The White-letter Hairstreak BUTTERFLY

BUTTERFLY CONSERVATION

DEDICATED TO SAVING WILD BUTTERFLIES AND THEIR HABITATS

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Introduction

Strymonidia w-album or the White-letter Hairstreak is not well known, so why produce a booklet devoted exclusively to this butterfly? If you ask the man in the street "What is a White-letter Hairstreak?" the vast majority would not have a clue! It is also quite possible that many butterfly watchers have never seen a live adult. In the wild the adult butterfly is very elusive, and this has resulted in little being known about its natural history. Then in the 1970s along came Dutch Elm Disease which has decimated the populations of the three main species of elm in the southern half of Britain. This brought about concern for the plight of the butterfly which lays its eggs on elm and whose larvae feed on various parts of the elm in each stage of its development. Would it become extinct ?

In 1984 the then World Wildlife Fund, using money generously donated by Associated Tyre Specialists (ATS) Ltd, sponsored Butterfly Conservation to carry out a nationwide survey to try to establish the status of the butterfly and learn a little of its ecology. Because of the work carried out by members of the Society it was considered appropriate that it should be the subject of a booklet early in the series: and because I lead the project on behalf of Butterfly Conservation you have me as the author.

History of the butterfly

Prepare to be confused, the famous scientist Linnaeus seems to have been, so you will be in good company! The present name of the butterfly originates from the turn of the century when Kirby (1896) and South (1906) both use White-letter Hairstreak; before that there had been a variety of names used and no small amount of confusion with the similar and near relative *Strymonidia pruni* now commonly called the Black Hairstreak.

Strymonidia w-album was first described to science by Knoch in 1782 from a specimen taken in Germany near Leipzig, although a butterfly thought to be *S. w-album* was mentioned as early as 1703 by Petiver and the species was successfully bred in 1710 by Ray. One interesting point about the original type description given by Knoch is that the British specimens frequently differ from it because they lack the small orange spot on the upper surface of the hindwing, called the Anal Spot; this is mentioned later in the section on aberrations. Linnaeus mentions the butterfly but seems to have put *S.w-album* and *S.pruni* together as one species. He certainly will not be the last person to get them confused ! Between 1710 and 1906 it had four scientific names and at least six common names, being known as 'The Hairstreak', 'Dark Hairstreak', 'Black Hairstreak', 'w-hairstreak', 'White-w Hairstreak, and finally 'White-letter Hairstreak'. To make matters worse S pruni has also been known as the 'Dark Hairstreak' as well as the 'Black Hairstreak'.

So much for its common names, what other scientific names have been used? Linnaeus in his 'confused species' refers to it as *Papilio (Plebejus) pruni*; from 1808 - 1828 it was called *Thecla pruni*. There now appears a gap until 1841 when it did not have a scientific name before *Strymonidia w-album* was brought into use by Humphreys and Westwood. Tutt introduced the name *Edwardsia w-album* for the species around the turn of the century, but this appears to be the only reference to this name. Shortly after this had been written the scientific name *Strymonidia w-album* was changed again and it is now being called *Satyrium w-album* and its relative, the Black Hairstreak, is now called *Satyrium pruni* !!!

Ford in his classic book 'Butterflies' (Collins, London 1945) says that the 'Dark Hairstreak' of Harris (1775) is the first reference to the occurrence of this butterfly in Britain. He also goes on to say that it is found just across the border

in South-East Wales, although its distribution through that beautiful country is now known to be much more widespread, as it has been recorded in all of the old counties except Anglesey. The butterfly has only twice been recorded in Scotland and neither recording was in this century; it has never been recorded in either the Isle of Man or Ireland.

Description of the butterfly

So with all this confusion around a description of the butterfly may help to distinguish it from its near relative the Black Hairstreak. When it is at rest with its wings folded together, which is its normal position, it is about the size of a human thumb nail. In fact the only time the author has managed to see the uppersides of the wings is on dead specimens pinned out in a museum! The Grayling *Hipparchia semele* is another species which, reputedly, never shows the uppersides of its wings, but during the summer of 1988 a colony of Graylings was observed as they went about the business of courtship and mating. During this they would pose with their wings open, and it was possible to photograph their uppersides. White-letter Hairstreaks have been observed mating but at no time did they pose with their wings open or even open them briefly.

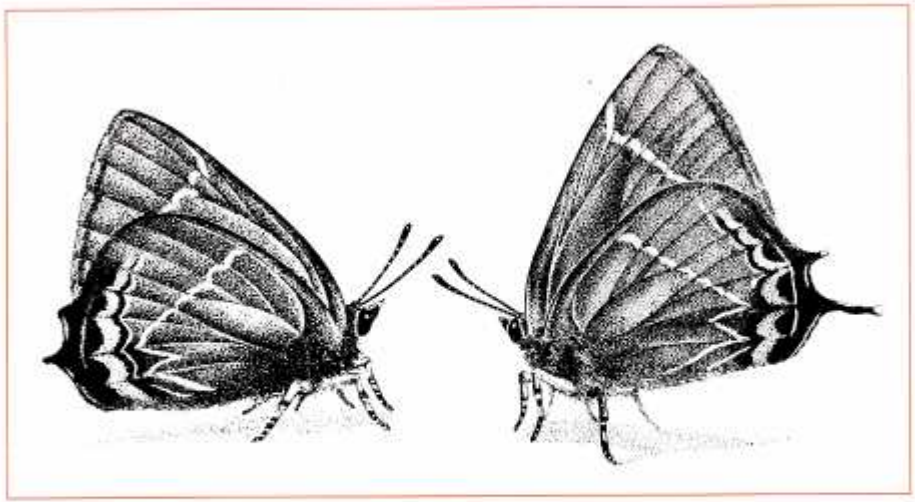

Figure 1 - The adult butterflies with the male on the left and the female on the right.

The butterfly is basically a darkish brown except for the white line or hairstreak from which it takes its name, which runs over both wings and ends in a 'w' shaped mark on the hindwing. There is also a band of orange / red edged with black on the rear edge of the hindwing. There are two tails found on the rear edge of the hindwing which are black with a white tip. This is a useful way of identifying males from females as the lower of these tails is far more developed in the latter. They are probably a defensive measure to mislead birds into attacking this area of the wings mistaking it for the head.

The antennae are black with white rings which give them an alternate black and white appearance like a 'Zebra Crossing', the same is true of the six walking legs, (this butterfly belongs to the family of butterflies called the 'Lycaenidae' which retain the usual insect pattern of six legs in the adult and not four as in the 'Nymphalidae', such as the Small Tortoiseshell and Peacock, or the 'Satyridae', e.g. the Meadow Brown and Speckled Wood). The head is pale brown with a pair of huge black compound eyes. When at rest the bottom part of the abdomen may be visible and it is matt brown in colour. Its shape may also help determine the sex of the butterfly as the female has a much more rounded appearance when seen from the side and is also fatter, presumably due to the ova developing within the reproductive organs. If this makes it sound that the butterfly described is dull and uninteresting it would give the wrong impression, as the butterfly has a petite quality and it is well worth the effort to find a freshly emerged specimen when it can be seen in all its glory.

The Black Hairstreak is very similar to the White-letter Hairstreak and could easily be mistaken for an aberration called 'rufextensa'. The Black Hairstreak has a more golden brown ground colour than the pale chocolate of the White-letter Hairstreak. The red scales on the hindwing are more extensive and extend onto the forewing, which apart from the aberration mentioned above does not happen with the White-letter Hairstreak. The latter, however, has a complete black line of scales on the inner edge of the red scales which is reduced to a series of dots on the Black Hairstreak. Finally, both male and female Black Hairstreaks have some orange scales on the upper side of the hindwings which will only be seen if an individual is examined carefully in a net. Butterflies which have to be examined in a net should be released as quickly as possible and handled with extreme care. Black Hairstreaks are only found in the East Midlands in a line running South-West from Peterborough to

Oxford and one isolated area of Surrey so apart from in these areas the butterflies you find are almost certainly going to be White-letter Hairstreaks.

ABERRATIONS

Thursday, 25th July 1985 was a red-letter day, or in this case a white-letter day. The author, walking through the research area,found a most unusual specimen. Instead of there being the usual, thin, white hairstreak marking, it was as though the white line had been painted on and then, before it had been given a chance to dry it had been smudged. It was quite remarkable. Photographs were taken and then the specimen was caught. It was subsequently identified by Dr. Paul Whalley, of The Natural History Museum, as an aberration known as 'albovirgata' which means 'white striped'; this was only the fifth specimen ever caught.

Following on from this, a visit was arranged to see the White-letter Hairstreak aberrations and other specimens held in The Natural History Museum. However, there are very few compared with some species such as the Small Copper, *Lycaena phlaeas* and the Chalk-hill Blue, *Lysandra coridon* both of which have drawers full of aberrant specimens. The White-letter Hairstreak seems to have produced very few aberrations, which may be a clue as to why it was so badly under-recorded in the past. The Victorian collectors often put great store by the number and range of aberrations they had in their collections; a species that apparently produces so few aberrations would have lost a lot of its interest to them and they would have searched less diligently for it, preferring to collect species where they had a greater chance of taking an unusual specimen.

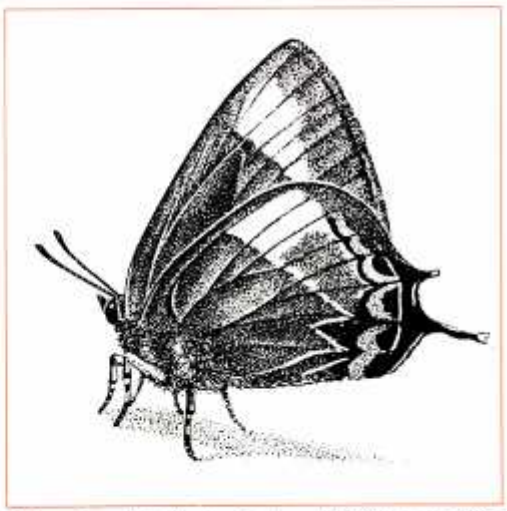

Figure 2 - ab. 'albovirgata' caught 25th July 1985 in Herefordshire.

So what aberrations have been recorded so far? The type description states that specimens should have a wing tip to wing tip measurement (usually known as the wingspan) of between 25-

35mm, therefore, anything that has a wingspan of less than 25mm is considered to be an aberration called 'minor', a specimen with a wingspan greater than 35mm is also an aberration called 'major'. There are few recorded specimens of either, although a few ab. 'major' have been found in the Caucasus and on the Parnassus. One ab. 'minor' was probably nothing more than a half-starved specimen as its larva had survived by eating Ash instead of the more normal larval food plant which is elm.

Earlier it was stated that the type specimen, first described to science, had an orange anal spot on the upper side of the hind wing, however, more than half of the British specimens looked at did not have this mark and are, therefore, classed as an aberration called 'obsoleta'.

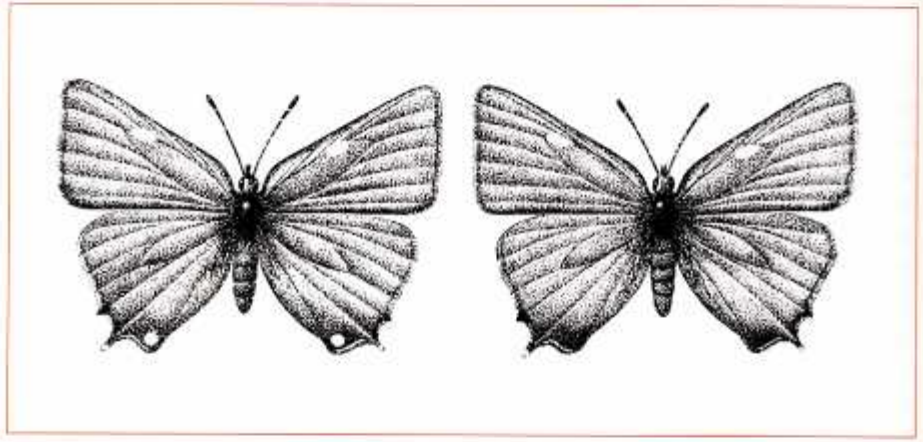

Figure 3 - This illustration shows two male butterflies. The specimen on the left has the small orange marks on the hindwings which is the 'type' specimen. The specimen on the right lacks this spot and is the aberration 'obsoleta'. The scent scales are the lighter patches on the forewings; these are only found in males.

'Rufextensa' is an aberration first caught at Symonds Yat, on the Herefordshire/ Gloucestershire border, in 1906, and possibly not recorded since. In this aberration the red band towards the outer margin of the underside of the hindwings is broader than in normal specimens. Also the band of black which normally borders this red band on its outer and inner margins is completely missing on the inner side. The red colouration also passes, untypically, onto the underside of the front wings as a chain of dots between the wing veins to the rear of the wings.

Another specimen exists where the normal dark brown coloration of the wings, thorax and abdomen has been replaced by a much paler sandy brown. The specimen is a male and the scent scales on the wings are also paler than the new wing colour; it is known as ab. 'albino'.

Ab. 'semialbovirgata' has wings on the right side which show the normal colour whereas those on the left are the same as ab. 'albovirgata". This specimen looks like a freak without the attractive qualities of the other aberrations.

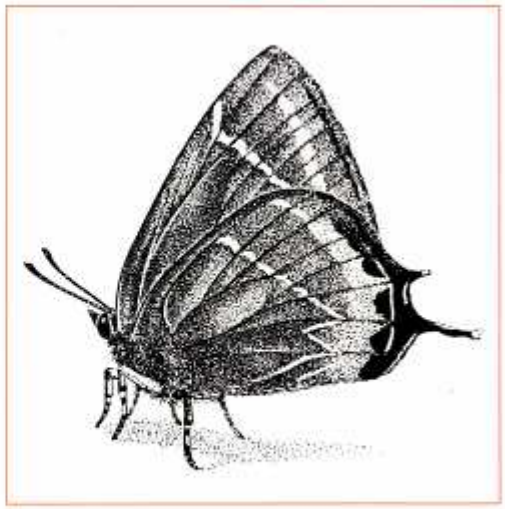

Figure 4 - The above illustration is the aberration 'rufextensa' which has additional red markings on the forewings and has lost some black scales from the hindwings.

The final aberration is described in a book published in 1906 by Tutt but is no longer listed in the official list in The Natural History Museum; this is ab. 'butlerowi' and it is distinguished by a lack of the white 'w' mark at the end of the hairstreak. So why is it no longer listed as specimens without this mark are still turning up now ? The reason could not be ascertained for certain but the following suggestion is offered based on many observations. It has been noticed that there is a range of intensity of coloration and completeness of the white hairstreak mark from intense to very faint, and a complete mark to a broken mark especially at the anal end where the 'w' may be partly or even completely absent. Thus ab. 'butlerowi' is only the end of a series of gradual changes that may not be obvious with a small range of specimens but as more are seen it becomes noticeable.

The above are the only aberrations we can find recorded. This is not a very impressive list when compared with some of the other species.

Life History

TIME OF APPEARANCE

The butterfly is on the wing from the beginning of July until mid August, although these dates can change if the weather is warm during the development period. In the summer of 1990, which followed a mild winter and a cold April the weather suddenly turned very warm from May 2nd onwards; as a result of these unusual conditions the first adults were seen on 19th June.

EGG LAYING

The adults search for elm trees on which to lay their eggs choosing Wych Elm - *Ulmus glabra* in preference to the other two common species English Elm - *U. procera* and Smooth-leaved Elm - *U. carpinifolia*. There are some sites where all three species exist together, and research carried out at one such site in 1984 confirmed this preference for Wych Elm; it also showed that the success rate was greater on Wych Elm (See Table 1 below which gives a summary of the records provided by Matthew Oates - pers. comm.).

The favoured site on a Wych Elm for laying the eggs is the girdle scar; this scar is found where the current year's growth joins last years growth on thin twigs. The scars show where the bud scales, which protected the terminal bud through the winter, were attached to the twig. On Common Elm, eggs are often found on the internode of last year's growth. It is rare to find more than two eggs on any one twig; where more than one egg is found it is often the result of more than one visit by a laying female over a period of time, or visits by different females.

Species of Elm	Number of Eggs	Number of Pupae	Success Rate
Wych Elm	32	12	37%
Smooth-leaved	48	9	19%
English or Common	20	4	20%

Table 1 - Elm Preference and Success Rate (Matthew Oates - pers. comm.) .

THE EGG

The eggs are about 0.8mm in diameter, round with a white rim and domed so that they are frequently likened to a 'Flying Saucer'. In the centre of the dome there is a small hole called a micropyle, through which the sperm, which fertilized the egg, passed. When first laid the egg is a dark sea green in colour but after about 48 hours this darkens to a dark chocolate brown, almost black. The white rim becomes darker and far less distinct by October.

Figure 5 - Two eggs laid at different times, possibly by different females, in the favoured position on Wych Elm, on the most recent girdle scar.

The eggs remain on the tree until the larvae hatches out in late winter, although the white rim fades with age.

THE LARVA

It is thought that some development of the larva takes place after the egg is laid but then there is a gap until development starts again prior to hatching. The switching on and off of the development is probably caused by temperature; as the average daily temperature falls off in the later part of the summer so development is halted, to be switched on again later as the temperature rises in the spring.

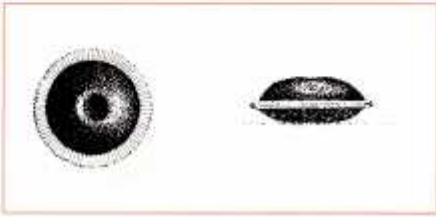

Figure 6 - The egg is about 0.8mm in diameter and when newly laid is deep sea green with a white rim. The sea green colour changes to a dark, chocolate brown after 48 hours.

Eventually the young larva emerges and unlike some other larvae it does not eat the remains of the egg, and these can be found still attached to the tree up to three months after they were vacated by the larva.

The larva moves along the elm twig until it finds a bud, usually a flower bud, which it bores into and then devours the contents, before moving on to the

next bud. When it first hatches out of its egg the larva is only a few millimetres long, 1.5 - 3mm. It is olive green, but covered in short black spines which give it a darker appearance. It feeds avidly on the contents of elm buds and after 6 days it sheds its skin and then grows rapidly for a day or two before its new skin has hardened off by a tanning process, preventing further growth until the next change of skin. The moult of a skin is called an ecdysis and each stage of a larva's life is called an instar. This means that it is the first instar that emerges from the egg, this undergoes ecdysis after about 6 days becoming the larger, (5-6mm long) second instar larva.

The second instar also feeds on part of the elm, preferring the flowers and the developing seed clusters to the buds. Elm flowers are pink in colour and the second instar also takes on this colour for camouflage. This stage lasts for 17 days and then the instar undergoes a second ecdysis resulting in the third instar, which is about 6.5-7.5mm long and lasts for about 12 days on average. Developing seeds and the young leaves are the next part of the elm to be attacked and in a year when the butterfly is common a considerable amount of damage can be done to the tree. As elm leaves develop they are pale green and folded in half along the midrib; the third instar mimics this shape and colour with an incredible accuracy, resulting in a superb camouflage.

Figure 7 - The seeds and young leaves form the main food of the third instar, note how the instar resembles the unopened leaf.

The fourth and final instar is probably the easiest to find. It is the largest, 15-16mm, which makes it more obvious despite the camouflage, and like the third instar it also mimics the young folded leaves. It rests on the underside of the leaf alongside the midrib and it is possible to stand under an elm tree and look up when the sun is shining on the leaves and see the dark shape of the larva in silhouette. The fourth instar feeds on the leaves and chews out large panels leaving a characteristic feeding pattern. As elms are also fed on by about five species of moth, another butterfly, the Comma *Polygonia c-album* and a Sawfly, a lot of damage can be done to the leaves. By recognising the correct patterns of feeding damage it is possible to find new colonies more readily. First spot the damaged leaves and you can then spend more time looking at those trees rather than other elms without the characteristic feeding patterns.

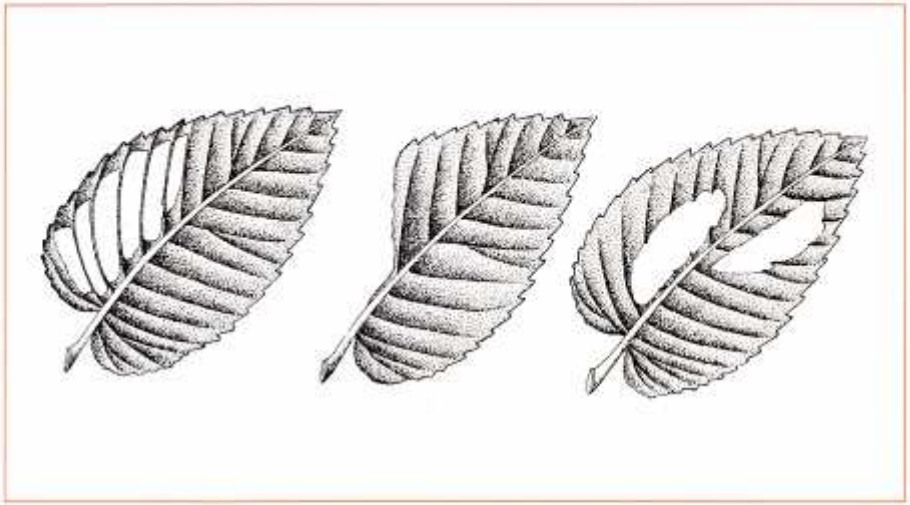

Figure 8 - The characteristic feeding pattern made by White-letter Hairstreak larvae on Wych Elm leaves.

All of the various instars are olive green (with pink overtones in the second instar) or greenish in colour as you would expect of an animal that relies on camouflage amongst various green plant structures for its survival. However, the colour can change. The early instars are olive green or a pinky green to match the colour of the flowerbuds or elm flowers, but as the leaves darken with maturity so the green of the two later instars changes to match. As well as this change in base colour, apparently all of the larvae take on a grey colour

about 24 - 36 hours before they change from larva to pupa. Larvae have also been found with a pair of black marks on the upper surface of the hind end of their abdomen. Originally it was thought that this could be the result of an attack by a parasite, probably a small wasp. As the first of these marked caterpillars was not caught it was impossible to confirm that this was the case, however, a second larva caught in 1991 successfully pupated with no sign of being infested by a parasite, so the origin of these black marks is still not known.

Many Lycaenid larvae have an association with ants of one species or another. For example the Large Blue, *Maculinea arion,* completes its development as a larva in the nest of an ant. It was the loss of the ants' nests that caused this butterfly to become extinct in Britain. There is no evidence to suggest that the White-letter Hairstreak is dependent on ants to complete its life cycle. However, individual larvae are sometimes attended by the large Wood Ants.

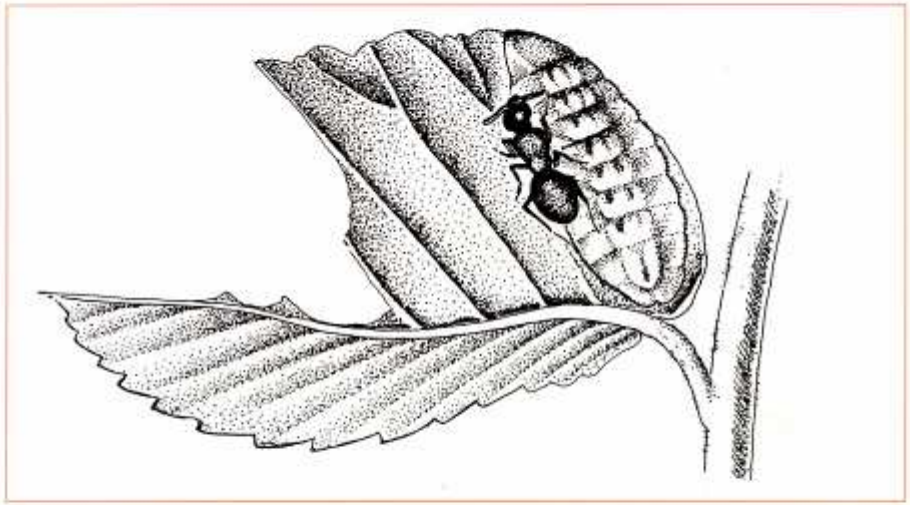

Figure 9 - Fourth instar being attended by Wood Ants.

The larva possesses a gland, towards the rear of its body, which makes a sweet liquid which ants find irresistible. It was impossible to tell whether the Wood Ants were after the secretion of this gland or simply regarded the larvae as a potential afternoon snack. If it was the latter they went away disappointed unable to harm the larvae. More likely they were interested in the secretion.

The advantage to the larvae being the protection afforded to it by the proximity of the Wood Ants who would undoubtedly keep some of the larvae's other enemies away.

THE PUPA

The next stage in the life cycle is the pupa or chrysalis which lasts for about 26 - 28 days under normal circumstances, but can be as short as 20 days with specimens in captivity. The pupa is about 9mm long and very rounded. It is mid-brown in colour with dark brown patches at one end, and looks like an elm bud. The usual site for the pupa is on the underside of a terminal leaf, or lying along the midrib on other leaves. A few will pupate openly on the stem which they match well in colour and one or two may be found in the forks of twigs. One pupa found was halfway along a 30cm strip of bark hanging from the end of a large twig. The pupa is held in place by a pad of silk at one end and a cremaster which is a silken thread or girdle.

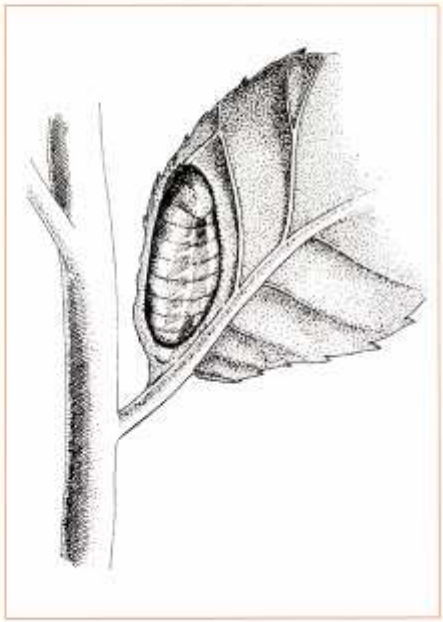

Figure 10 - Pupa of a White-letter Hairstreak showing the silken pad and the cremaster.

When the butterfly emerges, the pupal case is left attached to the leaf or twig. It is worth looking for one as it is interesting to see the way the butterfly makes two flaps in one end which are hinged and bent back like a pair of garage doors. As the pupal case ages it becomes dry and brittle and eventually disintegrates, but some will survive for a few weeks after the end of the adult flight period and provide evidence that the elms are being used as breeding trees. The author has never found pupae anywhere but on elm trees although that does not prove that they only pupate on elm. He has rarely looked elsewhere for them; he has never tried looking for a needle in a haystack either ! The pupae are fairly easy to find on elm and it is always worth looking for them in late May and June. The trick of standing under the tree and looking up through the leaves when the sun is shining is again helpful.

THE ADULT

The adult butterfly is a delightful and delicate insect which first puts in an appearance at the beginning of July, at least in Herefordshire. However, the date can vary depending on the weather in the spring, and in 1990 it came out as early as the 19th June. As with most, if not all butterflies, the colours of freshly emerged adults look brighter and fresher than those that have been around for a few days. This is due to wear and tear, scales being lost and colours fading over the few days that the adults live, so it is worth getting to those elm trees early in the season to see them at their best.

Behaviour and feeding habits

The adults spend much of their life resting high up on the elm trees used for breeding or other adjacent trees. They will certainly feed on the sticky secretion, called honeydew, that is left by aphids on the leaves of these trees. It is also thought that courtship and mating must occur in the tree canopy as it has, as far as I know, only been observed once! The author was lucky enough to find and photograph a mating pair of the butterflies on a thistle head in 1984. It is also thought that the density of eggs is greater towards the top of the tree than on the lower branches. However, many of these facts still need checking, the problem is how to reach all parts of the tree and find out. An attempt was made to solve this problem in 1984 by erecting a scaffold tower next to an elm used for breeding but apart from arousing a lot of interest from some members of the public who passed by, and a few strange remarks from others, it did not tell us much about the butterfly and its habits.

During the summers of 1984-6 a number of experiments were carried out which involved capturing the butterflies, marking them with an individual code and then releasing them. On subsequent days the procedure was repeated for new specimens and some of those marked on previous days would be recaught. The colony studied was found on either side of a ride through what had previously been a Larch Plantation within a Forestry Commission wood. The Larches had not been a great success and were clear felled leaving the deciduous Elm, Ash, Oak and Beech along the edge of the ride. The colony extended for about 345m and pegs were put in the ground every 15m, so that it was possible to record where and what each butterfly was doing using, pre-printed sheets. Two typical entries are given in table 2 opposite.

INITIAL CAPTURE				RECAPTURES			
Colour	**Date**	**Sex**	**Position**	**Nectar**	**Date**	**Position**	**Nectar**
Br-Bla-Br	8/7	M	60m	Creeping Thistle	16/7	60m	Creeping Thistle
					20/7	60m	Creeping Thistle
Ma-Y-lG	18/7	F	105m	Creeping Thistle	21/7	75m	Creeping Thistle
					29/7	165m	resting on Teasel

Table 2 - Extracts from Mark/Recapture Sheets.

The codes Br-Bla-Br (Brown-Black-Brown) and Ma-Y-lG (Maroon-Yellow-light Green) are two of the unique coloured spot sequences which were used to identify individual butterflies. By recording this information a great deal was learnt about the habits of the butterfly, including the following.

a) Favoured Nectar sources.
b) Movement about the colony
c) Average time spent on the colony.
d) Ratio of Males to Females during the flight period of the adult.

The adults will come down to take nectar from a range of plants, presumably more often in times of shortage of the aphid honeydew. Over the three years of recording the favoured nectar source was Creeping Thistle (See Table 3). This was despite the presence of many other plants such as Bramble and Ragwort which were being used by other species of butterflies and insects. Many of the books we looked at before embarking on this study stated that Bramble was the usual nectar source, but this was totally eclipsed by the Creeping Thistle. Although there were many Marsh Thistle plants we did not see a White-letter Hairstreak using this species once during the three years. A small patch of Marjoram which covered about 0.5m^2 was quite popular and if there had been more of it I am sure it would have figured more highly in the list. Subsequently I have received a number of reports of this butterfly using other nectar sources. Since completing the quantitative study the amount of Creeping Thistle has declined; this may be due to Forestry management or

the natural succession following the removal of the Larches and the consequent opening up of the ride. One further point about the use of the Creeping Thistle is that of disguise, the colouring and wing shape of the butterfly make it look uncommonly like the pointed end of a leaf sticking up behind a flower. The researchers were frequently caught out nearly netting leaves and almost missing adult butterflies. The moral of this tale is seek and there is a good chance you will find, paying particular attention to Creeping Thistle, but do be patient and look round the backs of the flowers as they will feed from the side and not just from the top.

Nectar Source	Approximate % of captures nectaring		
	1984	1985	1986
Creeping Thistle	75	78	91
Bramble	3	2	3
Ragwort	20	9	4
Marjoram	2	4	1
Hemp Agrimony	<1	2	1
Clematis		<1	
Sow Thistle		<1	
Teasel		<1	

Table 3 - Nectar Sources.

The colony was long and thin, with the elms spaced out evenly along it. As already stated, one of the records kept for each adult was the positions on the colony where they were caught. This led to the interesting observation that the butterfly does not like flying or moving through shaded areas. In fact apart from females crawling around on low elm branches looking for sites to lay eggs or the occasional, freshly emerged adult still drying its wings off, all of the adults were found in the sun. In two places belts of deciduous trees crossed the path and in these places there was almost continuous shade during the day. Adults seldom passed through or over these shaded areas.

At the start of each flight season the males emerged first, followed two or so days later by the first of the females. Also, surprisingly, it was males that predominated at the end of the season. The total numbers of adults caught during the period from the 7th July 1986 - 16th August 1986 show a close approximation to the 50:50 ratio, 54:46 male to female. The slight disparity may be attributable to the females spending time crawling around on the elms

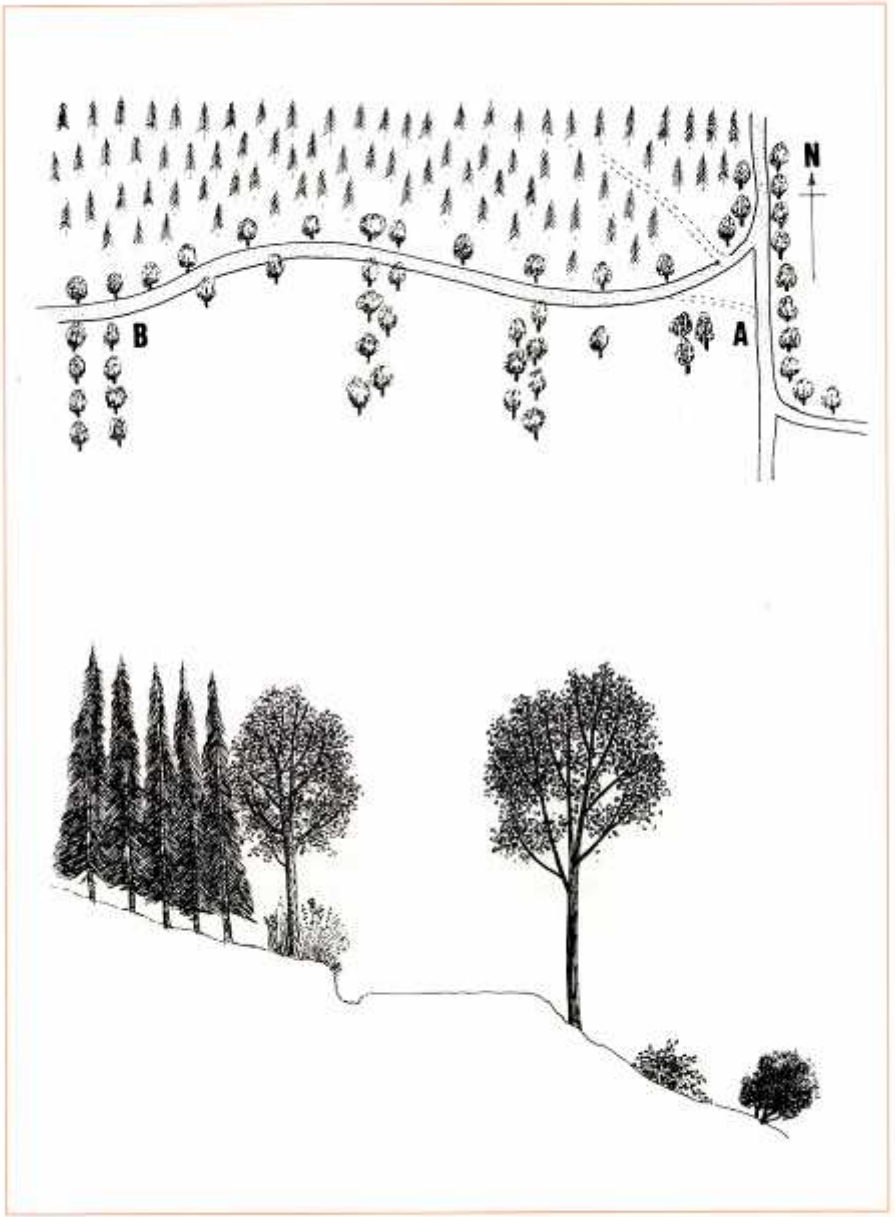

Figure 11 - Sketch map and cross section of the study colony.

looking for suitable sites to lay eggs. Another strange phenomenon noticed was that on the days when it was possible to put in a longer spell marking, say from 2pm until 6pm, it was often females recorded at first feeding on nectar, and then the males later on in the afternoon. The reason for this is unknown but one possible reason may be that the females needed to replenish their energy supplies after a morning spent in egg laying, whilst the males remained up in the canopy waiting for unmated females to come by, until they too felt the need to come down to refuel.

It is not known how long the adults live. One thing is certain that many fall prey to predators such as birds and spiders. Adults were found trapped in spiders' webs, and the capturing of an adult by a crab spider lurking on a Creeping Thistle flower was also witnessed. Many adults also showed evidence of unsuccessful attacks by birds, 'beak-shaped' pieces missing from their wings, often at the bottom of their hindwings where the 'tails' on the wings and colouring mislead the birds into believing they are attacking the insect's head. Some adults had much damage to their wings with up to 20% missing and still seemed able to fly, however the Wood Ants would soon finish off any that fell to the ground unable to fly.

What the figures did show was that the males and females spent, an average of about 8 - 9 days on the wing in the colony. This can not be equated to life expectancy, because it does not take into account the fact that some of the adults may leave the colony in an attempt to spread and colonise new areas. It is known that the adults can survive for longer than this; one male was recaught after a period of 21 days and, although worn, was able to fly off quite happily when released. It is also known that adults do emigrate, as they turn up in places away from the nearest colony. They obviously need sustenance on their journey; one record received was for the car park of a public house on the edge of the Black Mountains. It is not certain who was visiting the pub, the recorder or the butterfly! Whenever a nectaring butterfly was caught to mark it was handled with great care and usually put back on the same flower. By holding them there for a minute they could often be induced to start nectaring again and when released from the specially adapted forceps they would carry on as if nothing had happened. On other occasions they would immediately take to the wing; often the flight path was a vertical spiral until they were pointing in the direction of a large tree whereupon they flew straight for it and rested high up.

The adult males have been recorded 'feeding' on stony paths, it is thought that, along with most other butterflies, the male passes mineral salts, in particular sodium, as a component of sperm, during mating. The female uses these minerals to augment her own supply to make the egg shells that she will produce. This leaves the male short of some essential chemicals which he needs to allow the normal chemical reactions to take place inside his cells, and he has to replenish his reserves as quickly as possible. One way seems to be to absorb these minerals from paths and stone roads although how they manage to get anything from something as dry and inhospitable as these paths is a mystery! Some lepidopterists believe that the butterflies wipe the path or ground with their saliva, which dissolves the minerals from the substrate. The dissolved minerals are then taken into the male's body through his proboscis and eventually reach the cells. It is thought that the unsavoury habits that some butterflies have of feeding on dung and urine may be connected with the need to replenish vital minerals and amino-acids which are used to make protein. No record of the White-letter Hairstreak involving itself in this behaviour has been reported.

This is only an insight into some aspects of the life of this fascinating little butterfly. Much more is unknown and still waits to be unravelled. A casual observation may yet lead to some interesting new facet of its life history being revealed. So there is plenty of scope for further observation and research.

Finding them

One problem with this butterfly is its elusiveness. It can be very hard to find, in fact it is often easier to find eggs, larvae or pupae in season than the adults (See table 4).

Eggs	July/August - February/March
Larvae	February/March - May/June
Pupae	May - July
Larvae	July - August (In exceptionally early and/or warm spring adults may appear in June.)

Table 4 - Life Cycle

It is undoubtedly true that many colonies disappeared because of the losses

caused by Dutch Elm Disease. It is also true, however, that many colonies, which had existed unrecorded for many years came to light as a result of the special effort that was made in the mid 1980s. In Herefordshire, many new colonies were discovered and recorders almost came to expect to find them on every patch of elm that they searched. Many new colonies were also found in Cheshire, Derbyshire, Hampshire, Nottinghamshire, Staffordshire and Yorkshire. Limited success was had in Gloucestershire and Lancashire, and the northern boundary for the species was pushed a few miles nearer the Scottish border on both sides of the Pennines. An independent survey in Essex also discovered many new colonies which should give anybody hope that they will discover new colonies if they pluck up courage and go out and look for them. The paucity of records for some counties probably shows a paucity of recorders rather than of colonies; this is often true for many of the more sedentary or localised species and not just the White-letter Hairstreak. There are two records for Scotland both in the 19th Century, but if some of the predictions about global warming are to be believed then we can expect to find a gradual expansion northwards through Cumbria and Northumberland and possibly into Scotland again. The species has not been recorded in Ireland nor from the Isle of Man. The species was found in all but one of the old Welsh counties, the exception being Anglesey - even though it was found in woods near Bangor overlooking the Menai Straits. Distribution maps show that most Welsh colonies are close to the coast, but again the suspicion is that the lack of records for large parts of Wales is due to the lack of recorders.

If you are keen to find new colonies, first find your elms then start looking for the appropriate stage in its life cycle. Any elms are worth investigating. Mature Wych Elm is the favourite, but small elms less than 7m high will play host to a colony, if there are enough similar sized trees around. One colony found in Worcestershire was based on some Common Elms that had been allowed to develop into a small, triangular thicket where two hedges met. None of the elms were more than twenty feet high and the thicket was only 14m long and about 5m wide at it's base. The hedges radiating out from the thicket were predominantly elm and even though they had been cut down to about 1.5m in height, they could well provide an important route for females to disperse along to find new breeding sites. On the edges of woods or along the ride edges within woods are the best places to look, especially if they are south-facing. The presence of other trees increases the chances of there being sufficient aphid honeydew present to sustain the colony, but a supply

of suitable nectar sources nearby is also an advantage. Even single trees of a suitably large size will support colonies. Two such trees were found in 1984; one about 50m from the home of the author on the edge of a Council playing field, within Hereford's City boundary, and a second on the side of one of the Malvern Hills.

It is a natural reaction to go out looking for butterflies on the first decent day after a spell of cold, wet and/or windy weather, but, if you can contain your natural impatience, we suggest leaving it for an extra 24 hours. In our experience you are more likely to be successful on the second and subsequent days after the return of better weather than on the first.

The maps in Figures 12,13 and 14 illustrate what can happen when people go out and look for a butterfly. Many of these records were for eggs, larvae and, in one instance, an empty pupal case with no adults being seen.

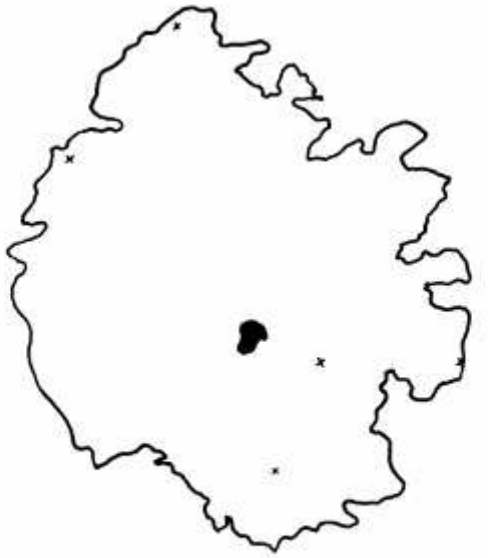

Figure 12 - Herefordshire records for the period 1976 - 1979.

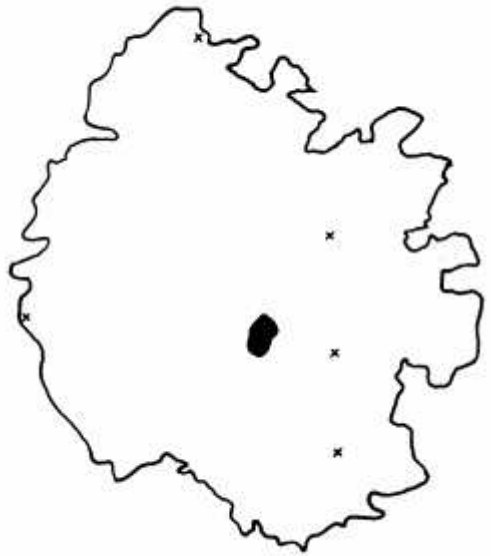

Figure 13 - Additional Herefordshire records for the period 1980-1983.

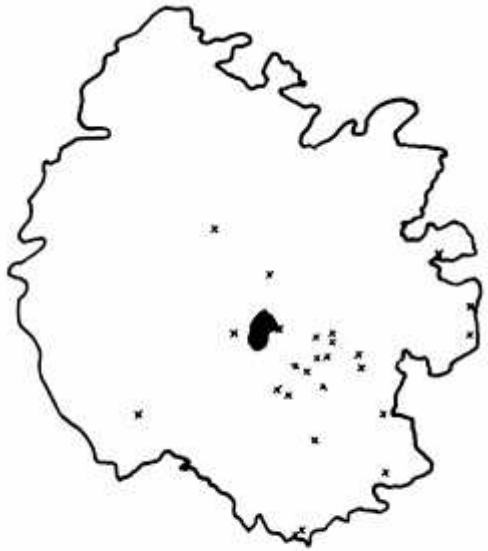

Figure 14 - Additional Herefordshire records for the period 1984-1991.

What of the future ?

Dutch Elm Disease is still very much present and many small trees which survived the first wave of the disease because they were too small are likely to be affected in subsequent outbreaks. This will undoubtedly further reduce the number of colonies in existence, but the continuing destruction of natural habitats by agricultural and silvicultural developments, such as the destruction of hedgerows, coniferisation, road developments, the building of new industrial and domestic units and all of the other pressures exerted by man are more likely to reduce the number of colonies further.

It would help the butterfly a little if people could be encouraged to plant Dutch Elm Disease resistant trees, such as 'Sapporo Autumn Gold'. This is a hybrid from a cross between two species *U. japonica* and *U. pumila*, and it has been shown in a research programme carried out by the West Midlands Branch of Butterfly Conservation, that the larvae will live, and successfully pupate, on young, non-flowering plants of this tree. The planting of these trees is obviously of greater value if they are planted close to an existing colony of the insect. I do not know if trees that are infected by Dutch Elm Disease are of any value for their timber. If you are unfortunate to get the disease on trees on your land it would make sense to remove the infected timber quickly, either by selling it to a timber merchant, or if it has no value, by burning it. Books written before 1980 often state that colonies of the butterfly cannot survive on non-flowering elm trees; this is simply not true. The larva of the White-letter Hairstreak will grow and pupate on suckering and short hedgerow elms, although it will probably have a lower success rate. Death of the mature elms does not necessarily mean the end of the colony, it may survive at a lower density on regenerating elm and sucker growth long enough for a planting programme of resistant elms to grow and provide a new home for the colony.

It may come as a surprise, therefore, that it is expected that the number of known colonies will increase rather than decrease! This will happen as a growing interest in, and awareness of, the plight of our butterflies encourages people to go out and look for the butterfly. We must be careful, therefore, that the discovery of new colonies does not mask the underlying trend which will be a reduction in the total number of colonies from all the causes listed above.

If this little book does nothing else I hope it will encourage people to go out and look for this delightful little butterfly. They may be lucky and actually find a new

colony. Even if they are unsuccessful at first, they should keep looking, eventually they will have success.

Many books have been written about butterflies in recent years. If you would like to find out more about the White-letter Hairstreak or butterflies in general the following books are worth reading. This is a personal choice of books that have been read, enjoyed and found useful.

A Complete Guide to British Butterflies,
Brookes and Knight
Book Club Associates, London.

Butterfly Watching,
Whalley
Severn House Publishers Ltd. ISBN 0-7278-2002-8

The Natural History of Butterflies,
Feltwell
Croom Helm. ISBN 0-7099-1059-2

The Moths & Butterflies of Great Britain & Ireland Vol 7(part 1),
Emmet and Heath
Harley Books. ISBN 0 946589 25 9

Butterflies of the British Isles
R.S.N.C. Guide
Thomas
Hamlyn.

The Butterflies of Britain and Ireland
Thomas and Lewington
Dorling Kindersley. ISBN 0-86318-591-6

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I would like to acknowledge the help and support of a number of groups and individuals. Firstly the World Wildlife Fund for their support and Associated Tyre Specialists (ATS) Ltd., for their sponsorship. Mike Williams for getting me involved in the first place. Adrian Hoskins (who took the picture on the front over), Matthew Oates, Graham Swift and Martin White who acted as regional co-ordinators and gathered information from local enthusiasts, recorders etc., and carried out much research work. To the members of Butterfly Conservation who helped with a lot of the field work in Herefordshire during the survey - Jane Follett, Rob Hall, Andy Nicholls, John Pembridge, John Preston, Les Smith, Jeremy Soulsby and Tim Wildridge. Also the County recorders who supplied so much information so readily, too numerous to mention individually, they were a great help. Dr Martin Warren who helped with some of the mathematical interpretation and offered encouragement. To all members of Butterfly Conservation who sent in reports, their response was magnificent, the information invaluable. Thanks must also be given to the Forestry Commission for their active help and support, and those members of Butterfly Conservation who have used their professional talents to produce this book in their spare time.

It is invidious to mention individuals but three deserve special thanks. Barry Fleming who spent hours, day after day, for three successive summers carrying out the mark / recapture experiments and during that time marked over 900 adult specimens and made many other observations at the Herefordshire site. The second is Bryan Ceney whose illustrations have made this butterfly come alive on these pages. Finally my wife, Diana, who put up with my comings and goings, produced meals at odd times, took numerous phone messages because I was out, continued to look after our two young sons, and still had to endure all of the talk about 'That Butterfly'!

Martyn G Davies
January 1992

The Author

Martyn Davies studied Zoology and Marine Biology at the University College of North Wales, Bangor, before going on to Bristol University to gain a Postgraduate Certificate in Education in 1973. Since leaving University he has worked at Whitecross High School, Hereford. He rekindled a childhood interest in butterflies when he failed to find any marine environments near Hereford. He became an active member of Butterfly Conservation and is currently Chairman of the Information and Education Committee.
Married with two sons, Andrew and Matthew, who can both tell the difference between a Peacock and a Small Tortoiseshell, in fact Matthew, at the age of five, told his teacher that there was no such thing as a Cabbage White, it was either a Small White or a Large White. They say that teachers' children are the worst !

The Illustrator

Bryan Ceney is an active committee member of the London Branch of Butterfly Conservation and much of his fine artwork has been used by the Branch at the various festivals and displays they attend. He plays a leading role in programmes of winter conservation work in different habitats.

His artistic talents were spotted at an early age when he won the 1953 Daily Mirror Children's Painting Competition. Later he worked as an illustrator in the aircraft industry and in 1957 was employed by the Canadian Airforce in Toronto and Ottawa. He studied the use of photography in advertising and the arts in New York and in 1978 had his first one-man exhibition at Farnborough in Hampshire. More recently he has exhibited in the Society of Wildlife Artists' exhibition at the Mall Galleries in London and at the Royal Academy.

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Collects data nationally and runs the Butterfly Recording Scheme.

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The White-letter Hairstreak Butterfly is just one of a series of booklets being produced by Butterfly Conservation. The others either available or in production will include:

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11. The Swallowtail Butterfly
12. The White-letter Hairstreak Butterfly

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