

2016 UNDERWING OCELLI

Introduction

Common Blue and Brown Argus butterflies in the vicinity of Sheffield have been compared with those from the Chalk-hill Blue further south in Gloucestershire and at Newmarket in Cambridgeshire. *The upper wings of males are consistent in colour, but underwing ocelli vary.*



CB female



BAHybrid male



C-HB male

The photos show under-wings of the 3 species: they are all similar in the general pattern of ocelli, though not identical. Sites visited and OS references are given below.

It proved quite difficult to photograph both Common Blue and Brown Argus in the Sheffield area due to lack of numbers plus difficulty in getting undersides both during the day and finding roosting individuals in the evening. The Longstone Edge data was obtained from several different visits while Longcliffe Quarry in Derbyshire was visited on 2 occasions, 21-June and 21-July. Thanks to many photos from Andrew Brown (Gloucs.) and a much better day at Devil's Dyke at the BC meeting on 7th August, reasonable numbers of Chalk-hill Blue were obtained. After an initial survey it was decided to obtain data from 3 hind-wing ocelli, the first, second and fourth going from near the body along the top of the hind-wing. It was soon evident that these ocelli varied randomly in the same specimen, as was expected. The Table shows the general variation which is similar to the 1997 paper results with most figures near the middle of the ranges and relatively small numbers at the extremities.

Table 1 2016 Hind-wing ocelli pupils as a linear % of each ocellus

SPECIES/SITE	10/15%	20%	25%	30%	35%	40%	45%	50%	55/60%	Total
CB LE		1	3	20	27	41	40	19	5	156
CB LC			2	9	12	8	9	11	3	54
CB RVCP				2	6	6	8	2		24
BAH LE	1(15)	3	9	11	10	9	5	2	1	51
C-HB SH		1		4	10	18	19	6	2	60
C-HB BH	2(10)			2	5	13	9	10	1/1	43
C-HB DD				8	15	25	17	9	8	82

CB Common Blue:

BAH Brown Argus hybrid:

C-HB Chalk-hill Blue

LE Longstone Edge OS SK1972: LC Longcliffe Quarry OS SK2256: RVCP Rother Valley Country Park OS SK4484: SH Swellshill OS SO8602: BH Breakheart Hill OS ST7596: DD Devil's Dyke OS TL66.

Shapes of each ocellus vary and measurements were made on two 'diameters' at right-angles. The lines were positioned to accommodate varying shapes in the best way. It is not possible to be precise, and the figures are placed in a 5% zone. For example, the 20% zone includes %s from 17.5 to 22.5, 25% is 22.5 to 27.5 and so on.

In the 1997 paper, data from a fore-wing ocellus from museum specimens showed the form of a sine-wave in a histogram. The data in the above Table shows general similarities – there is variation

over a similar range for both Common and Chalk-hill Blues. With the exception of BAH the highest figures are in the range 30-50% and follow as a % of the total.

CB LE 147/156 = 94.2%: CB LC 49/54 = 90.7%: CB RVCP 24/24 = 100%.

C-HB SH 57/60 = 95%: C-HB BH 39/43 = 90.7%: C-HB DD 7482 = 90.2%

The lower BAH figure is considered to be due to the diffusion of the Scottish race south through England which has increased the % of white scales. The fact that Common Blue and Chalk-hill Blue are similar is considered to be a matter of chance. There is no necessity for either species to alter its ocelli and wing pattern, because the under-side of hind-wings is almost the entire part of what is seen when roosting. This aspect of the butterflies' make-up has been successful since it first occurred and would not be affected by temperature variations. Contrast the distinctly darker colour and smaller number of lunules in the upper wings of the Brown Argus northern race. It is likely that an event similar to that in Scotland for the Brown Argus will have occurred for both species at points in time sufficiently far back for them to have subsequently roughly equalised throughout Britain via diffusion. The original events are likely to have occurred at different parts of Europe at different times, covering different areas and subsequently to have gradually evened out before both the Channel and North Sea were formed.

It is difficult to estimate a time for the events which generated white scales in Common and Chalk-hill Blues. They presumably will both have had an event like the Brown Argus in Scotland and (in my 1992 paper) the infiltration of white discal scales in male upper forewings averages 1% in the counties bordering the south coast since its occurrence. Looking at dates, I have 13,000 years BP in my blog but it might be much less than this as different authorities have quite different dates for the last ice-age glacial maximum and formation of the Channel and North Sea. The total length of time could be several tens of thousands of years or longer, possibly much longer.

Although blue male upper forewings are relatively consistent, it is possible to gather information from under-wings. In the case of the Brown Argus, an interesting point is the comparison between the colours in the upper and under-wings. I have a photo from the Yorkshire Dales (northern race) where the male upper wings are black with no marginal lunules.. At one time, before subsequent diffusion with the southern race, this is what the northern race would have looked like. Nowadays there are complex mainly dark brown colours in the northern race upper wings with variable relatively low numbers of marginal lunules. The southern race has a mainly lighter-brown general colour with lunules approaching the maximum of 6 although always varying.

To sum up, both north and south races and the Scottish variant of the Brown Argus have retained their marginal orange spots and general under-wing colour. During the cold days over long periods, upper-wing colours darkened to speed up warming from the sun which was in relatively short supply. This would help butterflies to fly and mate. At evening, when roosting, the emphasis was on camouflage which had been successful since the species was formed and which had not changed as a requirement in the colder temperatures.

Fore-wing Ocelli

In the 1997 paper, data from museum specimens was collected from both males and females via the 3rd down ocellus from the apex of the left-wing. Using the same spot from specimens facing either left or right, the male Chalk-hill Blue specimens provided a surprise and were quite different from females, also Brown Argus and Common Blue.

By no means all of the photos showed the upper-wing third spot, and there were only 3 Gloucs. females, 4 males from Newmarket, and 21 from the Gloucs. sites

The Table shows the comparison of Brown Argus and Common Blue museum specimens in the 1997 paper with Chalk-hill Blues in Gloucs in 2016.

Area.	Min%	Max%	Av%	Numbers	90-100%
NBA SW Scotland	0	10	2.6	22	0
BAH Peak district	20	55	46.5	18	0
BA Isle of Wight	30	70	53.4	22	0
CB Ross-shire	35	65	47	12	0
CB Kent	35	70	56	25	0
C-HB M Gloucs.	53	100	87.5	21	16/21=76
C-HB M Cambs.	70	100	86.6	4	2/4=50
C-HB F Gloucs.	50	67	58	3	0

NBA northern Brown Argus, BAH 50/50hybrid Brown Argus, BA southern Brown Argus

CB Common Blue, C-HB Chalk-hill Blue, M male, F female

Discussion

It is difficult to pick up information just by looking at figures in the Table so the main points are mentioned below.

The top line shows that the furthest south area of the Scottish race has a definite though low pupil content indicating some infiltration of BA (diffusion) north-ward. BA in the Isle of Wight has not been infiltrated by diffusion of the Scottish race and has figures very similar to CB in Kent. The Solent has proved to be an adequate barrier so far in the case of NBA diffusion.

The small numbers of C-HB females do not show any indication of fore-wing pupils going near 100%. They show up much more clearly than with males, but more specimens would be needed for greater certainty. If a distinct difference to males was confirmed this is not really much different from a difference between sexes in upper wings. Also, when Dr Klaus Schurian placed mature north German larvae in a domestic refrigerator, the resulting females had white rings on the upper fore-wing discal spots while the males were less affected and had clumps. So the creation of white scales in the Brown Argus at the same time has affected the sexes differently.

Figures for C-HB males in Gloucs. have adequate numbers with a total of 21 and with 16 of these having pupils between 90 and 100% any formation of white scales is at a much lower level than the hind-wings and also probably than the females. The undersides of forewings have no clearly defined function and it could be that differences between sexes plus some other factor determine the effect on these ocelli.

Comments

The type of variation shown by overall distribution of ocelli pupils in the 3 species is similar. Since the *Aricia* genus is agreed to have north and south race hybrids which result in flight periods of over 8 weeks, it is worth comparing the others. The Common Blue emergences are June-July and August-September, when double-brooded; a little over 8 weeks each; somewhat longer when single. The Chalk-hill Blue is single-brooded from early July to mid-September, distinctly over 8 weeks.

This leads to a conclusion that all 3 species have a hybrid similarity and have experienced the same sequences of colder and less cold fluctuating temperatures in adjacent areas over the last 1 million years, followed by diffusion between the colder and the less cold (original) race once the temperatures returned to normal relatively recently after the last mini ice-age.

There are more butterfly hybrids around than is generally recognised and the same comment can be made for plants and other species. This greater complexity is likely to help in adverse weather which will affect a smaller part of the more spread-out complete hybrid brood.

Acknowledgements

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Andrew Brown produced good numbers of male and a few female Chalk-hill Blue photos without which it would not have been possible to carry out both the hind-wing and fore-wing comparisons. My son Rik also produced several photos from Devil's Dyke near Newmarket.

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