

Hengistbury Head Butterfly Census Annual Report 2018

Compiled by Rachel Richards



Introduction

The UK is home to 59 species of resident butterfly and Hengistbury Head Nature Reserve nestled into the Dorset coast can boast that 26 of those species occur within its 162 hectares. Data has been collected from the nature reserve via a standardised transect line since 1976. This type of transect is often known as a 'Pollard Walk' and while it can provide an insight into species abundance and even allow population trends to be established, it is important to note that accurate population sizes of individual species cannot be calculated using this method (Pellet et al. 2012).

This is not to say that the data collected on these surveys is not important. Not only does it contribute to the UKBMS's data-set for the country, allowing localised and nationwide trends to be revealed for individual species, but is also critical for Hengistbury Head itself in order to assess the health and diversity of its ecosystems and to further advise methods of management which aim to increase the populations of their native butterflies and in turn strengthen the biodiversity of the habitats in which they live.

There are around 26 different habitat types at Hengistbury Head and this unique amalgamation of ecosystems makes the nature reserve a fascinating and important place to collect transect data from as it can tell us more about how generalist and habitat specialist species are faring and whether their ranges of tolerance are adapting with the abiotic conditions of their changing environments.

Data collection such as that done at Hengistbury Head and at other sites across the country is more vital than ever with the UKBMS stating that the four decades of data collection indicates that 76% of our butterfly species are in decline, either in abundance or distribution (Fox et al. 2015). This data is crucial to paint a more detailed picture and to help instruct more efficient conservation methods to halt these declines and prevent this flagship family from disappearing entirely from UK shores.

Method

To ensure scientific validity, the butterfly transect is formulaic and very similar to transects walked all over the country to collect data on species distribution and abundance, this is designed in accordance with UKBMS guidelines.

Once a week between the dates of the 1st of April and the 30th of September, a 3.5 kilometre route which winds around Hengistbury Head's 162 hectares and through 14 sections of Hengistbury Head's prime butterfly habitat, is walked by members of staff or volunteers. As there are a number of people conducting the survey, variation in identification skills, perspectives and time spent on the transect can differ and so all participants are trained on how to correctly record the data in order to minimise the risk of human bias.

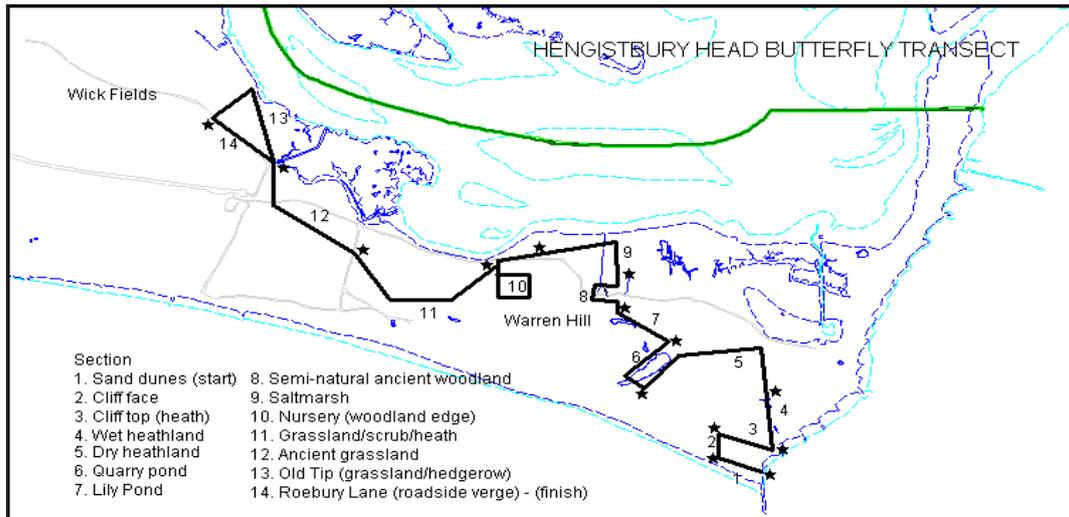


Fig. 1. A copy of the map of the route used for the butterfly transect including the different habitat sections.

The transect should be completed anytime between half past eleven and half past three and should ideally take place on a sunny day with minimal cloud cover. A guideline of around an hour and a half to complete the transect is given with participants advised to remain as mobile as possible during the walk to prevent the same butterflies being counted multiple times.

The sheet used to record the abundance of butterflies is exactly the same each year and is also used to record the temperature, wind speed, wind direction and percentage of sun.

Results

In some instances, the transect data may not be collected on some weeks due to unforeseen circumstances or bad weather. When submitting the data, estimates are created for missed weeks by the UKBMS to help create national trends.

In previous years, these estimates for weeks missed have been included in these reports but as they are only averages created from the remaining data, they cannot be completely accurate representations of what may have been recorded on that given week and so will no longer be used in the data analysis and results of these reports.

Within this section, the results from the transects will be used to create graphs in order to explore any changes or trends in the data, for example abundances between years, transect sections and the relationship between abundance and temperature. This information will be used to evaluate the state of local butterfly populations and could be used to advise on how best to manage them.

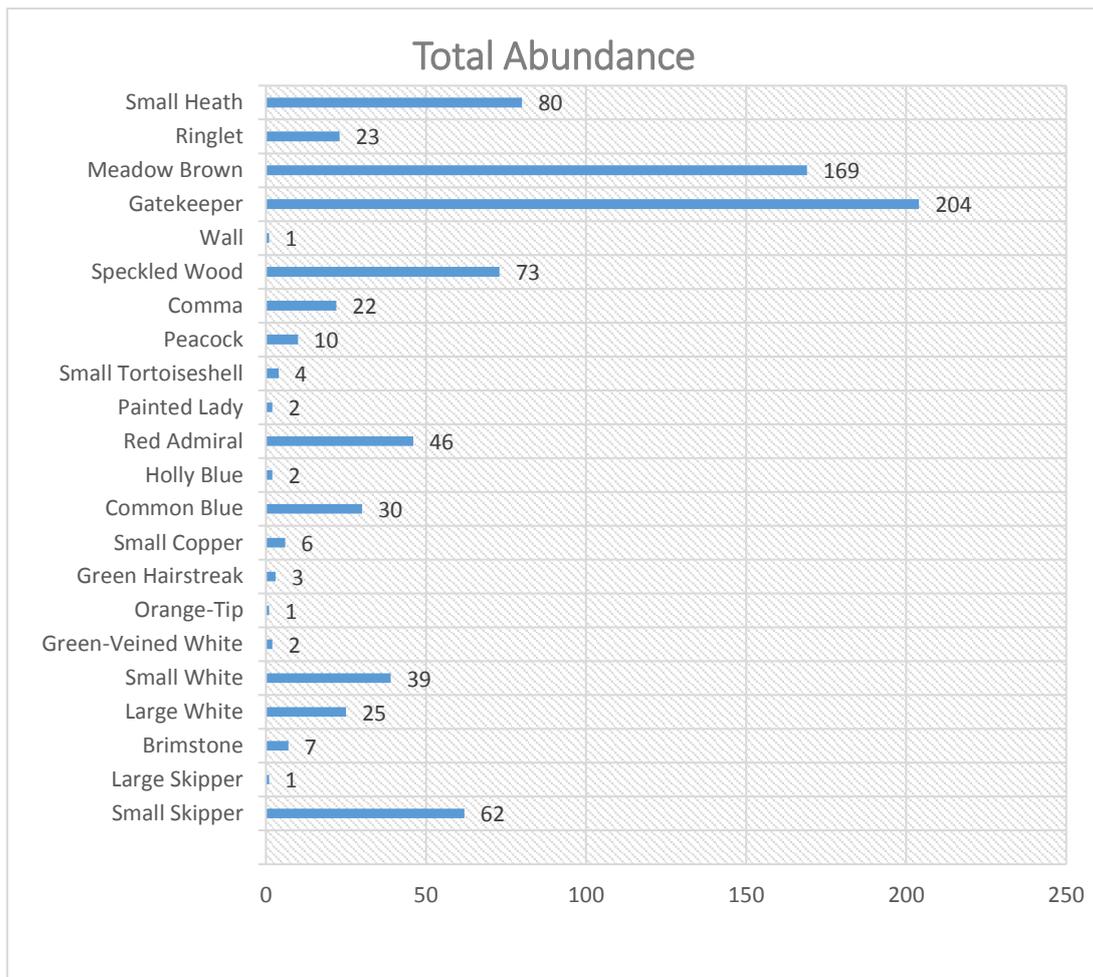


Figure 2. Total abundance of the butterfly species recorded at Hengistbury Head in 2017.

2017 had a total count of 812 butterflies, slightly decreased from last year's total of 836 butterflies. Several species of butterfly have increased however with particularly successful species including the Small Heath, Speckled Wood and our most commonly recorded species, the Gatekeeper. The Wall butterfly was recorded once this year again following a single sighting in 2016 too which although low, is promising considering it has not been recorded since 2010.

Conversely it has been the worst count since 1979 for Large Skippers with a 95% decrease in the last five years. Only 10 Peacock butterflies were recorded in 2017, another drastic drop in their population with Peacocks being the fourth most recorded species in 2015.

One species, the Marbled White, was not seen at all this year with only 1 recorded in 2016 whilst the Holly Blue was recorded twice this year and had not been recorded since 2015.

In the case of 2017, three walks were missed in total with two of those walks missed in the month of July which is the height of activity for many butterfly species. As estimates are not being used in this report, the total abundance for this year may have well have been higher had these walks not been missed and this information should be taken into account when comparing this year's abundance to previous years.

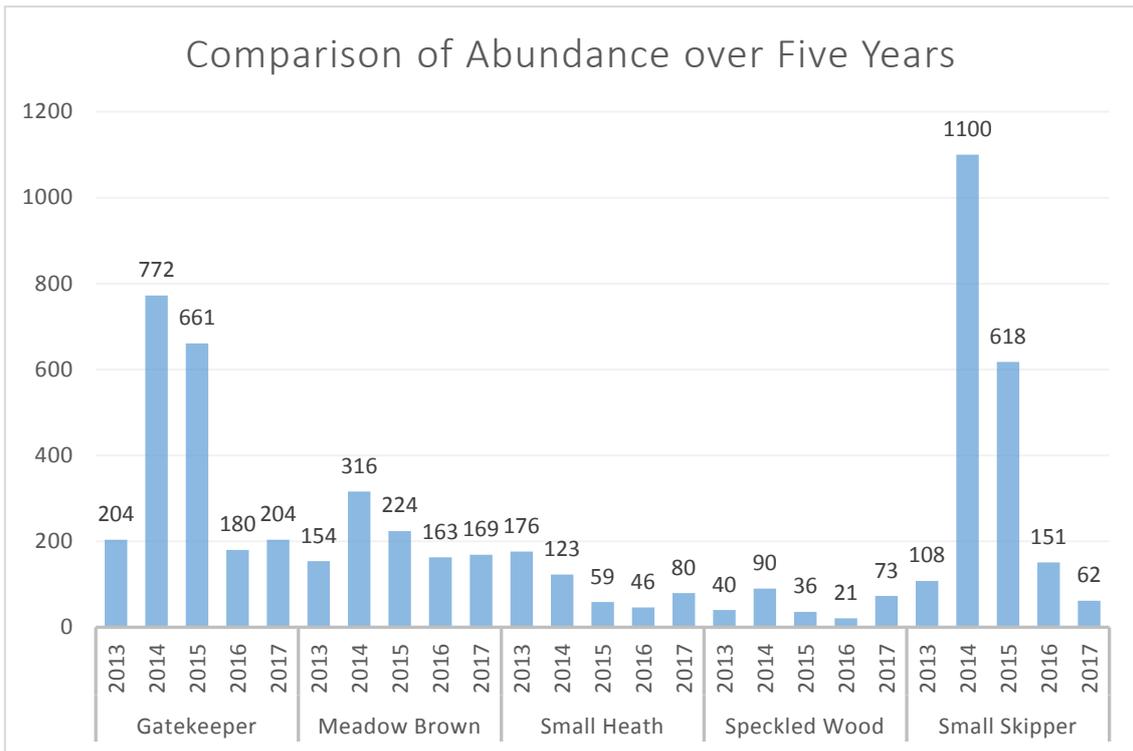


Figure 3. A comparison of the abundance of five of the most common species at Hengistbury Head over the last five years.

Figure 3 compares the recorded abundance of the five most common species at Hengistbury Head in 2017 over the last five years. The Gatekeeper has been the most prominent species for the last five years and is one of the most commonly spotted butterflies at Hengistbury Head and although nowhere near close to the population boom of 2014, both the Gatekeeper and Meadow Brown have increased marginally from 2016. From what appeared to be a steady decline, the Small Heath butterfly has increased by 74% to become the 3rd most recorded species in 2017 whilst the Speckled Wood has increased by an amazing 248% from 2016. The Small Skipper, a species that has been very common on site with a huge spike in population in 2014 and a record count of 1100 individuals has unfortunately decreased and recorded numbers have dropped by 59% from last year.

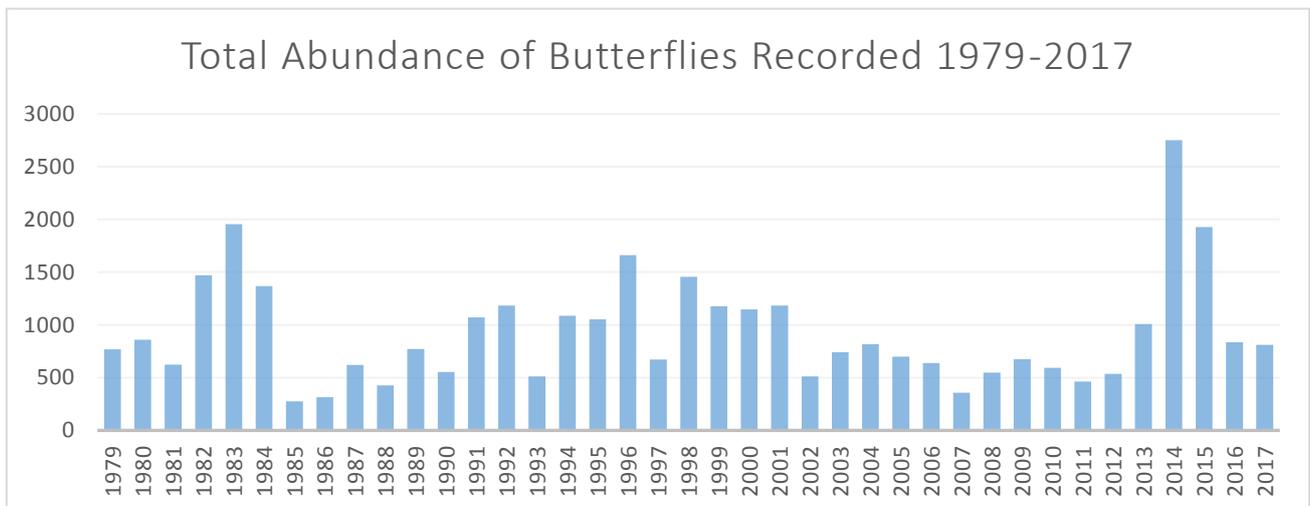


Figure 4. Total annual abundance of butterfly species recorded at Hengistbury Head since records began in 1979.

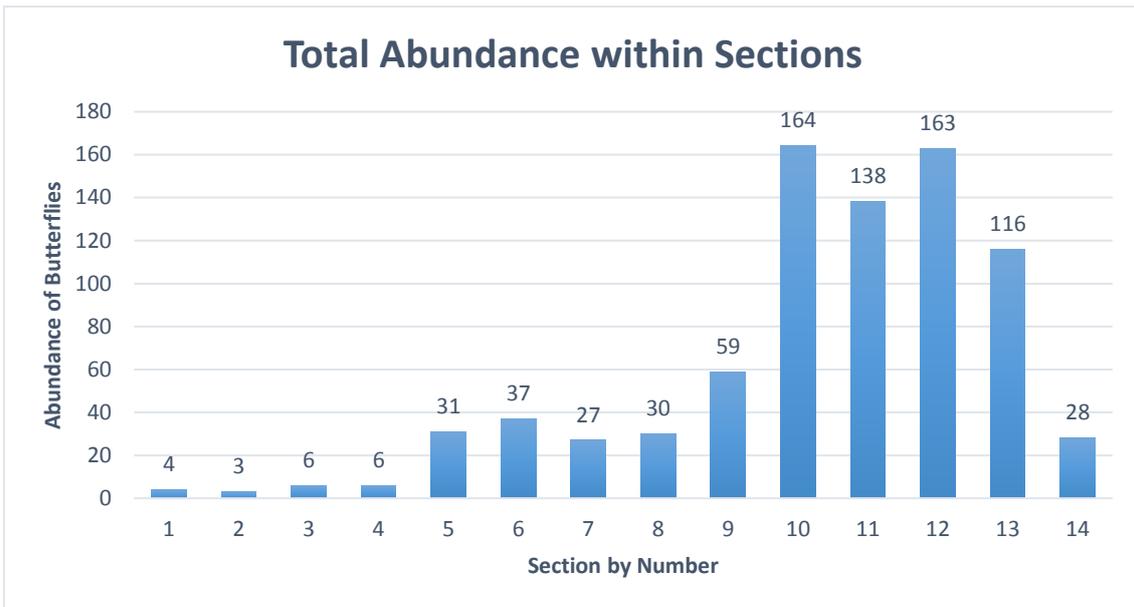


Figure 5. Abundance of butterflies recorded within each section of the transect.

<u>Transect Section</u>	<u>Number of Species Recorded</u>	<u>Commonly Recorded Species</u>
1 = Sand Dunes	4	N/A
2 = Cliff Face	3	N/A
3 = Cliff Top (Heath)	1	Gatekeeper
4 = Wet Heathland	4	Gatekeeper
5 = Dry Heathland	6	Gatekeeper, Meadow Brown
6 = Quarry Pond	8	Gatekeeper, Meadow Brown, Small White
7 = Lily Pond	6	Gatekeeper, Speckled Wood, Meadow Brown
8 = Semi-natural Ancient Woodland	8	Meadow Brown, Small Skipper, Speckled Wood
9 = Saltmarsh	7	Gatekeeper, Small Skipper, Meadow Brown
10 = Nursery (Woodland Edge)	20	Gatekeeper, Meadow Brown, Small Skipper
11 = Grassland/Scrub/Heath	15	Meadow Brown, Small Heath, Gatekeeper
12 = Ancient Grassland	13	Meadow Brown, Small Heath, Gatekeeper
13 = Old Tip (Grassland/Hedgerow)	12	Speckled Wood, Large White, Small White
14 = Roebury Lane (Roadside Verge)	7	Speckled wood, Red Admiral, Meadow Brown

Table 1. A breakdown of the 14 sections of the transect, the diversity of butterfly species recorded in 2017 and the most commonly recorded species within those sections. More than one individual of a species had to be recorded within a section for it to count as a commonly recorded species.

In figure 5, the abundance of recorded butterflies within each section of the transect is displayed. As can be seen, the areas with the highest counts of butterflies are sections 10, 11 and 12 which are all areas with woodland, scrub and grassland aspects. Some sections such as 1 and 2 are much shorter in relation to the other sections and are also located in areas that are much more exposed to the elements as opposed to transect sections 10 and 11 which are sheltered from strong winds by Warren Hill. Differences in

habitat types will also wield very different levels of diversity due to the vegetation structures and levels of available sunlight within each ecosystem.

It is also interesting to note that the diversity of butterfly species within the sections has increased over the years; since the first report written in 1979, the number of species in section 10 has doubled.

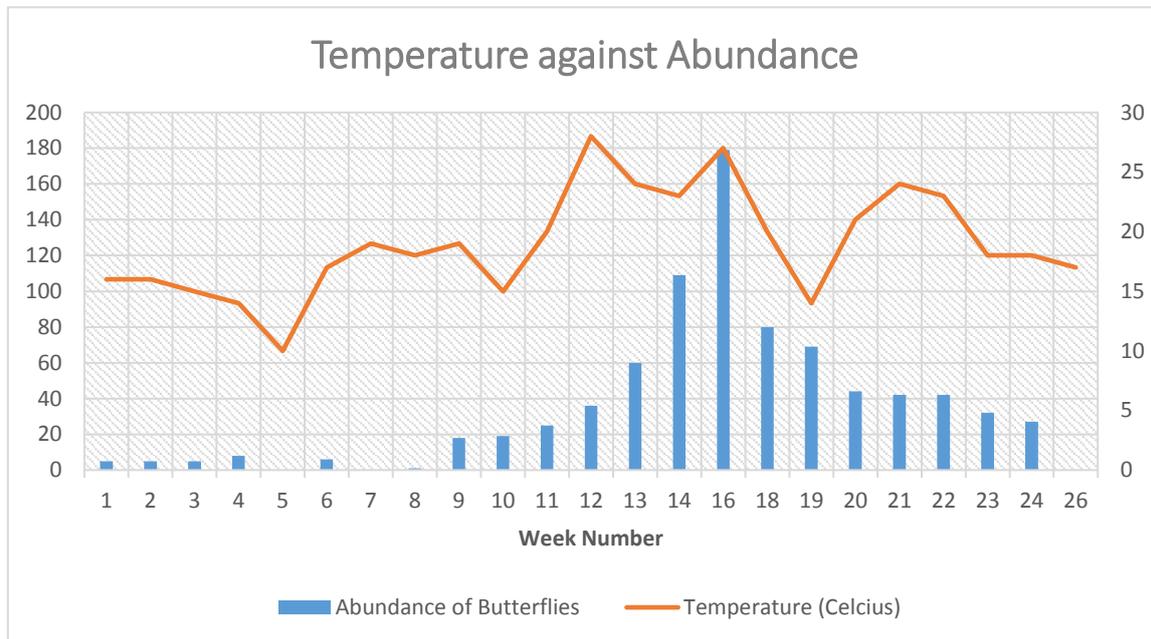


Figure 6. Temperature in Celsius against the abundance of butterflies recorded on the transect of each week.

The above graph depicts the relationship between temperature and the abundance of butterflies recorded each week. Although temperature is an important factor to consider when analysing the abundance of butterflies (as many species operate via abiotic cues), there are a number of environmental variables which could have cascading effects on their populations. 2017 has undoubtedly been an unusual year for the weather which can be seen within figure 6 with a range in temperature over the 26 weeks of 18°C. Spikes in temperature uncharacteristic of the month can also be seen with temperatures in August dropping to 14°C in August.

Discussion

As a Site of Special Scientific Interest (SSSI), Hengistbury Head is a protected area which provides a space for species such as butterflies to exist and breed without the encroachment of urbanisation, agricultural intensification and habitat loss which have been some of the main causes of declining butterfly populations in other areas of the country. This often means that protected areas and SSSI's have greater populations of butterfly species than other areas (Gillingham et al. 2014). There is also speculation that these protected spaces will be critical in the future for species such as butterflies with the looming threats of increasing habitat fragmentation and climate change, even allowing them to fully establish their populations in order to expand their ranges (Thomas et al. 2012).

In addition to location, the weather conditions and climate are also very important factors when considering fluctuating abundance in butterflies as temperature, precipitation and levels of sunlight affect every stage of a butterfly's life-cycle (Roy and Sparks 2000). Although species differ in their ranges of tolerance, most UK butterflies benefit from warm summers with little rainfall (Roy et al. 2001) whilst mild winters and climatic extremes can have very negative effects on butterfly abundance and distribution such as early emergence and population cascades (Oliver et al. 2015).

Following an increasingly familiar trend, 2017 has been a warm year. The fifth hottest in fact since 1910 with a warmer than average winter followed by a wet summer; this has been coupled with erratic weather events such as storms, flooding and heatwaves (Met Office 2017). Although the full extent of the effects that the current climate is having on the population dynamics of our UK butterflies is yet to be seen, with Hengistbury Head's lowest butterfly count in five years, it is undoubtedly playing its part.

The total count for 2017 was 812 individuals recorded across 22 species of butterfly. 13 of those species' have maintained a stable abundance or increased it from previous years with six of these species increasing their abundance by over 50% since 2016.

The Gatekeeper was the most abundant butterfly recorded on the transect in 2017 and this has been the case for the last three years. It is a wider countryside species and as can be seen in Table 1 in the results section, it utilizes many of the habitat types at Hengistbury Head. A generalist, the Gatekeeper is most often seen in shrubby grassland and woodland edge habitats and in the past, was a commonly spotted farmland species. However intensification of farming and loss of habitat has led to a decline in the Gatekeeper butterfly over the last four decades with its abundance decreasing by 47% (UKBMS 2016). Fortunately, this decline is not reflected in the number of Gatekeepers recorded at Hengistbury with 204 individuals counted this year and a 13% increase from 2016's total with this most likely being due to the wealth of unimproved habitats on site.

The Meadow Brown was the second most abundant butterfly on the transect and although its numbers have increased marginally since last year, it has been on a steady decline which correlates with the UKMBS's data of a declining trend of 6% since 1976 (UKBMS 2016).

The Small Heath butterfly, the third most recorded species, has increased by 74% since last year which is very promising after a rapid decline over the last four years, see figure 3. By looking at table 1, the Small Heath is most abundant within sections 11 and 12 which are grassland and scrub ecosystems with aspects of heath - prime habitat for this butterfly. With the Small Heath declining by over 50% in distribution and abundance nationally (Fox et al. 2015), Hengistbury Head's thriving population is not only positive news, but a good indication of the health of the ecosystems on site and diversity of grassland plants such as fescues and meadow-grasses which are critical for the larval life-stage of the Heath butterfly (Butterfly Conservation 2018).

Similarly, the Speckled Wood butterfly has enjoyed an exponential increase of 248% since 2016 after a tumultuous few years. Nationally, populations of Speckled Wood have increased by over 70% since 1976 but in trends calculated over the last ten years, this seems to have reversed with the abundance in fact decreasing by 9% (UKBMS 2016). Although predominately a woodland species, the Speckled Wood was also commonly recorded in sections 13 and 14, likely due to the presence of scrub, hedgerows and trees within those areas.

The Comma and Ringlet butterflies are also species whose abundance has been increasing. The Comma has increased by 120% from 10 individuals recorded in 2016 whilst the Ringlet has increased by 283% from just 7 individuals counted last year. A relatively common butterfly, the Ringlet's increase in abundance correlates with an increasing trend of 43% over the last ten years and whilst the Comma's distribution and abundance has increased over the last forty years, ten year trends indicate a decrease in abundance of 23% (UKBMS 2016).

The Red Admiral butterfly has also increased with 46 recorded this year, the highest count since 2012. Although not the most abundant species at Hengistbury Head, we are fortunate to see their increasing populations; this is most likely due to warm June and July temperatures and the abundance of foodplants that these butterflies thrive on such as bramble, nettles, thistle and even ragwort (UK Butterflies 2018).

Not all of Hengistbury Head's butterfly species have fared so well however, with 8 out of the 22 recorded species declining in abundance.

The Large White butterfly has decreased in abundance by 78% since 2016 with only 25 individuals recorded this year. This butterfly is a common woodland species and can have up to 3 broods a year (Newland et al. 2015). It could be that the warm winter temperatures of 2017 resulted in early emergence and breeding for the Large White, perhaps disrupting the later life stages and resulting in this considerable decrease in numbers.

The Small Skipper is another butterfly species which has seen a sharp decline from 1100 individuals counted in 2014, the highest count for any species since 1979, to just 62 in 2017, see figure 3. This is in contrast with the UKBMS's ten year trend for the Small Skipper, which indicates an 87% increase across England. With Hengistbury Head having many of the Small Skipper's prime habitats and being abundant in their favourite foodplant, Yorkshire Fog (UK Butterflies 2018), it is unlikely to be the ecosystems or any kind of habitat management that has detrimentally affected the Small Skipper.

The Peacock has also decreased since 2016 and has been in decline on Hengistbury since 2013; with a single brood and abiotic cues waking them from hibernation, warmer than average winter temperatures (UK Butterflies 2018) over the last couple of years may have caused premature brooding in Peacocks resulting in the declining populations. The Large Skipper has also been in decline, with only 1 recorded in 2017, the lowest count on record for this species.

The outlook projected by long-term trends for the butterfly species of this country are fairly bleak, The State of the UK's Butterflies Report 2015 stated that 76% of species had declined in both/either abundance and distribution since 1976.

Shorter term trends calculated from the last ten years are more positive with 52% of butterflies declining in abundance and 47% declining in distribution (Fox et al. 2015). For many of our generalist butterflies, the story is more positive still with over 50% of species increasing their distribution over the last three decades; this is thought to be an expansion of the northern boundaries of some species in a somewhat beneficial response to warming temperatures in a rapidly changing climate (Warren et al. 2001).

What these statistics do tell us for sure, is that the monitoring of our butterflies and the conservation and management of their populations is working. With over 2500 sites contributing their transect data to the UKBMS, and around 768,780km walked by volunteers since 1976 (Fox et al. 2015), the future for our butterflies is looking hopeful.

The future for Hengistbury Head's butterfly populations are also very hopeful. This has been the 39th year of walking the transect on this picturesque site and despite a higher count of individuals, 64% of the species recorded this year have increased their abundance from 2016. By looking at Table 1, we can see that the diversity of butterflies is high in the majority of the transect sections but especially within 10, 11, 12 and 13; signifying the ecological health of the ecosystems within those sections (mainly woodland edge, scrub and hedgerow) and their ability to support enough species to fill several niches.

The abundance of our butterflies has also managed to stay stable during a year of less than ideal climatic conditions and with more extreme seasonal weather set to increase in the future (Brereton et al. 2017), it will be interesting to see how the abundance and diversity of Hengistbury Head's butterflies will change in the coming years.

References

Title page photographs:

<http://www.bbc.co.uk/programmes/p01d0p7d/p01d0mb5>

<http://abugblog.blogspot.co.uk/2011/07/fresh-holly-blue-shows-its-tongue.html>

Brereton, T., M., Botham, M., S., Middlebrook, I., Randle, Z., Noble, D., and Roy, D., B., 2017. *United Kingdom Butterfly Monitoring Scheme Report for 2016* [online]. Centre for Ecology & Hydrology & Butterfly Conservation.

Butterfly Conservation, 2018. *Small Heath* [online]. Available from: <https://butterfly-conservation.org/679-777/small-heath.html> (Accessed 18 January 2018).

Fox, R., Brereton, T., M., Asher, J., August, T., A., Botham, M., S., Bourn, N., A., D., Cruickshanks, K., L., Bulman, C., R., Ellis, C., Harrower, C., A., Middlebrook, I., Noble, D., G., Powney, G., D., Randle, Z., Warren, M., S., and Roy, D., B., 2015. *The State of the UK's Butterflies 2015*. Wareham: Butterfly Conservation and the Centre for Ecology and Hydrology.

Gillingham, P., K., Alison, J., Roy, D., B., Fox, R., and Thomas, C., D., 2014. High Abundance of Species in Protected Areas in Parts of their Geographic Distributions Colonized during a Recent Period of Climatic Range. *Conservation Letters* [online], 8 (2), 97-106.

Met Office, 2018. *2017 Weather Summaries* [online]. Available from: <https://www.metoffice.gov.uk/climate/uk/summaries/2017> (Accessed 19 January 2018).

Newland, D., Still, R., Swash, A., and Tomlinson, D., 2015. *Britain's Butterflies: A Field Guide to the Butterflies of Britain and Ireland* [online]. 3rd Edition. Princeton University Press.

Oliver, T., H., Marshall, H., H., Morecroft, M., D., Brereton, T., Prudhomme, C., and Huntingford, C., 2015. Interacting Effects of Climate Change and Habitat Fragmentation on Drought-Sensitive Butterflies. *Nature Climate Change* [online], 5, 941-945.

Pellet, J., Bried, J., T., Parietti, D., Gander, A., Heer, P., O., Cherix, D., and Arlettaz, R., 2012. Monitoring Butterfly Abundance: Beyond Pollard Walks. *PLoS ONE* [online], 7 (7), e41396.

Roy, D., B., Rothery, P., Moss, D., Pollard, E., and Thomas, J., A., 2001. Butterfly Numbers and Weather: Predicting Historical Trends in Abundance and the Future Effects of Climate Change. *Journal of Animal Ecology* [online], 70 (2), 201-217.

Roy, D., B., and Sparks, T., H., 2000. Phenology of British Butterflies and Climate Change. *Global Change Biology* [online], 6 (4), 407-416.

Thomas, C., D., Gillingham, P., K., Bradbury, R., B., Roy, D., B., Anderson, B., J., Baxter, J., M., Bourn, N., A., D., Crick, H., Q., P., Findon, R., A., Fox, R., Hodgson, J., A., Holt, A., R., Morecroft, M., D., O'Hanlon, N., J., Oliver, T., H., Pearce-Higgins, J., W., Proctor, D.,

A., Thomas, J., A., Walker, K., J., Walmsley, C., A., Wilson, R., J., and Hill, J., K., 2012. Protected Areas Facilitate Species' Range Expansions. *PNAS* [online], 109 (35).

UKBMS, 2016. *Country Level Summary Tables* [online]. Available from: <http://www.ukbms.org/docs/reports/2016/Country-level%20Summary%20Tables%202016.pdf> [accessed 17 January 2018].

UK Butterflies, 2018. *UK Butterflies* [online]. Available from: <http://www.ukbutterflies.co.uk/index.php> (Accessed 20 January 2018).

Warren, M., S., Hill, J., K., Thomas, J., A., Asher, J., Fox, R., Huntley, B., Roy, D., B., Telfer, M., G., Jeffcoate, S., Harding, P., Jeffcoate, S., Harding, P., Jeffcoate, G., Willis, S., G., Greatorex-Davies, J., N., Moss, D., and Thomas, C., D., 2001. Rapid Responses of British Butterflies to Opposing Forces of Climate and Habitat Change. *Nature* [online], 414 (6859), 65-69.