

## SOME LEAF-MINING SPECIES IDENTIFIED ON THE *QUERCUS* GENUS IN THE HÂRBOANCA AND BĂLTENI FOREST RESERVES (VASLUI COUNTY)

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**Abstract.** The present study contains the results of our research on the leaf-mining insects that attack the *Quercus* genus in the Forest Reserves of Hârboanca and Bălteni (Vaslui County). We identified a number of 15 leaf-mining species that attack the *Quercus* genus: these species belong to 9 different genera, from 6 families and 3 orders. Lepidopteras represent the majority, with 4 families, while Coleopteras and Hymenopteras are represented only by one species each. There were not any Dipteras found on this genus. The presence of leaf-mining insects has been observed on 6 species of *Quercus* from the Fagaceae family of the Fagales order: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. virgiliana* (Ten.) Ten., *Q. dalechampii* Ten., *Q. pubescens* Willd. and *Q. pseudopubescens* Dobrescu & Beldie. The majority of the attacks of leaf-mining larvae were signalled on the *Quercus robur* species, while the *Quercus pubescens* is the least attacked of the *Quercus* species.

**Keywords:** leaf-mining insects, *Quercus*, mines.

**Rezumat. Specii de insecte miniere identificate pe genul *Quercus* din Rezervațiile Hârboanca și Bălteni.** Această lucrare cuprinde rezultatele cercetărilor asupra insectelor miniere care atacă genul *Quercus* din Rezervațiile Forestiere Hârboanca și Bălteni (Vaslui). S-au identificat 15 specii de insecte miniere care atacă genul *Quercus*, care aparțin la 9 genuri, 6 familii și 3 ordine. Cele mai numeroase sunt lepidopterele cu 4 familii, himenopterele și coleopterele fiind reprezentate fiecare de câte o familie. Nu am semnalat prezența unor specii de diptere. Plantele gazdă ale speciilor miniere identificate aparțin la 6 specii de *Quercus* din familia Fagaceae, ordinul Fagales: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. virgiliana* (Ten.) Ten., *Q. dalechampii* Ten., *Q. pubescens* Willd. și *Q. pseudopubescens* Dobrescu & Beldie. Cele mai numeroase larve ale insectelor miniere se dezvoltă pe specia *Q. robur*, iar cele mai puține pe *Q. pubescens*.

**Cuvinte cheie:** insecte miniere, *Quercus*, mine.

### Introduction

The Hârboanca and Bălteni Forest Reserves are both situated close by the city of Vaslui, but although they are both part of the Central Moldavian Plateau, and the distance between them is of approximately 5 km, the arborical vegetation differs much from one to the other, because of the hydrological and pedological conditions.

In the Bălteni Reserve, the arborical layer is represented by a mix of riverbank oak-trees with beech-trees and elm-trees, among which we can find the species *Quercus robur* L. and *Quercus petraea* Liebl.

In the Hârboanca Reserve we can find majority oak-trees species known in Romanian flora: *Quercus robur* L., *Q. petraea* (Matt.) Liebl., *Q. virgiliana* (Ten.) Ten., *Q. dalechampii* Ten., *Q. pubescens* Willd. and *Q. pseudopubescens* Dobrescu & Beldie. Besides the rich genera diversity, there is also a phenomena that is highly characteristic of the Hârboanca area, that is the hybridogenesis in oak species (Dobrescu, 1969).

Other researches on the insects of the Hârboanca and Bălteni Reserves have been made by M. I. Constantineanu and L. Gr. Țățan, who published studies on the biology, ecology and systemics of Ichneumonidas (Constantineanu & Țățan, 1973).

### Material and Methods

In order to study the leaf-mining species associated to the *Quercus* genus from the Bălteni and Hârboanca Forest Reserves, we have collected a large quantity of biological material, consisting in attacked leaves which presented „mines” containing larvae or pupae of leaf-mining insects, and also in attacked leaves with empty „mines” which we studied in order to determine what species caused them. Our research in this direction was lead both in nature as well as in the laboratory, for a period ranging between the years 2005-2007.

### Results and Discussion

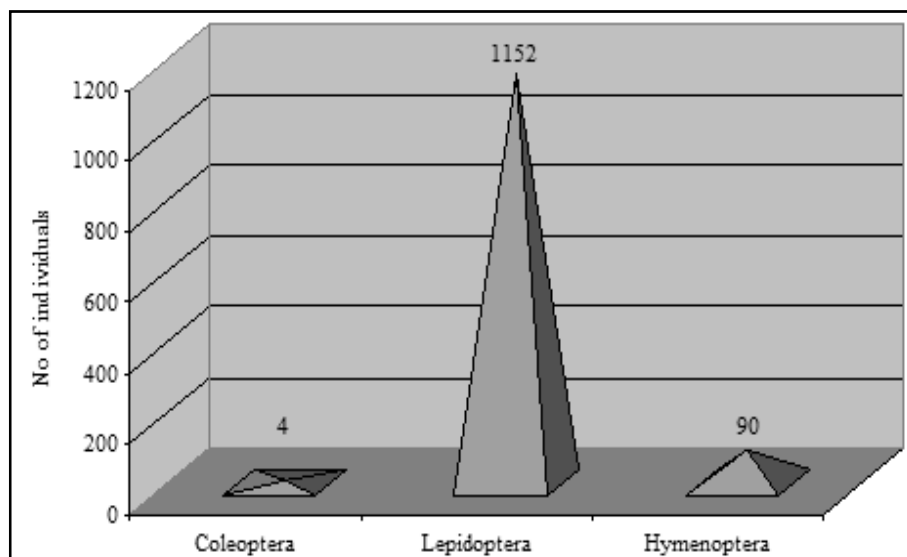
During our research we have identified 15 leaf-mining insects species which attack the *Quercus* genus: *Rhynchaenus quercus* (Linnaeus, 1758) (Fig. 5), *Bucculatrix ulmella* (Zeller, 1848) (Fig. 6), *Acrocercops brogniardella* (Fabricius, 1798) (Fig. 7), *Caloptilia alchimiella* (Scopoli, 1763) (Fig. 8), *Phyllonorycter harrisella* (Linnaeus, 1761), *P. heegeriella* (Zeller, 1848) (Fig. 9), *P. lautella* (Zeller, 1846) (Fig. 10), *P. messaniella* (Zeller, 1846), *P. roboris* (Zeller, 1839) (Fig. 11), *Ectoedemia albifasciella* (Heinemann, 1871) (Fig. 12), *E. heringi* (Toll, 1934) (Fig. 13), *Stigmella ruficapitella* (Haworth, 1828) (Fig. 14), *Tischeria decidua* (Wocke, 1876) (Fig. 15), *T. eckbladella* (Bjerkander, 1795), *Profenusa pygmaea* (Klug, 1816) (Fig. 16). These species are grouped in 9 genera, belonging to 6 families of 3 orders, as shown in Table 1.

**Table 1.** Species of leaf-mining insects that attack the *Quercus* genus species in the Hârboanca and Bălteni Reserves.

No. of species	Leaf-mining insect species	Hosting-plant species	No. of ind.	Total	%
<b>Coleoptera</b>					
<b>Curculionidae</b>					
1.	<i>Rhynchaenus quercus</i> (Linnaeus, 1758)	<i>Quercus petraea</i>	4	4	0.32
<b>Lepidoptera</b>					
<b>Bucculatricidae</b>					
2.	<i>Bucculatrix ulmella</i> Zeller, 1848	<i>Quercus robur</i>	19	63	5.06
		<i>Quercus petraea</i>	15		
		<i>Quercus virgiliana</i>	17		
		<i>Quercus dalechampii</i>	12		
<b>Gracillariidae</b>					
3.	<i>Acrocercops brogniardella</i> (Fabricius, 1798)	<i>Quercus dalechampii</i>	3	3	0.24
4.	<i>Caloptilia alchimiella</i> (Scopoli, 1763)	<i>Quercus virgiliana</i>	5	12	0.96
		<i>Quercus robur</i>	7		
5.	<i>Phyllonorycter harrisella</i> (Linnaeus, 1761)	<i>Quercus dalechampii</i>	21	41	3.29
		<i>Quercus robur</i>	11		
		<i>Quercus virgiliana</i>	9		
6.	<i>Phyllonorycter heegeriella</i> (Zeller, 1848)	<i>Quercus robur</i>	22	35	2.80
		<i>Quercus petraea</i>	13		
7.	<i>Phyllonorycter lautella</i> (Zeller, 1846)	<i>Quercus dalechampii</i>	6	62	4.98
		<i>Quercus petraea</i>	15		
		<i>Quercus robur</i>	20		
		<i>Quercus virgiliana</i>	21		
8.	<i>Phyllonorycter messaniella</i> (Zeller, 1846)	<i>Quercus robur</i>	3	3	0.24
9.	<i>Phyllonorycter roboris</i> (Zeller, 1839)	<i>Quercus robur</i>	42	242	19.42
		<i>Quercus petraea</i>	48		
		<i>Quercus dalechampii</i>	34		
		<i>Quercus virgiliana</i>	38		
		<i>Quercus pseudopubescens</i>	52		
		<i>Quercus pubescens</i>	28		

<b>Nepticulidae</b>					
10.	<i>Ectoedemia albifasciella</i> (Heinemann, 1871)	<i>Quercus robur</i>	11	<b>11</b>	<b>0.88</b>
11.	<i>Ectoedemia heringi</i> (Toll, 1934)	<i>Quercus robur</i>	21	<b>21</b>	<b>1.69</b>
12.	<i>Stigmella ruficapitella</i> (Haworth, 1828)	<i>Quercus robur</i>	26	<b>72</b>	<b>5.78</b>
		<i>Quercus pubescens</i>	46		
<b>Tischeriidae</b>					
13.	<i>Tischeria decidua</i> Wocke, 1876	<i>Quercus robur</i>	36	<b>75</b>	<b>6.01</b>
		<i>Quercus petraea</i>	27		
		<i>Quercus pseudopubescens</i>	12		
14.	<i>Tischeria ekebladella</i> (Bjerkander, 1795)	<i>Quercus robur</i>	192	<b>512</b>	<b>41.09</b>
		<i>Quercus petraea</i>	69		
		<i>Quercus dalechampii</i>	51		
		<i>Quercus pseudopubescens</i>	63		
		<i>Quercus pubescens</i>	53		
		<i>Quercus virgiliana</i>	84		
<b>Hymenoptera</b>					
<b>Tenthredinidae</b>					
15.	<i>Profenusa pygmaea</i> (Klug, 1816)	<i>Quercus robur</i>	35	<b>90</b>	<b>7.22</b>
		<i>Quercus dalechampii</i>	28		
		<i>Quercus petraea</i>	11		
		<i>Quercus virgiliana</i>	16		
<b>Total</b>	<b>15</b>	<b>6</b>	<b>1246</b>	<b>100</b>	

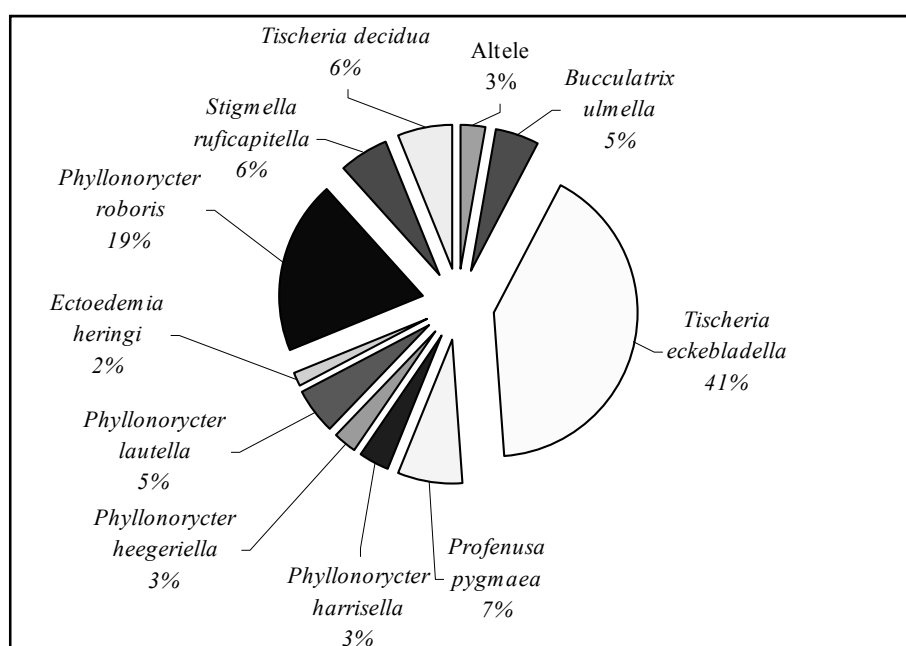
According to the numbers of individuals identified as per each of the 3 orders, the majority is represented by Lepidopteras, with a number of 1152 individuals, followed by Hymenopteras, with 90 individuals, and then by Coleopteras, with just one species and a number of 4 individuals (Fig. 1).



**Figure 1.** The number of individuals per each order that attacks the *Quercus* genus in the Hârboanca and Bălteni Reserves.

As far as the proportions between species are regarded, we have taken into account the number of individuals per each species and concluded that the *Tischeria ekebladella* species prevails, with a percentage of 41% out of the total, followed by *Phyllonorycter roboris*, with a percentage of 19%, the rest of the species being

represented by low percentages, under 10% (Fig. 2). This fact is explained by the preference which the first two species manifest towards the hosting species *Quercus robur* and *Q. petraea*. We have identified these two *Quercus* species in both reservations, prevailing in the Hârboanca Reserve, and with a relatively low rate of representation in the Bâlteni Reserve.



**Figure 2.** The proportions between the leaf-mining species attacking the *Quercus* genus in the Hârboanca and Bâlteni Reserves.

According to the number of leaf-mining species manifest towards each species of *Quercus*, we have concluded that the *Q. robur* species is attacked by 13 leaf-mining species, belonging to 7 genera of 5 families: Tischeriidae, Gracillariidae, Nepticulidae, Tenthredinidae and Bucculatricidae. 8 leaf-mining species were identified on *Q. petraea*, species belonging to 5 genera of 5 families: Tischeriidae, Gracillariidae, Bucculatricidae, Tenthredinidae, Curculionidae. *Q. virgiliana* is attacked by 7 leaf-mining species from 5 genera of 4 families: Tischeriidae, Gracillariidae, Bucculatricidae, Tenthredinidae. On *Q. dalechampii* we have identified 7 species of leaf-miners belonging to 5 genera of 4 families: Gracillariidae, Tischeriidae, Tenthredinidae, Bucculatricidae. The *Q. pseudopubescens* species is attacked by 3 species belonging to 3 genera of 3 families: Nepticulidae, Tischeriidae, Gracillariidae, and *Q. pubescens* is attacked by 3 species belonging to 2 genera of 2 families: Tischeriidae and Gracillariidae (Fig. 3).

As far as the preferences of the leaf-mining insects to the different species of *Quercus* is regarded, our research shows that the species *Tischeria ekebladella* and *Phyllonorycter roboris* can be found on all 6 *Quercus* species; *Bucculatrix ulmella*, *Phyllonorycter lautella* and *Profenusa pygmaea* attack only 4 species; the species *Phyllonorycter harrisella* and *Tischeria decidua* can be found on 3 species of *Quercus*; *Caloptilia alchimiella*, *Phyllonorycter heegeriella* and *Stigmella ruficapitella* attack only 2 species, while the species *Phyllonorycter messaniella*, *Ectoedemia albifasciella*, *Ectoedemia heringi*, *Acrocercops brogniardella* and *Rhynchaenus quercus* can be found only on one species of *Quercus* each (Fig. 4).

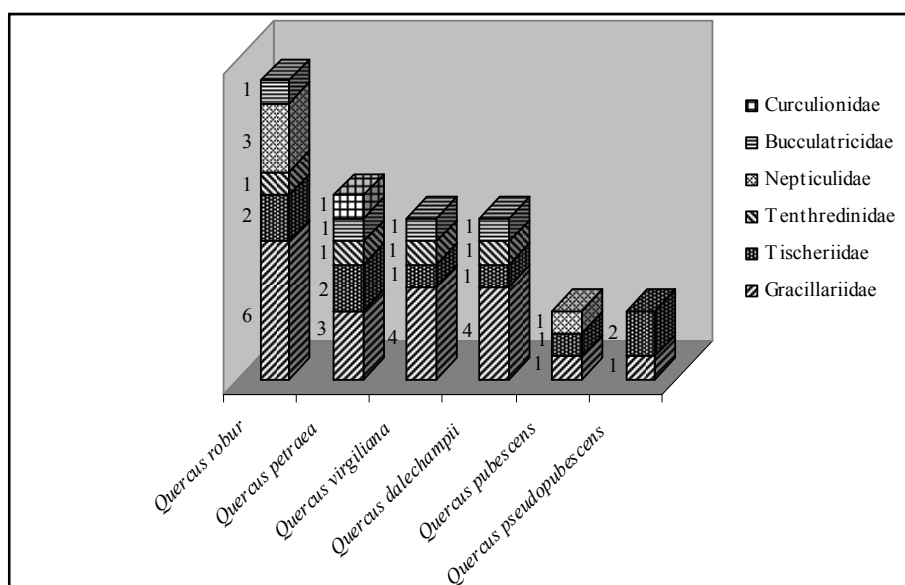


Figure 3. The proportions to which the different families of leaf-mining insects species are represented on the *Quercus* species in the Hârboanca and Bălteni Reserves.

### Conclusions

The research regarding the identification of the leaf-mining species that attack the *Quercus* genus we have conducted between 2005-2007 in the Forest Reserves of Hârboanca and Bălteni lead to the following conclusions: we have identified 15 leaf-mining insect species of the orders Coleoptera, Lepidoptera and Hymenoptera.

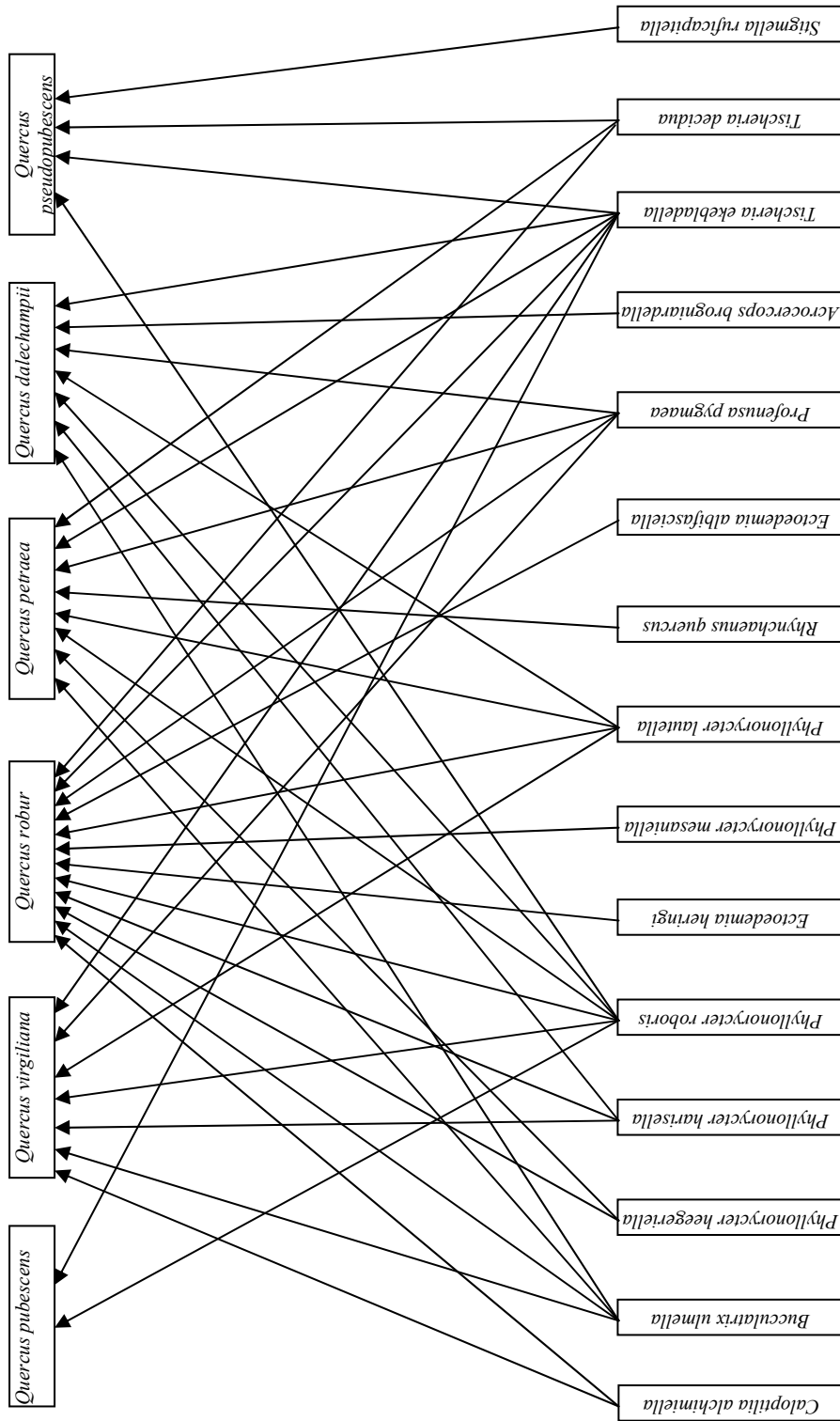
The two forest reserves are very different in their specific arborical composition: in the Bălteni Forest and Botanical Reserve we have identified the *Q. robur* and *Q. petraea* species, with a low rate of representation, while, in the Hârboanca Forest Reserve, we have found the species *Q. robur*, *Q. petraea*, *Q. virgiliana*, *Q. dalechampii*, *Q. pubescens*, *Q. pseudopubesces* with a very high rate of representation.

From the 15 leaf-mining species identified, the ones belonging to the Lepidoptera order prevail, with a number of 13 species, while the orders Coleoptera and Hymenoptera are represented by only one species each.

In terms of the rate of representation of the leaf-mining species on the *Quercus* genus, the species *Tischeria ekebladella* is the most represented, with a number of 512 individuals, followed by *Phyllonorycter roboris*, with a number of 242 individuals, while the other species have a low representation in the two forest reserves.

The majority of the leaf-mining species attack the *Quercus robur* species, on which we identified 13 different miners, followed by *Q. petraea*, attacked by 8 species, *Q. virgiliana* and *Q. dalechampii* by 7 species each, and *Q. pseudopubesces* and *Q. pubescens* by 3 species each.

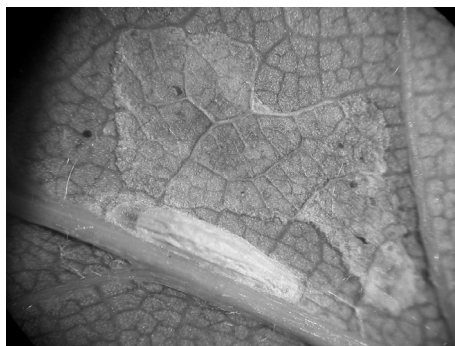
As far as the proportions to which the different leaf-mining insect families attack specific *Quercus* species, *Q. robur* and *Q. petraea* are attacked by miners from 5 families each, *Quercus virgiliana* and *Q. dalechampii* by representatives from 4 families each, *Q. pseudopubesces* by representatives of 3 families, and *Q. pubescens* suffers attacks from representatives of 2 families of leaf-mining species.



**Figure 4.** The proportions to which each species of leaf-mining insects attack the different species of *Quercus* in the Hârboanca and Bălteni Reserves.



**Figure 5.** Mine of *Rhynchaenus quercus* L. on *Quercus petraea* leaves.



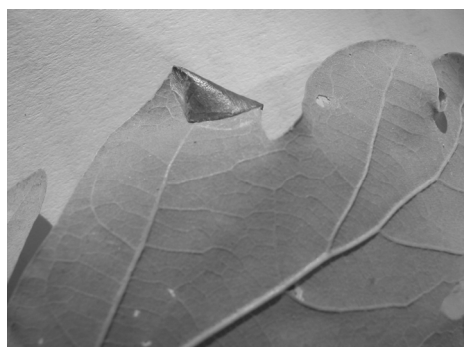
**Figure 6.** Mine of *Bucculatrix ulmella* Zell. on *Quercus dalechampii* leaves.



**Figure 7.** Mine of *Acrocercops brogniardella* Fabr. on *Quercus dalechampii* leaves.



**Figure 8.** Mine of *Caloptilia alchimiella* Scop. on *Quercus virgiliana* leaves.



**Figure 9.** Mine of *Phyllonorycter heegeriella* Zell. on *Quercus petraea* leaves.



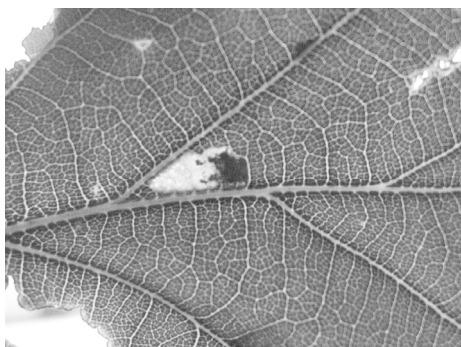
**Figure 10.** Mine of *Phyllonorycter lautella* Zell. on *Quercus dalechampii* leaves.



**Figure 11.** Mine of *Phyllonorycter roboris* Zell. on *Quercus robur* leaves.



**Figure 12.** Mine of *Ectoedemia albifasciella* Hein. on *Quercus robur* leaves.



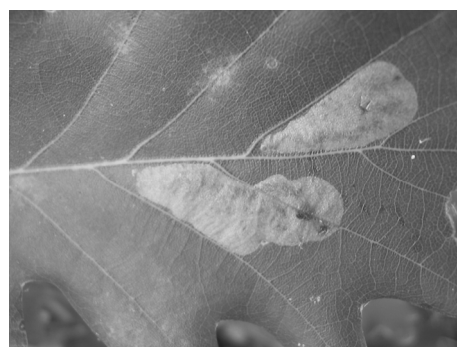
**Figure 13.** Mine of *Ectoedemia heringi* Toll on *Quercus robur* leaves.



**Figure 14.** Mine of *Stigmella ruficapitella* Haw. on *Quercus robur* leaves.



**Figure 15.** Mine of *Tischeria decidua* Wocke on *Quercus petraea* leaves.



**Figure 16.** Mine of *Profenusa pygmaea* Klug on *Quercus virgiliana* leaves.

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