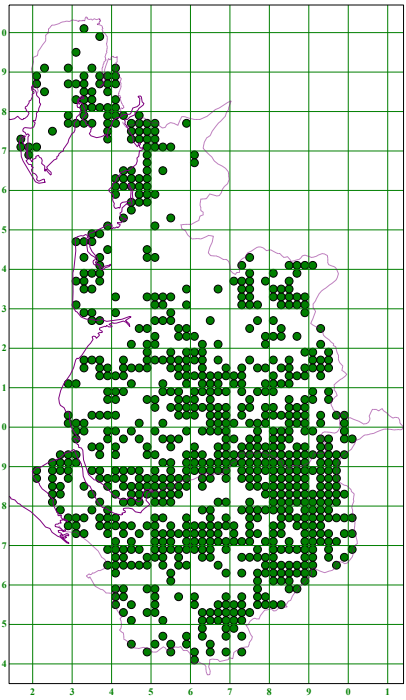
Gonepteryx rhamni 1990-1999



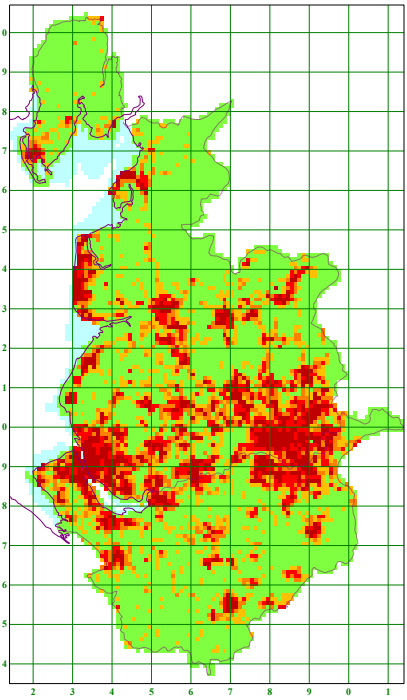
Gonepteryx rhamni 2000-2009



Gonepteryx rhamni 2010-2019



Urban cover



Habitats. Many of the records are from the well-vegetated river valleys, though many other biotopes have been noted, even in built-up areas. Hedgerows or woodland edges or rides are often favoured.

Hostplants. Alder Buckthorn *Frangula alnus*. This shrub has been planted in many sites in the area where it does not occur naturally, including in the Mersey Valley; this planting has clearly assisted the spread of the butterfly.

Broods. One single very long-lived brood per annum; butterflies are seen in late summer and early autumn sometimes up to early October, and in March, April and May (sometimes, including in 2019, in February) after hibernation. Butterflies seen in June may be either newly emerged, or overwintered ones still alive.

Behaviour. Sightings are usually of single butterflies, or at the most two, though in favoured localities there may well be quite a few more. Often they are actively moving; males patrol quite extensive beats looking for females, usually flying about ten feet above the ground and searching trees and tall shrubs; they are very conspicuous. This behaviour has regularly been noted in Carrington Moss, especially around the former orchard at the site of Moss Hall Farm (SJ7491). When they thermoregulate, it is always with closed wings (lateral basking). Stops for nectar, as with most of this family, are usually quite brief, and sometimes quite deep flowers are used – Daffodil and Bindweed have been noted – where the butterfly, often a female, will dive right into the corolla of the flower to reach the nectar (Hardy & Kinder, 2013; Dennis, Dennis & Hardy, 2016).

LARGE WHITE, *Pieris brassicae* (Linnaeus, 1758)


Male, Sale 4.8.2006


Female, Ainsdale 7.7.2018

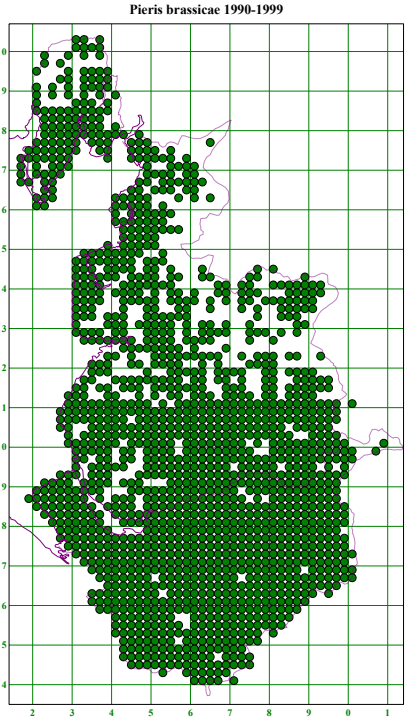

Haigh Hall 6.8.1995

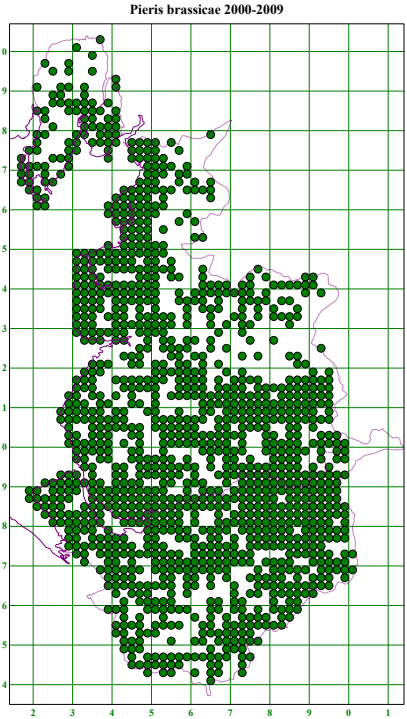

Eggs and young caterpillars, Sale 8.1998

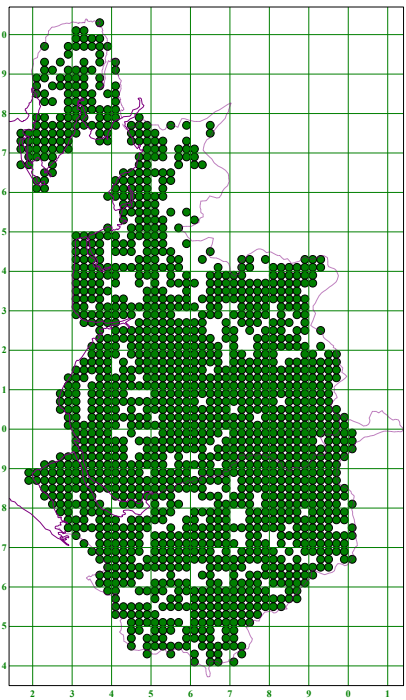

Caterpillars, Sale 4.9.1992

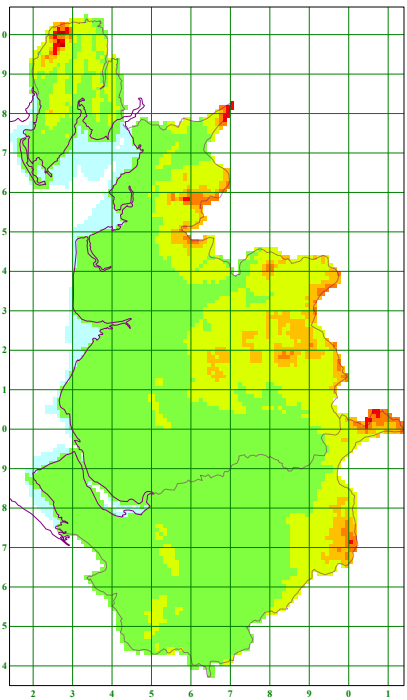

Unsuccessful courtship, male harassing female, Heysham 26.5.2018

Distribution. The recorded distribution seems to agree closely with the recording coverage in all three periods. The records show this species to be generally distributed, but in the author's experience it has not been nearly as abundant in recent years, especially around Manchester, as the Small and Green-veined Whites *P. rapae* and *P. napi*. Oddly, records from some other recorders seem to indicate that


Pieris brassicae 1990-1999


Pieris brassicae 2000-2009


Pieris brassicae 2010-2019


Altitude

elsewhere is has continued to be nearly as numerous as they. The Whites are always thought of as being very common; however that is partly an artefact of their apparency; being very conspicuous and mobile they seem more relatively abundant compared to other butterflies than they actually are. *P. brassicae* also seems to be becoming more of a rural, and less of a suburban, butterfly.

Habitats. A mobile and quite adaptable species capable of utilising a range of habitats including those severely modified by man. Woodland edges, river valleys, waste land and disturbed ground starting to revegetate are probably the best places for this species now. It does occur in agricultural land and suburban gardens but not nearly as much as formerly. Individuals are often seen on passage flights seeking new habitats.

Hostplants. Crucifers. From experiences in the Mersey Valley, dating back to the 1990s when the species did not appear to be any more abundant around the then cabbage-fields at New Manor Farm and Mosley Acre Farm, Stretford (SJ7893, 7993), and the suburban allotments where cabbages and other Brassicas were grown, than in other areas, and subsequent observations throughout the three periods, the inference is that it breeds more on wild than cultivated hosts – or has a better survival rate on them. It has very different biology from the Small White *P. rapae* as although it utilises the same hostplant species it needs larger plants for optimum survival, as it lays its eggs in batches and the caterpillars are gregarious. The survival rate can however be very low due to predation and parasitism; it is also possible that when the species attempts to breed in allotments the gardeners find and destroy the gregarious caterpillars more readily than the solitary larvae of *P. rapae* and thus reduce its breeding success compared with that species. Occasionally, caterpillars have been found in very small habitats amidst unfavourable environments: an extreme example of this was noted on 3.9.1992 when G. Bennion found a large brood on an isolated self-seeded Brassica plant with small, narrow leaves (species undetermined) growing at the edge of an alley behind terraced houses in Meadows Road, Sale (SJ7992). Perhaps even more remarkable is that not only had a female butterfly found the plant but also the butterfly's hymenopterous parasite had located it, as a good half of the caterpillars proved to be parasitised. The caterpillars were almost mature when discovered, but the plant had been virtually stripped and there was no other nearby, so whether any would have survived to pupation if they had not been brought into captivity is uncertain. The same year, Bennion also found an instance of batches of eggs of this butterfly and the Cabbage moth *Mamestra brassicae* laid on the same leaf of a wild Brassica plant. Garden Nasturtium *Tropaeolum majus* is sometimes used as a host, although there have been far fewer observations of caterpillars on this plant during the second and third periods than there were during period 1.
Dennis & Hardy (2006b) report on the finding (by R.L.H. Dennis) of fifteen caterpillars on six contiguous large plants of Garlic Mustard *Alliaria petiolata* at Alderley Edge (SJ8577) on 25th June 2005; it is likely that this plant is used more regularly than is generally appreciated.

Broods. Two broods per annum. The season is usually slightly shorter than that of the Small White *P. rapae* but slightly longer than the Green-Veined White *P. napi*

with sightings from late April to September, a few stragglers lingering into October. The broods overlap, but there is normally a distinct peak in May and a much larger one in late July and August. In 1991 and 1997 the summer brood was noticeably longer and the abundance continued well into September.

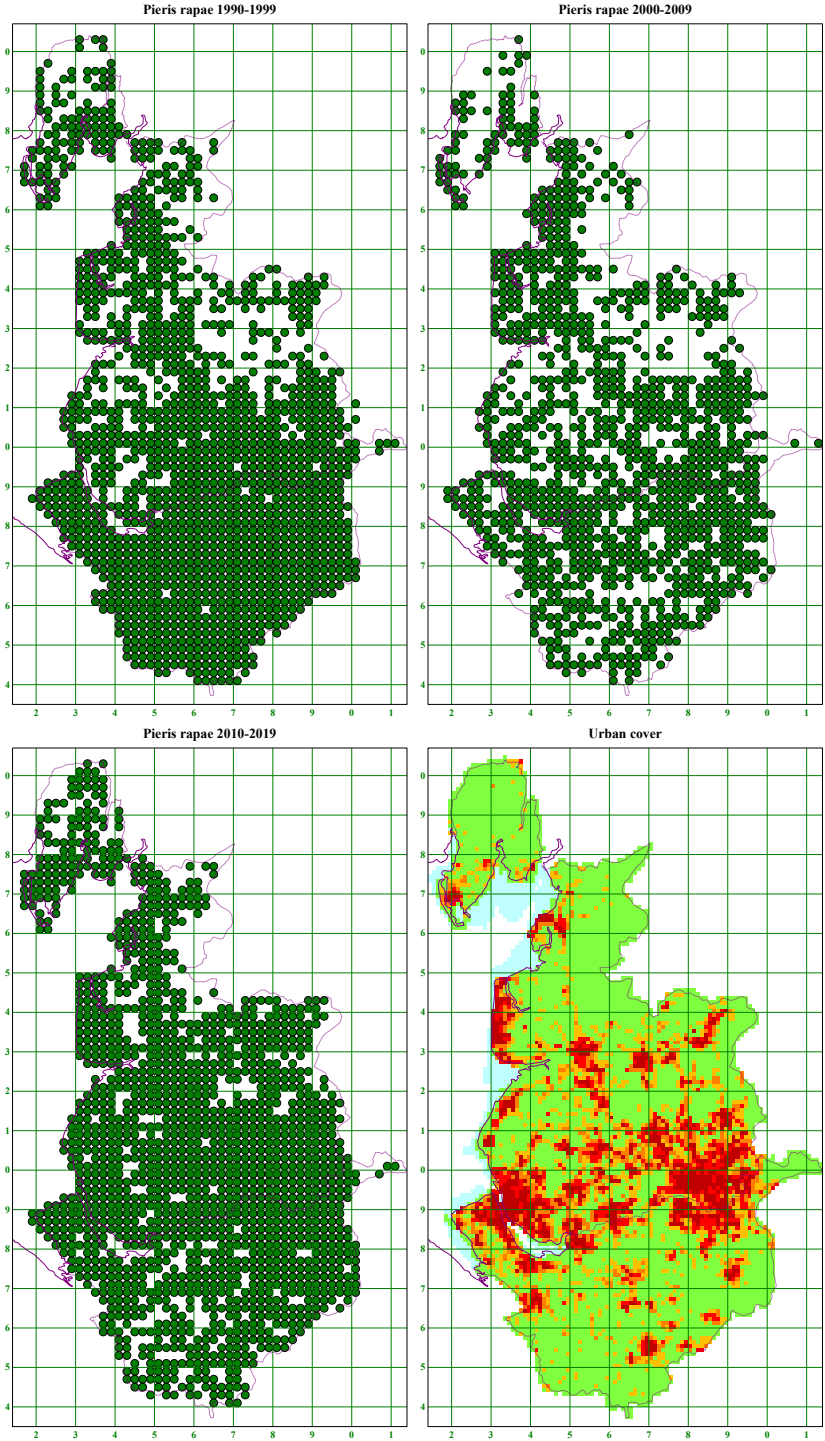
Behaviour. The flight of this species is stronger than the other Pierids; it tends to fly higher and ascend more quickly, frequently lifting straight up and over a line of tall trees with no apparent effort. It is normally fairly easy to distinguish it from the other Whites by its larger size and brighter white; however, small or worn individuals can be confused with large *P. rapae*. Although there are definite differences in the ecological requirements of the three *Pieris* species, there is considerable overlap and often two, or all three, are seen together. Sometimes interactions are of an aggressive nature; also frequently patrolling males of one species will investigate any other white butterfly, including a male of another species, in search of a potential mate. In the 1996/7 detailed nectar survey, this butterfly showed a much greater propensity for Buddleia than the other Whites. From previous years' observations it had been noted that it favoured Thistles; during the 1996/7 survey, however, it was only seen using these on four days. Also during that survey some unusual sources were used, including Himalayan Balsam *Impatiens glandulifera* (Priory, Sale (SJ8092), 31.8.1992, and once in 1997). The butterflies are seen far more often flying than taking nectar, and nectar stops are usually very brief.

SMALL WHITE, *Pieris rapae* (Linnaeus, 1758)

Male, Bollin valley, Dunham 27.4.2011 | Female, Heywood 18.9.1994 | Mating pair, Westhoughton 15.7.1995

Caterpillar, Sale 20.10.1990 | Chrysalis, Sale 2. 1991 | Adult, just eclosed, Sale 5.1991

Distribution. This very successful and adaptable species is likely to be seen anywhere in the mapped area apart perhaps from some high ground. *P. rapae* is normally the most abundant and most widely distributed of the three *Pieris* species; however, the possibility exists that it may have been slightly over-recorded because of the difficulty in distinguishing between it and *P. napi* (and sometimes, especially in the summer brood) in distinguishing large individuals from *P. brassicae*) in flight. There have been some years, such as 2011, when *P. napi* has considerably outnumbered the present species, which was relatively scarce that season, but they are in a minority. 2018 was a year of significant abundance for *P. rapae*; this was


Pieris rapae 1990-1999
Pieris rapae 2000-2009
Pieris rapae 2010-2019
Urban cover

especially noticeable around Liverpool, including on the north side of the estuary towards Hale Head in August; in 2019 also this species was far more abundant than *P. napi* especially in and around the cities.

Habitats. This species favours drier habitats than the next species, *P. napi***,** though there is some overlap. It can tolerate a wide range of habitats, including those considerably modified by man. It frequents river valleys, woodland edges, waste ground especially in the early stages of regeneration where cruciferous plants are among the first to recolonise; also farm land with Brassica crops, and suburbs especially but not exclusively where there are allotments. In the Maghull area of Liverpool, both this species and *P. napi* have been observed utilising self-seeded (?) crucifers at the edges of large wheat-stubble fields towards the end of the season.
As an instance of the frequency of this species in a suburban biotope, compared to other butterflies, in the Winstanley Road allotments, Sale (SJ7992), during a half-hour visit on 11.7.1995 (period 1), 52 of this species were recorded as against 2 *P. napi*, 8 *Maniola jurtina*, 7 *Aglais urticae* and 4 *Thymelicus sylvestris*; during another visit to the same site on 22.8.1995, 47 *P. rapae* were recorded with only 3 other butterflies, one each of *P. brassicae, A. urticae* and *Pararge aegeria*.

Hostplants. Crucifers. Cultivated Brassica crops are certainly used to some extent, but the species certainly does also use wild crucifers and indeed these are almost certainly its main resource, especially the yellow-flowering wild Brassicas which quickly colonise disturbed ground. As with *P. brassicae*, the females have extraordinary powers of locating very small scraps of potential hostplant. They are quite often seen ovipositing on pioneering crucifers only two or three inches high, such as Shepherd's Purse *Capsella bursa-pastoris*, on small patches of disturbed soil, or even growing in cracks in pavements. How well the caterpillars survive on such hosts is of course another matter. Another occasional host is garden Nasturtium *Tropaeolum majus*.

Broods. There are two main broods, but they overlap and the species is continuously on the wing from early April until September or October. The greatest abundance is in late July and August. In some years there is also a late emergence, which may represent a partial third brood. Although in the spring brood the numbers of this species and the Green-Veined White, *P. napi*, are nearer equal, this species usually produces a much stronger and earlier summer brood than *P. napi*. Possibly *P. rapae* pupae have a lower winter survival rate than *P. napi* owing to the preferred habitats being more susceptible to human disturbance as a result of crop harvesting, but *P. rapae* is better able to build numbers up during the summer.

Behaviour. On warm days the butterflies are restless and many individuals move out of the breeding site seeking new habitats. They are highly mobile and frequently seen well away from any apparent hostplant-habitat, sometimes even flying over high moorland. When a resting butterfly is inadvertently disturbed, it rises up and flies for what seems an inordinate time and distance before settling again – often to the infuriation of the observer trying to identify it for certain. Nectar stops are usually very brief. Occasionally these butterflies take nutrition from other sources than flowers: they have been observed on wet mud on canal banks and sometimes, though

rarely, on dung. Normally when these and other Whites bask, they only hold their wings three-quarters open; however at the end of the season lower ambient temperatures may cause them to thermoregulate with wings seven-eighths open, aligned exactly to the azimuth and with the abdomen slightly raised. The females' ability to locate very small, isolated patches of hostplant/habitat has already been remarked on. Similarly, males have extraordinary powers of locating females even in areas of very low density, as evidenced on 11.9.1994 when a mating pair were found sheltering from wind in long grass within a small thicket in the middle of a harvested cereal field at Dairyhouse Farm, near Altrincham (SJ7589); there was no obvious hostplant/habitat anywhere nearby and the area was virtually devoid of butterflies. On 8-9.9.1991, in a sudden short wave of abundance, large numbers of freshly-emerged males had gathered along a linear shelter-belt consisting of brambles and scrub beneath a line of low trees, running north-south at the eastern edge of fields north of Mosley Acre Farm, Stretford (SJ7993) in which Brassica crops had been grown that season. Hardly any females were observed and there were very few butterflies on the following days.

On 1.5.2018 in Newton Park, Timperley (SJ7790) a male of this species was observed to mate with a female *P. napi*, after having tried unsuccessfully to mate with another female of that species.

Newton Park, Timperley 1.5.2018: the male *P. rapae* unsuccessfully courting the first female *P. napi*

The male *P. rapae* mated with the second female *P. napi*

On 14.9.2019 on a derelict site with dumped rubbish near the centre of Liverpool (SJ3491), two butterflies were observed quite vigorously interacting over a piece of litter; at first it was thought that it was a courtship attempt, but then the butterflies

Male *P. rapae* apparently trying to mate with dumped wrapper, Liverpool 1.9.2019

were seen to be both males. One flew away but the other continued for some time to flutter over the piece of litter as though trying to arouse it into copulation. Presumably there must recently have been a fresh female on the litter and the pheromones were still apparent.

GREEN-VEINED WHITE, *Pieris napi* (Linnaeus, 1758)


Male, Stretford 3.8.2008


Female, Baguley Brook, Manchester 3.5.2013


Mating pair, Walves 5.8.2015

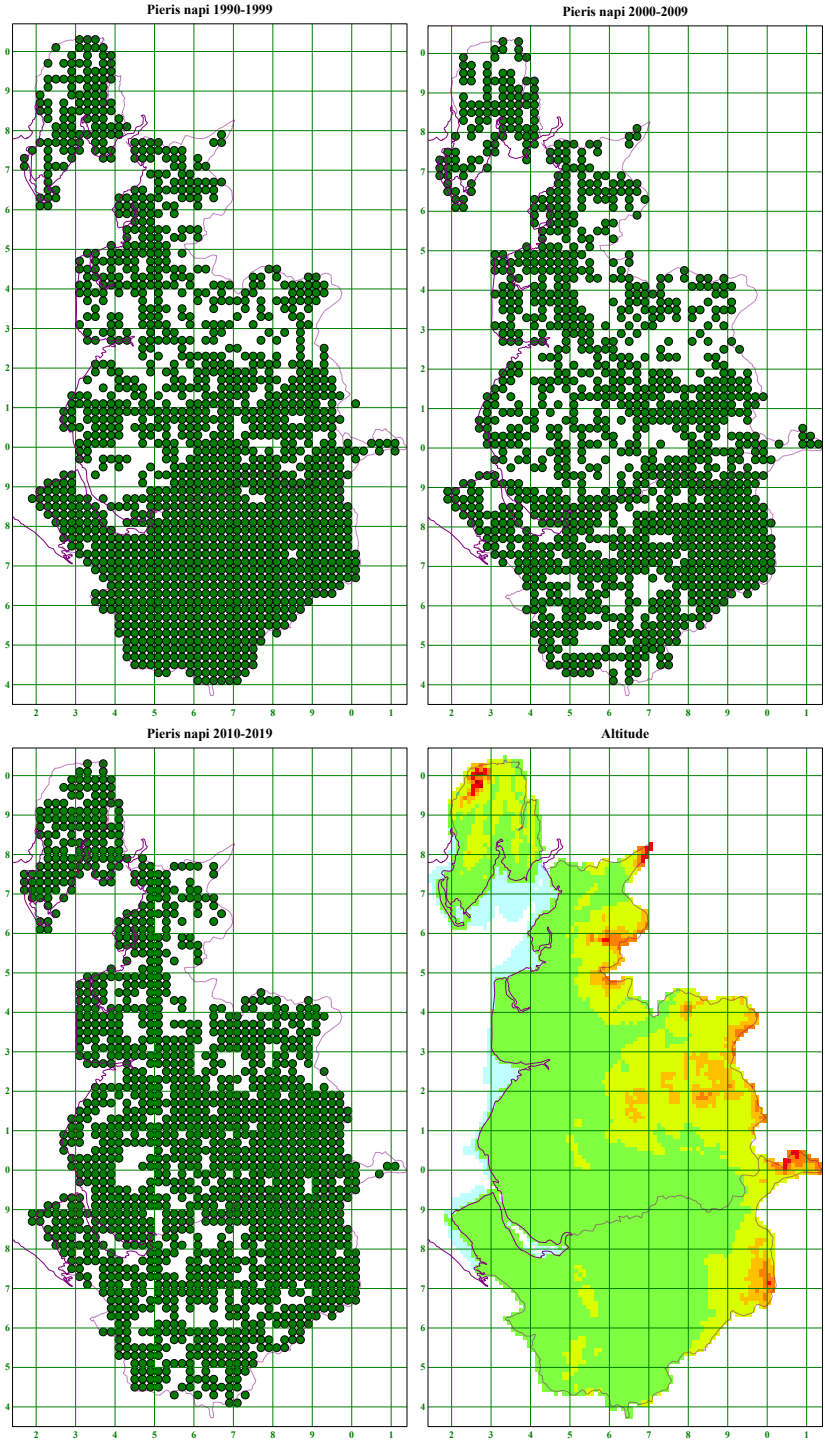

Female, Newton Park, Timperley 1.5.2018


Moston Brook, Manchester 11.5.2014


Eggs, Roch valley 4.6.1995

Distribution. This butterfly occurs over most of the area, including quite high up in the hills, and its distribution probably remains fairly constant. As it has different ecological requirements from the Small White *P. rapae* and is not quite as mobile as that species, it is less often seen away from the breeding habitat and in consequence seems less generally distributed. The perennial difficulty in trying to distinguish this butterfly from *P. rapae* in flight can cause considerable problems with recording. If anything *P. napi* has a slightly greyer look, sometimes almost bluish-grey, and usually does not fly as strongly. The chances are that a "small" White seen in a damp, sheltered habitat will be *P. napi* and one seen flying strongly through a suburban area will be *P. rapae*, but this is not always true and there are many times when the habitat, behaviour and appearance could fit either species. The summer brood can be even more difficult to distinguish as often the "green" veins on *P. napi* are very faint. Some of the records which have been received appear to show fewer *P. napi* in relation to *P. rapae* than might have been expected, and it is possible that *P. napi* may have been slightly under-recorded.

Habitats. A more sedentary and rural species than *P. brassicae* and *P. rapae*, although there is certainly much movement of individuals and a wide tolerance of habitat causing considerable overlap, and confusion, with *P. rapae* especially. This species occupies a wide range of habitats, but not as wide as the last; it favours damp and lush places, such as stream edges and wet meadows, often in similar situations to the Orange-Tip *Anthocharis cardamines*, and extends quite high up into the hills in the east. On the other hand, it also occurs in town and city parks, and also though to a lesser extent has been seen amongst (self-seeded?) crucifers at the edge of wheat-stubble fields along with *P. rapae* in the Maghull district of Liverpool. It also


Pieris napi 1990-1999
Pieris napi 2000-2009
Pieris napi 2010-2019
Altitude

frequents woodlands where it shares shady habitats with the Speckled Wood *Pararge aegeria* and often these are the only two butterfly species which will tolerate these conditions.

Females of both *P. rapae* (left) and *P. napi* (centre) were able to find breeding habitat at the egde of these stubble fields near Maghull, 30.8.2018

Hostplants. Many cruciferous plants including Cuckoo Flower *Cardamine pratensis* and Garlic Mustard *Alliaria petiolata*. These are also the preferred hosts of the Orange-tip *Anthocharis cardamines* but although the two species occur together they do not generally compete for resources; *A. cardamines* generally lays its eggs on pedicels of florets of mature plants, whereas *P. napi* will lay on any plant part, including leaves, usually of small plants (Dennis 1985a) and its eggs are very much more difficult to find than *A. cardamines*'s. *P. napi* also regularly uses other hostplants such as watercress *Nasturtium officinale*.

Broods. The first brood starts in April and continues until early June; the second is from July to August or early September. There is some overlap between late butterflies of the first brood and early ones of the second, but the broods are more distinct than in *P. rapae*. Unlike in *P. rapae* and *P. brassicae* where the summer brood is much more numerous, observations suggest that the numbers of *P. napi* in the two broods do not differ as much – i.e. *P. napi* is less numerous compared to the other two species in the summer brood than in the spring brood. This however does not appear to agree with data from the national butterfly monitoring scheme (Pollard, Hall & Bibby 1986) which cites an example from Carnforth Marsh, north Lancashire, in 1981 when numbers of *P. napi* in the summer brood were vastly greater than in the spring. It is possible that some populations on the moorlands in the north and east may be univoltine.

Behaviour. As with other Pierids, males patrol along linear faces such as woodland edges and river-banks in search of females; they have a slightly less vigorous, less sustained flight and seem slightly more inclined to settle or pause briefly to take nectar than *P. rapae*. In sites where the present species and the Orange-tip, *A. cardamines*, occur together, *P. napi*'s threshold temperature for flight is very slightly lower than *A. cardamines*'s, thus when the sun starts to break through on a dull day, as frequently happens in May, *P. napi* will start to fly slightly more readily than *A. cardamines*. The spring brood of *P. napi* continues on the wing slightly later in the season than the single brood of *A. cardamines*. In some sites Great Willow-herb *Epilobium hirsutum* is a very popular nectar source for the summer broods of all three *Pieris* species, but this one especially so as the plant frequently occurs in preferred *P. napi* habitat such as stream-sides and is in flower in late July and August. As well as nectar, these butterflies are occasionally seen taking nutrition by "mud-puddling" in hot weather. A somewhat surprising behaviour which the author has repeatedly witnessed in recent years is females, of both broods but especially the second brood, searching heavily mown grass in city and town parks, finding tiny

crucifers attempting to grow amidst the grass, and ovipositing on them. In 2009 this behaviour was observed in Manchester in Platt Fields Park (SJ8594), Birchfields Park (SJ8595/8695) and Marie Louise Gardens (SJ8391) (Hardy & Dennis, 2010) and has since been noted in several other parks. The chances of any larvae surviving to maturity in such locations would seem to be extremely remote.


Egg of *P. napi* on tiny crucifer in mown grass in Platt Fields Park 14.8.2009, and the exact location where it was found

Normally, as with any butterfly species, mated pairs tend to remain settled while copulating and only fly if disturbed. On 27.8.2018, however, during a period of unusually hot weather, in a small glade in scrub-woodland in Carrington Moss (SJ7391) containing abundant Great Willow-herb, a mated pair was observed flying about over the vegetation for between five and ten minutes around 4.30 p.m. The pair was being repeatedly harassed by other male Pierids, most of which appeared to be *P. brassicae*, but even when not being harassed still seemed very reluctant to settle. Once the pair paused on a leaf of a large sallow tree, but only momentarily. It was not possible to tell whether it was the male carrying the female or vice versa.

ORANGE-TIP, *Anthocharis cardamines* (Linnaeus, 1758)


Male, Sale 30.4.2012


Female, Stretford 17.4.2012


Male, Greenbooth 24.5.2016


Eggs on Cuckoo-flower, Kenworthy, Manchester 7.5.1991


Caterpillar, Irwell bank, Salford 3.6.2019

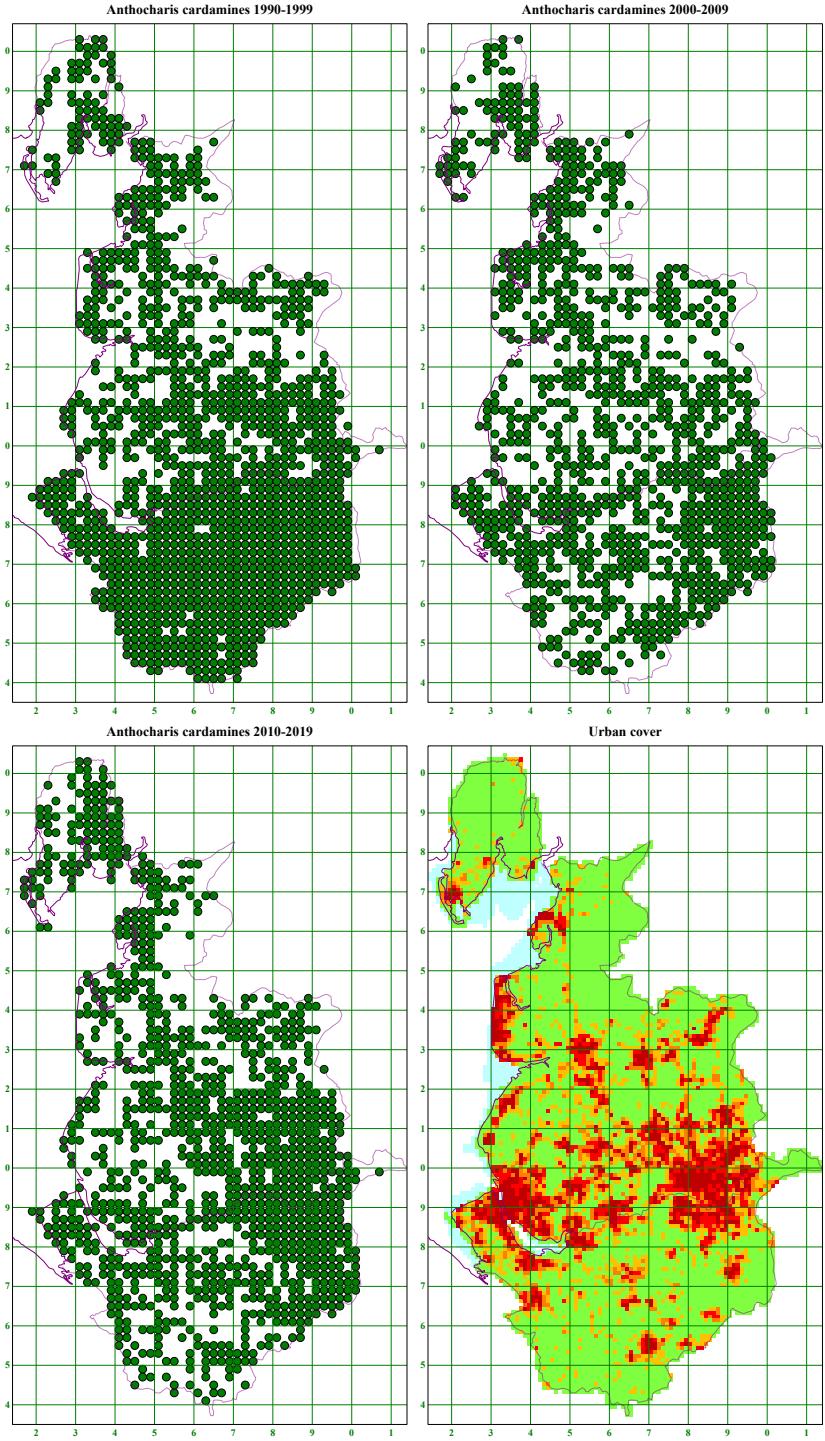

Chrysalis, Sale 12.6.1991

Distribution.

The map in Heath *et al* (1984) indicates that at that time this species was abundant in most of Cheshire except the north of the county, and also well represented in north Lancashire including the Furness, but scarce or absent from the rest of Lancashire. Blackie (1946), remarking on ten years of observation from Wythenshawe in south Manchester, mentions a few *A. cardamines* seen in 1945 but none previously or in 1946; in contrast the three *Pieris* species were common.

Regarding Liverpool and the Wirral, Whitehead (1986) states: “In the mid-nineteenth century, the Orange Tip was described as abundant from Allerton to Hale, and plentiful in the district between Crosby, Sefton and Lydiate; a few could be seen in the swampier parts of the Wirral. By 1890, the species was concentrated on Wirral as at Raby, Storeton and Barnston, whilst it was noted as very scarce at Rainhill”.
This butterfly is thus a fairly recent colonist in much of south Lancashire and around Liverpool and Manchester, though the date of colonisation is unknown. In the early 1970s it was present near Woodford (SJ8981) in the extreme south-east of what is now Greater Manchester, but it did not then appear to occur in the Mersey Valley. Now it ranges throughout most of the area. Females clearly must move about a great deal as frequently eggs are found in the most unlikely-looking places where there have been no sightings of the adult. Its distribution seems to have been fairly stable during the three periods.

Habitats. A species generally associated with river valleys, stream sides, wet flushes in and outside woods, and edges of damp woodlands; it is capable of penetrating quite high into hilly moorland up to 250 m altitude along stream edges, and also along river valleys almost into city centres. Its habitat requirements often coincide with those of *Pieris napi* although it is not quite such a generalist. In the foothills of the West Pennine Moors, to the north-west of Rochdale and Bury, although the greatest concentration is to be found in valleys, it also occurs, at low density, in many semi-“improved” meadows on the lower slopes, in which there is an abundance of Cuckoo Flower. Some of this butterfly’s habitats are in early stages of succession, and without intervention by man they stand to be lost. For example, in the Mersey Valley, in the 1980s and early 1990s patrolling males often used to be seen along the edge of a recently-planted wood in Crossford sports field, Sale (SJ7993), and the butterfly likely bred in a south-facing “amphitheatre”-type clearing in the wood; the wood has since matured and the amphitheatre has become too overgrown and shaded. Further west in the valley at Newcroft tree nursery, Urmston (SJ7894), many young trees were planted in a marsh in the early 1990s. A strong growth of Cuckoo Flower established itself in the soil disturbed by the planting, and in 1995/6 the butterfly was breeding very well at this site; however, in a few years the hostplant was shaded out as the trees grew. The butterfly continues to be regularly seen along the banks of the river Mersey and the females oviposit on Garlic Mustard which grows low down on the banks. The banks are mown, usually once per annum, by the water authority, who believe that the mowing increases the ability of the grass to develop strong roots to stabilise the bank; this mowing must destroy many ova and larvae every year but the butterfly persists. It is possible that some of the patrolling butterflies have bred in less disturbed parts of the valley and moved in to use the river-bank as a flyway.


Anthocharis cardamines 1990-1999
Anthocharis cardamines 2000-2009
Anthocharis cardamines 2010-2019
Urban cover

Hostplants. Normally Cuckoo Flower *Cardamine pratensis* and Garlic Mustard *Alliaria petiolata*. The first is the most favoured, and in good years in some sites where it is not too dense almost every plant will have some eggs. With both hosts, plants in small clumps, or even single isolated plants, are far more likely to have eggs than individual plants in large expanses. In large open fields full of Cuckoo Flower fewer eggs than expected tend to be found, and most of them are concentrated around the periphery. This is the "density effect" as a result of flight behaviour, explained by Courtney (1982a, b) – the butterfly appears to aim for a spatially even distribution of eggs rather than a distribution proportionate to the abundance of the hostplant.

As this is quite the easiest of any butterfly species to find in the egg stage, and searching for eggs can be very rewarding when the weather is too dull for flight, a number of checks were made in period 1 for possible alternative hosts. Eggs were found, mainly in 1995, on Sweet Rocket *Hesperis matronalis*, Honesty *Lunaria annua*, Common Wintercress *Barbarea vulgaris*, Watercress *Rorippa nasturtium-aquaticum* and Wild Turnip *Brassica rapa*. In period 1 it appeared that these alternative hosts were being selected later in the flight period. Possibly the females recognise that by this time the Cuckoo Flower and Garlic Mustard have become too senescent for the larvae and therefore elect for a less suitable plant in an earlier stage of flowering; in 2019 in period 3, when the species was especially abundant, there was an unexplained scarcity of Cuckoo Flower in many of the usual localities and it appeared that females were laying on whatever alternative plants they could find; indeed they were observed on several occasions investigating quite unsuitable plants in their efforts to find somewhere suitable to oviposit. In that year 2019 some eggs were found on other crucifers including Wall Rocket *Diplotaxis tenuifolia* at the edge of a street pavement in a run-down industrial area in Manchester (SJ8597), and on an unidentified yellow crucifer in the heavily-mown Ardwick Green Park, also in Manchester (SJ8597).

It is also possible that recorders have become so used to searching the usually accepted hostplants that they do not give enough attention to alternatives, and therefore many eggs on other plants go unnoticed. Courtney (1980) investigated whether larvae were able to complete development on these alternative plants, and suggested that they have varying success. Much research remains to be done; the only relevant observation made during the present survey is that half-grown larvae were found on wild Turnip in the Douglas Valley, near Gathurst (SD5208) on 14.6.1995.

Female *A. cardamines* searching unsuitable hostplants in the Medlock valley, Manchester 15.4.2019, during the shortage of the normal hosts

Broods. Unlike the other white Pierids this butterfly has only one brood. Emergence normally starts in mid-April, the peak is usually over by at the latest the last week in

May, and sightings after the first week in June are rare; there have been very occasional July and even August reports but the author in all his years of butterfly-watching has never seen one in those months, and suspects misidentification of *P. napi* as female *A. cardamines*. Females appear to linger on longer than males. The flight period is slightly, but noticeably, later in the north of the area than in the generally lusher south; it is also later at higher altitudes. In 2006 R.L.H. Dennis, along with the author and P.M. Kinder, compared the dates of egg-laying and subsequent larval development at three sites, the Priory Gardens, Sale (SJ7992, altitude 29m), Werneth Low Country Park (SJ9693, 215m) and the Goyt Valley (SK0171, 420m); development was significantly later as altitude increased (Hardy et al, 2010).

Behaviour. Males are frequently seen patrolling along defined flyways, such as river banks and woodland edges. Males usually seem to outnumber females by about 10 to 1; in reality the numbers of each sex are about equal but the males are much more inclined to fly than the females and are therefore much more apparent; also the females are easily mistaken for other white Pierids. The females must however be a lot more mobile than they seem, as it often happens that recently-laid eggs are found in places where no adults have been sighted; the female therefore must have visited earlier the same day and moved on. At the time when these butterflies emerge and lay, vegetation as a whole is at the peak of its vernal growth spurt – Nature's annual attempt to re-conquer – and apparently suitable young plants appear in many places before the vegetation either becomes too tall and senescent or (more likely) gets mown down with the loss of all the eggs and caterpillars. Sometimes it is said that females do not usually lay on plants where there is already an egg (Courtney, 1981 and Thomas, 1984, but see Dennis, 1982). In the present survey this certainly has not always been found to be the case. Many times plants have been found with two or more eggs, and once, in the Mersey Valley near Northenden (SJ8290) a single plant with nine eggs; in that case there were few other plants nearby and it would seem that several females must have been drawn by the same cues to what appeared to be an ideal plant (Dennis & Hardy, 2006a). Sometimes also newly-laid eggs and half-grown caterpillars have been found together, and several times more than one caterpillar on the same plant, in spite of their tendency to cannibalism. Normally females select plants for egg-laying which are growing in fairly open sites not too far from a shelter-belt; plants growing in shade are generally unsuitable.

Family LYCAENIDAE

GREEN HAIRSTREAK, *Callophrys rubi* (Linnaeus, 1758)


Rainshore 5.5.2007


Rainshore 5.5.2007

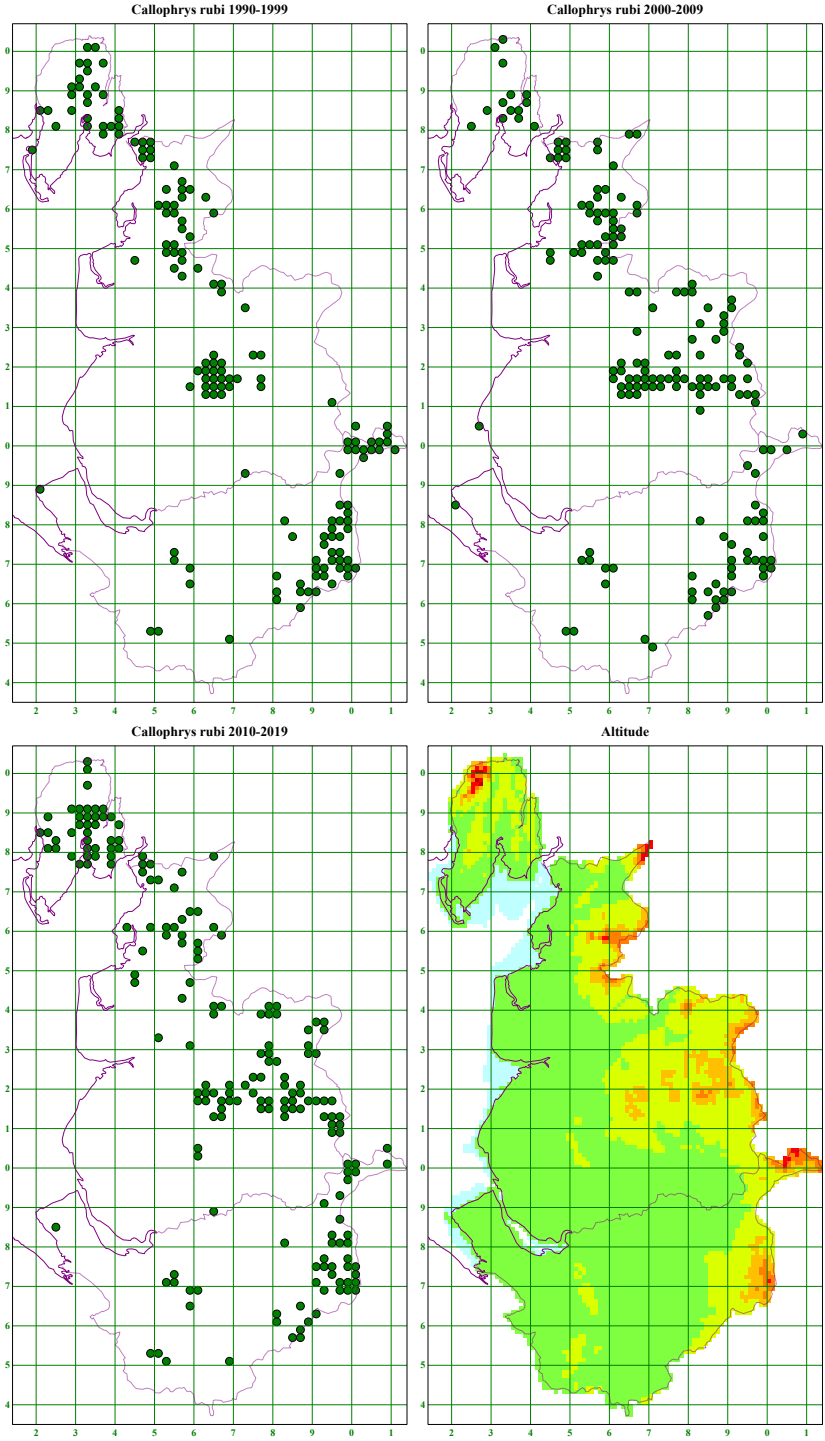

Diggle 6.5.2018: with reduced white markings

Distribution. A species mainly of higher ground in the Pennine foothills and northwards, extending into the Furness fells, frequenting sheltered slopes and declivities with abundant bilberry. In Cheshire it also occurs on low-lying mosses, and in north Lancashire it occurs on the Morecambe Bay limestones. Although the maps seem to show a considerable increase in south Lancashire, this may be due to greater efforts, especially by R.S. Greenwood of Rochdale in periods 1 and 2 and later by S.B. Smith around Oldham, to locate hitherto undiscovered colonies. The possibility of a range extension is not ruled out; on the other hand, investigation in period 3 of some sites where the butterfly was previously abundant found that it had died out there: two notable such sites were Dick Clough, Tunstead (SE0004) and Rainshore, near Norden (SDS8515). A formerly large colony on the north slope of Werneth Low (SJ9693) also seemed to have become much scarcer.

Some *C. rubi* habitats in Greater Manchester: (left) Birchen Holts, SD8417, 18.5.2014; (centre) Lady Lees Plantation, SD8416, 18.5.2014; (right) Werneth Low Country Park, SJ9693, 9.5.2010

Regarding the apparent isolated records in the Wirral and near Southport, Whitehead (1986) wrote of this region: "Prior to 1854, a specimen was taken in Jackson's Wood, Claughton, and in 1856 it was reported as being at Hale and Lydiate. The County Museum [Chester?] received a record in 1984 from Irby Heath, but this has not been confirmed." The Wirral records shown on the maps are from Red Rocks (1994, by an experienced recorder), West Kirby (larval record, 2003, again by a knowledgeable entomologist) and Thurstaston (2011); and the record near Southport is from Ravenmeols Hills (2005); it has been accepted by "BioBank" and also by Marsh & White (2019) who believed that it was a wind-blown stray; there is no other known record anywhere near.

Shaw (1998) stated that in the nineteenth century this butterfly was more widely distributed in Cheshire, and added: "Loss of habitat has undoubtedly been the main cause for its decline, particularly on the Cheshire Plain".


Callophrys rubi 1990-1999
Callophrys rubi 2000-2009
Callophrys rubi 2010-2019
Altitude

Habitats. Most of the colonies in the Pennine foothills are on south-west facing slopes or hollows which provide a warmer microclimate than the surrounding open hills. An exception was at Werneth Low country park (SJ9693) where a large colony existed on the north face of the hill where there is abundant bilberry just above the shelter of the tree-line; in spite of its northerly aspect this location was quite sheltered and warm. Large expanses of heather and bilberry on open hillsides are not suitable habitat. The lowland Cheshire colonies are in a different type of biotope: low-lying peat bog. Around Morecambe Bay the species occurs in lightly wooded limestone habitats including Gait Barrows.

Hostplants. The most usual hostplant is Bilberry *Vaccinium myrtillus*. As Gorse *Ulex europaeus* is present in some of the sites it is a possible alternative.

Broods. Single-brooded; it should be looked for in late April and May, occasionally persisting into early June.

Behaviour. Although not very conspicuous, this is by far the easiest to find of the four Hairstreaks occurring in the area, as its hosts are low-growing and it flies at eye-level. Normally when one individual is located, others will readily be found nearby. They give the impression that they are unlikely to fly far and that there is unlikely to be much if any movement between colonies. Like some other apparently sedentary butterflies, however, they may be more mobile than imagined.

BROWN HAIRSTREAK, ***Thecla betulae*** **(Linnaeus, 1758)**

Bernwood, Oxfordshire 1.9.1991

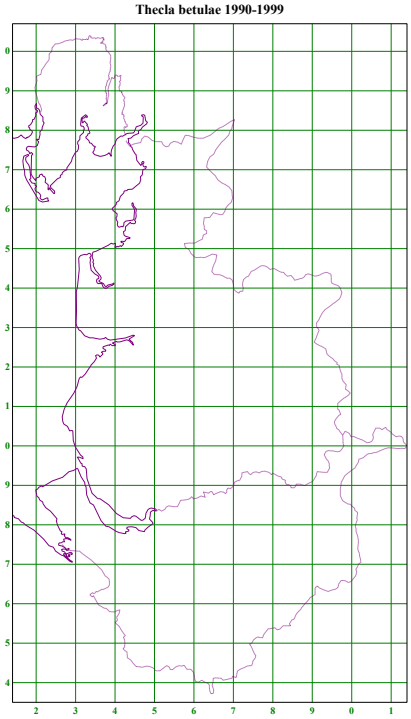
Distribution. Formerly resident in several locations around the Morecambe Bay limestones but not apparently having been seen since the 1980s, the species was rediscovered at Gait Barrows in 2016 and has been recorded annually there since.

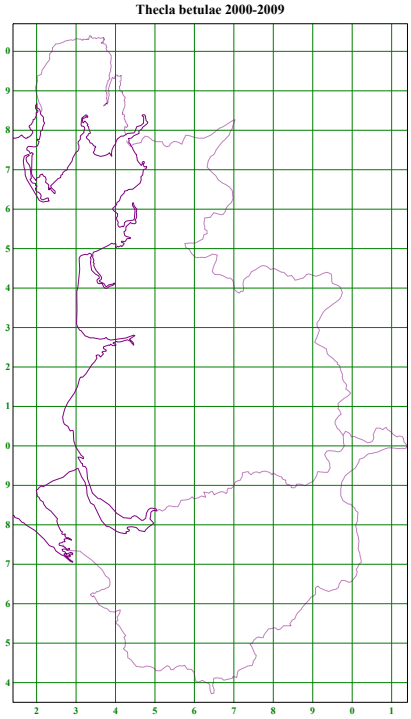
Habitats. Woodland on and close to limestone pavement.

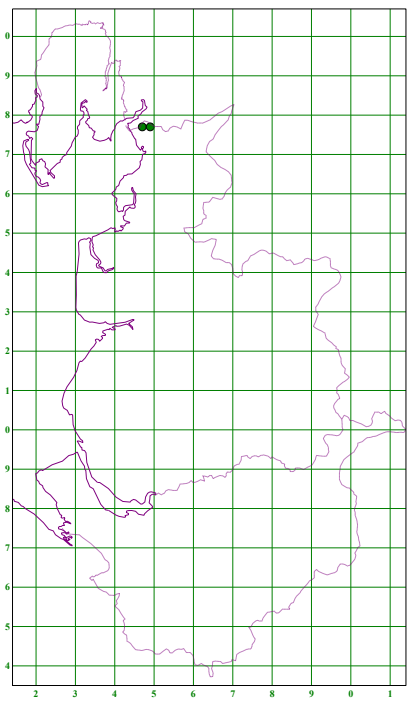
Hostplants. Blackthorn *Prunus spinosa.*

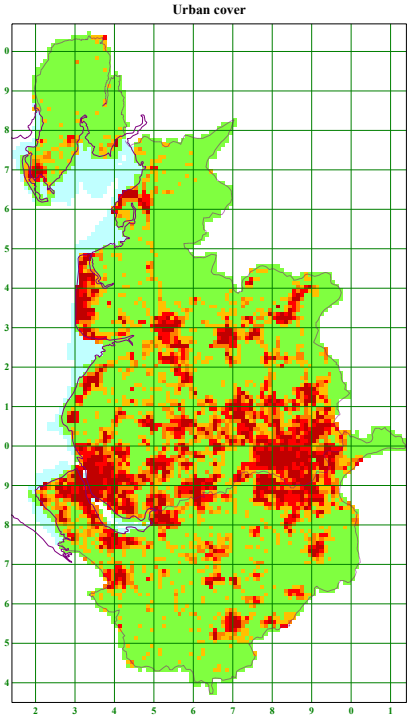
Broods. Single-brooded, from late July to mid-September.

Behaviour. As with most Hairstreaks, this species is secretive and inconspicuous, and should be looked for around Blackthorn bushes, preferably large mature ones on a woodland edge.


Thecla betulae 1990-1999


Thecla betulae 2000-2009


Thecla betulae 2010-2019


Urban cover

PURPLE HAIRSTREAK, *Favonius quercus* (Linnaeus, 1758)


Bookham Common, Surrey 5.8.1990


Stanley Green, Cheadle 16.7.2017


Wythenshawe Park 19.7.2017

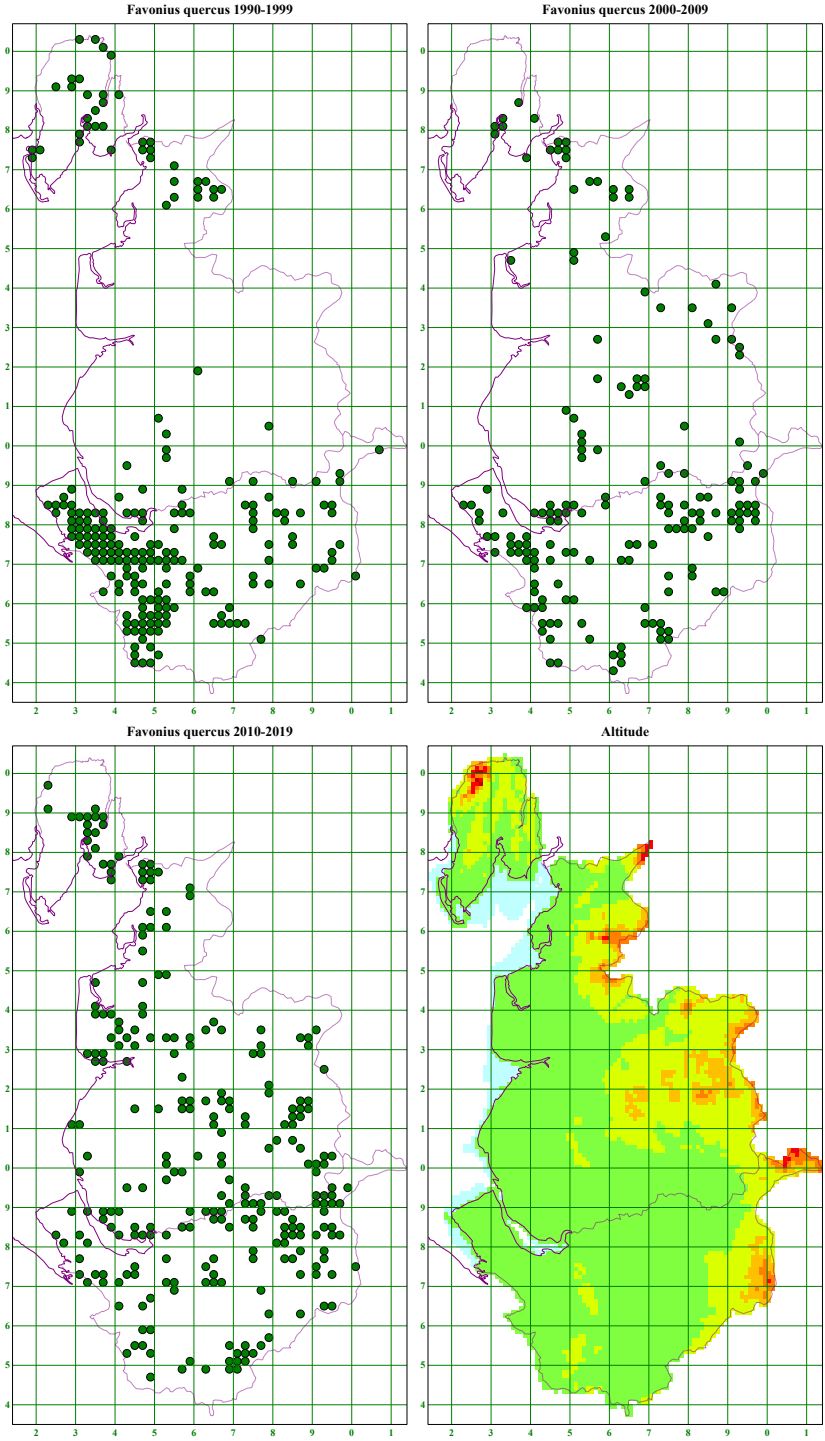
Distribution. There is no doubt that this butterfly is much more widely distributed and numerous than the maps indicate; this is solely due to its non-apparency because of its treetop habits. A seeming increase in numbers in 2011 was probably due to climatic conditions that year being more conducive to the butterflies' flying and coming down to lower levels.
Whitehead (1986) wrote: "... the only records being from around Eastham in the 1850s and 1860s. In 1983, it was discovered at Dibbinsdale and in Barnston Dale in the Wirral." As the maps for period 1 show, the reality in the Wirral is vastly different from this. Elsewhere in Cheshire, it was reported as "presumed to be extinct in the county" by Boyd (1946) and "very rare" by Smith (1948); again, the present-day situation is very different, and it probably has been distributed throughout the area all along. The lack of records in central Lancashire during period 1 is almost certainly due to under-recording and not to absence.

Habitats. Woodlands with mature Oak trees, tree lines and woodland edges; mature Oaks growing in parks are also favoured. This butterfly continues to be discovered in new localities; it is worth keeping an eye on any mature Oak trees during the flight season.

Hostplants. Oaks *Quercus robur* and *Q. petraea*.

Broods. One annual brood, in July and early August.

Behaviour. This butterfly normally keeps to the higher braches of trees and is very difficult to see; it obtains most of its nutrition from honey-dew on tree leaves. To see it, it is normally necessary to select a likely-looking tree and stand and watch the side of the tree on which the sun is shining, perhaps for up to half an hour, scanning the branches for any sign of movement; the butterfly usually looks light greenish-silver as the sun catches the underside while it flits quickly among the branches. Occasionally it descends to take nectar; one was even reported from a large suburban garden in Hale (SJ7886) in 1995 on a Buddleia bush, and in 2010 B. Smart of Chorlton, Manchester (SJ8192) recorded a worn female in his garden, taking nectar initially from Canadian Golden-rod and then from Ragwort. In 2011, it would seem that climatic conditions were more conducive to encouraging this species to fly and to descend to lower levels, as far more sightings were reported than normal, and the author personally observed two butterflies on the ground in July, one at a known site at Broadheath near the Altrincham incinerator (SJ7590) and one in Dunham New Park (SJ7587); they were obtaining nutrition from the bare soil.


Favonius quercus 1990-1999
Favonius quercus 2000-2009
Favonius quercus 2010-2019
Altitude

In July 2018, in Dunham Park (SJ7486), on several days R.L.H. Dennis, and also the author on one day, observed several of these butterflies patrolling fast and at low level along a ride running south-south-west to north-north-east through a plantation of young Oaks from which the deer which browse much of this park were excluded by fencing. Oddly, the numerous magnificent Oak trees along the main avenues in this deer-park do not seem to host the butterfly.

WHITE-LETTER HAIRSTREAK, *Satyrium w-album* (Knoch, 1782)

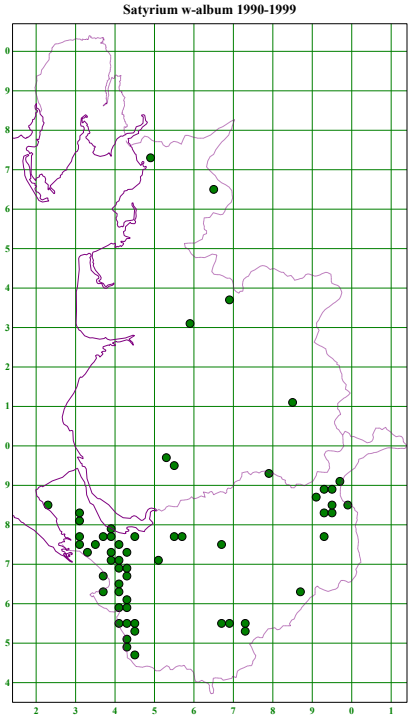

Nr. Stretford sewage farm 1.8.2013

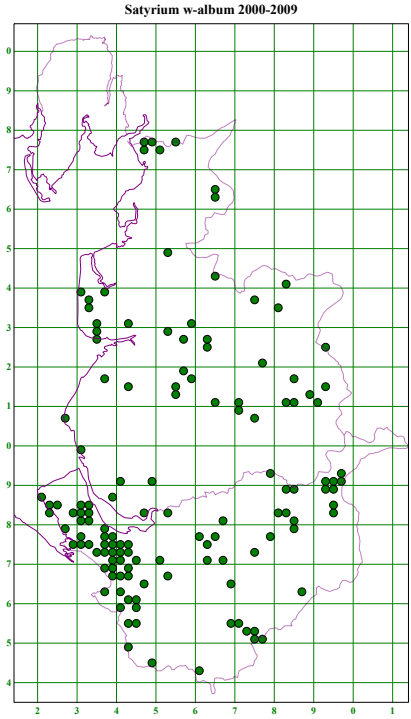

Caterpillar about to pupate, Wythenshawe 24.5.2018

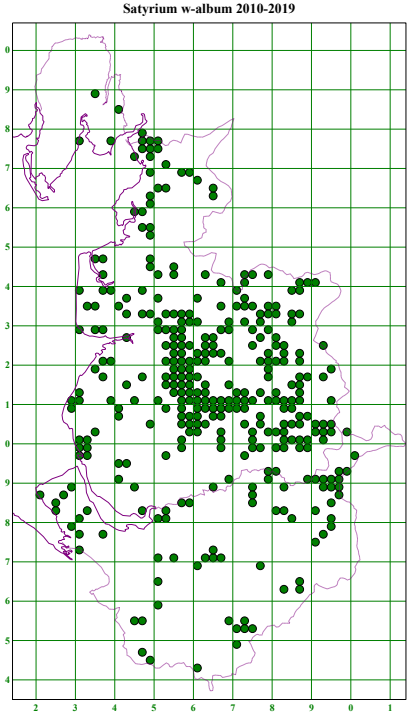

Chrysalis 27.5.2018

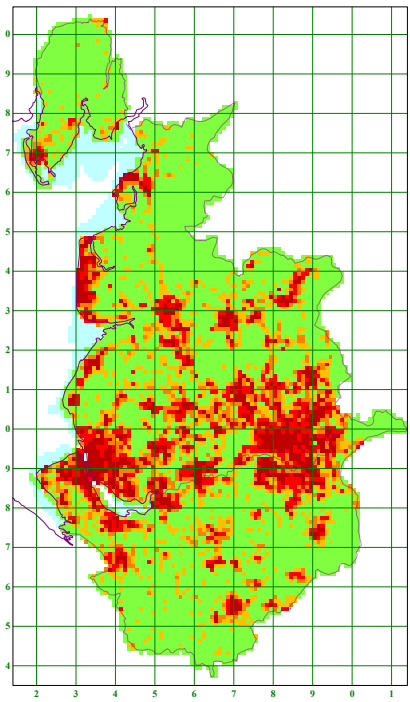
Distribution. Whitehead (1986) wrote: "First recorded in the [Wirral area] at Dibbinsdale in 1976." This, as with the last species, is certainly an effect of under-recording, not absence; as the maps show, the species is quite widely distributed in the Wirral and almost certainly will have been so all along. Elsewhere in Cheshire, the historic reports differ, with Boyd (1946) referring to a sighting in 1935 as being the first county record since the nineteenth century, whereas Mansbridge (1939) reported it as being common in the south of the county. As with *F. quercus*, *S. w-album* is almost certainly more generally distributed and numerous than the maps show, and also the apparent concentration of records in the south Wirral during the early periods is far more likely to be due to increased recording effort than a genuine greater abundance of the butterfly in that area than elsewhere. The large number of records in central Lancashire in period 3 is due to intensive efforts by K. Haydock and J. Mills, recording eggs as well as adult butterflies. It is unlikely however that the species will be as numerous as *F. quercus*, for the simple reason that Elm trees are now nowhere near as numerous as Oaks, and also are badly affected by disease. Anywhere with reasonably-sized Elms is worth trying; one noted locality is a suburban park in Blackpool (SD3138).
By 2014, S.B. Smith had discovered the species around several Elms in the Oldham area; more continued to be found until in 2018 a very extensive survey revealed that there were still over a hundred Elms in this district and a good three-quarters of them supported the butterfly. This seems quite extraordinary in view of the devastating losses of these trees, which in the latter years of period 3 have been particularly bad over much of Greater Manchester.

Habitats. Anywhere with reasonably-sized Elm trees is likely to support this butterfly. It used to be reckoned that the ideal habitat was the edges of mature woods containing Elms, though it has now become clear that trees in suburban streets, town parks and almost in city centres are just as likely. In 2015 the species was confirmed as occurring on Elms in the centre of Salford, near the Salford university and a single tree beside the decidedly industrial Hulme Street; it was still present on the last-mentioned tree in 2018 although most of the nearby trees had either died or been


Satyrium w-album 1990-1999


Satyrium w-album 2000-2009


Satyrium w-album 2010-2019


Urban cover

destroyed because of intensive building work – new blocks of flats – in the immediate vicinity.

11.1.2015 15.6.2015 28.3.2019

Three views of an Elm by Hulme Street, Salford where *S. w-album* was discovered in 2015. Since the third photograph was taken a further large block of flats has been built to the left of the tree, although at the end of 2019 the tree was still present and the butterfly was confirmed by K. Haydock as still breeding on it.

Hostplants. Elms. All records in this area are of Wych Elm *Ulmus glabra*.

Broods. One generation per year. In the 1980s and 1990s it seemed to be reckoned that the best time to look for the butterfly in this area was late July and the beginning of August, but latterly it seems to have been emerging earlier. In 2018, sightings began early in June and were over by the end of July. Interestingly, although pupation is believed normally to take place under a leaf, on 24th May 2018 a caterpillar spun up for pupation was found by chance on a discarded tomato-ketchup packet on the pavement of Altrincham Road, Wythenshawe; this was brought indoors, pupated and the butterfly emerged on 5th June, being released the following day at the site where the caterpillar was found (Hardy, 2019a). Sadly, it was noted that day that the Elms in the vicinity were mostly in an advanced state of disease.

Behaviour. This insect has very secretive habits and to see it often requires standing in front of a suitable Elm tree on a warm, calm day and repeatedly scanning the higher branches, when the butterflies may be seen flitting around the foliage or more likely silhouetted against the sky, sometimes two of them having a territorial interaction. *S. w-album* is perhaps slightly easier, or rather slightly less difficult, to see than *F. quercus* Some authorities have stated that this species, and *F. quercus*, are more readily seen during evenings than at the height of the day; experiences by recorders contributing to this book have not found this to be the case. Nutrition is usually obtained from honey-dew on the leaves of the trees, though occasionally a butterfly will come to a lower level and take flower nectar, usually from Thistles or Brambles.

In 2018, when observing in Oldham, S.B. Smith observed that *S. w-album* tended to fly high, above the trees, so that they were fairly easily visible against the sky. In 2019, when conducting surveys in other places around Manchester, he noted that they tended more to flutter around the leaves at canopy level, and therefore were not as easy to see. The summer of 2018 was very warm, but it was a dry heat, not humid; in 2019 the weather was more humid but not quite as hot. It seemed as though the humidity was a key factor in the flight behaviour.

SMALL COPPER, *Lycaena phlaeas* (Linnaeus, 1761)


Male, Rochdale 28.7.2018


Female, Shawfield 4.9.2016


Strinedale 17.9.1994

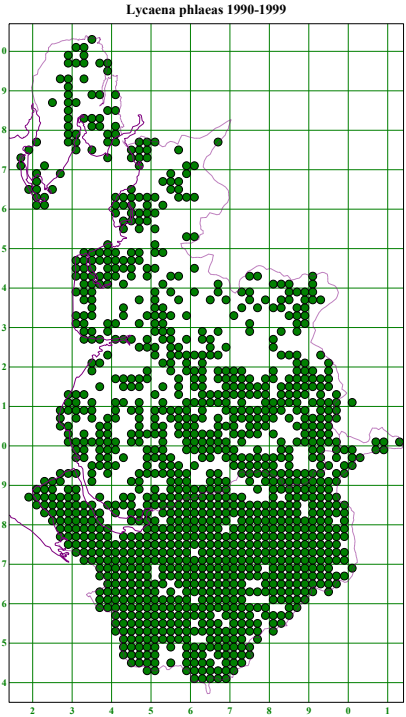

Var. *radiata*, Mersey bank, Stretford 2.8.1989

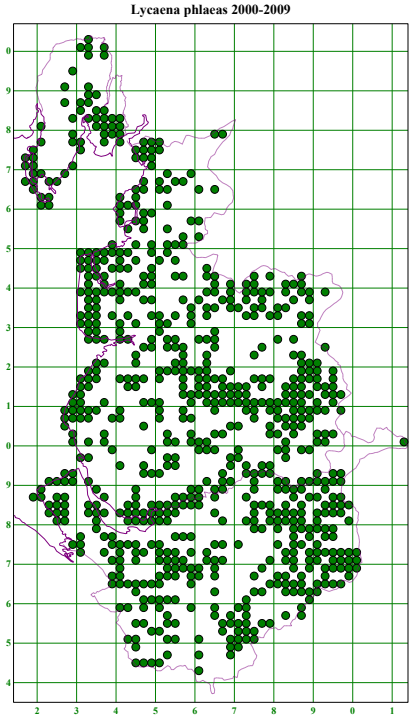

Var. *caeruleopunctata*, Stretford 30.9.2007

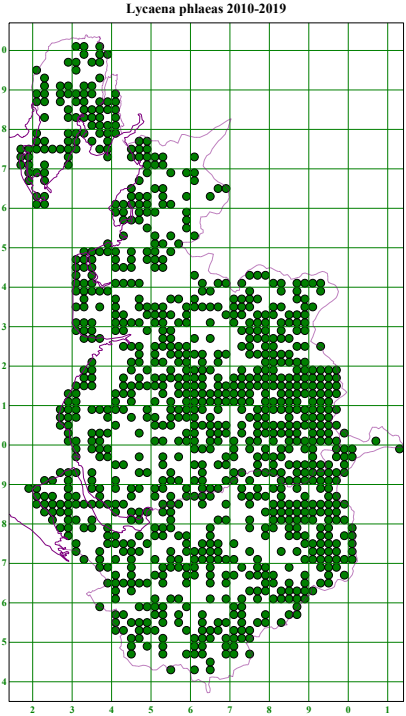

Caterpillar, Sale 2.7.1992

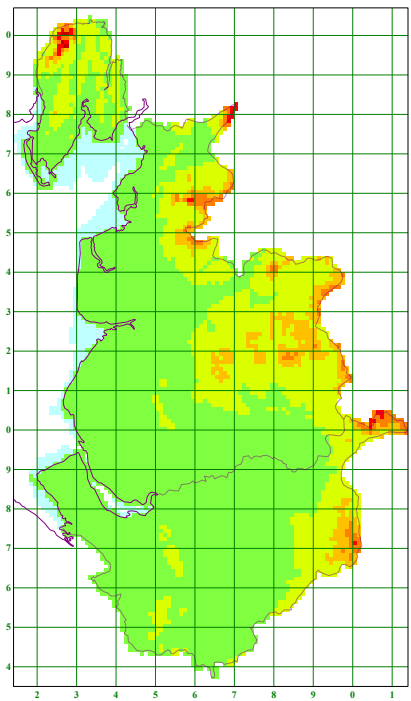
Distribution. This butterfly formerly appeared to be generally distributed but in varying numbers from year to year. Shaw (1998), referring to Cheshire, remarked: "... even though some losses have occurred in low-lying areas there is no evidence to suggest that its status has significantly altered in recent times". This has not been the case since then. Although the maps do not suggest an appreciable decline from period 2 to period 3, it is definitely not as common as it was up to the 1980s and 1990s. The map of period 1 seems to show a much fuller distribution in Cheshire than in Lancashire, but this is almost certainly an effect of greater recording effort in the former county. The even but much thinner distribution shown in the map for period 2 is probably a more realistic picture. The map for period 3 seems to show a slight increase, including around Manchester, but such has not been the author's impression, and again it is probably a result of increased recording coverage – including the "big butterfly count", which annually seems to turn up a number of records of this species in unlikely places; attempts have been made to leave out unlikely records, though this is a species which in theory should be unmistakeable: Sanders (1939) wrote: "No confusion is possible. Our only 'copper'", but he was being rather too optimistic as clearly some inexperienced observers have recorded it incorrectly. Early spring records have sometimes turned out to be misidentifications of the Orange Underwing moth *Archiearis parthenias*.
Around Manchester, in period 1 it used to be found on many patches of rough ground and in river valleys, notably the Mersey Valley; in period 2 it was still present though in lesser numbers, but it was lost to many of the lowland sites in period 3, and the best chances of finding it around Manchester in that period were at the higher altitudes, especially around Rochdale, where its upward retreat paralleled that of the Wall *Lasiommata megera.*

Habitats. This butterfly favours areas of rough grass mixed with flowers plus some taller vegetation to provide shelter and territorial perches. The habitat needs to be fairly warm. Suitable sites have occurred in many biotopes including river valleys, reclaimed tips, waste ground and regenerating sites. A certain amount of light mowing can be tolerated, as on the south-facing slope of the Mersey bank, Stretford


Lycaena phlaeas 1990-1999


Lycaena phlaeas 2000-2009


Lycaena phlaeas 2010-2019

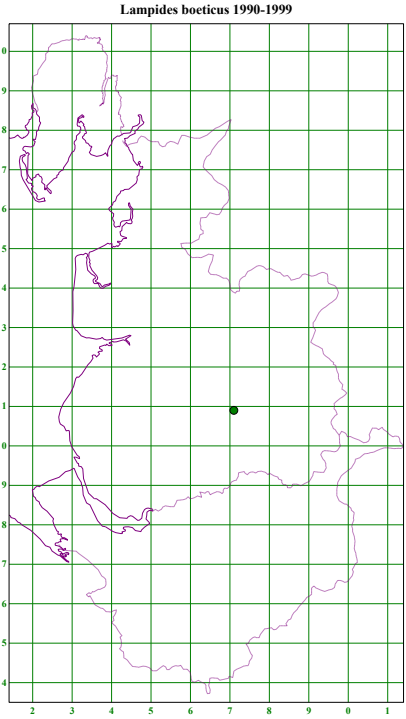

Altitude

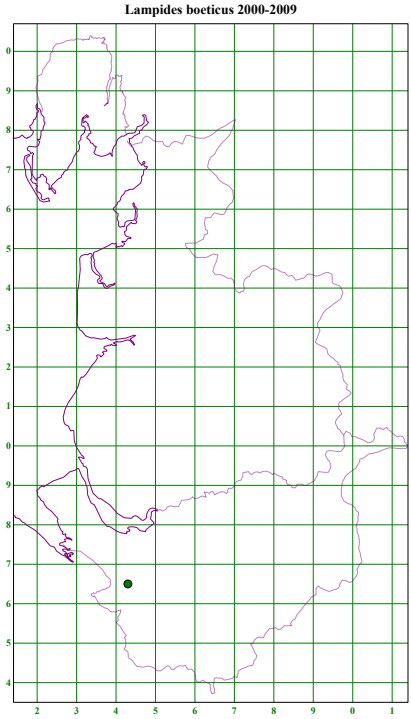
(SJ7892). Level hay meadows, even if they contain abundant sorrel, are not suitable habitat. It used to abound on patches of waste land resulting from abandonment of industry, and regenerating demolition sites, as well as sloping river banks, but has died out in many habitats that were once suitable. It seems to have persisted better at slightly higher altitudes. Very often it shares the habitat with the Wall *Lasiommata megera*.

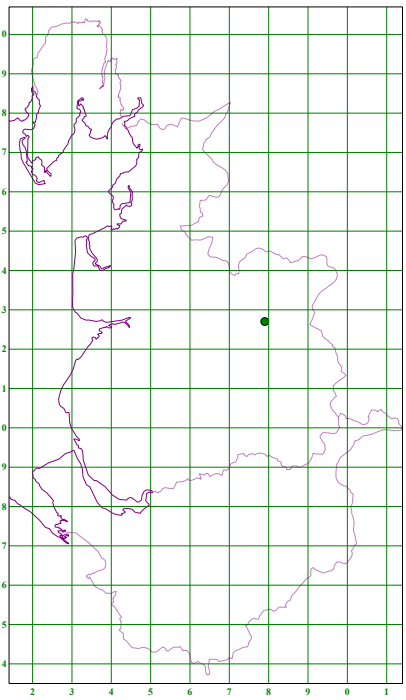
Hostplants. Usually common sorrel *Rumex acetosa*, but it has been recorded using dock. Development on dock will be slower and the larvae more vulnerable.

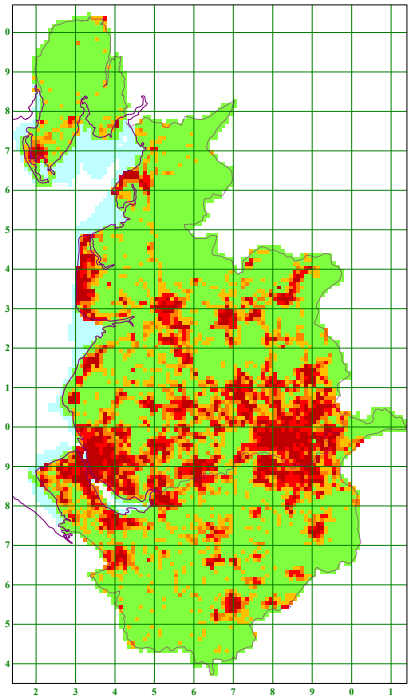
Broods. Two or three broods per annum. The first brood is out in May (early or late May depending on how advanced the spring is) to June, the second in July and August, and the partial third brood in September, occasionally October or even November, as in 2003 when sightings on the Mersey bank continued until the 7th of the latter month; in some years other observers have reported even later sightings. There is much overlap between late examples of one brood and early examples of the next and in different sites broods may be differently timed; a third brood may occur in some sites but not others. The second brood is normally much more numerous than the first. As well as the habitat coincidence mentioned above, the broods of this butterfly often used to appear to emerge in close synchrony with the Wall *Lasiommata megera*; the environment seemed to suit these two quite unrelated species equally. Perhaps it may be significant here that they both have a colour scheme comprising mainly orange and dark brown.

Behaviour. Ragwort *Senecio jacobaea* is very popular as a nectar source. Other composite flowers are used, including Creeping Thistle *Cirsium arvense*, and occasionally in the third brood Michaelmas Daisy *Aster x salignus*. In 1994 a butterfly was seen attempting to feed from stale animal dung on a south-west-facing slope near the Irwell valley in Salford (SD8200). Although *L. phlaeas* has generally been regarded as a sedentary butterfly it clearly does have considerable powers of dispersal and in the 1990s it readily colonised new sites, for instance regenerating waste ground in Salford (SJ8297, sites that have long since been built over). In 1992, the author found a single caterpillar of this species by chance when picking a dock leaf in the very small front garden of the terraced house in Dudley Road, Sale (SJ791926) in which he then lived. This meant that although the spring brood that year had appeared to be very small and had gone over very quickly, a fecund female must have strayed at least half a mile from the normal habitat in the Mersey Valley and found this hostplant. Butterflies of this species are unlikely to be noticed when "on passage"; owing to their small size and fairly dark colouration they are not easy to see apart from when basking with wings open or feeding at flowers. Dennis & Hardy (2018a) have shown that many butterfly species formerly believed to be sedentary ("closed populations") are in fact not so.


Lampides boeticus 1990-1999


Lampides boeticus 2000-2009


Lampides boeticus 2010-2019


Urban cover

LONG-TAILED BLUE, *Lampides boeticus*(Linnaeus, 1767)

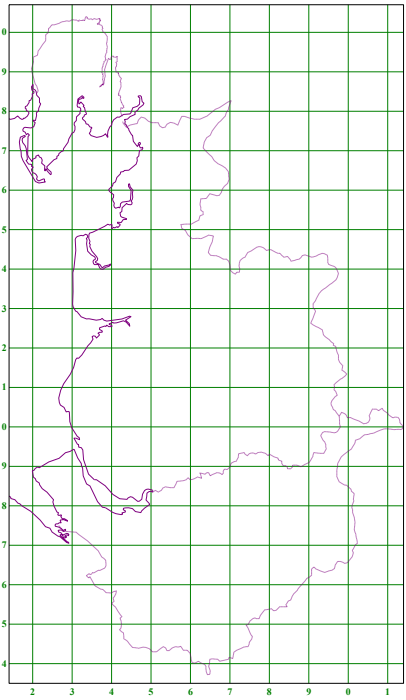
(Dalyan, Turkey) 18.5.1990

The record in period 1 was from a park in Bolton in 1995; that in period 2 was from a garden in Huntington, near Chester, in 2006 (Shaw, 2007); the one in period 3 was photographed on Hameldon Hill near Accrington in 2018 (Marsh & White, 2019).

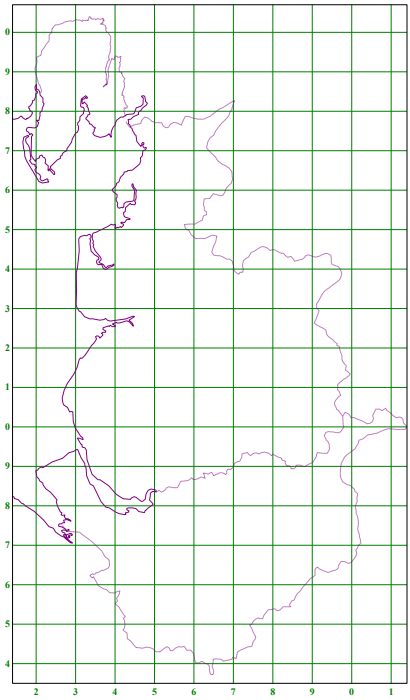
GERANIUM BRONZE, *Cacyreus marshalli (*Butler, 1897)

The only record is from Burwardsley (Cheshire) in 2010 (Shaw, 2011).

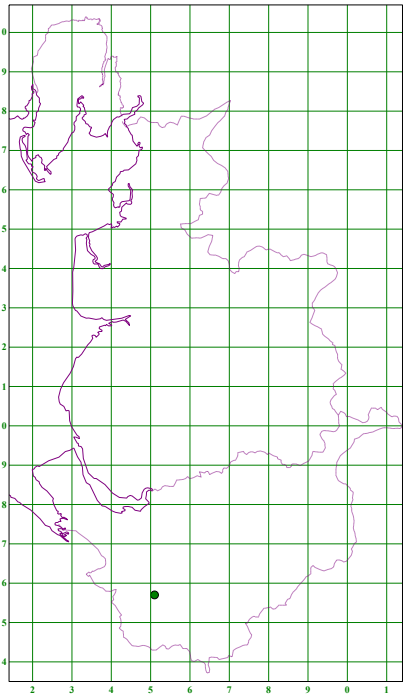
Cacyreus marshalli 1990-1999



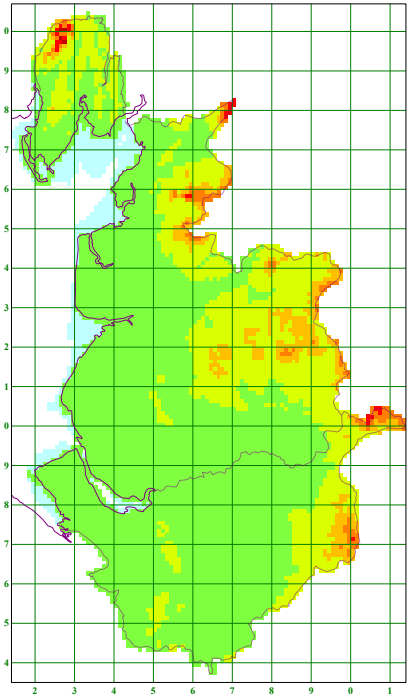
Cacyreus marshalli 2000-2009



Cacyreus marshalli 2010-2019



Altitude



SMALL BLUE, *Cupido minimus* (Fuessly, 1775)


Barrow 28.5.2019


Barrow 28.5.2019


Female ovipositing, Barrow 28.5.2019

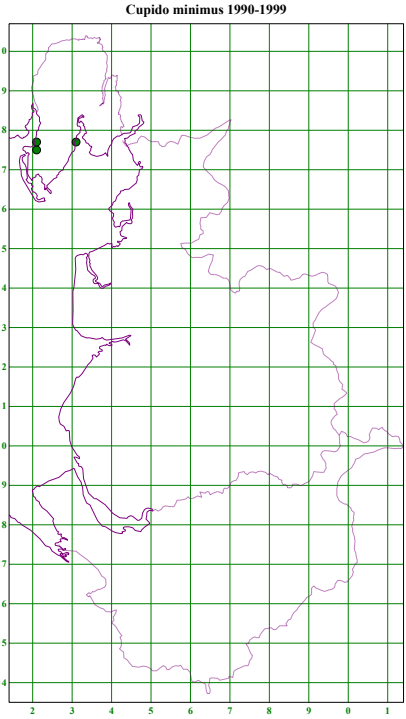
Distribution. A colony of some size was discovered near Barrow-in-Furness in 2016. There are earlier records from the Furness, a little further to the north and also near Ulverston, from the early 1990s; although these are shown on the map for period 1 the author has some misgivings about them as from experience several times supposed records of this species have turned out to be misidentifications by inexperienced observers of *Celastrina argiolus* or *Polyommatus icarus*.
As regards elsewhere, Day (1903) noted that this species was recorded at an unspecified site in the Wirral. Whitehead (1986) wrote: "The only records for this species within Merseyside are from the 1850s, when several were found between Rainhill and Ditton". These seem very unlikely, as also does a record from SJ89 ("Manchester area") from 1908.

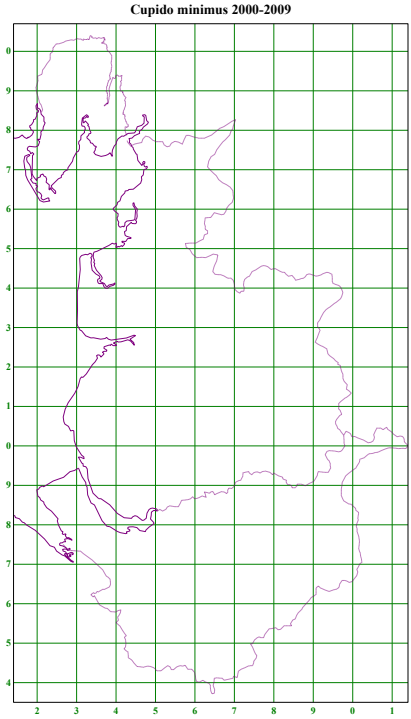
Habitats. The colony near Barrow occurs on a slag bank composed of industrial waste from the Barrow Hematite Steel Company (later Barrow Ironworks) which operated until the 1980s. The slag bank contains over a century's worth of waste from the iron and steelworks which was dumped in north Hindpool, adjacent to Walney Channel. Since the 1990s, an ongoing scheme has been reclaiming the derelict and contaminated land by laying soil on top of the heap. *C. minimus*, a butterfly favouring warm, sheltered hollows, usually on chalk or limestone, occurs mainly on an east-facing slope, where a species-rich limestone flora has developed.

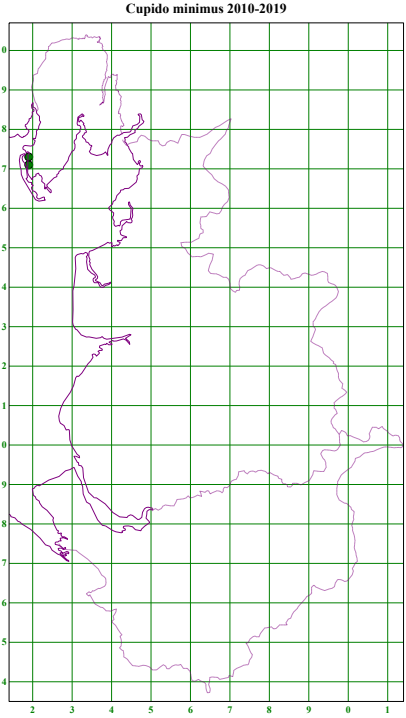
Hostplants. Kidney Vetch *Anthyllis vulneraria.*

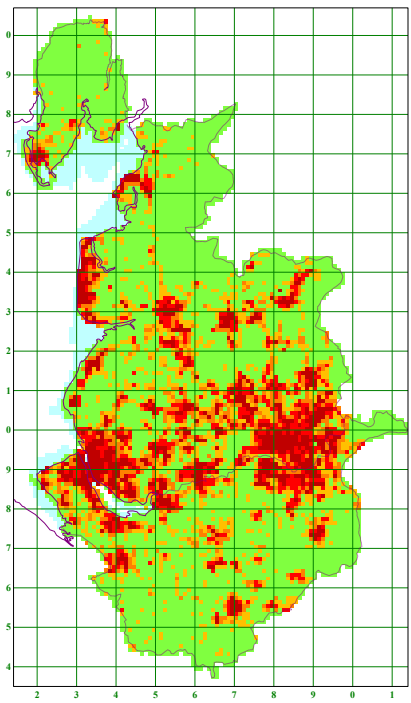
Broods. This species is normally single-brooded, in late May and June. In some locations a second brood is produced, and it seems likely that this is the case here, as in 2018 there were sightings in August and even September.

Behaviour. The butterflies fly low down, in company with the Common Blue *Polyommatus icarus*, frequently taking nectar, from flowers including their host-plant and Bird's-foot Trefoil *Lotus corniculatus*. Although when stationary they look plain brown on the upperside and greyish underneath, in flight they do distinctly have a blue sheen. The species has tended to be thought of as very sedentary and unlikely to move far from its habitat, but such is clearly not the case, as it is now known to be capable of quite long-distance movement and has even been reported once from the Isle of Man. The nearest point from which the Barrow colony might have originated is thought to be near Workington, about fifty kilometres to the north.

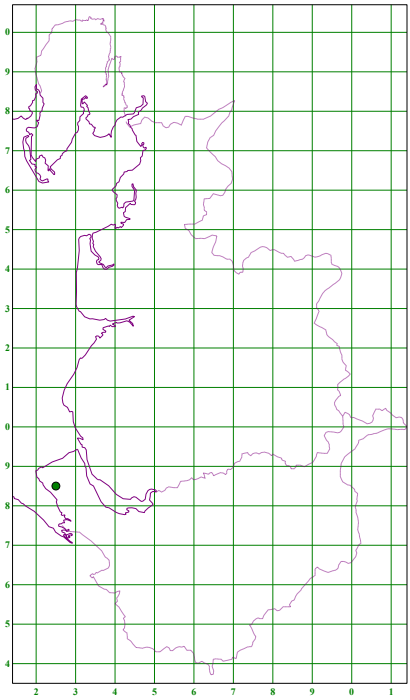

Cupido minimus 1990-1999


Cupido minimus 2000-2009

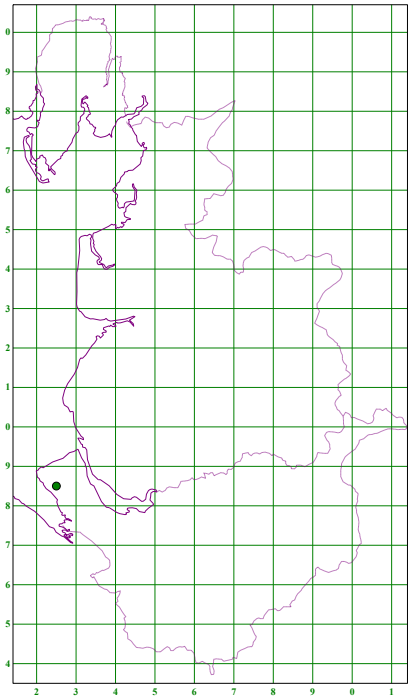

Cupido minimus 2010-2019


Urban cover

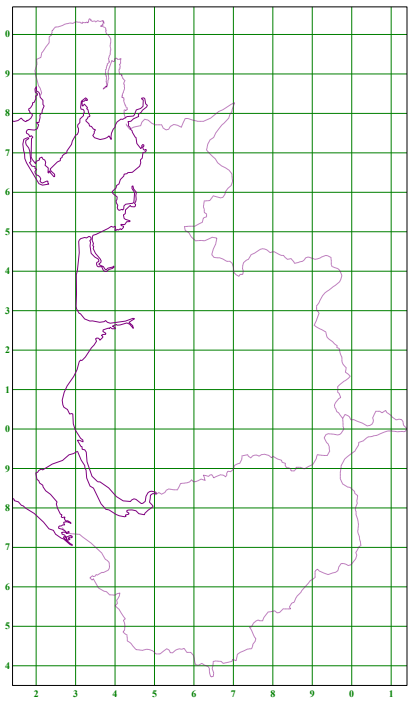
Plebejus argus 1990-1999



Plebejus argus 2000-2009



Plebejus argus 2010-2019



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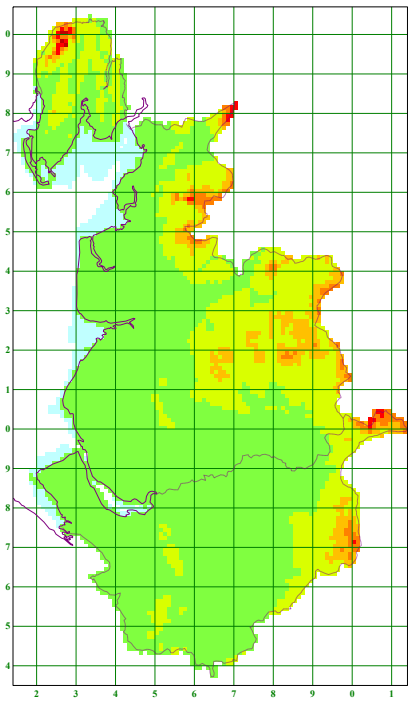


SILVER-STUDDED BLUE, *Plebejus argus* (Linnaeus, 1758)

Prees Heath, Shropshire 12.7.1987

Mating pair, Great Orme, Caernarvonshire 2.7.1989

Historically (pre-1940) this species occurred at a number of sites both in Lancashire and in Cheshire including the Wirral. Whitehead (1986) wrote: "The Silver-studded Blue could be seen at Jackson's Wood around 1850, at which time it was abundant at Bidston Hill. During the latter half of the nineteenth century, much of Bidston's heathland was planted as woodland, and the Silver-studded Blue appears to have died out there around 1885". The final Cheshire colony, at Delamere, is believed to have died out between 1921 and 1925 (Rutherford, 1983). There are also old records from Chat Moss (SJ79) in 1908 and SJ89 ("Manchester") some time after 1857.

A colony at Thurstaston Common on the Wirral was an artificial introduction, with survived for a number of years as a result of habitat "management", but has since died out, the last record being in 2004. The butterflies used to found this colony hailed from Prees Heath in Shropshire.

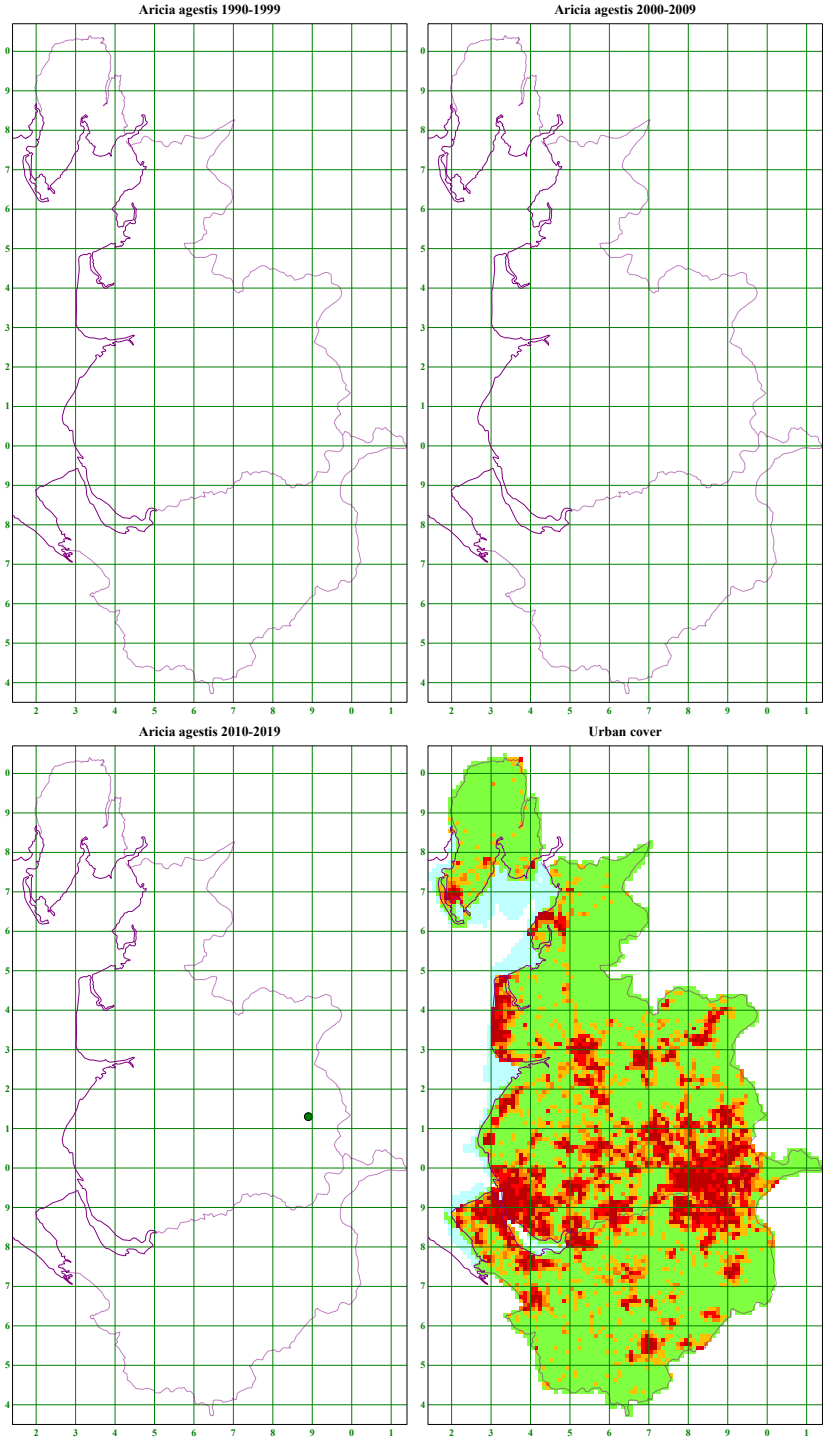
BROWN ARGUS, *Aricia agestis* ([Denis & Schiffermüller], 1775)

Denbies Hillside, Surrey 16.8.2009
("migratory" race)

Cunningdale, Derbyshire 6.6.2016
("Peak District" race)

There were historic records of either this species or the Northern Brown Argus *Aricia artaxerxes*, from SJ79 (Chat Moss, 1910) and SJ89 ("near Manchester", 1910+). It was assumed that the species, if it ever really did occur in the area, had died out, and no apparently suitable habitat had been noted.

In north-west Derbyshire (VC57), a species of *Aricia* occurs, over which authorities are divided as to whether it should be considered to be *A. agestis* or *A. artaxerxes*; it is sedentary and is referred to by K. Orpe, the Derbyshire butterfly record coordinator, as the "Peak District Brown Argus". One of these butterflies, a female, was recorded in 2009 in a garden in Mellor (SJ9688), which although classified since 1974 as being in Greater Manchester is actually in VC57 (Derbyshire), and therefore does not show on the map in this section, although it is on the map in the section *Along the Mersey*. The recorder, I.F. Smith, observed the female ovipositing on Rockrose in the garden, and later in the month found ova and then larvae, but there has not been any further report. The nearest previously known colony was at Cunningdale, near Buxton.


Aricia agestis 1990-1999
Aricia agestis 2000-2009
Aricia agestis 2010-2019
Urban cover

In July 2018 a butterfly presumably belonging to what K. Orpe would call the "Migrating Brown Argus", which is visually indistinguishable from the Peak District race but is much more mobile, was photographed at Stoney Hill in Rochdale, a small, sloping patch of semi-natural grassland surrounded by trees, extensively planted with wild flowers. The butterfly was taking nectar from Bird's-foot Trefoil *Lotus corniculatus*; there did not appear to be any hostplant-habitat nearby although the photographer reported that there had until recently been a patch of Meadow Cranesbill. Immediately afterwards there was a report from near Chorley and another from hills to the east of Ramsbottom: investigation however showed the Chorley one to be a misidentified female *Polyommatus icarus*; the Ramsbottom one was not photographed, the recorder was not 100% certain of the identification and the record has not been accepted. It should perhaps also be mentioned that Stoney Hill is very close to Rochdale Cemetery, where the previous year there had been sightings of Milkweed butterflies *Danaus plexippus*, which had almost certainly been captive-bred and released.

NORTHERN BROWN ARGUS, *Aricia artaxerxes* (Fabricius, 1793)

Arnside Knott, Westmorland 16.7.2005

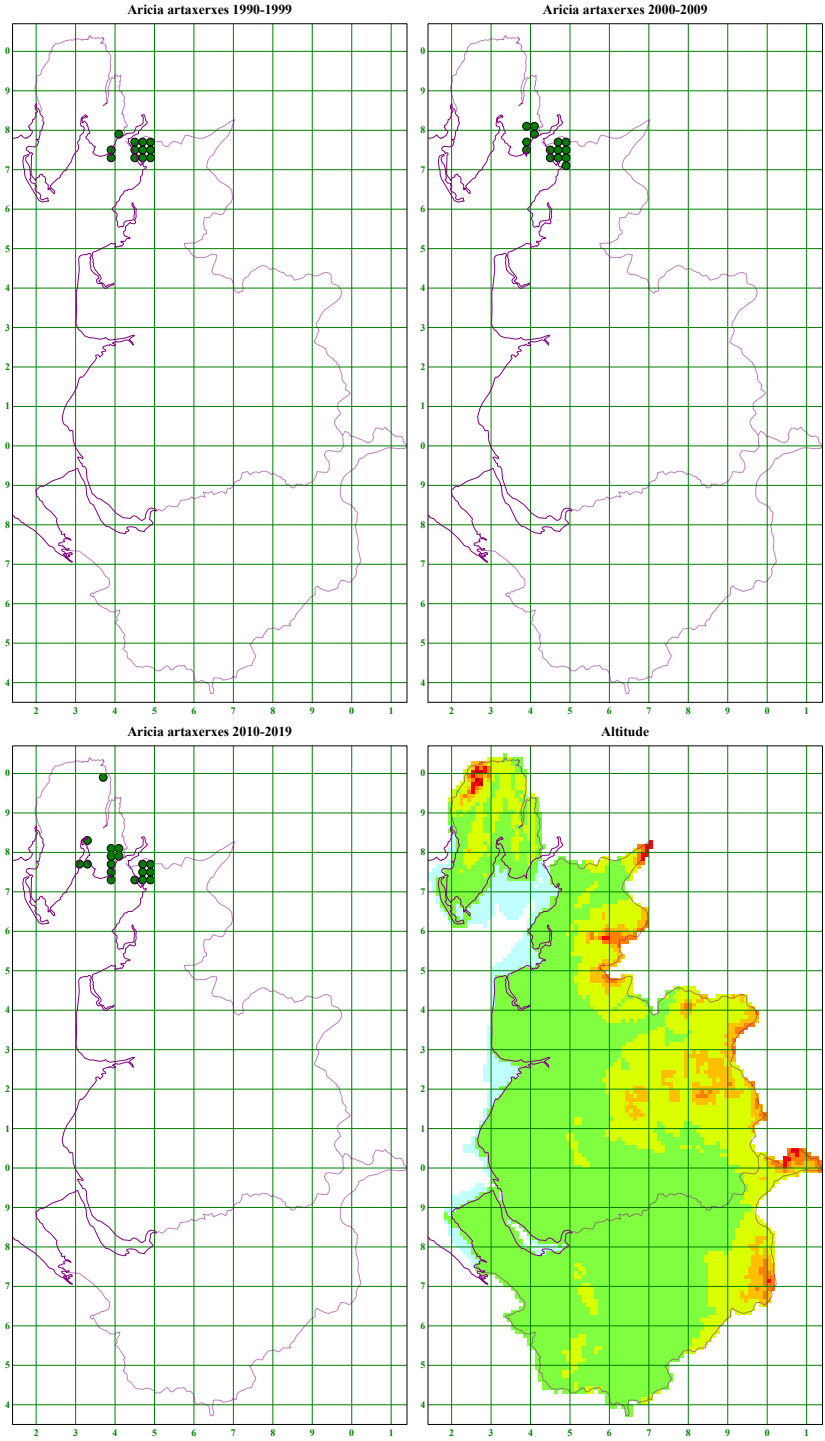
Castle Eden Dene, co. Durham 5.7.1992

Distribution. There is an established metapopulation of what is generally reckoned to be this species on the Morecambe Bay limestone (SD47); however in recent years the numbers have reduced somewhat and it will be noted that the map for period 3 has fewer dots to the east of Morecambe Bay than those for the first two periods. There are also records from the Furness, but not elsewhere in Lancashire or Cheshire.

Habitats. Usually limestone pavement.

Hostplants. Rockrose *Helianthemum nummularium.*

Broods. Normally believed to be single-brooded, but in some years there have been records from the end of May until September, which indicate either a very protracted emergence or a partial second brood, more in line with the "migratory" southern *A. agestis.* The Peak District race (see under *A. agestis*) is also normally regarded as single-brooded. There is little if any difference between the Peak District butterflies and those from north Lancashire, nor indeed much if any visual difference between either of them and examples from southern England, and the present author is unconvinced, despite all the literature on the subject, either that there are two distinct species in Britain or that the white-spotted "species" in Scotland is conspecific with what is classified as *A. artaxerxes* (or *allous*) on the continent.


Aricia artaxerxes 1990-1999
Aricia artaxerxes 2000-2009
Aricia artaxerxes 2010-2019
Altitude

Behaviour. The Morecambe Bay race, like the Peak District race, appears to be mainly sedentary.

COMMON BLUE, *Polyommatus icarus* (Rottemburg, 1775)


Male, Ardwick 10.6.2019


Male, Springfield Lane, Salford 6.6.2014


Female, Weaste 16.6.2014

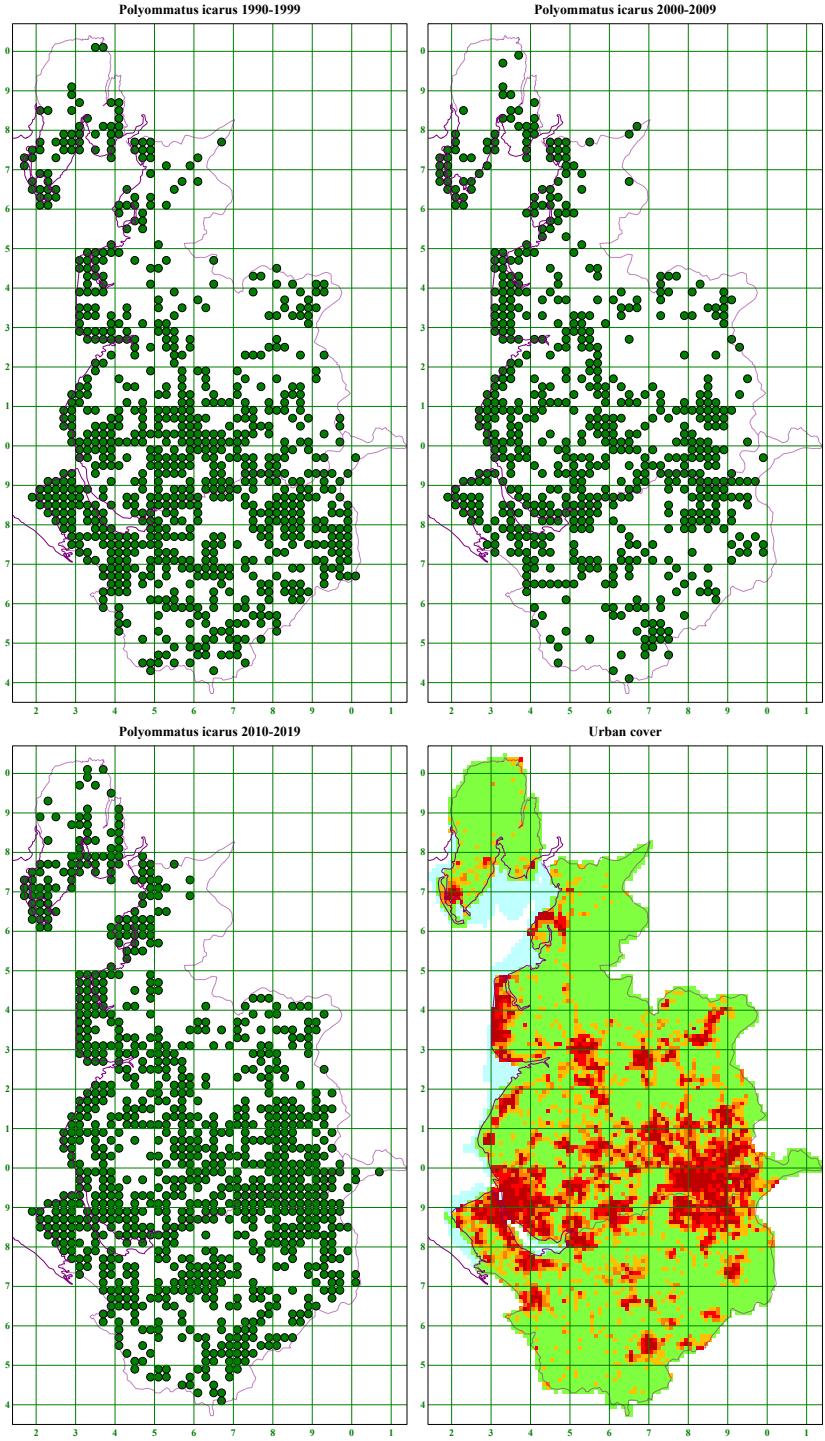

Female, Pickering's Pasture 3.8.2018


Female, Pickering's Pasture 3.8.2018


Mating pair, Ainsdale 28.5.2018

Distribution. The maps indicate a fairly stable general distribution which is probably correct, and the seeming coastal bias in west Lancashire is probably correct also. The map for period 3 suggests an increase in Greater Manchester; this however is almost certainly indicative of greater recorder activity including the annual "big butterfly count" in July and August, and it is possible that some records from that scheme, from inexperienced observers, might be misidentifications of the Holly Blue *Celastrina argiolus.* There are, or have been, a number of sites within a mile radius of Manchester city centre, the most noteworthy being the disused Pomona Docks (SJ8196). Abandonment of industry and mining has clearly been a major factor in the spread of this species. Many colonies have become established on former industrial land to the west and north-west of Manchester, including Horwich (SD6310) where scrub developed on former railway sidings, the former tip at Nob End south of Bolton (SD7406) where dumping of soda ash had created a very lime-rich, alkaline soil, Pennington Flash (SJ6499) where a very strong population used to thrive on a south-facing slope of coal-mining waste below the canal, the Wigan Flashes (SD5802/3) also from coal-mining waste, and a site between the disused railway and the B.P. oil works at Partington (SJ7291). Rixton Claypits and Woolston Eyes have held strong populations. Elsewhere, the coastal sandhills are favoured; there are clearly also many rural sites inland, as explained below.

Habitats. The natural habitat is acidic grass-land, low fertility and species-rich, with abundant Bird's-foot Trefoil, such as is found in some places on the coast (the Ainsdale nature reserve being a prime example). Most colonies around urban areas are on waste land, especially where there is a limestone content. Although limestone is not part of the natural geology of lowland Manchester, many habitats suitable for this species have developed from tipping or demolition sites which often include limestone from building foundations or roadstone, or from ballast along former railway lines or in abandoned railway yards; such sites are often transient in nature:


Polyommatus icarus 1990-1999
Polyommatus icarus 2000-2009
Polyommatus icarus 2010-2019
Urban cover

if left alone for a few years after the demolition, suitable flora will develop and the butterfly will colonise, but what generally happens after that is that either the site is built over or in a number of instances is converted into a formal park, with mown grass and no suitable habitat. Some reclaimed tips, for example the fly-ash tip at Flixton (SJ7393), were artificially coated with lime-rich topsoil imported from the Peak District: this introduced a limestone flora and the butterfly colonised. In south-central Lancashire, many large populations occur (or occurred) on habitats associated with former coal-mining. There are some colonies in the "mosses" to the west of Manchester, though they tend to be on roadsides or river-banks, or sites where there has been some introduction of lime. South-facing slopes are often favoured. In all habitats some shelter-belts, normally consisting of scrub, are present. The species often occurs with the Small Copper *Lycaena phlaeas*, notably on demolition sites which have been left alone for a few years but not yet become too scrubbed-over, although it uses totally different hostplants; it is less generally distributed but usually more numerous than *L. phlaeas* where it occurs.

Hostplants. Bird's-foot Trefoil *Lotus corniculatus* is the main host. In suitable sites the plant tends to form dense low mats and is not out-competed by grasses and other vegetation. On some other sites, including former tips, river banks and demolition sites, alternative hosts are White Clover *Trifolium repens* and Lesser Trefoil *Trifolium dubium*. The large clumps of Greater Bird's-foot Trefoil (*L. uliginosus*) which grow in long grass in some areas are unsuitable and do not support the butterfly; neither do the vigorous clover plants which rapidly spread over former tips and other disturbed ground in the early stages of restoration. The butterfly's breeding success at any particular hostplant/habitat site may well depend on the presence of ants.

Broods. The flight period is from late May to September (rarely October). The broods are ill-defined and seem to peak at different times in different sites. Although August is usually the month of greatest abundance, there is sometimes a high peak in June: an extreme example of this noted by the author was when 64 of these butterflies were recorded at the Pomona Docks site on 10th June 2015.

Behaviour. This butterfly usually occurs in colonies, and when one is sighted it is likely that there will be others nearby. They fly low over the ground, the males patrolling in search of females, and frequently take nectar, usually from their hostplant. Although most of the Blues have generally been regarded as sedentary species, *P. icarus* clearly does have a great deal of dispersal ability. As well as established colonies, several records are of single sightings. These could represent small colonies, but more likely are strays wandering out of the breeding area or dispersing, as often they are seen in habitat which does not appear suitable, yet not near any known colonies. It has often happened that as one site has been lost to building or landscaping, another has become suitable nearby, as a result of further demolition, and the butterfly has moved in. There is much variability in the colours of the females, and blue and brown forms occur together.

HOLLY BLUE, *Celastrina argiolus* (Linnaeus, 1758)


Male, Prawle, Devon 20.4.1992


Female, Timperley 25.7.2011

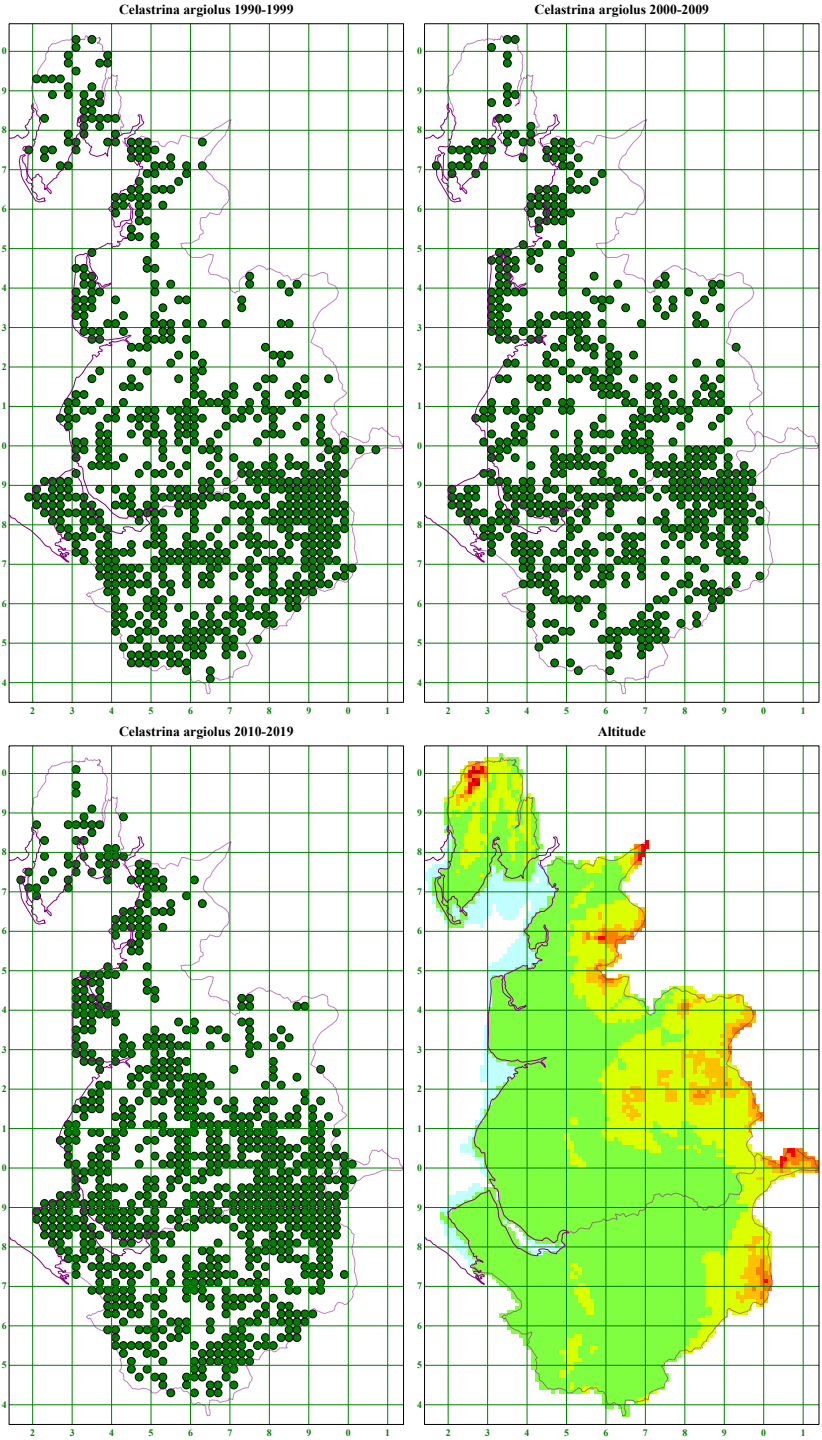

Timperley 23.5.2016

Distribution. Prior to 1990 the species had been very scarce in the Manchester area, and Heath *et al* (1984) show it as virtually absent from Lancashire apart from around Morecambe Bay and the Furness. Whitehead (1986) remarked: "A species that has its ups and downs on Merseyside, the Holly Blue is at best a rarity ... In 1981 a vagrant was recorded on Hilbre Island, and in 1985 there was an unconfirmed sighting in Royden Park, Wirral. Additional unconfirmed records received indicate that this species may be present on Wirral ... A definite sighting of at least two individuals was made in a small park in Crosby in May 1986". Rutherford (1983), referred to it as "not common and of uncertain appearance [in Cheshire]".
The above was certainly not the case during the three periods covered here. In 1990/1 *C. argiolus* underwent a population explosion over much of Britain, including the whole of Cheshire and Lancashire, and as the maps show it has maintained a fairly stable distribution, albeit with periodical fluctuations in abundance, since then.

Habitats. This species thrives in the conurbations; unlike most butterflies occurring in Lancashire and Cheshire this one finds more suitable habitat in suburbs, specifically those with large, long-established gardens with trees and shrubs including suitable host-plants, than in rural areas. It does also occur in more natural biotopes; the Morecambe Bay limestones have long held good populations in the woodlands such as Gait Barrows and Yealand Hall Allotment. Records from open countryside have included the river valleys, usually of butterflies flying along hedges and in scrub areas with bushes and small trees. Its habitat requirements are very different from those of the Common Blue *Polyommatus icarus*.

Hostplants. The usual hostplants are Holly *Ilex aquifolium* and Ivy *Hedera helix*. Another hostplant sometimes noted is Snowberry *Symphoricarpos albus*; an instance of this was noted in Worthington Park in Sale (SJ7991/2) in the summer of 2006. There used to be a good colony on the Irwell bank beside Bridge Street, in the centre of Manchester/Salford (SJ833983): butterflies of both spring and summer broods were noted there in 2004 and 2006; there was at that time a large growth of Ivy by the bridge but no Holly. The question therefore arises as to whether in this instance *both* generations of the butterfly had managed to complete their development on the Ivy. It is unlikely that any further information will be obtained, as in 2009 most of the Ivy had been destroyed and no butterflies have been seen there since.

Broods. There are normally two annual broods, the first in late April and throughout May and the second usually in July and August, sometimes extending into September. Occasional butterflies in October probably represent a partial third brood.


Celastrina argiolus 1990-1999
Celastrina argiolus 2000-2009
Celastrina argiolus 2010-2019
Altitude

At Gait Barrows, in the Morecambe Bay limestone (SD47), the species was usually easy to see in the fairly open woodlands in the spring in the early 1990s, but the then warden used to insist that there was never a second brood there – and certainly although there was quite a bit of Holly at the site, there was not much if anything in the way of Ivy. Records from the present century indicate that there is a second brood at Gait Barrows, but small compared with the first brood. In most localities, the second brood now appears more numerous than the first.

Behaviour. This butterfly has very different behaviour from the Common Blue *Polyommatus icarus*. It flies at a higher level: many sightings are of single butterflies flying actively round small trees and tall shrubs, frequently (but by no means exclusively) Holly or Ivy, and very occasionally pausing briefly to take nectar. They also quite frequently "mud-puddle", obtaining nutrition from minerals on damp ground or road surface – and once, near Wigan in August 2016 one sought nutrition from the surface of one of the author's rather muddy shoes! Often (though certainly not always) the sightings are not followed by others on the same or subsequent days and the inference is that the butterflies must be constantly on the move over a wide area and able to exist at a very low density.

Family RIODINIDAE

DUKE OF BURGUNDY FRITILLARY, *Hamearis lucina* (Linnaeus, 1758)

Gait Barrows 7.5.2007

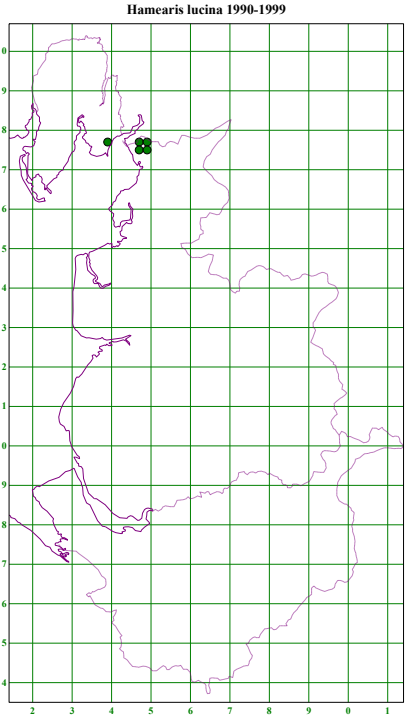
Gait Barrows 17.5.1992

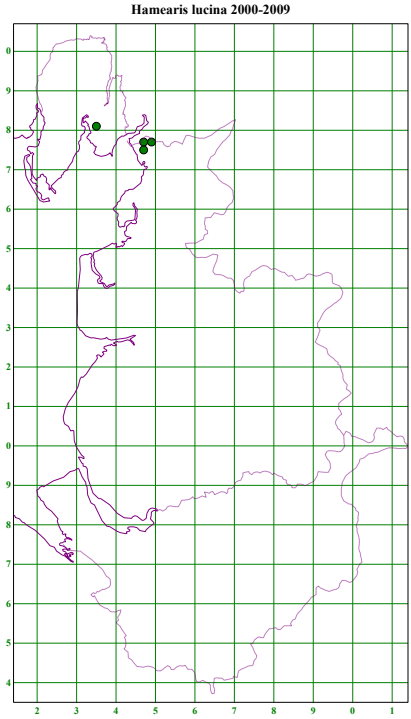
Distribution. Whitehead (1986) stated: "Several were taken in the 1850s on rough ground beyond Eastham". There is no other known record from Cheshire. In Lancashire, a population maintains a tenuous hold on the Morecambe Bay limestone (SD47), and there have been a few records from the Furness.

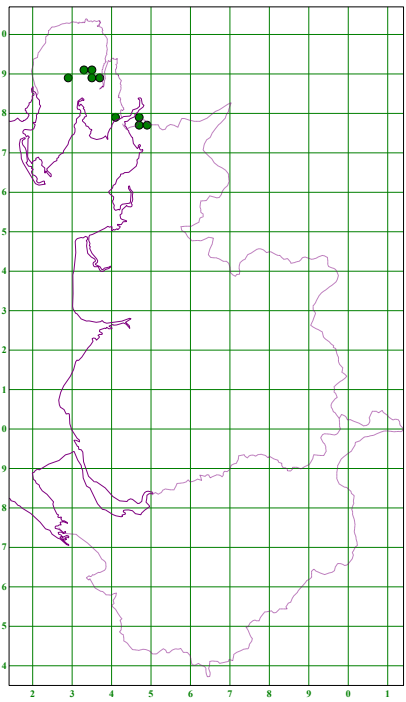
Habitats. The habitat is lightly wooded limestone "pavement", and much "management" work is done by the wardens of the national nature reserve at Gait Barrows to maintain it in suitable condition. The cowslip plants on which the butterflies lay are roped off during the flight season to try to prevent trampling by visitors.

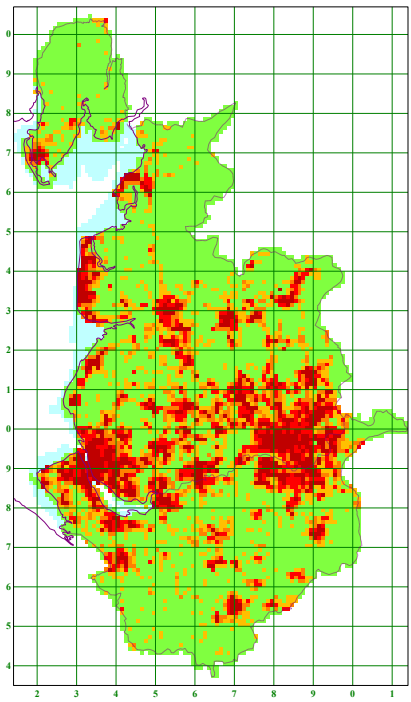
Hostplants. Cowslip *Primula veris*.

Broods. One annual brood, in May, sometimes extending into early June. In some years there have been sightings in late April.


Hamearis lucina 1990-1999


Hamearis lucina 2000-2009


Hamearis lucina 2010-2019


Urban cover

Behaviour. The butterflies are usually seen singly, making short flights around their host-plant or in nearby woodland rides.

Family NYMPHALIDAE (subfamily LIMENITINAE)

WHITE ADMIRAL, *Limenitis camilla* (Linnaeus, 1764)

Fermyn Woods,Northamptonshire 9.7.2005

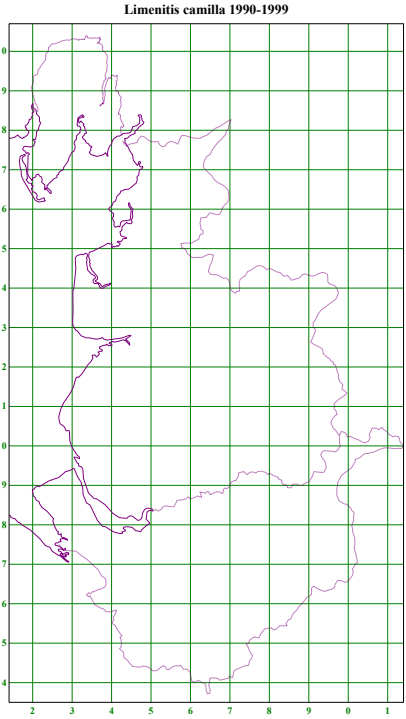
In 2004 and 2006 there were a few reports of single butterflies being seen in Cheshire. These were presumably strays which had migrated out of their normal habitat (somewhere in the eastern Midlands?) in attempts to colonise new pastures. As none have been seen since, they presumably did not manage to establish any colonies.

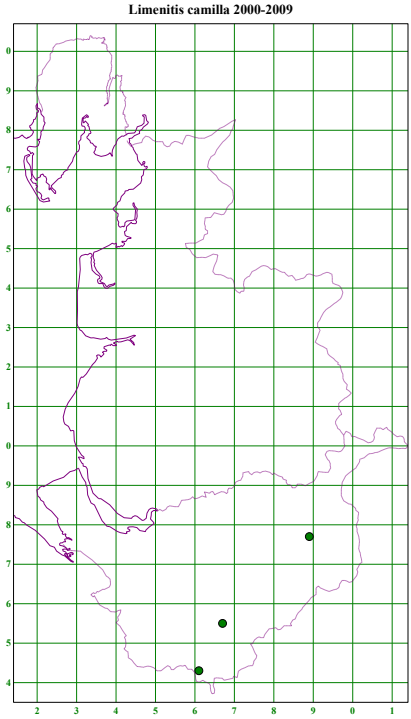
Family NYMPHALIDAE (subfamily APATURINAE)

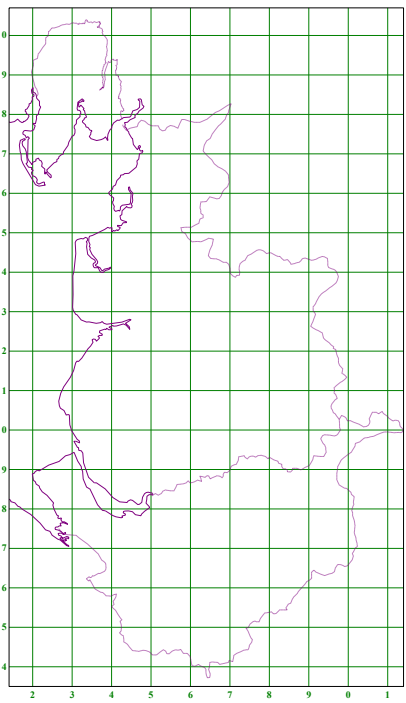
PURPLE EMPEROR, *Apatura iris* (Linnaeus, 1758)

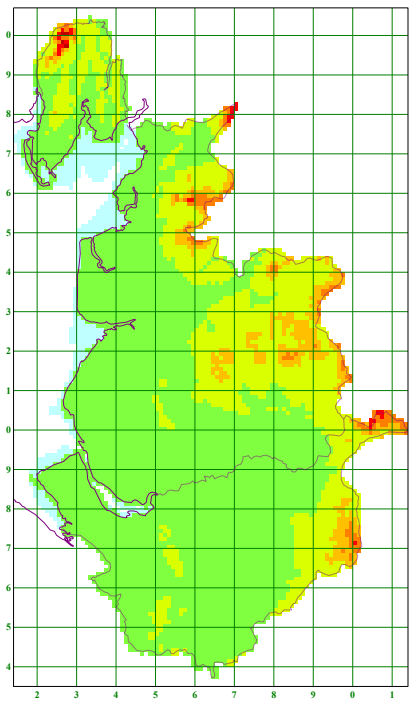
Fermyn Woods, Northamptonshire 9.7.2005

It is highly unlikely that this species has ever occurred naturally in Lancashire or Cheshire, though Whitehead (1986) wrote: "One was said to have been taken on hydrangea blossom in the grounds of Thornton Manor, Wirral, in August 1944. Introduction or mistaken identity may account for this record as they did for the 1982 Wirral Way 'Purple Emperor' which upon investigation turned out to be an Indian Silk Moth". Heath *et al* (1984) show a dot on their map for a record in square SJ28; Thornton Manor is in that grid square and it is likely that the dot refers to the same supposed record even though it has a pre-1940 symbol. Here it should be added that it is extremely rare that *A. iris* has ever been seen to visit flowers, as it obtains nutrition from other sources including dung, carrion and mud, and also hydrangea is not often used as a nectar source by any butterfly species.


Limenitis camilla 1990-1999


Limenitis camilla 2000-2009


Limenitis camilla 2010-2019


Altitude

Family NYMPHALIDAE (subfamily NYMPHALINAE)

RED ADMIRAL, *Vanessa atalanta* (Linnaeus, 1758)


Immigrant, Caldy 2.6.2018

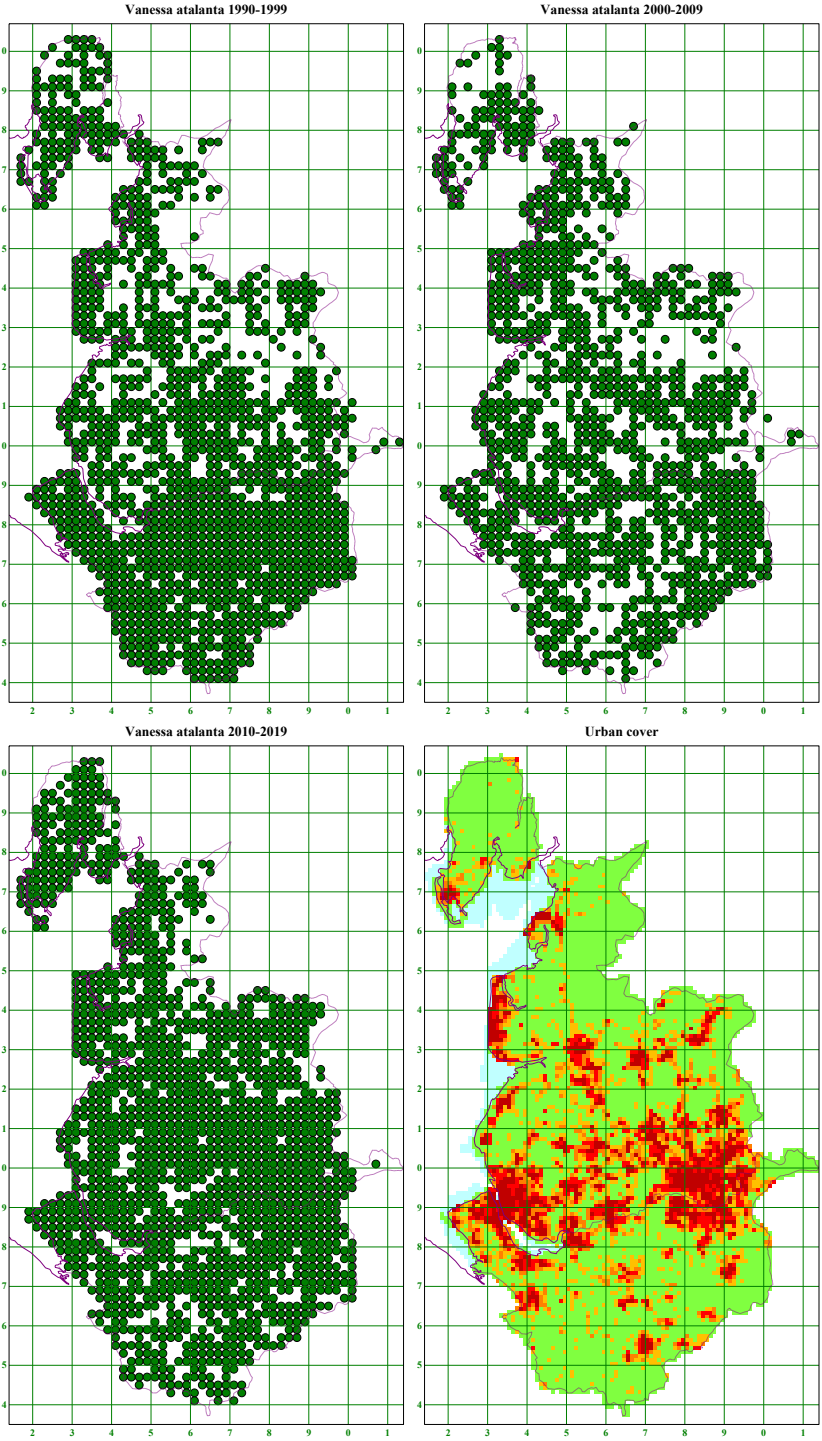

British-bred, Sale 4.8.2006


Sale 3.9.2003

Distribution. In seasons of abundance this species is likely to be encountered anywhere in the area where there are larval or adult resources. Individuals are often seen on purposeful cross-country flights. The butterfly will cross most terrain without the need for defined flyways, although it certainly does sometimes use such; it has been seen using the Mersey bank. Being a migrant, the species varies greatly in numbers from year to year.

Habitats. This migrant's foremost requirement is breeding habitat with Nettles. It is, however, far more readily seen in nectar-feeding than in breeding sites; it is the most extreme example of a species which moves out of its breeding habitat in search of adult nutrition. All the large Nymphalines do this to some extent, but this one particularly so, and because of its ready apparency to a casual observer it can give the uninitiated the false impression that it is most at home in flower gardens (Sanders, 1939) and that gardeners are doing butterflies a favour by clearing areas of "weeds" and planting gardens-full of flowers especially Buddleias. This of course is not the full picture and "wild" sites are essential. The ideal habitat for the species would appear to be woodland edges and rides, with Nettles. The butterfly likes sunny gaps with some shelter from trees and sometimes shares a habitat with the Speckled Wood *Pararge aegeria*; its range of tolerance is however much greater. Following arrival, usually in June, the immigrants are often seen ranging through the low-lying "mosses" including those to the west of Manchester, where there is a fair amount of this type of habitat. The locally-bred butterflies, in late summer and autumn, will home in to nectar sources, especially Buddleias *Buddleja davidii*, which they appear to be able to smell from a considerable distance and in the most unlikely places. Self-seeded Buddleia bushes have colonised waste land, and become a distinct feature of flora of Manchester and other cities, notably around railways and former railway yards; these are very popular with this species, as well as the many grown in suburban gardens. In the 1990s *V. atalanta*, along with other Nymphalines, favoured the then abundant Michaelmas Daisies *Aster x salignus* which grew in masses in regenerated sites often on former tips, including in the Mersey and Croal/Irwell Valleys near Manchester. Latterly, there have not been as many of these Michaelmas Daisies, and only occasional observations of the butterflies using them.

Hostplants. Nettles *Urtica dioica* and *U. urens*. Eggs are laid singly, and often on small clumps of nettles, unlike the Small Tortoiseshell *Aglais urticae* and Peacock *A. io*.


Vanessa atalanta 1990-1999
Vanessa atalanta 2000-2009
Vanessa atalanta 2010-2019
Urban cover

Broods. It seems fairly safe to say that the butterflies seen in June or earlier are immigrants from the Continent, and those from about August are locally bred. Butterflies will carry on emerging well into November in good years, nearly always later than the Painted Lady *V. cardui*, and possibly attempt to carry on breeding as long as the Nettles are suitable. The peak is usually in the second half of September, by which time even in good years the numbers of *V. cardui* will be on the decline.

Behaviour. In early summer the immigrant butterflies are sometimes seen thermoregulating on road surfaces where there is not much traffic, as in the mosses. The thermoregulation behaviour is noticeably different from that of the Painted Lady *V. cardui*; although both species require warmth the Red Admiral's requirements are not so extreme; and frequently, when resting or feeding, *V. atalanta* will only hold its wings three-quarters open whereas *V. cardui* will hold them fully open. A corollary of this is that it is more difficult to obtain a satisfactory photograph of the dorsal surface of *V. atalanta* than of *V. cardui*. Although in the "Indian summer" autumns of 1989, 1990 and 1991, in each of which *V. atalanta* was abundant, it very much favoured Michaelmas Daisies as a nectar source, in the following years its preference for Buddleia above all other potential sources was very noticeable, and indeed this preference has continued throughout the following periods. On several days in 1992 butterflies were seen on a Buddleia bush in a small garden of a terraced house in Sale (SJ791926) just outside the Mersey Valley, but not elsewhere on walks through the Valley. There was no breeding habitat near the house; it would be interesting to know how far the butterflies had come, whether they were the same individuals each day, and if so where they spent the nights. During the 1996/7 nectar survey, 77% of *V. atalanta* records/days were on Buddleia; the species was only seen on 6 other plants. In period 1 it was noted that the other Nymphalines also used Buddleia but not to such a disproportionate extent as *V. atalanta*. As an example, on 2.9.1995 on a patch of self-seeded Buddleias on waste ground near Leigh (SD6500) there were 29 *V. atalanta* as against 3 *V. cardui*, 9 *Aglais urticae* and 1 *Pieris napi*. Other non-indigenous flowers used by this species during the 1995 abundance included Everlasting Flower, African Marigold (28.8.1995), Dahlia (16.9.1995) Iceplant (*Sedum*) (16.9.1995 – seven were seen on this plant in a rural garden near Standish (SD5509), when none were seen in adjacent semi-natural habitat). On the other hand, that season there were a few sightings using native flowers, including several on Hemp Agrimony *Eupatorium cannabinum*, and on Fleabane *Pulicaria dysenterica* and Devil's-bit Scabious *Succisa pratensis* on the sunny south side of Ringley Wood (SD7605) in the late afternoon of 27.8.1995, along with several Commas *Polygonia c-album*. Although *V. atalanta* has often been noted as obtaining nutrition other than from flowers, the only records during period 1 were near Wigan (SD5409) on 16.9.1995 when some were seen on fallen apples, and 2.9.1995 when four had congregated to feed on dumped rubbish in Lilford Park, Leigh (SD6600). The species continues to fly later in the year than any other butterfly and in several years there are sightings in November. In 2006 they continued to be seen right to the end of that month, two being observed in Worthington Park, Sale (SJ7991) on 29th. Butterflies surviving into late autumn often use Ivy *Hedera helix* as a nectar source; the Ivies which used to be on the bank of the river Irwell in Salford (SJ8398/9) were very popular in 2006; and on 28.9.2017 S.B. Smith counted 45, and reckoned there were actually considerably more, on Ivy in a small remembrance garden in the centre

of Denton (SJ9295). During the intensive survey of butterflies around the centres of Manchester and Liverpool in 2019, Buddleia far outnumbered all other plants as the preferred source of nutrition for this species, and in that year the Ivy seemed to flower rather too late, and the butterflies to pass their peak numbers too early, for there to be many records of its use; the author only noted six *V. atalanta* using it that season.

The feeding of autumn butterflies, which can continue over several days, is obviously geared towards survival, but how successful this is, is another matter. There is increasing evidence that the species can survive the British winter, though that is perhaps more by way of slowed-down development than of true hibernation, and it seems reasonable to state that only a very small proportion do survive. There is also the possibility of a southwards migration in the autumn, and reports, also on 28.9.2017, from two independent observers, of seeing over three hundred *V. atalanta* flying over Winter Hill (SD6614) could well suggest this. The question however arises as to why they should choose to fly over the hill rather than take a route at a lower level? – or is it that when migrating southwards they always fly at high altitude to avoid lower-level obstructions, and were only visible because they happened to pass over the hill?

Although as shown above these butterflies will congregate quite amicably when feeding, at other times they can be very territorial. A single tree in a wood may form a territorial site for several weeks (R.L.H. Dennis, pers. comm.). "Hill-topping" has been observed in this species.

PAINTED LADY, *Vanessa cardui* (Linnaeus, 1758)

Ludworth Moor 27.9.2015

Sale 25.8.2019

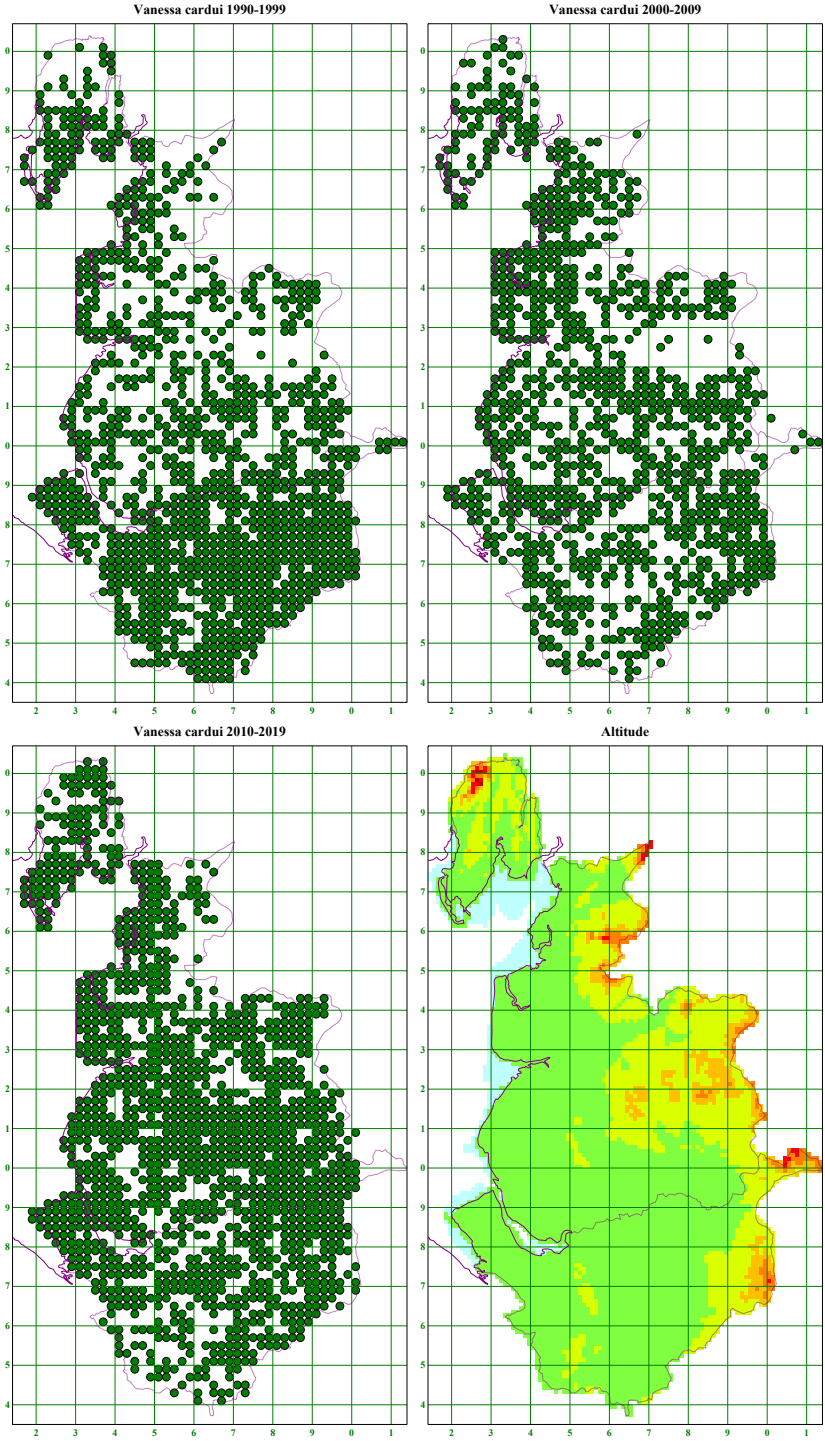
Caterpillars, Anfield, Liverpool 15.8.2019

One basking and one feeding, wood near Everton Park, Liverpool 1.8.2019

Pre-pupal caterpillar, Stretford 1.8.1996

Chrysalis, Stretford 1.8.1996

Distribution. In most years this migrant species is generally distributed throughout the area, though its numbers vary greatly. Normally it is much scarcer than *V. atalanta*, but in one year in each decade the reverse has been the case. In period 1, 1993, when there were only 69 records in the whole area, was exceptionally poor. Even more exceptional, however, was the invasion of 1996; the butterfly arrived in vast numbers in early June, quickly spread throughout Britain and at the peak, from 8.6 to about 20.6, was the most abundant species in most of the areas recorded. Another wave of abundance followed in August, commencing on 1.8 and gradually


Vanessa cardui 1990-1999
Vanessa cardui 2000-2009
Vanessa cardui 2010-2019
Altitude

lessening through the month; by this time *V. atalanta* was on the increase and for most of the remainder of the season the numbers of the two species were about equal. The concentrations of records on the map into certain areas, and absence from others, are far more an indication of where the recorders happened to be during the 1996 season than a representation of the butterfly's true distribution that year; it would almost certainly have occurred in every square: clearly, there were more active recorders then in Cheshire than in Lancashire. At the peak of the migration, observing from a randomly selected open site in Oldham (SD9106) on 9.6.1996, butterflies were observed passing at a rate of 10 per hour in a north-westerly direction. At another location in Oldham (SD9105) the same day, numbers of them were congregating on a scrap of waste ground bounded by an east-facing wall and taking nectar from Oxford Ragwort *Senecio squalidus*. The species reverted to its normal scarcity in 1997. In period 2, there was a widely reported wave of immigration in 2009, of which Eeles (2019) writes, referring to the situation nationally: "... the resulting emergence was impressive, with hundreds of thousands of adults estimated at several sites at the end of July and beginning of August, when new immigrants were still seen coming in off the sea";, and indeed some high counts were reported from parts of Cheshire and Lancashire that year. The present author's experience however was quite different: during the whole 2009 season he recorded a total of just 38 *V. cardui*, whereas in 1996 he had recorded 379 (which was likely an understatement, as the computer-programme which he was using for recording at that time had no facility for recording precise numbers, only categories of "2 to 9", "10 to 29", etc.). Granted he was away in Italy at the date when the immigration started (24.5.2009), but he had returned a week later and continued recording throughout the season; around Manchester at any rate the influx was certainly not followed by a British-bred summer generation comparable to that of 1996. In fact fewer butterflies were recorded in 2009 by the author than in 2003, and this also seems to have been the case with a number of other local recorders. In period 3, after a run of mediocre years, an immigration occurred in 2019 comparable with, possibly surpassing, the 1996 one; it differed from 1996 in so far as butterflies arrived at the end of June rather than the beginning, and the British-bred generation started appearing only just over a month later, at the end of July, and in vast numbers.

Habitats. The ideal breeding habitat is rough ground with abundant Thistles. Warm, open areas such as the mosses are popular. Being highly migratory, the butterflies are constantly investigating new areas as potential breeding sites or nectar sources, and may turn up almost anywhere, including in town centres in years of abundance.

Hostplants. The only hostplant noted during the 1996 survey was Creeping Thistle *Cirsium arvense*; in 2019 the author noted the use of Spear Thistle *C. vulgare*. These plants are widely distributed, on waste land and also in many rural areas, where they occur in extensive patches on the nutrient-rich land in fields which have been abandoned or temporarily left fallow.

Broods. Normally immigrants are first seen in June or July, followed by a locally-bred generation in August or September, sometimes continuing in smaller numbers into late September and October, and finishing on average about two or three weeks earlier than *V. atalanta*. Even in the "invasion" years, the numbers of *V. cardui* start

falling off at the beginning of September, at which time *V. atalanta* is usually on the increase, building up to a peak in the second half of that month. The timings vary from year to year; in the exceptional abundance in 1996 both broods were timed earlier than usual.

From the 2019 invasion
Silk Street, Salford 13.9.2019: (top) thermoreglating on a stone, wings open and appressed to the substrate, (bottom) the same individual, with wings closed for camouflage.

Strangeways, Manchester 18.9.2019: (top) a "var" with reduced dark markings, (bottom) a normal example, freshly emerged, basking on vegetation.

Behaviour. Although regularly seen with other large Nymphalines, this butterfly does show behavioural differences owing to its centre of geographical range being a warmer clime. The immigrant butterflies, rather disorientated on arrival, regularly pick out the hottest patches of bare soil, sun-baked slopes, stones or unsurfaced roads, and establish territories around them. These territories are often in the vicinity of Buddleia bushes; this non-native plant is very popular with this species as a nectar source, and are usually in a location with some shelter from any wind, such as a corner of a patch of waste land or a small glade in a wood. In such locations, the butterflies are wary, both when feeding and when basking, usually at ground level, around the Buddleia bush, and when disturbed they tend to fly up in a circular or spiral direction, clockwise, around the observer. The species basks more often than the Red Admiral *V. atalanta*, and when feeding generally holds its wings fully open whereas *V. atalanta* more often feeds with wings three-quarters open. In 1996, the author obtained the impression that although *V. cardui* would come into gardens to take nectar from Buddleia, its predilection for this plant was not as extreme as *V. atalanta*'s and it would use a much greater variety of other nectar sources; during the 1996/7 nectar survey, 36% of *V. cardui*'s recorded plant/days were on Buddleia as against 77% of *V. atalanta*'s, and *V. cardui* was noted on 24 other plants, including Wayfaring Tree *Viburnum lantana* on which numbers were observed in the Mersey Valley during the June 1996 immigration. In the 2019 abundance the recorders' experience was quite different: 77% of feeding *V. cardui* were noted as using

Buddleia as against 60% of feeding *V. atalanta*; *V. cardui* was noted on 23 other plant species and *V. atalanta* on 9. The author's own 2019 observations, which were mainly in and around city centres, gave an even more pronounced result in favour of Buddleia: of 771 *V. cardui* observed feeding, 743 (96%) were on Buddleia, and of 160 *V. atalanta*, 153 (96% again) were on Buddleia. The remaining 28 *V. cardui* were observed on 11 different nectar sources, and the remaining 7 *V. atalanta* on just 2. *V. cardui* does not continue feeding, or flying, as late in the day as *V. atalanta* as its flight temperature threshold is higher. In late summer, often butterflies have been seen adopting a territory on warm tarmac or concrete surfaces close to Buddleia bushes growing on derelict land.

"Hill-topping" has been recorded in this species, on hills in Cheshire including Tegg's Nose and Shutlingsloe, and also north of Bury at Holcombe Hill and Harcles Hill (Dennis & Dennis, 2006; Hardy & Kinder, 2007).

The season for *V. cardui* finishes earlier in the autumn than that of *V. atalanta*, and the likelihood of any surviving the winter is less than in that species. No definite reports of southward autumnal migration have been received, though elsewhere there is evidence of such.

A Peacock *Aglais io*, basking while surrounded by four *V. cardui*, in a small woodland just across the road to the west of Everton Park, Liverpool, 1.8.2019. This wood is fairly recent, with several glades interspersed between the trees and numerous wild Buddleia bushes. It was estimated that on this date there were over two hundred *V. cardui* within the four hectares occupied by this woodland, along with approximately forty *A. io.* Three weeks later, on 21.8.2019, again in apparently ideal weather, there were only five *V. cardui* and no *A. io.*

SMALL TORTOISESHELL, *Aglais urticae* (Linnaeus, 1758)


Stretford 7.9.2006


Sale 11.7.2010


Caterpillars, Ancoats, Manchester 4.6.2019


Three aberrations: Stretford tip 14.9.1989

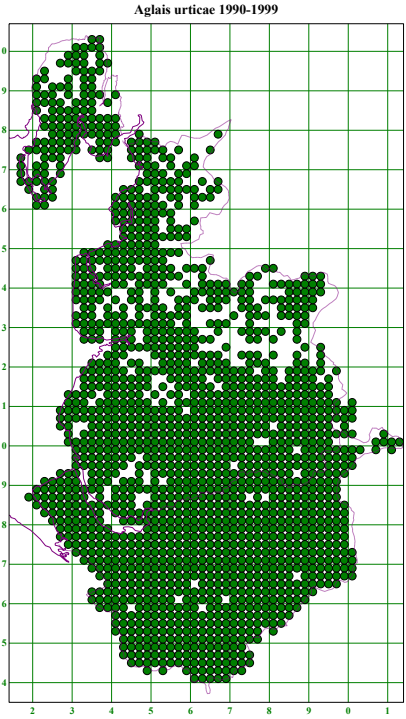

Levenshulme 19.7.1995

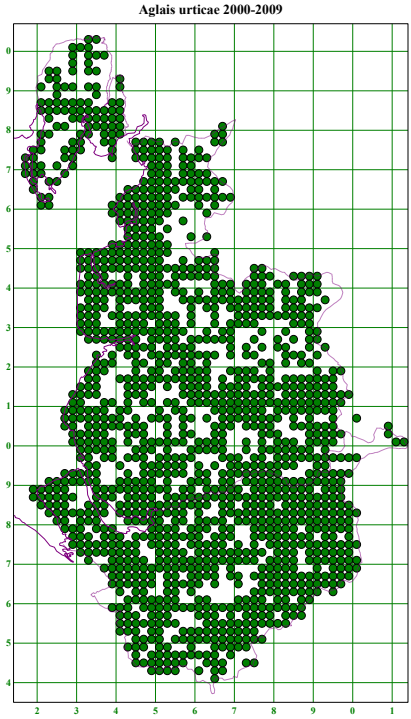

Stretford 9.9.1990

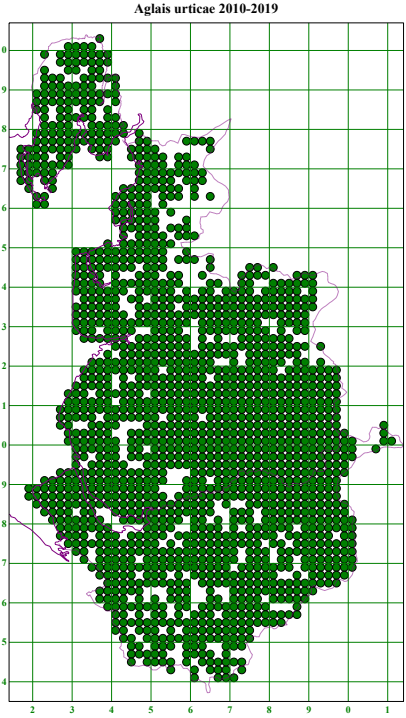
Distribution. Although the maps do not seem to show it, this species undergoes considerable fluctuation in numbers; probably as a result of weather conditions, and not always as predicted. In some years it may be exceedingly abundant in the autumn and then periods of comparative scarcity may follow, even of several years' duration. In good years it is found over virtually the whole area. Although not dependent on migration like the *Vanessa* species, adults of this species and the Peacock *A. io* are highly mobile and do not form permanent colonies which breed in any one site from year to year; the presence of a breeding population in any particular site in one year does not necessarily mean that there will be one the next. In period 1, 1997 was a year in which the species fared very well especially in the autumn emergence; as an example of its abundance compared to other butterflies, on 10.9.1997, a warm sunny day, during a 10-minute visit to a patch of waste land approximately 100 m x 70 m in size, in Sale (SJ792916), a former tennis court adjacent to a school playing-field where a flora comprising a number of pioneering plants including many young Buddleia bushes had developed, 51 *A. urticae* were recorded as against 3 *Pieris brassicae*, 7 *P. rapae*, 1 *Vanessa atalanta*, 2 *V. cardui* and 1 *Polygonia c- album*. Many of the records in autumn 1997 were of butterflies taking nectar from garden Buddleias.

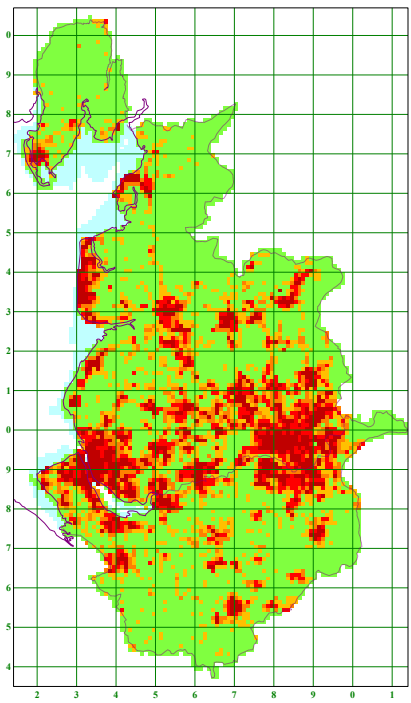
In period 2, a year of peak abundance was 2003, followed by a steady reduction in numbers to a low in 2007; the best year in period 3 was probably 2014, but numbers remained much lower during that period than in period 1 and the first part of period 2. There is however nothing to suggest that the species has undergone any range reduction.

In the course of the intensive surveys of inner-city Manchester and Liverpool in 2019, *A. urticae* appeared to be having a very good breeding season following early awakening from hibernation , and numerous webs of caterpillars were found in many locations in both cities; recording these on dull days provided a welcome means of sustaining interest in the project when few if any butterflies were on the wing. Matters however did not turn out as expected: on re-visiting the sites at the time when the adult butterflies should have been emerging, instead of the anticipated abundance there were hardly any. It can only be concluded that the warm early


Aglais urticae 1990-1999


Aglais urticae 2000-2009


Aglais urticae 2010-2019


Urban cover

spring must have been even more advantageous to the parasitoids and/or predators and/or pathogens than to the caterpillars.

Habitats. This species, in common with the Peacock *Aglais io* and Comma *Polygonia c-album*, has three main requirements: (1) breeding habitat, (2) nectar sources, (3) hibernation sites. These may not coincide, and additionally mating and roosting may occur at different sites (Baker, 1969). Regarding breeding habitat, in spring, following hibernation, the butterflies converge on warm spots where there are Nettles. The species is tolerant of agricultural land where Nettles often occur in association with farm waste, and around buildings and in otherwise "improved" fields; it also breeds on waste land in towns as well as more semi-natural biotopes especially in river valleys. In 2014, a year of comparative scarcity over most of the Manchester area, numerous butterflies and later larval webs were found along Harrop Edge Lane, Diggle, at an altitude of 300+ metres; the location was very exposed and the only shelter there was a low dry-stone wall (Hardy, 2014).
In summer and autumn, freshly-emerged butterflies move about in search of nectar and are often seen well away from breeding habitat, including in suburban gardens and parks. Regarding hibernation sites, the only observation during this survey was of numbers of these butterflies and *A. io*, plus two Herald moths *Scoliopteryx libatrix*, in old air-raid shelters at Bradley Fold, Radcliffe (SD7508) in October 1991 (period 1). Just to what extent these butterflies rely on man-made structures as hibernation sites is impossible to determine; presumably they must normally select somewhere more natural.

Hostplants. Nettles *Urtica dioica* and *U. urens*. Large clumps of Nettles growing in open-sunny situations are the most favoured; those growing under trees are not suitable. The caterpillars are usually very easy to find as they are gregarious.

Broods. There are normally reckoned to be two broods per year as usually butterflies start emerging in late June and fresh examples continue to appear through August and September. In some favourable years (e.g. 1997) there has been a peak abundance in September, but usually the records do not show very distinct peaks and butterflies are seen continuously throughout the summer; it also seems fairly certain that in some cold years only one brood has been produced: whilst caterpillars are usually fairly easy to find in May and June, there have been very few instances of any being noticed later in the season. Frequently, in late spring, very small and almost fully-grown larvae are found on the same Nettle-bed as a result of a very protracted egg-laying period, so it is probable that sometimes what may appear to be early second-brood butterflies are actually late first (or only) brood. On the other hand, on 12.9.1995 (period 1), young larvae were found in the Bollin Valley, Wilmslow (SJ8481). These could have represented an attempted third brood; apparently the exceptional heat of the 1995 summer overrode the butterfly's normal response to photoperiodicity (change in day-length) (Dennis, 1985b). At higher altitudes, such as the Harrop Edge Lane locality mentioned above, development is later.
The autumn butterflies hibernate and reappear, usually in March, but sometimes during an unusually warm spell in February, as in 1998, 2004, 2007, 2012 and especially 2019, or in cold wet springs sometimes not until April, and continue flying

into May. In 1990 one was seen flying on 18th January in the Mersey Valley, Sale, near the "Priory" woodlands (SJ7992); this was exceptional, and presumably butterflies which are thus awakened too early are capable of going back into hibernation. Hibernated butterflies are long-lived and sometimes a few overwintered adults can still be seen in June after the early summer brood has started emerging.

Behaviour. In the spring following hibernation, the butterflies spend much of the time warming up by dorsal absorbance basking, on the ground, stones and the like, with wings fully open. They are territorial and can be very aggressive; they regularly attack Peacocks *Aglais io* and also queen humble-bees which frequently invade their territories. At this time of year the butterflies, at any rate around Manchester, tend to use Dandelion *Taraxacum officinale* agg. as their main nectar source, and occasionally Sallow *Salix caprea* and *S. cinerea*. When the summer butterflies emerge, they frequently use Creeping Thistle *Cirsium arvense*; later in the season the flowers of this plant seem to become rather washed-out and less attractive, and the butterflies will then travel far in search of nectar and use non-indigenous flowers, chiefly Buddleia *Buddleja davidii* and (in some years) Michaelmas Daisy *Aster x salignus*. Sometimes these butterflies are recorded in the hills to the north and east, possibly in search of small pockets of Nettles amidst the largely grazed grass. On 13.5.1996 a number were seen on hills to the east of Bolton, where there appeared to be very little hostplant/habitat; at grid reference SD758135 five were flying and interacting together and it is wondered whether this behaviour was a form of the "hill-topping" process which some species adopt for mate-location. It is also possible that the colony along Harrop Edge Lane (see "Habitats" above) had developed as a result of "hill-topping".

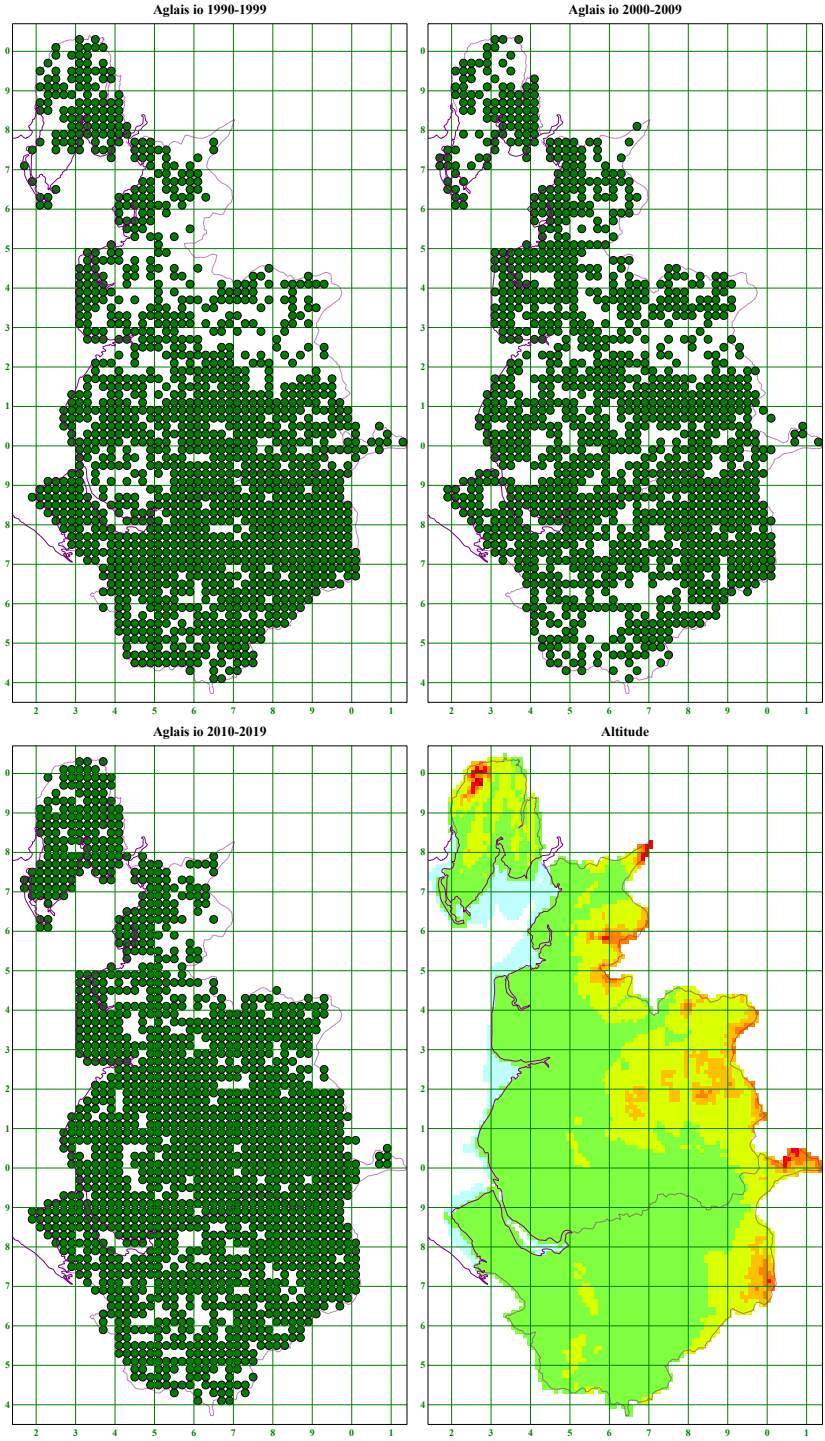
PEACOCK, *Aglais (Inachis) io* (Linnaeus, 1758)


Kenworthy, Manchester 21.4.2007


Stretford 12.5.2006


Caterpillars, Sale 2006

Distribution. Shaw (1998) stated: "It has always been a relatively common insect in the western half of Cheshire", thus implying that it was not as common in the eastern half. The map in Heath *et al* (1984) shows it as widely distributed over Cheshire, but scarce or absent in much of mid-Lancashire. Now, following a considerable increase in the 1990s, it is generally distributed over all the area. In period 3, however, following a steady increase to 2014, it underwent a downward trend and in 2018 its numbers were less than half the 2014 figure; the map does not show this as it covers the whole decade including the earlier years of greater abundance. Historically, *A. io* was never as numerous as the Small Tortoiseshell *A. urticae*, but in several years in the periods covered by this book (1998 to 2001, 2005 to 2010, 2018 and 2019) it has outnumbered that species, and this in spite of its decline since 2014.


Aglais io 1990-1999
Aglais io 2000-2009
Aglais io 2010-2019
Altitude

Habitats. This species has very similar ecological requirements to *A. urticae*, including the tendency to converge on warm sheltered spots in the spring after hibernation. This butterfly will use a very wide range of habitats, from woodlands through scrub and grassland to agricultural land, river valleys and waste land within cities, and even quite high up in the hills. Most open or lightly wooded habitats with Nettles can support the species, and like *A. urticae* it can use patches of Nettles growing near farms where "improved" agricultural land renders the habitat unsuitable for most other butterflies. It is more of a woodland butterfly than *A. urticae*; for example, during a walk through Botany Bay Wood, Worsley (SJ7298/7398), an extensive woodland consisting largely of mossland birch interspersed with rhododendron, and some larger trees, and not "managed" for wildlife, on 3.5.1997 (period 1), in warm cloudy weather, *A. io* was the only butterfly species seen; it occurred in good numbers in spite of there not being any apparent breeding habitat in the dense wood.
In summer the newly-emerged adults require abundant nectar and if this is not available in the breeding habitat they will move elsewhere, including into gardens, to seek it, though not to the same extent as the *Vanessa* species. The only observations of hibernation sites during this survey were in October 1992, when D. Bentley found a number of these butterflies hibernating in old air-raid shelters in Bradley Fold, Radcliffe (SD7508), along with *A. urticae* and two Herald moths *Scoliopteryx libatrix*, and on 3.9.1995, when two were found in a similar site near Bramhall (SJ8784). Both those sites were destroyed shortly afterwards. Whilst disused military buildings such as those, together with adjacent regenerated vegetation, certainly do provide valuable overwintering sites for butterflies and other wildlife, it is difficult to make a case for their retention on this account as the butterflies must surely normally utilise more natural sites, which remain undetected.

Hostplants. Nettles *Urtica dioica* and *U. urens*.

Broods. One annual brood, emerging in late July and August. When reared in captivity, whole broods will emerge synchronously; it is likely that this also happens in the wild, as often large numbers of fresh butterflies are seen together, for a short period, in biotopes with abundant Nettles and Thistles where they may well have bred. The summer flight period is short and butterflies normally enter hibernation early, presumably as soon as they have acquired enough nutrients to see them through the winter, even though hot weather may continue. Hibernated butterflies appear again in March or April to May, along with *A. urticae* and the Comma *Polygonia c-album*. They are extremely long-lived and very worn individuals are sometimes seen still alive in late June or even July.

Behaviour. In spring the overwintered butterflies need to thermoregulate frequently and are often seen on warm surfaces such as dry paths, stones or pieces of plastic litter, with their wings fully open and appressed to the substrate, exactly aligned to the sun's azimuth. They are territorial and also frequently interact with *A. urticae*. These interactions are normally aggressive but sometimes attempted courtship of an *A. io* female by a male *A. urticae* has been noted, usually towards the end of the spring flight period; an instance was on 3.5.1992 at the Urmston oxbow (SJ7693) in the Mersey Valley. Following emergence, the fresh summer butterflies will take

nectar from flowers such as Thistles if these are available close to the breeding habitat; on the other hand butterflies may disperse far and congregate at nectar sources; to cite an example from period 1, on 6.8.1995 there were 19 *A. io* on a single Buddleia *Buddleja davidii* bush at Haigh Hall (SD5908); none were seen elsewhere in the vicinity and no breeding habitat was observed nearby; other butterflies present were 5 *A. urticae*, 1 *Vanessa atalanta*, 4 *Pieris rapae* and 1 *P. brassicae*. Even more extreme was an aggregation in a field of Creeping Thistle *Cirsium arvense* on the Pennines just east of Dove Stone reservoir (SE0202) on 2.8.1995 when the distribution was 91 *A. io* with 14 *A. urticae*, 1 *V. atalanta*, 3 *V. cardui*, 3 *P. rapae* and 1 *Maniola jurtina*. Here it was possible that the *A. io* had bred nearby but more likely that their behaviour was a modification of "hill-topping" for the purpose of obtaining a pre-hibernation nectar source, and that they had come in from some distance; several individuals were seen flying over totally unsuitable terrain higher up the hill presumably in search of nectar. On 9.8.1997, a hot sunny day, during an afternoon of observations covering suburban and rural sites in approximately equal proportions, in the vicinity of Blackrod (SD61), of a total of 102 *A. io* observed taking nectar, 38 were using Buddleias, mainly in gardens, 54 were using Creeping Thistle, in open country, and only 10 were using other sources (Privet *Ligustrum ovalifolium* 4, Spear Thistle *Cirsium vulgare* 3 and Teasel *Dipsacus fullonum* 3).

Male *A. urticae* attempting to court female *A. io*, Urmston oxbow 3.5.1992.

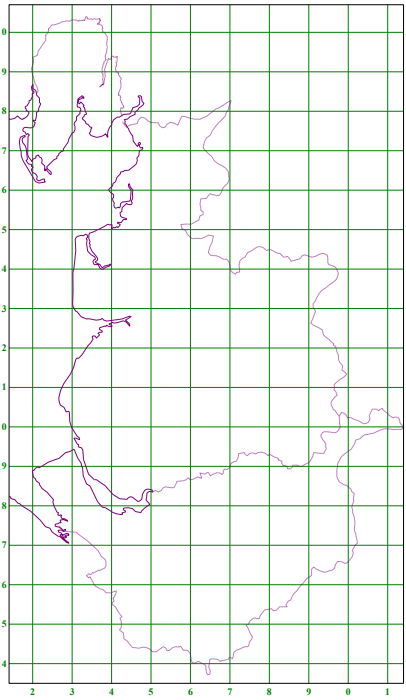
LARGE TORTOISESHELL, *Nymphalis polychloros* (Linnaeus, 1758)

Radipole, Dorset 5.5.1987

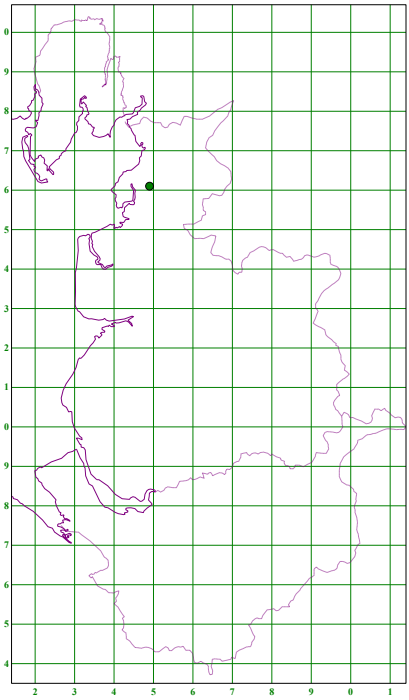
Historically, there is a record from SJ89 ("Manchester") in or shortly after 1857, and one from an unspecified site in SJ78 in 1899. Smith (1948) stated that during the mid-nineteenth century the species was resident in Cheshire in small numbers, the last record being from Chester in 1876.

In 2002 (period 2), one was reported as seen in an allotment in Lancaster, taking nectar from *Verbena bonariensis* in company with several other Nymphalids. Inquiries at the nearby Lancaster butterfly house, however, indicated that they had not been breeding this species, and therefore it may have been a genuine immigrant (Sivell & Palmer, 2003). Latterly, in the annual "big butterfly count", on occasions inexperienced observers have attempted to claim sightings of this species, but such are clearly misidentifications.

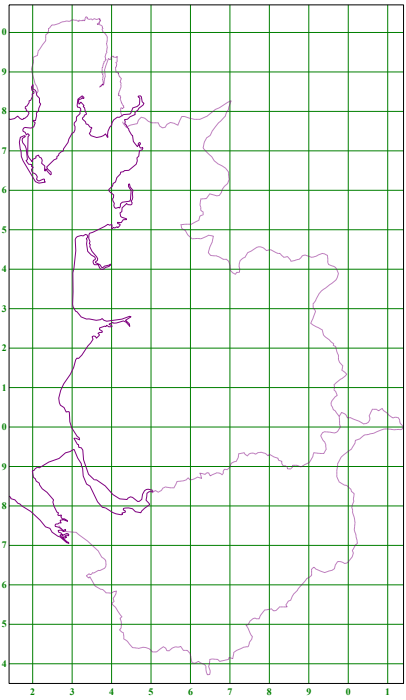
Nymphalis polychloros 1990-1999



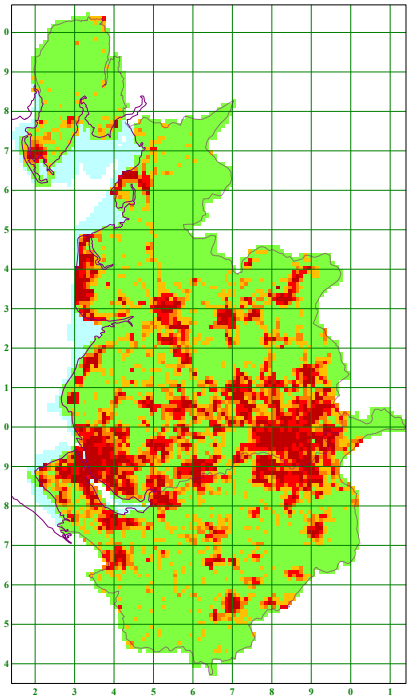
Nymphalis polychloros 2000-2009



Nymphalis polychloros 2010-2019



Urban cover



CAMBERWELL BEAUTY, *Nymphalis antiopa* (Linnaeus, 1758)

(Gangsei, Norway) 5.8.2006

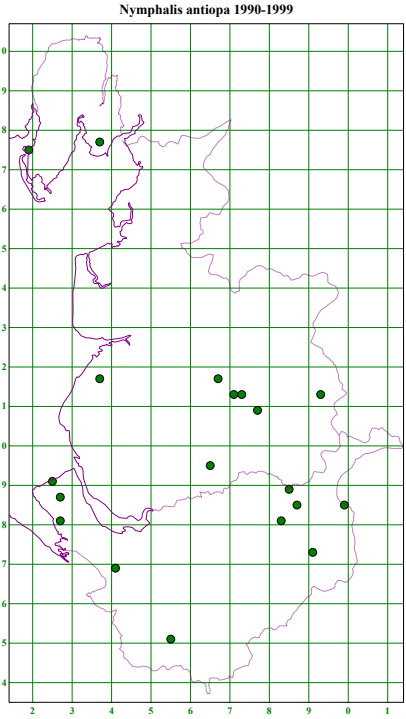
Distribution. A migrant, of very sporadic occurrence. An exceptional immigration reached Britain in 1995, and the dots in the map for period 1 are mostly from that year. We have records of seven in period 2 and six in period 3; of the latter, on 22.7.2016, one was seen by several bird-watchers, and photographed, at Pennington Flash (SJ6499), closely following a report from a Stockport garden (SJ9189) on 9.7.2016.

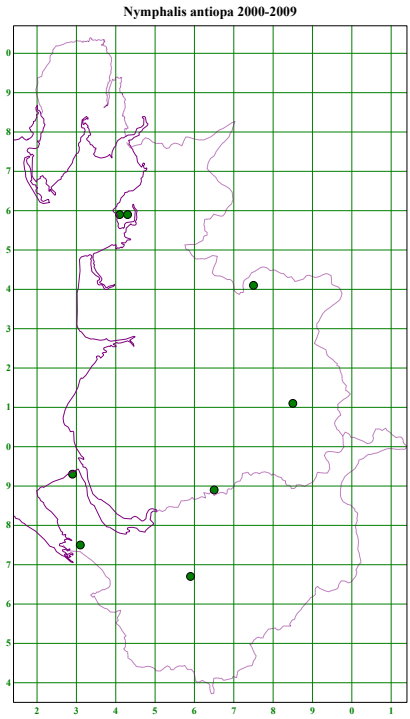
Habitats. Most of the records are from suburban areas, mostly gardens and one from a school. These are clearly not the butterfly's natural habitats; being well outside the normal breeding range the individuals seen were presumably seeking whatever nutrition was available. The one at Pennington Flash in 2016 was in a more appropriate biotope of woodland/grassland surrounding a lake developed from historic coal-mining subsidence.

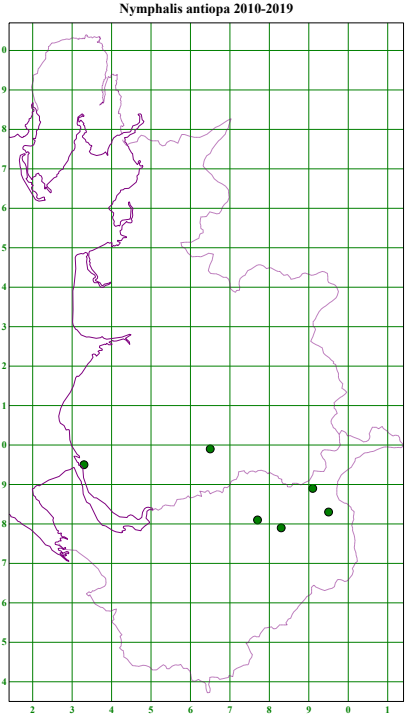
Hostplants. No record of breeding in the area.

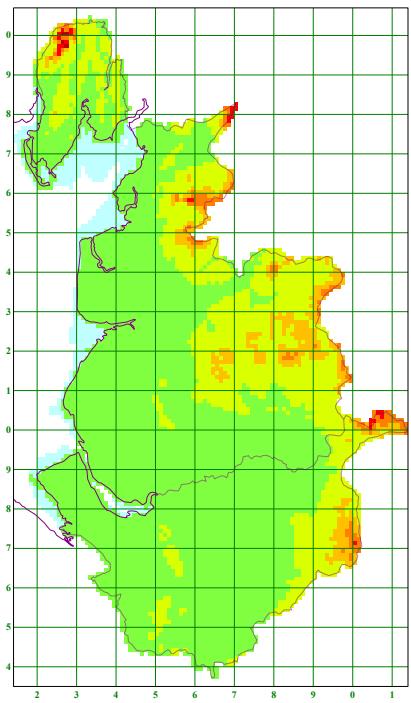
Broods. The life-cycle is a single brood overwintering as an adult butterfly. The sightings were of freshly-emerged immigrant butterflies.

Behaviour. Two of the 1995 records were of butterflies feeding on fallen fruit. One was utilising rotten pears in a hotel car park: although the fruits were swept up daily the butterfly was reported as remaining at the site three days; the other was on fallen apples.


Nymphalis antiopa 1990-1999


Nymphalis antiopa 2000-2009


Nymphalis antiopa 2010-2019


Altitude

COMMA, *Polygonia c-album* (Linnaeus, 1758)


Stretford 7.9.2006


Aberrant form, Croxteth Park 7.8.2017


Form *hutchinsoni*, Clifton Moss 6.7.2017


Hulme, Manchester 3.9.2019


F. *hutchinsoni*, Stretford 23.6.2007


Caterpillar, Collyhurst, Manchester 19.6.2019

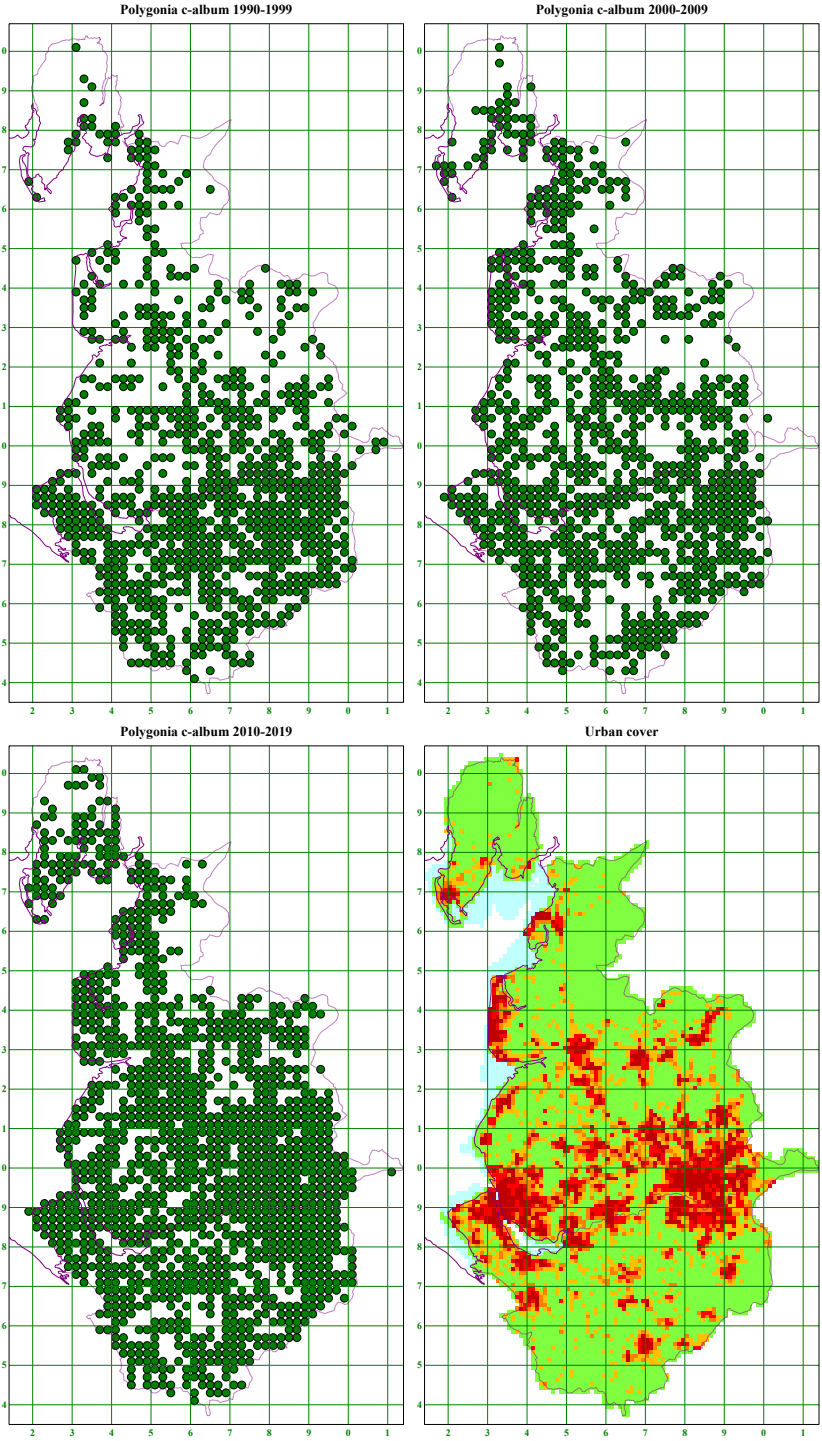
Distribution. Historically, Smith (1948), reviewing records during the first half of the twentieth century, revealed that there had been no sightings in Cheshire at all between 1904 and 1918, and that a slow recovery was under way by the 1940s. Heath *et* al (1984) show this species as widely distributed in most of Cheshire, apart from the south-east, but almost completely absent from Lancashire, except the extreme south. There was a definite spread northwards during the 1980s and early 1990s, and the populations seem to have stabilised since then with a fairly wide distribution covering virtually the whole of Cheshire and Lancashire.

Habitats. The most favoured habitats are woodland edges and rides, and open patches within woods, including in the river valleys, even quite near the city centre. Suburban green spaces, including parks with some trees, are sometimes suitable. *P. c-album* often occurs with *A. urticae* and *A. io*, but is more of a woodland species than either of them, and does not usually occur in such numbers, largely because its caterpillars are not gregarious as theirs are. The late summer butterflies are often seen away from breeding habitat in search of nectar prior to hibernation.

Hostplants. Mainly Nettle *Urtica dioica,* also Elm *Ulmus* spp. where these trees survive.

Broods. Hibernated butterflies appear in March or April and normally continue to fly until early May. The last of the overwintered butterflies are sometimes very long-lived and may even overlap with the mid-summer emergence of the paler, less angular form *hutchinsoni*. The mid-summer *hutchinsoni* flight is however very short-lived, occurring in late June and July. Non-*hutchinsoni* butterflies emerge from the second half of July and there is a later emergence stretching from August to October. Of the three hibernating Nymphalids, *P. c-album* usually is the one to continue to be seen flying latest in the autumn before hibernation.

Behaviour. Following hibernation the butterflies frequently bask on warm ground with wings fully open. They are often fiercely territorial, and sometimes aggressive


Polygonia c-album 1990-1999
Polygonia c-album 2000-2009
Polygonia c-album 2010-2019
Urban cover

to other species as well as their own. At Partington (SJ7291) on 21.6.1995 (period 1), a worn one was observed to attack two Large Skippers *Ochlodes sylvanus* which invaded its territory, but eventually they drove it out. The early summer *hutchinsoni* butterflies tend to remain close to the breeding habitat and often settle on trees, sometimes sharing habitat with the Speckled Wood *Pararge aegeria*. The later summer butterflies will move out of the habitat to seek nectar sources including Buddleias *Buddleja davidii*, for which they will come into gardens and parks, though not to the extent that some other Nymphalines do. Privet *Ligustrum ovalifolium* is sometimes used. The species will also take nectar from indigenous flowers when available, mainly composites such as Thistles *Cirsium* spp, and in spring Dandelions *Taraxacum officinale* agg. Michaelmas Daisies *Aster x salignus* used to be a very popular source with the autumn butterflies, but latterly have become less abundant and not as favoured. Another autumn nectar source is Ivy blossom *Hedera helix*. Over-ripe Blackberries are an alternative source of nutrition, and fallen fruit such as apples and pears. In the autumn, *P. c-album* is often seen feeding along with the Red Admiral *Vanessa atalanta*. Of the four Nettle-feeding Nymphalines, it is noteworthy that *P. c-album* concurs with *V. atalanta* in laying its eggs singly, whereas *A. urticae* and *A. io* lay eggs in batches; it is thought that this strategy, perhaps in combination with other factors, contributed to the greater abundance in 2017, for the first time in at least thirty years, of *P. c-album* and *V. atalanta* over *A. urticae* and *A. io* (Dennis & Hardy, 2018b).

Family NYMPHALIDAE (sub-family HELICONIINAE)

SMALL PEARL-BORDERED FRITILLARY, *Boloria selene* ([Denis & Schiffermüller], 1775)


Gait Barrows 7.6.2016 (with malformed left wings)


Allt Llwynwernod, Cardiganshire 11.6.2010


Allt Llwynwernod, Cardiganshire 11.6.2010

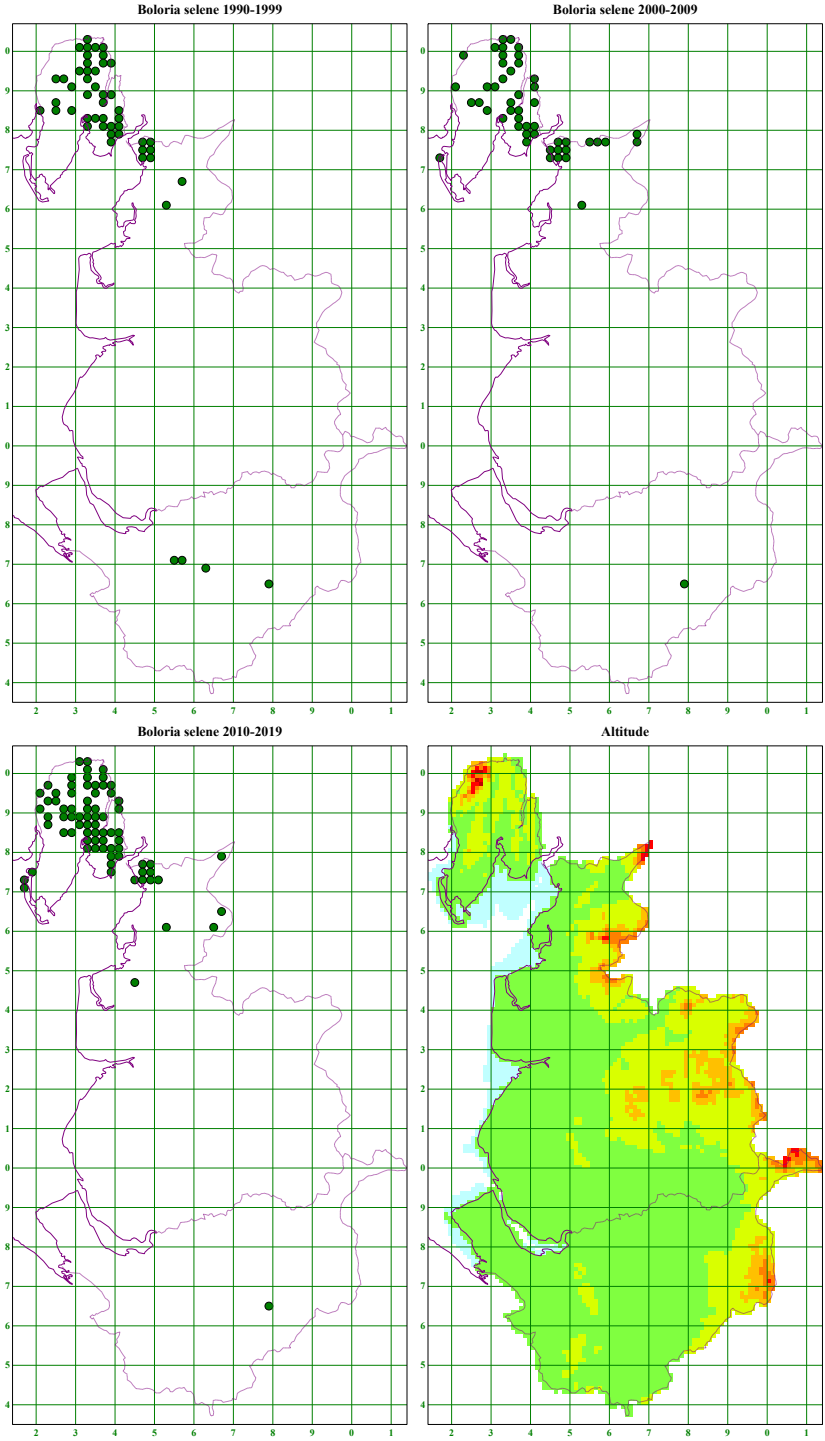
Distribution. No doubt centuries ago this, and the other Heliconiinae ("Fritillaries"), must have had a continuous distribution, but only very isolated fragments of that distribution now remain. Whitehead (1986), referring to Cheshire and the Wirral, wrote: "'Said to have been found at Eastham' according to the 'Fauna of Liverpool' by I. Byerley in 1854. This insubstantial reference is the only one traced, and as a Merseyside species the Small Pearl-bordered Fritillary must rank as unproven, although a small colony still survived at Delamere forest in the 1970s." There is a vague historic record from SJ89 ("Manchester") from 1857 or shortly afterwards.
By the end of period 3, the only places where this butterfly survived were in the Morecambe Bay limestone (SD47), near Quernmore (SD56) and a number of sites in the Furness. At a single very small isolated site in mid-Cheshire (Bagmere, SJ7964), the species hung on until 2013 but was then lost in spite of years of "management". The populations that once existed at Delamere Forest (SJ5571) and Wybunbury (SJ6950) died out in the 1990s and 1980s respectively.

Habitats. On the Morecambe Bay limestone, the habitat is fairly open woodland on limestone pavement. This species is in competition with the next one, *B. euphrosyne*, and in some sites it appears that it may out-compete that species to extinction – or has already done so. The habitat requirements are usually reckoned to be slightly different, *B. selene* favouring more open and less wooded biotopes, but there is much overlap. Currently all five resident British Heliconiines occur around Morecambe Bay, the only place in Britain where this occurs, but how long this situation can persist is another matter.
The former habitats in Cheshire were remnant peat bogs, in and near woodland.

Hostplants. Violets *Viola* spp.

Broods. One annual brood, starting in late May or early June and continuing through most of July; the timing is a little later than that of ***B. euphrosyne.***

Behaviour. These butterflies usually fly fairly low down, over the vegetation, and frequently take nectar from flowers such as Thistles. Their habitats are often dominated by Bracken and they can sometimes be seen basking on this plant.


Boloria selene 1990-1999
Boloria selene 2000-2009
Boloria selene 2010-2019
Altitude

PEARL-BORDERED FRITILLARY, *Boloria euphrosyne* (Linnaeus, 1758)

Gait Barrows 7.5.2007

Mating pair, Gait Barrows 31.5.1988

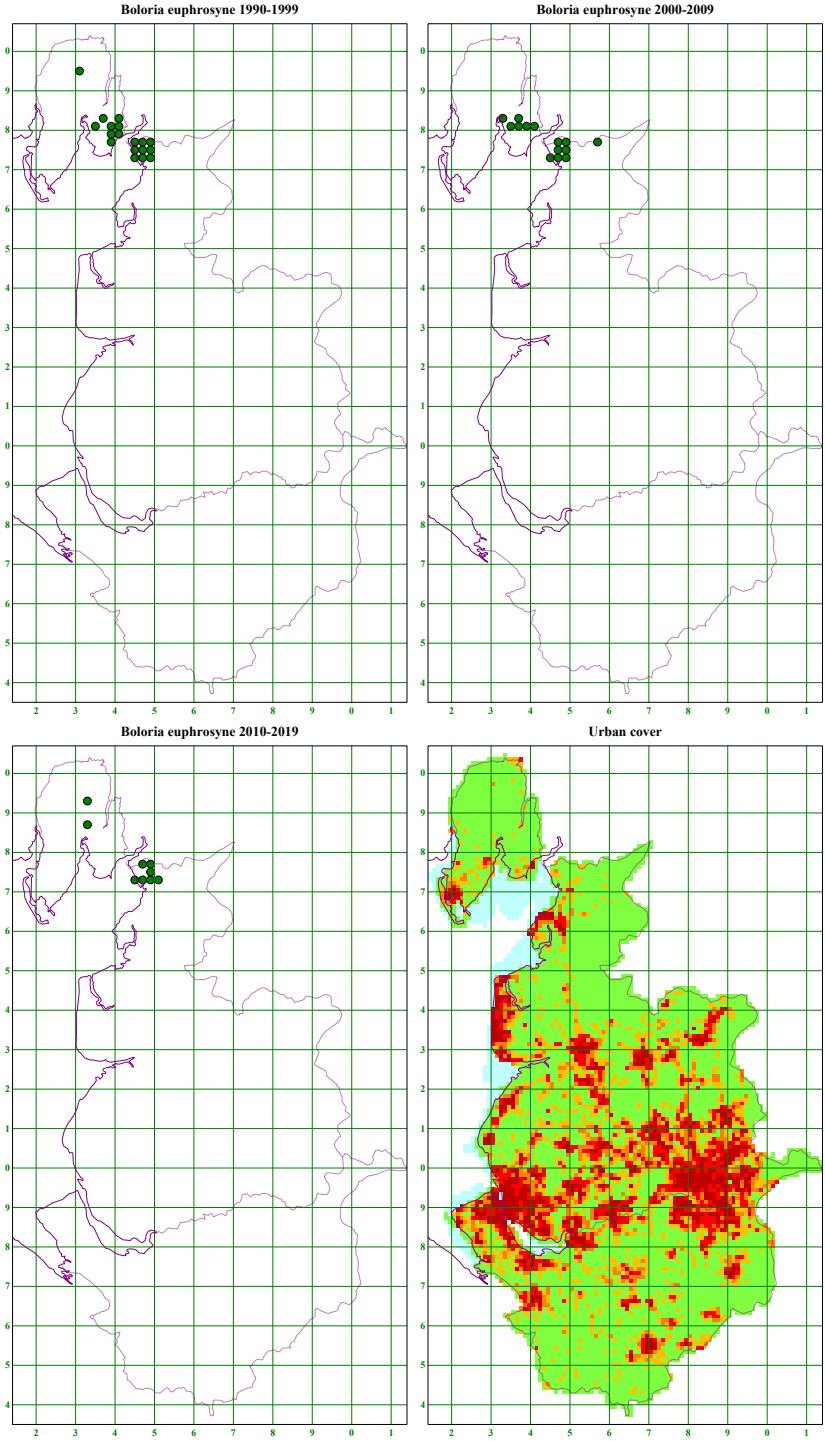
Distribution. This species used to be fairly numerous in the limestone woodlands around Morecambe Bay; however during period 3 it started declining and by the end of the period had become extremely scarce. In 2018 it was only reported from one site (Warton Crag) and it is feared that it will not survive there much longer. It does not occur anywhere else in Lancashire or Cheshire. It was also formerly to be found in a number of sites in the Furness, but by period 3 the Furness records were down to just two, one in 2010 and one in 2014. Historically, Shaw (1998) stated: "In the early 1900s the Pearl-bordered Fritillary could still be found at several localities in [Cheshire] including Delamere Forest, Saughall, Balderton and Eaton Park ... there was a last sighting at Delamere in 1941". There is also an improbable record from SJ89 ("Manchester"), in or after 1857.

Habitats. Woodland on limestone pavement. This species is usually reckoned to frequent drier biotopes than *B. selene*, but there is a considerable overlap.

Hostplants. Violets *Viola* spp.

Broods. One annual brood, starting in early May (sometimes late April) and continuing until mid-June. There have been a few later records (July) but these are possibly misidentifications of *B. selene.* The flight period is timed a little earlier than that of *B. selene.*

Behaviour. These butterflies used to be quite readily seen patrolling the woodland rides and clearings in their habitat. The *Boloria* species are not very mobile and with the one-time metapopulation becoming increasingly fragmented and quite isolated from any other there has become less and less opportunity for genetic interchange. Great efforts have been made by conservationists to maintain suitable habitat, but it appears that the population has become too weak and inbred for this management to be of any use.


Boloria euphrosyne 1990-1999
Boloria euphrosyne 2000-2009
Boloria euphrosyne 2010-2019
Urban cover

HIGH BROWN FRITILLARY, *Argynnis adippe* ([Denis & Schiffermüller], 1775)


Arnside Knott, Westmorland 22.7.2006


Arnside Knott, Westmorland 19.7.1992


Gait Barrows 14.7.1990

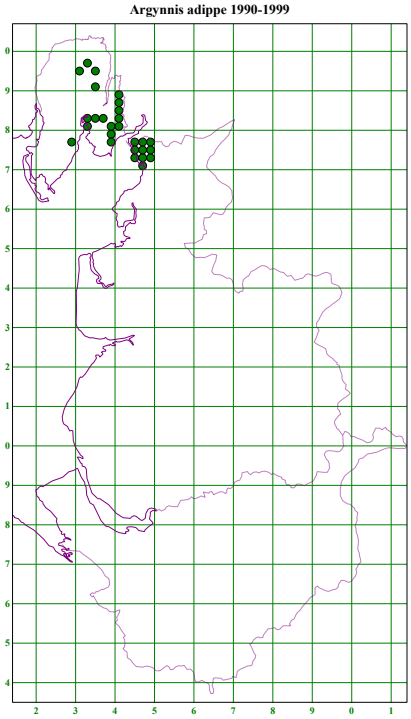
Distribution. As with the previous species, this one occurred in the open woodlands around Morecambe Bay (SD47) and in the Furness, Gait Barrows (SD4777/4877) in the former and Roudsea (SD3381/2) in the latter once being noted localities. It used to be fairly abundant in suitable places in July, but this is no longer the case and it is faced with extinction. Historically, in Cheshire, Day (1903) quoted "New Pale, Delamere", but without giving any dates. Smith (1948) referred to several at Delamere in 1919 and two at Pettypool in 1922.

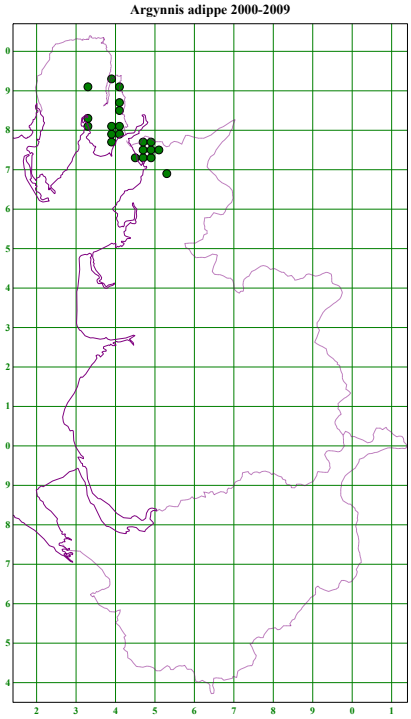
Habitats. The more open parts of woodland, and woodland edges, on limestone pavement. Being large and theoretically mobile, these butterflies could sometimes be seen in country between the main areas of habitat.

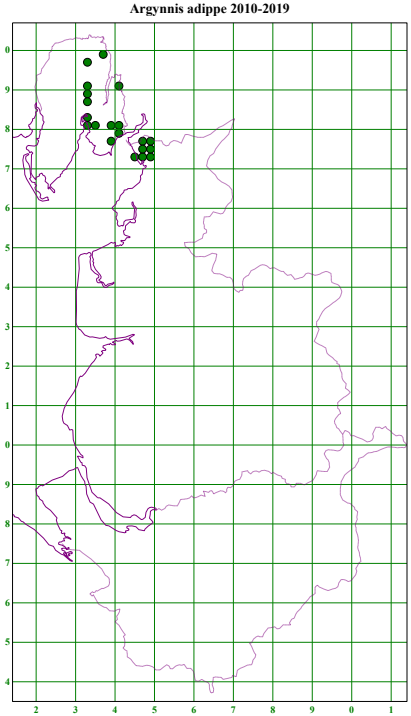
Hostplants. Violets *Viola* spp.

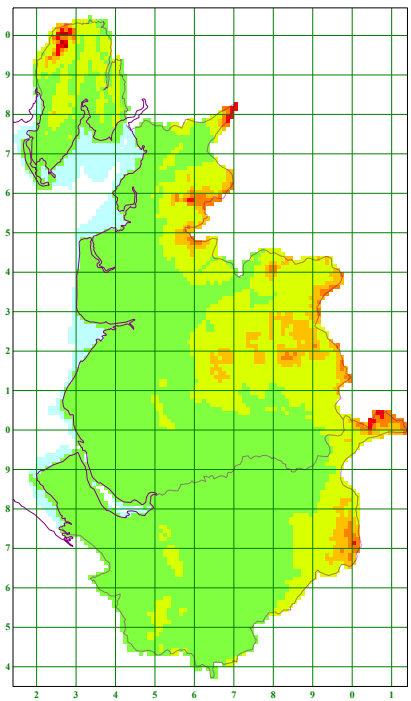
Broods. One annual brood, starting in mid-June and continuing until early or mid-August.

Behaviour. These butterflies used to be conspicuous and easy to see, flying and taking nectar along with other species in the glades and rides of their habitat; there used to be a large clearing, nearer to Gait Barrows than Arnside Knott, but on the walking route between those sites, full of Hemp Agrimony, and during period 1 *A. adippe* would take nectar from these flowers along with species such as *Aglais io, Vanessa atalanta* and *V. cardui.* The flight period of this species is later than that of the smaller "Fritillaries" and although it uses the same larval hosts (Violets) it does not seem to compete with them. It however came to find itself increasingly in competition with *A. aglaja*, and even in some sites with *A. paphia*. In the late 1980s it seemed to have the monopoly of large Heliconiines at Gait Barrows, but latterly *A. aglaja* has spread into that site. Further west but still in square SD47, just over the vice-county boundary at Arnside Knott in Westmorland (VC69) in the early 1990s *A. adippe* was quite definitely the dominant large Heliconiine, but in the first decade of the present century (period 2) *A. aglaja* all but supplanted it. Further west still, at Roudsea, in the Furness, *A. adippe* was supplanted by *A. paphia* and is believed to have completely died out, and indeed *A. aglaja*, which in 1992 seemed to be co-existing with *A. adippe* in about equal numbers, seems to have become scarce there. The causes of its decline, in spite of all the vast efforts by conservationists to prevent it, are unclear, but there seems to be a possibility that a pathogen might have been spread by the invading *A. aglaja.*


Argynnis adippe 1990-1999


Argynnis adippe 2000-2009


Argynnis adippe 2010-2019


Altitude

DARK GREEN FRITILLARY, *Argynnis aglaja* (Linnaeus, 1758)

Female, Ainsdale 7.7.2018

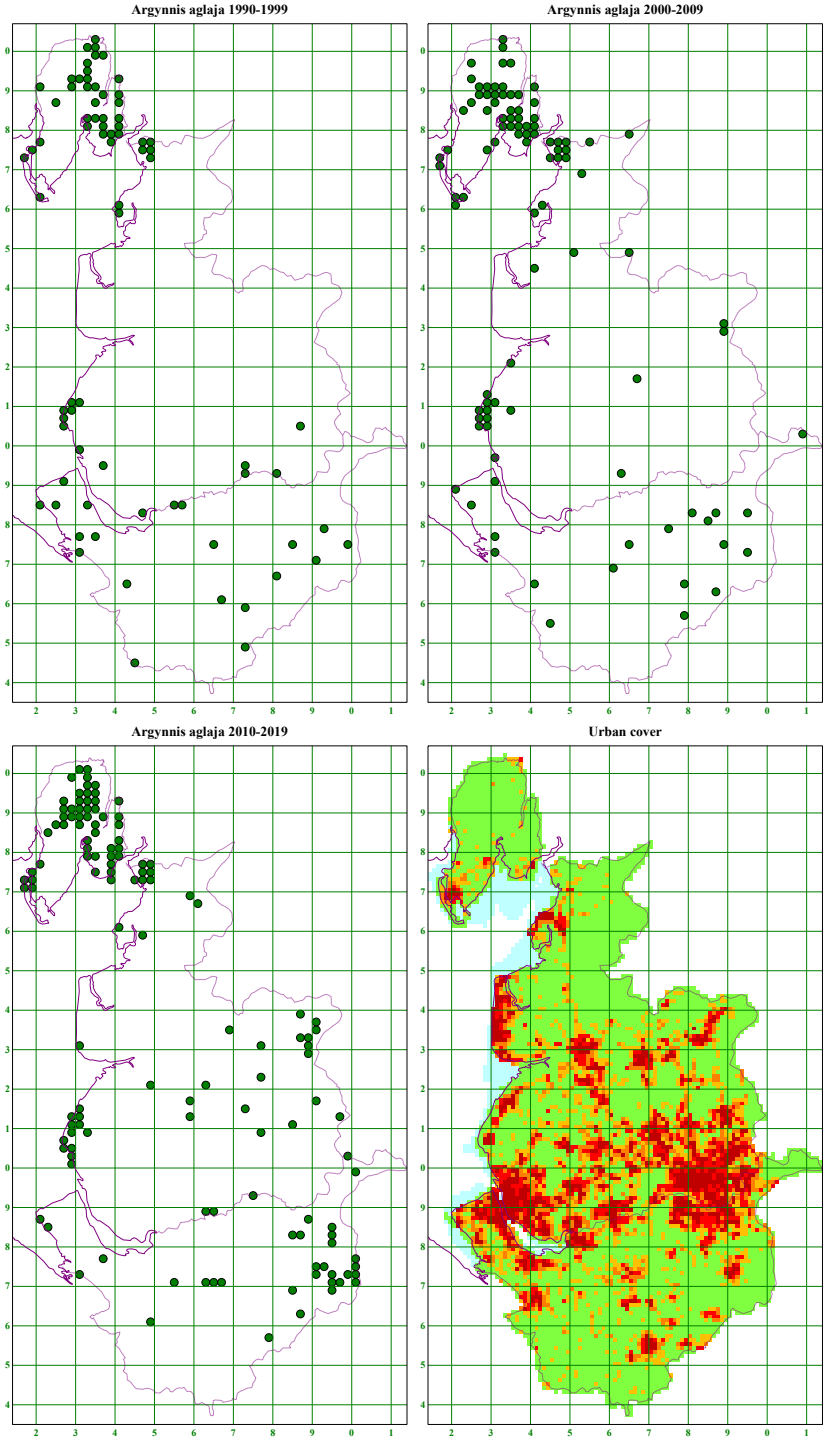
Female, Higher Swineshaw 28.7.2014

Male, Arnside Knott, Westmorland 26.7.2005

Distribution. Historically, in the mid-nineteenth century this species was apparently common on the sandhills of New Brighton and Wallasey (Shaw, 1998) but has long since ceased to breed there; in periods 1 and 2 it still occurred in other coastal locations in the Wirral, but there have been very few records from the Wirral in period 3. Smith (1948) noted the species in consecutive years during the 1940s at Delamere and Hartford, and believed that it was breeding there, whilst Michaelis (1954) referred to it as being "well established near Northwich". Any breeding populations in these inland sites have long since died out.

Currently, there is an established population on the sand dune system centred on the Ainsdale national nature reserve in south Lancashire, and the butterfly is widely distributed in the Furness. In Cheshire, the maps imply a reduction in numbers at coastal sites on the Wirral, but continued sightings of single butterflies elsewhere in the county, usually well away from any recognised habitat. In 2010 and 2011 there was a big increase in sightings in the Goyt Valley (SK07), and it is surmised that some of the butterflies seen in mid-Cheshire may have wandered from breeding grounds either there or further into the Derbyshire peak district. In 2013 and 2014, there were several sightings in various parts of Greater Manchester, especially in the east on the Pennine fringe, as for example at Higher Swineshaw reservoir (SK0099) on 28.7.2014, when a female was watched for about half an hour and photographed taking nectar from Creeping Thistles *Cirsium arvense*, and what was possibly another was seen passing over a nearby field. The biotope at Swineshaw has some resemblance to that in the Goyt Valley and it is just possible that there might be a small breeding population in this vicinity; searches in the years following the 2014 sightings have been fruitless but on no occasion was the weather really suitable; sightings have however been reported by other observers in other Pennine fringe locations not all that far away, including Piethorne and Dove Stone. On the other hand, five days before the Swineshaw sighting one was reliably recorded by K. McCabe in a Flixton garden (SJ7393) and this can only have been a wanderer on passage, presumably from the Lancashire coast. Likewise, a sighting by the author in 2018 in slightly hilly open grassland near Bury was of a butterfly which appeared to be flying through and not locally bred.

Higher Swineshaw reservoir, SK0099, 28.7.2014: the location where *A. aglaja* was seen that day.


Argynnis aglaja 1990-1999
Argynnis aglaja 2000-2009
Argynnis aglaja 2010-2019
Urban cover

Habitats. *A. aglaja* favours rough grassland with some slopes, rather than the open woodland biotopes favoured by the other Heliconiines; however in some localities it seems to be adapting more to the latter type of habitat, and, as mentioned under *A. adippe*, is increasing in numbers and possibly out-competing that species at sites on the Morecambe Bay limestone (SD47) and at Roudsea in the Furness (SD38).

Hostplants. Violets *Viola* spp.

Broods. A single annual brood, from late June to mid-August. In 2015, two sightings were reported from the Pennine fringe on 6th September, but this is very exceptional.

Behaviour. In its established haunts, this butterfly is often to be seen taking nectar from Thistles. The species is a strong flier and, although it is not normally regarded as migratory, the sporadic sightings in mid-Cheshire, south Lancashire and Greater Manchester must presumably have been strays from a considerable distance away: the nearest known breeding colonies are in the Peak District (Cunningdale, Lathkill Dale and the Fernilee/Errwood section of the Goyt Valley) and the Lancashire coast south of Southport.

SILVER-WASHED FRITILLARY, *Argynnis paphia* (Linnaeus, 1758)

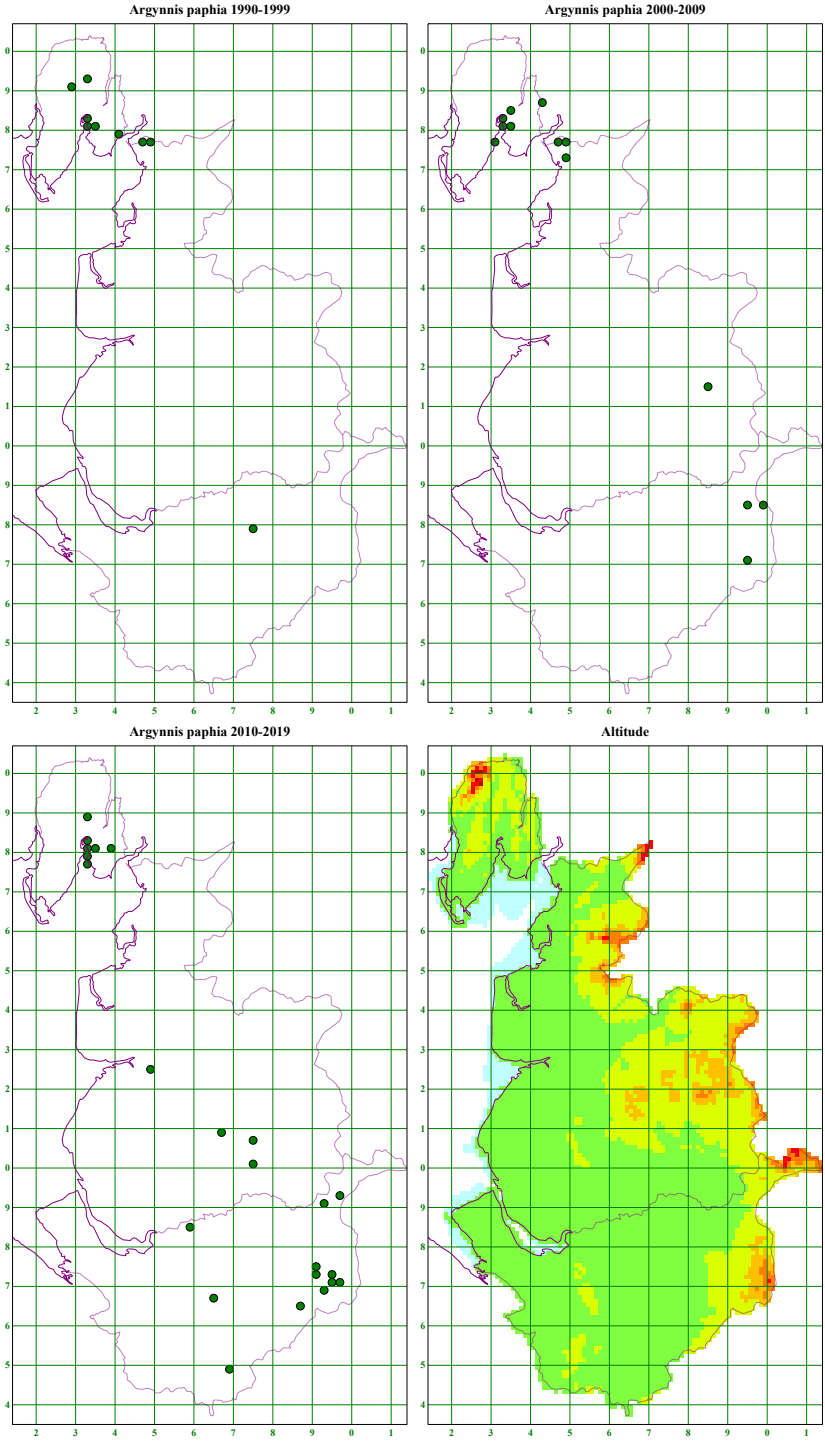

Male, Roudsea 22.7.2006


Female, Roudsea 22.7.2006

Distribution. Whitehead (1986) wrote: "It is quite possible that this beautiful fritillary was once a resident of Merseyside, but the only two specimens recorded do not really provide evidence of this. They were seen at Eastham in July 1948". Shaw (1998) remarked that in the nineteenth century there were occasions when it bred at Delamere and around the Wyches. There is a single record from SJ78 in 1950; the site is unspecified and it is uncertain whether or not it was inside the present Greater Manchester boundary.

The map in Heath *et al* (1984) shows a scattering of mainly pre-1940 records in Cheshire and one pre-1940 record in SD47 (Morecambe Bay). There were no further records in the Morecambe Bay area prior to the 1990s, but then the butterfly seemed to be starting to colonise the limestone woodlands in that vicinity; it would however seem that the colonies were transient as there were no records in period 3. Further west at Roudsea in the Furness, also in the 1990s *A. paphia* for a while established a stronghold in the national nature reserve woodland, and all but displaced *A. adippe* and *A. aglaja* there, but latterly it also seems to have become scarcer there; the future is not looking too good for any of the Heliconiines.

The dot in Cheshire on the map for period 1 relates to a report from Knutsford Heath (SJ7478) by B. Roberts., presumably a stray. The map for period 2 shows what were apparently four further isolated records in VC58 and VC59 which are believed to


Argynnis paphia 1990-1999
Argynnis paphia 2000-2009
Argynnis paphia 2010-2019
Altitude

have been wanderers either from the southern Lake district, in view of the abundance at Roudsea at the time, or from the next nearest colonies to the south, which would be in Shropshire or Derbyshire. The fact that butterflies were seen at virtually the same time in 2006 at such widely separated sites as Norden, Newtown (New Mills) and Middlewood, would seem to rule out the possibility that the sightings were due to the release of captive-bred specimens. The butterfly is large and powerful and quite capable of flying long distances, which it must have done to colonise Roudsea in the 1990s in the first place.
In 2019, there were several records from Macclesfield Forest, which seem to indicate that a small breeding colony may have established there (R.L.H. Dennis, pers. comm.). There were also further unexpected records that year as noted in the "Behaviour" section below, and one from Basford.

Habitats. The Lake District populations are (were) in woodland on limestone pavement. The Macclesfield population is in a mid-altitude mainly coniferous forest on millstone grit.

Hostplants. Violets *Viola* spp.

Broods. A single annual brood, in July and August.

Behaviour. In their established haunts, the butterflies are usually easily seen flying in the woodland rides and taking nectar, mostly from Brambles *Rubus fruticosus* agg. but at times from other flowers including Thistles *Cirsium* spp., Knapweed *Centaurea* spp. and Burdock *Arctium lappa.*
Regarding butterflies clearly out of habitat, and well away from any known colony, on 25.7.2006, David Winnard and Richard Greenwood saw and photographed a male taking nectar from a Buddleia *Buddleja davidii* by Greenbooth Road, Norden, near Rochdale (SD8514), and likewise P.M. Kinder photographed one on a garden Buddleia in Romiley (SJ9390) on 23.8.2019. On 29.7.2019 S. Dent photographed a slightly worn male taking nectar on Privet *Ligustrum ovalifolium* in Moses Gate country park in the Croal/Irwell Valley, near Bolton (SD7407), and on 13.8.2019 K. Haydock saw one taking nectar on Knapweed in a rough area of the Lostock golf course, also near Bolton (SD6608). Going back earlier in period 3, on 27.7.2013 G. Riley photographed a male of this species at Worsley garden centre (SD7401); this was concurrent with several sightings of *A. aglaja* in widely separated localities to the north of Manchester. Even more astounding, about the same time in 2013, was a sighting by G. Ashworth at Birtle (or Bircle) (SD8312) of what was almost certainly a Small Pearl-bordered Fritillary, *Boloria selene*; sadly he did not manage to photograph it.

Family NYMPHALIDAE (sub-family MELITAEINAE)

MARSH FRITILLARY, *Euphydryas aurinia* (Rottemburg, 1775)

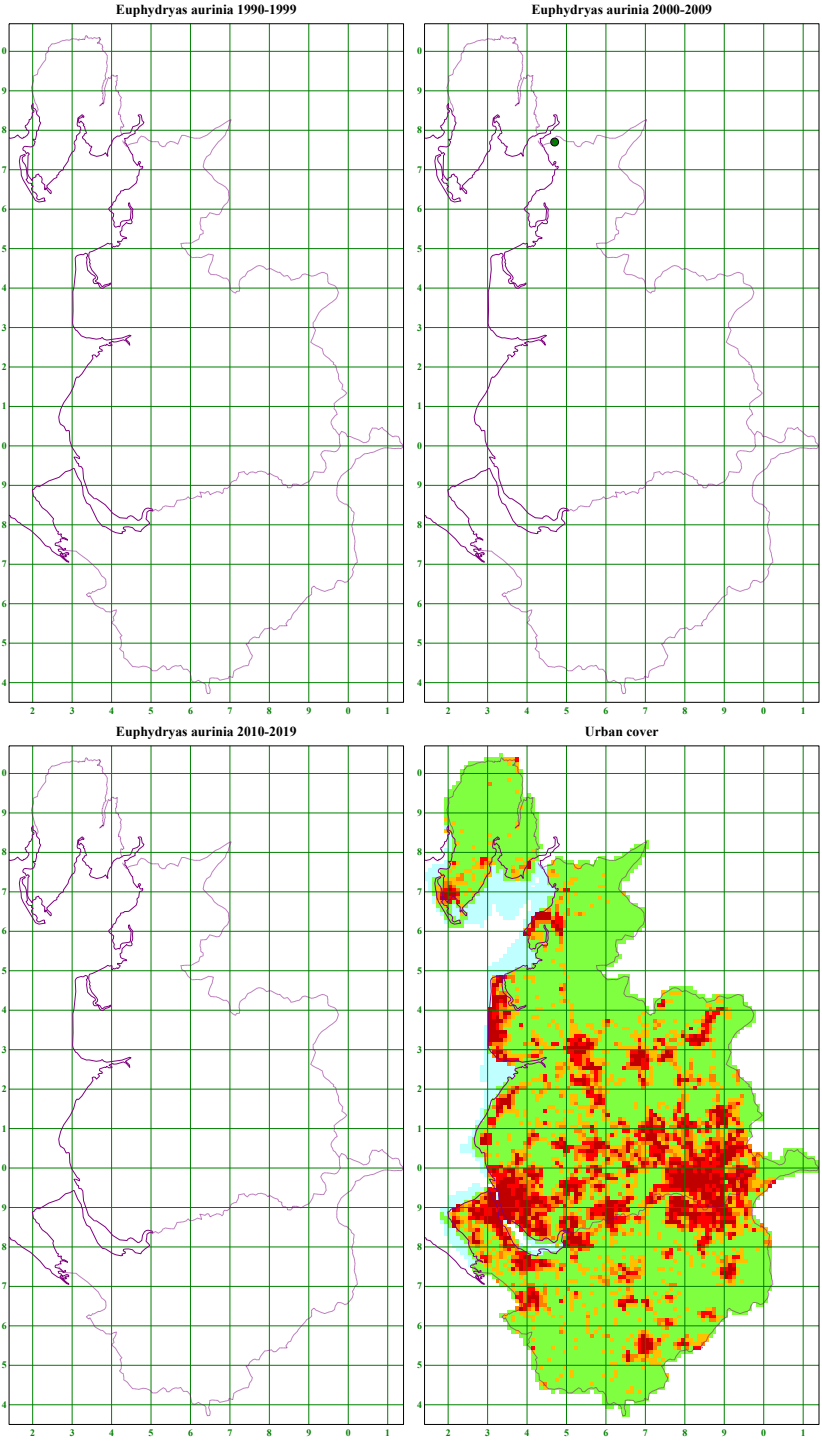
Pewsey Down, Wiltshire 25.5.1992

There are historic records from SJ78 (site unspecified) 1939, SJ88 (Stockport) 1846, SJ89 ("Manchester") 1857+ and SJ98 ("near Stockport") 1845. Shaw (1998) adds that "during the nineteenth century the Marsh Fritillary was described as being 'extremely local' in Cheshire, with the only records being from Ashley Meadows, Eastham, Malpas, Delamere and Knutsford ... A specimen ... taken in 1882 at the Wyches, on the southern borders of the county, is probably one of the last records".
In the 2002 Lancashire butterfly recording report (Sivell & Palmer, 2003), L. Sivell wrote: "A single butterfly was reported from the main public footpath at Gait Barrows, about 100 metres south of the permit-holders' car park. Given the very late date of July 16th, this can only be the result of an unauthorised and irresponsible release of a butterfly reared in captivity". There does not appear to have been any photograph taken to substantiate this claimed sighting. The nearest known colonies are in Cumberland, and the species is generally regarded as sedentary.

GLANVILLE FRITILLARY, *Melitaea cinxia* (Linnaeus, 1758)

Compton Chine, Isle of Wight 24.5.1992

Whitehead (1986) remarked: "There was an attempted introduction of this species to the Wirral in 1945. Unsurprisingly, adults only flew in one season and a colony was not established".


Euphydryas aurinia 1990-1999
Euphydryas aurinia 2000-2009
Euphydryas aurinia 2010-2019
Urban cover

Family NYMPHALIDAE (sub-family SATYRINAE)

SPECKLED WOOD, *Pararge aegeria* (Linnaeus, 1758)

Male (dark), Stretford 27.8.2007

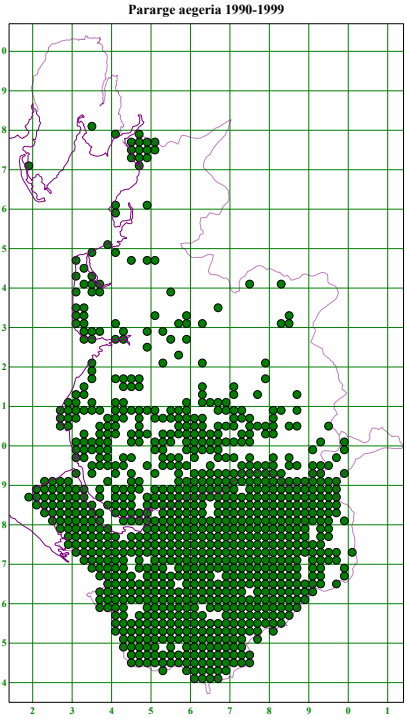
Walton Park, Sale 9.5.2006

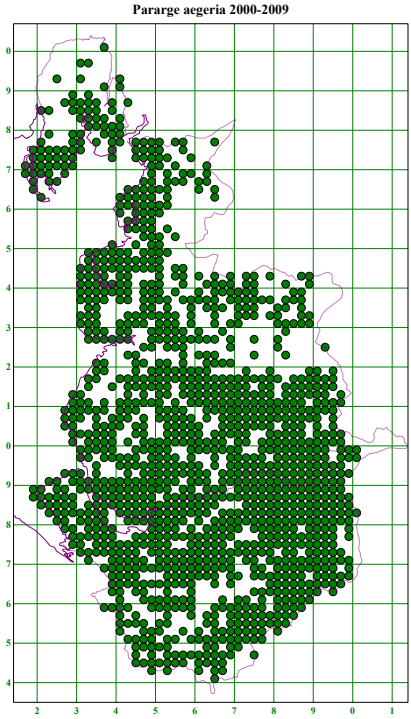
Female and male, Sale 21.4.2007

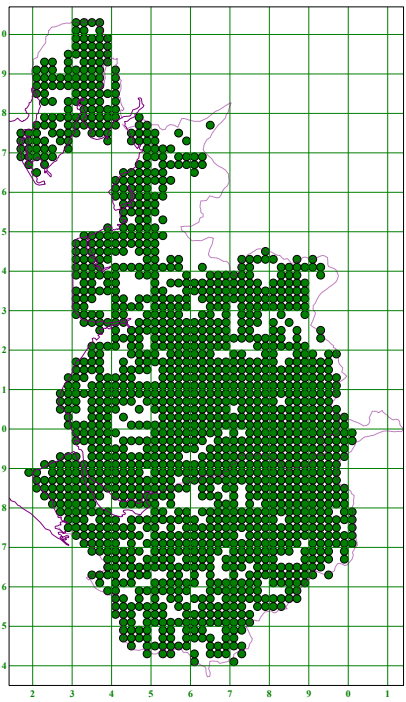
Aberrant form, Chorlton, Manchester 8.6.2016

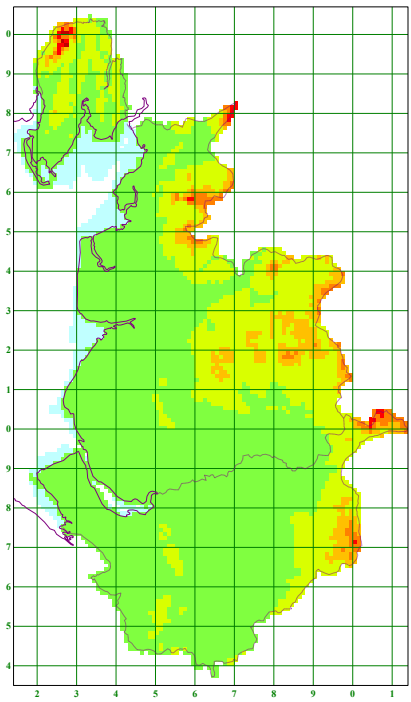
Stretford 3.8.2008

Distribution. The spectacular northward spread is clearly apparent by comparing the three maps. Rutherford (1983) remarked that in Cheshire it was "widely distributed, but with a south-western bias", but it was virtually unknown in the Manchester area and most of Lancashire until 1990. The following notes describe in some detail its colonisation of Greater Manchester. The Bollin Valley was colonised early, with several records in 1990 and numerous sightings in most of the woods in 1991. Further north in the Mersey Valley, the first sightings were also in 1990 (the Priory, Sale (SJ7992) south of the river, on 3.8.1990, and the Chorlton Ees (SJ8093) north of the river, on 8.8.1990), but colonisation was slower. A viable population established fairly quickly in the Priory, but the initial sighting in the Chorlton Ees was not followed by any more for several years, and it was probably 1995 before the butterfly was firmly established there. Similarly, it was first seen in the lane adjacent to the Stretford sewage farm (SJ7893) in 1992 but there were no further sightings there until 1994. These records indicate that of these three Mersey Valley sites one was a quick colonisation and the other two not immediate, the first sightings being strays – wandering butterflies exploring new habitats but not yet being able to found a colony. Alternatively, the breeding populations may have been established but in too low numbers to be apparent in the intervening years. Findlay & Tilley (1995) refer to *P. aegeria* as a "rather sedentary butterfly". This has certainly not been the case in Cheshire and Lancashire; to colonise as it has done the species must have very considerable powers of dispersal, and indeed individuals on passage have frequently been seen moving through unsuitable habitat, and crossing motorways. By 1995 the butterfly had spread to the Worsley area (SD7400/7501), west of Manchester, in good numbers, and had reached the Bolton and Wigan areas though in much lower numbers. At that time there were only a few records from the Stockport vicinity, and in the north and east of Manchester many apparently suitable sites had shown no sign of the butterfly. This situation has since changed: the range extension has continued and now there are no parts of Greater Manchester, or Lancashire, except the high moorlands in the north and east, where the butterfly is


Pararge aegeria 1990-1999


Pararge aegeria 2000-2009


Pararge aegeria 2010-2019


Altitude

not likely to be seen. Although climate change has been suggested as a cause of this range extension, the indications from Cheshire and Lancashire are of a steady increase from year to year during the 1990s in spite of fluctuations in the weather, and then a stabilising; there were more than twice as many sightings in period 2 as in period 1, but the numbers in periods 2 and 3 were almost equal. Some exceptional summers in the 1990s probably saw the establishment of new large source populations from which other large and small habitats were colonised.

Habitats. This butterfly species has come to tolerate a far wider range of habitats than was formerly thought, though there is still no doubt that it does like there to be some tree cover. Well known as a shade-loving butterfly, the prime requirements are biotope with at least semi-mature trees giving shelter plus a mixture of sunlight and shade. Mature woodlands, such as those in the Bollin Valley (SJ7884, 7983, 8082) provided suitable habitat at the beginning of the range extension; so did many of the more recently planted woodlands further north including in the Mersey Valley. Other new habitats developed from abandoned railways, for instance the former Walkden to Leigh line (SD6901 to 7201), which in period 1 formed the equivalent of a linear east-west strip of fairly sheltered woodland ride several miles long, as trees grew up on either side for most of its length. On 27.8.1995, in seemingly less than ideal weather (windy with heavy showers alternating with periods of sunshine) during a walk along this track, the present species and the Red Admiral *Vanessa atalanta* were both present in exceptional numbers, an instance of a particular combination of habitat and climatic variables fortuitously benefiting two not closely related butterfly species with very different biology, one being a recently established resident with specific requirements and the other an opportunist immigrant. This habitat has since been destroyed as the former railway track has been converted into a "guided busway". In 1995, 1996 and 1997 *P. aegeria* was found in two suburban parks in Sale (Worthington Park (SJ7991/2) and Walton Road Park (SJ7890)) where the formally planted trees and ornamental shrubberies appear to be sufficiently like a woodland edge to satisfy it, even though the grass is regularly mown very short. It also appeared to have established itself in some of the large suburban gardens in the west of Sale (SJ7791) where there was sufficient tree canopy to provide the required shade.
These observations around Manchester and the Mersey Valley have been mirrored elsewhere; most woodland biotopes in Lancashire and Cheshire, whether rural or urban, can support this species.

Hostplants. Grasses, which must be growing in at least partial shade. The only egg-laying observation during the survey was of a female laying on a small scrap of grass (species undetermined) on a mound of soil by the old lane adjacent to the Priory nature reserve, Sale (SJ8092) in period 1. If in fact the butterfly breeds in the suburban and city parks, as it appears to do, the caterpillars must be able to survive severe mowing.

Broods. The voltinism is somewhat confusing There appears to be a very long, staggered appearance of each brood due to the species overwintering in two different stages of development. The first butterflies are usually on the wing in April and May, though in some years they have been seen in late March. The April and May

butterflies appear to represent the first part of the spring brood (from overwintered pupae); there is then a gap with few or no sightings followed by the second part of this brood (from overwintered larvae) which is out in June. There are further emergences (first and second parts of the second brood?) in July and August/September; some butterflies later in September and in October possibly represent a third brood.

Behaviour. Ideal flying conditions are a mixture of sun and shade. As an illustration, on 13.8.1995 (period 1, when the species was newly colonising the Manchester area), in Nan Nook Wood in Wythenshawe Park (SJ8090), following an overcast morning in which very few butterflies had been flying, the clouds dispersed at mid-day and almost immediately seventeen *P. aegeria* appeared in a normally damp area in the centre of the wood (which however had dried out in the unusual heat of 1995), where gaps in the tree canopy admitted some light. The only other butterflies present were two Green-Veined Whites *Pieris napi*. This site is a unique habitat consisting of unmanaged mature woodland and swamp bounded to the south by a large expanse of formal parkland and to the north by housing.
Although its optimum conditions for flight are as above, the species does sometimes fly in overcast weather, and was even noted flying in slight rain during a period of exceptional abundance at the end of August 1995. It regularly thermoregulates by basking with wings open, in a small patch of sunlight, often on a leaf above ground level, but sometimes at ground level and even on pieces of white paper or plastic litter (Hardy, 2015a) and is very territorial. Satyrines are usually regarded as having rather weak flight; however *P. aegeria* is capable of putting on quite a turn of speed, and sometimes when disturbed on the ground it will fly up quickly and strongly into neighbouring trees. The butterfly is most often seen basking or flying and does not take nectar as frequently as most Satyrines. The flowers which it does sometimes use include several non-native species such as Michaelmas Daisy *Aster x salignus*, Buddleia *Buddleja davidii* and Ice-plant/Butterfly Stonecrop *Sedum spectabile*, plants not usually favoured by Satyrines; it has also been noted a number of times on indigenous plants especially Ragwort *Senecio jacobaea* and Bramble *Rubus fruticosus* agg. of which plant it utilises the ripe fruit as well as the flowers. Probably honeydew from aphids is a more popular source of adult nutrition for this species than floral nectar, and it has also been noted “mud-puddling” on several occasions.

WALL, *Lasiommata megera* (Linnaeus, 1767)


Male, Greenbooth 5.6.2015


Female, Holcombe 2.9.2014


Greenbooth 12.8.2014

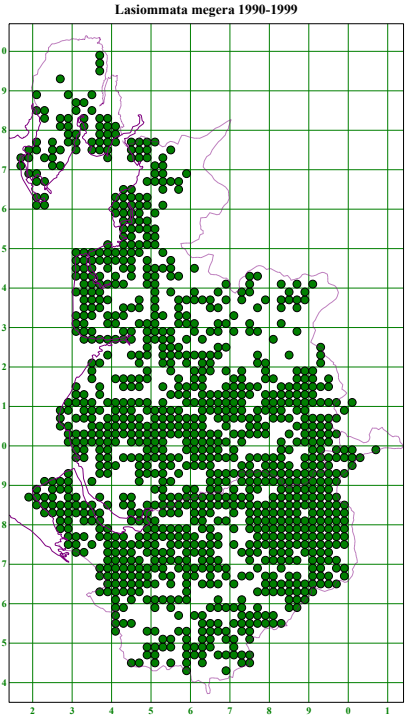

Var. *meadewiagens*, Mersey bank, Stretford 2.8.1989

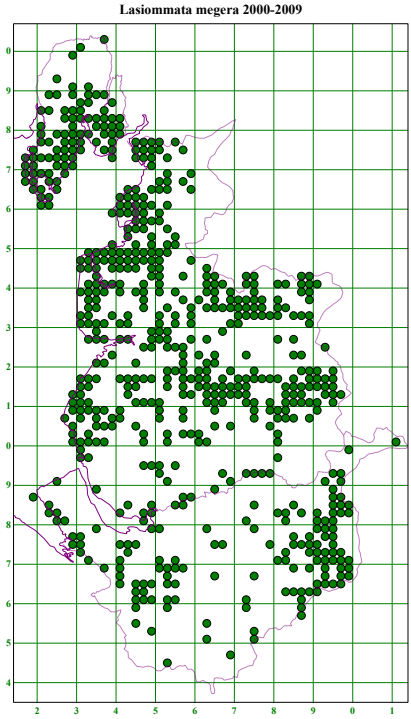

Mating pair, Greenbooth 12.8.2014

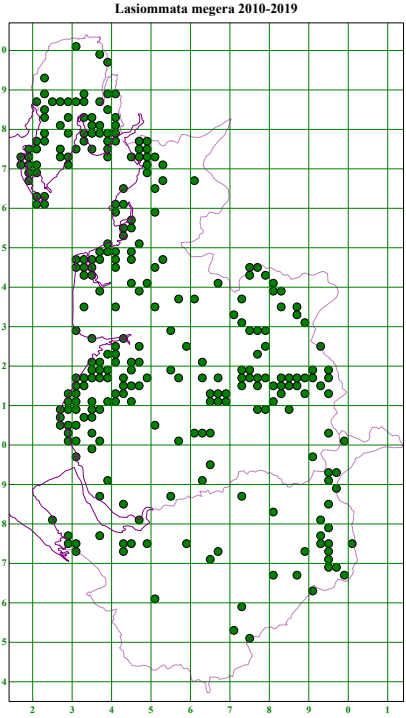

Courtship, Greenbooth 21.5.2014

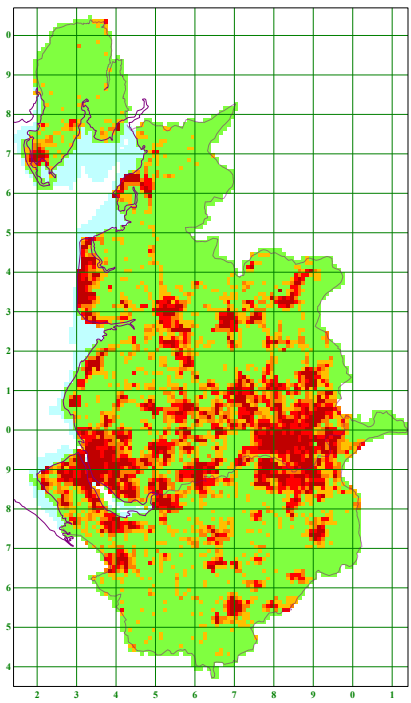
Distribution. Historically, in Cheshire, Day (1903) recorded this species as "common and generally distributed, except east of Delamere Forest where it appears to be entirely absent"; Boyd (1946) described its distribution as "irregular", and Rutherford (1983) regarded it as "common and widespread throughout the county". The subsequent catastrophic decline in Cheshire and South Lancashire is clear from the maps, which also show that further north in Lancashire, at mid to higher altitudes and near the coast, the decline has not been as severe. Over the whole area, in period 3 there were slightly over one-third as many sightings as in period 1. The maps for period 1 show a general distribution over most of Cheshire and Lancashire apart from the hilly ground in the north and east, and also numerous records in the mid-Mersey Valley (Sale and environs) and Manchester city centre. Unfortunately it appears that the climatic or other factors which favour the previous species, *P. aegeria*, affect this one adversely and in many places where *P. aegeria* colonised or increased *L. megera* declined or died out completely during period 2. It died out completely in the Mersey Valley, the last sighting there being in 2000, and similarly in all other sites around Manchester, apart from the hilly ground to the north and east. The position was much the same over almost the whole of lowland Cheshire and Lancashire: it either became very scarce or disappeared completely. The total number of records in period 2 was only 58% of the figure for period 1; in period 3 the total was a mere 20% of the period 1 figure (36% of the period 2 figure).

Although for most of period 2 and the beginning of period 3 the species was rarely recorded in double figures even at its most favoured remaining sites, in 2013 and 2014 it suddenly became quite abundant in a location on the west side of Greenbooth reservoir (SD8515), a sheltered site with suitable grass, abundant nectar flowers and many large stones and bare rock faces for thermoregulation (Hardy, 2015a). On 21.5.2014 sixty-six butterflies were counted by the author and P.M. Kinder in less than an hour of recording at this site and there were certainly many more. During 2014 the author also checked all the other known sites where *L. megera* had been recorded in Greater Manchester during the previous five years (two of which are illustrated below), but the increased abundance at Greenbooth was not mirrored anywhere else; in every other site either it continued at very low density or was not


Lasiommata megera 1990-1999


Lasiommata megera 2000-2009


Lasiommata megera 2010-2019


Urban cover

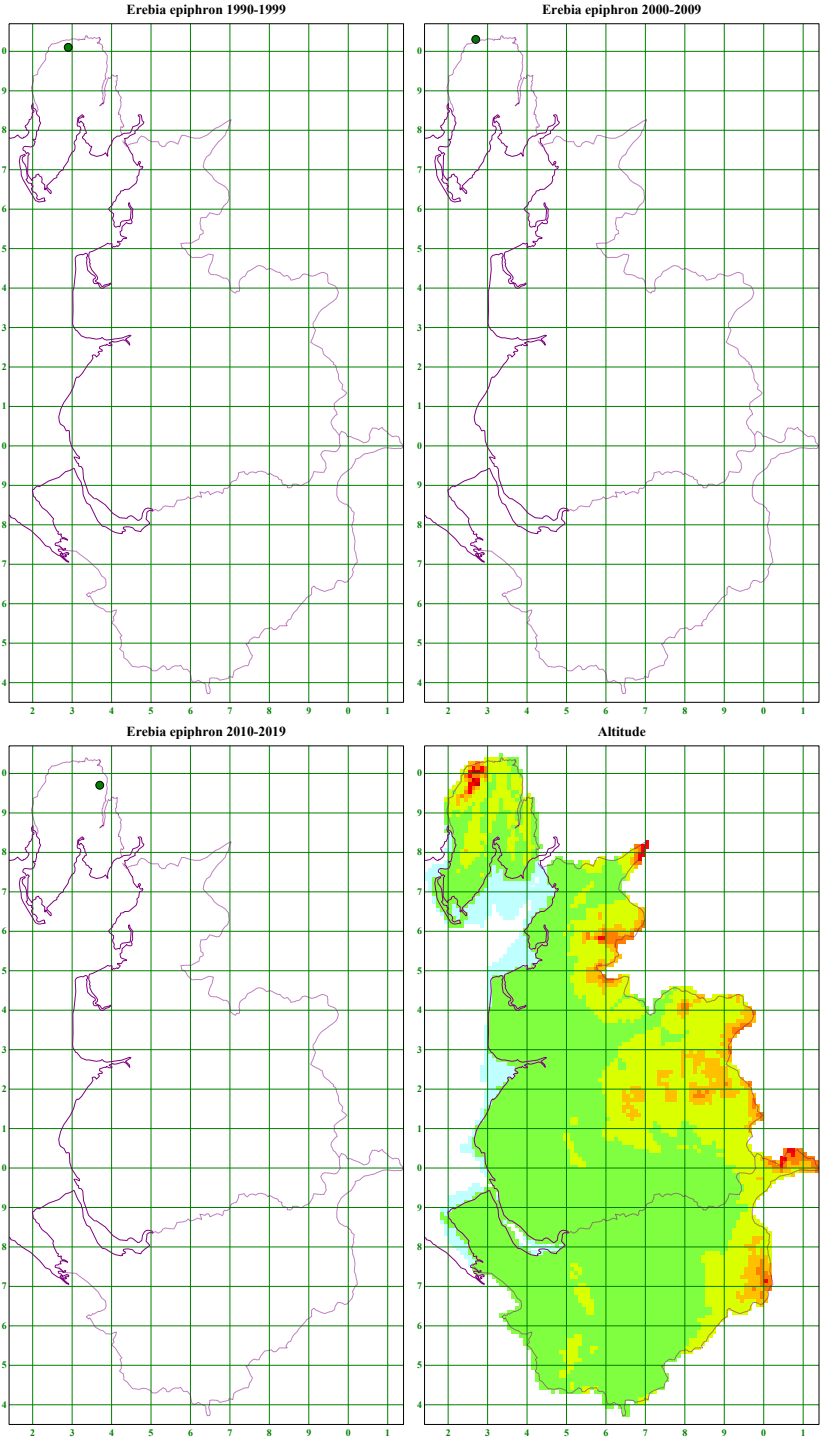
found at all. Over the next few years, Greenbooth continued to be the strongest site in the Manchester area, but the abundance steadily reduced and became more in line with other remaining sites.

Locations in Greater Manchester where *L. megera* still existed in period 3: (left) Greenbooth quarry, SD8515, 12.8.2014; (centre) Holcombe Moor, SD7716, 2.9.2014; (right) Ludworth Moor quarry, SJ9990, 27.9.2015

Dennis (2010), concluded, treating the SD grid squares as the "north region" and the SJ squares as the "south region", that "First, the butterfly was far more abundant on low ground than on high ground during period 1 [in this work, "period 1" was 1940-1994]. Second, numbers of the butterfly drop, often dramatically, in later periods at all elevations except on high ground [which he defines as land over 150 metres in altitude] where they increase (north region) and stabilise (latterly north and south region).The bias for higher elevations in the southern region suggests a degree of stasis in upland areas, but certainly of smaller losses in upland than in lowland areas of the Cheshire Plain. This is manifestly an **upland refuge effect**, a geographical bias in different survival rates."

Towards the end of period 3, there were hopefully some signs of a slight recovery; reports were received from locations where the butterfly had not been seen for some years; this applied to the Manchester area and also elsewhere in Cheshire and Lancashire. A surprising record by the author in the course of his detailed study of inner-city Liverpool was of a rather worn male on a small scrap of rough ground on a bridge over a railway line beside the roundabout of Pighue Lane and Rathbone Road in Wavertree (SJ388903) on 19th August 2019; this was the only *L. megera* which the author saw at all in Liverpool that year. Some coastal sites, notably Hightown Dunes, retained good colonies.

Habitats. Currently hilly grassland, also coastal sandhills. When it was widespread in the 1980s and 1990s, this butterfly favoured warm dry sites, such as waste ground, and sloping valley sides especially with a south-facing aspect. Abandoned railway sidings were popular. It was noted then that the main differences between the habitat requirements of this species and the Meadow Brown *Maniola jurtina* were that *L. megera* preferred areas of patchy grass amidst bare soil, including verges and grass next to hedges, and would not use thick tall grass; however the requirements of the two species did overlap and it was rarely possible to state categorically that any particular grassland site could support the one and not the other. Also, although the present species uses a very different hostplant, its habitats were remarkably similar to the Small Copper's *Lycaena phlaeas*, and, interestingly, both species are orange/brown in colour. Observations on the Mersey bank (SJ7892/3) showed that *L. megera* could tolerate a certain amount of mowing; the bank is normally mown at


Erebia epiphron 1990-1999
Erebia epiphron 2000-2009
Erebia epiphron 2010-2019
Altitude

least once per annum, and it does not appear to have been the mowing that caused the loss of the species from the bank (and very many other sites) in the late 1990s.

Hostplants. Grasses; the precise species used in the area have not been identified. Females prefer to lay on small clumps of fairly short grass in warm, sheltered spots.

Broods. There are always two broods per year; the second is usually more numerous than the first and of longer duration. The first brood appears in May, usually from the middle of the month until mid-June, but in 1990, a year with a warm spring, numbers of butterflies were seen on 1st May in the Mersey valley and the females had already started laying; elsewhere that year there were records from early April. The second brood is normally out in late July and August, though in some cold summers it has not started until mid-August and has continued into September or even early October. In some years, the late September and October butterflies may have represented a partial third brood.

Behaviour. The flight of this butterfly is usually quite low over the ground, with its wings held in a distinctive "V" position. It is well known for its habit of basking on warm surfaces with wings fully open; however only occasionally is one observed to bask on a wall, as the vernacular name suggests. Much more popular are bare earth and rocks. Railway ballast used to be favoured when the species had a wide distribution including disused railway sidings and the like. Since the major change in distribution and its retreat to the hills, although it certainly does still at times bask on the quarry rocks, it also sometimes adopts quite a different behaviour, akin to hill-topping; male butterflies are seen, presumably searching for females, along features in the landscape including dry-stone walls or rocky gullies. In the Pennines further south (towards the Cheshire/Derbyshire border), definite hill-topping has been observed on several peaks (Dennis & Dennis, 2006); this is a behaviour understood to facilitate mate-location in thinly-spaced populations, where convergence on a suitable eminence brings males and females into close proximity.

SMALL MOUNTAIN RINGLET, *Erebia epiphron* (Knoch, 1783)

Honister Pass, Cumberland 5.7.1987

Honister Pass, Cumberland 5.7.1987

Distribution. On high ground in the Lake District only. The species only just comes into the area covered by this work; there are just a few records from the extreme north of the Furness.

Habitats. Grassy slopes, sometimes close to passes between mountains.

Hostplants. Mat Grass *Nardus stricta.*

Broods. One annual brood, of short duration, in late June/early July. The species sometimes has a two-year life-cycle, which can result in its being abundant in a particular site in one year and scarce or absent in the next.

Behaviour. These butterflies are active in settled, sunny weather, and although they fly low over the grass they are very skittish and difficult to approach. The species does not appear to be very mobile.

SCOTCH ARGUS, *Erebia aethiops* (Esper, 1777)


Arnside Knott, Westmorland 28.7.1991

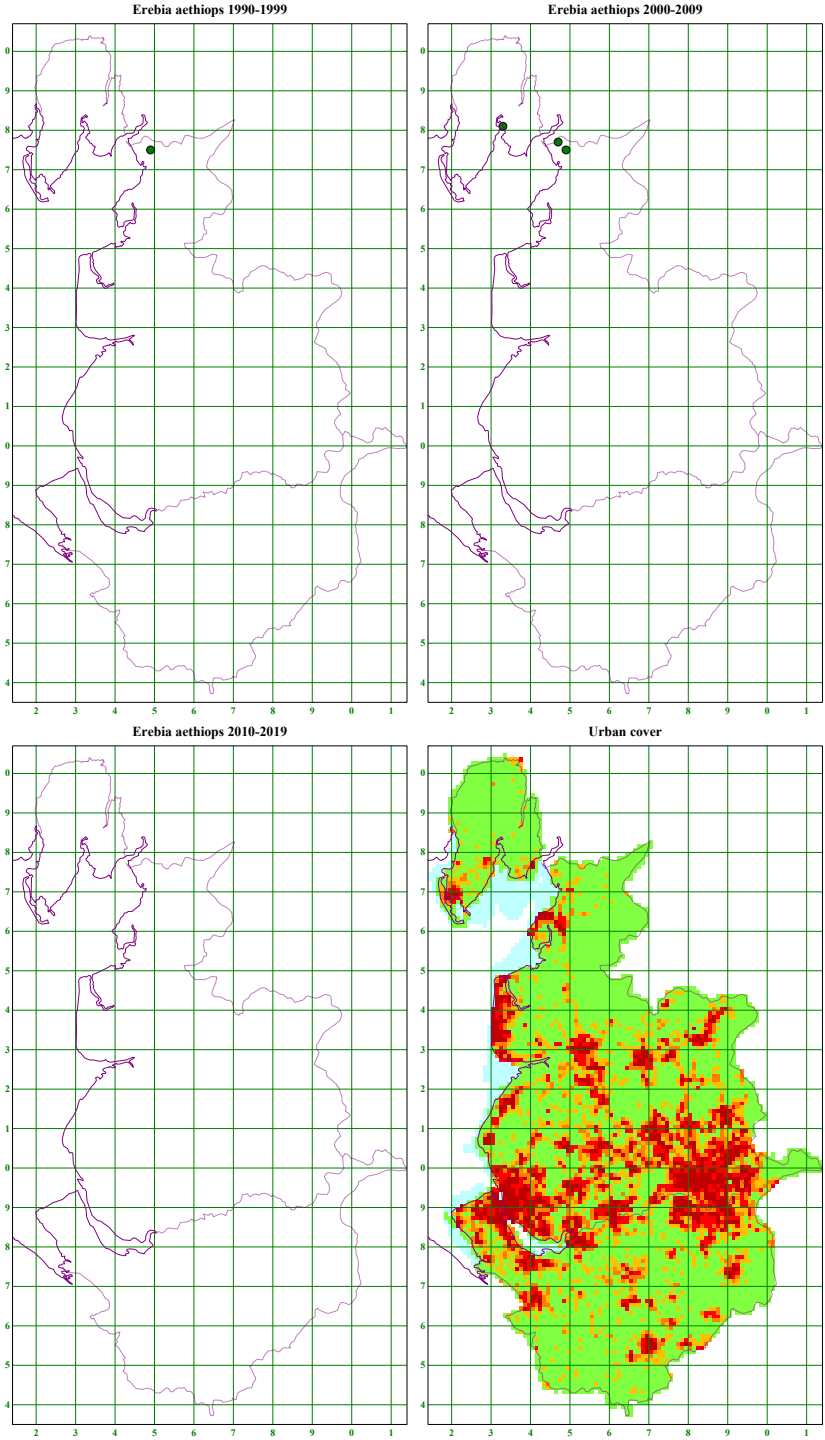

Ballindalloch, Banffshire 9.8.2004

Distribution. The few dots in the area of the Morecambe Bay limestones in the maps are outliers from the large population on Arnside Knott, in the Westmorland portion of SD47; in 2009 there was also a record from Roudsea in the Furness: L. Sivell writes: "I was leading a butterfly walk at the time and several of the group saw it. Someone got a photo, but the angle was wrong and it wasn't much good. Doubt it got there unassisted". One wonders how many centuries the Arnside colony has been completely isolated: currently the next nearest colony is twenty-six miles to the north-east and after that in Scotland, 70 miles to the north, and how many more decades it will be able to persist, with absolutely no possibility of any gene interchange. Towards the end of period 3 there were worrying signs that numbers were declining.

Habitats. Grass/scrub on a lightly wooded hill.

Hostplants. Blue Moor Grass *Sesleria caerulea*.

Behaviour. This seems to be a rather sedentary butterfly species, rarely straying far from its main colony. The butterflies fly at fairly low level, often basking with wings open or taking nectar, and are much easier to approach than *E. epiphron.*


Erebia aethiops 1990-1999
Erebia aethiops 2000-2009
Erebia aethiops 2010-2019
Urban cover

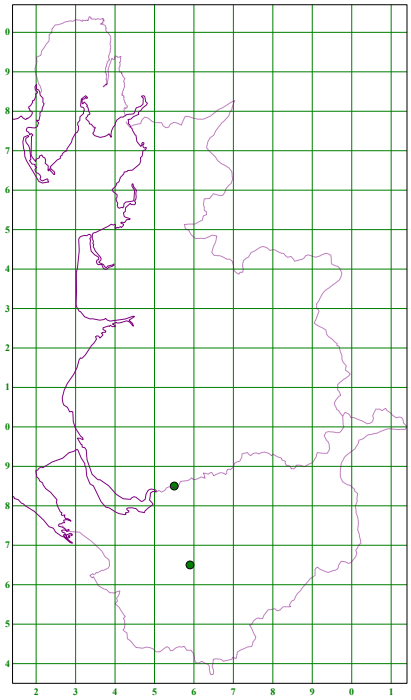
MARBLED WHITE, *Melanargia galathea* (Linnaeus, 1758)

Prawle, Devon 6.7.1993

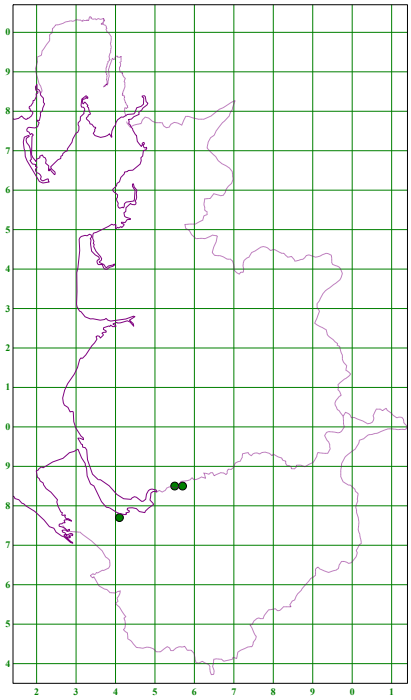
Whitehead (1986) wrote: "Two or three specimens were recorded at Dibbinsdale, Wirral in July 1976. It is assumed that these were 'migrants', although it is usual for only local shifts in its distribution to occur. The nearest established colonies of this species are over fifty miles away from our ... boundaries." Shaw (1998) adds "several at Hockenhull Platts on an unspecified date in the 1980s" and "one at Bromborough on 7th June 1982"; he considered the reports to be reliable. Whether this species has ever really been a resident of Cheshire or Lancashire is doubtful.

In the periods covered by the present work, there are the following records: (period 1) Fiddler's Ferry power station nature reserve (SJ5585/6) in 1992 and Little Budworth (SJ5965) in 1994; (period 2) Fiddler's Ferry (again, and by the same person) in 2003, and Moore (SJ5785) and Freeman's Copse, Ellesmere Port (SJ4076) in 2005; (period 3) the Shavington by-pass at Weston, near Crewe (SJ7352) in July 2012. A suggestion by Shaw (2006) that the Moore example, apparently seen by two observers, and the Ellesmere Port example, seen by another observer, were the same individual, is considered by the present author to be highly improbable. Essentially a species of chalk downland, it is not one which would be expected at any of the above-mentioned sites, or indeed anywhere in these counties; it is possible that all the sightings were of released captive-bred butterflies. It is also possible that some of the records could have been misidentifications: in theory, the species is unmistakable, but in practice, in going through the "big butterfly count" records in latter years the author has found that not a few inexperienced observers have claimed sightings of *M. galathea* which could not possibly have been correct. The record in period 3 on the Shavington by-pass is however attested by a photograph by R. Benson (Shaw, 2013). There were no photographs to support any of the others (B.T. Shaw, pers. comm.) and having examined some of the locations where they were allegedly seen (Moore and Fiddler's Ferry) the author inclines to the opinion that they were erroneous.

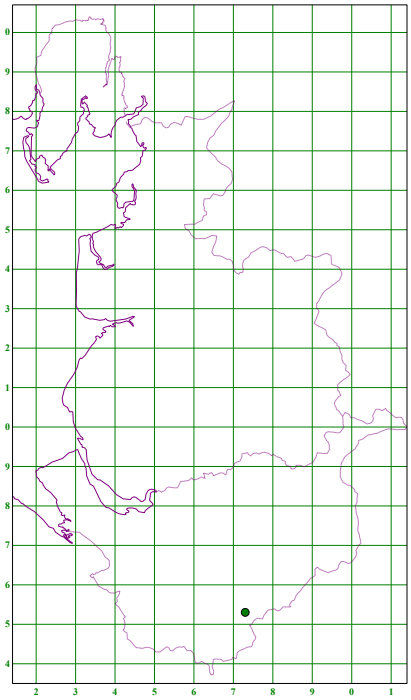
Melanargia galathea 1990-1999



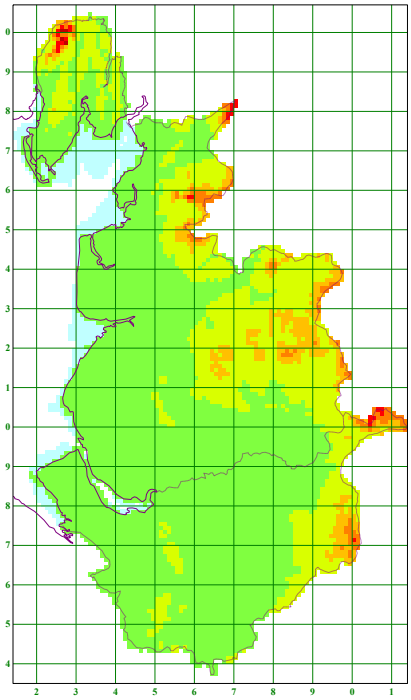
Melanargia galathea 2000-2009



Melanargia galathea 2010-2019



Altitude



GRAYLING, *Hipparchia semele* (Linnaeus, 1758)


Ainsdale 17.9.1989


Formby 7.7.2018


Ainsdale 27.7.2019

Distribution. Whitehead (1986) stated: "In the middle of the [nineteenth] century the Grayling was local but plentiful at New Brighton and Bidston Heath, and common at Waterloo and Crosby. In 1890 the species was abundant on all coast sandhills from the Dee to Southport and also on Bidston Hill. There was an upsurge of Graylings at Red Rocks, Wirral, in 1975, and it is regularly recorded there now and on some other suitable habitats on the coastal fringe from Thurstaston to Ainsdale." This distribution has continued much the same, and although the maps seem to show a slight reduction in period 3, in fact there were more records overall in that period than in period 1.

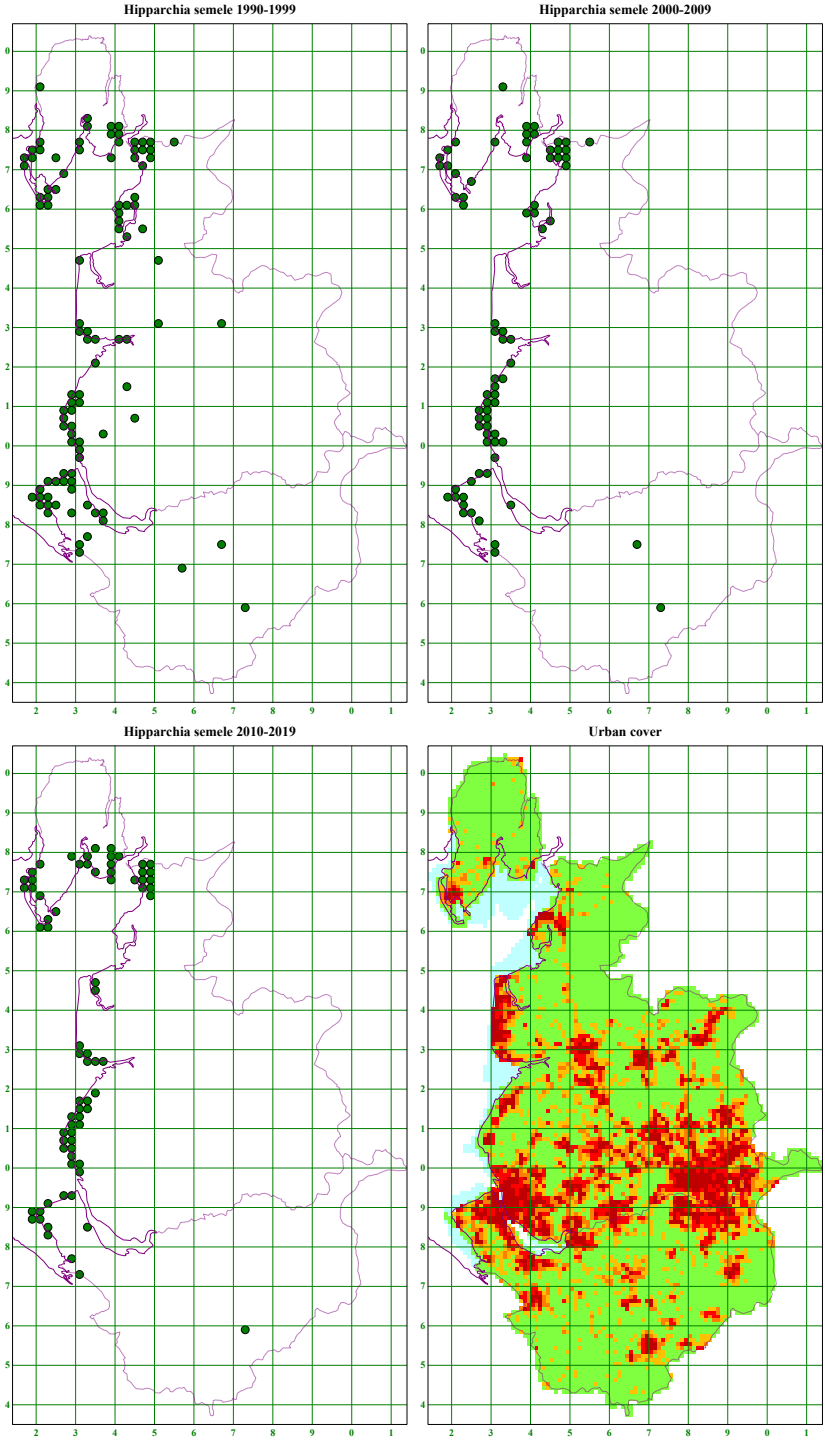
The species also occurs around Morecambe Bay and in the Furness, and there were tenuous colonies at two isolated inland sites on salt flashes in Cheshire, near Northwich (SJ6674) and Sandbach (SJ7259), and one at a sand quarry near Delamere (SJ5769) in the early 1990s. Historically, Day (1903) and Smith (1948) gave Malpas, Duckington Hill and Bickerton as inland breeding sites in Cheshire. The map for period 1 shows a few inland records in Lancashire; these seem improbable and could be misidentifications. A historic record from SJ98 (site unspecified, but this square is to the east of Stockport) in or shortly after 1939, also seems improbable.

Habitats. The coastal sites are on sand dunes. Around Morecambe Bay the favoured biotope is limestone pavement. The inland colonies in Cheshire were salt flashes and a sand quarry.

Hostplants. Grasses; on the coast Marram grass *Ammophila arenaria* is probably the main host.

Broods. A single annual brood, from late June to early September.

Behaviour. This butterfly flies low and quite fast over warm sunny surfaces, often settling and basking on the hot sand or stone, though always with wings closed (lateral basking) and very inconspicuous. Favoured nectar sources include Ragwort *Senecio jacobaea*, Sea Holly *Eryngium maritimum* and Thistles. It is not as mobile as some Satyrines, and populations tend to acquire their own individual characteristics, especially as regards the eye-spots on the underside, depending on the type of biotope which they inhabit, with little if any interchange between populations.


Hipparchia semele 1990-1999
Hipparchia semele 2000-2009
Hipparchia semele 2010-2019
Urban cover

GATEKEEPER, *Pyronia tithonus* (Linnaeus, 1771)

2 males, Swallow Wood, Hollingworth 25.7.2016

Female, Altrincham 25.7.2011

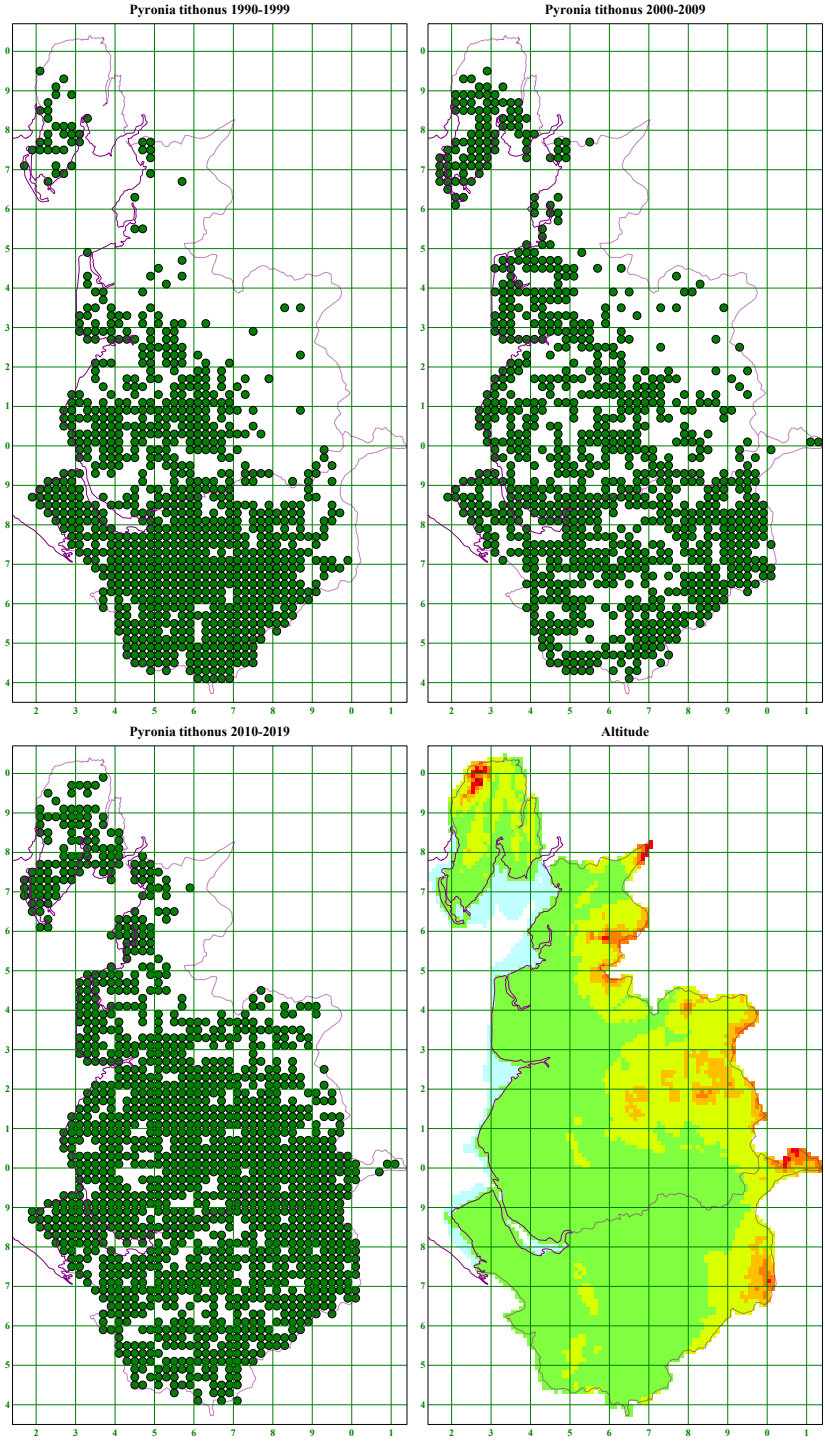
Pomona Docks 21.7.2019

Extra-spotted var, Ainsdale 7.7.2018

Rakewood 8.8.2010

Distribution. Prior to the 1990s, *P. tithonus* was localised, and in Cheshire and Lancashire more or less confined to the west. Boyd (1946) found that in the 1930s it was "virtually unknown on the Cheshire plain", but by the early 1980s it had become extremely common in south-west Cheshire and the Wirral, but still virtually absent from east Cheshire (Rutherford, 1983 and Shaw, 1998). In south Lancashire, including Greater Manchester, at the start of period 1 there were established and increasing colonies around Wigan, Leigh and adjoining districts but not elsewhere; the species then vastly extended its range, spreading northwards and eastwards. The eastward spread of this species is not as well demonstrated by the maps as might have been expected, as much of it had already occurred by the end of period 1; there is however clear evidence of range infilling in the north of VC59 and much of VC60 (West Lancashire) and VC69 (Furness). The extension in range was analogous to those of the Small Skipper *Thymelicus sylvestris* and the Speckled Wood *Pararge aegeria*, but from a different direction (from the west rather than from the south) and not quite as rapid (Hardy, Hind & Dennis, 1993). In 2004 the species had reached the Manchester/Salford city centre, being seen on the Irwell bank in Salford (SJ8289/8389), and an increasing number of reports were being received from the Stockport area. Rochdale and Oldham were reached from 1999; colonisation was slow at first but steady. By the end of period 3, the distribution covered virtually the whole of Cheshire, and Lancashire apart from some hilly districts in the north-east, and appeared fairly stable.

Habitats. The species favours rough grassland, even very small patches in field margins or in towns and cities, or scrub, often with abundant Brambles, which are a popular nectar source, and often with tall grass and bracken. Some shelter-belt is essential. When it co-occurs with the Meadow Brown *Maniola jurtina*, *P. tithonus* often outnumbers that species. The bright orange Satyrines (i.e. *P. tithonus* and the Wall *Lasiommata megera*) seem more associated with warmer, drier localities than the darker brown species. In 1995, which was soon after *P. tithonus* and *P. aegeria* had both colonised the area, an instance of habitat stratification between these two species was observed near the railway and the Manchester ship canal near Flixton


Pyronia tithonus 1990-1999
Pyronia tithonus 2000-2009
Pyronia tithonus 2010-2019
Altitude

(SJ7293); the two species came to occur in very close proximity on the river-bank on the south side of the railway embankment and a lower-level wooded track on the north side, but the shadier habitat suitable for *P. aegeria* was at a slightly but noticeably lower level, and although the two species could be seen within a few yards of each other they did not normally overlap.

Hostplants. Grasses. The precise species used in the area have not been identified.

Broods. One annual brood, flying from mid-July into August. The flight period is shorter and later than that of *M. jurtina*.

Behaviour. Ragwort *Senecio jacobaea* is by far the most popular nectar source with this species, followed by Creeping Thistle *Cirsium arvense.* Bramble *Rubus fruticosus* agg. is also quite often used. The species often feeds along with *M. jurtina* and also the Small Skipper *Thymelicus sylvestris. P. tithonus* is livelier than *M. jurtina* and more inclined than that species to bask with wings open. In the main it exists in quite large colonies (though alleged counts of 1000 in a single six-figure grid square – at Heswall and also at Woolston Eyes – seem a little exaggerated); individuals do however move out of the main colonies and can sometimes be seen in suburban and even urban locations. It tends to frequent biotopes with a little more in the way of shrub vegetation than *M. jurtina*, though there is much overlap and they are often seen together, sometimes taking nectar on the same clump of flowers.
On 10.7.2019, on the south-facing bank of the river Irwell near Mocha Parade, Salford (SJ8299), a male of this species was seen to attempt to court a female Small Tortoiseshell *Aglais urticae*; on the second attempt the *A. urticae* lay on its side apparently pretending to be dead (thanatosis) (Hardy, 2019b).

Male *P. tithonus* attempting to court female *A. urticae*, and thanatosis by the latter, Irwell bank, Salford 10.7.2019

MEADOW BROWN, *Maniola jurtina* (Linnaeus, 1758)


Male, Stretford 10.7.2015


Female, Levenshulme 5.8.2016


Male, Salford 19.6.2018

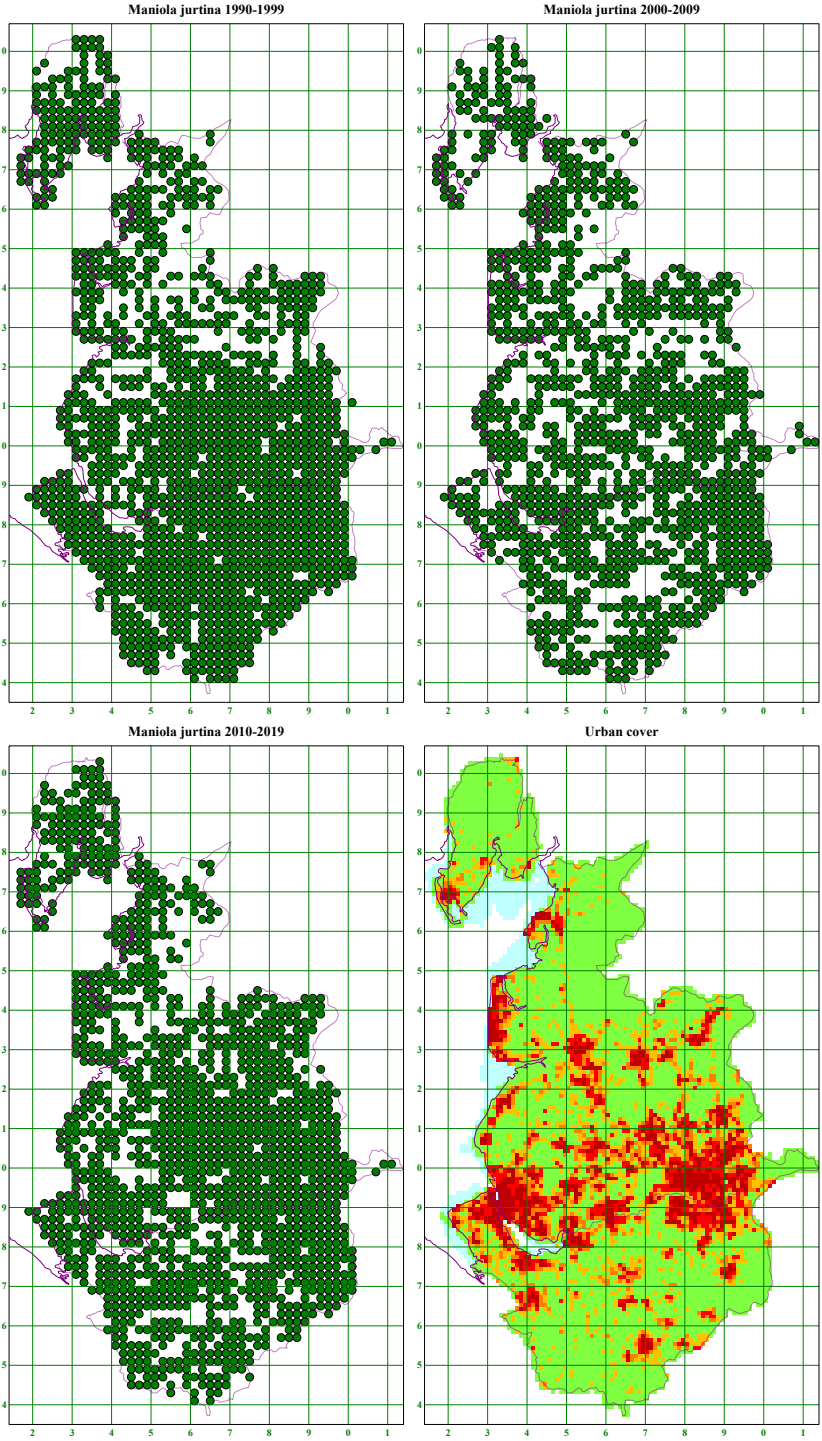

Male with pathological left hind-wing, Stretford 24.7.1991


Female with single fore-wing ocellus, Ardwick, Manchester 16.7.2019


Female with double fore-wing ocellus, Liverpool Innovation Park 13.7.2019

Distribution. In the 1990s, in most years during its flight period this was the commonest butterfly and virtually guaranteed to be seen in any suitable spot. The maps and also the total numbers of records in each of the three periods indicate a stable and general distribution over most of Lancashire and Cheshire. In some localities, including the Mersey Valley (Greater Manchester), however, it has become scarcer and more restricted in recent years, possibly being out-competed by the spreading species such as the Gatekeeper *Pyronia tithonus* and (in the Oldham area) the Ringlet *Aphantopus hyperantus.* The map for period 3 implies a less continuous distribution in most of Cheshire and the west of Lancashire, and yet a more continuous distribution in south-east Lancashire, including Greater Manchester; this may however be due to increased recording effort in those parts. During the 2019 intensive survey of inner-city Manchester and Liverpool, *M. jurtina* was unquestionably the dominant Satyrine in the rough-grassland sites in both those cities. For example, on 13.7.2019 at the Liverpool "innovation park" (SJ3790), 196 *M. jurtina* were recorded as against just 1 *P. tithonus* and 1 *A. hyperantus*. Other species noted at that site (which is unlikely to survive much longer as it is expected to be built over) that day were the Small Skipper *Thymelicus sylvestris* (15), the Small White *Pieris rapae* (5) and the Green-veined White *P. napi* (1).

Habitats. A very tolerant species occurring in most places with a reasonable amount of not too coarse grass. It does like some shelter, and thus frequents field edges, gully sides, and grass areas in scrubland. Woodland edges are favoured and frequently the butterflies roost in the adjacent trees. In general, high ground and warm, dry slopes are less suitable than damper sites; the species does however occur in such sites as a small hollow at the top of Holcombe Hill, at an altitude of 350 m, north of Bury (SD7716). The butterfly prefers medium-length grass; it can tolerate a certain amount of mowing such as the annual cut in hay-meadows or on the river-banks in the Mersey Valley, but not mowing to the extent practised in sports fields and individuals occasionally seen flying over such sites are presumably on passage. Micro-distribution is by no means even; in the most favoured spots it can occur at a very high density, but it will also be present in ones and twos in surrounding less


Maniola jurtina 1990-1999
Maniola jurtina 2000-2009
Maniola jurtina 2010-2019
Urban cover

suitable habitat, presenting a good case for the use of small-scale mapping. *M. jurtina*'s habitat tolerance range is very similar to that of the Large Skipper *Ochlodes sylvanus* and very frequently the two species are found together. It also sometimes occurs with *T. sylvestris*, though the latter tends to prefer hotter, drier sites, and also in some sites with *P. tithonus* or *A. hyperantus*, though here again there are slight differences, *P. tithonus* tending to favour sites with more brambles and scrub, and *A. hyperantus* slightly damper, less open sites.

It is unusual for *M. jurtina* to occupy the same biotope as the Speckled Wood *Parage aegeria*, but here one is so doing, in Princes Park, Liverpool 20.7.2019

Hostplants. Grasses. The precise species used in the area have not been identified.

Broods. It is generally accepted now that this butterfly is always single-brooded with a staggered emergence giving a very long flight period, beginning in mid to late June and continuing through July and August, with sometimes a few individuals surviving into September.

Behaviour. Normally the species can exist at high densities and numbers can be seen taking nectar together, frequently using Creeping Thistle *Cirsium arvense*, Ragwort *Senecio jacobaea,* Brambles *Rubus fruticosus* agg. or (less often) Tufted Vetch *Vicia cracca*. It often takes nectar in company with *O. sylvanus* and *T. sylvestris*, but otherwise its behaviour is very different from theirs: *M. jurtina* tends to skulk in the long grass and take short, slow flights, whereas *O. sylvanus* prefers to perch on adjacent taller vegetation. Sometimes however *M. jurtina* can be very territorial and aggressive; it will attack larger butterflies including large Nymphalines and Pierids; the author can well remember a visit to Roudsea Wood (SD3382) in 1991, when he saw several instances of aggression by *M. jurtina* towards the High Brown and Dark Green Fritillaries *Argynnis adippe* and *A. aglaja* along the woodland rides, and wondered at the time how detrimental this harassment of the Heliconiines might be to their survival. Though *M. jurtina* is not usually aggressive when feeding, and not usually a frequenter of Buddleias *Buddleja davidii*, one was observed in a quite violent interaction with a Peacock *Aglais io* on a Buddleia near "Kirkwood Cottage", Chadkirk (SJ9390) on 29.7.1995. On 16.7.1995, one was seen to chase a bee. Other instances of atypical behaviour noted during period 1 of this survey include one seen feeding on horse dung in the Tame Valley, Denton (SJ9395); the same day one was seen taking nectar from privet *Ligustrum ovalifolium*. On 2.8.1995, a small patch of cultivated marjoram *Origanum vulgare* in the garden of the "1937 social club" near Greenfield (SE0003) was observed to have drawn this species well out of its usual habitat.
This species and *A. hyperantus* are more tolerant of weather conditions than any other butterflies and will fly in almost any conditions including quite heavy rain, provided that the temperature is reasonably high. Although it seems fairly sedentary

it clearly must move a fair amount to be able to colonise sites as readily as it does, and occasionally dispersing butterflies are seen well out of habitat.

SMALL HEATH, *Coenonympha pamphilus* (Linnaeus, 1758)


Compton Chine, Isle of Wight 20.5.1991

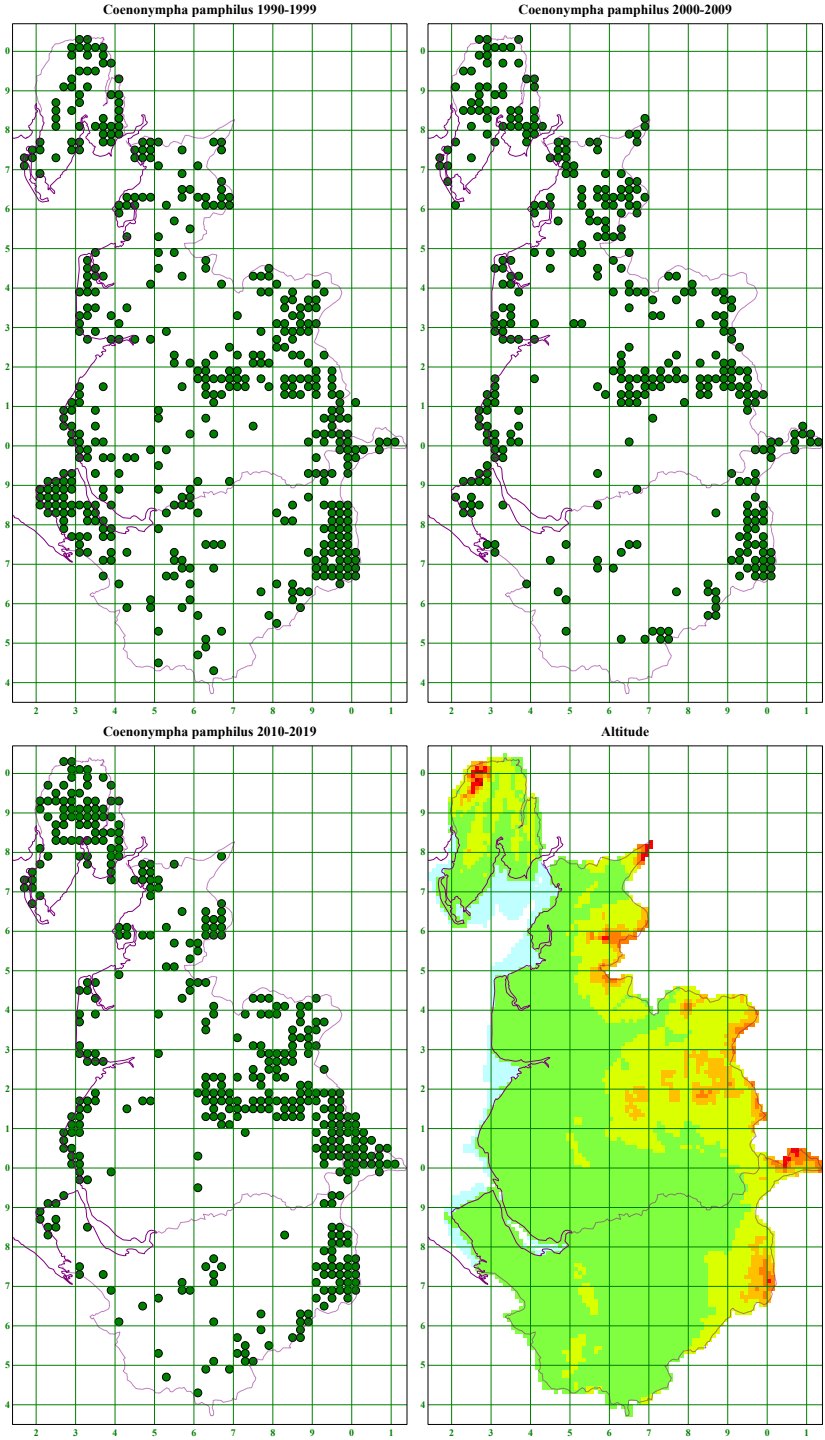

Ainsdale 20.6.2010


Rakewood 7.9.2014

Distribution. Historically, this species was "generally distributed and common [in Cheshire], probably everywhere, except in the immediate neighbourhood of large towns" (Mansbridge, 1940). During the 1990s it underwent losses on the Cheshire Plain and lowland parts of South Lancashire, but remained stable in the higher ground on the Pennine fringe, perhaps indicating an upland refuge effect as described under the Wall *Lasiommata megera*. The map for period 3 however still shows some scattered records in mid and south Cheshire. Currently, the main colonies occur mainly in the hills in the north and east, and on the coast, and there are many records from the Furness and the limestones around Morecambe Bay.
In the Manchester area, B.T. Shaw (pers. comm.) mentioned former colonies in the Heald Green area (SJ8485), which appear to have flourished in the 1980s but died out in 1991; and the species was reported in 1991 and 1993 from the embankment beside the Wilmslow to Altrincham road near the airport tunnel (SJ8083); however searches of this site in 1994 and 1995 indicated that it no longer occurred there; the same applies to the various reports to the north-west of Manchester. In 1997, there were reports from two observers of single sightings on the reclaimed Adswood tip, Stockport (SJ8887), a large expanse of open grassland; but there have been none since and most of that site has been destroyed. A number of vague reports from casual observers in the early 1990s of sightings in the lowland parts of Greater Manchester turned out on investigation to be misidentifications; although it has aimed to exclude doubtful records from the maps it is possible that some incorrect ones may have slipped through.

Habitats. The species requires short, rough grassland, with some shelter from the full force of the wind, usually on hillsides. It is very localised, though it can be numerous when found, and some of its moorland habitats are suitable for no other butterfly. Favoured haunts are sheltered pockets and warm slopes or gullies; most of the open moorland has been severely degraded by a long history of sheep-grazing and is too impoverished to support any butterflies. On the coast, the sandhills are good habitats.

Hostplants. Grasses. The precise species used in the mapped area have not been identified.


Coenonympha pamphilus 1990-1999
Coenonympha pamphilus 2000-2009
Coenonympha pamphilus 2010-2019
Altitude

Broods. In the literature (see, for example, Emmet & Heath (1989) and Pollard & Greatorex-Davies (1997)), this butterfly is mentioned as usually single-brooded in the north of the country, and multi-brooded elsewhere. Records from Lancashire and Cheshire suggest that either the single brood is very extended, as in the case of the Meadow Brown *Maniola jurtina*, or there is more than one brood, as sightings have been reported from May to September.

Behaviour. The butterflies are usually seen flying short distances low over the grass, and rarely take nectar. When thermoregulating, they always bask with wings closed (lateral basking). Although normally found in isolated colonies, vagrants can travel considerable distances.

LARGE HEATH, *Coenonympha tullia* (Müller, 1764)

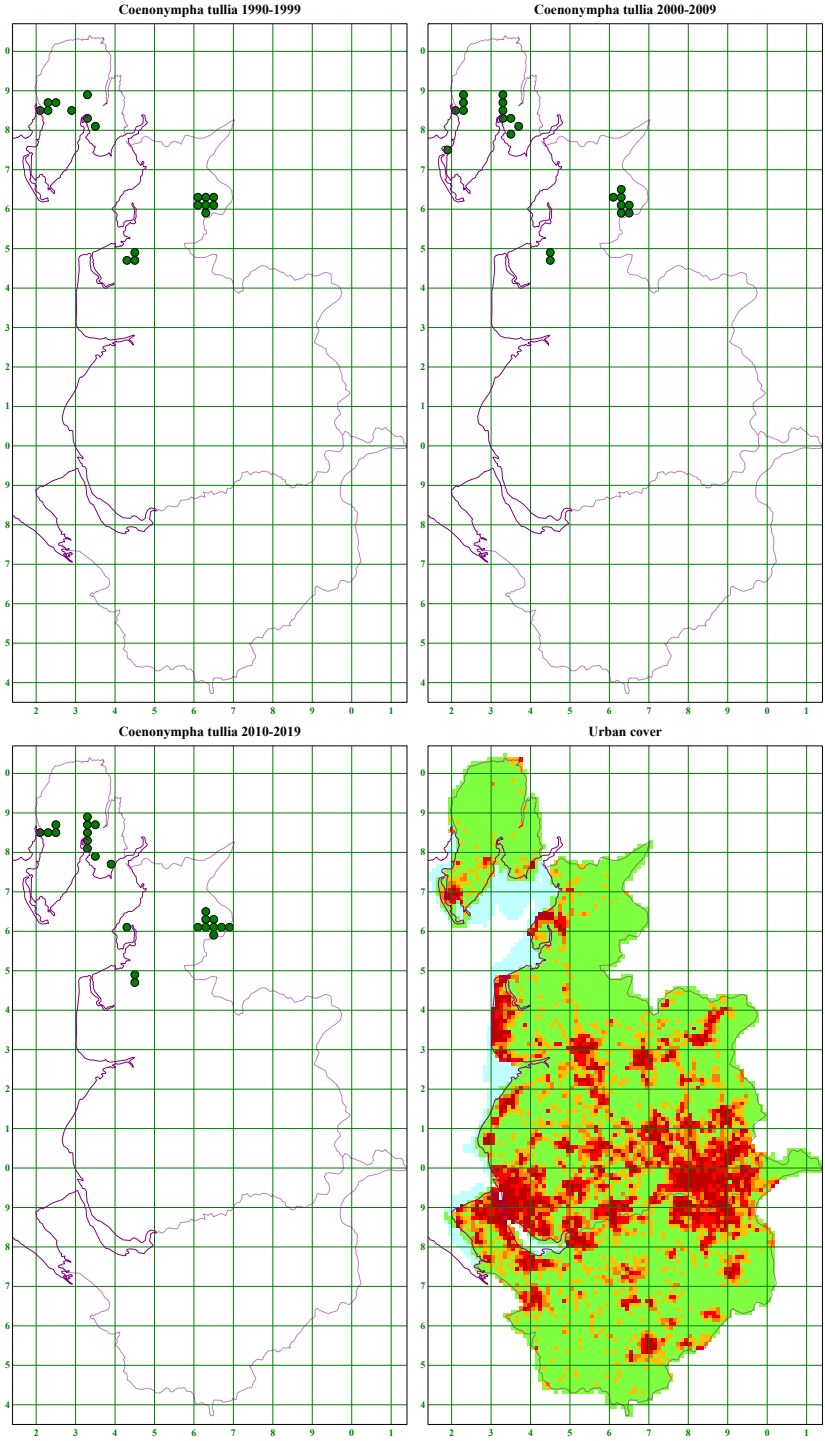
Roudsea 21.7.1991

Distribution. There are historic records from SJ79 (Chat Moss) in 1857 or shortly afterwards, and SJ88 (site unspecified) in 1939; this species was once known as the "Manchester Argus" but that name has long since ceased to be appropriate and it probably became extinct in the Manchester area prior to 1920. Whitehead (1986) states: "In the 1850s, this butterfly was found in profusion on Simmonswood [sic] Moss. Forty years later, it was still common on all the mosses of Lancashire, including Simmonswood [sic]. There was one record in 1907 and two in 1911, but by 1913 it was scarce or extinct on all these sites". Shaw (1998) states that "this species used to occur on many mosslands in Cheshire, with those around Delamere being prime sites ... The last authenticated record is of a specimen ... which was taken from Delamere on 11th July 1929".
Currently, there are two naturally-occurring populations in West Lancashire (VC60): Winmarleigh Moss (SD4447) and around Goodber Fell and Thrushgill (SD66), and a reintroduction has been attempted at Heysham Moss (SD4260). There are good colonies in the Furness (VC69) including at Roudsea (SD3382).

Heysham Moss, SD4260, 7.12.2019, a remnant of a formerly far more extensive mossland. *C. tullia* was introduced to this site in 2014, and was still present in 2019.

Habitats. This is a butterfly of damp, boggy habitats and its range is consequently very restricted.

Hostplants. Mainly Hare's-tail Cottongrass *Eriophorum vaginatum*.


Coenonympha tullia 1990-1999
Coenonympha tullia 2000-2009
Coenonympha tullia 2010-2019
Urban cover

Broods. One annual brood, of short duration, from mid-June to mid-July and thus very different from *C. pamphilus*.

Behaviour. Butterflies of this species are flighty and difficult to approach; they usually occur amongst Heather, from which they fly up as one walks through, fly a fairly short distance and settle, but immediately take off again when they detect movement. Sometimes they take nectar from flowers, such as Bell Heather *Erica cinerea* or Cross-leaved Heath *E. tetralix*.

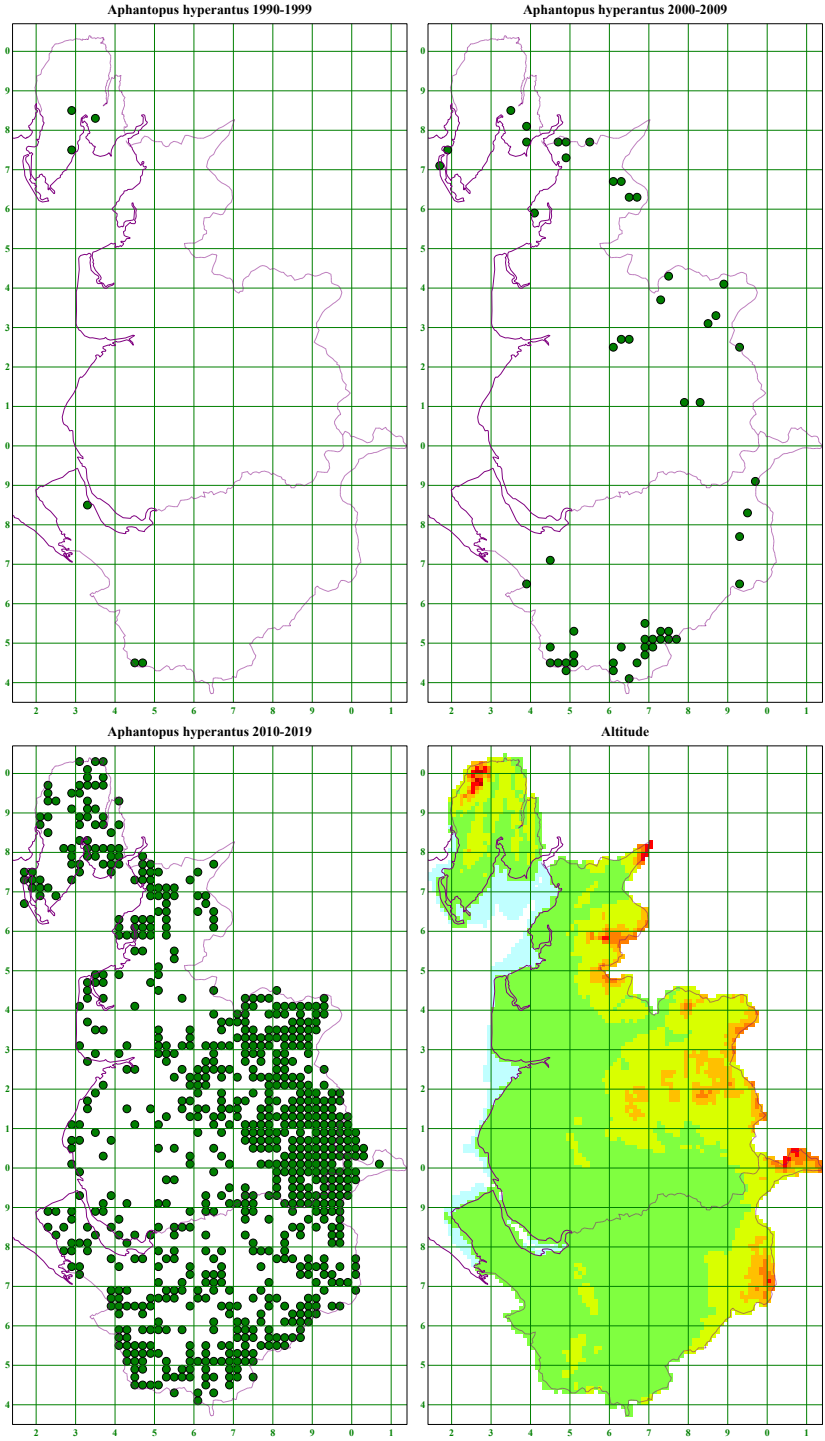
RINGLET, *Aphantopus hyperantus* (Linnaeus, 1758)


Collyhurst, Manchester 26.6.2019


Sedgley Park, Prestwich 17.7.2015


Mating pair, Oldham 14.7.2011

Distribution. Prior to the early 2000s it was a mystery why this species did **not** occur in Lancashire or Cheshire, as it occurred to the south, east and north and there was no lack of seemingly suitable habitat. The map for period 1 shows two records in the extreme south-west (the Wych valley), one in the Wirral, at the New Ferry "butterfly park" (photographed, but of suspect origin?) and a few in the Furness; then the second map shows a considerable increase in the south of Cheshire (VC58), and further records in the east of the vice-county, the east and north of VC59 (South Lancashire), many of them seemingly on the lower slopes of hilly terrain, and some around Morecambe Bay; then comes the astounding increase in period 3, especially around Oldham in VC59. There were no confirmed reports of this species anywhere in the Manchester area prior to 2007, when two were seen and photographed at Prettywood, Rochdale (SD8310), a reclaimed tip. Also in 2007 a report was received of a sighting in the Etherow Country Park (SJ9790/1), and in July 2008 a small colony seemed to have established there, in a small patch of species-rich grassland on the bank of the river. No sightings were reported in the Manchester area in 2009 or 2010, although it was noted that a colony at Bunsal Cob in the Goyt Valley, Derbyshire, discovered by R.L.H. Dennis in 2008 on a small, triangular patch of grassland between the Errwood and Fernilee reservoirs, was persisting, even though no trace had been discovered of any other colonies nearby. Then in 2011 the picture changed. A single sighting was reported by K. McCabe from Flixton (SJ7393), then several were seen by S.B. Smith on 2.7.2011, and later by R.S. Greenwood, at Birtle (Bircle) (SD8212); then on 4.7.2011 S.B. Smith discovered a large colony in the Oldham area, to the north of Park Bridge. During a visit to this locality on 14.7.2011, approximately one hundred and fifty *A. hyperantus* were recorded, and it was easily the dominant butterfly species. The area of distribution spread over squares SD9301, 9302, 9303, 9402 and 9403. Neither Smith nor any other recorder had visited the area for a number of years, and it is therefore a matter for speculation how long the colony has been present. From its size, Smith, who carried out an extensive survey in July 2011 to determine the extent of the


Aphantopus hyperantus 1990-1999
Aphantopus hyperantus 2000-2009
Aphantopus hyperantus 2010-2019
Altitude

distribution, estimates that it may have been established between five and ten years. The Oldham colony has continued to expand since 2011 and in July 2014 the butterfly could be seen in almost any suitable grassland in Oldham. It was also recorded in Hyde (Newton Moor), Droylsden (Sunny Bank Vale), in smaller numbers in the Goyt and Tame Valleys, by B. Smart in the Mersey Valley at Chorlton; and a single butterfly was seen by the author to the south-west of Sale at SJ7590; this was the beginning of its colonisation of the Mersey Valley; this colonisation was slow but in 2019 B. Smart reported over a hundred at Hardy Farm, Chorlton (SJ8192).
As shown by the map for period 3, the species also spread over the remainder of Lancashire and Cheshire, thinly over the whole area and densest in the south and east; also there have been noticeable increases around Morecambe Bay and in the Furness. Colonisation of the Liverpool area had certainly begun, but up to 2019 the species was not very numerous there; most of Manchester however has been colonised including grassland near the city centre.

Habitats. This butterfly favours patches of medium-length rough grassland with shelter belts in the form of scrub or woodland edges. It will share habitats with *Maniola jurtina*, but its requirements are slightly more restricted, as discussed under that species. Especially around Oldham, where the two species occur together, *A. hyperantus* dominates and possibly outcompetes *M. jurtina*. Some of the recently colonised habitats are at mid-altitude, including the rides in Macclesfield Forest where it is now well established.

Hostplants. Grasses. The precise species used in the area have not been identified.

Broods. There is a single annual generation, starting in mid to late June and usually finishing in early August. The emergence usually starts a few days later than *M. jurtina* and earlier than *P. tithonus*.

Behaviour. This butterfly flies low over the grassland and usually does not appear to wander far from its habitat, though clearly there must be some dispersal of individuals. Provided that the ambient temperature is fairly high it will fly in poor weather, even in slight rain. Especially when fresh, the butterflies will bask with open wings for a short time, usually in the morning. To an experienced eye the flight is noticeably different from that of *M. jurtina***,** more persistent and less inclined to settle, but confusion with males of that species is certainly possible: it should be noted that *A. hyperantus* is slightly smaller than male *M. jurtina* and does not show any trace of orange; even the darkest *M. jurtina* show some orange on the underside. *A. hyperantus* does not visit flowers as often as some other Satyrines.
In Oldham, there have been a few occurrences of the *arete* form, with greatly reduced ocelli on the underside.

Family NYMPHALIDAE (sub-family DANAINAE)

MILKWEED (MONARCH), *Danaus plexippus* (Linnaeus, 1758)

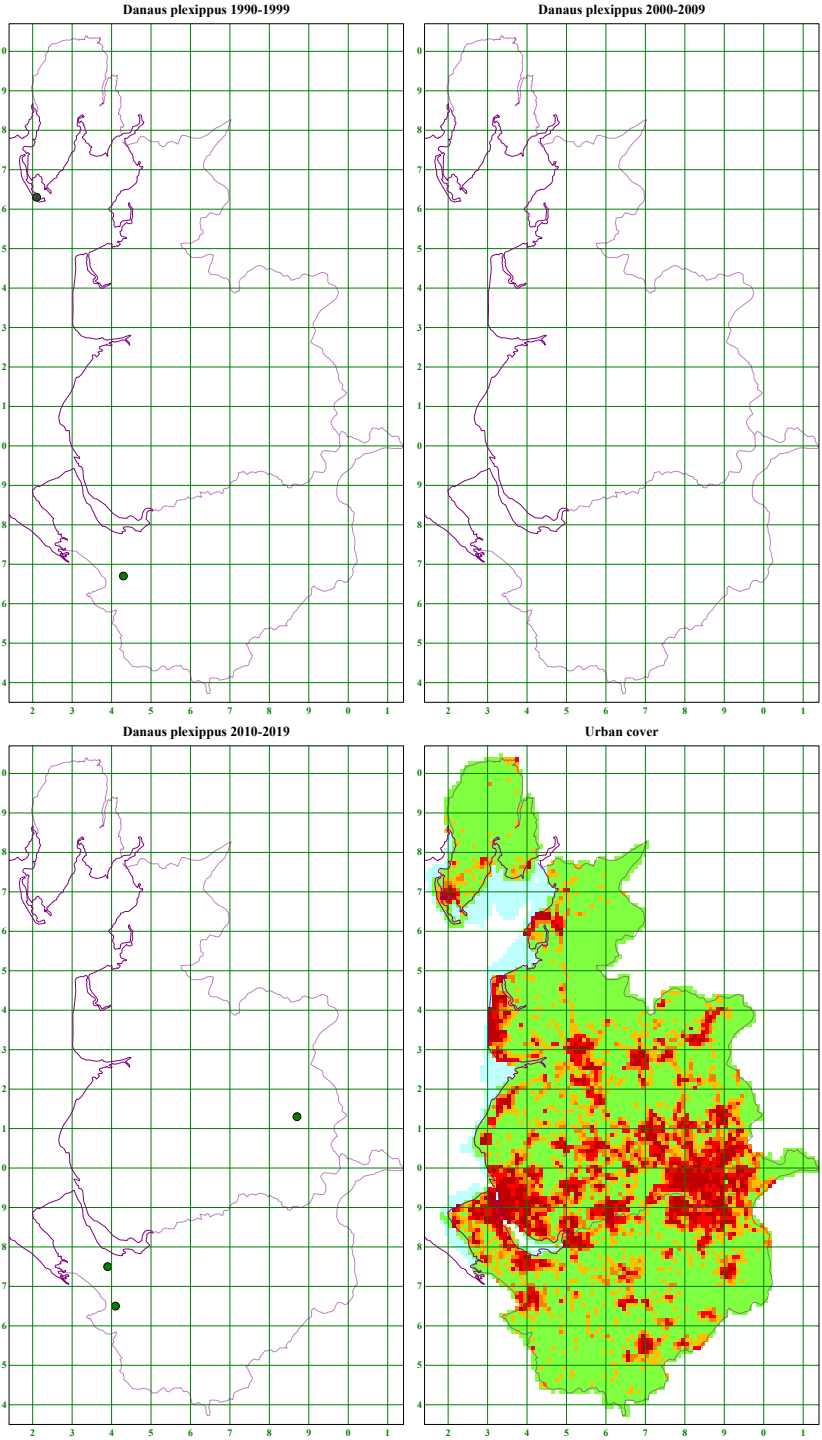

Rochdale Cemetery 19.6.2017


Rochdale Cemetery 19.6.2017

It is just possible that some of the records shown on the maps represent genuine immigrants (the record at Walney Island in 1995 shown on the map for period 1 and maybe the one at Great Sutton in 2013 in period 3?). Unfortunately however there has come a tendency to breed large showy butterflies in captivity and release them in totally inappropriate places at weddings, and apparently also at funerals. Two of the distribution dots in the map for period 3 represent sightings at cemeteries (Handbridge and Rochdale) and there can be little doubt of the origin of those butterflies.

On 17.6.2017, Stephen Costa of Rochdale reported a sighting of two butterflies of this migratory species in Rochdale cemetery, SD878133. During the following week, several other observers, including the author, visited the cemetery and were able to see the butterflies. From photographs, it is clear that at least three different individuals were present. Whilst the origin of the butterflies has not been established with certainty, it seems, sadly, that they were most likely captive-bred and released, probably from Central American stock, and not genuine immigrants. Whatever their origin, however, they had clearly found the location to their liking, even though in the absence of any host-plants it was clearly impossible for them to breed.

The site was a memorial garden, a south-facing hollow in the shape of an amphitheatre, beneath tall trees on sloping ground, and containing numerous cultivated non-native flowering plants. The *D. plexippus* were flying around the garden and frequently alighting on the flowering plants; they probably took nectar from some, though this was not confirmed. . They were also observed basking on the mown grass, and even engaging in territorial disputes. Several times a butterfly was observed descending from the trees behind the amphitheatre, the inference being that they roosted in the trees.


Danaus plexippus 1990-1999
Danaus plexippus 2000-2009
Danaus plexippus 2010-2019
Urban cover