United Kingdom
Butterfly Monitoring Scheme

ANNUAL REPORT 2006

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Tracking changes in the abundance of UK butterflies

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Cover photograph of Silver-washed Fritillary by Keith Warmington
The Silver-washed Fritillary (*Argynnis paphia*) had a particularly good year in 2006, with record numbers recorded on many transects. It was also recorded on transects where it has not been seen for some years, and on a few for the first time. General records also indicated that this butterfly experienced a within Britain migration with many being recorded in areas where they are not known to breed and where they have not been seen for many years.

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Butterfly Conservation
Saving butterflies, moths and their habitats

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

JOINT NATURE CONSERVATION COMMITTEE

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Department for Environment Food and Rural Affairs

REPORT CONTENTS

ABOUT THE UKBMS

Welcome to the second report of the United Kingdom Butterfly Monitoring Scheme (UKBMS).

Changes in the abundance of butterflies throughout the United Kingdom have been monitored using transects since 1976. Over the past 31 years, recorders have made over 154,000 weekly visits to 1453 different transects, walking almost 380,000 km and counting nearly 11.5 million butterflies!

The UKBMS is based on a well-established and enjoyable recording method and has produced important insights into almost all aspects of butterfly ecology.

Butterflies are uniquely placed amongst British terrestrial insects and other invertebrate groups to act as indicators of the state of the environment, allowing us to assess the impacts of habitat change, climate change and the progress of government policy initiatives such as the UK Biodiversity Action Plan, agri-environment schemes and the condition of Sites of Special Scientific Interest (SSSIs). Not only are butterflies biologically suitable as indicator species, having rapid lifecycles and, in many cases, high sensitivity to environmental conditions, but the recording and monitoring volunteer networks and datasets built up by Butterfly Conservation (BC) and the Centre for Ecology and Hydrology (CEH) enable accurate assessment of their trends.

The UKBMS is run as a partnership between **Butterfly Conservation (BC)** and the **Centre for Ecology and Hydrology (CEH)**. The scheme also benefits from the active involvement of the **National Trust**, the **Royal Society for the Protection of Birds** (**RSPB**), the **Forestry Commission** and several **wildlife trusts** and **local authorities**.

The UKBMS project has been funded for three years (2005-2008) by a multi-agency consortium led by the **Department of the Environment, Food and Rural Affairs (Defra)**, and including the **Joint Nature Conservation Committee, (JNCC) Countryside Council for Wales** (**CCW**), **Natural England** (**NE**), **Environment & Heritage Service (Northern Ireland)** (**EHSNI**), **Forestry Commission** (**FC**), **Scottish Executive, Environment and Rural Affairs** (**SEERAD**), and **Scottish Natural Heritage** (**SNH**). Further funding is currently being sought for continuation of the scheme.

UKBMS objectives

- To maintain and develop a network of transect and other monitored sites in order to assess and interpret changes in the abundance and status of UK butterflies.
- To encourage participation in scientific butterfly monitoring by supporting volunteer recording networks.
- To ensure a high level of quality assurance for butterfly monitoring data by development and promotion of standards, and by applying rigorous data validation and verification procedures.
- To secure and manage butterfly monitoring data and provide access to academia, governments, industry and the public.
- To advance knowledge in butterfly ecology through interpretation of butterfly monitoring data.
- To provide scientific underpinning for solutions to butterfly conservation issues arising from habitat and climate change.
- To provide a knowledge base, including indicators of change, for government policies addressing environmental issues.
- To promote public awareness and understanding of butterflies through communication of the results of the scheme.

Much information on the UKBMS can be found on our website www.ukbms.org

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MEET THE TEAM

David Roy has been based at CEH Monks Wood since 1994. He took over from Dorian Moss as manager of the BMS in 2003 and is now based in the Biological Records Centre (BRC). He is an ecologist who specialises in data analysis. He manages the UKBMS database and his research focuses on the impacts of climate change.

Tom Brereton has worked for BC since 1997 after completing a PhD on the ecology of the Grizzled Skipper. At BC he is head of monitoring, and project manages the UKBMS for BC. Tom is particularly involved in developing butterfly indicators and farmland research, management and policy.

Ian Middlebrook joined BC in January 2007 as their Butterfly Monitoring Co-ordinator. He had already been based with BC at Manor Yard for 6 years, leading conservation work on a suite of rare (non-lepidopteran) invertebrates through the 'Action for Invertebrates' partnership project. With the UKBMS Ian is the first point of contact for recorders and local transect co-ordinators.

Nick Greatorex-Davies was co-ordinator of the BMS based in the BRC from 1995 to 2006. He has worked at Monks Wood as an entomologist since 1974 where he has specialised in moths and butterflies. Currently his main UKBMS role is developing the quality control and data validation side of butterfly monitoring.

Val Burton has been based in the BRC at Monks Wood since 1971. Her involvement with the BMS really began in 1990 when she took over the task of data entry each autumn. Her speed and accuracy in data entry has made her an invaluable part of the team.

Jim Bacon joined CEH in 2007 as a website designer. His role has included updating and extending the UKBMS site.

Katie Cruickshanks joined BC in April 2006 after completing a PhD in ecology at Southampton University. In her role as wider countryside field researcher, Katie is responsible for planning and conducting the pilot studies for the wider countryside monitoring scheme.

Peter Rothery has been based at CEH Monks Wood since 1995. He is a biometrician specializing in the application of statistical methods and mathematical models in ecology. He collaborates with David Roy on the analysis of UKBMS data.

We would like to take this opportunity to welcome Ian Middlebrook and Jim Bacon who joined the team in 2007.

HIGHLIGHTS IN 2006

2006 was a record year for monitoring effort – with more than 660 transect and 120 timed /larval web count sites contributing data for the indices and trends presented in this report. This is a remarkable increase in data utilisation through the UKBMS, as just 140 sites were used in the BMS only two years ago. The extra data enabled trends to be calculated for nine new species (bringing the total up to 50 since 2004) and more precise indices and trends for established species.

The summer of 2006 rated among one of the warmest on record. In fact July was the hottest month ever recorded in the UK and September was the hottest September since records began.

Despite this, butterfly numbers were not as high generally as might have been expected, as it is now well established that many butterfly species are more abundant during warm sunny conditions providing it does not produce drought conditions. Following a wet May, rainfall was well below average for June and July, but the vegetation did not generally become parched.

In fact, overall 2006 can be classed as an 'average' year for butterflies, with 2006 ranking 15th out of 31 years of the BMS/UKBMS (see page 8).

However two species did particularly well, the Chalkhill Blue (pictured below) and the Silver-washed Fritillary (front cover). They both produced their highest index since monitoring began in 1976. The warm weather encouraged the Silver-washed Fritillary to disperse into many places where it had not been seen for years, including north of it's core range in counties such as Oxfordshire, Hertfordshire, Bedfordshire and Cambridgeshire.

It was also a good year for migrant butterflies, with Clouded Yellow, Painted Lady and Red Admiral producing some of their highest indices of the series. Many recorders will also remember 2006 as a phenomenal year for migrant moths too, with for example, Hummingbird Hawkmoth's turning up widely on transects.

On balance though, more species decreased in abundance in 2006 compared to the previous year (27 species compared to 22), with four species having their worst year of the series: Grizzled Skipper, Wall Brown Small Tortoiseshell and Wood White.

The year ended with very mild weather and on the 1st January 2007, Red Admiral's were seen in at least 12 counties, making us think about how we might change our recording periods in the future in the light of climate change.

In future UKBMS reports, we hope to improve our assessment of how butterflies are faring overall, by using government adopted butterfly biodiversity indicators.

Basking Chalkhill Blues early evening. *Photo Tom Brereton*

SURVEY METHODS

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 (Pollard & Yates 1993). The transect method, which was established in 1976, involves weekly butterfly counts along fixed routes through the season made under strict weather, recording area and time of day criteria. 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 (Rothery & Roy 2001).

For a number of specialist species (especially the fritillaries) two 'reduced effort' scientific methods; adult timed counts (Warren *et al.* 1981) and larval web counts (Lewis and Hurford, 1997), are also used to monitor annual abundance, especially in remoter parts of the UK. In both timed and larval web counts, systematic recording is made on single days in suitable weather (when UKBMS recording criteria are met), with the counts converted to a robust index that accounts for both the size of the colony and the time in the season when the count was made.

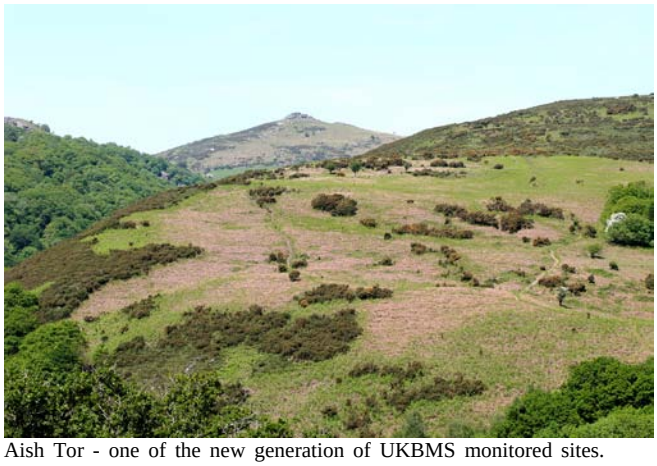
Data from transects (1200 sites) and timed counts/larval webs (~200 sites) is combined each year to derive regional and national 'collated' indices and to estimate trends over time. Because not all sites are monitored each year, a statistical model (using log-linear regression) is needed to estimate 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'.

Survey coverage in 2006

In 2006 a record-breaking 660 transect and 120 timed /larval web count sites were monitored and contributed data to the analyses presented in this report, with good geographic spread across the UK, including an increasing number in Northern Ireland, Scotland and Wales. The totals represent a huge increase in the number of sites used in annual reporting of UK-wide species trends since inception of the UKBMS (there were 140 sites in the BMS in 2004). A country-level breakdown of the sites monitored in 2006 is given in **Table 1**, and their distribution is shown on **Map 1**.

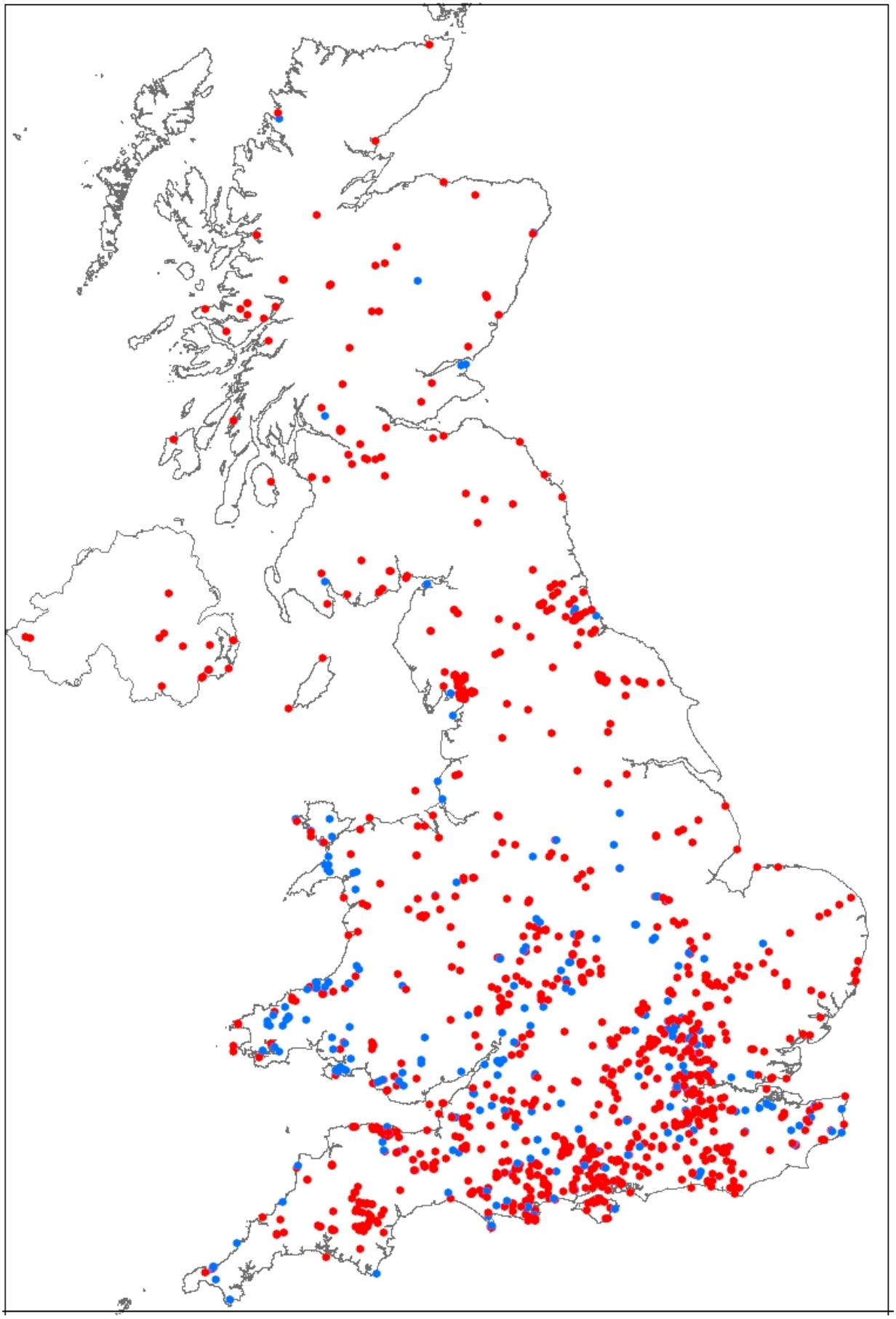
Table 1. Number of monitored sites by country

Country	No. sites
England	660
Scotland	57
Wales	44
Northern Ireland	15



Aish Tor - one of the new generation of UKBMS monitored sites. There has been more than a five-fold increase in the number of sites used to assess national species trends since the launch of the UKBMS. *Photo Tom Brereton*

Collated Indices were calculated for 50 of the 59 regular UK butterfly species (compared to 41 species in 2004 under the BMS), with the UKBMS combined dataset enabling trends to be calculated for nine more species than under the BMS in 2004. Trends were assessed for four canopy species; Purple, White-letter and Brown Hairstreaks and the Purple Emperor, even though transects are generally not considered the best monitoring method for them. However, they are included because 'extreme' high or low years in the abundance of these species can be determined from transect monitoring.



Map 1. Location of UKBMS monitored sites. Red dots show monitored sites that produced indices between 2002 and 2006, blue dots are those which did not produce indices in that period.

REVIEW OF THE 2006 SEASON

Introduction

This is the second year that data for a combined UKBMS dataset has been used to calculate trends in butterfly populations. Graphs showing the Collated Indices for all 50 species for which they are calculated can be found in **Appendix I**. The inclusion of data from additional transects means that the Collated Index graphs showing earlier years will not correspond exactly to those in the 2005 report, but in most cases will be extremely similar. This also applies to rank order in **Table 2** (best versus worst years). We have not produced separate indices for double-brooded species or for those that have a spring and summer flight, but may do this in future. Instead we have produced a combined single index for all sites.

Summary of the weather in 2006

Here we have picked out features of the weather most likely to influence butterfly numbers (e.g. focusing on weather variables in particular months or periods), to help interpret the butterfly results for 2006. For further weather details see http://www.met-office.gov.uk/climate/uk/2006/index.html.

In summary, 2006 was a record breaking year in terms of temperatures. It was the warmest year overall on record and had the hottest July and September ever recorded. There was good sunny weather with low rainfall for both June and July. Overall it was a year with mixed amounts of rainfall following a dry winter.

Rainfall: The period covering December 2005 to February 2006 was generally dry with below average rainfall for most parts of the UK. This period followed a relatively dry 2005, with only April and October of that year producing above average amounts of rainfall. March 2006 had above average rainfall in many parts, and May was especially wet. August was also quite wet in England. However June and July were dry months in 2006 with many areas receiving well below average amounts of rainfall especially in July.

Sunshine: The months of April, June, July and September all experienced above average amounts of sunshine, especially July which was exceptionally sunny with 50% more sunshine overall than average (long term average; 30 year period: 1971-2000).

Temperature: For the UK as a whole, 2006 was the warmest year since records began in 1914. It was also the warmest year on record in terms of the Central England Temperatures (CET) series, which has been recorded since 1659. All months except March had above average temperatures and July was the hottest of any month ever recorded (including CET). The year also had the warmest ever September on record (including CET) and the warmest period April to October ever recorded.

2006 ranked an average year for butterflies

In view of the hot summer months, especially during June and July, numbers of butterflies recorded would be expected to be high for many species, but as will be seen this was not generally the case, and responses were very mixed. Using our ranking procedure, overall 2006 was classed an average year for butterflies, ranking 15th out of 31 years of transect recording. Numbers were slightly lower than 2004 and 2005. (**Table 2**).

In future UKBMS reports, we will use government adopted butterfly biodiversity indicators to assess whether it was a good or bad year for butterflies.

Table 2. How good a year was 2006 relative to other years? In this, 2006 is ranked relative to other years. The rank is calculated by summing the ranks of the 33 most common butterfly species for the period 1976-2006 and is expressed here in order of best to worst years, with 1 being the best year.

YEAR	RANK	YEAR	RANK
1976	9	**1992**	1
1977	30	**1993**	27
1978	21	**1994**	20
1979	16	**1995**	7
1980	25	**1996**	6
1981	31	**1997**	2
1982	3	**1998**	19
1983	12	**1999**	24
1984	4	**2000**	18
1985	17	**2001**	29
1986	23	**2002**	26
1987	22	**2003**	10
1988	28	**2004**	14
1989	11	**2005**	13
1990	8	**2006**	15
1991	5		

More declines than increases

Of the 50 species for which Collated Indices were calculated, 27 showed a decrease in abundance and 22 an increase, with one showing no change. The figures indicating these changes are given in **Appendix II**.

Species with highest or lowest indices

Several species produced their highest or lowest Collated Indices since monitoring began in 1976. Both the **Chalkhill Blue** and the **Silver-washed Fritillary** produced their *highest index* of the series.

The **Chalkhill Blue** showed a big increase in 2005 to produce a high index, the third highest in the series, only previously bettered in 1997. There was a further (smaller) increase (13%) in 2006 to produce the *highest index* of the series. Annual Indices for some individual sites where there were substantial changes from 2005 to 2006 are shown in **Table 3**.

Chalkhill Blue, West Sussex, 2006. *Photo Nick Greatorex-Davies*

Table 3. Selected sites where Chalkhill Blue showed substantial increases and decreases over the previous year.

Site	BC Region	2005 Index	2006 Index	% change
Swyncombe Downs	Upper Thames	29	98	+237
Juniper Hill	Surrey	82	212	+159
Badbury Rings	Dorset	135	293	+117
Brading Quarries	Hants & IOW	2517	5139	+104
Park Downs	Surrey	103	210	+104
Therfield Heath, (Base Church Hill)	Herts & Middlesex	60	118	+97
Martin Down	Hants & IOW	61	112	+84
Draycott Sleights	West Country	365	640	+75
Pewley Down	Surrey	1467	2288	+56
Broughton Down 2	Hants & IOW	317	493	+56
Coombe Bottom & St Boniface Down	Hants & IOW	469	380	-19
Giant Hill (Cerne Abbas)	Dorset	438	306	-30
Castle Hill NNR	Sussex	1814	1196	-34
Fontmell Down (DTNC)	Dorset	243	157	-35
Martin Down North	Hants & IOW	135	76	-44
Brush Hill, Princes Risborough	Upper Thames	56	26	-54
Stoke Camp	West Country	492	227	-54
Aston Rowant North	Upper Thames	221	85	-62
Lankham Bottom	Dorset	243	64	-74
Therfield Heath, Rifle Range	Herts & Middlesex	682	152	-78

However, not all sites (or sub-sites) did well, suggesting that the national increase was a result of an overall improvement in habitat conditions across monitored sites – at least partly attributable to favourable management. At Therfield Heath the butterfly increased by 97 % at one of the transects, but decreased by 78 % at one of the others! At some sites, numbers were remarkably stable, for example at Lydden Temple Ewell the index was 2456 in 2005 and 2453 in 2006.

Silver-washed Fritillary, form valezina. *Photo Eddie John.*

The **Silver-washed Fritillary** showed a large increase (92%) in its Collated Index from 2005 to 2006. At many sites the species produced its highest Annual Index since monitoring began. High counts were particularly apparent on transects in Devon, Dorset, Wiltshire, Hampshire, West and East Sussex, and Berkshire. Figures for some transects which showed big increases are shown in **Table 4**. The exceptionally hot weather during July seems to have triggered a dispersal of **Silver-washed Fritillaries** within Britain. There were many records in places where **Silver-washed Fritillary** had not been seen for many years and in a few cases it was recorded for the first time on transects.

Table 4. Selected sites where the Silver Washed Fritillary showed substantial increases over the previous year.

Site	BC Region	2005 Index	2006 Index	% change
Martin Down Kitts Grave	Hampshire & IOW	12	100	+733
Bowdown (Baynes/Bomb Site)	Upper Thames	14	78	+457
Langford Heathfield	West Country	39	151	+287
Roydon Woods - Southern Fields	Hants & IOW	17	60	+253
Sheepleas	Surrey	53	179	+238
Bartley Heath New 1	Hants & IOW	16	52	+225
Headley Warren	Surrey	7	22	+214
Oaken Wood	Surrey	36	107	+197
West Dean Wood	Sussex	87	256	+194
Ryton Wood East	Warwickshire	19	54	+184

Four species produced their lowest Collated Index of the series. These were **Grizzled Skipper**, **Wood White**, **Small Tortoiseshell** and **Wall Brown**.

The **Grizzled Skipper** showed a drop of nearly 30% in its Collated Index, with a drop in counts at three times as many sites as there were sites with increased counts. Annual Indices for some individual sites where there were substantial changes from 2005 to 2006 are shown in **Table 5**.

Grizzled Skipper, Woodwalton, Cambridgeshire, 2007. *Photo Nick Greatorex-Davies*

2006 was undoubtedly a poor year generally for the **Grizzled Skipper**, and the longer term trend shows a significant decline (P=<0.05) in this species overall. At individual sites longer term declines are apparent at around twice as many sites as those that have shown increases. The data indicate extinctions and colonisations at a very small number of sites.

Table 5. Selected sites where the Grizzled Skipper showed substantial increases or decreases over the previous year.

Site	BC Region	2005 Index	2006 Index	% change
Wye & Crundale Down	Kent	5	47	+840
Martin Down Kitts Grave	Hants & Isle of Wight	10	21	+110
Fontmell Down (DTNC)	Dorset	69	103	+49
Magdalen Hill Down Original	Hants & Isle of Wight	17	22	+29
Aston Upthorpe Downs	Upper Thames	47	58	+23
Botley Wood 1	Hants & Isle of Wight	41	18	-56
West Moors (RAOC)	Dorset	38	15	-61
Crook Peak	West Country	47	18	-62
Mottistone Down	Hampshire & isle	29	10	-66
Twyford Sanctuary	Lincolnshire	51	16	-69
Worley Hill	West Country	34	10	-71
Stoke Camp	West Country	16	4	-75
Twyford Glades	Lincolnshire	67	17	-75
Sheepleas	Surrey	12	1	-92
Park Corner Heath	Sussex	15	1	-93

The **Wood White** showed a big decrease from the well below average index of 2005. There was a drop in the numbers counted on all transects which produced an Annual Index in both 2005 and 2006. These sites were distributed across southern England as far north as Warwickshire, indicating that the decline shown was real and was widespread.

Wood White. *Photo Eddie John*

The **Small Tortoiseshell**, like many species, has shown large fluctuations in abundance over the monitoring period. Since the late 1980s the data appear to show a more cyclic pattern of increase and decline, but overall the picture appears to be one of decline. Recent good years were 1997 and 2003.

Small Tortoiseshell, Bevills' Wood, Cambridgeshire, 2006. *Photo Nick Greatorex-Davies*

The **Wall Brown** continues to fare very badly except at some coastal and northern sites with the data indicating an increasing number of site extinctions. There was a sharp drop in abundance (36%) from 2005 to 2006. As yet there is no real indication as to why the Wall Brown is faring so badly in general in the UK. Work on the ecology of the Wall Brown is ongoing by Rebecca Harker at Oxford Brookes University.

A good year for migrant butterflies

All three species of common migrant butterflies, **Clouded Yellow**, **Red Admiral** and **Painted Lady**, did well in 2006, all showing increases from 2005. Both **Clouded Yellow** and **Painted Lady** produced their *third highest index* of the series and the **Red Admiral** its *fourth highest*. The **Painted Lady** showed a particularly big increase (1153 %!), but did not reach the high numbers of 2003. The **Clouded Yellow** index increased by 318%, making 2006 the fifth consecutive year that relatively high numbers of this species have

been recorded on transects. **Table 6** shows the top 10 transects in terms of numbers recorded for each of the three species.

Painted Lady, Cambridgeshire, 2007. *Photo Nick Greatorex-Davies*

The **Red Admiral** was recorded at the most sites with over 13,500 butterflies recorded. It was well recorded throughout the UK and did particularly well at some Scottish sites (for examples see **Table 6**). Some of the butterflies recorded would have been 'home-grown' from overwintering adults, but it is probable that the majority would be migrants (Pollard & Greatorex-Davies 1998).

Over 10,000 **Painted Ladies** were recorded on transects throughout the UK with high numbers recorded at some southern sites, for example Bishops Stortford Southern Country Park in Hertfordshire, Whippingham (Fields) on the Isle of Wight and Anchor Bottom in West Sussex (**Table 6**), but the highest counts were at Warton Crag in north Lancashire and Killean Lismore in Argyll in Scotland!

Clouded Yellow pairing, South Downs, West Sussex, 2006. *Photo Nick Greatorex-Davies*

The highest numbers of **Clouded Yellows** were recorded at Whippingham (Fields) on the Isle of Wight, Hinkley Point Power Station in Somerset and at Carymoor Environmental Centre also in Somerset (nearly 100 in each case) (**Table 6**).

As to be expected with this species, highest numbers were recorded in southern counties, with double figures on some transects from Cornwall to Kent. But the butterfly was also recorded on transects in north Wales, Scotland and Northern Ireland with, for example, 15 being recorded on the transect at Newborough Warren (Anglesey), four on the transect at Loch Fleet on the north-east coast of Scotland, and 22 at Murlough (Northern Ireland).

Table 6. The top 10 transects in terms of numbers recorded in 2006 for the three common migrant butterfly species. Figures give the number recorded followed by the position (in parentheses). Numbers are also given where these fall outside of the top 10 as this gives some indication as to whether the site was good for migrants in general. Where a range of numbers is given in parentheses this is because the same number of individuals was recorded on more than one transect.

Top 10 transects for common migrant butterflies in 2006				
Site	County	Red Admiral	Painted Lady	Clouded Yellow
Brading Quarries	Isle of Wight	163 (4)	100 (13)	26 (31-33)
Whippingham (fields)	Isle of Wight	156 (5)	206 (4)	98 (1)
Magdalen Hill Down North	Hampshire	14 (258-270)	136 (10)	1 (174-231)
Cerne Abbas Giant	Dorset	26 (155-160)	15 (169-179)	47 (10)
Deadmoor Common	Dorset	33 (117-123)	19 (130-137)	53 (5)
Melbury Down & Wood	Dorset	127 (8)	7 (290-307)	1 (174-231)
Stubhampton Bottom (Private)	Dorset	113 (10)	7 (290-307)	3 (127-145)
Anchor Bottom	West Sussex	22 (182-189)	185 (5)	48 (8-9)
Park Bottom	Wiltshire	33 (117-123)	35 (64-67)	85 (4)
West Yatton Down	Wiltshire	44 (80-82)	10 (232-252)	49 (6)
Buckland Wood	Somerset	20 (200-211)	12 (204-218)	48 (8-9)
Carymoor Environmental Centre	Somerset	43 (83-90)	45 (43-45)	96 (3)
Hinkley Point Power Station	Somerset	120 (9)	156 (6)	97 (2)
Somerton	Somerset	5 (404-426)	17 (146-159)	49 (7)
Stour Valley	Suffolk	135 (7)	15 (169-179)	3 (127-145)
Bishops Stortford Southern Country Park	Hertfordhsire	9 (324-338)	216 (3)	1 (174-231)
Stevenage	Hertfordshire	5 (404-426)	147 (8)	0
Martin Mere	Lancashire	402 (1)	33 (54)	0
Warton Crag RSPB	Lancashire	65 (43-44)	389 (1)	14 (58)
Smardale Gill	Cumbria	91 (22-23)	144 (9)	0
Killean Lismore	Argyll	143 (6)	294 (2)	0
Culvie Wood	Moray	330 (2)	42 (48-50)	0
Loch Fleet	Highland	170 (3)	151 (7)	4 (103-126)
Total number of transects species recorded on		636	584	299

Other species that did well

The **Silver-spotted Skipper** continues to do well at many monitored sites. There was a very small drop in the Collated Index from 2005 making it the *fifth highest* in the series. It was recorded on 39 transects including for the first time on two long-running transects. These were Wye and Crundale Down in Kent (13 recorded) and Castle Hill in East Sussex (17). Such high first time counts suggest that breeding populations may already be established on these sites.

The **Adonis Blue** had its fourth good year in a row and although there was a small drop in its Collated Index it ranked *third highest* in the series.

The **Dark Green Fritillary** also had its fourth good year in a row and its best year since 1976, producing its *second highest* index of the series.

Comma, Monks Wood NNR, 2005. *Photo Nick Greatorex-Davies*

The **Comma** had yet another good year, producing its *second highest* index of the series, beaten only by 2003. The extraordinarily rapid expansion in the range of this species northwards, now well into Scotland, is very clearly shown by comparing the distribution of records of the species in the three butterfly atlases (Heath *et al.* 1984, Asher *et al.* 2001, Fox *et al.* 2006). It was only in the mid nineties that the **Comma** was first recorded on transects in north Lancashire and Cumbria. It is now well established there as transect counts indicate at Leighton Moss, Gait Barrows, Roudsea Wood, Warton Crag and Smardale Gill for example. In Scotland in 2006 it was recorded for the first time on the transects at Whitlaw Mosses (The Borders), a site that has been monitored since 1992; Harestanes (Borders - data only since 2003); Blackford Hill in Edinburgh (monitored since 2001), and Morton Lochs in Fife (monitored 1979-96, 2005-06).

Marsh Fritillary, Somerford Common, Wiltshire. *Photo Nick Greatorex-Davies*

The **Marsh Fritillary** produced its *third highest* Collated Index of the series. According to the data that is in the UKBMS database, the **Marsh Fritillary** has been monitored on over 200 sites. The data suggest that the **Marsh Fritillary** has become extinct on nearly a quarter of the transects that have records for 10 or more years with at least one index in the last 5 years. (9 out of 41 transects; see **Table 7**).

Other species that did not fare so well

Apart from the **Silver-spotted Skipper**, other skippers did not do well in 2006. The **Grizzled Skipper** has already been mentioned. **Dingy**, **Small/Essex** and **Large Skippers** all produced low indices, though in the case of the **Large Skipper** there was a small increase on the 2005 figure. All these skippers have had below average indices for a run of nine years, all showing a substantial drop in 1998 from above average indices in 1997.

The **Green-veined White** had a particularly poor year producing its *second lowest index* of the series. The **Orange-tip** also produced a low index.

Green-veined White, Cambridgeshire. *Photo Nick Greatorex-Davies*

Three fritillaries, The **Pearl-bordered**, **Small Pearl-bordered** and **High Brown Fritillaries** all had poor years

The **Pearl-bordered Fritillary** had its *second lowest Index* with a substantial drop of 39% from 2005. At the 53 transect sites where it was recorded in 2006, no count got higher than double figures, the highest being 87 at Dunsford Wood, Devon. Looking at trends in the data for transects that have operated for 10 or more years with at least one index in the last 5 years (41 sites), 11 show declines, 10 appear to have more or less

Pearl-bordered Fritillary *Photo Nick Greatorex-Davies*

stable or fluctuating populations, at 16 they appear to have become extinct, only at 4 sites do they appear to be increasing overall. Only on two of these transects, Gait Barrows and Marsland, have counts regularly reach three figures in recent years.

After its all-time low index in 2000, the **Small Pearl-bordered Fritillary** has shown small annual increases until 2005. However there was a small drop in the index in 2006.

The **High Brown Fritillary** produced its *third lowest Index* of the series with a slight drop from its 2005 Index. Counts dropped or increased on roughly equal numbers of transects. Looking at trends in the data for transects that have operated for 10 or more years with at least one index in the last 5 years (21 sites), 6 show declines, 3 show increases, it has become extinct on 2 and on the remaining 10 it appears to be more or less stable with varying degrees of fluctuation.

Status of BAP Priority and selected habitat specialist species on individual transects

Trends in Biodiversity Action Plan species, and selected other habitat specialist species, at individual sites are given in **Table 7**. Some of these species have already been mentioned above, others are referred to in the text below.

Table 7. Trends in some UK Biodiversity Action Plan Priority species (highlighted in bold) and a few other scarce or vulnerable species. The number of transects that have operated for 10 or more years with at least one index in the last 5 years are given for each species, as are the number of those transects that have shown an overall increase, a decline in numbers, or where populations appear to be relatively stable. In some cases, especially with the Marsh Fritillary, assessment is difficult due to the large natural fluctuations in numbers. The number of these transects where the species appears to have become extinct is also given.

SPECIES	10 + years data	Increase	Colonisations	Decline	Extinct	Stable
Silver-spotted Skipper	24	17	3	4	-	3
Wood White	13	1	0	2	4	6
Northern Brown Argus	11	1	0	6	-	4
Small Blue	36	14	0	11	3	8
Silver-studded Blue	16	2	0	10	1	3
Adonis Blue	36	10	4	1	1	24
Duke of Burgundy	42	4	0	23	13	2
Pearl-bordered Fritillary	41	4	0	11	16	10
High Brown Fritillary	21	3	0	6	2	10
Heath Fritillary	7	2	0	3	-	2
Marsh Fritillary	41	2	0	15	9	15

The **Northern Brown Argus** had a low Index but changed little from 2005. Largest numbers were recorded at Thrislington Plantation (185) and Smardale Gill (175), counts at both these transects indicated increases from 2005.

There was a 19% drop in the **Small Blue** index to produce an about average figure, with equal numbers of transects showing increases (17 increase, 16 decrease, 1 no change).

Small Blue, Kenfig NNR, south Wales. *Photo Nick Greatorex-Davies*

Looking at the data for transects going back 10 or more years with at least one Annual Index during the past 5 years, and where more than the occasional **Small Blue** is recorded, out of 36 transects considered in this category 14 transects show an increase over the years, whereas 11 show a decline in numbers. The others showed no overall pattern of decline or increase; though numbers clearly fluctuate considerably at some sites.

Table 8. Selected sites where the Small Blue showed substantial increases and decreases over the previous year.

Site	BC Region	2005 Index	2006 Index	% change
Pewley Down	Surrey	4	28	+600
Portsdown (Comp. 1-3)	Hampshire	28	88	+214
Oxwich	South Wales	55	127	+131
Durlston Country Park East	Dorset	15	33	+120
The Mountain (Meon Valley 3)	Hampshire	62	121	+95
Martin Down (South)	Hampshire	34	49	+44
Pewsey Downs NNR	Wiltshire	11	15	+36
Melbury Down & Wood	Dorset	39	53	+36
Durlston Country Park West	Dorset	34	45	+32
Portland Broadcroft (DBC)	Dorset	134	96	-28
Martin Down Kitts Grave	Hampshire	16	9	-44
Frog Firle Farm	Sussex	30	16	-47
Swyncombe Downs	Upper Thames	1042	468	-55
College Lake - combined	Upper Thames	21	7	-67
Porton Down 1 (Roche Court Dn.)	Wiltshire	25	2	-92
Riddlesdown Quarry	Surrey	10	0	-100
Downe Bank	Kent	12	0	-100

The **Small Blue** has apparently colonised two sites over the past decade, but become extinct at three. However due to gaps in the data the above results are not entirely conclusive. Annual Indices for a selection of transects where there was a substantial increase or decrease from 2005 to 2006 in numbers of Small Blue recorded are shown in **Table 8**.

The Collated Index for the **Silver-studded Blue** showed a substantial rise from its below average index in 2005 indicating that this species had a relatively good year, however there were about equal numbers of transects showing declines as increases. The largest numbers were recorded on the Great Orme in North Wales. Here there was a large increase from 3958 recorded in 2005 to 6736 in 2006!

Silver-studded Blue. *Photo Tom Brereton*

Duke of Burgundy, Denge Wood, Kent. *Photo Nick Greatorex-Davies*

There was a slight rise in the **Duke of Burgundy** index in 2006, though the overall trend has been down in recent years. Of 42 sites with long data runs (>10 years), the overwhelming majority have shown a decline in numbers recorded, with apparent extinctions at 13 of them – highlighting that this butterfly is in serious trouble. Only at Totternhoe Old Chalk Quarry (Bedfordshire), The Mountain (Meon Valley, Hampshire) and at Gait Barrows (Lancashire) does the butterfly appear to be bucking this downward trend.

The Meon Valley, Hampshire – prime habitat is being maintained at this site for the Duke of Burgundy. *Photo Tom Brereton*

NEWS

UKBMS NEWS

DATA COLLATION

A new, fully integrated system for data collation was set up in 2006, with tight deadlines being set for transect walkers to submit their data. UKBMS staff were delighted with the positive response from volunteers, with record levels of data collated – much of which was received far earlier than ever before.

In total 735 transect datasets were received, with 660 received in time for inclusion in the annual analysis, and about 70% of these were submitted by volunteers in advance of the end of November deadline. Another positive sign was that nearly 90% of transect data was received as full data in electronic (Transect Walker) format. This really speeds up the process of incorporating data into the national database.

We also requested all paper data last year, and were pleased to receive such from about 60% of sites. This enabled an extensive data validation exercise to be carried out, which showed very low error rates that had little effect on the overall indices.

In fact, the results were so impressive that we will not be asking for back-up paper data again this year.

In addition to the transect data, we were also able to incorporate butterfly counts from a further 120 sites where other forms of structured monitoring, such as timed counts and larval web surveys, are being undertaken. This enables us to make a better UK-wide assessment of the status of some specialist species that are not so well covered by transects, including Duke of Burgundy, High Brown Fritillary, Marsh Fritillary, Pearl-bordered Fritillary, Small Blue and Small Pearl-bordered Fritillary.

TRANSECT WALKER SOFTWARE UPDATE

The updated Transect Walker 2 has been in widespread use since its release last year, and we are constantly trying to improve the user-friendly nature of this software as well as ensuring data integrity.

The latest version (v2.5) is now available for download from the UKBMS website at www.ukbms.org/resources.htm. This incorporates a number of minor corrections and improvements, following useful feedback from users over the course of the summer.

Users are also reminded that there is an internet based help group for this software, which you can join by sending an email to UKTransect-subscribe@yahoogroups.com.

REGIONAL TRANSECT DEVELOPMENT

In September 2005, BC and CEH published a Regional Transect Development Plan (which is available for download from the UKBMS website http://www.ukbms.org/resources.htm). This document sets out the priorities for developing the established monitoring network, so that transect coverage might be improved across the country. Further development of the monitoring network means that the published trends will provide a more representative picture for all species nationwide.

With the Wider Countryside Scheme developing new efficient techniques for monitoring our common and widespread butterflies, transect network development will focus more on improving the coverage of the priority 'specialist' species occurring in semi-natural habitats.

Since setting out these future priorities, great efforts have been made to address some of the short-comings in transect coverage. UKBMS staff have been working closely with Butterfly Conservation's network of local transect co-ordinators and regional staff to prioritise and promote opportunities for setting up new transects.

The geographical distribution of active transects, as shown on Map 1 (page 7), demonstrates a distinct bias towards southern England with other pockets of activity in the West Midlands, North East England and the Morecambe Bay area. In contrast, transect coverage in Scotland, Wales and Northern Ireland has historically been more patchy.

Scotland, Wales and Northern Ireland

Some great strides had already been made to address this issue in Scotland, with local efforts raising the number of transects rapidly from around a dozen sites in the late 1990s to over 50 by 2004. The 2006 analysis now includes data from 63 Scottish sites, and we believe the full number of active transects in that country could even be nearer to 80.

Over the last two years, much effort has been directed at producing similar growth in Wales and Northern Ireland, with a series of butterfly monitoring workshops and targeted follow-up by staff and co-ordinators.

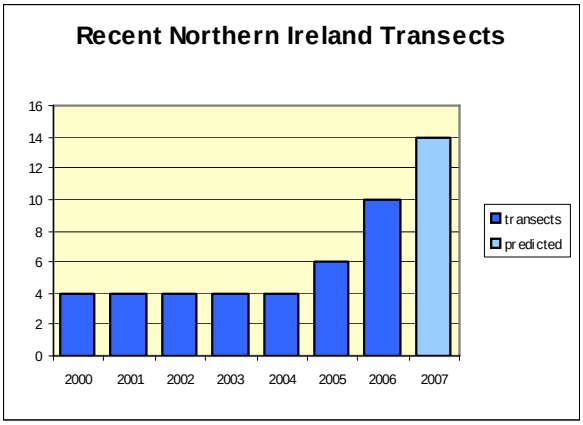


Figure 1. The growth in transect monitoring in Northern Ireland.

There had been a fairly active transect scheme running in Northern Ireland through the 1980s, with up to 17 sites being monitored in some years. However, without the proper support network, interest tailed off through the 1990s until only a handful of transects remained active. Now, the collective efforts of staff and volunteers are turning things around with, potentially, a 2-3 fold increase in 3 years (**Figure 1**).

The story for Wales is slightly different, where transect walking remained low profile for many years (**Figure 2**). Coverage has increased in fits and starts since the mid 1990s, with the most recent increase being around the turn of the millennium when BC employed a Project Officer to help develop the volunteer network across that country. Now with more focussed development work, we are hopeful that monitoring can be moved on once again.

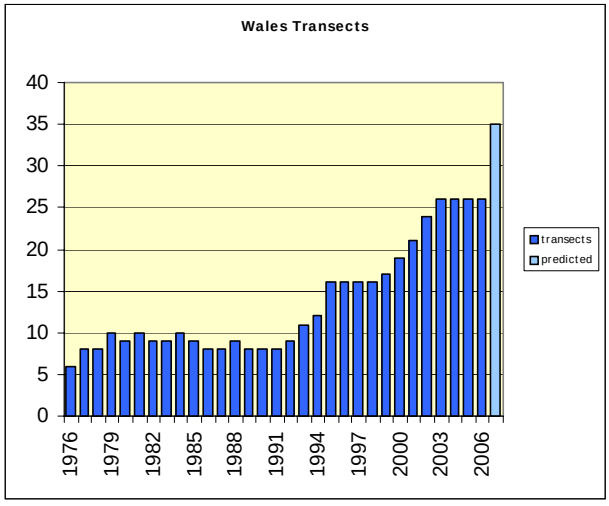


Figure 2. The growth in transect monitoring in Wales

Setting Targets

When looking to expand the transect network for a region, we analyse the existing sites for gaps in coverage under three categories:

- Geographical coverage of the region.
- Representative samples of semi-natural habitats.
- Coverage of habitat specialists and nationally/regionally important butterfly species.

This helps us to target areas and sites to bring in to the monitoring network. Where geographical coverage is poor, any new transects will add greatly to the picture for the region. In regions where transect coverage is already quite good, better value can be added to the overall picture by targeting specific habitats or priority butterflies that may not be so well represented on the existing sites.

Box 1 – Example of priorities and targets in Northern Ireland

Priorities for all-species transects

- County Tyrone
- Londonderry or north Antrim coast
- Broad-leaved woodland (eg. Crom Estate, Fermanagh)
- Blanket bog (eg. The Antrim plateau)
- Lowland heathland (eg. lowers slopes of the Mourne mountains, Co. Down)
- Lowland meadow (eg. South Armagh)

Priorities for single-species monitoring

- Dingy Skipper (Fermanagh)
- Wall Brown (Co. Down)
- Green Hairstreak (North of Lough Neagh)
- Large Heath (Tyrone or Armagh)
- Silver-washed Fritillary (South Down)

Promoting specific targets at monitoring workshops and through newsletters can help potential transect walkers to see where their efforts may be most valuable locally and nationally. The targets shown in Box 1 above were presented at a workshop in Northern Ireland, after analysing the current gaps in coverage. They are typical of the approach taken and have already produced a great response.

DEVELOPING A WIDER COUNTRYSIDE BUTTERFLY MONITORING METHOD

Introduction

Last year we reported on a new project; the development of a new scheme that will enable us to monitor common and widespread butterflies in the wider countryside. This is something that the current scheme is unable to do effectively as most transects are on nature reserves and other areas of semi-natural habitat.

The development phase is a three and a half year project running from 2005 to 2008 with the expectation that this new additional scheme will be launched in 2009. Here we report on the work carried out over the winter of 2005/6 and the 2006 field season.

Winter work

Over the winter of 2005/6, the main activities included (1) developing and refining the survey method and (2) planning for the field testing in summer 2006.

Survey design – broad methodology

A core aim of the project has been to develop a survey method that is both scientifically robust and appealing to recorders (e.g. by being easy to do and not too time consuming). After investigating many possibilities, we concluded the best option was to adopt broadly the BTO's Breeding Birds Survey (BBS) method, but with some important adaptations necessary for butterflies.

- A 'BBS for butterflies' involves counting butterflies along, as far as is practically possible (see later), two evenly-spaced (500m apart), parallel 1-km long survey lines located in randomly selected 1-km squares (**Figure 3**).
- The survey lines within each square are set up objectively (unlike conventional butterfly transects, which are selected with 'free choice' by recorders) to ensure that intensive habitats are just as likely to be sampled as semi-natural habitats.
- The aim of random squares and systematically placed survey lines is to ensure that the countryside as a whole is sampled without major bias.
- Recording protocols follow those used to walk conventional transects with butterflies counted in a 5m box, and under set weather conditions and time of day criteria.
- Importantly, a reduced number of visits (2-3 compared to 26 on conventional transects) are made to the square to generate the annual abundance indices.

Survey design – developing a reduced effort approach

Prior to the field testing, UKBMS transect data was analysed to determine the number of sites and visits likely to be required to sufficiently detect butterfly declines. The results show that:

- For wider countryside species, a 3 visit scheme would be able to provide accuracy comparable to the full 26 weeks with only twice as many sites.
- On average, a scheme with 3 visits in the core period of July-August, would have the power to detect a 25% decline of a species over 10 years provided around 600 sites were surveyed every year.
- It is predicted that all wider countryside species (see Asher *et al.* 2001) except for Orange-tip can be effectively monitored by such a reduced effort scheme.

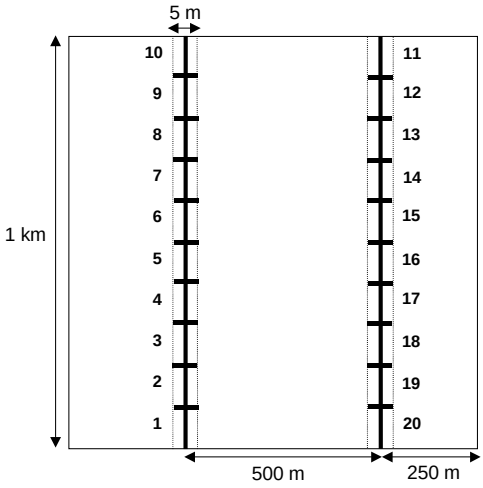


Figure 3. In the proposed survey design, butterflies are counted along two 1-km long survey lines in a randomly selected 1-km square. Recording rules (e.g. time of day) follow those used for UKBMS transects.

Field testing in 2006

The 2006 fieldwork focused on the effectiveness in scientific and practical terms of using the 'BBS for butterflies' method. The focus of the field-testing was lowland farmland as this occupies much of the UK land surface and is under-sampled by current transect monitoring. A limited number of volunteers were invited to take part. For 2007, wider volunteer participation and sampling in upland areas were to be the focus of the field-testing (see later).

Katie Cruickshanks counting butterflies in semi-improved grassland. *Photo Dennis Jonason*

In total, 30 squares were surveyed twice in the core July and August period, with a further 16 squares surveyed once. Squares were surveyed by field researcher Katie Cruickshanks, volunteers and a project student. In particular, the fieldwork was designed to look at (1) General suitability of the survey method including whether sufficient numbers of butterflies are seen and (2) Encounter rates of butterflies with different numbers of visits to squares. Additionally, intensive surveys of 19 squares (especially in Dorset) were carried out to look at a variety of other issues including (3) The effect of visit date on numbers seen (4) What proportion of species and habitats present in the squares are picked up along the survey lines (5) Can other insect taxa groups be monitored at the same time? (6) Can the recording area be legitimately widened to increase butterfly counts? (7) Can the available recording times go beyond current BMS rules?

Results of field testing

Species abundance and occupancy

26 species were recorded from single visits to the 49 survey squares (**Table 9**). In Dorset, 25 species were recorded in four visits to 10 squares - 18 wider countryside species, four habitat specialists (Grayling, Lulworth Skipper, Adonis Blue and Dark Green Fritillary) and 3 migrants. In the 49 squares, the most abundant species were Small White, Meadow Brown and Gatekeeper, accounting for 63% of all individuals seen across all 49 squares (**Table 9**).

All wider countryside species that occur in England and Wales were detected in the sampled squares, with the exception of White-letter Hairstreak and, as expected, both Orange-tip (as it only flies in spring) and Scotch Argus (which does not occur in the pilot survey areas). Encouragingly, occupancy rates (% of squares recorded in) were good, with the lowest from two visits being 3%. It is interesting to note that if a future scheme achieved coverage of 600 squares, 3% occupancy would equate to occurrence in 18 of the 600 squares – a total sufficient to calculate a reasonably representative national index.

Effects of visit number and date on the number of butterflies seen

The three walks conducted within the main flight period (walks 1, 2 and 3: early July to early August) were looked at to assess the numbers of butterflies potentially encountered with a 3-visit method (**Table 10**). Combining the first three walks only, 25 species and 2196 individuals were recorded. It is likely that the final design will require a minimum of two visits during the summer and from the data collected in Dorset the best time to carry out these visits is mid July and early August. If a large enough number of squares are walked it is hoped that visits will be evenly spread across the main flight period. Therefore a sufficient number of sites (>600) will pick up all species including those that peak at the end of the summer such as Brown Argus and Small Copper.

Though peak butterfly diversity is picked up in late July/early August, a good spread of visits are required throughout July and August, to pick up species like Brown Argus. *Photo Jim Asher*

Table 9: Abundance (total no. counted) and occupancy (% of cells recorded in) of butterflies recorded in the sampled squares.

	1 visit (n=49 squares)		2 visits (n=30)	
Species	**% Occ.**	**Abun.**	**% Occ.**	**Abun.**
Brimstone	4	2	27	11
Brown Argus	10	21	17	27
Clouded Yellow	4	2	27	9
Comma	18	13	27	16
Common Blue	27	52	40	83
Dark Green Fritillary	4	3	17	19
Essex Skipper	12	14	23	16
Gatekeeper	53	418	83	638
Green-veined White	45	106	70	232
Holly Blue	10	6	23	10
Large Skipper	16	36	33	43
Large White	67	153	83	202
Marbled White	8	20	27	106
Meadow Brown	78	656	100	998
Painted Lady	41	51	73	69
Peacock	29	25	60	65
Purple Hairstreak	4	3	3	1
Red Admiral	59	84	87	187
Ringlet	29	63	60	117
Small Copper	16	11	20	14
Small Heath	14	24	27	62
Small Skipper	14	32	33	40
Small Tortoiseshell	22	27	40	51
Small White	88	346	93	491
Small/Essex Skipper	10	30	40	52
Speckled Wood	33	53	53	84
Wall	4	4	7	2

Note Occ. = occupancy and Abun.. = abundance.

Does counting along the survey lines adequately reflect the species and habitats present in the square?

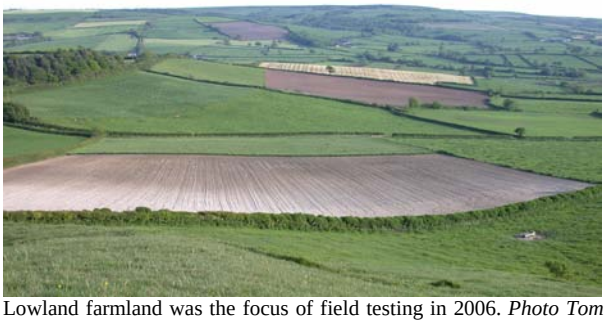
A project student carried out intensive whole square surveys of the 1-km squares in Dorset to compare butterfly diversity along the survey lines with that found in the square as a whole. The aims being to assess whether the survey lines (1) provide a

representative sample of the whole square in terms of butterfly numbers and habitats, including whether they (2) consistently miss particular species and habitat features.

Table 10: Butterfly abundance and diversity recorded using the new method in ten 1-km squares on different visits between 1st July - 25th August 2006 in Dorset.

	1st visit Early July	2nd visit Mid July	3rd visit Early Aug.	4th visit Mid Aug.
No. individuals	447	1196	553	280
No. species	19	20	21	19

Comparisons showed that survey lines in general picked up a good number and variety of the species found in squares. Standardising for effort, significantly more butterflies per unit of effort (on average twice as many individuals and five more species per square) were found along the survey lines compared to across the square as whole, reflecting differences in habit quality (see later).



Lowland farmland was the focus of field testing in 2006. *Photo Tom Brereton*

Effects of positioning the survey lines along a compromise route

In each 1km square, the two survey lines follow an 'ideal route' running north-south for 1km and are exactly 500m apart. Inevitably though, a 'compromise route' needs to be followed because of either the terrain (e.g. presence of water bodies) or the need to avoid damage to crops. We compared butterfly diversity along compromise and ideal routes to investigate effects of this compromise.

We found that the number of species encountered on the 'compromise route' was significantly higher (by on average 5 species and more than twice the number of individuals) than on the 'ideal route'. The higher butterfly diversity along the 'compromise route' reflects the fact that these routes tend to be located (three times) more often along hedgerows and other linear features, where butterfly diversity in intensive landscapes is relatively high.

Though the over-sampling of linear habitats does introduce bias, we hope that survey coverage of a rolled out scheme will be sufficiently high to enable correction for this. On the plus side, because linear features are relative hotspots for butterflies in the intensively managed countryside, covering them well should make the survey more appealing to recorders.

Can other insect groups be monitored at the same time?

A conclusion from the winter work and pre-pilot studies in 2005 was that only insects with a similar search image can be monitored at the same time as butterflies, thus ruling out grasshoppers, bees and hoverflies. This leaves moths and dragonflies, which were recorded in selected squares in 2006, though this element was to be a bigger focus of the research in 2007.

For other insect species (bees etc), a range of optional rapid survey methods were developed to be completed at the end of the butterfly survey (*i.e.* after section 20), again with a view to testing in 2007.

Recording area – going beyond the 5m box?

Preliminary analysis of the data collected in 2006 indicated it is unlikely that the width of the recording area can be widened beyond the conventional 5m, due to the rapid drop off in detectability with distance of less conspicuous species like Small Skipper.

Time of day recording criteria

Fieldwork was carried out to investigate whether the current monitoring period (traditionally 10:45-15:45 in the BMS) can be extended to make the survey more attractive to recorders. Initial results from this work suggest that on warm, sunny days earlier morning recording may be permissible on unshaded sites though more research data is needed (a focus in 2007).

Day-flying moths, like this Six-spot Burnet, are a feature of the proposed new scheme. *Photo Tom Brereton*

Assessing future recording effort

Initial assessment of the likely level of future participation in a future wider countryside butterfly monitoring scheme was completed in consultation with BC Branches and the BTO.

Early indications are that coverage of ca400-800 squares would be achieved if the scheme was rolled out in 2008. This is based on 5-30 squares (mode 20) per BC Branch (ca30 Branches), plus 5-10% uptake by BTO BBS recorders (who cover ca2500 squares).

Conclusions
Preliminary evidence from the 2006 field testing was highly encouraging and suggested that the proposed method is likely to provide representative national abundance indices for practically all of the wider countryside species, assuming volunteer recorders can cover 600+ squares. Our initial assessments suggest it is highly likely that this level of participation can be achieved.

Fieldwork plans for 2007
In 2007, the focus has been wide scale field testing of the method by both BC (in four Branches) and BTO (in 32 regions) volunteer recorders. Special effort has been made to test the method in upland areas, and for this Katie has been based at Lake Vyrnwy RSPB Reserve in North Wales. Further work has continued into some of the design issues discussed previously. This will be reported on in the UKBMS Annual Report for 2007.

Future of the project
The initial pilot phase of the wider countryside project ends in April 2008. It is hoped that funding will continue for at least two further years to incorporate a planning, testing and development phase in 2008, with a roll out across the UK in 2009.

To find out more please contact Dr Katie Cruickshanks:
kcruickshanks@butterfly-conservation.org
or visit the UKBMS website:
www.ukbms.org/wider_countryside_pilot.htm

STOP PRESS 2007 field testing update

There has been a huge positive response by BC and BTO volunteers to the request to field test the method in summer 2007, with over 250 recorders taking part in spite of the weather! Good numbers of butterflies have been seen, and it seems highly likely that the scheme as proposed would be able to report effectively on the status of wider countryside species across the whole of the UK's landscape – and to a greater degree than previously predicted. Don't miss next years UKBMS report with all the details!

PROGRESS IN USING BUTTERFLIES AS BIODIVERSITY INDICATORS

There is a great demand for biodiversity indicators amongst European Governments, to measure progress in meeting global, EU and national targets that seek to tackle the loss of biodiversity by 2010. The UK Government now recognises butterflies as "good indicators of the broad state of wildlife and the countryside" and there has been great progress over the current reporting period in their formal adoption as biodiversity indicators.

In March 2007, Defra, on behalf of the UK Biodiversity partnership, published for the first time a set of biodiversity indicators for the UK (http://www.jncc.gov.uk/pdf/2010-BIYP2007.pdf). The set comprised 18 indicators, including "1b Trends in populations of butterflies", which is compiled from UKBMS data and charts changes in the abundance of habitat specialist and wider countryside butterflies from 1976-2005 (**Figure 4**). The indicator shows that since 1976, populations of habitat specialists and butterflies of the wider countryside (generalists) have declined by 56 per cent and 12 per cent respectively. Since 2000, specialists have increased by 19 per cent and generalists by 3 per cent.

The new UK butterfly indicator sits alongside the longer established wild bird indicator to give new insights into how butterflies (and through them thousands of other insect species) may be faring across the countryside. The adoption of butterflies as a top-level UK Indicator is also important in conservation terms as it helps to put the problems butterflies face in the countryside far higher up the political agenda.

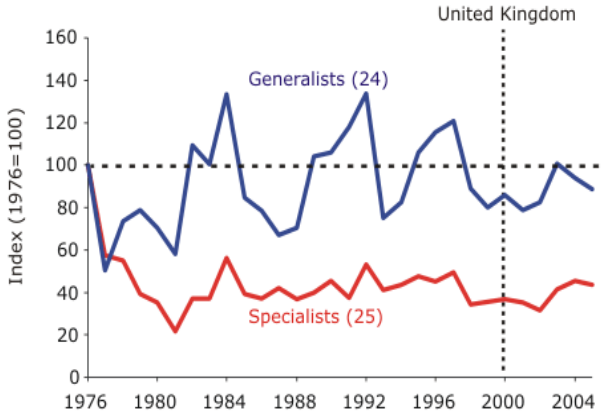


Figure 4. A new UK Governmental biodiversity indicator - trends in the abundance of specialist (habitat specialists) and generalist (wider countryside) butterflies from 1976-2005.

In the longer-term, this should bring greater resources for conservation action and support for continued monitoring, which will benefit not only butterflies but a wide range of other invertebrates as well.

There has been considerable progress in developing butterfly indicators at the country level. Last year we reported the adoption of Butterflies as Headline Biodiversity Indicators to inform progress in implementing the England Biodiversity Strategy. The butterfly indicator was launched in November 2006 in the report "A biodiversity strategy for England. Measuring progress: 2006 assessment" and can be

viewed at http://www.defra.gov.uk/environment/statistics/wildlife/kf/wdkf10.htm.

In Scotland, a draft Butterfly Indicator was compiled for Scottish Natural Heritage (SNH) in November 2006. The indicator was developed in the same way as for the UK and England, with separate trends for all-species, habitat specialists and wider countryside (generalists) species, covering the period 1976-2005. The indicator shows that butterflies have fared slightly better in Scotland compared to England, with habitat specialists down by 27% and wider countryside species (generalists) up by 51%. A similar pattern has been found in moth abundance, with Rothamsted data showing that common moths have fared significantly better in northern Britain over recent decades compared to the south. Both the butterfly and moth results are likely to be attributable to the fact that in general land use intensification has been less severe in the north and that southerly parts of northern Britain have become suitable for some wide-ranging species as the climate has warmed.

Developments have also been afoot at a European scale and butterflies are close to being adopted (alongside birds) by the European Union as one of a suite of 26 headline indicators that will form the first European Set of Biodiversity Indicators for assessing the 2010 target.

To show the possibilities of developing a suitable European Butterfly Indicator, a Grassland indicator was compiled using similar methods developed for European birds by the European Bird Census Council. Chris van Swaay of Dutch Butterfly Conservation and Arco van Strien of Statistic Netherlands led the work.

The indicator comprised seven widespread species and ten grassland specialists using data from monitoring schemes active in nine countries (UK, Ukraine, Germany, Netherlands, Flanders (Belgium), Spain, Switzerland, Finland, and France) and covering the period 1990 to 2005. The indicator shows that the grassland butterflies are declining across Europe, with widespread species down by 31%, specialists by 45% and all-species by 41%. The decline is more extreme than that for birds (33% compared to 9% for farmland birds, (**Figure 5**), emphasising that monitoring birds may not be enough to assess biodiversity change and that butterflies can play a valuable complimentary role.

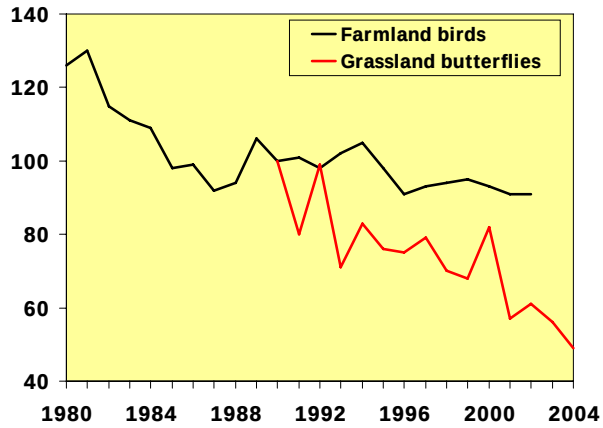


Figure 5. Across Europe, grassland butterflies are declining at a faster rate than farmland birds.

In February 2007, a meeting was held in the Netherlands and attended by co-ordinators of monitoring schemes from 12 European countries to develop the indicator further. A woodland butterfly indicator is currently being compiled in time for potential inclusion in the first indicator based assessment of Europe's biodiversity, due in 2008.

Clearly fantastic progress has been made, but there is plenty of work to be done in using UKBMS data to develop similar indicators for Wales and Northern Ireland, to update current indicators, to finalise the EU indicator and in developing new indicators, for example to track the impacts of climate change.

We are currently updating the England, Scotland and UK butterfly indicators to include 2006 data. These will be published by the relevant Government Departments. Latest details and relevant web links will be published on the UKBMS website.

Country co-ordinators of Butterfly Monitoring Schemes across Europe met in the Netherlands in February to discuss developing the European Butterfly Indicator. *Photo per De Vlinderstichting (Dutch Butterfly Conservation)*

RESEARCH ROUND UP AND UKBMS PUBLICATIONS IN 2006/7

Butterfly transect data continues to be in high demand for conservation and research. In 2006 projects and publications (**Pub**.) using the data included:

Land use policy and habitat management

- **Pub.** Davies, H., Brereton, T., Roy, D. & Fox, R. 2007. Government targets for protected area management in England – will threatened butterflies benefit? *Biodiversity and Conservation*. Published online June 2007, 18pp.
- **Pub.** Brereton, T., Warren, M., Stewart, K., & Roy, D. 2007. The changing status of the Chalkhill Blue butterfly *Polyommatus coridon* in the UK: the impacts of conservation policies and environmental factors. *Journal of Insect Conservation*. Published online July 2007.
- A PhD study by Kate Pressland will use UKBMS data to look at the effects of game management on butterfly abundance in woodlands in southern England, (University of Bristol).
- In a project led by the RSPB, UKBMS data are being used to help assess the impacts of Tir Gofal on biodiversity conservation.
- **Pub.** Slater M. 2007. Creation of a drystone wall to create egg-laying habitat for grizzled skipper *Pyrgus malvae* at Ryton Wood Meadows Butterfly Conservation Reserve, Warwickshire, England. *Conservation Evidence*, 4, 35-40.
- **Pub.** Sutton R. 2006. The effect of cutting grass for butterfly conservation at Witch Lodge Field, Somerset, England. *Conservation Evidence*, 3, 49-51.
- **Pub.** Pearson, M. 2006. Management of an artificially created wildflower meadow for Common Blue (*Polyommatus icarus*) butterflies at Bunkers Park, Hertfordshire, England. *Conservation Evidence*, 3, 109-110.
- **Pub.** Brereton, T. 2006. Monitoring the Heath Fritillary *Mellicta athalia* at Thornden and West Blean Woods. In: *Monitoring Nature Conservation in Cultural Landscapes: a practical guide and case studies*, (eds. C. Hurford & M. Schneider). Springer, Dordrecht.
- **Pub.** Brereton, T., Davis, T. & Parson, P. 2007. Butterflies and moths. In: *The Farm Wildlife Handbook*, (ed. R. Winspear) pp. 58–65 RSPB, Sandy.

Climate change research

- Evolution of migration in a changing climate (PhD student with York University).
- Phenological advancement in the Silver-spotted Skipper (*Hesperia comma*) (with York University).
- **Pub.** Cross-taxa analyses of trends in the abundance of birds, butterflies and moths (with Rothamsted Research, British Trust for Ornithology and York University). Completed for PhD thesis.
- **Pub.** Menzel, A., Sparks, T.H., Estrella, N., & Roy, D.B. 2006. Geographic and temporal variability in phenology. *Global Ecology and Biogeography*, 15, 498-504.

Butterfly population dynamics

- A PhD with the Institute of Zoology titled "Resource limitation in butterflies: implications for macroecology and conservation" has begun. The project will combine analysis of UKBMS transect data with field testing.
- Population dynamics, weather and habitat management effects on the Wall Brown (*Lasiommata megera*) (with Oxford Brookes University).
- A NERC fellowship has been awarded to Nick Isaac to develop a unified approach to studying animal abundance: integrating evolution, ecology and scale dependency (with the Institute of Zoology). UKBMS transect data, along with mammal population data, will form a basis for this work.
- **Pub.** A book chapter on population structure and dynamics of butterfly populations (including metapopulations) for a book on the Ecology of Butterflies in Europe (with Universidad Rey Juan Carlos, Madrid) (in press).

Methodological developments

- **Pub.** Roy, D.B., Rothery, P. & Brereton, T. 2007. Reduced-effort schemes for monitoring butterfly populations. *Journal of Applied Ecology*, 44, 993–1000.
- With European Partners, a Best Practise Guide was produced for countries planning to set up national butterfly monitoring schemes. (In: Van Swaay, C.A.M. 2007. Workshop Development of the methodology for a European Butterfly Indicator. Report VS2007.006, De Vlinderstichting, Wageningen, 15pp).
- Development of indicators of butterfly abundance for Europe (with Butterfly Conservation Europe and partners monitoring butterflies in Europe).
- Developing methods to monitor the condition of butterfly habitats.
- The use of butterfly monitoring in an expanded Environmental Change Network (ECN) for Defra. (Morecroft, M.D., Sier, A.R.J., Elston, D.A., Nevison, I.M., Hall, J.R., Rennie, S.C., Parr, T.W. & Crick, H.Q.P. 2006. *Targeted Monitoring of Air Pollution and Climate Change Impacts on Biodiversity*. Final report to Department for Environment, Food and Rural Affairs, Countryside Council for Wales and English Nature (CRO322), 78pp. (published online)).

Butterfly atlases and status reviews

- **Pub.** Warren, M., Bourn, N., Brereton, T., Fox., R., Middlebrook, I. & Parsons, M. 2007. What have Red Lists done for us? The values and limitations of protected species listing for invertebrates. In. *Insect Conservation Biology* (eds. A. Stewart, T.

New & O. Lewis). Royal Entomological Society, London.

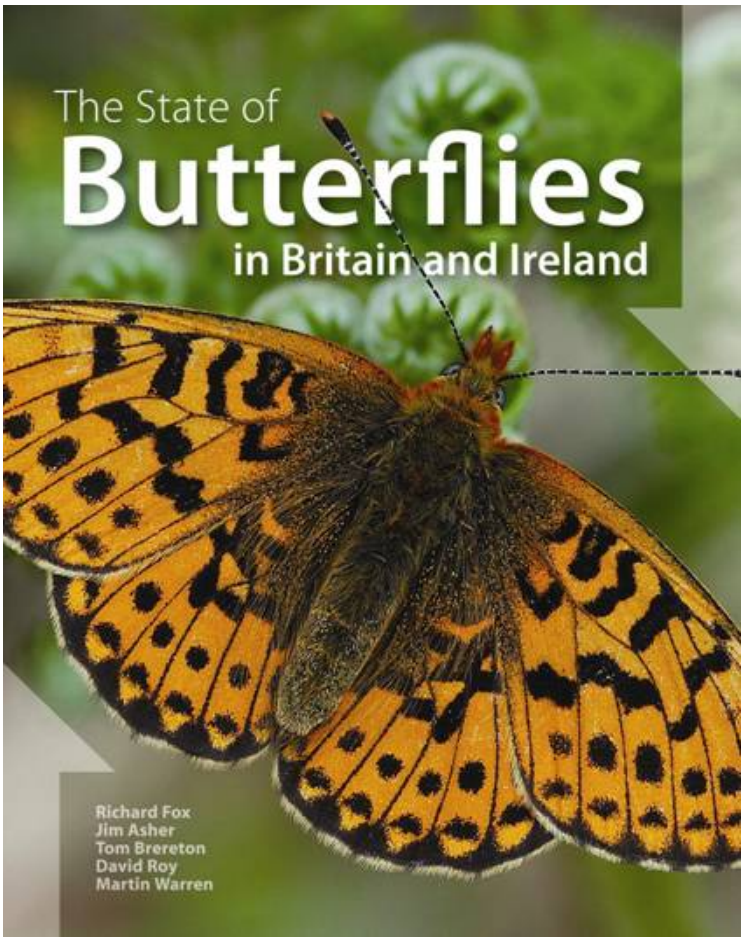
- **Pub.** Fox, R., Warren, M. & Brereton, T. 2006. Contract report to the Joint Nature Conservation Committee No. F90-01-915.
- **Pub.** Fox, R., Asher, J., Brereton, T., Roy D. & Warren M. 2006. *The State of Butterflies in Britain and Ireland*. Nature Bureau, London. 112pp.
- **Pub.** Fox, R., Warren, M.S., Asher, J., Brereton, T.M. & Roy, D.B. 2007. The *state of Britain's butterflies 2007*. Butterfly Conservation and the Centre for Ecology and Hydrology, Wareham, Dorset. 12pp.
- Butterfly Atlas for the Borders, East of Scotland BC and SBBRC.
- **Pub.** Field, R., Perrin, V., Bacon, L. & Greatorex-Davies, J.N. 2006. *The Butterflies of Cambridgeshire*, Butterfly Conservation, Cambridgeshire & Essex Branch. 122pp.

Butterfly indicators

- **Pub.** Brereton, T.1, van Swaay, C. & van Strien, A. (in press). Developing a butterfly indicator to assess changes in Europe's biodiversity. *Proceedings of the 17th International Conference of the European Bird Census Council, Bird Numbers 2007*. Chiavenna, Italy.
- **Pub.** Brereton, T. 2007. Brussels embraces butterflies. *Butterfly*, 95, 13.

Publicity

- The UKBMS project continues to be promoted widely through a range of media including talks, interviews, popular articles and press releases.
- **Pub.** Brereton, T., Roy, D., Greatorex-Davies, N. 2006. Thirty years and counting. The contribution to conservation and ecology of butterfly monitoring in the UK. *British Wildlife*, 17, 162–170.



The SOBBI report, published in 2006, is the first status review of the butterflies of Britain and Ireland to use both butterfly abundance (transect) and distribution data.
Photo per the NatureBureau

TRANSECT MONITORING BEST PRACTICE

Introduction

The purpose of this article is to promote to recorders what we consider 'best practice' when it comes to certain aspects of monitoring butterflies by fixed weekly transects. Full details of how to set up and record a butterfly transect in the UK can be found elsewhere, notably on the UKBMS website at http://www.ukbms.org/resources.htm, (see also Hall 1981, Pollard & Yates 1993). All recorders should familiarise themselves with these documents, especially form G2.

Following on from the introduction, background and a brief description of the transect methodology, we highlight certain aspects of transect recording where we consider clarification on best practice is most needed. We believe that if these recommendations are followed they will help ensure the consistent gathering of high quality data by recorders from butterfly transects. High quality data are essential if the data are be put to the many and varied uses that are demanded of them to allow rapid and reliable reporting of trends. The conservation of butterflies relies on high quality 'evidence' of how species are faring. We are extremely grateful for the fact that many recorders and others involved with transect recording already do an excellent job, but there are always areas that can be improved. We hope that you will find the following information helpful and that many of these things don't apply to you, because you are already doing them!

Background

There are now data from over 1400 transects in the UKBMS database. In 2006 we received data from about 660 full transects and a further 120 single-species monitoring sites. In the past collated indices were calculated from data collected from a much smaller number of transects (nearly 140 in 2004). In 2005, with the merging of the Butterfly Monitoring Scheme with transects co-ordinated by Butterfly Conservation, Collated Indices were calculated from the data from over 1000 transects. At the same time, for comparison, Collated Indices were calculated from just those that had been BMS transects. The results were remarkably similar, and there was little difference between the two sets of figures with regard to the overall pattern of changes over the years for most species (see page 5 in 2005 report). This served to demonstrate just how robust these indices are.

However the data in the database are only as good as the data that go into it and producing Collated Indices is only one of the many uses of the data. We are therefore very keen that data gathered are of the highest quality as is practically possible so the data can be legitimately used for a wide range of purposes. Apart from the Collated Indices there are many other uses, especially in research and for nature conservation (page 22), to which the data have been put, and to which they are likely to be put in the future. Many use the data collected from individual transects to assess how butterflies are faring on those sites compared to national trends and to assess local effects such as management on the site.

The methodology for monitoring butterflies by the transect method was developed and fully tested during the period 1973 to 1975. Details of this can be found in Pollard & Yates (1993). The method needed to be simple and easy to follow, but robust enough to consistently produce comparable results year on year so that real changes in butterfly abundance could be measured over time. A standard methodology was decided upon which has remained the basis for transect monitoring for butterflies ever since, and has been more or less adopted by butterfly monitoring schemes that have arisen subsequently in many other parts of Europe, and indeed in other parts of the world.

Methodology in brief

A fixed-route walk (transect) is established at a site and butterflies are recorded along the route on a regular (weekly) basis, normally from April to September, when weather conditions meet set criteria. Transect routes are chosen to sample, ideally evenly, the habitat and management activity on sites. Care needs to be taken in choosing a transect route as it must then remain fixed to enable butterfly sightings to be compared from year to year. Transects are typically about 2-4 km long, taking between 45 minutes and two hours to walk, and are divided into sections corresponding to different habitat or management units, though if time is likely to be a limiting factor a shorter transect of 1-2 km taking 45 minutes to 1 hour should be considered.

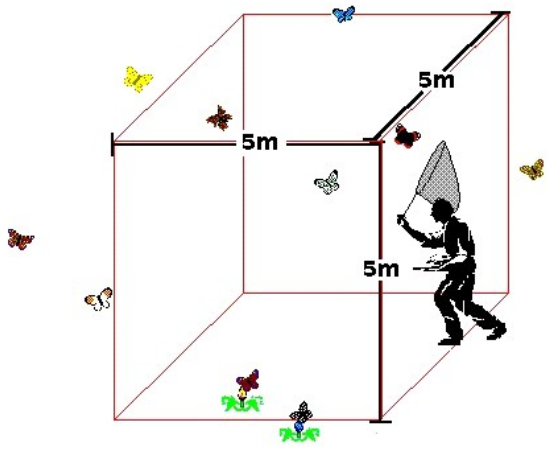


Figure 6. Diagrammatic representation of 'recording box'. Only those butterflies judged to be seen within the 'box' should be recorded as part of the transect count. The recorder depicted here is about to net the white butterfly in front of him to check its identity.

Butterflies are recorded in a fixed width band (typically 5m wide, 2.5m either side of the recorder) (**Figure 6**), along the transect route each week from the beginning of April until the end of September yielding, ideally, at least 26 counts per year. Counts may also be carried out

in March and October. Transect counts should ideally be made between 10.45am and 3.45pm, though 10.00 and 17.00hrs is usually acceptable at least during the months in the middle of the season. Counts should only be carried out when weather conditions are suitable for butterfly activity: dry conditions, wind speed not more than Beaufort Scale 5, and temperature 13°C (11°C in northern upland areas) or greater if there is at least 60% sunshine, or at least 17°C if overcast (but not raining). Due to the vagaries of the British and Irish weather, it is rare in practice to achieve a full set of 26 weekly counts. However, for a small number of unrecorded weeks, missing values can be estimated using other counts during the season.

Best practice tips with respect to aspects of recording

In the first instance each recorder should thoroughly familiarise themselves with the methodology and what the criteria are for when a butterfly transect can be walked. An important over-riding principle to always bear in mind when recording a butterfly transect is the need for consistency. Each recorder should follow exactly the same route and as far as possible record in the same way as the main recorder/each other.

Setting up a transect

As we are currently developing a new butterfly monitoring method to more efficiently monitor widespread butterfly species across the general countryside (see pages 17-20), transects are becoming increasingly targeted at habitat specialist species and semi-natural habitats. If you want to start up a new transect please first consult the Regional Development Plan which is available on the UKBMS website at: http://www.ukbms.org/Downloads/TransectDevelopmentPlan.pdf. This sets out what we consider to be the priorities in terms of species that need to be monitored in different regions, areas where geographic coverage is poor, and habitats that need more coverage (see also page 15). It would be helpful if your transect can fit into one or more of these priorities. Please also consult your Local Co-ordinator (see list on pages 37-38) as they will have more local information and should be informed that a new transect is to be monitored. When setting up a new transect, careful thought should be given to why it should be done and just what it should consist of in terms of habitat and length. Long transects in remote situations, for example, can be difficult or onerous to maintain in the longer term.

- Consider what should be the priorities of the transect in terms of the species monitored, main habitat(s) sampled and its location.
- Consider sampling just one major habitat type as this makes analysis easier.
- Consider accessibility of the transect in terms of distance from the main recorder or where recorders may come from in the longer term.
- Although transects have traditionally tended to be mostly between 2 and 4 km in length, a shorter transect of 1-2 km should be considered – something that could be covered in a lunch-break! Again this makes a longer term commitment to keeping the transect going easier.
- Try to make the transect representative of the area and habitat(s) you are sampling, sampling it as evenly as possible. Consider not only where butterflies are now on the site but where else they might move to on the site in the future.
- Unless the start/end of each section is clearly defined (by an appropriate landmark(s)) consider using numbered marker posts (**Figure 7**), these should last quite a few years, though on some sites vandalism may be a problem.

Figure 7. Section marker posts can be very useful, particularly in featureless landscapes as here at Tentsmuir Point on the east coast of Fife in Scotland. *Photo Nick Greatorex-Davies*

Know your transect

It is important that all recorders know the correct route and limits of the transect. Too often we discover well after the event that a transect route has been modified or that not all recorders record the same route!

- Every recorder should accompany an experienced recorder on a transect count(s) (until they are confident they can accurately follow the route and know exactly where each section starts and finishes) before recording a transect on their own.
- An accurate map should be made of the transect route showing clearly where each section starts and finishes (add notes if necessary). The map should also have marked on it the limits of the recording 'box' for any sections where these limits are different than the standard 5 metre 'box'.
- Every recorder should have available a copy of the map (plus any notes) to take into the field.
- The limits of the recording 'box' for each section should be known by every recorder.
- Once fixed (when the transect is set up) the route should not be changed. If it is changed, please consult your Local or National Co-ordinator. In most cases the transect will need to have a new name. (Significant changes in the route mean that comparing results before and after the change(s) will not be comparing like with like).

Record consistently between recorders

Probably the biggest source of error in transect data comes from the way different recorders record. There are things that are hard to address, e.g. failing eyesight and colour-blindness, but differences can be minimised and recording made more consistent.

- When new recorders accompany an experienced recorder for the first time they need to carefully see how it is done, and learn and keep to the standard methodology; only record what is seen within the limits of the recording box; avoid the temptation of recording something unusual or rare but which flies outside those limits; only record what is seen while actually walking (at a slow (2km per hour) steady pace) and don't linger in hotspots hoping for something 'good' to turn up; only record what you see in front of you; try and avoid double counting.
- When recording as part of a team (where recorders take it in turns to walk the transect), periodic checks should be made to see whether similar counts of different species are being made by each recorder and appropriate steps taken to rectify problems.
- Remember that you don't have to see every butterfly that is in your 'box'. If it is hidden behind vegetation, then it is hidden behind vegetation, you don't have to go looking for butterflies that are out of sight as you walk along.
- When two or more people walk a transect together, only one person should do the actual recording, and only what that person sees should be recorded (unless the recorder thinks they would have seen the butterfly had they been on their own!). Two pairs of eyes will generally see more butterflies than a person on their own and results will therefore be biased.
- The one(s) not recording should walk far enough behind the recorder so as not to interfere with the recorder's line of sight (i.e. the back of the imaginary recording 'box').
- The one recording should ensure they concentrate on the task of accurately recording and are not unduly distracted from the task of recording by any companions.
- Try to record at the same time of day. There is often an optimum tine of day for a particular transect that will depend on aspect and topography.

Recording forms

We strongly recommend the use of standard recording forms in the field. There are several reasons for this:

- The form 'asks' for all the information required, so it is less likely that anything will be missed out than when using for example a notebook.
- The list of species is in the same order, and the form in the same format, as the data entry form in Transect Walker (TW), reducing the likelihood of transcription errors when entering data into TW.
- It reduces the delay in sending forms in to your Local Co-ordinator or to CEH at the end of the season if you are not entering the data into TW yourself. They are already filled in and simply need to be sent off.
- A customisable EXCEL version of the recording form can be downloaded from the UKBMS website. On this you can include only the species that occur on your site (ensure they are ordered as in TW), and you can widen rows for recording more numbers, (e.g. 'five-barred gates', '9's or what ever system you use) for the more abundant species.
- Please make sure you complete the whole form when you finish the walk and look over the data for any errors that might have been inadvertently made. It will be much harder (if not impossible) to accurately fill in any blanks at the end of the season.

What you record

- Please record a sunshine value for each section. Some recorders put an average across all sections, which is fine if the sunshine was 100%. However, if sunshine varies along sections, then it is useful to have a separate estimate for each section (these data are of value researching weather effects on activity). To do this, estimate roughly (to the nearest 10%) the proportion of the length of the section that was sunny as it was walked. This is not difficult and one soon gets used to doing this while walking the transect. It should be classed as sunny only if the sun casts a distinct shadow (i.e. with sharp edges) on the ground (even if quite faint as when sunshine is hazy or with bright cloud). Only if cloud obscures the sun to the extent that there is no distinct shadow on the ground should it be considered as not sunny. Shade cast by tree canopy does not count as not sunny. Even under dense tree canopy some direct sunlight will reach the ground, so it should be possible to determine whether the sun would be shining in the recording box if there was no tree canopy.
- Recorders should make sure they know and use the Beaufort Scale for recording windspeed, and should take a copy with them into the field for reference. Windspeeds of '0' or '1' are recorded surprisingly frequently by some recorders. These records are hard to believe when in reality times when the windspeed is that low are very rare, in the case of '0' extremely rare (smoke rises vertically, i.e. not a breath of wind). Most often windspeeds are between 2-4.
- Where estimates have to be made (when numbers are too large to count accurately) please make sure a figure is recorded. Computers don't understand '40+'. As the one who actually saw what was there the recorder

is best placed to make the best estimate and this should be done at the time the count was made.

- If something unusual is recorded, please add a note to the bottom of the form to confirm that what you have recorded is correct (e.g. a Chalkhill Blue recorded in woodland with no colony nearby). Otherwise anomalous looking data will simply be omitted.
- Please record any management events that have taken place when you first observe that they have occurred. These should be entered on the UKBMS site changes form available from Butterfly Conservation. These data will prove very useful in interpretation of changes in butterfly numbers at the site level.

N.B. In future we will have to be much more ruthless in excluding data from the analysis if the recording criteria are not met or information is missing. We will not have time to examine each case individually as we have in the past. However this does not mean that we do not want data from counts walked when weather and other criteria are not met. These data can be used for other forms of analysis and so will still be entered into the database.

Health and safety

Most recorders are volunteers and may not have insurance cover to help them if they are injured while walking butterfly transects. Here are a few simple precautions that can help ensure your safety.

- Take a mobile phone with you.
- Let at least one other person know when (and where) you are going out on a transect walk and when you expect to return. Let them know when you have returned.
- Wear appropriate footwear and clothing for the terrain and weather conditions. If it is hot and sunny you should consider wearing a sunhat, applying sunblock to exposed areas of skin and taking a drink with you.

When and how often you record

Full species transects require a commitment to record weekly throughout the main recording period from the beginning of April to the end of September.

- Walk as many of the 26 weeks as possible. Although a few weeks can generally be missed (e.g. because weather conditions are unsuitable), gaps of two weeks or more are likely to mean that data will be too few for the calculation of Annual Indices for some species.
- If commitment to a full season of counts is likely to be difficult and there are rare or scarce species present on the site (especially BAP species), then it might be desirable to consider a single species transect that covers just the flight period of the target species. It is much better to have good data for one or a few species than data with many gaps that is unusable for analysis.
- Record on the first opportunity that presents itself each week. You may not have another opportunity despite what the weather forecast says!

Use of nets

The use of butterfly nets is frowned upon in some quarters, largely due to their association with collecting. However they are an extremely valuable tool for the butterfly recorder, even for the most experienced. Few people, if any, can reliably separate more than a proportion of the Small and Green-veined Whites they see in flight, and this only gets worse when eyesight begins to deteriorate. Female Orange-tips can also readily be mistaken for these whites, as can small specimens of the Large White. Nets are also very useful for checking other groups of species that are similar such as some skippers, blues and fritillaries (N.B. a license is needed for netting High Brown Fritillaries). With a little practice, nets can soon be used safely and butterflies can be netted, identity checked and released unharmed (however it is advisable to practice on common species until the technique has been mastered). At some sites there may be restrictions on using butterfly nets and permission may need to be sought.

A kite net is recommended, of the sort sold by Watkins and Doncaster (http://www.watdon.com/) (**Figure 8**). Though quite expensive (about £35 for a complete net), these are by far the best nets for effective netting of butterflies. When netting a butterfly, a clean sweep of the net to catch the butterfly (carefully avoiding brambles and dog rose etc.!), followed by flipping the end of the net bag back underneath the net frame and turning the net over so the bag ends up on top of the frame (done once the butterfly is in the end of the bag) is all that one needs to do!

Figure 8. Kite nets are generally considered the best for netting butterflies and are extremely useful on transect walks for helping to identify species that are difficult to separate in flight such as some whites, blues and fritillaries. *Photo Nick Greatorex-Davies*

Summary data and data checking

With data from so many transects to process, in future we need to streamline data processing and we will not have the time or resources to correct many of the errors that appear in the data. If data obviously does not meet the required standards it simply will not be used for

analysis or worse still not be entered into the database at all. It is in the recorders interests that the data provided has been checked for accuracy before it is submitted. As we are no longer asking for paper forms to be sent in, in future we will contact the Principal Contact or Local Co-ordinator for information to correct any important errors, so paper forms should be kept (see below).

- If the recorder or Principal Contact is able to produce a summary table of the seasons counts before sending the data in, this is a good way to check for errors in the data. More obvious errors will show up well on summary tables. The recorder or Principal Contact is in a much better position to correct these errors than we are, and if it is not corrected we may need to contact the recorder to resolve anomalies.
- If you are the Principal Contact or most experienced recorder of a transect, please check the counts of less experienced recorders to 'flush out' any dubious records. This may also highlight where inexperienced recorders need help in learning to accurately identify certain species in the field, and so should be addressed accordingly.

Use of Transect Walker software

Transect Walker (TW) is easy to use and provides a medium for transect data to be downloaded rapidly, and in the correct format into the main UKBMS database. Therefore we strongly encourage as many recorders as can to use it.

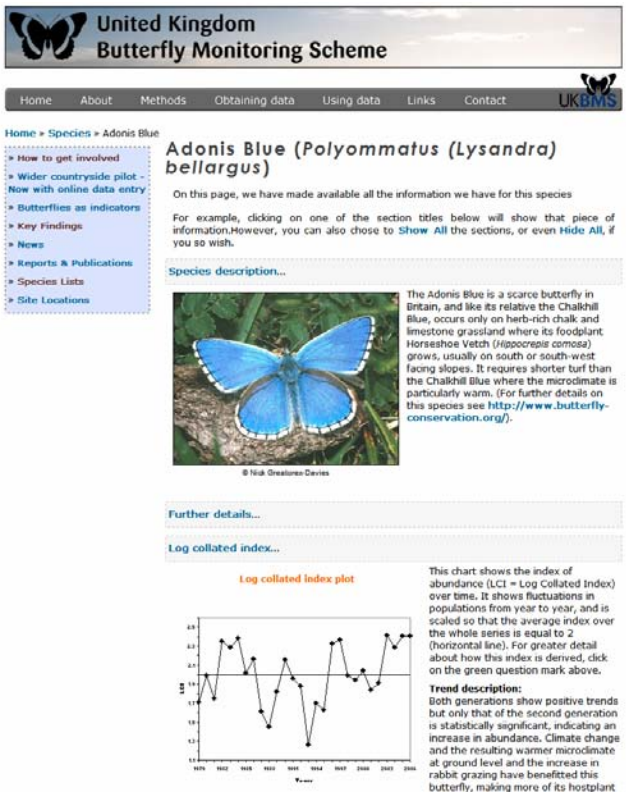
- Please make sure that the TW files contain the full and correct name and county of the sites. With so many transects it is surprising how frequently certain names come up. This can cause confusion.
- If you are recording day-flying moths, please ensure these are also entered into TW.

Keep Field Recording Forms

It is not expected that we will require Field Recording Forms (FRFs) in future (see section on Data Collation on page 15), except where data are not being entered into Transect Walker by the Principal Contact, Local Co-ordinator or other designated person. Where this is not the case the forms need to be sent to CEH. However FRFs should always be kept (ideally by the Principal Contact or Local Co-ordinator) in case they are needed for checking errors as the original data source (i.e. in this case the FRFs) is always the best way of finding out what should have been recorded if errors or anomalies in the computerised data are apparent. In addition FRFs often contain additional information that is not recorded elsewhere, e.g. additional butterflies seen 'off transect', information on management carried out, other species seen etc.

A variety of resources are available on the UKBMS website (http://www.ukbms.org/resources.htm) including:

- Names and contact details of all Local Co-ordinators.
- Latest (free) downloadable version of Transect Walker (version 2.5).
- A variety of guidance notes including a summary of the methodology (including the relevant part of the Beaufort Scale) and how to set up a butterfly transect.
- Weekly recording forms to download including: 1). Standard printable version; 2). Ready to print but customisable version in EXCEL.



A screen shot from the UKBMS website

Concluding remarks

Walking butterfly transects is fun and enormously rewarding in many ways. Many recorders have enjoyed it so much and appreciated the benefits that they have continued to walk transects for many years (see pages 35-37), and many continue to provide invaluable data to the scheme. We are greatly indebted to all who have provided us with useful data (which is the vast majority). However, for all the data collected to be useful the scientifically designed methodology must be followed.

The advice given here is intended to help you to do just that, particularly those who are 'starting out'. For those of us who are seasoned recorders it can be useful to be reminded from time to time of the methodology we should be following and we very much hope you will find the tips given here helpful in that respect and that this article will continue to be useful for future reference. None of this is meant as criticism, just to help maintain or encourage high standards of recording!

THRIVING FRITILLARIES – THE SUCCESSFUL CONSERVATION OF PEARL-BORDERED AND SMALL PEARL-BORDERED FRITILLARIES AT WELCOMBE AND MARSLAND NATURE RESERVE

Gary Pilkington (Devon Wildlife Trust) and Tom Brereton (Butterfly Conservation)

Introduction

Welcombe and Marsland is a large (212 hectare) nature reserve located along the beautiful north Devon and Cornwall coast in a sparsely populated region where the two counties meet. The reserve is a classic example of a north Devon/Cornwall combe valley and comprises a mosaic of habitats including steep-sided oak and mixed woodland, coastal heath, maritime, acidic and marshy grassland, woodland glades and pastures, Bracken slopes and small streams and ponds. This diversity of habitats creates many opportunities for a wealth of wildlife including butterflies, and the site supports up to 34 species, including Dingy Skipper, Grizzled Skipper and five species of fritillary (including High Brown), whilst Large Blue formerly occurred in the 1970s.

The wildlife interest of the site has been long known with, for example, SSSI designation in 1952. In terms of reserve status, Christopher Cadbury (of chocolate family fame) purchased the land in the 1950s and created a private nature reserve, this being handed to the Royal Society for Nature Conservation (RSNC) in the 1970s. The current managers, Devon Wildlife Trust, took over the day-to-day running in 1997. Due to a progressive national decline in status, the violet-feeding fritillaries have become an increasingly important management focus, particularly through the custodianship of Gary Pilkington, site manager for more than 20 years, who has maintained a passion for conserving these charismatic butterflies.

Active management for Pearl-bordered and Small Pearl-bordered Fritillaries (pictured in **Figure 9**) started in the late 1980s. In the preceding years (of the 1970s and 1980s) available records suggest that the Pearl-bordered Fritillary was an uncommon butterfly on the reserve, chiefly restricted to diminishing fragments of suitable habitat in increasingly overgrown rides and glades running through the woodland. Earlier in the twentieth century, the butterfly was likely to have been more common when the woodland was actively managed, including through coppicing, with some grazing of the surrounding rough meadows and Bracken slopes by cattle and other stock animals. Information on Small Pearl-bordered Fritillaries is scant though there is likely to have been a similar pattern of decline associated with abandonment of traditional management practices and subsequent scrubbing over of suitable habitat.

To get better information on the changing status of fritillaries on the reserve, a butterfly transect was established in 1982, which has been closely documented since 1988. There has been recording in every year subsequently, making it one of the longest-running butterfly monitored sites in South West England. The count data generated has proved vital not only in documenting the changing butterfly fauna, but in evaluating the effects of the active fritillary management carried out at the site.

Figure 9. Pearl-bordered and Small Pearl-bordered Fritillaries. *Photos Gary Pilkington*

Figure 10. Aerial view of Welcombe and Marsland Reserve, showing main Pearl-bordered Fritillary colonies (shaded red). Hard Hills is the eastern most area. *Source: Google Earth*

Species ecology

Through detailed monitoring and more casual observation a good knowledge has been built up of the ecology of Pearl-bordered and Small Pearl-bordered Fritillaries on the reserve. The studies have shown that the reserve is generally one of the earliest sites for Pearl-bordered and Small Pearl-bordered Fritillaries in the UK. Pearl-bordered Fritillaries typically emerge at the of end April/early May, with a flight season lasting four to seven weeks that is mostly over by the end of May. In warm springs, emergence can be very early and the flight season barely more than a couple of weeks. For example, in 1997 and 2003, emergence respectively occurred on the 15th and 13th April, with numbers peaking in the third week in April. The Small Pearl-bordered Fritillary generally flies from the middle of May and throughout June but there is an obvious cross over period when both species are present. In 1989, Small Pearl-bordered Fritillaries emerged on the 29 May and flew throughout June, July, August and September with 1st brood adults almost merging with 2nd brood individuals. The 2nd brood is usually small but in 2005 it reached a peak of 50+ at the main colony. The data seems to indicate that 2nd broods typically occur every 3 years, though there has been a second brood for each of the last four years. ***Stop press*** The warm spring of 2007, brought another extremely early emergence, with Pearl-bordered Fritillary out by the 14th April and in large numbers (n=176) two days later, whilst Small Pearl-bordered Fritillary were out in good numbers by the 27th April. A substantial and early second brood of Small Pearl-bordered Fritillaries was recorded from the third week in July.

Distribution and habitat requirements

Pearl-bordered Fritillary occurs in four main areas on the site (**Figure 10**), with the main colony being at 'Hard Hills', a 15 acre warm and sheltered west-facing slope dominated by Gorse and Bracken, with patches of moderately acidic grassland. Small Pearl-bordered Fritillaries occur alongside Pearl-bordered Fritillaries across the site, but some additional small/medium populations also occur in other suitable habitats such as flushes and damp grasslands. The distribution of both species is largely determined by the precise egg-laying requirements of the females and the location of suitable breeding vegetation. Pearl-bordered Fritillaries are chiefly confined to dry ground where Common Dog-violets grow through and amongst flattened beds of Bracken and Gorse litter that are exposed to and warmed by the spring sunshine (**Figure 11**).

Small Pearl-bordered Fritillaries differ slightly in that they tend to be at the more grassy lower slopes of the hillsides favouring 'bushy' violet growths, including in the wet flushes where lush-leaved Marsh Violet plants grow amongst tussocky grasses. Within breeding areas, the preferred nectar plant of the Pearl-bordered Fritillary is Bugle, though Lesser Celandine and Dandelion may be used early in the season and Buttercup species later on when Bugle is scarce. The reverse is true for Small Pearl-bordered Fritillary, which uses Bugle if the preferred nectar sources, Meadow Buttercup and Creeping Buttercup, are not flowering.

Figure 11. Classic breeding vegetation for Pearl-bordered Fritillaries. *Photo Tom Brereton*

Habitat management

The key area for fritillary management on the reserve is Hard Hills, which typifies (**Figure 12**) the management approach for fritillaries across the other parts of the reserve and as a consequence is described in detail below. In the early half of the twentieth century, Hard Hills was grazed by sheep/goats but this management had ceased by the end of the Second World War, leading to gradual scrub and Bracken invasion.

In the early 1980s, when the first reserve management plan was produced, the management aim at Hard Hills was to remove the scrub and Bracken in order to restore/revert to a preferred (generic) grassland/ heathland habitat mosaic. Management actions included scrub clearance by tractor swipe, Bracken spraying with Asulox, Bracken cutting and Bracken/scrub clearance through burning. The periodical burning of the slopes following the cessation of grazing resulted in a dense Bracken litter layer, though fortunately a comparatively diverse herb layer survived underneath. Sadly, the early 1980s management did no more than maintain precariously small populations of Pearl-bordered and Small Pearl-bordered Fritillary in the area.

In 1988, crucial changes in the management approach were made - periodic burning was abandoned and a new regime (which continues today) was implemented involving cutting the Bracken/scrub in compartments on a rotation. The aim of management has been to maintain suitable habitat conditions for both species and to meet all the resource requirements of both the adult and the immature stages.

Figure 12. Recently cleared Gorse and Bracken at Hard Hills. Pearl-bordered Fritillaries typically colonise the second year after clearance amongst the brown Bracken/Gorse litter and the fresh growth of violets. *Photo Gary Pilkington*

Objectives include creating violet-rich early successional stage Bracken litter beds (‘*brown areas’*) for breeding Pearl-bordered Fritillaries, later stage medium turf swards (*lusher ‘green areas’)* for breeding Small Pearl-bordered Fritillaries (**Figure 13**), and in providing scrub for shelter and flower-rich areas for nectaring for both species. In order to maintain this mosaic, Bracken and scrub components are managed on a coppice cycle so that fresh suitable habitat is re-created every few years. There are around ten compartments on Hard Hills managed in strips, so that in any one year there is (1) suitable habitat for both Pearl-bordered and Small Pearl-bordered Fritillary, (2) habitat coming into condition (recently cut) and (3) habitat that has recently gone out of condition (e.g. overgrown), but which is going through a (shading) phase that will make it suitable in the near future. As the fritillaries may use cleared patches for only one or two years, new habitat needs to be constantly re-created and between a third and half of strips are cut each year. Pearl-bordered Fritillaries tend to use cleared Bracken/scrub compartments in years two and three after cutting, whilst Small Pearl-bordered Fritillaries can usually persist in clearings for a year or two more than this.

The timing of cutting is determined by the vegetation structure underneath the Bracken/Gorse canopy. Cutting occurs when the ground underneath the vegetation is *bare* (i.e. when the grasses have been suppressed by shading), which takes from 2-5 years under Bracken and 4-6 years under Gorse.

Figure 13 Coppicing willow and alder scrub in a boggy valley bottom for Small pearl-bordered Fritillary. *Photo Gary Pilkington*

Cutting is carried out during the autumn/winter, to allow butterfly foodplants to set seed and to discourage grass growth. Most of the cut material is raked and removed, to allow violets, Bugle and other woodland herbs to flourish, though in some areas Bracken fronds are left in violet-rich areas as a light cover to provide breeding vegetation for Pearl-bordered Fritillaries. Raked material is stacked in piles that have become a good habitat for spiders, lizards and grass snakes. Some of the cut scrub is burnt and about 10% of the stumps are treated.

Additionally, some Bracken sections are cut monthly during the summer season in order to create open areas for other butterflies to use, especially Dark Green Fritillaries which breed in them. Bracken that encroaches onto grassland areas is also cut during the summer. The height of cutting for Bracken and Gorse compartments is about 10 cm (3-4 inches) and never allowed to drop down to ground level, so that foodplants such as Common Bird's-foot Trefoil are left uncut. Cutting is done by tractor mounted swipe or clearing saw. The base of Hard Hills comprises two grassy compartments of roughly equal size. One of the compartments is cut annually, with the other is cut bi-annually. All cutting of grassland compartments is carried out in the winter so that nectar sources are not removed during the flight season.

Monitoring management impacts

The management at Hard Hills and across the rest of the reserve has proved a winning formula and importantly over a *long-term* period. Substantial populations of both Pearl-bordered and Small Pearl-bordered Fritillary have been maintained, that have gained increasing importance due to the declines witnessed elsewhere.

Over the 19-year monitoring period, the Pearl-bordered Fritillary has increased significantly in abundance by 219%, in sharp contrast to the national trend where over the same period there has been a very highly significant decline of 54% (**Figure 14**). Similarly, the Small Pearl-bordered Fritillary has increased significantly in abundance on the reserve by 358%, in comparison to the national trend where there has been a very highly significant decline of 53% (**Figure 15**).

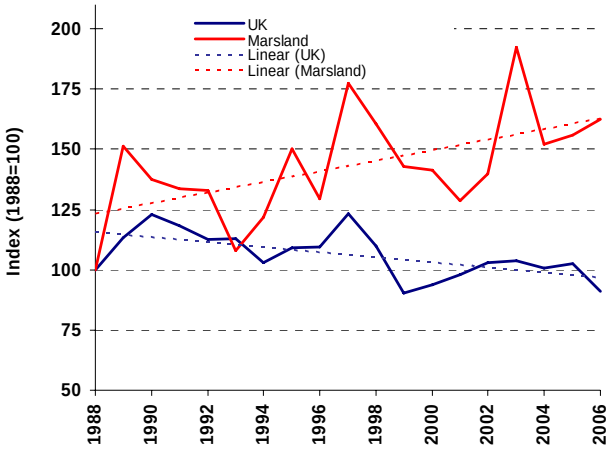


Figure 14. Trends in abundance of Pearl-bordered Fritillary and on the reserve (red line) in relation to the national trend (blue line).

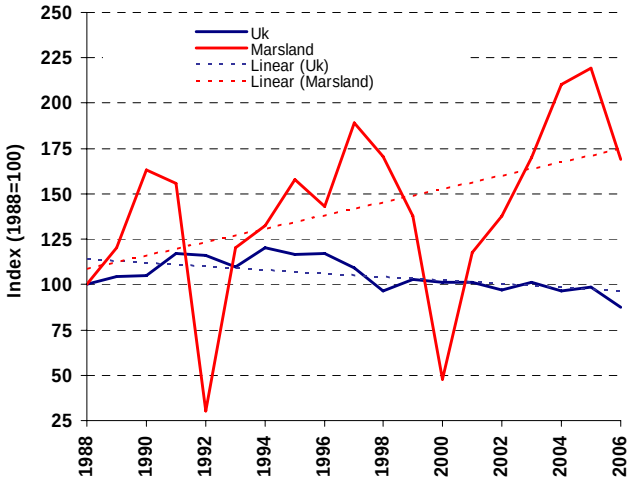


Figure 15. Trends in abundance of the Small Pearl-bordered Fritillary on the reserve (red line) in relation to the national trend (blue line).

Conclusions

The management successes at Marsland demonstrate that it is technically possible to maintain and expand large populations of some of our most rapidly declining and 'problematic' fritillaries on a long-term basis. With new opportunities created by agri-environment schemes (especially Higher Level Environmental Stewardship in England), woodland grant schemes and favourable condition management of SSSIs, it is hoped that similar sensitive and long-term management can be implemented throughout the range of both species, so that we can a see a long-awaited turn around in their fortunes.

Acknowledgements

We would like to thank Steve Robbins for his initial efforts on the site in the early 1980's and James Cadbury and his father the late Christopher Cadbury for their insight. We would also like to thank the Devon Wildlife Trust for their continued support of the project and current staff, Steve Threlkeld and Kate Langdon for all their hard work. www.devonwildlifetrust.org

SPOTLIGHT ON A LOCAL CO-ORDINATOR – *Neil Gregory*

Local co-ordinators do an essential job in helping to maintain the network of transects in their area, encouraging recorders, recruiting new recorders and ensuring that data are gathered in and collated at the end of each season. Many are also involved in training recorders, including holding meetings, in some cases annually, for this purpose. Without them it simply would not be possible to maintain such a large network of transects across the UK with such excellent coverage of most our butterfly species. Here we focus on just one of our Local Co-ordinators, Neil Gregory, who currently co-ordinates a network of over 60 transects across the whole of Scotland.

Neil Gregory took over from Julie Stoneman (of Butterfly Conservation) as the Scottish Transects co-ordinator in 2006. Julie had already built considerably on the foundation for transect walking in Scotland laid by CEH, almost doubling the number walked from 25 to almost 50. Over 60 transects will have been walked in 2007 and Neil will soon be receiving the data from the walkers. Most of it comes in electronic form now and Neil's computing skills have been put to good use in supporting people who are unfamiliar with Transect Walker software.

Neil Gregory. *Photo Corinna Gregory*

Neil was formerly Transect Co-ordinator for the West Midlands until he and his family moved to Scotland in 2004. He and his wife Corinna had the rather unenviable task of entering about 200 years worth of paper records on to Transect Walker to enable analysis. He also walked 2 transects, one on a 'brownfield' area in Birmingham and the other on a Local Nature Reserve. The biggest difference he has found in co-ordinating in Scotland is that the area covered is so much larger. It is not so easy to visit sites or to walk a new transect with a new person to ensure that they know what is required of them. It was one challenge in the Malvern Hills area to find a group of local people with sufficient knowledge who were willing to walk a new transect, and to organise a training day for them. It is quite a different challenge trying to set up new transects, especially in the more remote areas of Scotland; areas which could have vital sites for some Scottish specialities, or species which are in decline in parts of England. Notable species found on transects in Scotland include Chequered Skipper, Pearl-bordered Fritillary, Marsh Fritillary, Large Heath, Mountain Ringlet and Small Blue.

As well as Transect Co-ordinator, Neil has various other roles within Butterfly Conservation. He is currently Branch Chair for Southwest Scotland and County Moth Recorder for Inverclyde, Renfrewshire and Ayrshire. He realises the importance of building up a comprehensive set of records of both rare and common species. He has also come to realise that there are a very few people covering a very large area in Scotland and therefore we may not have a true representation of species. However he is not one to be beaten and is forging good links with other local groups such as the RSPB, SWT, the local bat group and the LBAP steering group. His enthusiasm is infectious!

We would like to take this opportunity to express our gratitude and appreciation to all the Local co-ordinators for all the work they do, in their own time and unpaid. Many of them also walk transects. The dedication of our Local Co-ordinators and of the many recorders who walk transects, and the fact that we have such a full coverage of the UK, is a measure of how much we as a nation value our butterflies and other wildlife. It demonstrates by action that we want to do what we can to ensure that appropriate data is gathered that will help us to understand the ecology of our butterflies better and the changes to them that are taking place. The gathering of this information is crucial if we are to have the data we need to inform us of conservation priorities and so that appropriate measures can be taken to enhance and maintain healthy populations of all our species and the habitats they occupy in the long-term.

FEATURES

RECORDER ACHIEVEMENTS – A REVIEW

The results produced through the UKBMS are only possible thanks to the tireless efforts of a whole army of dedicated volunteer recorders who meticulously count butterflies week in week out and year in year out on their local transect sites, then willingly supply this data to local co-ordinators and the national scheme. What is more remarkable is that the vast majority of recorders and co-ordinators are *volunteers*.

In this article, we attempt to pay tribute to these efforts by quantifying some of the quite remarkable individual and collective recording achievements. Please note that this is a first attempt from the recently combined database and inevitably there will be some errors and omissions, especially as we have only been able to calculate the statistics from the original BMS database and the BC datasets received in Transect Walker 'full data' format.

From an investigation of the UKBMS database we can now confirm at least **3200** recorders have carried out butterfly transect walks since the original BMS began in 1976 - a figure substantial higher than we had estimated before. The total number of people who have carried out scientific annual monitoring of butterfly populations is likely to be even higher and nearer to **4000**, as there are additional recorders from (1) about 140 historical sites for which we have no recorder name and (2) about 200 sites which are monitored by other methods (e.g. timed counts, larval webs) that typically involve a different set of recorders.

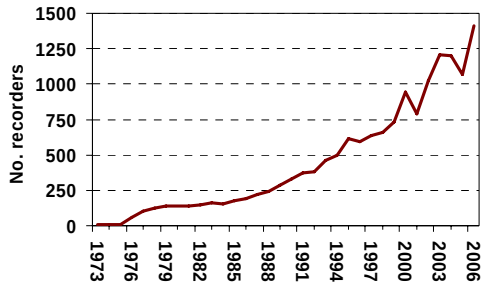
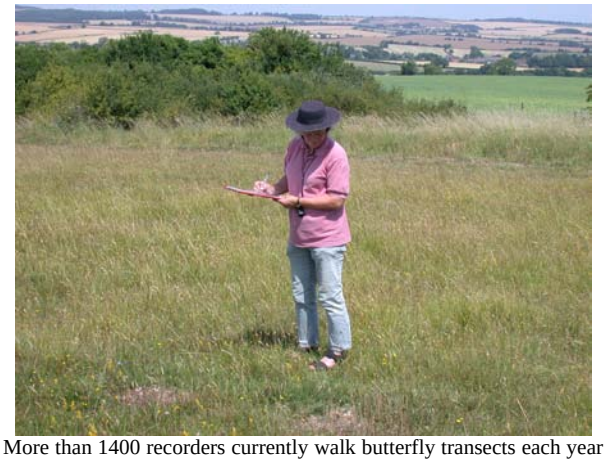


Figure 16. Growth in the number of recorders involved in walking butterfly transects

The majority of transects are walked by single observers who may have back up for times of holiday and illness, though in some regions (e.g. Dorset) transects are walked by larger teams on a rota basis. On some sites, there has been a substantial turnover in recorders, including at Skomer where 58 recorders have undertaken transects over the years!

There has been a steady growth in the number of recorders involved in butterfly transects since the mid 1970s, which has accelerated at times in recent years e.g. 2000, 2003 and 2006 (**Figure 16**). In 2006, approximately **1400** recorders undertook transect walks across the UK and supplied data to the UKBMS, with the substantial increase on 2005 attributable to both new recorders coming onboard, but also improved full data collation.



More than 1400 recorders currently walk butterfly transects each year including Linda Smith, who has carried out nearly 550 walks and counted over 80,000 butterflies at Martin Down transects since 1992. *Photo Tom Brereton.*

Since the start of the BMS, collectively recorders have walked approximately 236,000 miles counting butterflies on transects. More than 20 recorders (**Table 11**) have chalked up in excess of a thousand 'transect miles' including Ernie Pollard and Richard Williamson, who have more than doubled that. Top position goes to Richard Williamson, the West Dean Wood and Kingley Vale NNR recorder, who has walked an impressive ~2700 miles over the years, a journey equivalent to walking either the whole coastline of England and Wales; the length of Chile; or travelling from Birmingham to Baghdad!

Butterflies are not as far away from the moon as you may think. Since the start of the BMS, collectively recorders have walked ca236,000 miles counting butterflies, a distance equivalent to walking nine times around the earth or direct to the moon! *Photo Jim Asher*

Richard Williamson is also top of the table for seeing the most butterflies on transects, with a tally of over 150,000 out of a combined grand total (from all recorders) of about 11.5 million since the start of the BMS. Twenty-six recorders have counted more than 50,000 butterflies over their transect walking careers, including Linda Smith the highest ranking woman, who

has counted over 80,000 at Martin Down NNR in Hampshire (**Table 12**). In sharp contrast, and lest we forget them, 21 recorders had a brief dalliance with butterfly transect walking, seeing no more than a single butterfly over their transect careers!

Table 11. Long distance travellers - recorders who have walked more than 1000 miles counting butterflies

	No. miles walked
1. Richard Williamson	2679
2. Ernie Pollard	2131
3. Ken J Orpe	1904
4. John Wilson	1790
5. J Rees Cox	1616
6. Ian Woiwod	1610
7. Bob V Russell	1554
8. Helen Read	1478
9. Michael F Walter	1402
10. Jess Pain	1271
11. Keith Powrie	1237
12. Martin Allison	1210
13. Roy Leverton	1208
14. Russell J Jones	1197
15. Graham Dennis	1195
16. Mike Enfield	1193
17. Chris S Waller	1188
18. Martin Newcombe	1127
19. Pete K Kinnear	1098
20. Nick Greatorex-Davies	1001

Table 12. The '50,000 club' – recorders who have counted more than 50,000 butterflies on transects.

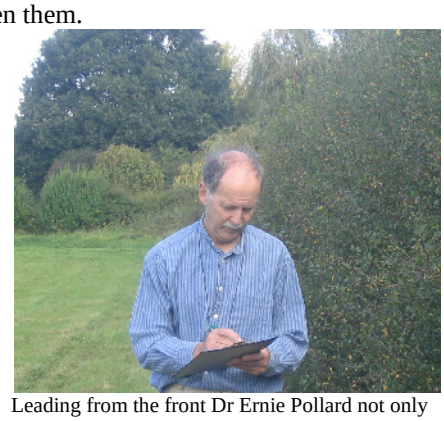
Recorder	No. Counted
1. Richard Williamson	156548
2. Keith Powrie	126921
3. Bob V Russell	116202
4. John McAllister	109676
5. Roy Leverton	96685
6. Ian Woiwod	96128
7. Ken J Orpe	91008
8. Linda Smith	80231
9. R J (Dick) Ryan	78806
10. Michael F Walter	74739
11. Ernie Pollard	73523
12. Phil Williams	73083
13. Val Lane	70205
14. John Wilson	69076
15. Mike Fuller	68505
16. Graham Dennis	66221
17. John Burrell	64668
18. Owen Tudor	64615
19. Phil Grey	63340
20. Gail Jeffcoate	61429
21. David Chandler	59522
22. Peter Brown	59429
23. Ron Baines	59003
24. Dr Michael Sammes	56953
25. David Smith	53869
26. Nick Greatorex-Davies	52930
27. Lawrie de Whalley	50762
28. Terry W Bailey	50097

The recorder with the highest 'strike rate' is John Burrell, who walks a selection of West Country butterfly-rich transects and sees on average nearly 300 butterflies per transect! A total we, at times, struggle to get over the whole year at the BC HQ Lulworth transect! Eighteen other recorders see on average over 200 butterflies per visit (**Table 13**), the majority of which record on chalk grassland sites, an exception being Rob Macklin, RSPB Warden of North Warren, who enjoys on average 231 butterflies per visit at this Suffolk heathland and acid grassland reserve. At the other extreme, a dedication award must surely go to Roger Juckes who is doing some valuable single species transect walking for scarce species in Warwickshire clocking in over 150 visits at two sites since 2000, but counting on average only 2.5 butterflies per visit.

Table 13. Recorders who see on average more than 200 butterflies per visit.

1. John Burrell	295
2. Phil Grey	287
3. Peter Brown	268
4. John McAllister	266
5. David chandler	262
6. Lawrie de Whalley	259
7. Dr Michael Sammes	245
8. Maurice Avent	244
9. E W (Ted) Baigent	244
10. Rob Macklin	231
11. Richard Williamson	228
12. D Painter	227
13. Mick Bird	219
14. Bill G Shreeves	216
15. Andy Barker	211
16. Mark Brown	206
17. John Tubb	204
18. R J (Dick) Ryan	202
19. Alan E Holden	200

Since the BMS was launched in 1976, more than 150,000 separate transect visits have been made by recorders, with ten recorders notching up over 700 visits each (**Table 14**). However, four recorders, Ernie Pollard, Ian Woiwod, Richard Williamson and Rees Cox have made a particularly unique contribution, carrying out recording in each of the 31 years the scheme has been active, amassing nearly 3500 visits between them.



Leading from the front Dr Ernie Pollard not only devised the UKBMS method, but remains it's longest serving recorder having walked transects in every year since 1973.

Special mention should be made of (living legend) Ernie Pollard who spent three years walking transects as part of developing the methodology prior to the scheme launch and is currently (2007) in his 35th consecutive year of transect walking (!) – a fantastic achievement that shows remarkable dedication. Surprisingly though, Ernie has not carried out the most transect walks, the comfortable leader in this is East Midlands Transect Co-ordinator Ken Orpe, who has

undertaken a staggering 1770 visits in his 26 years of transect walking, nearly 400 more than even Ernie.

Finally, mention should be made of Martin Newcombe who had a prolific twelve year recording spell from the early 1990s undertaking 1129 visits and averaging nearly 100 transect walks per year!

Table14. Top ten recorders in terms of the most transects walked.

	No. visits
Ken Orpe	1770
Ernie Pollard	1388
Martin Newcombe	1129
Mike Fuller	952
Martin Allison	914
Bob V Russell	870
Keith Powrie	749
Nick Greatorex-Davies	743
Mike Slater	722
J Rees Cox	710

Roll of honour (*Part* I*) – *Outstanding achievers in butterfly monitoring*

Below is a list of recorders who have made an outstanding contribution to transect walking in terms of the number of years walked (given in parentheses).

30 years or more service

Ernie Pollard (34 years)
Ian Woiwod (31)
Richard Williamson (31)
Rees Cox (31)
Martin P Barnsley (30)

25 years or more

Dick Southwood (29)
Mrs Anne Williamson (28)
Roy Leverton (28)
Bob V Russell (27)
Jess Pain (27)
David G Thurlow (27)
Ken J Orpe (26)
Mike Fuller (26)
Ian H Findlay (25)

20-25 years

Michael F Walter (24)
John Wilson (24)
John Walker (24)
Val Lane(24)
Margaret K Baker (24)
Tina J Yates (24)
Margaret M Cochrane (24)
Chris S Waller (23)
Glynne C Evans (23)
Barry Proctor (23)
Richard T Vulliamy (22)
Mike A Freeman (22)
Bill Shreeves (22)
Robert Smith (22)
Keith Powrie (21)
Gillian M Barker (21)
John McAllister (21)
Becky Woodell (21)
Rob Petley-Jones (21)
Penelope Harwood (21)
Roger and Linda Dobbs (20)
Phil A Page (20)
Russell Leavett (20)
Nick Greatorex-Davies (20)

*Note: this is very much a Roll Of Honour Part I. We are extremely grateful to every single recorder. All data and every individual contribution is valuable and next year we aim to acknowledge all recorders once we have more fully cleaned up the recorder names database.

CONTACT DETAILS FOR LOCAL CO-ORDINATORS

RECORDING AREAS	NAME & ADDRESS OF MONITORING OFFICER	TELEPHONE	EMAIL
UK	Ian Middlebrook Butterfly Conservation, Manor Yard, East Lulworth, Wareham, Dorset, BH20 5QP.	01929 400209	transect@butterfly-conservation.org
SCOTLAND (all)	Neil Gregory 32 Oldhall Drive, Kilmacolm, Renfrewshire PA13 4RF	01505 874 275	droitwich@btinternet.com
NORTHERN IRELAND	Brian Nelson Curator Freshwater Invertebrates, Department of Zoology, National Museums Northern Ireland, Cultra, Holywood, Co. Down, BT18 OEU	028 9039 5265	Brian.Nelson@magni.org.uk
WALES (all)	Clare Williams Butterfly Conservation (Wales), 10 Calvert Terrace, Swansea, SA1 6AR	01792 642972	cwilliams@butterfly-conservation.org
	ENGLAND		
NORTHERN ENGLAND (Fritillaries)	Dr Sam Ellis 38 High Street South, Langley Moor, Durham DH7 8JW	0191 3789216	sellis@butterfly-conservation.org
Bedfordshire & Northamptonshire	Greg Herbert 3 Candale Close, Dunstable, Bedfordshire LU6 3PE	01582 663784	
Bedfordshire & Northamptonshire	*Data co-ordinator* Keith Balmer 6 Salcombe Close, Bedford, Bedfordshire MK40 3BA	01234 355435	keith@balmer.co.uk
Cambridgeshire & Essex	Val Perrin 13 Pettitts Lane, Dry Drayton, Cambs, CB3 8BT	Not available	Valperrin@aol.com
Cheshire & Peak District	Stu Burnet 17 Alderdale Road, Cheadle Hulme, Cheadle, Cheshire, SK8 5PP	0161 485 5107	stuburnet@ntlworld.com
Cornwall	Jim Barker An Arth, Alexandra Road, St Ives, Cornwall, TR26 1BX	01736 794134	jimfrances@anarth.freeserve.co.uk
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Lincolnshire	Allan Binding 6 Willow Court, Washingborough, Lincs, LN4 1AS	01522 879002	allan.binding@ntlworld.com
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	WALES		
Ceredigion	TBA		
Denbigh, Flintshire & Wrexham	TBA		
Glamorgan	TBA		
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Montgomeryshire	TBA		
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TBA = To be announced

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Although this funding support is essential for the existence and running of the UKBMS, there would be no UKBMS without the contribution of an army of volunteers, it simply could not operate. As a consequence we are extremely indebted to all who co-ordinate and record butterfly transects throughout the United Kingdom, as well as to those who allow access to their land and in some cases actively promote butterfly monitoring thereon. Almost all 'our' recorders are in some way volunteers, in addition Local Transect Co-ordinators (usually transect recorders themselves) give up large chunks of their time co-ordinating transects, finding new walkers when others have to, or wish to, give up, and making sure data are gathered in and collated at the end of each recording season. In addition many input data into Transect Walker where recorders do not do this themselves, and are also involved in training 'new recruits', often organising local training events for the purpose.

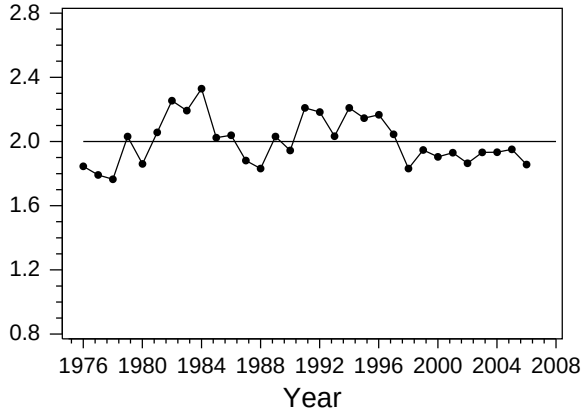
The success of the UKBMS depends on this level of volunteer support if it is to provide the knowledge base from butterfly monitoring to help preserve our nations butterflies and provide these data for ecological research, which itself feeds back into conservation by providing us with a better understanding of butterfly ecology. The huge support from so many volunteers, the much increased 'power' of the enlarged scheme, the UKBMS, and new Wider Countryside scheme, planned to be launched in 2009, bodes well for the future and we are greatly encouraged. Thank you - we greatly appreciate all you all do (recorders, Local Co-ordinators and others involved in maintaining the operation of transects) and we will continue to try and give you the support and feedback you need and deserve.

We would also especially like to thank Dr Ian McLean (JNCC) who has given so much support to the BMS/UKBMS, for a number of years in his role as BMS, and latterly UKBMS, project officer for the JNCC. He has played a major role in promoting the value of butterfly monitoring to potential funding organisations, in bringing together butterfly monitoring in the UK, and in the formation of the UKBMS. Ian has now retired from this role with JNCC and has been replaced by Dr Lawrence Way.

Finally we would like to thank Carl Thompson and Barry Davies at the Joint Reprographic Services Unit at the Natural Environment Research Council's headquarters in Swindon for producing the proofs for, and organising the printing of, this report. Thanks also to Juliet Francis who, as part of our admin team in the Biological Records Centre at Monks Wood, helps with mail-outs and other administrative tasks from time to time.

APPENDIX 1: COLLATED INDEX GRAPHS

Small/Essex Skipper



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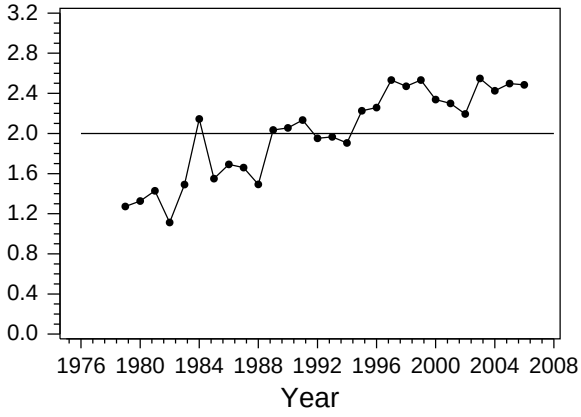
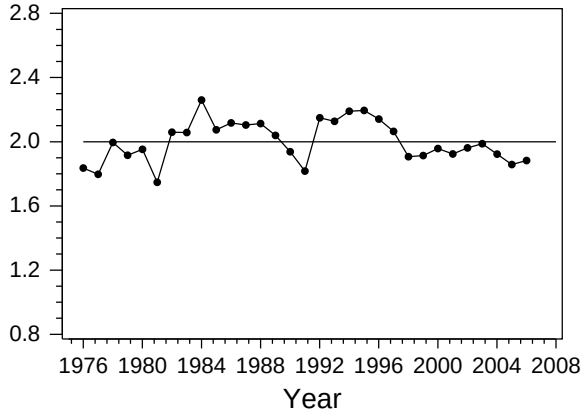


Large Skipper



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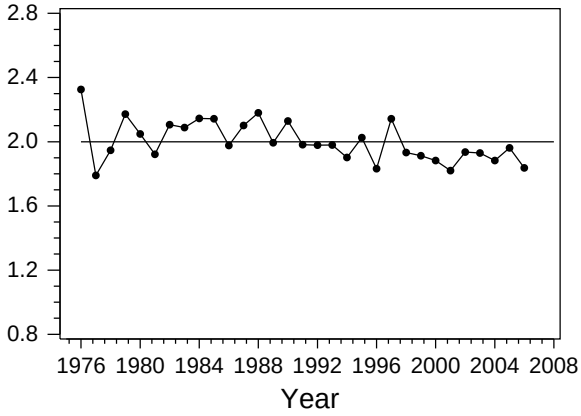
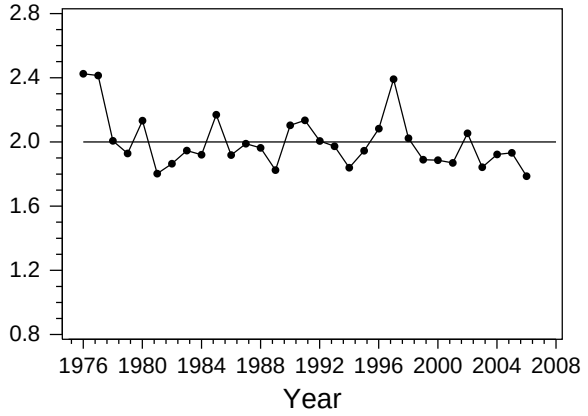


Grizzled Skipper



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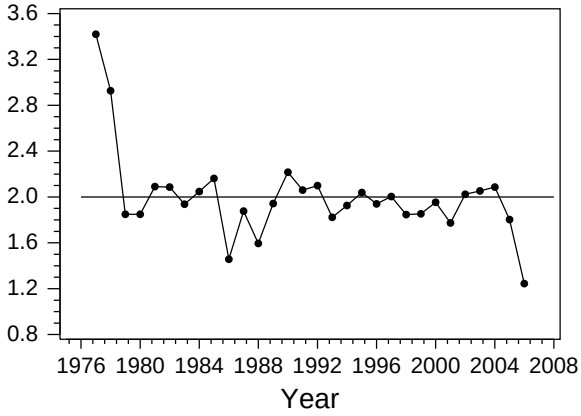

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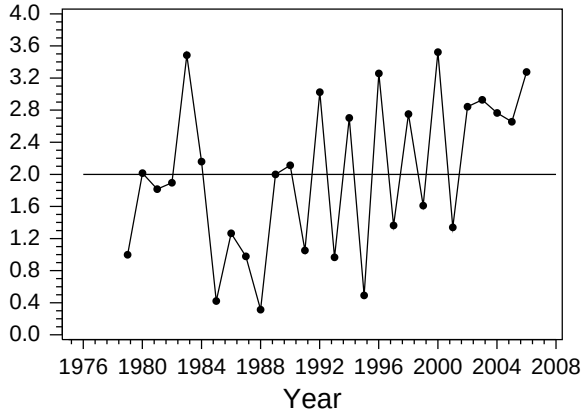

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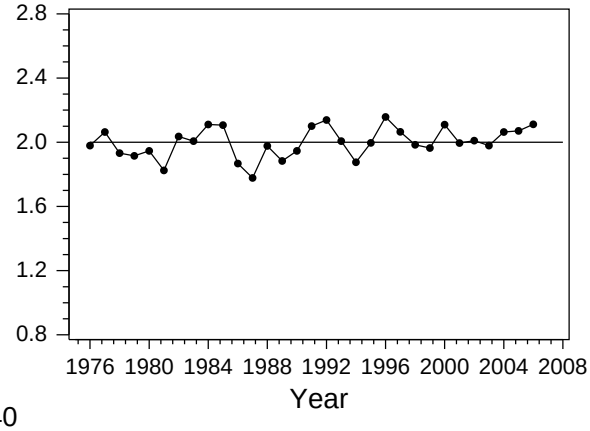

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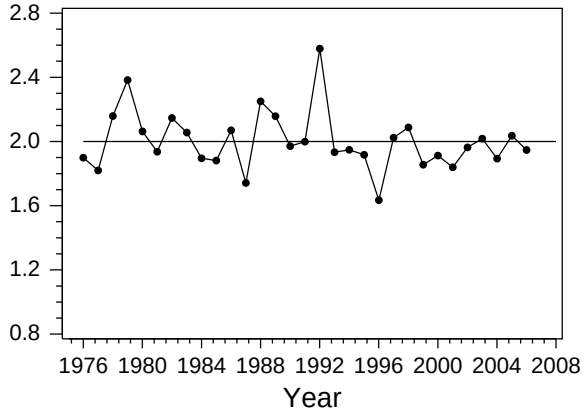

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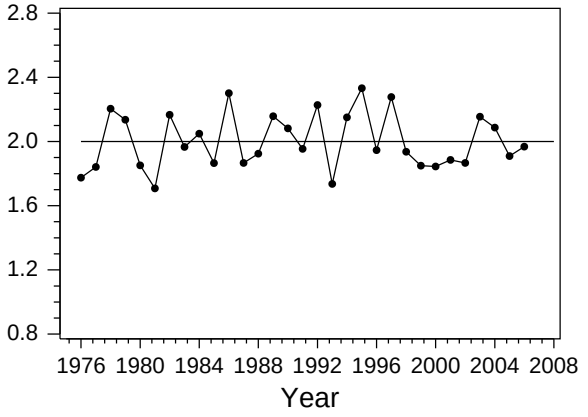

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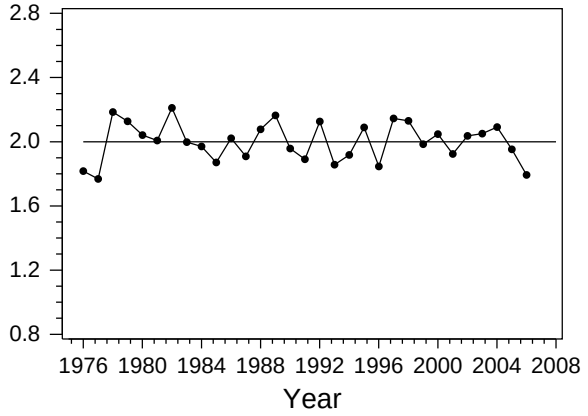

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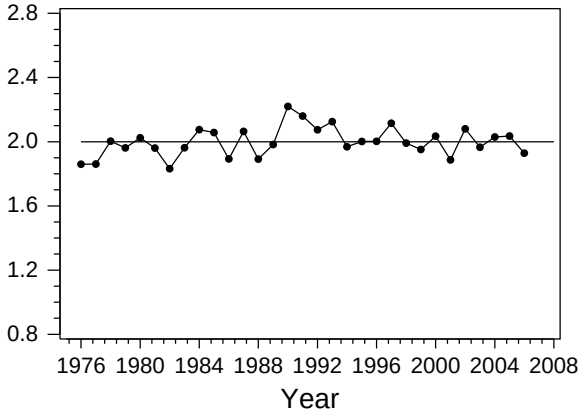

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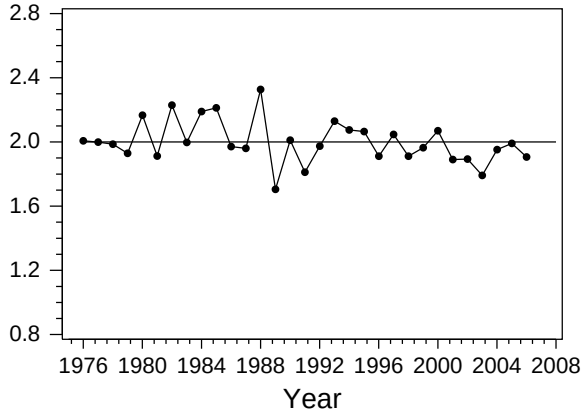

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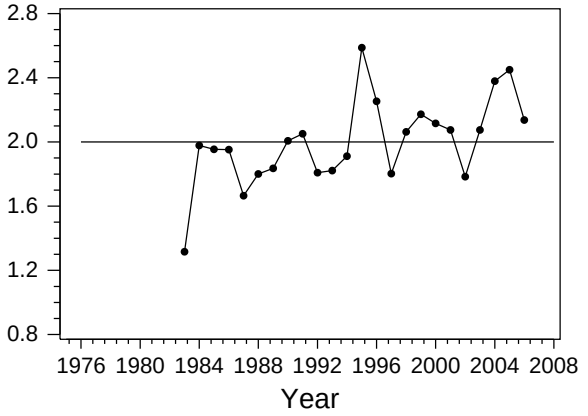

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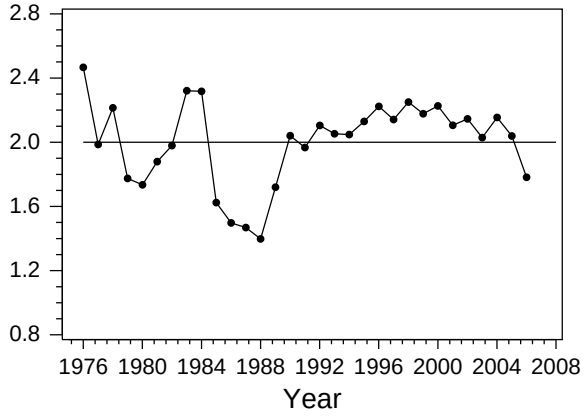

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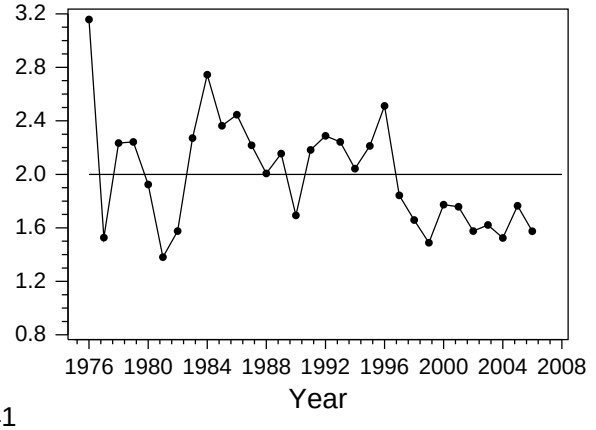

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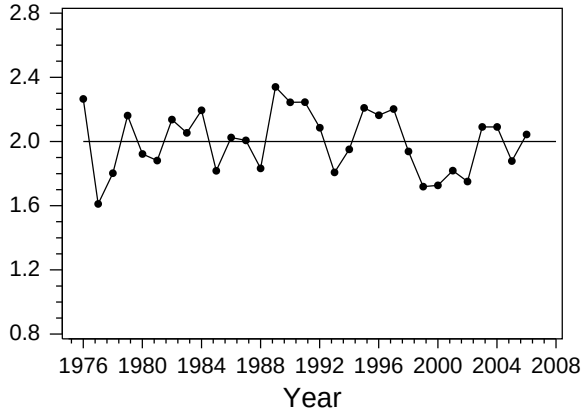

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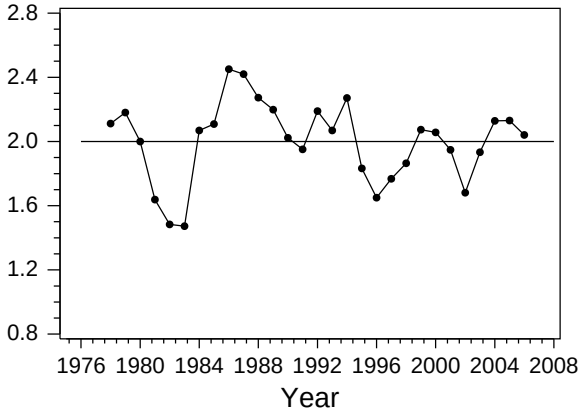

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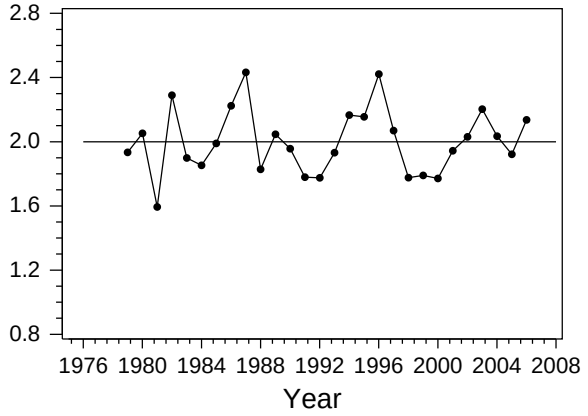

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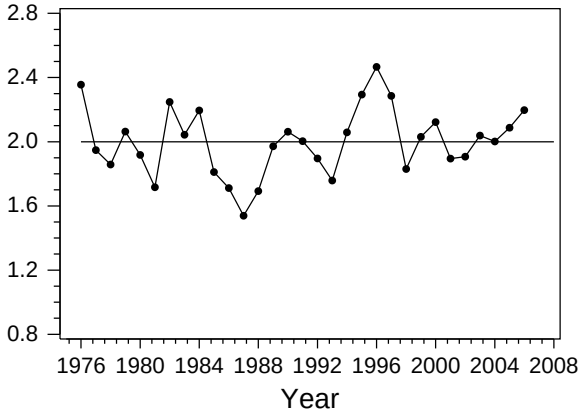

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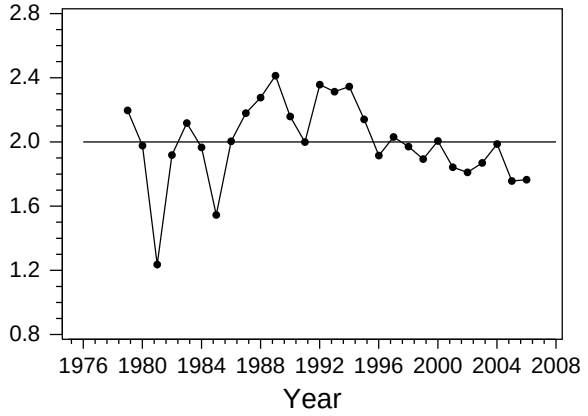

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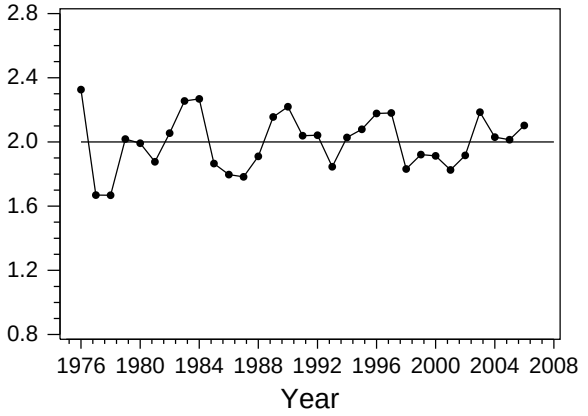

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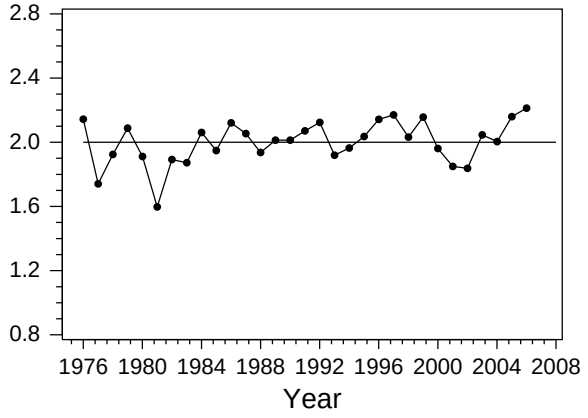

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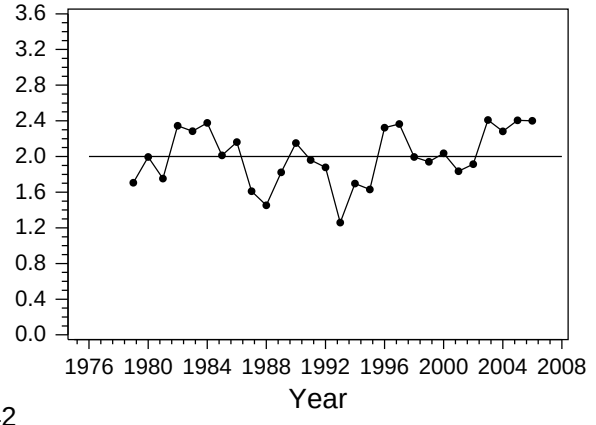

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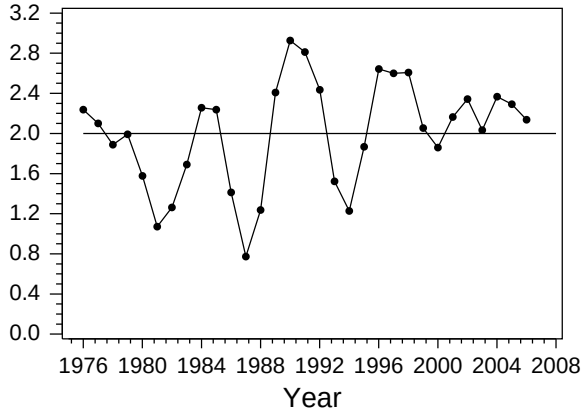

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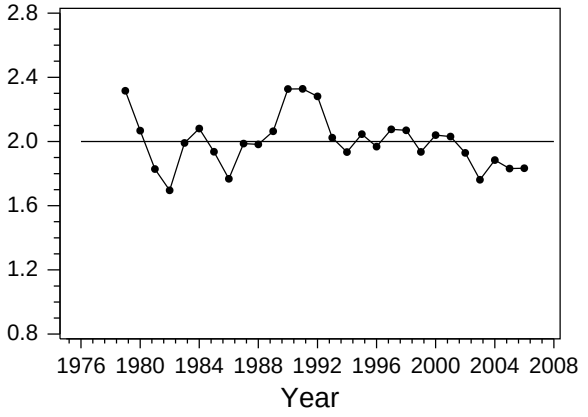

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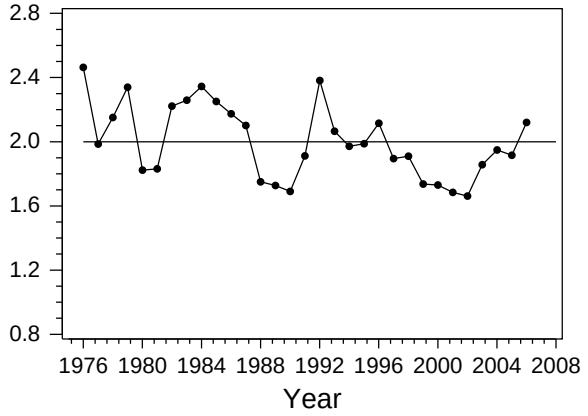

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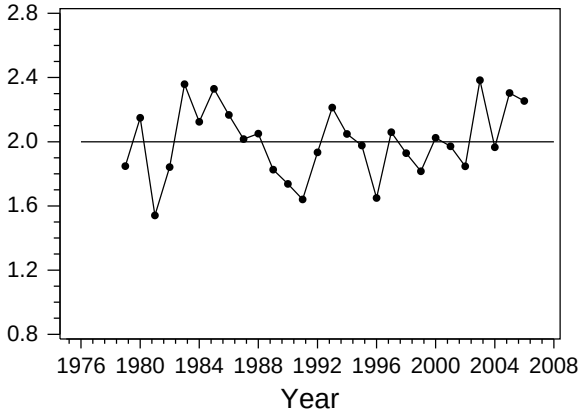

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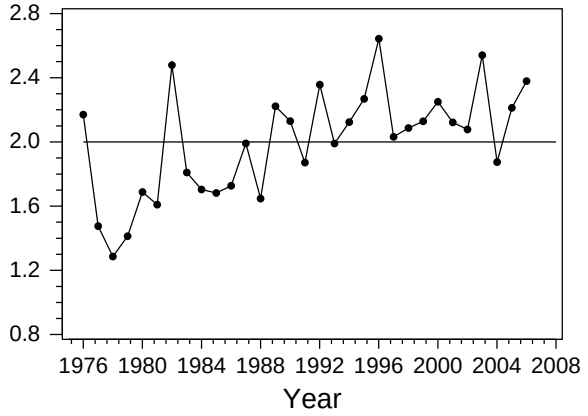

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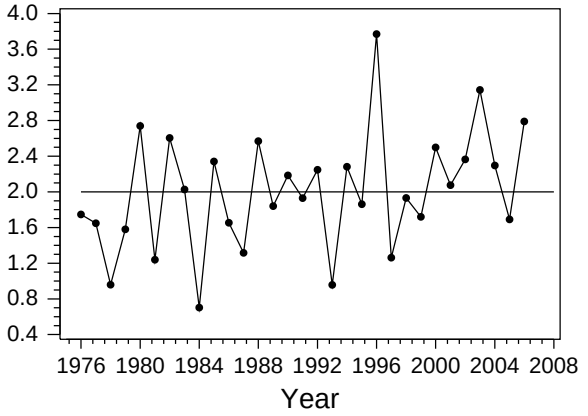

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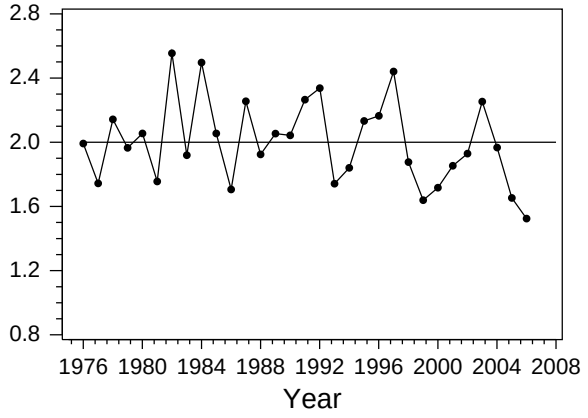

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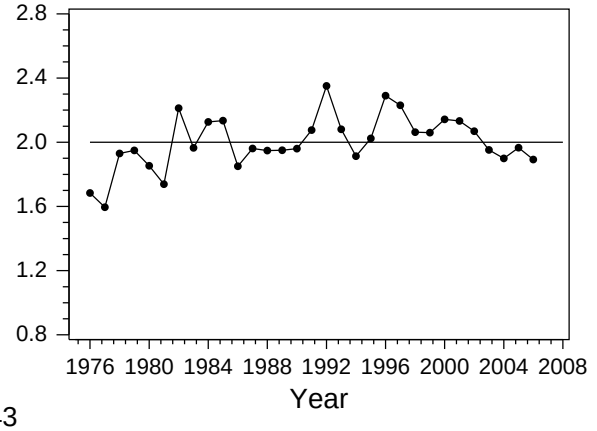

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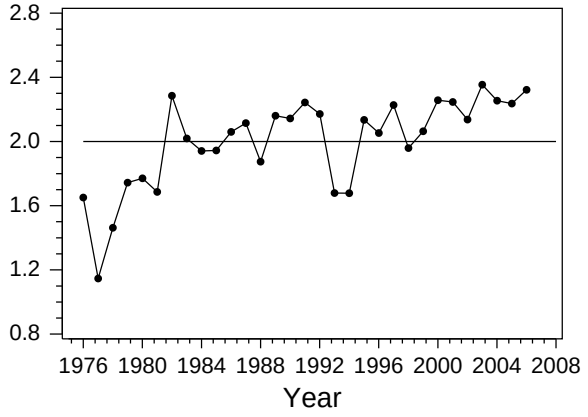

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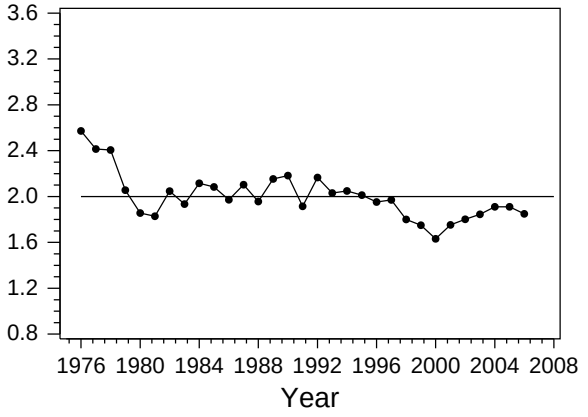
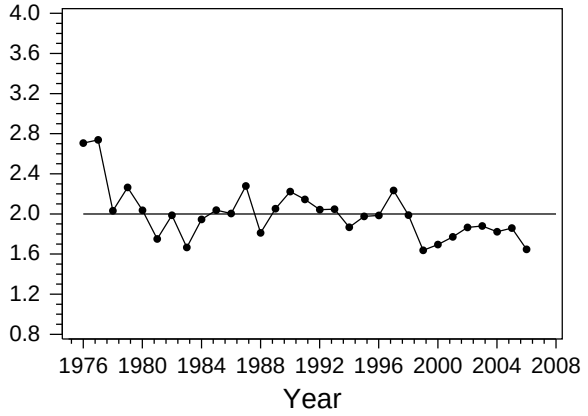


Pearl-bordered Fritillary



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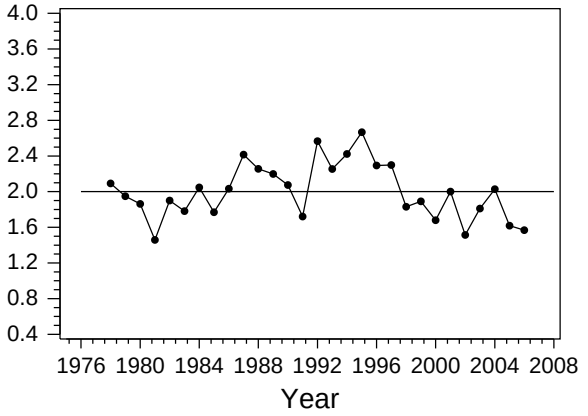

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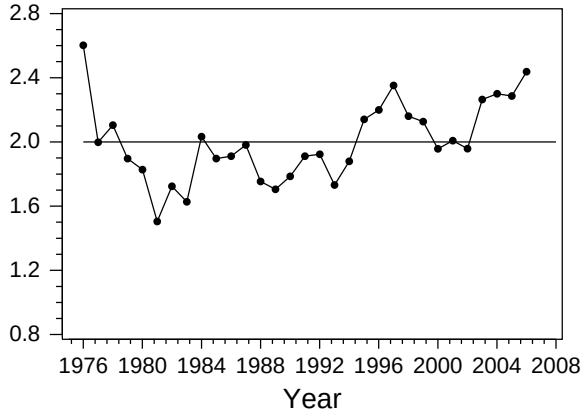

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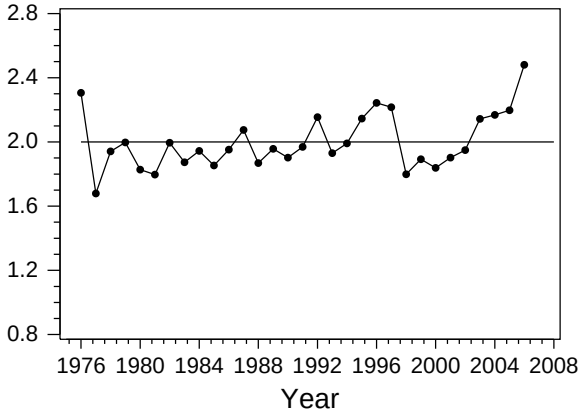

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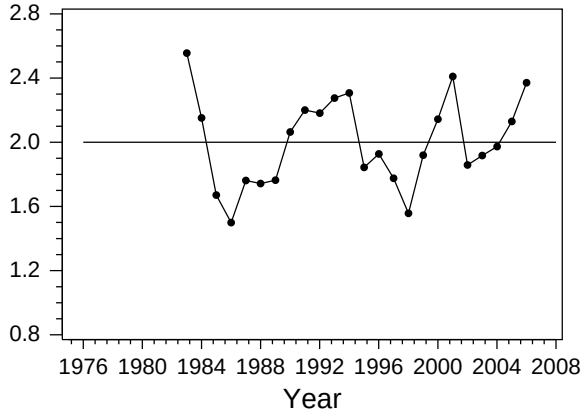

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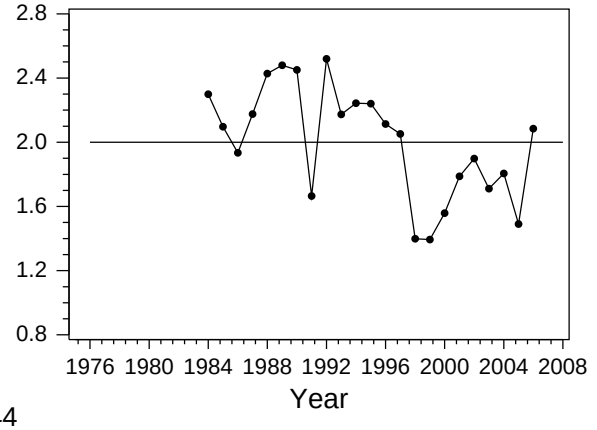

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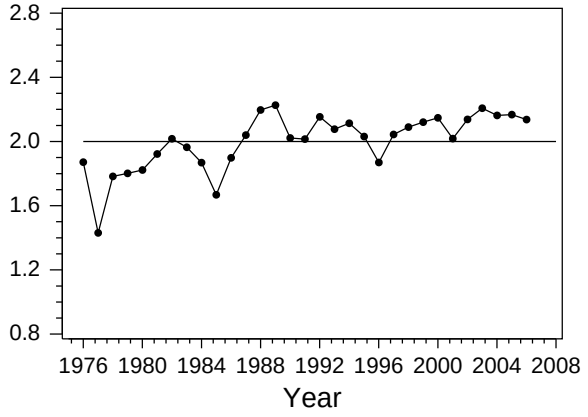
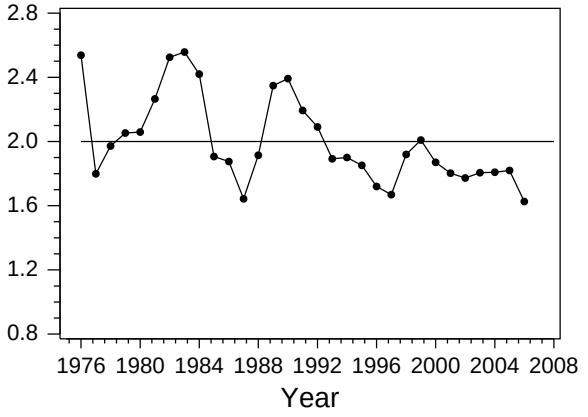
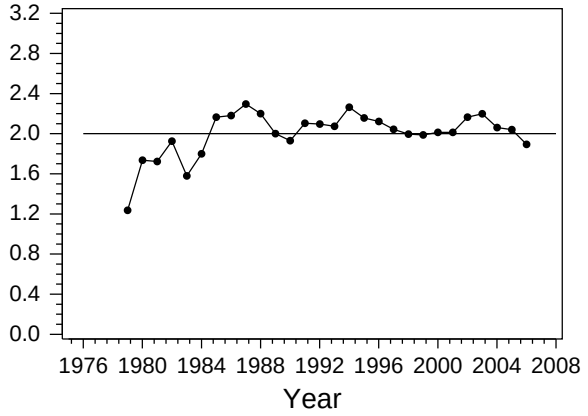


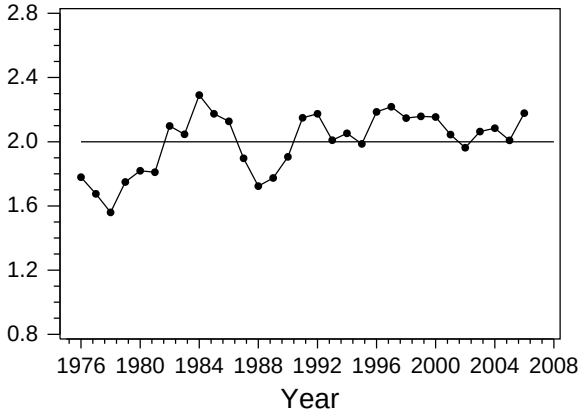
Wall Brown



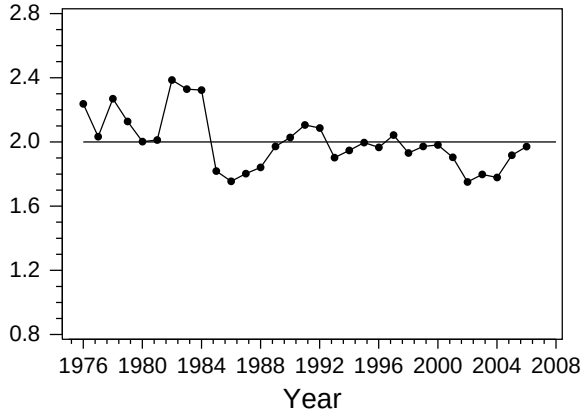
Scotch Argus



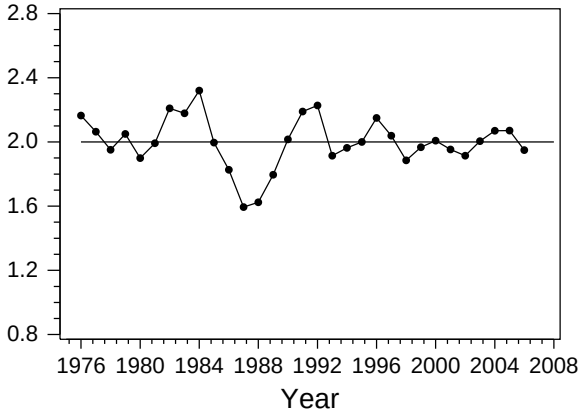
Marbled White



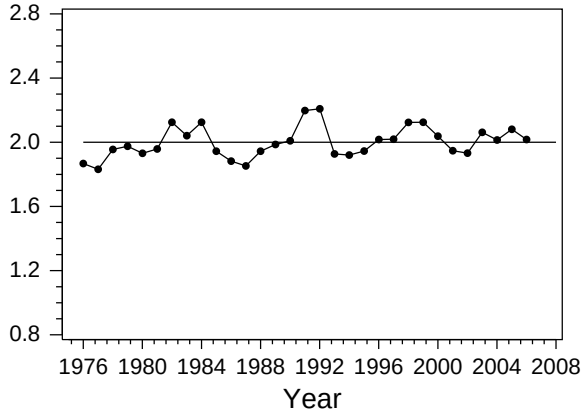
Grayling



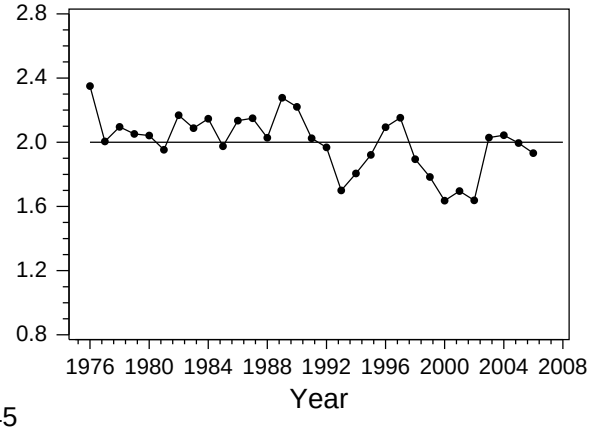
Gatekeeper

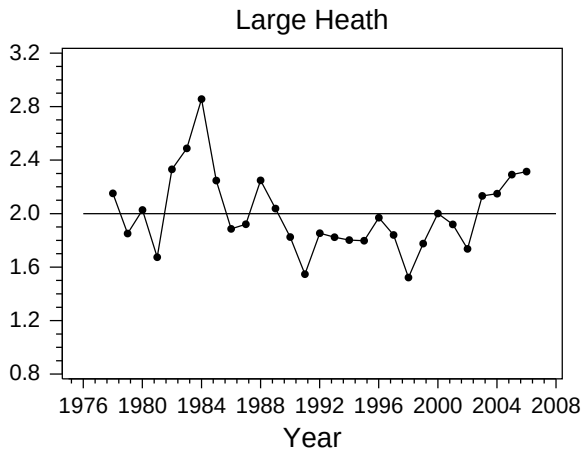


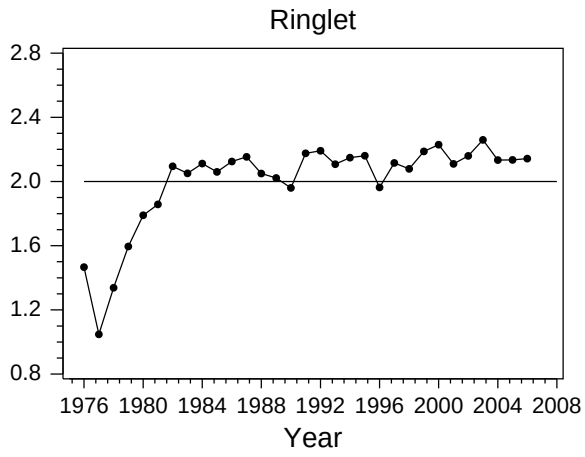
Meadow Brown



Small Heath




Large Heath
3.2
2.8
2.4
2.0
1.6
1.2
0.8
1976 1980 1984 1988 1992 1996 2000 2004 2008
Year


Ringlet
2.8
2.4
2.0
1.6
1.2
0.8
1976 1980 1984 1988 1992 1996 2000 2004 2008
Year

APPENDIX II: SUMMARY OF CHANGES 2005/2006

SPECIES	2005 all-sites index	2006 all-sites index	% change down	% change up	Rank order of 30 years 2005	Rank order of 31 years 2006	Lowest / highest all-sites index	Comments	Trend in all sites index
Small / Essex Skipper	73	45	38		16	26	Low	Below average for 9 years	-30
Silver-spotted Skipper	313	305	3		4	5	High	Dramatic long-term increase	2301 ***
Large Skipper	72	76		6	27	26	Low	Below average for 9 years	0
Dingy Skipper	92	69	25		18	28	Low	Below average for 9 years	-38 **
Grizzled Skipper	86	61	29		18	31	Lowest in series	Mostly poor years since high of 1997	-36 *
Clouded Yellow	452	1890		318	11	3	3rd highest	Fifth consecutive year of good numbers	2513 *
Wood White	64	18	72		26	30	2nd lowest	Big decrease	-73 *
Brimstone	118	129		10	8	3	3rd highest		26
Large White	108	88	19		11	18	Average		-23
Small White	81	93		14	20	14	Average		7
Green-veined White	90	62	31		21	30	2nd lowest		-2
Orange Tip	108	85	22		10	25	Low		17
Green Hairstreak	98	81	18		15	26	Low		-26
Purple Hairstreak	109	61	45		18	24	Low	Sizeable decrease	39
White-letter Hairstreak	58	38	36		20	27	Low		-75 *
Brown Hairstreak	282	137	51		2	6	High	Sizeable decrease	339 **
Small Copper	75	111		47	22	15	Average	Substantial increase	-11
Small Blue	135	110	19		8	16	Average		-2
Silver-studded Blue	83	137		64	19	8	High	Substantial increase	11
Brown Argus	122	157		29	9	6	High		28
Northern Brown Argus	57	58		2	26	25	Low		-17
Common Blue	103	127		23	17	9	Above average		13
Chalkhill Blue	144	163		13	3	1	Highest in series		43 *
Adonis Blue	255	252	1		2	3	3rd highest		92
Holly Blue	195	137	30		10	15	Average		268
Duke of Burgundy	68	68		0	24	23	Below average		-26
White Admiral	82	132		60	18	10	Above average	Substantial increase	-56 **
Purple Emperor	201	179	11		4	5	High		32
Red Admiral	163	239		47	9	4	High	Substantial increase for 2nd year	354 ***
Painted Lady	49	618		1153	22	3	3rd highest	Huge increase	485 *
Small Tortoiseshell	45	33	26		29	31	Lowest in series		-39
Peacock	92	78	15		15	26	Low		60 *
Comma	172	210		22	8	2	2nd highest		317 ***
Small Pearl-bordered	81	70	13		22	24	Low		-63 ***
Pearl-bordered Fritillary	72	44	39		23	30	2nd lowest		-66 **
High Brown Fritillary	41	37	11		26	27	Low		-25
Dark Green Fritillary	194	274		42	5	2	2nd highest	Substantial increase for 2nd year	109 *
Silver-washed Fritillary	158	303		92	5	1	Highest in series	Substantial increase for 2nd year	68 *
Marsh Fritillary	135	235		74	10	3	3rd highest	Substantial increase	46
Heath Fritillary	31	122		293	21	12	Above average	Big increase	-87 **
Speckled Wood	147	137	7		4	9	Above average		151 ***
Wall Brown	66	42	36		22	31	Lowest in series		-68 **
Scotch Argus	110	78	29		15	23	Below average		134 *
Marbled White	102	151		48	19	4	High	Substantial increase	114 **
Gravling	83	94		13	22	18	Average		-50 **
Gatekeeper	118	89	24		8	23	Below average		-10
Meadow Brown	120	104	14		7	12	Above average		27
Large Heath	196	206		5	5	4	High		-30
Small Heath	99	86	13		19	23	Below average		-50 **
Ringlet	136	139		2	11	10	Above average		312 ***

APPENDIX III. VERNACULAR AND SCIENTIFIC NAMES OF SPECIES REFERRED TO IN THIS REPORT.

Butterflies

(order and nomenclature follows Fox *et al*. 2006).

Chequered Skipper	C*arterocephalus palaemon*
Small Skipper	*Thymelicus sylvestris*
Essex Skipper	*Thymelicus lineola*
Lulworth Skipper	*Thymelicus acteon*
Silver-spotted Skipper	*Hesperia comma*
Large Skipper	*Ochlodes sylvanus*
Dingy Skipper	*Erynnis tages*
Grizzled Skipper	*Pyrgus malvae*
Wood White	*Leptidea sinapis*
Clouded Yellow	*Coleus croceus*
Brimstone	*Gonepteryx rhamni*
Large White	*Pieris brassicae*
Small White	*Pieris rapae*
Green-veined White	*Pieris napi*
Orange-tip	*Anthocharis cardamines*
Green Hairstreak	*Callophrys rubi*
Brown Hairstreak	*Thecla betulae*
Purple Hairstreak	*Neozephyrus quercus*
White-letter Hairstreak	*Satyrium w-album*
Small Copper	*Lycaena phlaeas*
Large Copper	*Lycaena dispar*
Small Blue	*Cupido minimus*
Silver-studded Blue	*Plebeius argus*
Brown Argus	*Plebeius agestis*
Northern Brown Argus	*Plebeius artaxerxes*
Common Blue	*Polyommatus icarus*
Chalkhill Blue	*Polyommatus coridon*
Adonis Blue	*Polyommatus bellargus*
Holly Blue	*Celastrina argiolus*
Long-tailed Blue	*Lampides boeticus*
Large Blue	*Glaucopsyche arion*
Duke of Burgundy	*Hamearis lucina*
Purple Emperor	*Apatrua iris*
Red Admiral	*Vanessa atalanta*
Painted Lady	*Vanessa cardui*
Small Tortoiseshell	*Aglais urticae*
Peacock	*Inachis io*
Comma	*Polygonia c-album*
Small Pearl-bordered Frit.	*Boloria selene*
Pearl-bordered Fritillary	*Boloria euphrosyne*
High Brown Fritillary	*Argynnis adippe*
Dark Green Fritillary	*Argynnis aglaja*
Silver-washed Fritillary	*Argynnis paphia*
Marsh Fritillary	*Euphydryas aurinia*
Heath Fritillary	*Melitaea athalia*
Speckled Wood	*Parage aegeria*
Wall Brown	*Lasiommata megera*
Mountain Ringlet	*Erebia epiphron*
Scotch Argus	*Erebia aethiops*
Marbled White	*Melanargia galathea*
Grayling	*Hipparchia semele*
Gatekeeper	*Pyronia tithonus*
Meadow Brown	*Maniola jurtina*
Ringlet	*Aphantopus hyperantus*
Small Heath	*Coenonympha pamphilus*
Large Heath	*Coenonympha tullia*

Plants

(Alphabetical order, nomenclatrure follows Stace 1997)

Common Bird's-foot Trefoil	*Lotus corniculatus*
Bracken	*Pteridium aquilinum*
Bugle	*Ajuga reptans*
Common Dog-violet	*Viola riviniana*
Creeping Buttercup	*Ranunculus repens*
Dandelion	*Taraxicum* spp.
Gorse	*Ulex spp.*
Lesser Celandine	*Ranunculus ficaria*
Marsh Violet	*Viola palustris*
Meadow Buttercup	*Ranunculus acris*


Butterfly
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