



United Kingdom  
Butterfly Monitoring Scheme

# Annual Report 2012

# UKBMS Annual Report 2012

## The UKBMS

The UKBMS is run by the Centre for Ecology & Hydrology (CEH), Butterfly Conservation (BC) and the British Trust for Ornithology (BTO) and is co-funded by a multi-agency consortium led by Joint Nature Conservation Committee (JNCC) and including the Department of the Environment, Food, and Rural Affairs (DEFRA), Natural Resources Wales (NRW), the Forestry Commission (FC), Natural England (NE) and Scottish Natural Heritage (SNH).

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## Citation

Botham, M.S., Brereton, T.M., Middlebrook, I., Randle, Z. & Roy, D.B. 2013. United Kingdom Butterfly Monitoring Scheme report for 2012. Centre for Ecology & Hydrology.

This report can be downloaded from  
<http://www.ukbms.org/reportsAndPublications.aspx>

Cover photograph of High Brown Fritillary, *Argynnis adippe*. One of the UK's rarest butterflies, the High Brown Fritillary suffered a further decline in 2012 with numbers the lowest since 1978.  
Photograph by Tim Melling

## UKBMS partners



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Department of the Environment, Food, and Rural Affairs, Nobel House, 17 Smith Square, London, SW1P 3JR  
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Natural Resources Wales, Tŷ Cambria, 29 Newport Road, Cardiff, CF24 0TP  
[www.naturalresourceswales.gov.uk](http://www.naturalresourceswales.gov.uk)



National Office Forestry Commission, 620 Bristol Business Park, Coldharbour Lane, Bristol, BS16 1EJ  
[www.forestry.gov.uk](http://www.forestry.gov.uk)



Head Office, Natural England, Foundry House, 3 Millsands, Riverside Exchange, Sheffield, S3 8NH  
[www.naturalengland.org.uk](http://www.naturalengland.org.uk)



Scottish Natural Heritage, Great Glen House, Leachkin Road, Inverness, IV3 8NW  
[www.snh.gov.uk](http://www.snh.gov.uk)

## Acknowledgements

*We would like to acknowledge the financial contribution by the Joint Nature Conservation Committee, the Department of the Environment, Food, and Rural Affairs, Butterfly Conservation, British Trust for Ornithology, Centre for Ecology & Hydrology, Natural Resources Wales, Forestry Commission, Natural England and Scottish Natural Heritage. We are indebted to all the volunteers who co-ordinate and contribute data to the scheme throughout the United Kingdom, as well as to those who allow access to their land and in some cases actively promote butterfly monitoring thereon. We would like to thank the photographers for allowing their superb images to be used in this report.*

*Finally we would like to thank the JRS Document Solutions - part of the support services to the UK Research Councils - for designing and printing the report.*



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Unlike the majority of butterflies in 2012, Chalkhill Blues had a good year, up by 17% over 2011. Photograph by Tom Brereton

## Online resources

Further information on the UK Butterfly Monitoring Scheme, including individual species and site trends, and how to take part in butterfly monitoring can be found at:

**<http://www.ukbms.org/>**

For Wider Countryside Butterfly Survey go to

**<http://www.ukbms.org/wcbs.aspx>**

For online data entry go to

**<http://www.ukbms.org/mydata/>**

For information on Biodiversity Indicators go to

**<http://jncc.defra.gov.uk/page-1824>**

The following links provide more information on the UKBMS partner organisations:

Centre for Ecology & Hydrology:

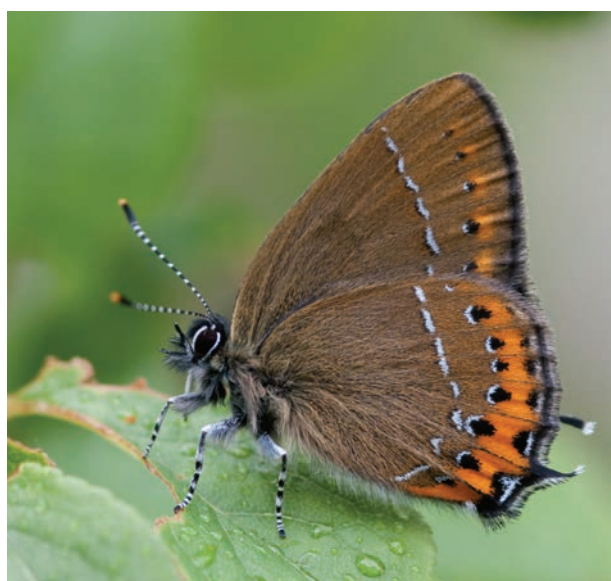
**<http://www.ceh.ac.uk/>**

Butterfly Conservation:

**<http://butterfly-conservation.org/>**

British Trust for Ornithology:

**<http://www.bto.org/>**



Black Hairstreak numbers were down by a staggering 98%. Photograph by Peter Eeles.



# News and research

## NEW REPORT FORMAT

We hope you like the new report format, which represents a radical departure from the previous lengthy format. The latter was popular, but time consuming to produce. The results from a consultation exercise on the report format were that the vast majority of recorders were keen to move to a shorter report published nearer to the start of the new field season. This should be possible from 2014 onwards. The new short report will sit alongside a more detailed report produced every five years. As in previous years we will continue to publish a Table of Trends on the UKBMS website around the time of the National Recorders meeting in March, whilst the UKBMS website will be fully updated with species and site trends by the start of the field season in April.

## CUTTING DOWN ON PAPER COPIES OF THE REPORT

The UKBMS partner organisations are looking to reduce the use of paper where possible. While we will continue to produce paper copies of the new UKBMS report format for the time being, we are looking at ways to reduce the number of printed copies. If you would prefer to receive your copy of the UKBMS report electronically, please contact [transect@butterfly-conservation.org](mailto:transect@butterfly-conservation.org) to let us know. We will continue to send paper reports to those who currently receive them unless we are instructed otherwise.

## UKBMS ONLINE

Transect Walker software which was launched in 1998 has been highly successful in enabling transect data to be entered and collated through a single platform. The system is showing signs of age and is being superseded by a new online system, which offers many advantages including regular updates to any fixes and enhancements, a mapping component and instant feedback of sightings and results across the network of UKBMS sites. The new online data entry system was fully tested over the winter of 2012-13 – firstly by the UKBMS staff and then by a panel of volunteers who were experienced with the previous, stand-alone version of Transect Walker. Following this testing, and incorporating many improvements, the new system went live on 9th April 2013. Details and instructions were initially circulated to all branch transect co-ordinators, and more widely later that week via email to a full list of transect walkers.

The initial response has been fantastic. By the end of May 2013, there were already over 360 registered users on the site, with these user accounts linked to (and able to enter data for) over 520 sites, with counts of nearly 20,000 butterflies entered. Details for 45 new transect routes had already been entered onto the system. Another benefit is that we have taken the opportunity to acquire and digitise many more route maps as part of the registration process. It is now very easy for volunteers to see how species are progressing across the UK throughout the year, and this is a very popular feature. In addition to butterfly records, volunteers are also encompassing the ability to record other species along their routes. About 85 non-butterfly species had been entered by the end of May

2013 including moths, birds, beetles and dragonflies. Most feedback received has been extremely positive, particularly about the ease of data-entry.

Over the coming year, further enhancements are planned including the facility for branch co-ordinators to validate and comment on the records that are coming in from their area, additional reporting functionality for transect data, online data entry for reduced effort methods including timed counts and integration with the online Wider Countryside Butterfly Survey.

## CHANGES TO ANALYSIS METHODS

After a phase of development and testing that has been detailed in previous reports, we intend to implement a new method of analysis for UKBMS data in the future. A paper describing the method has been published in a widely respected peer-reviewed scientific journal, *Methods in Ecology and Evolution* (to find online, search for DOI: 10.1111/2041-210X.12053). Briefly, the method uses all butterfly counts in a season to estimate the seasonal pattern of butterfly counts for that year, and uses this to weight observed counts when calculating annual population indices and trends over time. Compared to the current analysis approach, the new method has several advantages. Firstly, it provides a more precise method for measuring butterfly trends. Secondly, it enables us to include all transect counts within the assessment of trends, thereby making more efficient use of recorders' efforts and covering more sites within the geographic range of each species. Finally, for reporting trends in the future, we intend to combine data from traditional transects and data from the Wider Countryside Butterfly Survey, enabling butterfly trends to be more representative.

## MOTHS ON TRANSECTS

As part of the switch over to online data entry, we have recently extracted moth records entered into Transect Walker software. This has been an interesting exercise in gaining an overview of day-flying moth recording on transects, although more data is likely to have been collected that has not been entered into this software, especially data from the original BMS.

The data extraction exercise reveals that there is Transect Walker data for 122 species, with 13,622 records (by individual date at the site level) and 109,485 individuals counted from 403 sites. The amount of moth data captured through Transect Walker has risen rapidly from fewer than 200 records by 2000 to almost 20,000 records by 2011.

*Six-spot Burnet. Photograph by Ben Woodward*

The ten most frequently recorded species (in descending rank order) are Silver Y, Six-spot Burnet, Cinnabar, Burnet Companion, Speckled Yellow, Common Heath, Mother Shipton, Chimney Sweeper, Narrow-bordered 5-spot Burnet and Five-spot Burnet. These are also the most abundant species, with Six-spot Burnet in pole



position with more than twice the number counted than any other moth. Over the last decade there appears sufficient data available to calculate collated indices and a temporal trend for these day-flying species and possibly others, which would be a valuable addition to the UKBMS.



Mother Shipton, a common day flying moth regularly recorded on transects.  
Photograph by Tim Melling.

Furthermore, there seems a lot of potential to improve monitoring coverage of day-flying species, including Priority Species such as Narrow-bordered Bee Hawkmoth and Cistus Forester. There have been a number of local initiatives in this respect (e.g. in Dorset), and moth recording is a feature of the Wider Countryside Butterfly Survey. With the new online system it will be easier than ever to enter records of other wildlife, which provides a real opportunity to boost coverage of day-flying species.

For further information on counting moths on transects, including regional priorities contact

**[transect@butterfly-conservation.org](mailto:transect@butterfly-conservation.org)**

## NEW 'DOOMSDAY' REPORT ON THE HEALTH OF THE UK'S WILDLIFE

In May 2013, Sir David Attenborough launched a ground breaking report, the *State of Nature*<sup>#</sup>, compiled by a coalition of 25 of the UK's leading wildlife conservation and research organisations including Butterfly Conservation. Trends in abundance, distribution or both were compiled for 3,148 plant and animal species. The report outlines that a shocking 60% of wildlife species assessed have declined over the last 50 years, whilst 31% have declined strongly. Population trends from the UK Butterfly Monitoring Scheme used in the report, show that 50% of butterflies declined in abundance between 1976 and 2011, whilst 27% have declined strongly. A novel aspect to the report was the development of a new Watchlist biodiversity indicator to measure the changing abundance of conservation Priority species, based on a sample of 155 species with suitable data (13% of the total), including 19 butterfly species. The Watchlist Indicator shows that Priority wildlife species have declined by a massive 77% since 1970 and continue to decline, with abundance down by 18% between 2000 and 2010. Of the 19 butterfly species included in the Watchlist Indicator, 74% have declined, whilst 63% have declined strongly.

## NATIONAL TRUST BUTTERFLY MONITORING AND PERFORMANCE

The National Trust is making a crucial contribution to monitoring UK butterflies, hosting more than 10% of all sites monitored each year across England, Northern Ireland and Wales. Monitoring effort shows a year on year increase with 114 sites monitored in 2011. There is now sufficient coverage to assess long-term trends for 48 of 58 regularly occurring species across National Trust land, with two more species likely by 2017 (representing 86% of all species). The majority of monitoring sites sample higher quality land for biodiversity, with 7% of sites falling within protected areas, enabling accurate trends to be assessed for specialist species which are good indicators of habitat condition. Coverage could be improved through the establishment of new annual monitoring effort in target regions including the Lake District, Snowdonia, on the Gower Peninsula, in the New Forest, and along the coast of south Devon and south Cornwall. It is vital to ensure that current butterfly monitoring effort is maintained, whilst workshops with BC involvement could help fill coverage gaps.

On National Trust land, more species had declining abundance trends (52% of species), than stable or increasing trends.

This result was not surprising, and reflects the situation for non National Trust land (46% of species declining) in the sampled countries and for the UK as a whole (50% of species declining). Composite measures of butterfly abundance showed that wider countryside butterflies are in long-term decline (measured over 33 years) at both National Trust and non National Trust sites. On the positive side, habitat specialist species were performing significantly better on National Trust land over the long term (measured over 20 years), with an apparent increase of 24% compared to a significant decline of 24% on non National Trust land. This result is even more encouraging considering that for the UK as a whole, habitat specialists are in long term decline. Several Priority species have performed better on National Trust land over the long term than elsewhere, including Dingy Skipper, Grayling, Grizzled Skipper, High Brown Fritillary, Marsh Fritillary, Small Blue, Small Heath and Small Pearl-bordered Fritillary, yet no Priority species have more favourable trends on non National Trust land. Improved targeting and tailoring of management are likely causal factors of why (on average) the National Trust is out-performing other land management bodies. Nine Priority species are continuing to decline on National Trust land and there is a need to understand what management approaches work to aid their recovery. Population trends in habitat specialist butterflies are used as a Governmental biodiversity indicator in English, Scottish and UK Governments so these results have wider implications. An annual update of butterfly performance on National Trust sites is recommended, containing the latest wider countryside and habitat specialist composite trends. Such an output would be valuable to the National Trust for overall conservation performance assessment.

<sup>#</sup>Burns, F., Eaton M.A., Gregory R.D., et al. (2013) State of Nature report. The State of Nature partnership.





## RESEARCH

### Ongoing projects

The UKBMS data continues to be used for a wide range of research projects. Each year we receive a high number of data requests and the data has been used as a model example of long-term ecological data by lecturers to teach students, particularly with regards to the effects of climate change on insect populations. The following is a brief description of some of the larger projects using UKBMS data in 2012:

#### Population resilience to extreme climatic events

A study at CEH being led by Dr Tom Oliver in collaboration with BC is using UKBMS data to consider how different species respond to extreme weather events such as drought and unusually cold winters. The research shows that several species are particularly drought sensitive. Colder winters generally benefit butterflies, but species overwintering as adults or pupae and migrant species appear relatively more susceptible. Within individual species, responses to these extreme events vary across UKBMS sites, and Tom is attempting to explain this variation in terms of the local intensity of the extreme weather and also site and landscape attributes. For example, for the Ringlet butterfly he found that the total amount and configuration of broadleaved woodland around sites affected the population sensitivity to- and recovery from- the 1995 UK drought event (populations were more resilient in landscapes with more, and less-fragmented, woodland). He is now extending this approach to other butterfly species.

### Publications

**Brereton, T., Pilkington, G., & Roy, D.** (2012). Conserving violet-feeding fritillary butterflies at Marsland Nature Reserve. *British Wildlife* 24, 1-8.

**Devictor, V., van Swaay, C., Brereton, T. et al** (2012) Uncertainty in thermal tolerances and climatic debt reply. *Nature Climate Change*, 2, 638-639. DOI: 10.1038/NCLIMATE1347.

**Curtis, R.** (2012) The importance of resources in determining butterfly population abundance at multiple scales. PhD Thesis. University College London, London.

**Fox, R., Brereton, T., Asher, J., Botham, M., Middlebrook, I., Roy, D. & Warren, M.** (2012) The State of the UK's butterflies. *British Wildlife*, 23, 229-238. ISSN: 0958-0956.

**Mair, L., Thomas, C.D., Anderson, B.J., Fox, R., Botham, M. & Hill, J.K.** (2012) Temporal variation in responses of species to four decades of climate warming. *Global Change Biology*, 18, 2439-2447. DOI: 10.1111/j.1365-2486.2012.02730.x.

**Oliver, T., Roy, D.B., Brereton, T. & Thomas, J.A.** (2012) Reduced variability in range-edge butterfly populations over three decades of climate warming. *Global Change Biology* 18, 1531-1539. DOI: 10.1111/j.1365-2486.2012.02737.x.

**Oliver, T.H., Gillings, S., Girardello, M., Rapacciuolo, G., Brereton, T.M., Siriwardena, G.M., Roy, D.B., Pywell, R. & Fuller, R.J.** (2012) Population density but not stability can be predicted from species distribution models. *Journal of Applied Ecology*, 49, 581-590. DOI: 10.1111/j.1365-2664.2012.02138.x.

**Oliver, T.H., Thomas, C.D., Hill, J.K., Brereton, T. & Roy, D.B.** (2012) Habitat associations of thermophilous butterflies are reduced despite climatic warming. *Global Change Biology*, 18, 2720-2729. DOI: 10.1111/j.1365-2486.2012.02737.x.

#### A trait-based approach to understanding changes in Lepidoptera distributions

As part of a collaborative project between CEH, BC, Rothamsted Research and the University of York, PhD student Suzanna Mason has recently started investigating changes in UK butterfly and moth distributions, and trying to explain these changes in terms of species traits.

#### Developing a new indexing method for long-term monitoring data

Dr Steve Freeman, CEH, and his PhD student, Eleni Matechou, at the University of Oxford, have been working on developing a new method to calculate butterfly population indices from the UKBMS data. The new method has a lot of potential as the single model gives (1) an absolute abundance estimate without the need for marking (2) indices for separate broods (3) a new phenology statistic - mean date of emergence, and (4) mean residence rates by latitude.



Large White. Photograph by Steve Chilton

**Pateman, R.M., Hill, J.K., Roy, D.B., Fox, R. & Thomas, C.D.** (2012) Temperature-dependent alterations in host use drive rapid range expansion in a butterfly. *Science* 336, 1028-1030. DOI: 10.1126/science.1216980.

**Powney, G.D., Broaders, L.K. & Oliver, T.H.** (2012) Towards a measure of functional connectivity: local synchrony matches small scale movements in a woodland edge butterfly. *Landscape Ecology*, 27, 1109-1120. DOI: 10.1007/s10980-012-9771-y.

**Soulsby, R.L. & Thomas, J.A.** (2012) Insect population curves: modelling and application to butterfly transect data. *Methods in Ecology and Evolution*, 3, 823-841. DOI: 10.1111/j.2041-210X.2012.00227.x.

**Suggitt, A.J., Stefanescu, C., Paramo, F., Oliver, T., Anderson, B.J., Hill, J.K., Roy, D.B., Brereton, T. & Thomas, C.D.** (2012) Habitat associations of species show consistent but weak responses to climate. *Biology Letters*, 8, 590-593. DOI: 10.1098/rsbl.2012.0112.

**Westgarth-Smith, A.R., Roy, D.B., Scholze, M., Tucker, A. & Sumpter, J.P.** (2012) The role of the North Atlantic Oscillation in controlling U.K. butterfly population size and phenology. *Ecological Entomology*, 37, 221-232. DOI: 10.1111/j.1365-2311.2012.01359.x.

**Woodcock, B.A., Bullock, J.M., Mortimer, S.R., Brereton, T., Redhead, J.W., Thomas, J.A. & Pywell, R.F.** (2012) Identifying time lags in the restoration of grassland butterfly communities: a multi-site assessment. *Biological Conservation*, 155, 50-58. DOI: 10.1016/j.biocon.2012.05.013.

# Background and methods

*In the UKBMS, data on the population status of UK butterflies is derived from a wide-scale program of site-based monitoring.*

In the UKBMS, data on the population status of UK butterflies is derived from a wide-scale programme of site-based monitoring. The majority of sites are monitored by butterfly transects. The transect method, which was established in 1973-75, involves weekly butterfly counts along fixed routes through the season made under strict weather, recording area and time of day criteria<sup>1</sup>.

Weekly counts for each species are summed to generate annual abundance indices. For sites with missing weekly counts, a statistical model (a Generalised Additive Model, 'GAM') is used to impute the missing values and to calculate the index<sup>2</sup>.



Marsh Fritillary.  
Photograph by Tim Melling

For a number of habitat-specialist species (especially the fritillaries) two 'reduced effort' methods are also used to monitor annual abundance, especially in more remote parts of the UK: adult timed counts<sup>3</sup>

<sup>1</sup>Pollard, E., and Yates, T.J. (1993). *Monitoring Butterflies for Ecology and Conservation*. Chapman and Hall, London

<sup>2</sup>Rothery, P., and Roy, D.B. (2001). Application of generalized additive models to butterfly transect count data. *Journal of Applied Statistics* **28**:897-909.

and larval web counts<sup>4</sup>. In both methods, systematic recording is made on single days in suitable weather (when UKBMS recording criteria are met), with the counts converted to an index that accounts for both the size of the colony and the time in the season when the count was made.

Data from all past and present transects, timed counts and larval web counts from monitored sites is combined each year to derive regional and national 'Collated' Indices (CI) and to estimate trends over time. Because not all sites are monitored each year, a statistical model (using log-linear regression) is needed to estimate missing values and to produce indices and trends. The model takes into account the fact that for a particular butterfly species, some years are better than others (a year effect), typically due to the weather, and some sites support larger populations than others (a site effect). The precision of indices and trends is estimated by a further statistical technique called 'bootstrapping'.

<sup>3</sup>Warren, M., Thomas, C.D., and Thomas, J.A. (1981). *The Heath Fritillary*. Survey and conservation report. Unpublished report to the Joint Committee for the Conservation of British Insects. Butterfly Conservation, Wareham.

<sup>4</sup>Lewis, O.T., and Hurford, C. (1997). Assessing the status of the Marsh Fritillary (*Eurodryas aurinia* Rott.) – an example from Glamorgan (UK). *Journal of Insect Conservation* **1**:159-161.

## Sample coverage

*In 2012 1,106 sites were monitored, including 965 in England, 51 in Wales, 70 in Scotland, 24 in Northern Ireland and five on the Channel Islands.*

There were 991 sites monitored using standard transects, whilst 115 were monitored using other methods such as timed counts and larval web surveys. Incredibly, given the continued poor weather throughout 2012, 1,027 (93%) of these sites produced an index for at least one species.

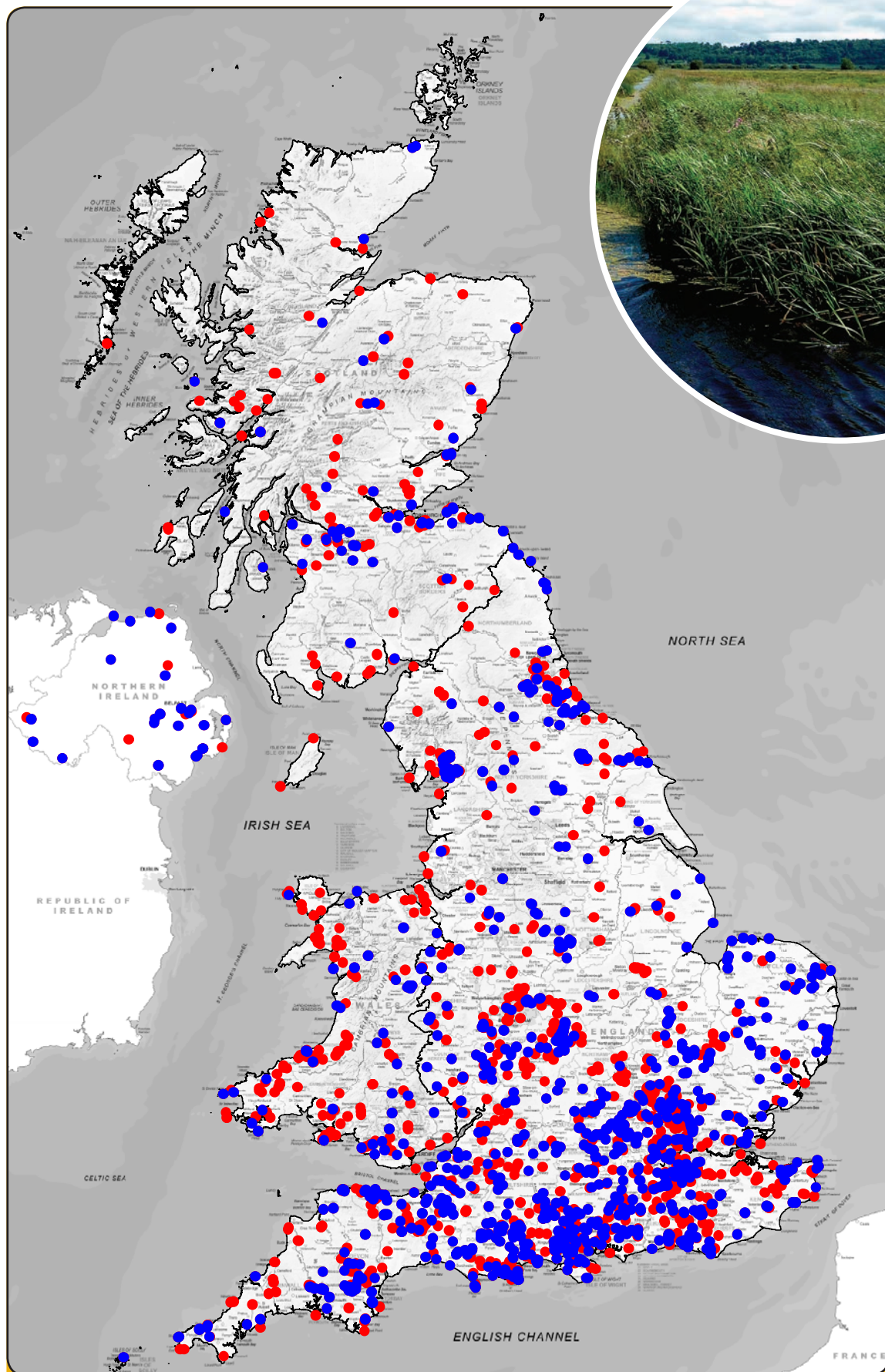
Since 1976 a total of 2,105 sites have been monitored. There is approximately a 5-10% site turnover each year. In 2012 a further 85 new sites were established and monitored for the first time. seven of these were in Scotland, and two in Wales whilst the rest were in England. Within England, Norfolk had the greatest number of new sites with 10, whilst close behind were Warwickshire and the West Midlands, both with nine.

*"Despite the deluge data were collected from over a thousand sites for the third year running"*



Heath Fritillary numbers were the lowest since 1976 after signs of recovery in recent years. Photograph by Keith Warmington





West Sedgemoor - ranked 4th in the UK in terms of the number of butterflies counted in 2012. Photograph by Tom Brereton.

Figure 1. Sites producing a site index in 2012 (blue points) and sites producing site indices prior to 2012 (red points)





# The 2012 season

## SUMMARY

2012 was a disaster year for butterflies, with the year ranking as the worst since records began 37 years ago. The dismal highlights from the survey were that:

- 300,000 fewer butterflies were counted in 2012 compared to 2011
- The average number of butterflies counted per site was the lowest since monitoring began
- 52 of the 56 species assessed suffered declines between 2011 and 2012
- 20 species showed a greater than 50% annual decline
- 13 species had their worst ever year on record
- Abundance across all species combined was lower than in any other year in the series

The 'washout summer' was largely to blame for the declines. 2012 was the wettest summer for a hundred years and the fourth wettest since records began in 1727. Unsettled weather with relentless rain and dull weather meant that emergence was reduced, whilst those butterflies that did emerge struggled to find food, shelter and mating opportunities, reducing survival and leading to much lower numbers in subsequent generations.

Unlike recent years, where the majority of species have appeared earlier than the series average, 2012 was a much more mixed year. Over half of species showed a later date of mean abundance than the series average, yet many spring species were brought out early by the warm weather leading up to the monitoring season.



Large Heath has significantly increased since 1990, but in 2012 numbers were down by 70%. Photograph by Paul Kennedy

"2012 produced the lowest combined index ever making it the worst year since monitoring began"



All three of the UK's most widespread white butterflies, Large, Small and Green-veined, had their worst year on record. Photograph by Steve Covey

## MONTHLY ROUND-UP

With mild weather in **JANUARY** reaching a maximum of 14°C in *Devon* and with above average sunshine, seven species emerged early in southern counties including **Red Admiral** (1st), **Peacock** and **Brimstone** (2nd), **Small Tortoiseshell** (6th), **Comma** and **Painted Lady** (8th) and a remarkably early **Speckled Wood** on the 13th in *Cornwall*. **FEBRUARY** saw a return to more typically wintry weather around the seasonal average; consequently few butterflies were seen. However, a spell of warm weather towards the month end led to the emergence of **Small White**, with sightings on the 23rd in *South Wales* and *Oxfordshire*.

Warm, dry weather continued into **MARCH**, with temperatures peaking at almost 24°C in *Aberdeenshire* on the 27th. By mid-month a hosepipe ban was put in place across south east England, with a summer drought more likely than a deluge. It was the third warmest March since 1910, with a further 11 species making their first appearance, including **Holly Blue** (9th), **Green-veined White** (10th), **Large White** (11th), **Orange-tip** (11th), **Clouded Yellow** (19th), **Small Copper** (23rd), **Grizzled Skipper** (24th), **Green Hairstreak** (24th), **Wall** (24th), **Small Heath** (26th) and a very early **Small Blue** on the 30th on the *Isle of Wight*.

With continued good weather early in the month a further three spring specialists emerged in **APRIL** including **Pearl-bordered Fritillary** (1st), **Duke of Burgundy** (6th) and **Dingy Skipper** (6th), whilst a **Camberwell Beauty** was also seen in *Middlesex* on the 1st. The warm early spring weather helped advance the mean flight date of *Small Copper* by almost two weeks beyond the series average. Our increasingly chaotic weather took a change for the worse from the



middle of the month onwards, making April the wettest on record and the coldest since 1989. There were immediate consequences for spring butterflies, with **Orange-tip**, **Dingy Skipper**, **Grizzled Skipper** and **Dingy Skipper** reduced in numbers by between a quarter and a third over 2011 levels, whilst **Green Hairstreak** collapsed by 68%. Species which overwinter as adults fared worst with **Brimstone** and **Small Tortoiseshell** reduced in annual abundance by 37% and 36% respectively. In spite of the poor weather new species continued to appear towards the month end including **Wood White**, **Brown Argus**, **Common Blue** and **Marsh Fritillary**. Each of these four species had a terrible year with **Marsh Fritillary** and **Common Blue** both producing their worst index of the series.

Poor weather continued over much of **MAY**, save for a mini heat wave near the month end. First sightings were made for 21 new species including early records of **Purple Hairstreak** (16th) in *Kent* and **Chalkhill Blue** (27th) in *East Sussex*. **Duke of Burgundy** saw its numbers drop by almost half, making 2012 the second worst year on record. Common and widespread butterflies were in short supply. For example, the widespread 'Whites' including **Green-Veined White** and the two 'Cabbage Whites', **Large White** and **Small White**, saw their populations tumble by more than 50%. Each of these species had their worst ever years.

**JUNE** was atrocious, with below average temperatures, the month being the wettest since 1860 and having the least sunshine since 1909. Only a further six species emerged, none especially early. **Black Hairstreak** was all but wiped out on monitored sites, with numbers reduced by a staggering 98%. Good news was hard to come by, but came in the form of **Large Blue** egg counts which were up by 70% over 2011, though adult numbers were generally low.

Unsettled weather with cooler than average temperatures continued in **JULY**. Heavy rain brought extensive flooding, whilst storms battered the *South Coast*. It was somewhat academic, but the final hosepipe bans were lifted early in the month. A further four resident species emerged, whilst the first of four Channel Islands records of **Large Tortoiseshell** were logged. As the season progressed, more and more species were coming out later than the average, including **White Admiral** and **Purple Emperor**. Offspring of 2011's overwintering **Peacock** and **Brimstone** were delayed by a week or more. Early summer species were decimated by poor June and July weather with **White Admiral**, **Large Skipper**, **Small Pearl-bordered Fritillary**, **High Brown Fritillary**, **Heath Fritillary**, **Black Hairstreak** and **White-letter Hairstreak** all having their worst ever years.

Low pressure again dominated in **AUGUST** bringing cool temperatures and relentless rain bringing localised heavy flooding. Autumn was already upon us by the month end with the first frost logged in *Aberdeenshire*. The last resident species to emerge was the **Brown Hairstreak** (5th) in *Surrey* with the date of mean abundance almost two weeks

later than the series average. Summer species which had poor years included the **Silver-spotted Skipper**, which collapsed by 52%, and the **Brown Hairstreak**, which fell by 29%. Although the majority of species fared badly, some managed to thrive, particularly in areas less affected by adverse weather conditions. In south east England for example, it was slightly warmer and sunnier than average in August with bumper numbers of **Adonis Blues** and especially **Chalkhill Blues** noted at some sites. Both species had above average years. The summer's incessant rain prompted substantial grass growth and provided good conditions for some grassland species such as the **Meadow Brown**, **Ringlet** and **Scotch Argus**, the latter having its second best year since 1976.

**SEPTEMBER** remained unsettled, though there were some decent spells with 41 species recorded over the month.

**OCTOBER** was cooler and wetter than average. Optional visits to transects produced 14 species on 114 visits, bringing the recording season to an end.

*"18 species suffered greater than 50% annual declines"*



Large Skipper had its worst year on record down by over 50%. Photograph by Nick Edge

**Table 1. Summary of species abundance changes in the UK from 2011 to 2012 and long-term (over the entire time series: no. yrs max = 37) and short-term (last 10-years) changes. The mean flight date is calculated as the weighted mean date of counts and is highly correlated to both first appearance and the peak flight date (Botham et al. 2008). Significance of trends: \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Red text has been used to highlight those species that had their worst year of the series in 2012.**

Species	Start Year	No. Sites with Index	No. Years with Index (as of 2012)	2012 Rank	% change 2011-2012	Series trend (%)	10-year trend (%)	Mean flight date 2012	Series Mean flight date
Small Skipper	1976	462	37	37	-16	-73***	-66**	26-Jul	21-Jul
Essex Skipper	1977	261	36	34	-4	-64*	-91***	28-Jul	25-Jul
Lulworth Skipper	1992	9	21	19	-5	-88***	-88***	04-Aug	28-Jul
Silver-spotted Skipper	1979	28	34	20	-52	854***	-55	15-Aug	15-Aug
Large Skipper	1976	458	37	37	-55	-21	-18	12-Jul	06-Jul
Dingy Skipper	1976	169	37	14	-24	-28*	49	28-May	01-Jun
Grizzled Skipper	1976	120	37	12	-31	-31	63	25-May	29-May
Swallowtail	1976	6	33	23	-70	81*	-16	26-Jun	20-Jun
Wood White	1979	36	34	29	-61	-84***	-59	17-Jun	17-Jun
Clouded Yellow	1979	176	34	26	-59	367	-98**	28-Jul	09-Aug
Brimstone	1976	364	37	36	-37	9	-30	18-Jun	09-Jun
Large White	1976	537	37	37	-53	-36	-40	25-Jul	21-Jul
Small White	1976	536	37	37	-58	-29	-55	24-Jul	23-Jul
Green-veined White	1976	489	37	37	-61	-13	-16	08-Jul	09-Jul
Orange-tip	1976	328	37	9	-34	20	59	14-May	17-May
Green Hairstreak	1976	190	37	37	-68	-43**	-26	28-May	29-May
Brown Hairstreak	1983	33	30	29	-34	-11	-75**	05-Sep	25-Aug
Purple Hairstreak	1976	224	37	32	-41	-8	-8	01-Aug	31-Jul
White-letter Hairstreak	1976	119	37	37	-72	-86***	-69*	27-Jul	25-Jul
Black Hairstreak	1995	10	17	17	-98	-38	-40	23-Jun	29-Jun
Small Copper	1976	413	37	26	-35	-23	-16	21-Jul	03-Aug
Small Blue	1978	90	35	24	-46	21	0	22-Jun	30-Jun
Silver-studded Blue	1979	45	34	30	-54	5	-40	22-Jul	18-Jul
Brown Argus	1976	257	37	36	-73	6	-35	30-Jul	01-Aug
Northern Brown Argus	1979	21	34	31	-39	-47	-27	11-Jul	12-Jul
Common Blue	1976	433	37	37	-60	-15	-52	18-Jul	25-Jul
Chalkhill Blue	1976	148	37	7	17	14	13	10-Aug	09-Aug
Adonis Blue	1979	57	34	15	-5	168*	-46	26-Jul	26-Jul
Holly Blue	1976	333	37	22	-32	145	-23	23-Jun	29-Jun
Large Blue	1983	23	30	3	70	1,954***	4	27-Jun	25-Jun
Duke of Burgundy	1979	67	33	32	-47	-49**	-58	28-May	31-May
White Admiral	1976	143	37	37	-39	-57**	-44	24-Jul	18-Jul
Purple Emperor	1979	50	34	23	-7	43	-55	30-Jul	22-Jul
Red Admiral	1976	548	37	11	-29	3318***	-25	12-Aug	07-Aug
Painted Lady	1976	303	37	31	-37	244	-94	28-Jul	31-Jul
Small Tortoiseshell	1976	464	37	36	-36	-74***	-77*	16-Jul	10-Jul
Peacock	1976	452	37	36	-16	15	-30	28-Jun	02-Jul
Comma	1976	467	37	25	-24	262***	-39	27-Jul	20-Jul
Small Pearl-bordered Fritillary	1976	75	37	26	-34	-56***	17	22-Jun	25-Jun
Pearl-bordered Fritillary	1976	71	37	21	-31	-70***	10	31-May	02-Jun
High Brown Fritillary	1978	55	35	35	-46	-61*	-81***	14-Jul	16-Jul
Dark Green Fritillary	1976	217	37	10	-37	153**	12	26-Jul	22-Jul
Silver-washed Fritillary	1976	283	37	16	-42	106**	-2	31-Jul	26-Jul
Marsh Fritillary	1981	55	32	32	-71	8	-52	30-May	06-Jun
Glanville Fritillary	1992	9	21	11	-68	-34	4,957**	13-Jun	08-Jun
Heath Fritillary	1981	25	32	32	-50	-82***	-76**	04-Jul	05-Jul
Speckled Wood	1976	515	37	28	-44	128***	-20	27-Jul	27-Jul
Wall Brown	1976	220	37	36	-15	-85***	-67**	16-Jul	28-Jul
Scotch Argus	1979	9	34	2	55	170**	-5	17-Jul	12-Jul
Marbled White	1976	355	37	23	-7	46	-28	10-Aug	10-Aug
Grayling	1976	122	37	34	-19	-60***	18	19-Jul	16-Jul
Gatekeeper	1976	537	37	35	-25	-37*	-62***	09-Aug	05-Aug
Meadow Brown	1976	585	37	15	21	5	-31	07-Aug	02-Aug
Small Heath	1976	348	37	28	-26	-54***	-22	29-Jul	21-Jul
Large Heath	1990	8	23	15	-70	292***	-6	04-Jul	09-Jul
Ringlet	1976	537	37	18	-26	312***	14	02-Jul	09-Jul





**Table 2. Summary of species abundance changes for England, Scotland and Wales (where calculable) from 2011 to 2012 and long-term (over the entire time series: no. yrs max = 37 for England and Wales, 34 for Scotland) and short-term (last 10-years) changes. Significance of trends: \*P < 0.05 (significant), \*\*P < 0.01 (highly significant), \*\*\*P < 0.001 (very highly significant). Note: some country-level changes are based on relatively small sample sizes and thus should be interpreted with caution. N/A refers to insufficient data to calculate a trend.**

Species	No. sites producing an index in 2012			% change in Collated index 2011-2012			SERIES TREND			10-YEAR TREND		
	Eng	Scot	Wales	Eng	Scot	Wales	Eng	Scot	Wales	Eng	Scot	Wales
Small Skipper	453	-	9	-14	-	41	-74***	-	-26	-66***	-	-1
Essex Skipper	261	-	-	-4	-	-	-64*	-	-	-91***	-	-
Lulworth Skipper	9	-	-	-5	-	-	-88***	-	-	-88***	-	-
Silver-spotted Skipper	28	-	-	-52	-	-	854***	-	-	-55	-	-
Large Skipper	450	-	7	-54	-	-42	-19	-	-70***	-17	-	-40
Dingy Skipper	165	-	-	-24	-	-	-23	-	-	53	-	-
Grizzled Skipper	120	-	-	-31	-	-	-32	-	-	64	-	-
Swallowtail	6	-	-	-70	-	-	81*	-	-	-16	-	-
Wood White	34	-	-	-61	-	-	-84***	-	-	-59	-	-
Clouded Yellow	172	-	3	-55	-	N/A	386	-	N/A	-98**	-	N/A
Brimstone	362	-	1	-37	-	N/A	7	-	N/A	-30	-	N/A
Large White	504	13	10	-54	-28	-29	-35	83	-28	-40	-62	-17
Small White	507	16	6	-58	138	-21	-26	5	-74***	-56	-71	-68
Green-veined White	450	19	11	-63	-25	-19	-16	-5	123*	-19	-3	127
Orange-tip	305	11	5	-28	-75	-56	8	331**	342***	54	228*	45
Green Hairstreak	184	3	-	-67	N/A	-	-46**	N/A	-	-27	N/A	-
Brown Hairstreak	32	-	-	-45	-	-	-13	-	-	-77**	-	-
Purple Hairstreak	219	-	-	-41	-	-	-10	-	-	-8	-	-
White-letter Hairstreak	117	-	-	-72	-	-	-85***	-	-	-72*	-	-
Black Hairstreak	10	-	-	-98	-	-	-38	-	-	-40	-	-
Small Copper	386	10	10	-37	-19	-71	-19	-19	-46	-21	49	-30
Small Blue	90	5	-	-48	-29	-	21	244**	-	-1	244*	-
Silver-studded Blue	43	-	-	-54	-	-	-32	-	-	-49	-	-
Brown Argus	255	-	1	-73	-	N/A	11	-	N/A	-34	-	N/A
Northern Brown Argus	18	3	-	-46	N/A	-	-64***	N/A	-	-33	N/A	-
Common Blue	404	15	5	-63	-6	-51	-15	28	24	-54	-49	-13
Chalkhill Blue	148	-	-	17	-	-	14	-	-	13	-	-
Adonis Blue	57	-	-	-5	-	-	168*	-	-	-46	-	-
Holly Blue	323	-	4	-32	-	N/A	151	-	N/A	-23	-	N/A
Large Blue	23	-	-	70	-	-	>1,954***	-	-	4	-	-
Duke of Burgundy	67	-	-	-47	-	-	-49**	-	-	-58	-	-
White Admiral	142	-	-	-39	-	-	-57**	-	-	-44	-	-
Purple Emperor	50	-	-	-7	-	-	43	-	-	-55	-	-
Red Admiral	523	14	7	-29	-52	-50	325***	>1,000**	169*	-25	-48	-39
Painted Lady	287	4	6	-41	N/A	64	238	N/A	-3	-94	N/A	-95
Small Tortoiseshell	425	16	12	-38	-24	-40	-74***	-47	-31	-78*	-35	-49
Peacock	423	16	7	-10	-75	-47	16	162	-34	-27	-61	-45
Comma	457	1	7	-24	N/A	-59	265***	N/A	23	-39	N/A	-13
Small Pearl-bordered Fritillary	59	11	5	-39	41	45	-32	-42	-25	29	-45	83
Pearl-bordered Fritillary	56	4	12	-37	N/A	-2	-48*	N/A	111	4	N/A	33
High Brown Fritillary	46	-	9	-45	-	-88	-61*	-	-25	-82***	-	-95
Dark Green Fritillary	185	16	11	-37	-33	-71	360***	-36	-85***	-1	107*	2
Silver-washed Fritillary	276	-	5	-44	-	-48	120***	-	-87**	-4	-	91
Marsh Fritillary	42	-	4	-78	-	N/A	-67*	-	N/A	-58	-	N/A
Glanville Fritillary	7	-	-	-60	-	-	-32	-	-	5,341**	-	-
Heath Fritillary	25	-	-	-50	-	-	-82***	-	-	-76**	-	-
Speckled Wood	496	5	7	-44	-40	-47	126***	7	140***	-21	-8	-42
Wall Brown	208	1	7	-20	N/A	206	-86***	N/A	-59**	-67**	N/A	-42
Scotch Argus	5	4	-	N/A	N/A	-	-66**	N/A	-	-62	N/A	-
Marbled White	352	-	-	-9	-	-	44	-	-	-29	-	-
Grayling	106	4	6	-18	N/A	-20	-39**	N/A	-88***	27	N/A	124*
Gatekeeper	520	-	11	-27	-	-5	-41*	-	90**	-62***	-	-32
Meadow Brown	536	27	12	18	-12	96	4	3	49	-30	-73***	17
Small Heath	319	15	7	-26	-2	25	-59***	158**	31	-22	-21	23
Large Heath	1	5	-	N/A	-48	-	N/A	-59	-	N/A	-59	-
Ringlet	498	20	13	-24	-23	-29	318***	37	186***	20	-44*	4

# Long-term trends

UK-wide and country level trends are described below, whilst further information on each species, including individual collated index plots are available at the UKBMS website [www.ukbms.org](http://www.ukbms.org).

*"Habitat specialists have declined by 83% since 1976"*

## UNITED KINGDOM

For the UK we are able to report on long term and ten-year trends for 56 of the 59 regularly occurring species, including 28 habitat specialist species, 25 wider countryside species and the three regular migrants (Table 1). Since 1976, 54% of species show positive trends, whilst 46% show negative trends. Of the species showing significant trends, twelve species (40%) show a long-term increase, whilst eighteen (60%) are in significant decline. The top ten species in most acute long-term decline (in descending rank order) include **Lulworth Skipper, White-letter Hairstreak, Wall Brown, Wood White, Heath Fritillary, Small Tortoiseshell, Small Skipper, Pearl-bordered Fritillary, Grayling and Small Pearl-bordered Fritillary**. The top ten species showing the largest population increase (in descending rank order) include **Large Blue, Silver-spotted Skipper, Red Admiral, Ringlet, Large Heath, Comma, Scotch Argus, Adonis Blue, Dark Green Fritillary and Silver-washed Fritillary**.

Over the last decade 44 species (79%) show negative trends including all three regular migrants, 11 species (18%) show positive trends, whilst Small Blue shows no change. The **Glanville Fritillary** shows a significant ten-year increase, whilst eleven species are in significant decline over the period. In descending rank order declining species (most rapid first) include **Clouded Yellow, Essex Skipper, Lulworth Skipper, High Brown Fritillary, Small Tortoiseshell, Heath Fritillary, Brown Hairstreak, White-letter Hairstreak, Wall Brown, Small Skipper and Gatekeeper**.

The UK butterfly indicator includes data from 26 habitat specialist and 24 wider countryside species. Since 1976, habitat specialists and wider countryside species show declines of 83% and 54% respectively. Analysis of the underlying smoothed trends shows that since 1976 specialists have declined significantly but for species of the wider countryside there has been little or no overall long-term change, although the current population index is significantly lower than over the period 1982 to 2003. Since 2000, specialists have shown a decrease from 30% to 17% of the 1976 level. However, the underlying analysis shows that this change was not statistically significant. Species of the wider countryside have shown a substantial decrease from 79% to 46% of the 1976 level. The underlying analysis indicates that this decline was statistically significant. In 2012, specialists decreased by 50% from the previous year, whilst wider countryside species decreased by 38%. For both wider countryside and habitat specialist species

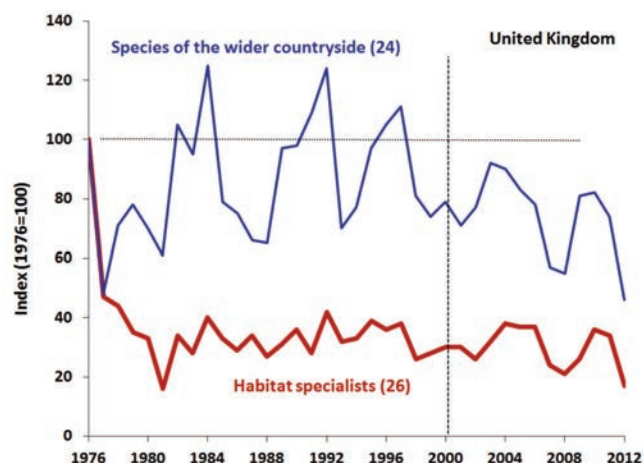


Fig: 2 Trends in butterfly populations for habitat specialists and species of the wider countryside, 1976 to 2012.

the smoothed and unsmoothed indices in 2012 were the lowest in the series.

## ENGLAND

For England, we are able to report on long-term and ten-year trends for 52 of the 58 regularly occurring species, including 26 habitat specialist species, 23 wider countryside species and three regular migrants (Table 2). Since 1976, 38% of species show positive trends, whilst 62% have a negative trend. Of the species showing significant trends, eight species (33%) show a long-term increase, whilst seventeen (67%) are in decline. The ten species in most severe long-term decline (in descending rank order) include **Wood White, Lulworth Skipper, Wall Brown, White-letter Hairstreak, Heath Fritillary, Small Skipper, Marsh Fritillary, Northern Brown Argus, High Brown Fritillary and Small Heath**. The eight species showing a significant population increase (in descending rank order) include **Silver-spotted Skipper, Dark Green Fritillary, Red Admiral, Ringlet, Comma, Adonis Blue, Speckled Wood and Swallowtail**.

Over the last decade, 43 species (84%) show negative trends including all three regular migrants, eight species (16%) show positive trends, whilst a trend is not calculable for **Large Heath**. No species shows a significant ten-year increase, whilst six species are in significant decline. In descending rank order declining species (most rapid first) include **Clouded Yellow, Small Tortoiseshell, Brown Hairstreak, Heath Fritillary, White-letter Hairstreak and Wall Brown**.

Composite indices of butterfly abundance are calculable for 23 wider countryside and 26 habitat specialist species. Since 1976, habitat specialists and wider countryside species show apparent declines of 82% and 56% respectively. Analysis of the underlying smoothed trends shows that since 1976 specialists have declined significantly but for species of the wider countryside there has been little or no overall long-term change, although the current population index is significantly lower than over the period 1980 to 2003. Since 2000, specialists have shown an apparent decrease from 33% to 18% of the 1976 level. However, the underlying analysis



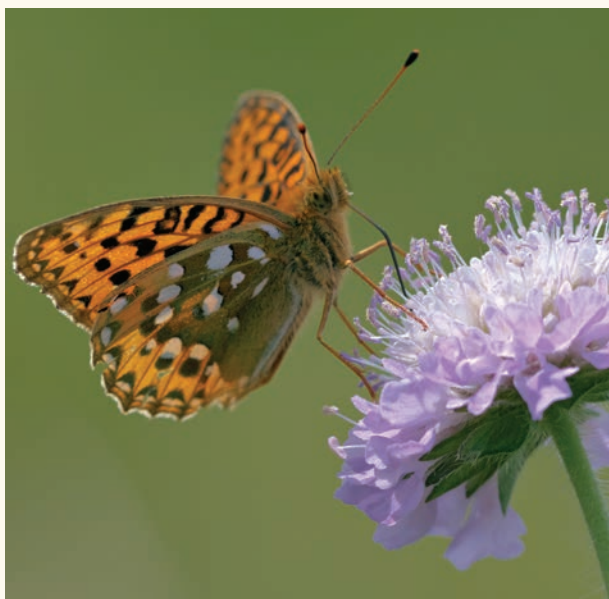
shows that this change was not statistically significant and the trend is classed as uncertain. Species of the wider countryside have shown a substantial decrease from 79% to 44% of the 1976 level. The underlying analysis indicates that this decline was statistically significant. In 2012, specialists decreased by 53% from the previous year, whilst wider countryside species decreased by 40%. For both wider countryside and habitat specialist species the smoothed and unsmoothed indices in 2012 were the lowest in the series.

The English Government uses population trends of wider countryside butterflies in farmland and woodland habitats as biodiversity indicators. Since 1990, the composite measure for 21 butterfly species on farmland has fallen by 49%, reaching a historical low point in 2012. There have been fluctuations in numbers from year to year, but the overall change since 2000 from the underlying analysis shows a downward trend. Species in severe decline on farmland include **Small Heath**, **Small Tortoiseshell**, **Small Skipper**, **White-Letter Hairstreak** and **Wall Brown**.

The combined measure on butterfly numbers in woodland from 23 species has fluctuated considerably since 1990, but the overall trend is downward. In 2012 numbers reached a historical low, with 50 per cent fewer than in 2011. Between 1990 and 2012 there has been a 73 per cent decrease in the population of butterflies of the wider countryside. Since 2000, the index is shows a downward trend. Declining woodland butterflies include **Gatekeeper**, **Small Skipper** and **Wall Brown**.

#### NORTHERN IRELAND

In Northern Ireland, data is too sparse to calculate long-term trends. Over the short term **Large White**, **Marsh Fritillary**, **Small Tortoiseshell** and **Speckled Wood** have negative trends, whilst **Ringlet**, **Meadow Brown** and **Orange-tip** show positive trends.



Dark Green Fritillary has significantly increased in England since 1976. Photograph by Heath McDonald



White-letter Hairstreaks were more elusive than ever with numbers the lowest since 1976. Photograph by Tony Cox

#### SCOTLAND

For Scotland we are able to report on long-term and ten-year trends for 20 of the 34 regularly occurring species, including six habitat specialist species, 13 wider countryside species plus Red Admiral (Table 2). Since 1979, 60% of species show positive trends, whilst 40% show negative trends. Of the species showing significant long-term trends, three species (60%) show an increase, whilst two (40%) are in significant decline. Declining species (in descending rank order) include **Grayling** and **Large Heath**, whilst those increasing (in descending rank order) include **Red Admiral**, **Orange-tip** and **Small Heath**.

Over the last decade 16 species (80%) show negative trends including all three regular migrants, whilst four species (20%) show positive trends. Of the significant trends over this period, **Dark Green Fritillary** and **Orange-tip** increased, whilst **Ringlet** and **Meadow Brown** decreased.

*"In the last 10 years  
Grayling has significantly  
increased in Wales"*

#### WALES

In Wales, we are able to report on trends for 25 of the 41 regularly occurring butterfly species in Wales (Table 2). Over the long term, 46% of species show a positive trend, whilst 54% have a negative trend. Of the 12 species showing significant change, there is an equal number of increasing and decreasing species. The six species in long term decline (most severe decline first) are **Grayling**, **Silver-washed Fritillary**, **Dark Green Fritillary**, **Small White**, **Large Skipper** and **Wall Brown**. The six species increasing over the long term (most rapid increase first) are **Orange-tip**, **Ringlet**, **Red Admiral**, **Speckled Wood**, **Green-veined White** and **Gatekeeper**. Over the last ten years 40% of species show positive trends including **Grayling** which has increased significantly, whilst 60% show negative trends.



# Wider Countryside Butterfly Survey (WCBS)

*The WCBS ran for a fourth year in 2012. Despite inclement weather, there was a fantastic response by volunteers to the challenge of improving coverage, with more squares sampled than in any other year.*

*"Over 1/3 of butterflies recorded were Meadow Brown"*

The WCBS is similar to the traditional UKBMS transect surveys, but sites are randomly positioned and recorders only need to carry out surveys twice a year. Over 3,000 km of survey line were walked by 648 recorders who made 1,548 visits to 771 squares (57% BC squares, 43% BTO BBS). This is a substantial improvement in volunteer effort, with 114 more squares sampled than in 2011, an increase of 17%. Extra resources helped, enabling BC to run successful training workshops in South West Scotland and North Wales and to promote the scheme more widely.

In total 64,452 butterflies of 46 species were counted. Good coverage (present in more than 30 squares) was achieved for 22 species, whilst 18 of these were present in more than 100 squares. Meadow Brown, Gatekeeper, Small White, Ringlet and Green-veined White accounted for over two-thirds of butterflies observed.

Highlights from a provisional analysis of the data (without accounting for differences between seasons and visits) indicated that it was a good year for some (though not

all) of the grass-feeding Browns. For the fourth year in a row, Meadow Brown was the most abundant species and comprised over one-third of all butterflies counted during July and August. However, it was a poor year for most species – the worst in the four-year series. Species which fared particularly badly included Small White, Large White, Peacock, Common Blue, Speckled Wood, Wall Brown and Small Tortoiseshell. For the latter species less than half the number were counted than in 2011, whilst the butterfly was found in a third fewer squares than 2009 and for the first time was present in less than half of squares sampled.

The provisional analysis indicates that there has been a year on year decline in mean butterfly abundance in each year of the WCBS, with diversity approximately half that encountered in 2009. On average, recorders counted 44 butterflies of four species per survey made over July and August in 2012, compared with 80 butterflies and eight species in 2009.



Along with other summer Browns, Meadow Brown was recorded in good numbers on WCBS squares. Photograph by Tim Melling

In 2013 the WCBS will run for a fifth year at a similar resource level and we aim to further increase coverage.

If you would like to take part please contact  
Zoë Randle, WCBS Co-ordinator  
[survey@butterfly-conservation.org](mailto:survey@butterfly-conservation.org)

New and existing BTO volunteers will again be coordinated by Kate Risely, BTO BBS National Organiser  
[bbs@bto.org](mailto:bbs@bto.org)

To keep up to date with the project visit the website  
[www.ukbms.org/wcbs.aspx](http://www.ukbms.org/wcbs.aspx)

or follow on Twitter  
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And for the most recent report  
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**The Centre for Ecology & Hydrology (CEH)** is the UK's Centre of Excellence for integrated research in terrestrial and freshwater ecosystems and their interaction with the atmosphere. As part of the Natural Environment Research Council (NERC) CEH works in partnership with the research community, policymakers, industry and society, to deliver world-class solutions to the most complex environmental challenges facing humankind.



**Butterfly Conservation** is the charity aimed at securing a lasting future for butterflies, moths and their habitats. It works in partnership with thousands of volunteers and a wide range of organisations in the UK and Europe to secure a healthy environment where we all can live.



**The British Trust for Ornithology (BTO)** is an independent charitable research institute combining professional and citizen science aimed at using evidence of change in wildlife populations, particularly birds, to inform the public, opinion-formers and environmental policy- and decision-makers.



**The Joint Nature Conservation Committee (JNCC)** is the statutory adviser to Government on UK and international nature conservation. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems. JNCC delivers the UK and international responsibilities of the four country nature conservation agencies - Council for Nature Conservation and the Countryside, Natural Resources Wales, Natural England and Scottish Natural Heritage.



**The Department for Environment Food and Rural Affairs** is the UK government department responsible for policy and regulations on the environment, food and rural affairs. The overarching challenge for Defra is to secure a healthy environment in which we and future generations can prosper. As we build a low carbon, resource efficient economy, Defra helps people to adapt to changes, deals with environmental risks and makes the most of the opportunity we have to secure a sustainable society and a healthy environment.



**Natural Resource Wales** is the principle adviser to the Welsh Government on the environment, enabling the sustainable development of Wales' natural resources for the benefit of people, the economy and wildlife.



**The Forestry Commission** is the government department for forestry in Great Britain. It works to improve people's lives through the many benefits provided by sustainably managed woods and forests, including timber production, public recreation, nature conservation, and rural and community development. It does this by supporting woodland managers with grants, tree felling licences, regulation and advice, and advising Ministers in the UK, Scottish and Welsh Assembly Governments on forestry policy. It manages more than 1 million hectares (2.5 million acres) of public forest land owned or leased by Ministers to provide the above benefits, and through its Forest Research agency, it conducts world-class scientific research and technical development relevant to forestry.



**Natural England** is an independent public body whose purpose is to protect and improve England's natural environment, for its intrinsic value, the wellbeing and enjoyment of people and the economic prosperity that it brings.



**Scottish Natural Heritage** is the government body that looks after all of Scotland's nature and landscapes, across all of Scotland, for everyone.

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