The Secret Life of Laeosopis evippus (HÜBNER, 1793) (Lepidoptera : Lycanidae)

Pieter Kan, Brigitte Kan – van Limburg Stirum
La Ferrage du Ray, 83830 Callas E-mail : P.Kan@wanadoo.fr

Translated by **Mo Scott** from French to English
Lépidoptères – Revue des Lépidoptéristes de France : Vol.18 – N° 44 Decembre 2009

Abstract

Little is known about the ecology an biology of the Spanish Purple Hairstreak (*Laeosopis evippus*). A research since 2003 un till 2009, about a small population *Laeosopis evippus* on an isolated place in the river bed of the Endre in the South of France, leaded to surprising discoveries. So was found the most important host plant wasn't the Ash tree but proved to be two species of Phillyrea (*P.latifolia* and *P.angustifolia*). Newly-laid eggs are a remarkable red colour. Most of the eggs were found less than 20cm from soil level. In summer it's hot and very dry, and in winter the small river is transformed by heavy rain into a torrent which floods the Gorge and the host plants. Further wise the females appeared to choose only those host plants who would be submerged during winter floods in a strong torrent. During the winter of 2009 the eggs were monitored. After being submerged the eggs change colour and become off-white, blending in with the bark. Eggs that undergo submersion, hatch quicker than eggs which have not received this treatment. Since they've hatched the caterpillars are surrounded by and cared for by ants (*Lasius niger* and *Lasius cinereus*). The caterpillars venture out at nightfall to feed. During the day they hide in the leaf litter. During the flight period males start posting after 2 PM.
In order to investigate its lifecycle, the authors filmed all of their discoveries.

Key words

Laeosopis, evippus, biologie, comportement, behaviour, larval foot plant, Var, France.

Introduction

The Spanish Purple Hairstreak (*Laeosopis evippus*) not only occurs on the Iberian Peninsula but also in the Midi of France. It is however rare to encounter it because the populations are localised. In June, one generation is on the wing and it hibernates in egg form.
We have had the opportunity to be able to follow it closely for several years.
Our first sighting of this elusive butterfly took place in June 1997 in the Gorges de Pennafort, Callas in the Var. It wasn't just a one-off appearance but one that was significant enough to arouse our curiosity. We tried to obtain as much information as possible about this species. Unfortunately there was very little available about it's way of life.

A Population by the River Endre

The following years we decided to search for this butterfly, but without success. Than the 15th June 2003 brought us success at last. After a difficult trek through dense vegetation at the bottom of the gorge of the River Endre we found 6 butterflies on a flowering Christ's Thorn bush (*Paliurus spinachristi*) in a wonderful almost inaccessible location. Here the Endre widens, flowing over the rocks in an S-shape, and empties into a small pool about 15m across. Where the river had burst it's banks after heavy rain the area was covered with pebbles, sand, and small bushes 2-3 m in height, most of which were broad-leaved species *Phillyrea latifolia*, several European Privets (*Ligustrum vulgare*), Turpentine Tree (*Pistachia terebinthus*), Italian Buckthorn (*Rhamnus*

alaternus) and Prinkly juniper (*Juniperus* oxycedrus) surrounded by large Ash trees (*Fraxinus angustifolia*), as well as several Poplars and Hackberries.

In 2006 we decided to film the butterflies of our region. We regularly went on expedition with the camera and consequently we were able to film the following events.
On the 10th June, towards 10.15am several *Laeosopis evippus* were drinking from the flowers of a Christ's Thorn bush, and to our surprise (at11am) we discovered more of them, between the leaves of a small Hawthorn (*Crataegus oxyacantha*), feeding off the branches. Yet there wasn't any sign of aphids that had deposited drops of honeydew. We have mentioned that the vegetation in the area of the Hawthorn had been flooded by the stream breaking it's banks the previous winter. Some fragments of wood and piles of plants carried down by the current were visible nearly 2m up in the shrubs. It's possible that the butterflies were feeding on the mineral salts deposited on the branches as a result of the flooding. Several days later on the 14th June, around 11.45am, we saw a dozen *L. roboris* feeding on honeydew on the large leaves of a Downy Oak (*Quercus pubescens*).

In January 2008 we went in search of the eggs of *Laeosopis evippus*. From our experience of the Spanish Purple Hairstreak, we looked particularly at the accessible buds at the top of the oak as well as the buds on the branches. Unfortunately we didn't find any.

Territorial behaviour

After a very wet and cold winter and spring, we visited our site on the 10th June at 10.30am. Between 11am and 12.30pm we spotted mostly males drinking from Maritime Camomile (*Anthemis maritimus*) and Christ's Thorn (*Paliurus spinachristi*). From 12.30pm until 3pm the butterflies were well hidden in the bushes and immobile. At 3pm some other males began to fly around the *Phillyrea latifolia* and the Turpentine Tree (*Pistachia terebinthus*). After a quick flight, the males came to rest cautiously on the leaves to warm up in the sun's rays, opening their wings, then took off to chase the other males. From time to time two males chased each other, then flew off to a look-out post in a shrub so they could watch over their territory.
Around 3pm a female appeared from the leave litter and climbed up the trunk of a *Phillyrea latifolia* then rested on a leaf about 1½ m from the ground half in the sun and half in the shade. She was resting on her feet. Without doubt she was newly hatched… This was very surprising because there weren't any Ash trees nearby. Several females were resting on some *Phillyrea latifolia*. When we left around 5.30pm the males were still vigorously patrolling the area.

The Courtship

On the 20th June we arrived at the bottom of the Gorge at about 3pm. The very new females were resting 1m up in a *Phillyrea latifolia*, half in the shade, their wings closed,
slowly stroking their fore wings with their hind wings. At this stage the males were ignoring them. Towards 3.30pm the females became more active. One female groomed herself, turned around, then flew a little higher up, where she could be in the sun and in view of the males, wings half-open. A male spotted her almost immediately, after a short courtship flight, mating followed high up in a Wild Dog Rose (*Rosa canina*).
Half an hour later another female came out of her hiding place and positioned herself a little higher where she also began a little tour of her leaf, wings half open. A little later on she was also spotted by a male, a short courtship followed, and they mated a little higher up in the same bush. A third female displayed the same behaviour. We were interested to see how long the mating lasted, but at 7pm it was time to go. So we left while the butterflies were still in the act (the first mating lasted nearly 3 hours), despite the drop in ambient temperature.

Egg Laying

The next day, on 21st June, at 2.30pm we were once again at our lovers' rendez-vous. The

number of males patrolling the bush in search of a female was considerably less than we reported the day before. We saw a female lingering on a *Phillyrea latifolia* which instead of staying seated, withdrew into the bush. Whilst exploring the bush with her antennae, she climbed down the stem stopping at each branch testing the surroundings with her abdomen and continued down to the base of the stem. It was obvious that she was looking for somewhere to lay her eggs! Strangely enough she was not on an Ash tree! On exploring deeper into the twigs the female had laid a big red egg near a lateral branch. The same day three more females penetrated the bushes *Phillyrea latifolia* and laid their eggs in several places going as far down as the soil. One egg was also placed on a dead branch. The location where the eggs were laid was even more astonishing because it was where the Gorge was completely flooded the previous winter after the heavy rains and implies that the eggs would be subjected to very strong currents. Continuing our search this day we found dozens of newly laid eggs on several small *Phillyrea latifolia*, and a small *Phillyrea angustifolia*, most of them less than 20cm up. We collected two that were laid on *Phillyrea latifolia*, and another laid on *Phillyrea angustifolia*, so that we could follow their development more closely. Downstream the Endre is more wooded and we were surprised to see on 27th June a female flying downstream, and to our great surprise go into a small Narrow-leaved Ash (*Fraxinus angustifolia*) growing amongst several big rocks and its branches just above the water. For certain she laid 3 eggs on one of these branches which would, without doubt, be immersed by the winter current, the eggs included.

Over-wintering of the Eggs

From mid-September 2008 there was a lot of rain (90 mm) and the Gorge was flooded on several occasions. Between the end of October and the first week of November more than 200mm fell. As soon as the weather permitted, we returned on 25th November to examine the eggs. It was obvious that the eggs had been immersed and we could report that they had all faded and all turned an off-white colour. Some debris was present on the host plants. The 4 eggs laid on the *Phillyrea latifolia* were still there. We found 2 of the 3 eggs on *Fraxinus angustifolia*. Throughout the winter there was heavy rain in Provence (between the end of November and the beginning of February around 450mm).

At the beginning of the spring, the 3 eggs that we had brought back with us were still their red colour even though we subjected them to immersion in cold stream water 3 times for 30 minutes.

On the 26th March 2009, we went down to the Gorge to look at the condition of the eggs, and to check if they had hatched. Many of the shrubs growing in the river bed had been taken away by the current and several trees had fallen. The smallest bushes were tangled with leaves and piles of weeds, evidence that there had been strong currents. In the bush containing the eggs, the most exposed ones had disappeared. The ones which were a little further inside the bush were still there. They had however the head start of further fading but had not yet hatched.

Hatching of the eggs

On the 31st March at 8am some action appeared in one of the eggs, it wasn't until 28 hours later that a little caterpillar emerged from it's shell on the 1st April at about 11am. Out of ignorance we had put the caterpillar on a branch of Mediterranean Buckthorn (*Rhamnus alaternus*) which we had confused with *Phillyrea latifolia*. The caterpillar after examining the branch, the leaves and the flowers which he wasn't at all happy with, ended up quitting the plant at about 4pm the next day. We should note that the caterpillar often reared up when orientating itself. Quickly we picked a branch of Common Ash (*Fraxinus excelsior*), without any flowers. The caterpillar immediately enjoyed eating the newly opened leaves.

On the 8th April the eggs in the Gorge had still not hatched. We broke off a branch from *Phillyrea angustifolia* with one egg and brought it back with us.
On returning we were surprised to see ants patrolling around the caterpillar on the *Fraxinus*

excelsior. It had left the leaf to find a better sheltered spot, in a leaf bract, most likely to moult. Two ants (*Crematogaster scutellaris*) were keeping guard. After a shower of rain, it was completely submerged in it's hiding place. It was several hours before the water completely evaporated. Luckily the caterpillar (4mm) survived this mishap and since ate mostly in the evenings and hid during the day at the base of the stem in the shade, and were *Crematogaster scutellaris* chased by *Lasius niger*.

The following days the 2 other eggs that we had collected the previous year hatched in 24 hours. On the 25th April the egg which had spent the winter in the Gorge had also hatched in less than 2 hours. It seems that the immersion of the egg in the icy current aids and speeds up the hatching of the caterpillar. It's plain that further studies on the subject are necessary to rule out any degree of happenstance.

The Caterpillars

The same day we went back to examine the condition of the 2 eggs that we left in the Gorge. We found two little caterpillars, 1mm in size, inside a bud of *Fraxinus angustifolia*, on a branch brushing the river. We got the impression that they were not feeding on the plant but on the debris in the branch, wedged here during the floods. They were guided by ants (*Lasius cinereus*) which did not leave them for a moment.

Sadly, one by one, we lost sight of our 3 little caterpillars on the Phillyrea, partly because of their small size (2-5mm) and because of their perfect camouflage, and perhaps more as a result of a change in their environment to a very sunny one with us, and no-where to shelter. At the time we overlooked the need for the caterpillars to have somewhere to sleep. Although they inhabit a dry and arid habitat, they really need shade and humidity to survive. Only the caterpillar living on the Ash branch, protected from the sun, and well surrounded by *Lasius niger* survived for a month. It grew to 1.5cm, then disappeared mysteriously.

We still don't have any proof that the caterpillars feed on the leaves of Phillyrea. To understand better, we went back to the Gorge to look for the caterpillars. On these trips we were not successful in finding any. Similarly the ones that we filmed on the Ash were not to be found.

On the 17th May we carefully searched through the layers of debris on a little *Phillyrea latifolia* bush where we had found the largest number of eggs. Here we found 2 caterpillars nearly 2 cm long, resting, perfectly camouflaged and nearly invisible, between the dead leaves and twigs, each with 2 ants which were watching over their exocrine glands. This is a specialised gland, situated on the 7th abdominal segment and produces honey-like secretions. As soon as the caterpillars became active, several ants (*Lasius niger*) surrounded them.
We collected the 2 caterpillars and a Phillyrea branch, full of debris. In the evening we saw the two caterpillars, completely covered in ants (*Lasius niger*) begin to feed on the leaves.

The Chrysalises

On the 25th May, a caterpillar changed into a chrysalis, perfectly camouflaged amongst the dead leaves. The second caterpillar was also in the last phase and was transformed into a chrysalis the next evening. The chrysalises were guarded by a small group of *Lasius niger*, until the 6th June when we removed them to make it easier for filming. During which *Lasius niger* had been chased by *Lasius emarginatus*, which in turn took up the vigil over the chrysalises. This species had never been in contact with the caterpillars. It therefore seems clear that the chrysalises emit a signal (pheromones or vibrations) which attract ants (Elfferich, 1968)

Emergence of the Butterflies

On the 7th June around 3pm, 2 males emerged. They had to squeeze out of the leaf litter before they could spread their wings. The next morning, while we were returning the butterflies to the Gorge, we were able to admire around 4pm clouds

of 30 or so butterflies (mostly males) in frenzied pursuit of each other around the bushes. It was very fine weather.

Final Observations

On the 28th July 2009, we discovered around 20 eggs on *Phillyrea latifolia* about 20cm above the soil. To our great surprise we also found 8 eggs, scattered here and there on a small branch 10 cm in length, very exposed and easily visible. On another shrub we found 9 well-hidden eggs of which 5 had been eaten, only the remains of the shells were left.
After 2 months of drought, we recorded on the 22nd September that all the eggs had disappeared without trace. Strangely, that day we found on a branch, a cluster of 7 well-hidden eggs at soil-level.

Conclusion

The *Laeosopis roboris* population that we have followed since 2003 inhabits an isolated place at the bottom of the Gorge where the river Endre flows into a pool. In summer it's hot and very dry, and in winter the small river is transformed by heavy rain into a torrent which floods the Gorge and the host plants and the eggs laid on them.
This population of *Laeosopis evippus* uses in particular, *Phillyrea latifolia* as a host plant. Even though this plant is abundant in the hills and in the Gorge, only those plants that grow in places susceptible to flooding in winter are used as host plants. For the females, this location is only for laying eggs.
In the literature some different species of Ash have been described as host plants (Lafranchis, 2000), as well as Privet (*Ligustrum vulgarea*) and Mock Orange (Siepi, 1932).
All the host plants cited in this conclusion are from the family Oleaceae.
Comment: There is a strong resemblance between *Phillyrea latifolia* and Mediterranean Buckthorn (*Rhamnus alaterus*). They are almost identical, however Rhamnaceae species are not used as a host plants.

Most of the eggs were found less than 20cm from soil level. Two eggs were found about 1m up. Above 30 cm the eggs are laid individually, it's rare to find them higher up. Conversely, below 30 cm, we see the number of eggs increase and we find them in little clusters of 2-7 eggs at soil level. At first the newly-laid eggs are a remarkable red colour. After being submerged the eggs change colour and become off-white, blending in with the tree bark. We have observed that the eggs that undergo submersion by the strong current, hatch quicker than eggs which have not received this treatment.
The debris carried by the current seems to be essential to the caterpillars. During the day it protects them from the sun and drought. The caterpillars venture out at nightfall to feed. We have been able to ascertain that once the caterpillars hatch they attract ants. These will stay with them until the emergence of the butterfly. The caterpillar possesses a Newcomer exocrine gland which the ants palpate with their antennae. We did not observe on the caterpillars of *Laeosopis evippus* the 2 tentacles which are very easily seen on certain other species of the Lycaenidae family.

Although in the wild, the caterpillars and also the chrysalises are surrounded by and cared for by ants, the later are not essential because there are examples of caterpillars in captivity that exist without them (Jutzeler, 1988)
Caterpillars from this Lycenes family emit sounds to attract ants (Elfferich, 1989).
The chrysalis forms at the base of the host plant hidden in the leaf litter. It also seems to attract ants (Elfferich, 1968).
At the height of their flying stage, the males patrol from 2pm peaking at around 3.30pm. After the female hatches she rests, then mates around the end of the afternoon.

Discussion

We can ask ourselves if this adaptation is purely a local phenomenon on the banks of the Endre or is this the normal way of reproduction for this species?

The lack of information regarding its way of life makes this question difficult to answer.
Observations have been made at the following sites : The Hautes-Alpes along the banks of: the river Onde (CHAULIAC, comm.pers.), the river Durance (JUTZELER, 1988 ; CLEU, 1951 ; VERHULST, 2008 ; DROIT, 1951), the Alpes-de-Haute-Provence on the banks of the river Bès (MARION, 1967), the river Sasse (DROIT), the river Miroux (MARION, 1967), in the Gard on the banks of the river Vidourle (GAILLARD).
These authors describe similar observations to our own: on the banks of small rivers, where ash trees grow, but no-one describes the state of the eggs in their natural environment, or whether or not, due to their location, the eggs will become submerged.
In the Bouches-du-Rhône, North of Mont St Victoire, along a small stream without ash trees, but with a lot of *Phillyrea latifolia* (CHAULIAC, comm.pers.).
The following observation sites differ from the others by the absence of a small river; in the Var ; at Mazaugues, at the foot of the Glacières of Font Frège (CHAULIAC, comm. pers.) and at Mont Ste Baume (SIEPI, 1932).
To answer these questions it's necessary to go back to these sites over a period of several consecutive years, observe them, and search for the eggs. Then we will have a better understanding of their specific way of reproduction. Also these answers could prove how important of the dynamics of their habitat is to the success of their survival.

Acknowledgements

We would like to thank André Chauliac and Kars Veling for being available and for their consideration in kindly accepting our research on *Laeosopis evippus* and for participating in the production of this article.
Nico Elfferich provided us with facts on the interaction between caterpillars and ants (for 30 years he has researched the noises made by caterpillars in order to attract ants).
We would like to thank Sophie Kan for photographing the butterflies on one of our trips.
A big thank you goes to Henri Bergreen for meticulously recording the rainfall in Callas for the past years.

Références Bibliographiques

BLAMEY, M., C. GREY-WILSON. - Wildflowers of the Mediterranean. *A & C Black – London, 2004.* Olive family (Oleaceae) 1244 – *Ligustrum lucidum*; 1245 – *Fraxinus angustifolia*; 1246 – *Phillyrea angustifolia*; 1247 – *Phillyrea latifolia*.

ELFFERICH, N.W. - De merkwaardige vriendschap tussen mieren en blauwtjes. *Vlinders, 1989, 4(3) : 12-15.*

ELFFERICH, N.W. - Is the larval and imaginal signalling of Lycaenidae and other Lepidoptera related to communication with ants? *DEINSEA 1998, 4/ 91-95.*

ELFFERICH, N.W. - Intieme communicatie. *Vlinders, 2007, 1 (22 februari).*

BETTI, G. - Nouvelle sous espèce de Lycaenidae palé arctiques. *Alexanor, 1977, Tome X, Fasc. 2 : 87 – 96.*

CLEU, H. - Supplément au peuplement en lépidoptères du bassin supérieur de la Durance. *Revue Française de lépidoptérologie, 1951, Vol XIII. 153-160.*

Droit, P. - Notesb de chasse dans la zone du bassin moyen de la Durance.
Revue Française de lepidoptérologie, 1951, Vol XIII, 103-112.

JUTZELER, D. - Eine Aufzucht von *Laeosopis roboris* (ESPER, 1793) (Lepidoptera, Lycaenidae). *Mitt. Entom. Gesellschaft Basel, 1988, 38 (4): 151 – 155.*

LAFRANCHIS, T. - Les Papillons du jour, de France, Belgique et Luxembourg et leur chenilles. – La Thécla du frêne (*Laeosopis evippus,* HÜBNER, 1793). *Collection Parthénope. 2000 : 179.*

MALICKY, H. - Versuch einer Analyse der Ökolgischen Bezichungen zwischen Lycaeniden (Lepidoptera) und Formiciden (Hymenoptera). *Tijdschrift voor Entomologie, 1969, Deel 112 : 213 – 298.*

MARION, H. - Curieux comportement de *Laeosopis roboris*. (Lycaenidae, Arctiidae). *Alexanor, 1966, Tome V 1967 Fasc. 3 : 129 – 132.*

TOLMAN, T., R. LEWINGTON. - Guide des papillons d'Europe et d'Afrique du Nord. *Delachaux et Nieslé 1999 : 65 – Laeosopis roboris , Thécla du frène.*

NEL, J. - Sur la plasticité écologique et la biologie de quelques lépidoptères (Rhopalocera) du sud-est Méditerranéen de la France. *Université de droit, d'économie et des sciences d'Aix-Marseille, 1984. Thèse : 71-73.*

SIEPI. - Catalogue raisonné des lépidoptères du département des Bouches-du-rhône et de la région de la Sainte-Boume. *Annales du Musée d'Histoire Naturelle de Marseille, 1932, Tome XXV , Imprimerie municipale de Marseille.*

VERHULST, G. - A propos d'un élevage de *Laeosopis evippus* (HÜBNER, 1793) (Lep.Lycaenidae). *Oreina – aout 2008.*