Butterfly Surveys, Knepp Castle Estate, 2019

Headlines

In the Northern and Middle Blocks, the longer term trends of increasing species diversity and butterfly abundance were maintained.

In the Northern and Middle Blocks, 2019 'winners' included the Gatekeeper and Small Heath, with the latter (a *Section 41 species of principal importance under the NERC Act in England*), probably providing the best single indicator of habitat improvement over this part of the Wildland. This species colonised the area as recently as 2017.

In the Southern Block, during the spring period, the improvements in both diversity and abundance over recent years (2017 – 2019) largely reflect the increasing abundance of Small Heath and the addition (colonisation) of species including Common Blue, Small Copper, Dingy Skipper and Green Hairstreak. All of these spring species prefer their foodplants (including fine-leaved grasses, Bird's-foot Trefoil and sorrels) to be growing on sparsely vegetated or bare ground; conditions created by the rootling action of Tamworth pigs.

In the Southern Block, during the summer period, species which fared particularly well include the Marbled White, Gatekeeper and Small Skipper. Species diversity and butterfly abundance remain close to the 2012 – 2018 mean.

The Purple Emperor experienced a rather average year (but the population remains by far the largest in the UK), and the Brown Hairstreak, a poor one.

Transect Survey, Northern & Middle Blocks (with reference to surveys July/August 2005 – 2018)

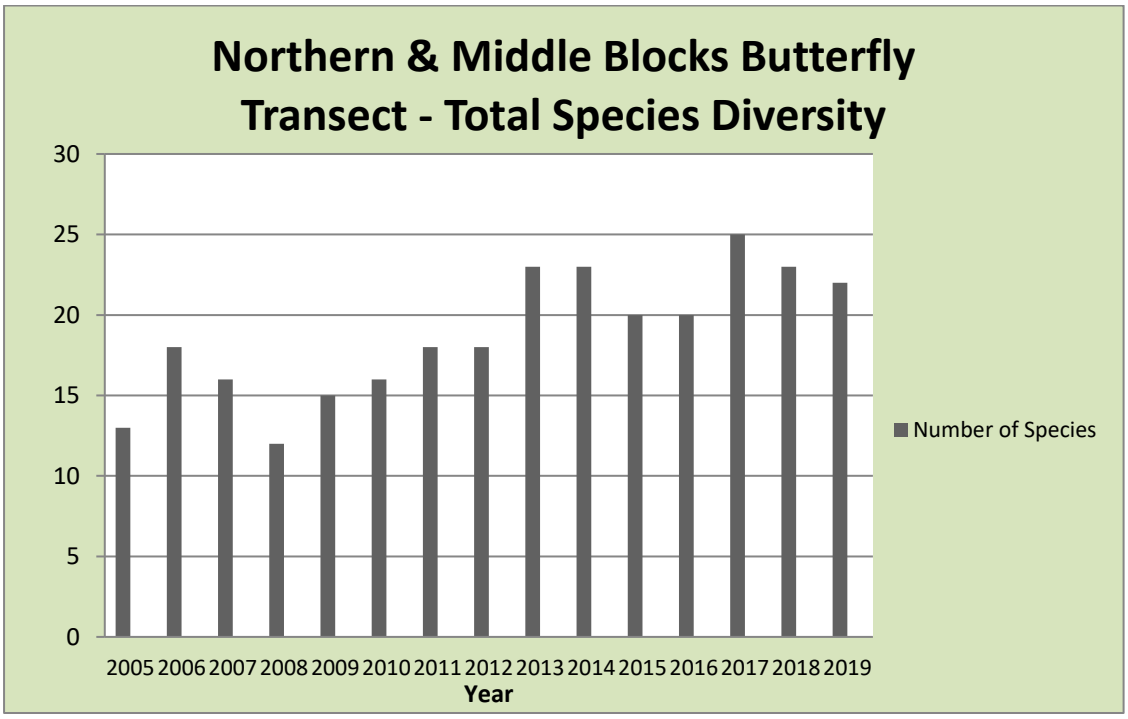
Introduction

Butterflies have been the subject of annual surveys, usually in July, for a total of fifteen years (2005 - 2019 inclusive), as part of the overall monitoring programme to assess the effects of the naturalistic grazing regime first implemented in 2001 and since expanded over much of the Knepp Castle Estate. These surveys of the Northern and Middle Blocks were initially conducted by Rich Howorth of the Sussex Wildlife Trust, but in 2012 the task of monitoring butterflies over the wider Wildland project area was taken on by Neil Hulme, Conservation Adviser for the Sussex Branch of Butterfly Conservation.

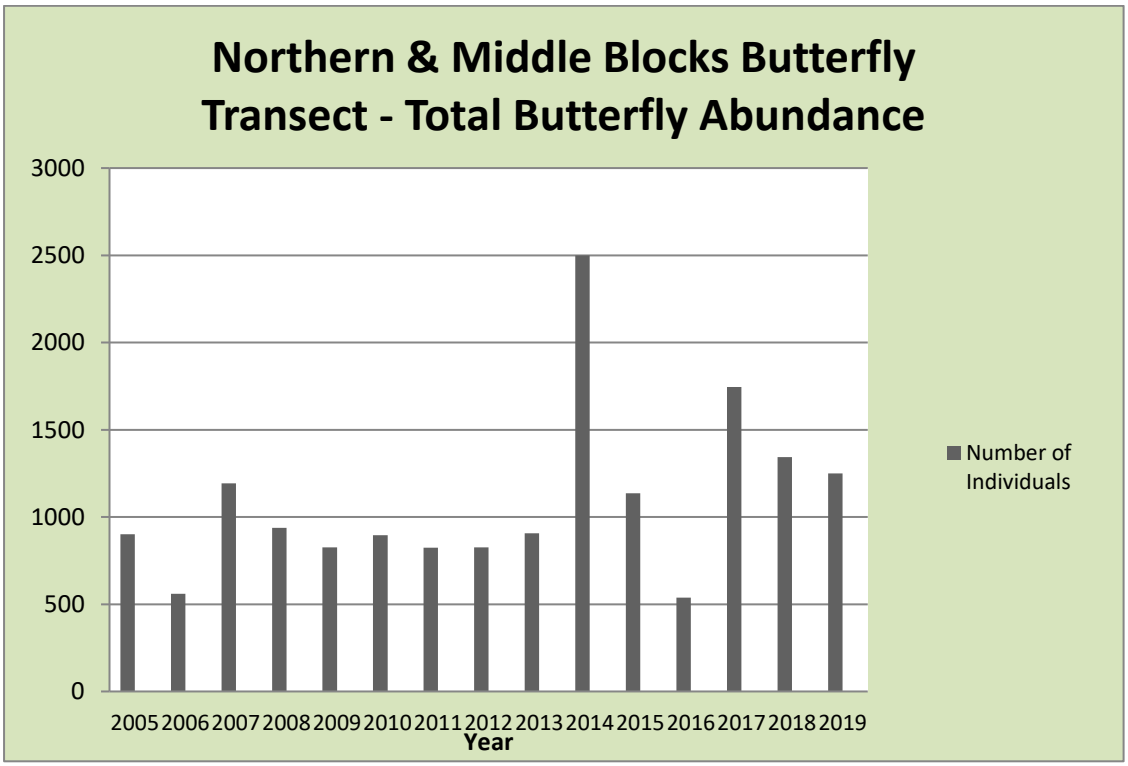
The methodology previously employed by Howorth has been maintained for the Northern and Middle Blocks; namely the standard UKBMS Transect technique, the details of which have been described in earlier reports. The key feature to note is the subdivision of the Transect route into 26 recording parcels.

This year the Transect was again walked over two days, as it has proven increasingly difficult to complete the route within a single day, during the hours when butterflies are likely to be on the wing, due largely to significant increases in abundance and diversity. This year the Transect was walked on 28th July and 2nd August.

Results



This bar chart shows the total number of species seen (species diversity) along the Transect route across the Northern and Middle Blocks between 2005 and 2019.



This bar chart shows the total number of butterflies counted along the Transect route across the Northern and Middle Blocks between 2005 and 2019.

NORTHERN & MIDDLE BLOCKS BUTTERFLY TRANSECT – RECORDED SPECIES: TOTAL ABUNDANCE															
Species	2005 Abn	2006 Abn	2007 Abn	2008 Abn	2009 Abn	2010 Abn	2011 Abn	2012 Abn	2013 Abn	2014 Abn	2015 Abn	2016 Abn	2017 Abn	2018 Abn	2019 Abn
Small Skipper	35	23	1	38	9	8	21	15	62	790	52	18	64	19	73
Essex Skipper	3	0	33	0	0	11	9	41	15	159	65	3	7	3	5
Large Skipper	2	1	1	2	2	1	6	0	5	14	4	0	11	8	1
Clouded Yellow	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0
Brimstone	2	1	0	0	0	0	0	6	2	1	0	1	1	2	1
Large White	9	62	27	45	24	18	20	3	55	15	28	9	11	23	6
Small White	15	16	19	42	36	20	70	0	7	6	8	9	2	3	2
Green-veined White	0	4	4	2	3	6	5	43	124	123	57	91	56	45	25
Purple Hairstreak	0	2	1	0	0	0	0	1	1	13	3	6	43	47	10
Small Copper	0	0	0	0	1	5	3	1	2	1	2	1	1	1	0
Small Blue	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Argus	0	0	1	0	0	0	2	0	0	0	0	3	0	0	0
Common Blue	0	21	0	0	1	43	1	1	2	1	27	3	44	35	12
Holly Blue	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0
White Admiral	0	0	1	0	0	0	0	1	0	3	0	0	2	2	0
Purple Emperor	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Red Admiral	0	3	0	0	0	2	7	0	1	4	0	10	13	1	3
Painted Lady	0	7	2	0	313	0	0	0	2	3	3	6	4	1	0
Small Tortoiseshell	0	0	0	0	0	0	0	1	1	8	0	0	5	1	1
Peacock	1	0	4	17	19	1	2	2	19	37	5	8	16	3	3
Comma	2	2	0	4	8	1	2	2	6	11	7	3	5	4	2
Silver-washed Fritillary	13	16	26	19	34	59	38	20	60	70	64	14	40	29	22
Speckled Wood	5	6	5	10	9	9	17	6	6	2	8	6	6	10	20
Marbled White	0	0	0	1	0	2	1	1	4	33	7	0	2	1	9
Gatekeeper	198	179	92	138	131	332	187	154	164	251	338	82	505	358	514
Meadow Brown	611	214	974	619	233	377	431	527	364	946	448	262	897	741	498
Ringlet	5	1	1	0	2	0	2	0	3	4	8	0	2	2	8
White-letter Hairstreak	0	0	0	0	0	0	0	0	0	4	0	2	0	0	1
Dark Green Fritillary	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Brown Hairstreak	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
Small Heath	0	0	0	0	0	0	0	0	0	0	0	0	1	5	32

TOTAL SPECIES = 31

This table shows the total number of butterflies of each species counted along the Transect route across the Northern and Middle Blocks between 2005 and 2019.

Summary

1) The July/August survey of the Northern and Middle Blocks produced the fifth highest number of species (22) recorded since this survey began in 2005, when only 13 were recorded. 20 or more species have been recorded annually over the period 2013 – 2019, with a pre-2013 maximum of 18. The longer term trend of increasing species diversity is thus being maintained.

2) The count of 1250 individual butterflies is the fourth highest total achieved since 2005. With the exception of 2016, this maintains the significantly higher number (annually >1000) observed over the period 2014 – 2019, with >1000 only being recorded once in the nine-year pre-2014 series. The longer term trend of increasing butterfly abundance is thus being maintained.

3) As always, the year saw some species doing particularly well, while others suffered a relatively poor flight season. 'Winners' included the Gatekeeper (514), which had its best ever year here, and the Small Heath (32), which had its best ever year by a spectacular margin. This species had never been recorded in the Northern and Middle Blocks prior to 2017, when a single specimen was observed. The performance of the Small Heath, which is a *Section 41 species of principal importance under the NERC Act in England*, probably provides the best single indicator of habitat improvement over this part of the Wildland.

4) 'Losers' included Green-veined White (25), Peacock (3) and Comma (2), all of which probably suffered through desiccation of their larval foodplants in the heat of 2018. The Large White (6) also had a poor season, as did the Essex Skipper (5), which has decreased in abundance very significantly since its 2014 high of 159.

Timed Count Survey, Southern Block, May 2019

Introduction

In 2012 the decision was taken to increase the number and spread of butterfly surveys across the Wildland project area. Two of these additional, annual surveys focus on a fixed route, planned to cover a variety of habitats over part of the Southern Block.

One of the aims of this spring survey (this year conducted on 23rd May) is to record species which potentially occur on the estate, but which fly earlier in the year, thus avoiding 'capture' by the original recording regime.

The methodology employed for these two surveys is significantly different to the standard UKBMS Transect technique employed for the Northern and Middle Blocks. The Transect technique does have limitations when only performed on one or two days each year, rather than the recommended 26 weekly repetitions.

These Southern Block surveys are conducted as Timed Counts, with a standardised period of recording being spent (flexibly) within each of the named survey sections (e.g. 'Sallow Fields') along the route. A more generous survey corridor is allowed (20 m width, rather than 5 m) and

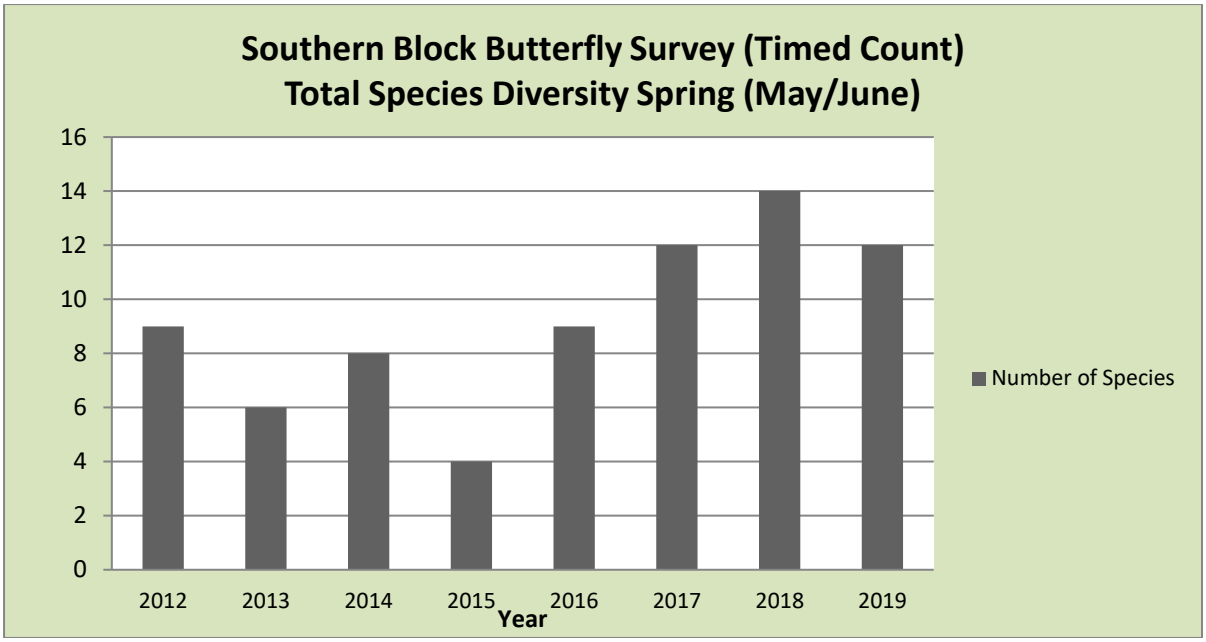
there is no ceiling to the recording cube, allowing for the easier 'capture' of arboreal species. There is no requirement to walk at a steady, rapid pace, so that more interesting habitat patches can be examined more thoroughly, potentially allowing for the sighting of less common butterflies; indeed some species are notoriously adept at avoiding inclusion within Transect counts. Wind speed, cloud cover and temperature are recorded. Precise details of this Southern Block route, including the time limits for each survey section, are appended to this year's report (see Timed Count survey route map).

Results

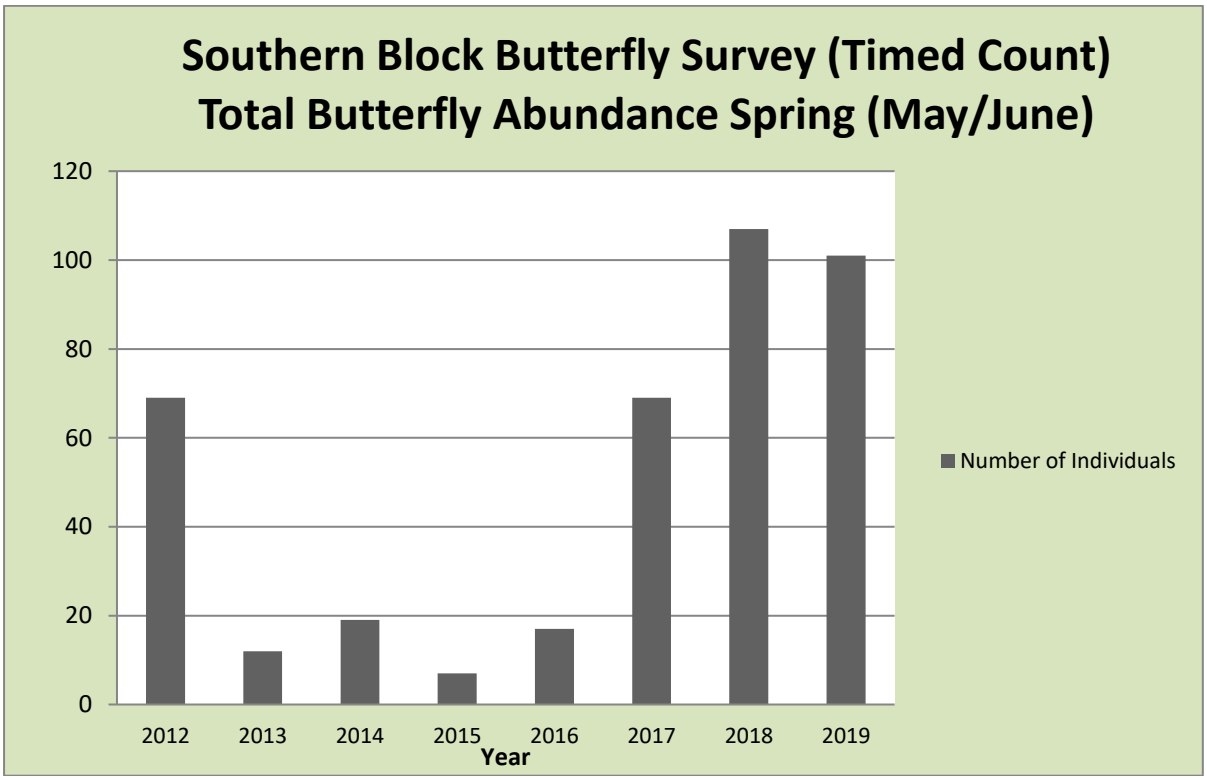
SOUTHERN BLOCK BUTTERFLY SURVEY (TIMED COUNT) – MAY 2019											
	Survey Section										
Species	Green Lane Approach	Green Lane	Pen Bridge North	Pen Bridge West	The Strip	Brookhouse Farm	Sallow Fields	Grasslands	Woodland Block	Emperor Walk	**Total Species Counts**
Large White	1				2	1					**4**
Green-veined White		1								2	**3**
Small Heath	1	1	10	18	13	3	7	14		2	**69**
Speckled Wood	2	4	1		1						**8**
Common Blue				1	1	2					**4**
Large Skipper				2	1						**3**
Small Copper			3	1		1					**5**
Orange-tip										1	**1**
Dingy Skipper			1								**1**
Green Hairstreak		1									**1**
Brimstone		1									**1**
Peacock							1				**1**
TOTAL SECTION COUNTS	**4**	**8**	**15**	**22**	**18**	**7**	**8**	**14**	**0**	**5**	**101**
TOTAL SECTION SPECIES	**3**	**5**	**4**	**4**	**5**	**4**	**2**	**1**	**0**	**3**	

TOTAL SPECIES = 12

This table shows the number of butterflies of each species counted in each named survey section (e.g. 'Sallow Fields') along the Timed Count survey route across the Southern Block in May 2019.



This bar chart shows the total number of species seen (species diversity) in spring along the Timed Count route across the Southern Block between 2005 and 2019.



This bar chart shows the total number of butterflies counted in spring along the Timed Count route across the Southern Block between 2005 and 2019.

Summary

1) The 23rd May survey of the Southern Block produced the second highest number of species (12) recorded since this survey began in 2012. This included single specimens of Green Hairstreak and Dingy Skipper, both of which were seen for the first time on the Wildland in 2018, suggesting that these recent colonisers may be becoming established.

Species diversity during the spring period has increased (to 12 or more) over the period 2017 – 2019, with the 2012 – 2016 best being nine.

2) The count of 101 individual butterflies was the second highest recorded since 2012, being bettered only in 2018 (107). Butterfly abundance during the spring period has increased (mean 92) over the period 2017 – 2019, from a 2012 – 2016 mean of 25.

The Small Heath fared particularly well (69), bettering its previous highest count in 2018. The Small Copper (5) and Common Blue (4) also did well.

3) The improvements in both diversity and abundance over recent years (2017 – 2019) largely reflect the increasing abundance of Small Heath and the addition (colonisation) of species including Common Blue, Small Copper, Dingy Skipper and Green Hairstreak. All of these spring species prefer their foodplants (including fine-leaved grasses, Bird's-foot Trefoil and sorrels) to be growing on sparsely vegetated or bare ground, where some of their larvae (Common Blue, Small Copper, Green Hairstreak) may be associated with ants.

The creation of bare ground and the development of a more heterogeneous sward/forb structure, due to the rootling action of the Tamworth pigs, are likely to have been influential.

Timed Count Survey, Southern Block, July 2019

Introduction

In 2012 the decision was taken to increase the number and spread of butterfly surveys across the Wildland project area. Two of these additional, annual surveys focus on a fixed route, planned to cover a variety of habitats over part of the Southern Block. This particular survey, conducted on 17th July, was designed to 'capture' high summer species over a previously (pre-2012) unsampled area of the estate.

The methodology employed for these two surveys is significantly different to the standard UKBMS Transect technique employed for the Northern and Middle Blocks. The Transect technique does have limitations when only performed on one or two days each year, rather than the recommended 26 weekly repetitions.

These Southern Block surveys are conducted as Timed Counts, with a standardised period of recording being spent (flexibly) within each of the named survey sections (e.g. 'Sallow Fields') along the route. A more generous survey corridor is allowed (20 m width, rather than 5 m) and there is no ceiling to the recording cube, allowing for the easier 'capture' of arboreal species. There is no requirement to walk at a steady, rapid pace, so that more interesting habitat patches can be examined more thoroughly, potentially allowing for the sighting of less common butterflies; indeed some species are notoriously adept at avoiding inclusion within Transect

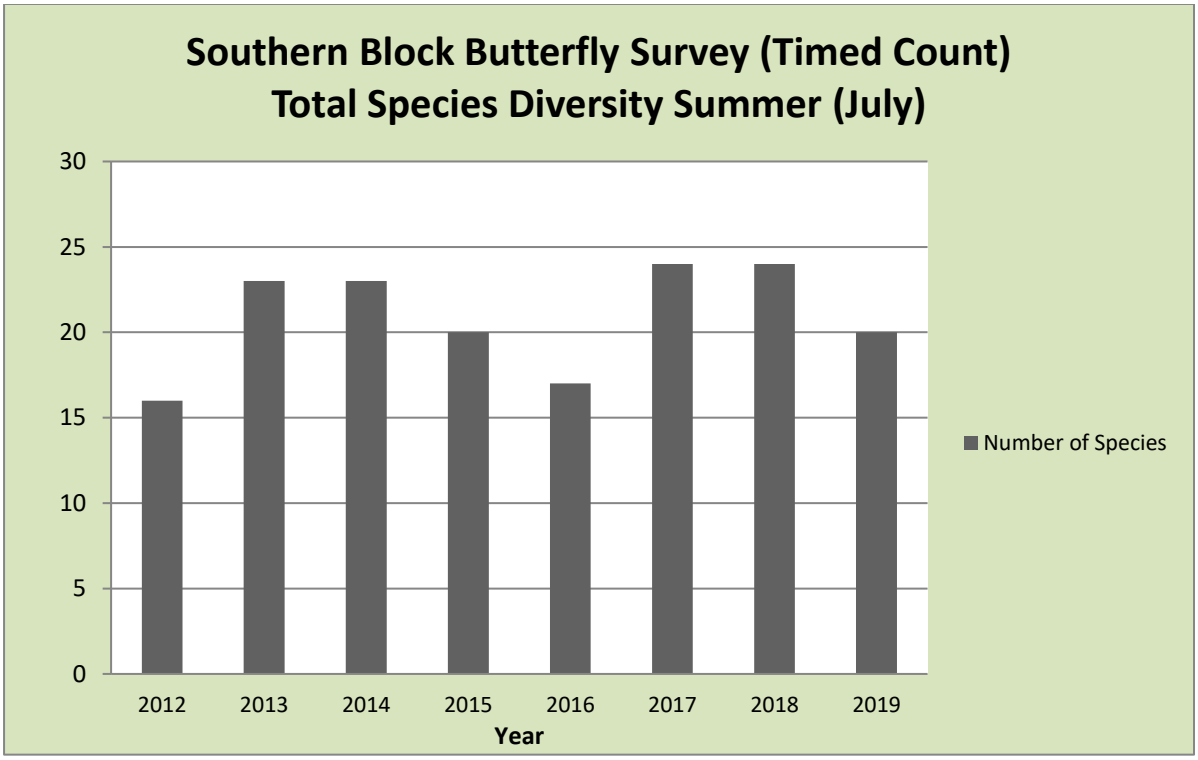
counts. Wind speed, cloud cover and temperature are recorded. Precise details of this Southern Block route, including the time limits for each survey section, are appended to this year's report (see Timed Count survey route map).

Results

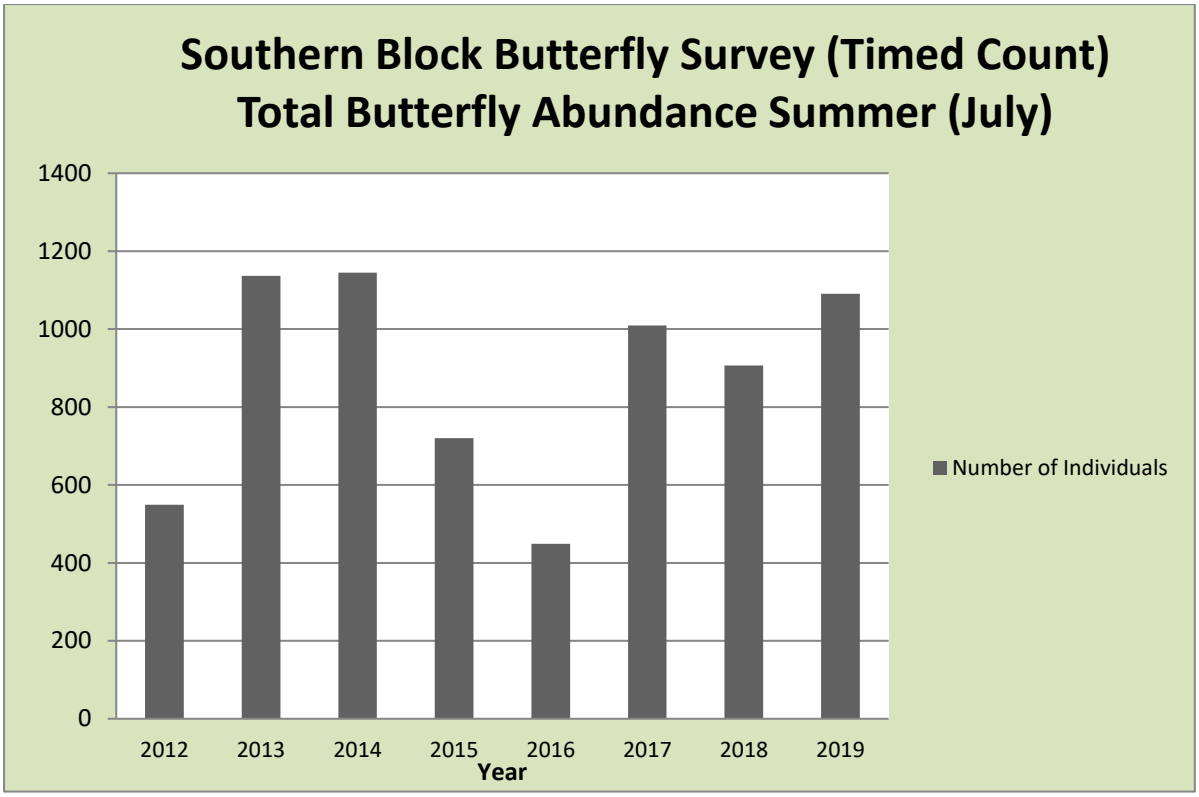
SOUTHERN BLOCK BUTTERFLY SURVEY (TIMED COUNT) – JULY 2019											
	Survey Section										
Species	Green Lane Approach	Green Lane	Pen Bridge North	Pen Bridge West	The Strip	Brookhouse Farm	Sallow Fields	Grasslands	Woodland Block	Emperor Walk	**Total Species Counts**
Small Skipper	1	3	11	15	5	13	21	28	1	2	**100**
Large Skipper		1	1							1	**3**
Large White	1	3	3	1	3	4	3			3	**21**
Small White	1										**1**
Green-veined White	5	8	5	1	5	7	3	3	3	8	**48**
Purple Hairstreak	1	4	2				2	1	2	7	**19**
Purple Emperor		1				3	4	7			**15**
Red Admiral	1	1		1	1	2		1		1	**8**
Peacock	1		2		1	1					**5**
Painted Lady										1	**1**
Comma		1		1	2				1		**5**
Marbled White		2	12	15	4	19	2	8	1	5	**68**
Gatekeeper	5	12	32	55	17	56	52	69	8	44	**350**
Meadow Brown	11	43	53	54	23	57	53	74	19	31	**418**
Ringlet	2	3					3			2	**10**
Speckled Wood		2				3			1		**6**
Silver-washed Fritillary		1				2		1			**4**
Small Heath				2	3	1					**6**
Small Copper				1		1					**2**
White Admiral		1									**1**
TOTAL SECTION COUNTS	**29**	**86**	**121**	**146**	**64**	**169**	**143**	**192**	**36**	**105**	**1091**
TOTAL SECTION SPECIES	**10**	**15**	**9**	**10**	**10**	**13**	**9**	**9**	**8**	**11**	

TOTAL SPECIES = 20

This table shows the number of butterflies of each species counted in each named survey section (e.g. 'Sallow Fields') along the Timed Count survey route across the Southern Block in July 2019.



This bar chart shows the total number of species seen (species diversity) in summer along the Timed Count route across the Southern Block between 2005 and 2019.



This bar chart shows the total number of butterflies counted in summer along the Timed Count route across the Southern Block between 2005 and 2019.

Summary

1) The July survey of the Southern Block produced a total of 20 species, which is comparable with the 2012 – 2018 mean of 21.

2) The count of 1091 individual butterflies is slightly higher than the 2012 – 2018 mean of 845.

3) Those species which fared particularly well include the Marbled White, achieving its highest ever count of 68 and demonstrating a spread across an increasingly wide area of the Southern Block. The Gatekeeper had its best ever year (350), and the Small Skipper its second best (100).

4) Other 'winners', based on casual (non-Timed Count route) records, include White Admiral (10 individuals on 1st and 3rd July) and White-letter Hairstreak (14 individuals on 28th June). High numbers of Purple Hairstreak (>100) were again seen during evening walks.

Single Species Survey (Purple Emperor), Southern Block, June/July 2019

Introduction

In 2013 several additional butterfly surveys were added to the already improved and extended programme covering the Wildland project area. In addition to the more formalised UKBMS style Transect (2005 onwards), Timed Counts (2012 onwards) and Brown Hairstreak egg searches

(winter 2012/2013 onwards), there are now focused, Single Species surveys for the Purple Emperor.

This species is invariably under-recorded by most standardised survey methods, due to its arboreal lifestyle and highly elusive habits. Numerous casual records of the Purple Emperor are also now collated each season, often arising from field outings run as part of the Knepp Safaris programme.

The methodology employed is very informal, involving a search of the areas considered most likely to reveal the presence of the butterfly, based on detailed knowledge of the species' autecology. As this requires a considerable level of experience, the results are not necessarily repeatable by other observers.

Summary

1) The 2019 Purple Emperor season at Knepp commenced on the relatively late date (compared to the C21st average) of 25th June and ran to at least 31st July. This five-week flight period was a little shorter than the six week norm.

2) The maximum day counts were made on 4th July (113), 5th July (108) and 13th July (105), with the first date also providing the highest total observed on the Green Lane Transect (45). The peak flight season (>20 counts) lasted from 29th June until 17th July.

Purple Emperor numbers in 2019 were therefore significantly lower than during the *annus mirabilis* of 2018 (maximum day count 388), but comparable with the maxima observed in 2017 (148) and 2015 (126). 2019 was a far-from-poor year for the species and the Knepp Wildland population remains by far the largest in the UK.

3) In the Northern Block, on the edge of Horsham Common, a single female was observed egg-laying on 28th July.

Single Species Survey (Brown Hairstreak), Southern Block, August 2019

Introduction

Brown Hairstreak egg surveys have been included as part of the extended Knepp Castle Estate Wildland monitoring programme since the winter of 2012/2013. However, bearing in mind that a large body of data has now been collated, and that the oviposition habits, egg distribution and the factors which may influence the abundance of eggs from year to year (e.g. browsing pressure and hedgerow structure) are now well understood, this year a search was made for adult females in August. This survey (24th August) had the added benefit of assessing whether the Brown Hairstreak might represent a viable target species for a potentially expanded Wildland Safaris programme.

Summary

1) A full day, peak season search (24th August) over a wide area of the Southern Block, under perfect weather conditions, produced no sightings of Brown Hairstreak of either sex. However,

Matthew Oates observed very modest numbers of male butterflies congregating at 'master trees' on 14th July (1), 22nd July (6) and 23rd July (9).

The abundance of Brown Hairstreak has therefore returned to the low levels recorded over the period 2005 – 2016 and during 2018, which is in stark contrast to the population explosion observed in 2017, when 53 females contributed towards a total of 222 individuals seen nectaring or perched at low level (i.e. not in 'master trees').