Butterfly Surveys, Knepp Castle Estate, 2017

Headlines

Butterflies had an excellent year on the estate in 2017, with species including the Purple Emperor, Brown Hairstreak, Purple Hairstreak, Gatekeeper, Red Admiral and Common Blue all doing particularly well.

The spring/early summer survey of the Southern Block produced the highest number of species (12) recorded since this survey began in 2012, with the count of 69 individual butterflies equalling the previous best total.

The July survey of the Southern Block produced the highest number of species (24) recorded since this survey began in 2012, with the count of 1009 individual butterflies being only slightly bettered by the 2013 and 2014 totals.

The July survey of the Northern and Middle Blocks produced the highest number of species (25) recorded since this survey began in 2005, when only 13 were recorded. The count of 1746 individual butterflies has only been bettered by the 2014 total of 2499, and is significantly higher than the 2005-2017 average.

The sighting of a Wall Brown on 17th July in New Barn 1 brought the total number of species seen on the estate since 2005 to 34.

The Purple Emperor had a good (and exceptionally early) season on the Southern Block, confirming Knepp's population as the largest in the UK. A new British record count of 148 individuals was made on 21st June.

The Brown Hairstreak experienced a population explosion of unprecedented magnitude and, if sustained, Knepp can now claim to host the largest population centre in the UK. Adults had never been encountered on the structured surveys conducted between 2005 and 2016; this year 15 individuals were recorded. The annual average number of adults observed nectaring, perched or flying at low level (not high in 'master trees') between 2005 and 2016 is less than one; this year 222 such records were collated, although the monitoring effort was greatly increased. A similar trend was observed during the winter egg survey, with the eggs-per-hour find rate rising from the 2012-2016 average of 1.8 (which is a low figure for West Sussex) to 30.6; an increase of 1600%. This increase in population size, which appears to be greater than an order of magnitude, has been linked to changes in browsing pressure and hedgerow structure. The species did not do unusually well anywhere else in West Sussex this year.

The Purple Hairstreak had an exceptionally good season and delighted the many visitors by regularly descending to ground level. An estimated 500+ individuals were observed at peak on 26th June (non-transect count). This was the best season for this species in Sussex (and over much of its wider national range) since 1976.

Although now considered a rarity in West Sussex, small pockets of the White-letter Hairstreak undoubtedly remain unmapped, and the Wildland area is no exception. In 2017 the species was again recorded on small specimens of Wych Elm, distributed widely but thinly within hedgerows across the Southern Block.

Transect Survey, Northern & Middle Blocks (with reference to surveys July 2005 – 2016)

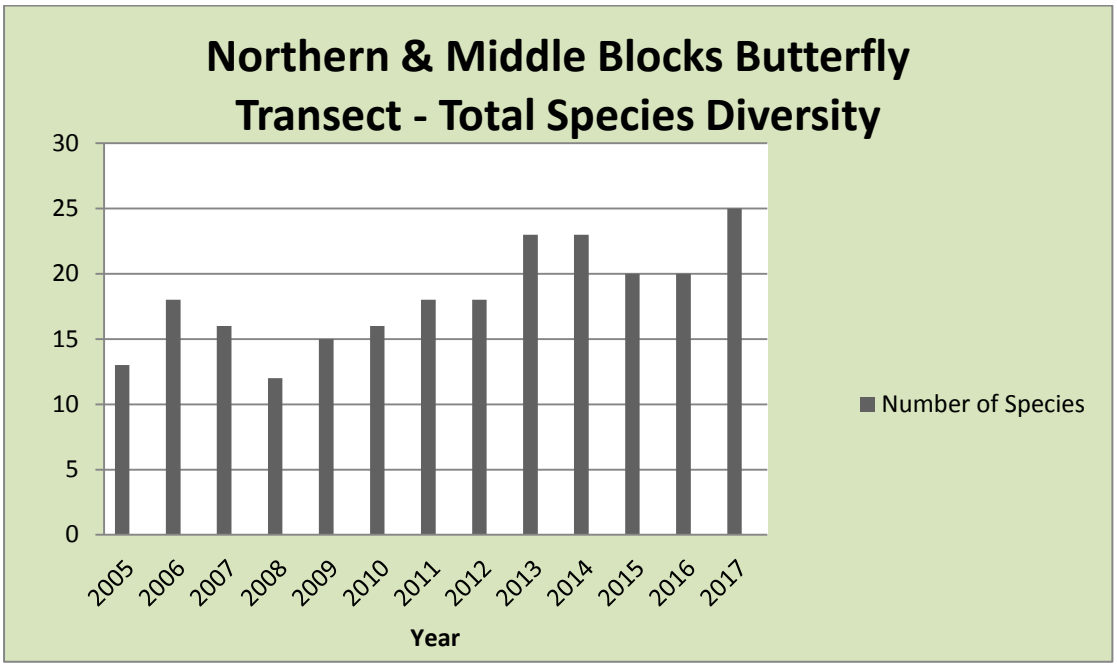
Introduction

Butterflies have been the subject of annual surveys, usually in July, for a total of thirteen years (2005 - 2017 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.

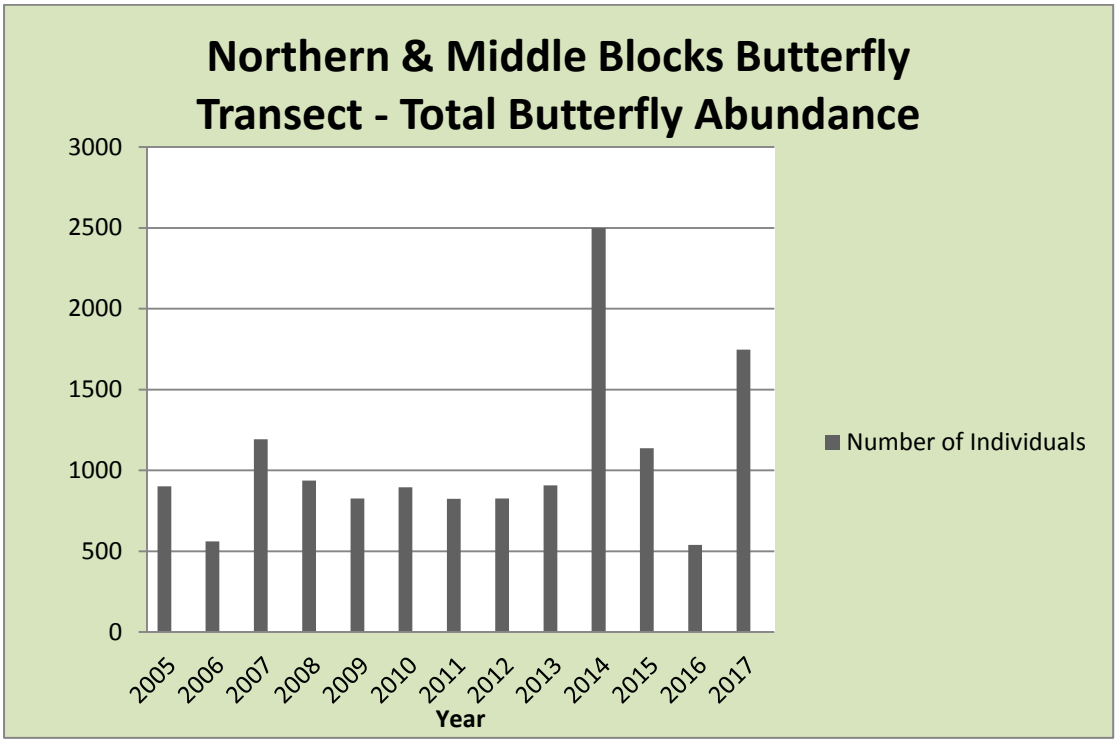
The methodology previously employed by Howorth has been maintained for the Northern and Middle Blocks; namely the standard UKBMS Transect technique, the details of which have been described in earlier reports. The key feature to note is the subdivision of the Transect route into 26 recording parcels.

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 31st July and 1st 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 2017.



This bar chart shows the total number of butterflies counted along the Transect route across the Northern and Middle Blocks between 2005 and 2017.

NORTHERN & MIDDLE BLOCKS BUTTERFLY TRANSECT – TRANSECT SECTIONS: SPECIES DIVERSITY													
Parcel Number	2005 Spp.	2006 Spp.	2007 Spp.	2008 Spp.	2009 Spp.	2010 Spp.	2011 Spp.	2012 Spp.	2013 Spp.	2014 Spp.	2015 Spp.	2016 Spp.	**2017 Spp.**
1	4	6	1	5	7	3	6	1	2	4	1	2	**3**
2	3	7	6	4	5	5	9	2	4	4	8	5	**6**
3	1	1	4	4	1	2	3	1	5	7	3	3	**4**
4	4	9	8	6	9	7	11	5	6	8	4	8	**11**
5	3	6	5	5	8	4	9	8	10	11	9	5	**15**
6	4	4	5	6	7	7	7	5	7	10	6	5	**9**
7	5	9	6	7	7	3	6	4	10	9	13	7	**10**
8	6	7	8	8	7	9	10	7	9	13	13	12	**11**
9	1	4	4	7	4	6	4	9	11	8	11	9	**8**
10	3	2	9	5	8	3	3	3	5	9	6	0	**7**
11	3	4	3	3	5	5	2	5	6	5	3	3	**5**
12	2	4	5	4	6	4	3	7	11	7	5	4	**9**
13	3	5	3	4	2	2	4	4	5	3	5	4	**4**
14	2	3	4	5	8	5	2	6	6	10	9	8	**8**
15	5	7	6	4	5	4	1	4	7	10	6	7	**9**
16	2	1	2	3	5	1	2	2	5	7	5	3	**6**
17	4	5	4	4	6	5	5	4	5	9	10	10	**7**
18	2	5	3	3	2	2	2	4	3	6	5	2	**4**
19	3	3	5	5	3	6	3	2	6	7	5	2	**8**
20	1	1	1	2	1	2	1	3	2	5	1	0	**5**
21	3	2	3	5	1	4	2	5	9	7	4	4	**7**
22	4	2	2	4	1	4	1	4	7	13	4	3	**9**
23	No data	No data	No data	No data	No data	No data	No data	2	0	2	1	0	**2**
24	3	0	0	2	0	1	1	0	1	0	0	0	**1**
25	3	0	2	2	1	0	1	3	4	5	3	1	**5**
26	3	0	1	2	1	0	1	2	3	8	1	1	**4**
ALL	13	18	16	12	15	16	18	18	23	23	20	20	**25**

This table shows the total number of species seen (species diversity) in each of the 26 recording parcels along the Transect route across the Northern and Middle Blocks between 2005 and 2017.

NORTHERN & MIDDLE BLOCKS BUTTERFLY TRANSECT – TRANSECT SECTIONS: ABUNDANCE OF INDIVIDUALS													
Parcel Number	2005 Indivs	2006 Indivs	2007 Indivs	2008 Indivs	2009 Indivs	2010 Indivs	2011 Indivs	2012 Indivs	2013 Indivs	2014 Indivs	2015 Indivs	2016 Indivs	**2017 Indivs**
1	30	31	7	23	17	4	24	10	8	23	13	7	**29**
2	6	17	32	30	30	68	57	16	35	24	74	9	**34**
3	4	1	6	4	1	13	3	1	8	22	10	3	**19**
4	90	57	163	160	151	66	90	64	46	152	62	22	**102**
5	61	42	92	96	106	106	177	125	59	371	173	31	**216**
6	19	11	20	11	21	50	38	12	34	43	36	16	**41**
7	70	103	45	64	38	73	32	26	76	128	94	32	**56**
8	64	45	63	60	43	103	89	41	74	170	158	55	**123**
9	10	32	31	64	31	32	16	124	136	313	144	78	**142**
10	13	10	18	24	24	20	15	6	18	17	17	0	**30**
11	28	20	10	11	5	39	6	6	12	19	6	3	**16**
12	27	19	52	62	87	54	55	85	64	267	38	32	**135**
13	33	33	74	36	12	7	23	18	13	57	24	19	**33**
14	26	24	130	42	109	71	16	41	77	163	92	83	**134**
15	51	32	23	9	26	23	1	22	67	86	27	28	**85**
16	14	4	30	27	41	5	7	15	24	55	17	4	**71**
17	95	37	86	45	26	56	41	64	58	141	77	71	**119**
18	42	14	38	22	10	3	18	25	11	30	7	2	**25**
19	44	10	77	40	16	50	24	16	20	71	16	12	**80**
20	10	1	25	6	5	5	7	20	2	22	1	0	**31**
21	12	14	42	26	1	35	19	40	24	63	14	12	**47**
22	75	3	89	49	12	10	28	28	28	184	30	16	**88**
23	No data	No data	No data	No data	No data	No data	No data	4	0	21	1	0	**26**
24	48	0	0	2	0	2	1	0	1	0	0	0	**1**
25	5	0	27	14	9	0	16	13	8	42	4	2	**41**
26	24	0	12	10	4	0	1	4	4	15	1	1	**22**
ALL	901	560	1192	937	825	895	824	826	907	2499	1136	538	**1746**

This table shows the total number of butterflies counted in each of the 26 recording parcels along the Transect route across the Northern and Middle Blocks between 2005 and 2017.

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

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 2017.

NORTHERN & MIDDLE BLOCKS BUTTERFLY TRANSECT – RECORDED SPECIES: FREQUENCY (IN PARCELS)													
Species	2005 Freq	2006 Freq	2007 Freq	2008 Freq	2009 Freq	2010 Freq	2011 Freq	2012 Freq	2013 Freq	2014 Freq	2015 Freq	2016 Freq	**2017 Freq**
Small Skipper	5	5	1	9	3	4	8	6	11	19	7	8	**17**
Essex Skipper	1	0	11	0	0	4	4	15	5	12	12	1	**6**
Large Skipper	1	1	1	1	2	1	3	0	2	5	2	0	**4**
Clouded Yellow	0	1	0	0	0	0	0	0	1	0	0	0	**1**
Brimstone	1	1	0	0	0	0	0	5	2	1	0	1	**1**
Large White	7	13	13	16	12	5	7	3	19	11	12	4	**10**
Small White	7	7	12	17	11	8	10	0	4	3	7	4	**1**
Green-veined White	0	3	4	2	3	4	4	14	21	20	13	15	**19**
Purple Hairstreak	0	1	1	0	0	0	0	1	1	6	3	5	**15**
Small Copper	0	0	0	0	1	2	3	1	1	1	2	1	**1**
Small Blue	0	1	0	0	0	0	0	0	0	0	0	0	**0**
Brown Argus	0	0	1	0	0	0	1	0	0	0	0	2	**0**
Common Blue	0	6	0	0	1	9	1	1	2	1	7	3	**5**
Holly Blue	0	0	0	0	0	0	0	1	0	0	1	1	**0**
White Admiral	0	0	1	0	0	0	0	1	0	2	0	0	**2**
Purple Emperor	0	0	0	0	0	0	0	0	1	0	0	0	**0**
Red Admiral	0	3	0	0	0	2	4	0	1	4	0	9	**4**
Painted Lady	0	4	2	0	11	0	0	0	2	2	3	5	**3**
Small Tortoiseshell	0	0	0	0	0	0	0	1	1	3	0	0	**3**
Peacock	1	0	3	10	8	1	1	2	8	15	5	5	**10**
Comma	2	2	0	4	6	1	1	1	4	7	5	3	**5**
Silver-washed Fritillary	3	5	6	5	9	6	4	7	10	10	9	7	**10**
Speckled Wood	3	5	4	4	3	3	4	4	4	2	5	5	**4**
Marbled White	0	0	0	1	0	2	1	1	4	10	4	0	**2**
Gatekeeper	23	17	17	16	17	19	17	15	18	23	17	12	**26**
Meadow Brown	26	21	22	24	22	23	24	23	24	25	23	16	**25**
Ringlet	1	1	1	0	1	0	2	0	3	4	3	0	**2**
White-letter Hairstreak	0	0	0	0	0	0	0	0	0	1	0	1	**0**
Dark Green Fritillary	0	0	0	0	0	0	0	0	0	0	1	0	**0**
Brown Hairstreak	0	0	0	0	0	0	0	0	0	0	0	0	**5**
Small Heath	0	0	0	0	0	0	0	0	0	0	0	0	**1**

TOTAL SPECIES = 31

This table shows the total number of recording parcels in which each species of butterfly was seen (frequency) along the Transect route across the Northern and Middle Blocks between 2005 and 2017.

Summary

1) The July survey of the Northern and Middle Blocks produced the highest number of species (25) recorded since this survey began in 2005, when only 13 were recorded. This species total beat the previous best of 23, achieved in both 2013 and 2014.

2) The count of 1746 individual butterflies has only been bettered by the 2014 total of 2499, and is significantly higher than the 2005-2017 average.

3) Those species which fared particularly well include the Purple Hairstreak (total 43 counts; previous best 13 in 2014), Brown Hairstreak (total 7 counts; never previously observed on transects), Gatekeeper (total 505 counts; previous best 338 in 2015), Common Blue (total 44 counts; previous best 43 in 2010) and Red Admiral (total 13 counts; reflecting a strong year nationally).

Timed Count Survey, Southern Block, June 2017

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 1st June) 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) – JUNE 2017											
	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									**1**
Green-veined White						1					**1**
Painted Lady									1		**1**
Small Heath			5	4	2	3		9			**23**
Holly Blue		1				1					**2**
Speckled Wood	1	3			1	1				1	**7**
Common Blue			4	1	2	1	1			1	**10**
Large Skipper			2	2	1	4					**9**
Red Admiral	1	1	1					1		2	**6**
Meadow Brown		1		1		1	2	1		1	**7**
Small Copper			1								**1**
Small Tortoiseshell					1						**1**
TOTAL SECTION COUNTS	**2**	**7**	**13**	**8**	**7**	**12**	**3**	**11**	**1**	**5**	
TOTAL SECTION SPECIES	**2**	**5**	**5**	**4**	**5**	**7**	**2**	**3**	**1**	**4**	

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 June 2017.

Summary

1) The 1st June survey of the Southern Block produced the highest number of species (12) recorded since this survey began in 2012, beating the previous best of 9, achieved in both 2012 and 2016.

2) The count of 69 individual butterflies equals the previous best total, recorded in 2012. The Small Heath fared particularly well (23).

Timed Count Survey, Southern Block, July 2017

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 18th 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 2017

	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			8	7	3	14	3	7		3	**45**
Essex Skipper			2				1				**3**
Large Skipper					2	4				1	**7**
Large White	2	3			1	1					**7**
Green-veined White		2	1	2	3	3	2	1		1	**15**
Purple Hairstreak	4	9	1	13	3	5	1	1	2	4	**43**
Purple Emperor		8				1	1				**10**
Red Admiral	1	2	1	1	2	3	1			2	**13**
Peacock								2		4	**6**
Painted Lady										1	**1**
Comma		2		3		1	2	1		3	**12**
Marbled White			1	1	1	8		4		1	**16**
Gatekeeper	5	21	15	93	25	79	27	35	6	28	**334**
Meadow Brown	23	41	60	37	49	78	16	75	3	62	**444**
Ringlet		2									**2**

Speckled Wood		4		2	1	1					**8**
Brown Hairstreak	1			2			3	1		1	**8**
Silver-washed Fritillary		2									**2**
Common Blue		1	3	2	1	7		1			**15**
White Admiral		1									**1**
Small Heath			2	2	2	3		4			**13**
Small Copper			1	1							**2**
Clouded Yellow					1						**1**
Brimstone					1						**1**
TOTAL SECTION COUNTS	**36**	**98**	**95**	**166**	**95**	**208**	**57**	**132**	**11**	**111**	**1009**
TOTAL SECTION SPECIES	**6**	**13**	**11**	**13**	**14**	**14**	**10**	**11**	**3**	**12**	

TOTAL SPECIES = 24

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 2017.

Summary

1) The July survey of the Southern Block produced the highest number of species (24) recorded since this survey began in 2012, beating the previous best of 23, achieved in both 2013 and 2014.

2) The count of 1009 individual butterflies has only been bettered by the totals recorded in 2013 (1137) and 2014 (1145).

3) Those species which fared particularly well include the Purple Hairstreak (total 43 counts; previous best 18 in 2016), Brown Hairstreak (total 8 counts; never previously observed on timed count surveys), Gatekeeper (total 334 counts; previous best 274 in 2013), Common Blue (total 15 counts; previous best 3 in 2015) and Red Admiral (total 13 counts; reflecting a strong year nationally). These are exactly the same species which performed well in the Northern and Middle Blocks.

Single Species Survey (Purple Emperor), Southern Block, July 2017

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.

Results

Date	15.6	16.6	17.6	18.6	19.6	21.6	26.6	30.6	1.7	2.7	5.7	6.7	7.7	8.7	9.7	12.7	13.7	14.7	17.7	20.7	25.7
Total	**3**	**5**	**26**	**32**	**36**	**148**	**138**	**57**	**72**	**67**	**47**	**25**	**36**	**16**	**57**	**24**	**25**	**21**	**20**	**7**	**3**

This table shows the total number of individual Purple Emperors counted by various observers (mainly Oates, Drew & Hulme) on each day. Great care is taken to avoid 'double-counting'.

Summary

1) The 2017 Purple Emperor season at Knepp commenced on the exceptionally early date of 15th June; the earliest ever date for Sussex. This species was recorded even earlier in Surrey, on 11th June; the earliest British record since 1893. The egg-laying female seen on the Wildland on 18th June may be the earliest ever observation of this behaviour.

2) The flight season ran from at least 15th June to 25th July and was of typical duration. As always, males made the early running, with females dominating the tail-end of the season, often visiting sap bleeds to collect life-extending nutrients.

3) Peak counts were made on 21st June (148) and 26th June (138), with both tallies exceeding the previous best national one-day count of 134. The majority of individuals were again observed within the one kilometre squares at TQ1319, TQ1320, TQ1321, TQ1420 and TQ1421.

4) The number of male butterflies visiting ride surfaces appears to now be increasing from year-to-year.

Brown Hairstreak Egg Survey, All Blocks, Winter 2017/2018

Introduction

Winter Brown Hairstreak egg surveys are now included as part of the extended Knepp Castle Estate Wildland monitoring programme, initiated during 2012. This report sets out the findings of searches conducted at five locations within the Southern Block of the project area on 16th December 2017.

The methodology employed is straightforward and easily repeatable, involving a timed count of Brown Hairstreak eggs over areas where suitable blackthorn growth occurs. A measure of their relative density is achieved by calculating the number of eggs discovered per hour of searching.

Results

BROWN HAIRSTREAK EGG SURVEY (TIMED COUNT) ALL BLOCKS – WINTER 2017/2018					
Survey Area	Hampshire Buildings Small & Bull Field	Wild Flower Meadow	Oaklands 5	Fresco West	Fresco West /East
Grid Ref	TQ140212	TQ137207	TQ133205	TQ143204	TQ144204
Eggs Per Hour	34	40	5	26	48

This table shows the relative density of Brown Hairstreak eggs found by searching suitable blackthorn growth in each survey area, measured as the number of eggs discovered per hour.

Summary

1) The Knepp Castle estate (particularly the Southern Block) has always had the potential to support an unusually large population of the Brown Hairstreak, based on the vast extent of the Blackthorn-rich hedgerows which crisscross the area. However, winter egg searches conducted since 2012 have, until this year, always revealed very low relative densities (average 1.8 eggs per hour) when compared to unflailed hedgerows immediately outside the Wildland perimeter fence (average 21.3 eggs per hour).

2) In the 2016 report it was stated that "It is becoming increasingly clear that heavy browsing pressure over large parts of the Wildland is significantly reducing the local population of Brown Hairstreak, by removing a very large proportion of the young blackthorn shoots upon which the butterfly selectively lays its eggs.", and that "These figures, when compared with egg densities detected both inside and outside the Wildland perimeter, suggest that heavy browsing pressure has a similar effect to mechanical flailing on egg numbers."

3) A search of five hedgerows in the Southern Block on 16th December 2017 produced very different results, with the eggs-per-hour find rate rising from the 2012-2016 average of 1.8 (which is a low figure for West Sussex) to 30.6; an increase of 1600%. The Brown Hairstreak did not do unusually well anywhere else in West Sussex this year.

4) This spectacular increase in the egg find rate is unsurprising, given the explosion in the numbers observed within the adult population during late July and August.

5) This rapid and unprecedented increase in population size has been linked to changes in browsing pressure and hedgerow structure, and is discussed in the next section.

The 2017 Brown Hairstreak population explosion and the link to browsing pressure and hedgerow structure

Introduction

Adult Brown Hairstreak butterflies are highly elusive and usually occur in low densities across most of the species' geographical range; early morning searches for males around the canopy of 'master trees' present the easiest means of spotting them. However, these clusters of male butterflies do not provide an accurate measure of population size, as they represent points at which males congregate after hatching over a wide area of the surrounding countryside.

These factors have led to the universal acceptance of egg counts as the best, standardised method of assessing Brown Hairstreak populations (UK Butterfly Monitoring Scheme, Centre for Ecology and Hydrology, Butterfly Conservation). The technique involves the timed count of eggs along sections of Blackthorn (or Bullace) –rich hedgerow in 'suitable condition to host eggs', in the height range 0.25m – 1.75m (CEH, BC). Surveys of this type have been conducted on the Knepp Castle Estate since 2012.

From mid July onwards this year, adult Brown Hairstreaks were seen at low level in exceptionally high numbers, often nectaring on Creeping Thistle or Fleabane. This provided numerous enthusiasts with a rare opportunity to observe the species at close quarters, and encouraged many more to visit the Wildland.

Single Species surveys were performed through late July and August in an effort to elucidate the magnitude and spread of this population increase, in conjunction with the winter egg survey.

Bearing in mind that Brown Hairstreak egg surveys conducted between 2012 and 2016 have revealed much lower densities than areas peripheral to the Wildland, and that this paucity has been linked to browsing pressure, this glut of adult sightings prompted a renewed look at hedgerow structure; a report follows.

Results

Adult Brown Hairstreak Counts 2017

Date	Observers	Total	Male	Female	Nectaring or perched/ flying at low level	Transect	Master Tree count
13.7.17	Oates, Drew, Longhurst, Hulme	3	3		3		
14.7.17	Oates, Drew, Longhurst, Hulme	16	16		16		
17.7.17	Oates, Drew	39	39				39
17.7.17	Hulme	12	12		12		
18.7.17	Hulme	8	8			8 (Southern)	

20.7.17	Oates, Hulme	7	7		7		
21.7.17	Farrell	8	8		8		
21.7.17	Rapley	18	18		18		
23.7.17	Oates	52	52				52
23.7.17	Hulme, Sadler	6	5	1	6		
24.7.17	Eade, Arnott	9	9		9		
25.7.17	Hulme, Knight	32	30	2	32		
30.7.17	Hulme, Watson	11	6	5	11		
31.7.17	Hulme	4	4			4 (Middle/ Northern)	
1.8.17	Arnott	36	30	6	36		
1.8.17	Hulme	3	1	2		3 (Middle/ Northern)	
4.8.17	Hulme	33	17	16	33		
5.8.17	Hulme	21	9	12	21		
20.8.17	Hulme	7	1	6	7		
21.8.17	Jeffcoate	3		3	3		
TOTAL		**328**	**275**	**53**	**222**	**15**	**91**

Notes: Total number of Brown Hairstreak adults observed on transects 2005 – 2016 = 0
Annual average number of Brown Hairstreak adults observed nectaring or perched/flying at low level 2005 – 2016 = <1

Browsing Pressure and Hedgerow Structure

The Blackthorn-rich hedgerows of the Wildland can be broadly divided into three main types as follows, reflecting the browsing pressure exerted by two groups of herbivores; larger herbivores and Rabbits.

1) Advancing Phase Hedgerows

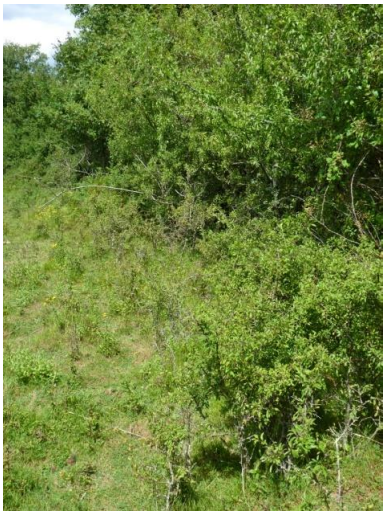
Oaklands 6

Hampshire Buildings Small

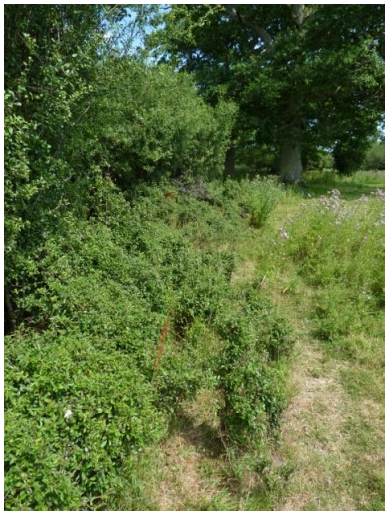
Advancing Phase Hedgerows are categorised as those where browsing pressure is low, allowing young suckering growths to step out, resulting in a graded profile and increasing hedgerow width. No obvious browse-lines are evident. The suckering growths comprise new, 'clean', tapering wood without lichen crusts.

Hedgerows of this type provide ideal nursery areas for the Brown Hairstreak, which prefers to lay its eggs on the younger growths. These hedgerows also provide the ideal nesting habitat for Nightingales, and protective barriers to the browsing of tree seedlings.

2) Static Phase Hedgerows



New Barn 1



Brookhouse C

Static Phase Hedgerows are categorised as those where browsing pressure is medium. Outgrowths are visible in front of the more mature hedge-line, but these are older suckers, the development of which has been arrested by browsing. Hedgerow width is stable and browse-lines are usually still evident. The outgrowths comprise older, quite thick, 'blunt' wood, often with a lichen crust.

Hedgerows of this type provide very modest opportunities for the Brown Hairstreak to breed, with very few eggs being found below 2 metres height. Those eggs (up to 10% - 15%) which are laid above 2 metres will survive the effects of browsing by larger herbivores.

3) Retreating Phase Hedgerows

New Barn 1

Keens Field

Retreating Phase Hedgerows are categorised as those where browsing pressure is very high, preventing the growth of suckers and removing most or all new seasonal growth below the browsing height of most larger herbivores. The hedgerow develops a concave profile and is of stable or even diminishing width. Two clear browse-lines are evident: an upper resulting from the browsing action of larger herbivores; a lower resulting from the browsing action of Rabbits, giving the hedgerow a 'leggy' appearance.

Hedgerows of this type provide poor opportunities for the Brown Hairstreak to breed, with no eggs usually being found below 2 metres height. Those eggs (up to 10% - 15%) which are laid above 2 metres will survive the effects of browsing by larger herbivores.

These hedgerows are unsuitable as nesting sites for many species of bird, including Nightingale. No protection is afforded to the development of tree seedlings in adjacent areas.

Summary

1) Adult Brown Hairstreaks had never been encountered on the structured surveys conducted between 2005 and 2016; this year 15 individuals were recorded. The annual average number of adults observed nectaring, perched or flying at low level (not high in 'master trees') between 2005 and 2016 is less than one; this year 222 such records were collated, although the monitoring effort was greatly increased (by approximately tenfold).

2) This spectacular increase in population size, measured by both adult and egg counts, appears to be greater than an order of magnitude, and has been linked to changes in browsing pressure and hedgerow structure.

3) A change in hedgerow structure has been observed over particularly the Southern Block of the Wildland, with a shift from Retreating and Static Phase, to Static and Advancing Phase.

4) One of the key drivers of this shift in hedgerow structure is considered to be a rapid fall in the Rabbit population. This may be due to one of, or a combination of, the following factors: cessation of Fox control and the recovery of this predator, as witnessed by the recent increase in sightings; a shooting campaign; disease.

5) Rabbits play a pivotal role in suppressing the early stage development of scrub and large numbers are effective at removing the pioneering growths of Blackthorn on which the Brown Hairstreak often lays its eggs. The importance of young, low Blackthorn suckers was confirmed by following ovipositing females on 4th, 5th and 20th August in the field 'Twenty Seven Acres'. Six different females were observed laying a total of 27 eggs, at heights ranging between c.2cm and c.80cm.

6) The browsing pressure exerted by larger herbivores, which may affect both pioneering and younger Blackthorn growths at higher levels within the hedgerows, may also have decreased in recent times. The intensity of browsing by larger herbivores may reflect a complex combination of factors, including their numbers and movements, and variations in the amount of alternative forage available. The latter may itself reflect factors such as weather, the dominance of unpalatable vegetation, and Rabbit numbers.