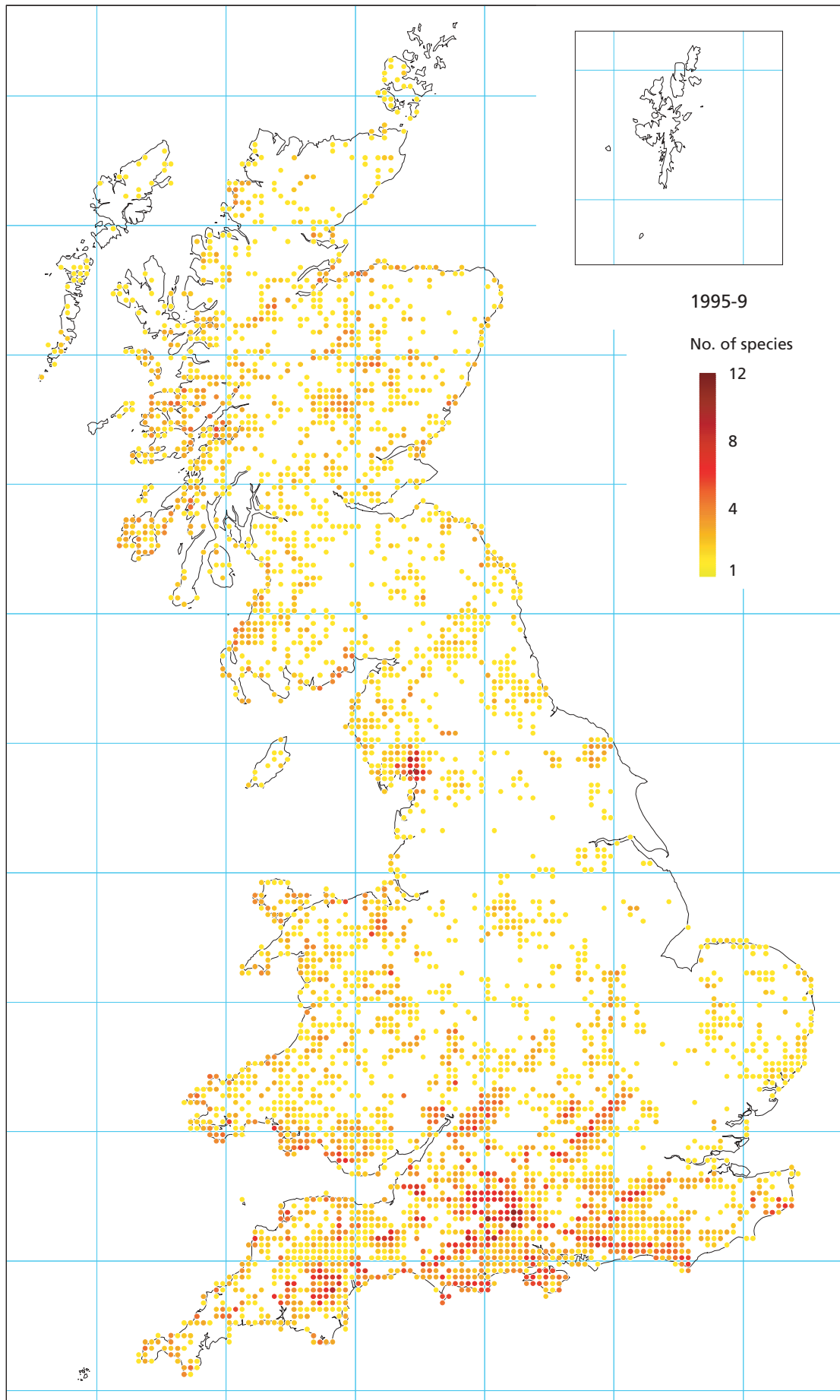


The State of Britain's Butterflies



Centre for
Ecology &
Hydrology



Biodiversity Action Plan Priority Species and candidate Priority Species.

The BNM data set provides a unique and up to date insight into the distribution of our butterflies. The map shows areas where conservation measures such as agri-environment schemes should be targeted to conserve Britain's most threatened species.

Summary

- ◆ The Butterflies for the New Millennium (BNM) project completed the largest and most comprehensive survey of butterflies in Britain and Ireland between 1995 and 1999. This report summarises the main findings for Britain, and compares them with records from the previous national survey (1970-82) and historical information dating back to 1800.
- ◆ During the last 200 years, over half of our 59 resident species have undergone substantial (>20%) loss of range, including 15 that have declined by >50% and five that have become extinct.
- ◆ The new survey shows that many habitat specialist species have continued to decline in range rapidly over the last two decades and data from the Butterfly Monitoring Scheme (BMS) show that some species have undergone declines in abundance even on protected sites.
- ◆ Most Biodiversity Action Plan species continue to decline and 10 further species warrant consideration for priority status.
- ◆ Some species that are more widely distributed in the landscape (wider countryside species) have also declined in abundance, although their ranges may not have decreased overall.
- ◆ Habitat destruction, changing management and increasing fragmentation are the causes of most declines. These factors have been driven by the intensification of agriculture and forestry. Reform of the Common Agricultural Policy and other land-use policies will be necessary to reverse declines.
- ◆ In contrast, 15 species (mostly wider countryside species) have extended their ranges northwards since the 1970s, probably in response to climate change. Five declining species have also shown signs of recovery, partly due to conservation management.
- ◆ Climate change may pose a threat to habitat specialists, many of which are isolated on fragments of semi-natural habitat and, unlike wider countryside species, will be unable to shift their range. Maintaining and restoring large habitat networks as part of a new landscape-scale approach to conservation will be vital to ensure their survival.
- ◆ Butterflies are valuable indicators of the impact of environmental changes upon our countryside quality and characteristic biodiversity. The BNM survey provides an enhanced baseline to assess future change and devise conservation strategies. The organisations that compiled this report plan to expand recording and monitoring schemes to further improve our understanding of the state of Britain's butterflies in the future.



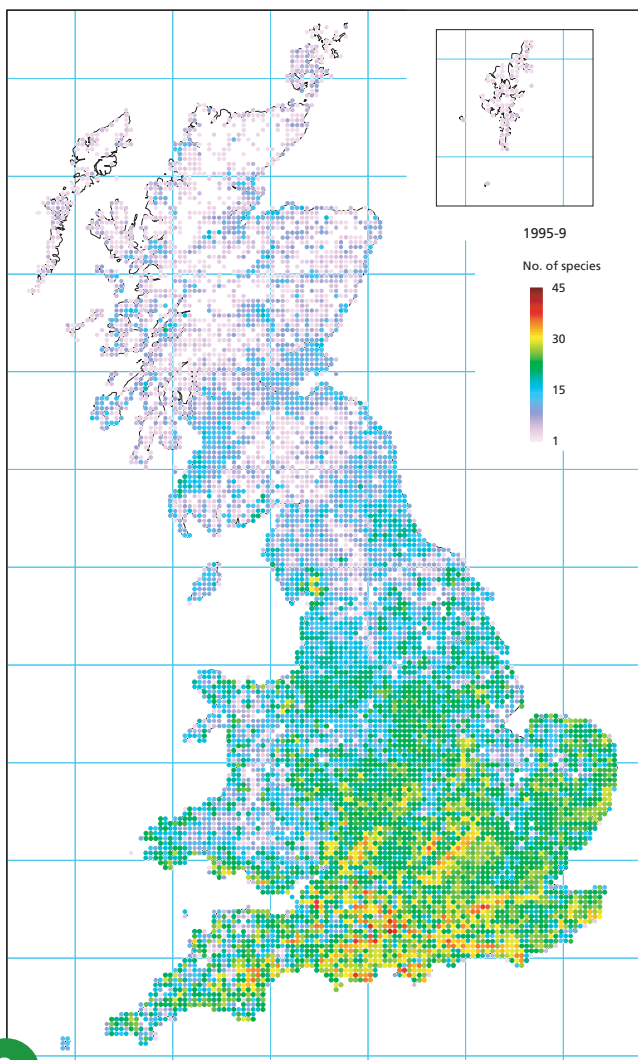
Butterflies for the New Millennium — *the biggest ever butterfly survey*

The twentieth century was a period of rapid and dramatic change for butterflies, their habitats and our knowledge of their distribution and ecology. The Butterflies for the New Millennium (BNM) project completed the largest and most comprehensive survey of butterflies in Britain and Ireland, between 1995 and 1999. Combined with records from the previous national survey (1970-82) and historical information dating back to 1800, the BNM project provides an unique opportunity to assess the status of all species and their changing fortunes over two centuries. This report summarizes the main findings in Britain.

The BNM project was co-ordinated by Butterfly Conservation and the Biological Records Centre at the Centre for Ecology and Hydrology (CEH), and involved the collaboration of hundreds of national and local conservation and natural history organisations. Ten thousand people took part in the five-year survey, contributing over 1.5 million records to the database covering 99% of the 10 km grid squares in Britain.



Butterfly Conservation volunteers recording on the Isle of Wight.



CEH also produces an annual index of abundance for more than 30 species through the Butterfly Monitoring Scheme (BMS). Most rare species are not included in the BMS, but data from other sites co-ordinated by Butterfly Conservation enable indices to be calculated for some additional species.

The BNM survey shows that a biodiversity gradient exists across Britain, with more species occurring in the south and east than in the north and west. Areas with high species richness are clearly revealed, including the North and South Downs, the Chilterns, the Cotswolds, Salisbury Plain, the Dorset coast, the Morecambe Bay area, and parts of Argyll. This information, together with precise records of butterfly colonies, will help conserve species and inform policy and planning decisions.

Species richness 1995-9. The number of species recorded in each 5 km square in the BNM survey.

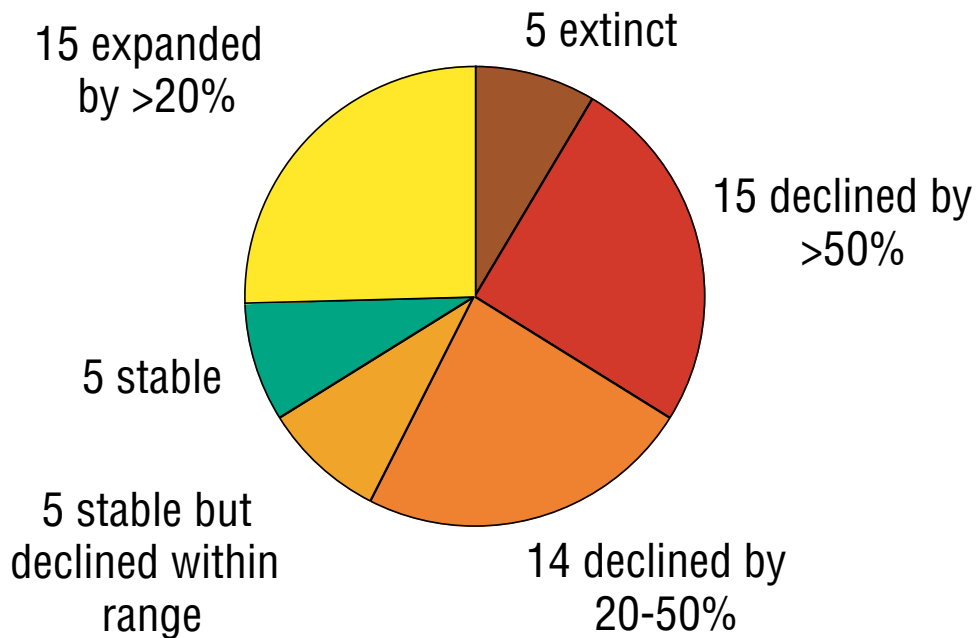
OVERALL CHANGES SINCE THE 19TH CENTURY

Five of our 59 resident species have become extinct and more than half have undergone substantial declines in their distribution. Of these, 15 have lost more than 50% of their range at the 10 km square level. These changes are likely to be an underestimate due to the comparatively low level of recording prior to 1970. In contrast, 15 species have recently expanded their range by over 20%.

Butterflies can be divided broadly into two types: habitat specialist species and wider countryside species. The habitats used by specialist butterflies are relatively localised and often occur as small, isolated patches (e.g. chalk grassland and ancient woodland). Habitat specialist butterflies may not be able to colonise suitable habitat, and their distributions tend to be restricted. The habitats and foodplants of wider countryside species are still relatively common in the landscape (e.g. hedgerows and roadside verges). They tend to be mobile species that are able to colonise suitable habitat quickly and, as a consequence, many have extensive distributions.



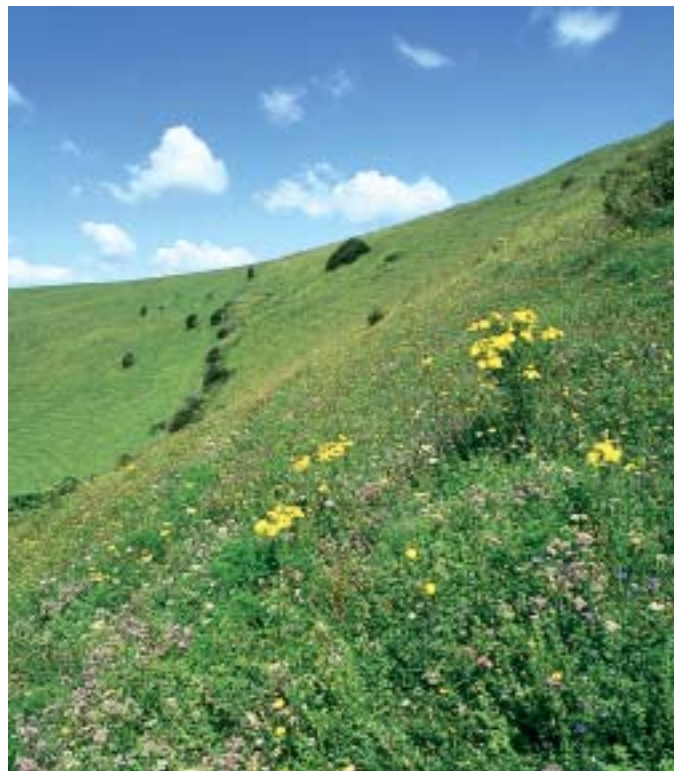
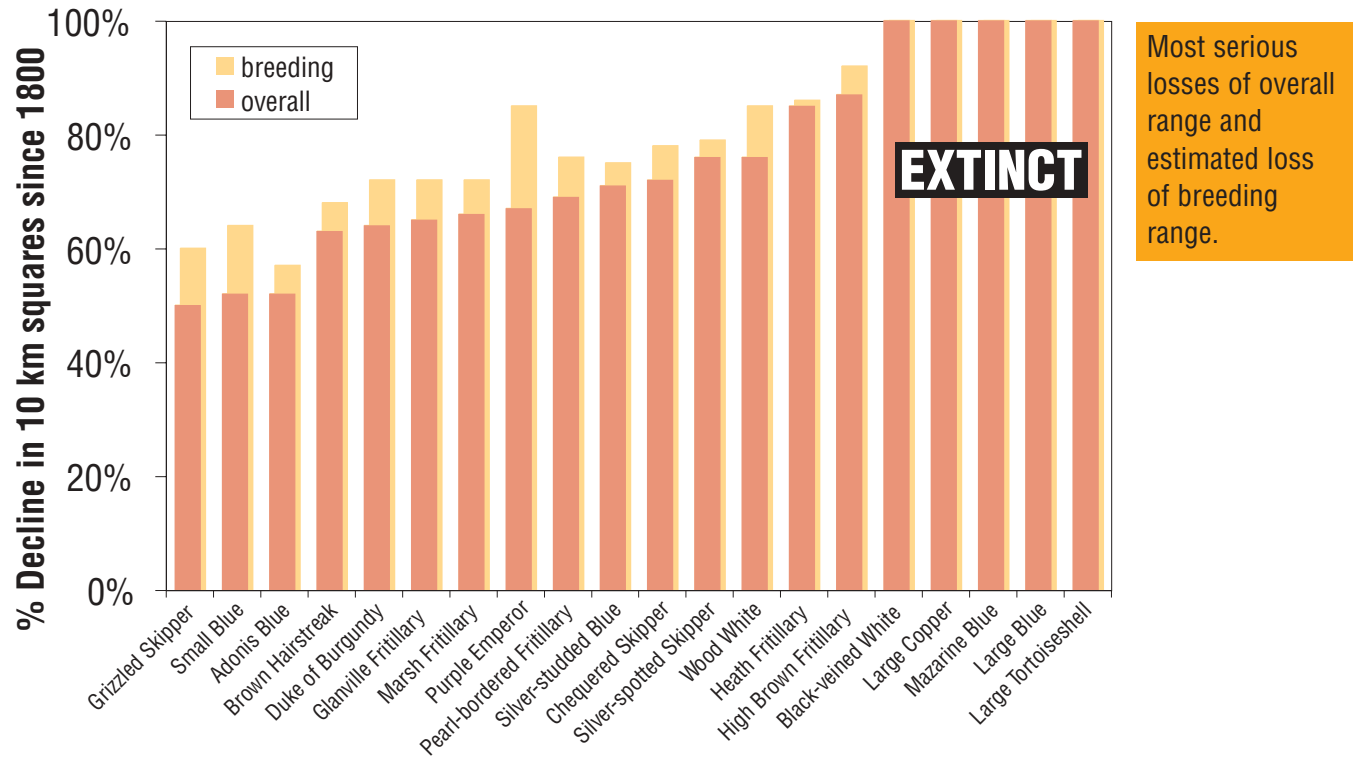
The **Large Blue** is one of five species to become extinct in Britain since 1800. The others are the **Black-veined White, Large Copper, Mazarine Blue** and **Large Tortoiseshell**.



The BNM survey shows that the distributions of most habitat specialists have declined while the distributions of most wider countryside species have expanded or remained stable.

DECLINING HABITAT SPECIALISTS

Among the most rapidly declining species are those that breed in woodland glades and clearings, and bracken-dominated habitats (e.g. the High Brown Fritillary, Heath Fritillary, Pearl-bordered Fritillary, Chequered Skipper, Duke of Burgundy and Wood White). Other declining species are associated with chalk and limestone grasslands (e.g. Silver-spotted Skipper, Duke of Burgundy, Marsh Fritillary, Adonis Blue, Small Blue and Grizzled Skipper), heathland (Silver-studded Blue), extensive broad-leaved woodland (Purple Emperor), hedgerows (Brown Hairstreak) and coastal landslips (Glanville Fritillary).



Two key butterfly habitats for declining butterflies: coppiced woodland (left) and calcareous grassland (right).

CAUSES OF DECLINE

Habitat destruction and neglect

Historically, many declines were due to the destruction of habitats as a result of intensification of agriculture and forestry. Since the 1940s, 97% of lowland flower-rich grasslands have been lost, together with 80% of chalk and limestone grasslands and 50% of ancient woodland. However, many species have suffered equally badly from changing land management, especially the cessation of coppicing in woodlands and changes in livestock farming (leading to key habitats being abandoned in the lowlands and more heavily grazed in the uplands).

Isolation and fragmentation

Habitat loss and changing management have led to the fragmentation and isolation of remaining habitats. Further losses then occur because small, isolated butterfly populations are more prone to extinction and their habitat patches are less likely to be re-colonised. As climate continues to change as a result of global warming, habitat specialist species may be stranded on their habitat patches, unable to colonise other patches even if they become climatically suitable. In such a situation, climate change and its effects on vegetation may pose a serious long-term threat to the survival of many colonies.

A new landscape-scale approach is needed, which focuses on the conservation and restoration of habitat networks, so that butterflies are able to move in response to changing climate.



The decline of extensive livestock farming has had a major impact on many habitat specialist butterflies e.g. the High Brown Fritillary in bracken habitats on Dartmoor (left) and the Marsh Fritillary in Culm grasslands in Devon (right).

WIDER COUNTRYSIDE SPECIES

Species that are more widely distributed in the landscape have generally fared better. The distributions of some have fluctuated, declining in the latter part of the 19th century and early 20th century but later recovering all or part of their former range. Others have simply spread to colonise new areas. Nevertheless, some such as the Wall have declined seriously and evidence suggests that many others are less widespread and numerous than in the past. We should not take their long-term future for granted.



The **Marbled White** had declined prior to the 1970-82 survey but has since recolonised almost all of its former range.

Trends of UK BAP priority species

Eleven butterflies are accorded Priority Species status in the UK Biodiversity Action Plan (BAP). In the past two decades, seven have continued long-term declines and two (the Silver-spotted Skipper and Adonis Blue) have shown small recoveries, while one (the Large Blue) has been reintroduced following extinction. The continuing declines are all the more dramatic because of the high level of recording effort and warmer than average weather during the BNM survey. Moreover, rates of decline calculated at the coarse scale of 10 km squares are known to greatly under-estimate population-level change.



Chequered Skipper
Carterocephalus palaemon

Loss of 1970-82 squares **30%**
Estimated decline in breeding squares **37%**

The butterfly became extinct in England in 1976, due to shading of its open woodland habitat. It survives in a small region of western Scotland, where its distribution has remained more or less stable in recent decades. Here too most colonies are dependent on grazing (by livestock and deer) and active woodland management to maintain open grassy habitats. Trials are underway to reintroduce the species to England.



Silver-spotted Skipper
Hesperia comma

Loss of 1970-82 squares **29%**
Estimated decline in breeding squares **29%**

This chalk downland species declined rapidly during the 20th century as sites were ploughed or became overgrown following abandonment of livestock grazing. By 1982 fewer than 50 colonies remained. Conservation management and increased rabbit grazing have since led to a recovery and the butterfly is now breeding in 30% more 10 km squares than in 1970-82. Numbers on monitored sites have increased tenfold since 1976.



Large Copper
Lycaena dispar

EXTINCT (1864)

Attempts to reintroduce this species from the Netherlands have been underway in Britain for almost a century. The native race became extinct in the 19th century because of the drainage of the once extensive East Anglian Fens. Most remaining fragments of fenland are too small to support the species and current hopes rest upon conservation work to extend suitable habitat in the Norfolk Broads.



Silver-studded Blue
Plebeius argus

Loss of 1970-82 squares **44%**
Estimated decline in breeding squares **47%**

Destruction of heathland and the cessation of traditional management such as burning and livestock grazing have been the main causes of decline. Concerted efforts to conserve and restore heaths are underway, but in most areas this sedentary species continues to decline.



Northern Brown Argus
Aricia artaxerxes

Loss of 1970-82 squares

30%

Estimated decline in breeding squares

35%

This butterfly requires sheltered, unimproved grasslands that are lightly grazed. Many colonies have been lost to neglect or overgrazing. Although there have been declines in north-east England and southern Scotland, increased survey effort during the BNM project has led to the discovery of many previously unknown colonies.



Adonis Blue
Polyommatus bellargus

Loss of 1970-82 squares

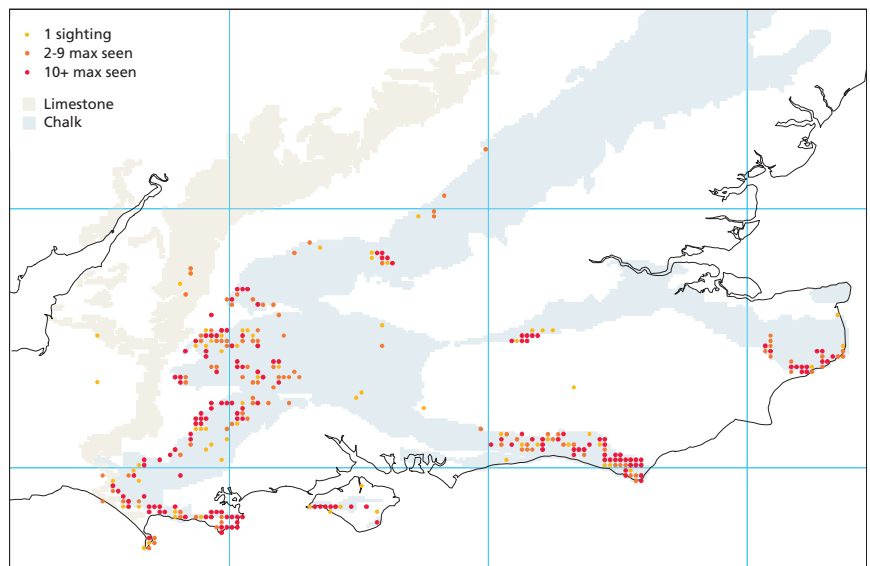
30%

Estimated decline in breeding squares

33%

The widespread decline and partial recovery of this species has many similarities with that of the Silver-spotted Skipper. Both are species of short turf, whose calcareous grassland habitats have been reduced by agricultural intensification, the reduction of livestock grazing and the effects of myxomatosis. The Adonis Blue has benefited from the recovery of rabbit populations and the reinstatement of livestock grazing under agri-environment schemes and on nature reserves. It is now breeding in 5% more 10 km squares than in the 1970s.

The distribution of 1995-9 records of Adonis Blue at 2 km square resolution, against a background of the main chalk and limestone strata of southern England.



Large Blue
Maculinea arion

EXTINCT (1979)
and reintroduced since 1983

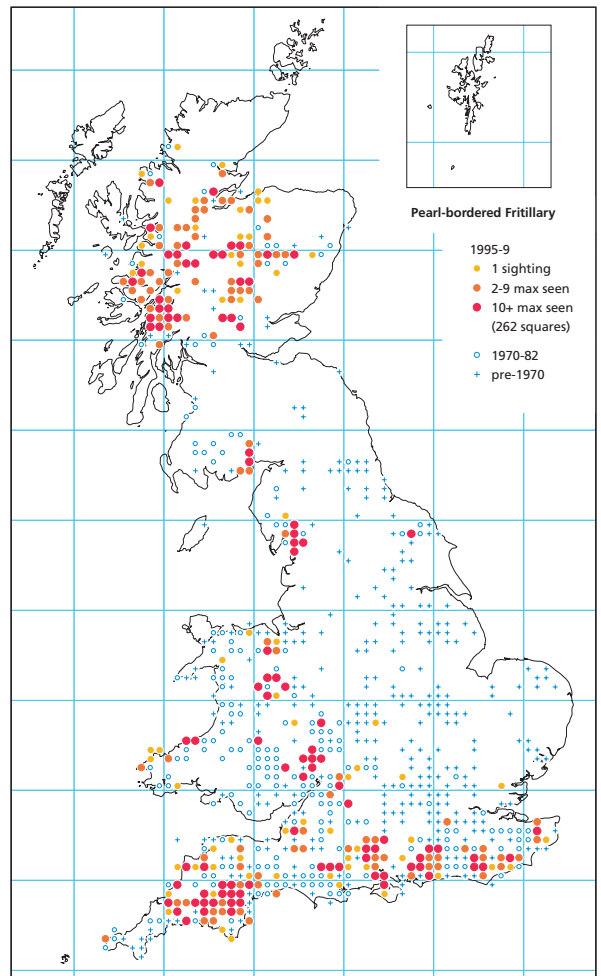
This globally threatened butterfly became extinct in Britain despite considerable conservation efforts. Thanks to detailed research, we now know that a major cause was the relaxation of grazing pressure on its unimproved grassland habitat, although many sites were also lost to agricultural 'improvement'. The butterfly relies on a single species of red ant (upon which its larvae feed) that is dependent on warm, short-turf conditions. Armed with good ecological knowledge, it has been possible to restore habitats and reintroduce Large Blues from Sweden to 8 British sites.



Pearl-bordered Fritillary
Boloria euphrosyne

Loss of 1970-82 squares **60%**
Estimated decline in breeding squares **68%**

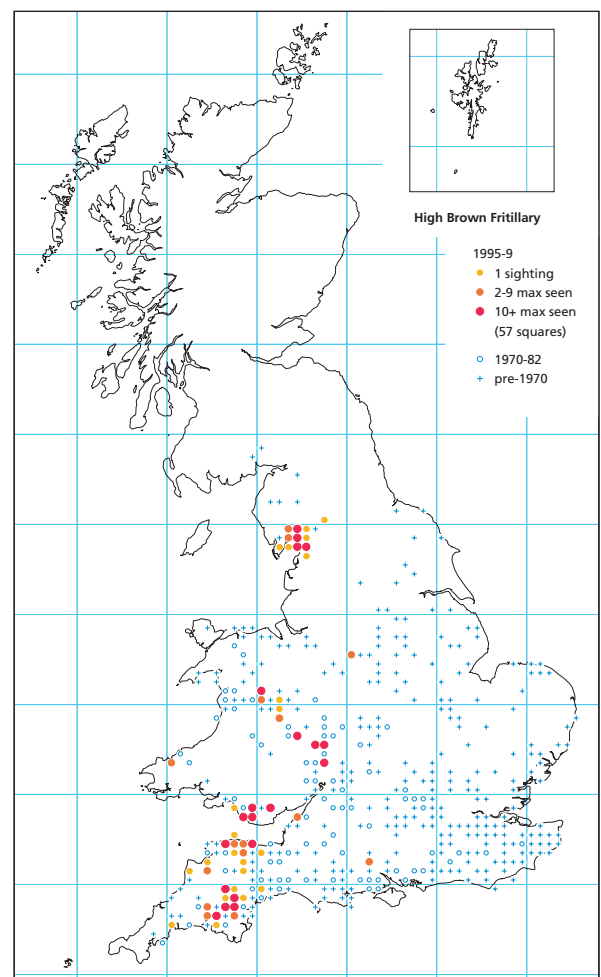
This is one of our most rapidly declining butterflies. Once widespread in woodland clearings and bracken-dominated habitats across Britain, it is now threatened in England and Wales. Even on the protected sites in the BMS, numbers have dropped by 89% in 25 years. Reduction in woodland management, particularly the decline in coppicing, is the major cause, but bracken habitats have also deteriorated due to abandonment or overgrazing. In Scotland, surveys have identified many previously unknown colonies, but there are threats from loss of habitat and woodland regeneration schemes.

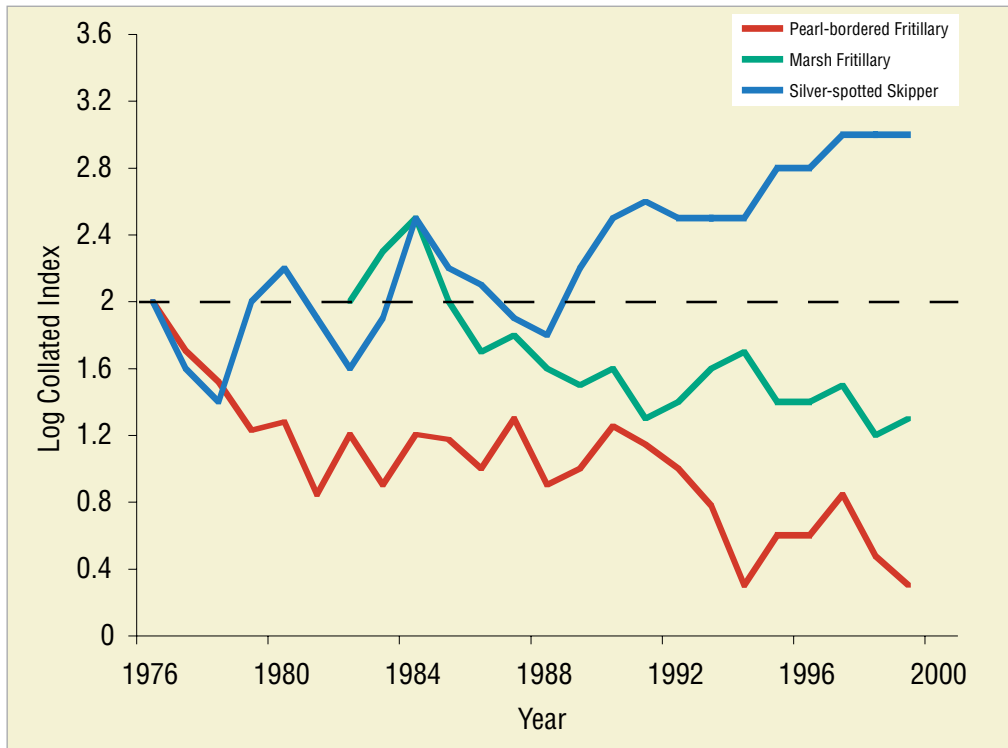


High Brown Fritillary
Argynnis adippe

Loss of 1970-82 squares **77%**
Estimated decline in breeding squares **82%**

Like the Pearl-bordered Fritillary, this species was once widespread in coppiced woodlands and grazed bracken habitats. Its decline since the 1950s has been sudden and severe, and it is now restricted to around 50 sites with either bracken-dominated vegetation or limestone outcrops. Management for the butterfly on some nature reserves has been successful, but elsewhere colonies continue to be lost as extensive livestock farming declines.





Trends for BAP Priority Species at monitored sites: The Pearl-bordered Fritillary (BMS data) and the Marsh Fritillary (Butterfly Conservation data) show significant declines in abundance, while the Silver-spotted Skipper (Butterfly Conservation data) has increased significantly, in part due to conservation management at its monitored sites.



Marsh Fritillary
Euphydryas aurinia

Loss of 1970-82 squares **55%**
Estimated decline in breeding squares **60%**

Severe declines, especially since 1950, have led to the extinction of this species throughout eastern Britain. Such declines have occurred across Europe. The remaining British strongholds, on damp grasslands in western Scotland, Wales and south-west England and on the chalk of Salisbury Plain, are now of international importance. Destruction of unimproved grasslands for agriculture and the decline of extensive cattle grazing continue to cause the loss of colonies in these strongholds. Landscape-scale conservation measures are needed to maintain networks of suitable habitat.



Heath Fritillary
Melitaea athalia

Loss of 1970-82 squares **31%**
Estimated decline in breeding squares **38%**

Never as widespread as other priority fritillaries, this species has undergone a severe decline and is one of our rarest butterflies. The decline is strongly linked with the cessation of coppicing, but conservation action has saved the last few woodland colonies by reinstating suitable management. The other habitat used by the species, heathland valleys on Exmoor, is now threatened by a reduction in both grazing and burning, and the number of colonies has halved since 1989.

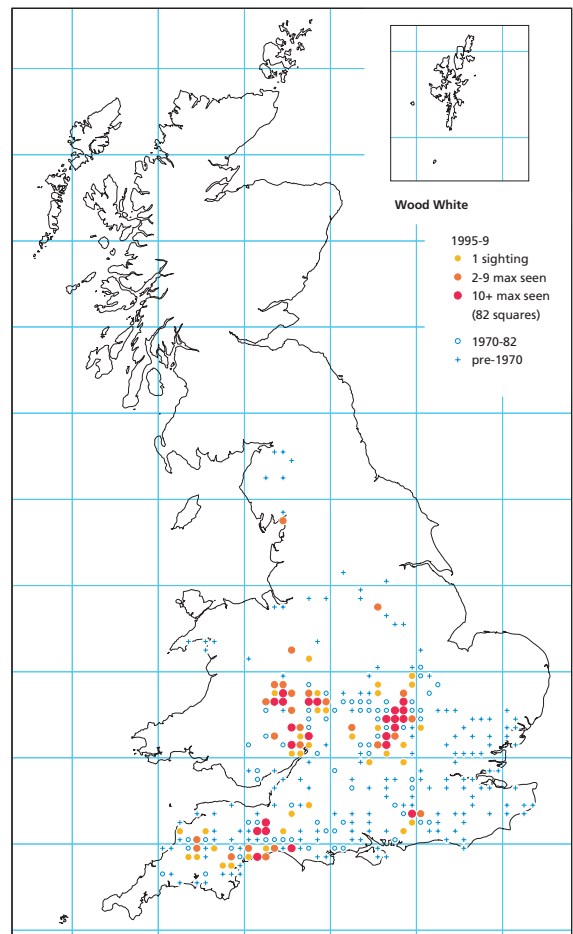
Trends in Species of Conservation Concern

Most of the 14 Species of Conservation Concern listed in the BAP have undergone substantial declines over the past two decades. Butterflies of open woodland habitats (e.g. clearings, glades and rides) have fared particularly badly as traditional management practices, particularly coppicing, have been abandoned or broad-leaved woods have been replaced by conifer plantations. The Wood White has been lost from 62% of the 10 km squares in which it was recorded in 1970-82. This becomes a 72% loss of breeding squares, if squares with only single sightings in the BNM survey are excluded. The Duke of Burgundy and Small Pearl-bordered Fritillary have both declined by 39%, with particularly heavy losses in woodland. If recent squares with only single sightings are excluded, their losses become 47% and 52% respectively.



Wood White
Leptidea sinapis

The Wood White has declined so rapidly in recent decades that it now meets the criteria for BAP Priority Species status. Most colonies breed in partially shaded woodland rides and clearings. Successful conservation has been achieved at several nature reserves and Forest Enterprise sites by maintaining open sunny rides and periodic cutting of edge vegetation. At Monkwood, a Butterfly Conservation reserve in Worcestershire, Wood Whites have increased fivefold since the mid-1980s in response to improved management.



Two BAP species declining in British woods, the Duke of Burgundy (left) and Small Pearl-bordered Fritillary (right).

The remaining Species of Conservation Concern are mainly associated with open habitats. Losses of semi-natural grassland and changes to grazing regimes have led to the decline of the Small Blue, Chalkhill Blue and Duke of Burgundy. Only two species, the Lulworth Skipper and Glanville Fritillary have remained relatively stable in their core areas in recent decades.



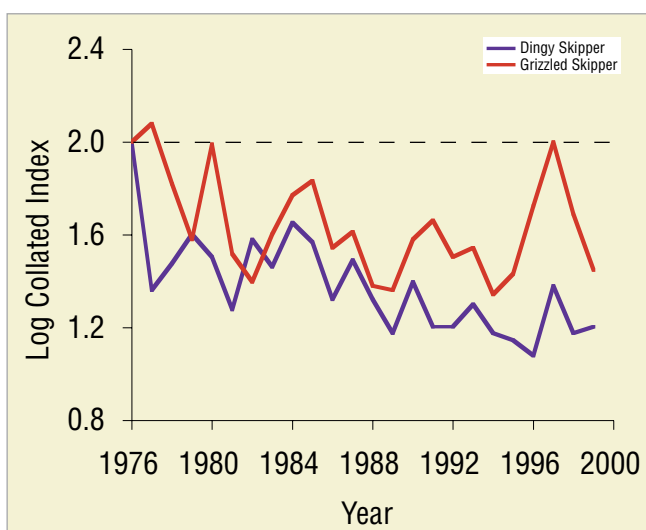
The Large Heath (left) has declined seriously in England and Wales, but is still widespread in parts of Scotland. Drainage, afforestation and peat extraction have destroyed its wet moorland and bog habitats. Over 90% of lowland raised bogs have been lost in the last two centuries. Overgrazing by sheep in the uplands, as a consequence of EU subsidies, has also played a major part in the butterfly's decline. Similar losses in other countries have led to the species being classified as Vulnerable in Europe.

NEW PRIORITIES FOR CONSERVATION

The distribution declines measured by the BNM project (see p.12) indicate that additional species should be considered for inclusion in the BAP or have their priority level increased. The Wood White, Brown Hairstreak, Small Blue, Duke of Burgundy, Small Pearl-bordered Fritillary and Large Heath all now meet decline criteria for Priority Species status. The Dingy Skipper, Grizzled Skipper, Dark Green Fritillary and Grayling also now meet these decline criteria, although none are listed in the BAP at present.

Concern over the distribution declines of the Dingy Skipper (right) and Grizzled Skipper is heightened by collated index trends from the BMS. These show that numbers of both species have almost halved since monitoring began in 1976.

Increased recording effort as part of the BNM project led to the discovery of many new colonies of these skippers on abandoned industrial sites, disused railways and old quarries. Such 'brownfield' sites are often targeted for redevelopment, and their value for regionally important butterflies and other wildlife has yet to be fully recognized.



TRENDS IN BUTTERFLIES OF CONSERVATION CONCERN IN BRITAIN

| | 10 km squares recorded 1995-9 | Long-term decline ¹ | Squares lost since 1970-82 ² | Decline in breeding squares since 1970-82 ³ | European status ⁴ | UK BAP target |
|---|--------------------------------|--------------------------------|---|--|------------------------------|--|
| BAP PRIORITY SPECIES | | | | | | |
| Chequered Skipper | 27 | 72% | 30% | 37% | D | Maintain colonies, reintroduce to England |
| Silver-spotted Skipper⁵ | 31 | 76% | 29% | 29% | D | Maintain colonies |
| Large Copper | 0 | 100% | - | - | D/E | Consider reintroduction |
| Silver-studded Blue | 97 | 71% | 44% | 47% | D/E | Maintain colonies, restore 1982 distribution |
| Northern Brown Argus⁶ | 121 | 38% | 30% | 35% | D | Maintain range |
| Adonis Blue⁵ | 95 | 52% | 30% | 33% | D | Maintain colonies, restore 1982 distribution |
| Large Blue | 5 <small>introduced</small> | 100% | 100% | 100% | Endangered | Maintain 5 colonies and introduce to a further 5 |
| Pearl-bordered Fritillary | 262 | 69% | 60% | 68% | D | Halt decline, restore to former range |
| High Brown Fritillary | 57 | 87% | 77% | 82% | D | Halt decline, restore suitable habitat |
| Marsh Fritillary | 224 | 66% | 55% | 60% | Vulnerable | Halt decline, maintain large colonies in key areas |
| Heath Fritillary | 13 | 85% | 31% | 38% | D | Maintain colonies, restore to 25 colonies in Kent. |

| BAP SPECIES OF CONSERVATION CONCERN | | | | | | |
|--|-----|-----|-----|-----|------------------------|--|
| Lulworth Skipper⁷ | 12 | 54% | 23% | 23% | Vulnerable | |
| Swallowtail⁸ | 6 | - | 0% | 0% | D | |
| Wood White | 82 | 76% | 62% | 72% | D | |
| Brown Hairstreak | 137 | 63% | 34% | 39% | D | |
| Black Hairstreak | 25 | 47% | 33% | 42% | D | |
| Small Blue⁶ | 245 | 52% | 30% | 41% | D | |
| Chalkhill Blue | 204 | 43% | 25% | 33% | D | |
| Duke of Burgundy | 106 | 64% | 39% | 47% | Near Threatened | |
| Purple Emperor^{5,6} | 89 | 67% | 33% | 64% | D/E | |
| Small Pearl-bordered Fritillary⁶ | 768 | 42% | 39% | 52% | D | |
| Silver-washed Fritillary⁵ | 495 | 40% | 24% | 38% | D/E | |
| Glanville Fritillary | 9 | 65% | 29% | 43% | D | |
| Mountain Ringlet⁶ | 39 | 37% | 41% | 48% | S? | |
| Large Heath⁶ | 340 | 43% | 47% | 57% | Vulnerable | |
| CANDIDATE SPECIES | | | | | | |
| Dingy Skipper | 571 | 47% | 39% | 49% | D | |
| Grizzled Skipper | 385 | 50% | 36% | 48% | D | |
| Dark Green Fritillary | 925 | 37% | 36% | 55% | D | |
| Grayling | 582 | 44% | 38% | 49% | D | |

1 Long-term trend is the overall loss of 10 km squares that were occupied at some point between 1800-1994, but not re-recorded in 1995-9.

2 To take account of greatly increased recording intensity since the 1970-82 survey, declines have been assessed from the number of squares recorded in 1970-82 from which species have been 'lost' (not re-recorded in 1995-9).

3 This estimate refines the assessment of loss between recording periods by excluding 10 km squares in which only one individual of a species was seen during 1995-9. In most cases such records indicate vagrant individuals, leaving a more accurate figure of squares in which breeding colonies are located. It should be treated with some caution for species in which records are biased towards single sightings for ecological reasons (e.g. canopy species such as the Purple Emperor and Black Hairstreak).

4 D= declining in several European countries, E= expanding in several European countries, S= stable, derived from Swaay and Warren (1999).

5 Species for which a substantial number of new 10 km squares have been recorded since 1970-82 due to range expansion.

6 Species for which a substantial number of new 10 km squares have been recorded since 1970-82 due to improved recording in the BNM.

7 Long-term decline since 1800 should be treated with caution because of unverified historical records.

8 Pre-1970 records of the Swallowtail are difficult or impossible to separate into the resident race and immigrants of the continental European race. Therefore, an assessment of overall change is not possible.

Declining Common Species

There is strong evidence that some of our 'common' species have declined in abundance, although their ranges have changed little (or even expanded) at the 10 km square level. Many people believe that they see fewer butterflies now than in their youth and scientific research is beginning to support this view.

Detailed studies in north Wales have estimated that the flight areas (the total area of land used by a species) of many common species have declined substantially during the 20th century, whilst their overall distributions had changed little at a coarse geographical scale. For example, declines of the Small Copper have been estimated at 91%, Brown Argus at 77% and Common Blue and Large Skipper at 75%. Even the Meadow Brown, the most abundant butterfly in Britain, had lost over half of its flight area in the study region. More generally, wider countryside species, such as the Small Heath and Small Copper, are increasingly scarce within 10 km squares and overall distribution

declines may be expected as colony losses continue. Numbers of the Small Heath have declined by 63% at BMS sites.

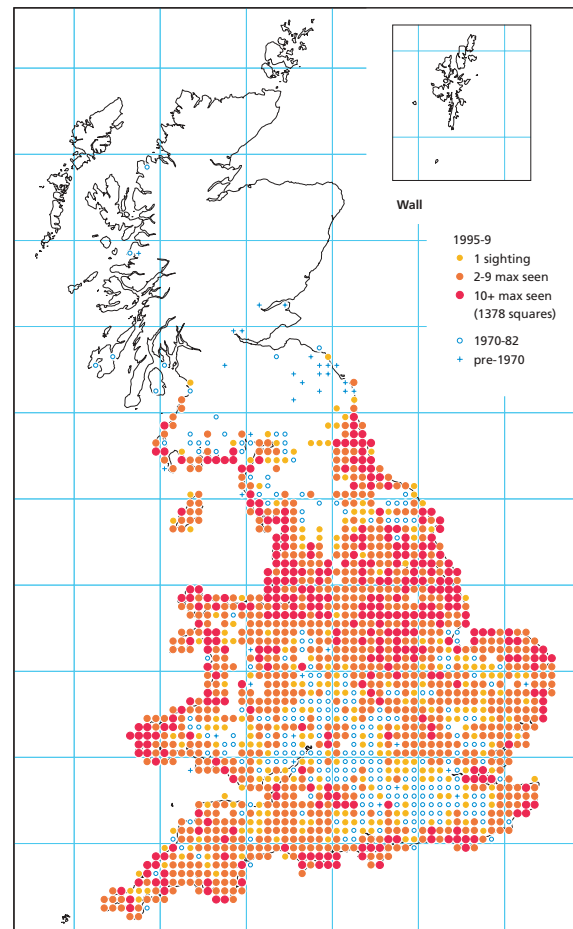
It is not hard to understand why. Semi-natural grasslands and 'rough' grazing land have been lost and the network of hedgerows and field margins, which provides vital breeding habitat for many wider countryside species, has been severely reduced. Where hedgerows remain in farmland (or where new ones have been planted), their value for wildlife has often been damaged or destroyed by management practices such as the cultivation of former field margins, the use of herbicides and the flailing of hedges each year.

Major reform of the Common Agricultural Policy is needed to reverse the decline of common as well as rarer species. Farm support should be conditional on the maintenance of existing wildlife and landscape features, and agri-environment schemes must be expanded to encourage suitable management and restoration of habitats throughout the countryside.



Wall
Lasiommata megera

The Wall is one of the few wider countryside species to show a substantial decline in its 10 km square distribution since 1970-82. It has disappeared from a large part of southern England and the west Midlands. Numbers recorded at inland BMS sites have also plummeted, whilst they have remained relatively stable at coastal sites. The reasons for this decline are not clearly understood, but the loss of suitable habitats has certainly played a part.



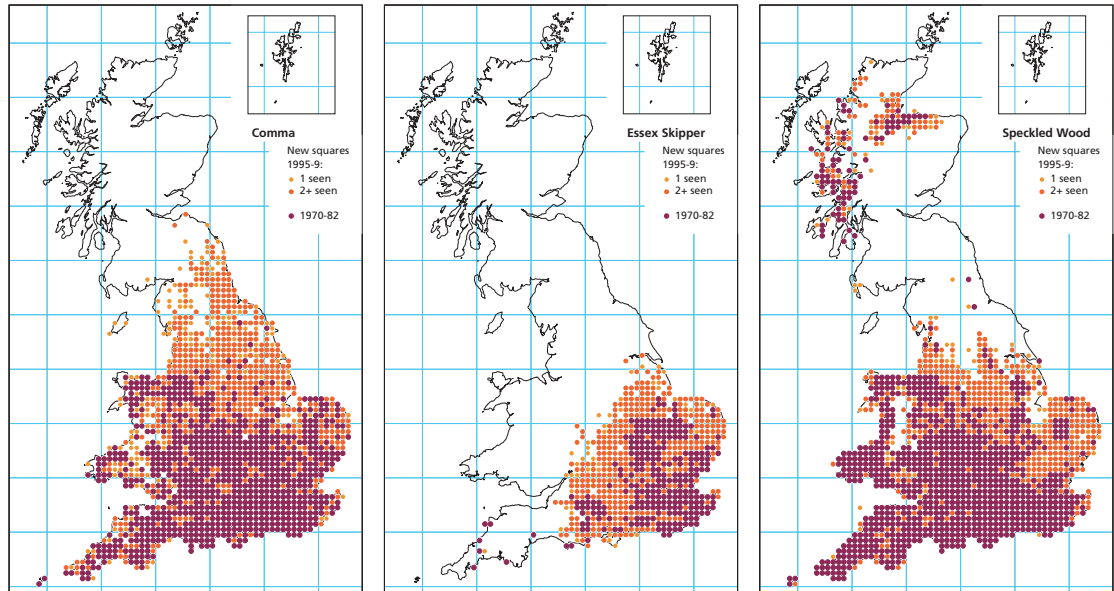
Expanding Species

Fifteen species, a quarter of the resident butterfly fauna, have shown substantial expansions in range since 1970-82.

The recent expansions of the Orange-tip, White Admiral, Peacock, Comma and Speckled Wood represent the continuation of long-term trends identified by the previous survey. However, the rate of spread has increased in the past two decades and the expansions of several species have become apparent only since the 1970s. A few of the expanding species (e.g. the Brown Argus and Marbled White) have undergone reversals of fortune, as they were declining at the time of the 1970-82 survey.

Most of these species are spreading northwards in Britain, although some are spreading to the east or west at the same time. The exact pattern of change varies with each species. Some have spread away from core areas that have been occupied for many decades (e.g. the Essex Skipper and Brown Argus). Others, including the Comma and Speckled Wood, have re-expanded following a contraction during the late 19th and early 20th century. Although the expanding species have different life histories and larval foodplants, all but one (the White Admiral) can be considered wider countryside species.

Maps showing the expansion of the Comma (left), Essex Skipper (centre) and Speckled Wood (right) since 1970-82.



| Species | Overall distribution increase (10 km squares) since 1970-82 | Margin extension northwards (km) |
|--------------------------------------|---|----------------------------------|
| Small Skipper | 37% | 89 |
| Essex Skipper | 139% | 72 |
| Large Skipper | 31% | 32 |
| Brimstone | 37% | 42 |
| Orange-tip¹ | 43% | 112 |
| Purple Hairstreak² | 78% | - |
| Brown Argus | 108% | 39 |
| Holly Blue | 89% | 36 |
| White Admiral | 56% | 70 |
| Peacock² | 34% | - |
| Comma | 79% | 220 |
| Speckled Wood¹ | 54% | 49 |
| Marbled White² | 66% | - |
| Gatekeeper | 33% | 43 |
| Ringlet | 53% | 70 |

1 Species with disjunct British distribution. Margin expansion refers to the southern distribution.

2 Patchy historical and current distributions make it difficult to assess the range margin.

CAUSES OF EXPANSION

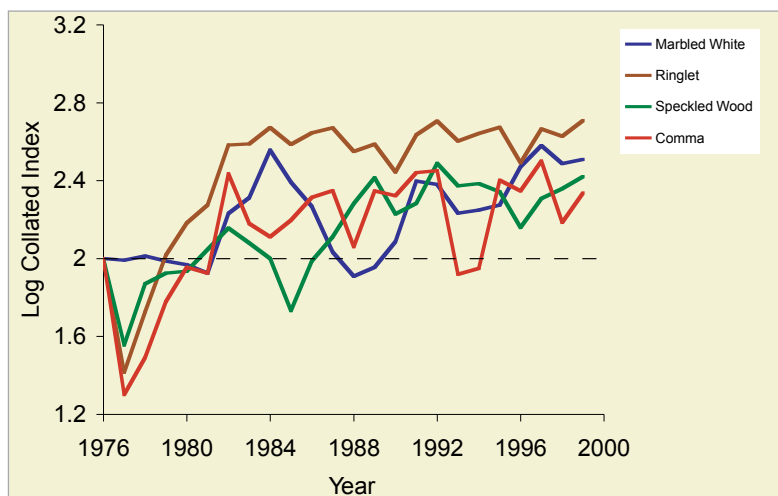
Climate change

Climate appears to be the main factor causing butterflies to spread. Average spring and summer temperatures in Britain have increased by 1.5 and 1 °C respectively in the past 25 years, a substantial increase for butterflies, many of which reach their European range margin in Britain. Many short-term effects of climate have already been elucidated from BMS data, and populations of several species have increased considerably in the last 25 years. The evidence for the role of climate change in range expansions comes from the simultaneous spread of species, counter to the decrease in extent of most butterfly habitats, and also from northward range shifts elsewhere in Europe.

Changing habitats

Climate change is not the only factor implicated in range expansions: several species have benefited from changes in management. For example, the spread of the White Admiral is connected with increased shade in woodlands during the 20th century, as coppicing was abandoned and many woods became overgrown. Many of the expanding species are those that breed in linear habitats and may have been influenced by changing management practices. Species favouring longer grass (e.g. the Essex Skipper and Marbled White), may have benefited from the reduced frequency of cutting and spraying of road and railway verges and, probably, from arable set-aside.

Butterflies are good indicators of environmental change. They have specific climatic and habitat requirements, respond quickly to change and are easy to record. Measuring the distribution responses of butterflies is an effective way of assessing some of the effects of climate change upon the 29,000 plus species of British invertebrates.



Trends for expanding species at BMS sites:

The Marbled White, Ringlet, Speckled Wood and Comma, all wider countryside species which have spread in recent decades, show significant increases in abundance at monitored sites.



Spreading northwards: the Speckled Wood (left) and Orange-tip (right).

Conclusions

- ✦ The distributions of butterflies in Britain have changed substantially during the last two centuries, with particularly heavy losses over the last 50 years. At the start of the new century and millennium, butterflies continue to be threatened by many factors, ranging from agricultural intensification and change of land use, to climate change. There is little doubt that butterfly distribution and status will continue to change in the future and we must be prepared to re-assess the situation regularly and base our actions on sound, up to date information. The BNM project has provided an unprecedented amount of information on how distributions have changed and a valuable new database that can be used to support conservation. It also provides a detailed baseline against which future change and the success of the BAP targets can be measured.
- ✦ Conserving butterflies is undoubtedly a large and difficult task, but we have never been better equipped to face the challenge. We have the benefit of decades of pioneering research into butterfly ecology and conservation, and a wealth of experience with habitat management. Some of the prominent issues that need to be addressed over the coming decades have been outlined. There is no doubt that new problems will appear in the future and conservationists will need to be forward-looking and adaptable.
- ✦ For much of the last century, conservationists fought a rear-guard action that was unable to prevent the progressive loss of habitats and species, except in a few notable cases. A more positive agenda for conservation must now be developed, to identify underlying causes of decline and try to tackle problems before they become unstoppable. The BAP provides a powerful new mechanism for delivering the conservation of threatened species and habitats, but it needs to be properly resourced if the downward trends are to be halted and reversed.
- ✦ The loss of butterflies must be seen in the context of the declines seen in many other wildlife groups. In almost all cases, measures to protect one species or habitat will serve others and unified policies are needed to avoid duplication of effort. The BAP process shows how this integration can be achieved and it is to be hoped that it will ensure that wildlife conservation is given greater emphasis, locally and nationally, in the future. More people than ever before participate in schemes such as the BNM and also support practical conservation of butterflies. These familiar and attractive insects, together with many other invertebrates, are now widely regarded as an essential part of our wildlife heritage that is worthy of concerted conservation action.

FUTURE RECORDING AND MONITORING

The BNM project and the BMS have provided complementary datasets that are probably the largest available on an insect group anywhere in the world. The three organisations that run them (Butterfly Conservation, CEH, and JNCC) are determined to continue and develop the schemes to provide a better and more accurate picture of the changing status of British butterflies in the future. For example, Butterfly Conservation has recently begun a project to co-ordinate the 550 or more butterfly monitoring transects that have been established independently of

the BMS, as part of a MAFF-funded project to examine the impact of agri-environment schemes on butterfly populations. A new network of transect co-ordinators has been established and new software developed to enable volunteers and organisations to enter data locally, and facilitate central collation. Butterfly Conservation, CEH, and JNCC hope to be able to integrate this new and valuable data into the BMS soon, to provide an even more comprehensive picture of the trends in abundance of butterfly populations.

These schemes demonstrate the value of volunteers in recording and in providing vital information on the health of the environment and the sustainable use of the countryside.

FURTHER READING

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The State of Britain's Butterflies could not be assessed without the dedication and skill of thousands of people who record and monitor butterflies as part of the Butterflies for the New Millennium project and transects co-ordinated by the Butterfly Monitoring Scheme and Butterfly Conservation. It has also depended upon the enthusiastic participation and support of many organisations, both local and national, statutory and voluntary.

We are deeply grateful to the Vincent Wildlife Trust, Esmée Fairbairn Foundation and ICI for sponsorship of the BNM project; the Centre for Ecology and Hydrology and the Joint Nature Conservation Committee who fund both the Biological Records Centre and the Butterfly Monitoring Scheme; and the Ministry of Agriculture, Fisheries and Food who support Butterfly Conservation's co-ordination of transect data.

Photo credits

COVER

Adonis Blue Ken Willmott; digital image, Rob Still

Alan Barnes: Chequered Skipper (p.6), Silver-spotted Skipper (p.6), Silver-studded Blue (p.6), Marsh Fritillary (p.9), Heath Fritillary (p.9), Duke of Burgundy (p.10), Dingy Skipper (p.11), Speckled Wood (p.15), Orange-tip (p.15).

English Nature (Peter Wakeley): Coppice woodland (p.4), chalk grassland (p.4).

Robert Thompson: Dark Green Fritillary (p.1), Marbled White (p.5), Large Copper (p.6), Pearl-bordered Fritillary (p.8), High Brown Fritillary (p.8), Small Pearl-bordered Fritillary (p.10), Large Heath (p.11), Wall (p.13).

Martin Warren: volunteers (p.2), Large Blue (p.3), Dartmoor (p.5), Culm grassland (p.5), Large Blue (p.7), Wood White (p.10).

Ken Willmott: Northern Brown Argus (p.7), Adonis Blue (p.7).

The Millennium Atlas of Butterflies in Britain and Ireland

A detailed assessment of all Britain's butterflies, the habitats they live in and the threats that they face is presented in *The Millennium Atlas of Butterflies in Britain and Ireland* (ISBN 0 19 850565 5). This major new book, published in March 2001 by Oxford University Press, presents all of the findings of the Butterflies for the New Millennium survey, long-term distribution trends and changes elsewhere in Europe. In addition, the book summarizes the wealth of new information about butterfly ecology and habitat management, incorporates findings from the Butterfly Monitoring Scheme and presents a vision of how these popular insects might be conserved in the future. See the Butterfly Conservation web site for more information.



Butterfly Conservation

Butterfly Conservation (the British Butterfly Conservation Society) is the largest insect conservation charity in Europe. Its aim is the conservation of butterflies, moths and their habitats in the UK. As well as taking a lead role in butterfly recording and monitoring, Butterfly Conservation is Lead Partner for the Priority Species in the UK Biodiversity Action plan and carries out research and conservation programmes for over 60 threatened species of butterfly and moth.

UK Headquarters: Butterfly Conservation, Manor Yard, East Lulworth, Wareham, Dorset BH20 5QP.
Tel: 01929 400209 Fax: 01929 400210 E-mail: info@butterfly-conservation.org

Scottish Office: Butterfly Conservation, Balallan House, Allan Park, Stirling FK8 2QG.

Visit the Butterfly Conservation web site: www.butterfly-conservation.org

Joint Nature Conservation Committee

The Joint Nature Conservation Committee is responsible to the UK Government for research and advice on nature conservation at both UK and international levels, on behalf of the Countryside Council for Wales, English Nature and Scottish Natural Heritage, together with independent members and representatives from the Countryside Agency and Northern Ireland. The JNCC supports surveillance and monitoring of UK species, including invertebrates, by contributing funds to projects such as the BMS.

Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough PE1 1UA.
Tel: 01733 562626 Fax: 01733 555948

Visit the JNCC web site:
www.jncc.gov.uk

Biological Records Centre

The Biological Records Centre (BRC) works with naturalists and research and conservation biologists to co-ordinate their efforts in studying the occurrence of plants and animals in the UK, and to make the results of these studies available to others. BRC was established in 1964 and is funded mainly by the NERC Centre for Ecology and Hydrology (CEH) and the Joint Nature Conservation Committee. BRC takes a leading role in the development of the National Biodiversity Network.

Biological Records Centre, CEH Monks Wood, Abbots Ripton, Huntingdon PE28 2LS.
Tel: 0148 777 2400. Fax: 0148 777 3467

Visit the Biological Records Centre web site:
www.brc.ac.uk