

ENTOMOFAUNA OF LEAF MINERS ON PUBLIC GREENERY DENDROFLORA IN AND AROUND BELGRADE

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Leaf miners were found on 113 plant species classified into 14 families and 29 genera. One hundred and thirty-five species of leaf miners were registered on the dendroflora of the region of Belgrade, and the findings were scientifically processed. The largest number of registered species (84.45%) belong to the *Lepidoptera* order. Moths were represented by species belonging to 9 families and 19 genera. The families with the largest number of represented species were: *Nepticulidae* (48), *Gracillariidae* (43), *Coleophoridae* (7), *Lyonetiidae* (6), etc. The largest number of miners in the Belgrade region inhabited plants of the following genera: *Quercus* (18), *Malus* (16), *Prunus* (13), *Salix* (11), *Ulmus* (11), *Pyrus* (10) and *Sorbus* (10). Most of the species (121) were registered for the first time in the region of Serbia. New hosts (plants sustainers) and positions and forms of mines were also observed.

KEY WORDS: leaf miners, plants, families, genera, dendroflora.

INTRODUCTION

Our investigation was carried out in the region of Belgrade, which spreads on 324400 ha, and in the neighbouring areas. The Belgrade region has 4500 ha of city parks (the local firm "Zelenilo" owns 2610 ha or 57.77% of the total area), about 67000 trees lined in rows (or about 400 km) and 38851 ha of forests.

Public greenery is greatly important from various aspects, particularly in urban areas (improving enormously the living and working conditions and providing a healthier environment in terms of ecological, hygienic-sanitary, psycho-physiologi-

cal influence, antimissional function, protection against winds, snow and sand deposits, vibrations and noise, air-pollution caused by industry and traffic, regenerative, recreative, and even economic and decorative function). According to international standards, the minimum green surface per capita is 0,33 ha but in Belgrade the figure does not exceed 0,024 ha. Various pests, primarily insects, and plant disease carriers additionally reduce the active assimilation surface of plants. Major defoliators, such as leaf miners, contribute to a great extent to such reduction.

Insects of the group of miners have long become a serious problem concerning greenery of the Belgrade region (*Phyllonorycter populifoliella* Tr., *Phyllonorycter latani* Stgr.) (BOGAVAC, 1959; MIJIN, 1960). Over the past few years, massive infestation by leaf miners of horse chestnut (*Cameraria ohridella* Deschka & Dimić) and premature defoliation of chestnut (DIMIĆ, MIHAJLOVIĆ, 1993 and 1994; DIMIĆ, 1995a, 1995b) have become an outstanding issue. The problem of leaf miners, considered in this context and in agricultural plant production, has become particularly evident as coming primarily under the immediate influence of anthropogenic ecological factors (different human activities, especially mosquito dusting, air-pollution of urban areas, ect.) and a drastic reduction of beneficial insects that regulate population density.

Available data from scientific and professional literature clearly indicate that the problem of leaf miners in dendroflora, studied in this research, had not been previously investigated in this region.

LOCALITY, MATERIAL AND METHOD

For several reasons, leaf miners need to be investigated at as many localities as possible throughout the monitored region, and a large number of samples need to be analysed, which practically means that all plants and leaves have to be examined at each locality.

Sampling and investigation of leaf miners of forest trees were carried out depending on the species and the number of species of plants, interest expressed in certain plant species or leaf miners and access to localities (up to 20 check-ups, but mostly 3). Leaf miners are generally easiest to collect in large quantities in autumn. However, some other aspects of vegetation must by no means be ignored as the occurrence of miners does not coincide temporally for all species and some of them appear only in brief intervals of particular seasons (early spring, spring, summer, autumn). Before and after that period, which is needed for their development, they cannot be found. Each locality and the same plants therefore need to be examined repeatedly over the year. Samples from the broad area of Belgrade were collected from 636 localities.

All plant species were covered by this investigation. Leaf miners were found on 113 woody species classified into 14 families and 29 genera. The most abundant species belong to the families: *Salicaceae* (21 or 18.58%), *Fagaceae* and *Rosaceae* (each with 18 species or 15.93%), *Aceraceae* (13 species or 11.50%), *Corylaceae* (12 species or 10.62%), etc. Similarly, the investigation included all trees: single, secluded trees, those growing in large or small street jardinières, on roofs or balconies, in streets, squares, parking-lots, private yards, as well as those growing in stands and plantings, i.e. in small or large groups of trees, gardens, tree rows, parks, park forests and single locality forests (all categories of greenery as defined by communal documentation).

PLANT SPECIES INFESTED BY LEAF MINERS

- Acer campestre* L. - клен
Acer dasycarpum Ehrh. - сребрнолисни јавор
Acer ginnala Maxim. - кинески, манџурски јавор
Acer heldreichii Orph. - планински (грчки) јавор
Acer monspessulanum L. - маклен
Acer negundo L. - пајавац
Acer obtusatum Kit - јавор глувач
Acer palmatum Thunb. - дланолики јавор
Acer platanoides L. - јавор мљечац, млеч
Acer platanoides var. *atripurpureum* Spreng
Acer pseudoplatanus L. - горски (бели) јавор
Acer saccharinum L.
Acer tataricum L. - жестика, жешља
Aesculus carnea Hayne - црвени, дивљи кестен
Aesculus flava Ait. - амерички жути (дивљи) кестен
Aesculus hippocastanum L. - дивљи кестен
Alnus cordata Desf.
Alnus glutinosa Gaertn. - црна јова
Alnus incana Moench.
Betula pendula Roth. - брадавичаста бреза
Betula pubescens Ehrh. - маљава бреза
Betula sp. - бијела бреза
Betula papyrifera Marsch.
Betula alleghaniensis Britt.
Carpinus betulus L. - граб
Carpinus orientalis Mill. - белограб, кукрика
Castanea sativa Mill. - питоми кестен

- Celtis australis* L. - црна кошћела, копривић
Celtis occidentalis L. - копривић
Cerasus serrulata (Lind) Sokolov - јапанска трешња
Corylus colurna L. - медвеђа леска
Cydonia vulgaris Pers - дуња
Fagus moesiaca Domin - балканска буква
Fagus sp. (Arboretum)
Fagus sylvatica L. - европска буква (обична)
Fagus sylvatica f. *atropurpurea*
Fagus sylvatica f. *pendula*
Fraxinus americana - амерички јасен
Fraxinus angustifolia Vohl. - пољски јасен
Fraxinus excelsior L. - бели, горски јасен
Fraxinus lanceolata Bor.
Fraxinus ornus L. - црни јасен
Juglans cinerea L. - сиви орах, масловац
Juglans nigra L. - црни орах
Juglans regia L. - орах
Malus floribunda Houtt
Malus niedzwetzkyana Dieck - туркестанска јабука
Malus pumila L. - дивља јабука
Malus spp. - украсне азијске врсте и форме јабуке
Oreoherzogia fallax (Voiss.) Vent - илирска љиговина
Ostrya carpinifolia Scop. - грабић, црни граб
Platanus acerifolia Willd. - јаворолисни платан
Platanus occidentalis L. - западни платан
Populus alba L. - бела топола
Populus alba var. *pyramidalis* Vge.
Populus canadensis Moench. - канадска топола
Populus candicans Ait.
Populus deltoides Marsh - црна америчка топола
Populus grandidentata Michx.
Populus nigra L. - црна топола
Populus nigra var. *pyramidalis* Spach - јаблан
Populus robusta
Populus simonii Carr. - симонијева топола
Populus tremula L. - јасика, трепетљика
Prunus avium L. - дивља трешња
Prunus cerasifera Ehrh. - џанарика

- Prunus cerasifera* v. *pissardii* Bailey - црвенолисна џанарика
Prunus insititia L. - трношљива
Prunus mahaleb L. - рашељка
Pyrus pyraister Burgsd. - дивља крушка
Quercus borealis var. *maxima* Sarg. - црвени амерички храст
Quercus cerris L. - цер
Quercus coccinea Münch. - гримизни храст
Quercus frainetto Tenore - храст сладун
Quercus petrae Lieblein - китњак
Quercus pubescens Willd. - храст медунац
Quercus robur L. - храст лужњак, дуб
Quercus robur var. *fastigiata* Kuntz - лужњак пирамидалне крошње
Quercus sessiliflora Salisb. - храст горун
Quercus sp.
Quercus trojana Webb. - македонски храст
Quercus virgiliana Ten. - крупнолисни медунац
Rhamnus cathartica L. - пасдрен
Rhamnus frangula L. - крковина
Rhamnus tinctoria W.K. - бојаџиски пасдрен
Robinia pseudoacacia L. - багрем
Salix alba L. - бела врба
Salix aurita - уваста врба
Salix babylonica L. - жалосна врба
Salix caprea L. - ива
Salix cinerea L. - барска ива
Salix elaeagnus Scop.
Salix fragilis L. - крхка, крта врба
Salix matsudana Koidz. - јапанска врба
Salix purpurea L. - ракита, плетарска врба
Salix triandra L. - бадемаста врба
Sambucus nigra L. - зова, базга
Sorbus aria (L.) Crantz. - мукиња обична
Sorbus aucuparia L. - јаребика
Sorbus aucuparia var. *pendula* Kirschn
Sorbus austriaca (Beck) Hedlund - мукиња планинска
Sorbus scandica Fries. - скандинавска мукиња
Sorbus torminalis (L.) Crantz - брекиња
Syringa vulgaris L. - јоргован
Tilia cordata Miller - ситнолисна липа, позна

- Tilia euchlora* - зелена или кримска липа
Tilia intermedia DC. - хибридна липа
Tilia platyphyllos Scop. - крупнолисна липа, рана
Tilia tomentosa Moench. - сребрна, бела липа
Ulmus glabra Hunds - брдски, горски брест
Ulmus laevis Pallas - вез
Ulmus minor Miller - пољски брест
Ulmus montana var. *pendula* Rhed. - украсни (жалосни) бријест

The intensity of infestation, i.e. the abundance of each individual species (measured on a 1-5 point scale), was determined in each sampling and registering. For species with extremely abundant populations, we monitored their population dynamics and the course of development in the ecological conditions of Belgrade (*Cameraria ohridella* Descha & Dimić, *Parectopa robinella* Clem., *Caloptilia fidella* Rtti., *Stigmella aceris* Frey, *Parnatenella* Kulg., ect.). This is highly important in choosing the method and optimal moment of intervention. Our research was occasionally hampered by various factors, primarily by mosquito dusting.

The leaf miner samples were collected according to conventional methods for that group of insects. As miners are never collected at the adult stage, as most other insects, it made the investigation considerably more difficult. Leaves or entire plants infested by larvae (primarily mature ones) or by pupae (if the miners remained in the leaf) were collected and the miners were reared into the adult stage under controlled natural or laboratory conditions, in biological tubes, flacons, cylinders, petri dishes, photoelectors, entomological cages, etc. Owing to significantly altered conditions existing in the leaves separated from plants (turgor, etc.), as well as the increased number of parasites and other factors influencing growing, much of the collected material decayed. Plenty of material therefore had to be collected at all times, to allow determination and further investigation of the few individuals that reached the adult stage. For identification, the collected samples were reared to reach adult stage and were prepared (moths in a special way) or adequately conserved prior to determination (herborized in 40% alcohol for determination according to the look of the mine, etc.).

The determination of the miners was carried out according to E.M. HERING's Tables for Miner Determination and based on the host plant, the look of the injury, i.e. the mine, the sac (for species of the *Coleophoridae* family), the adults and the male genitals.

The miners' natural enemies were collected and grown simultaneously.

RESULTS AND DISCUSSION

One hundred and thirty-five leaf miner species, classified into 4 orders, 14 families and 33 genera, were found on the dendroflora of Belgrade. Most of the detected species belong to the *Lepidoptera* order (114 species or 84.45%). Fewer miner species (15.55%) belong to the three remaining orders: *Hymenoptera* (9 species or 6.67%), *Diptera* (6 species or 4.44%) and *Coleoptera* (6 species or 4.44%).

The largest number of literature references were consulted for checking previous findings on the occurrence of certain species in the investigated region and throughout the Republic of Serbia (ČUTURILO, 1952; DIMIĆ, 1976; GRADOJEVIĆ, 1926, 1930; GRUJIČIĆ & TOMAŠEVIĆ, 1956; HADŽISTEVIĆ, 1955; JEREMIĆ, 1954; 1963; GROUP OF AUTHORS, 1952, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988; MARTINOVIĆ & BJEGOVIĆ, 1950; MIHAJLOVIĆ, 1994; TOMIĆ et al., 1992; ŽIVOJINOVIĆ 1963).

SYSTEMATIC LIST OF LEAF MINER SPECIES FOUND IN SAMPLES

1. COLEOPTERA

Buprestidae

Trachys minutus L.

Chrysomelidae

Zeugophora flavicollis Mrsh.

Curculionidae

Ramphus oxacanthae Mrsh.

Rhynchaenus fagi L.

Rhynchaenus populi F.

Rhynchaenus subfasciatus Gyllh.

2. DIPTERA

Agromyzidae

Liriomyza amoena Mg.

Phytagromyza langei Hg.

Phytagromyza populi Kltb.

Phytagromyza populicola Hardy.

Phytagromyza tridentata Lw.

Diptera.

3. HYMENOPTERA

Tenthredinidae

Kaliofenusa (Fenusa) ulmi Sund.

Heterarthrus aceris Kltb.

Heterarthrus microcephala Kl.

Heterarthrus ochropoda Kl.

Hinatara recta Thoms.

Messa sp. (*Populus* spp.)

Parna tenella Klug.

Profenusa pygmaea Kl.

Scolioneura betulae Zdd.

4. LEPIDOPTERA

Nepticulidae

Ectodemia pulverosella Stt.

Ectodemia quinquella Bed.

Ectodemia spinosella Joann.

Ectodemia turbidella Zell.

Etainia sphendamni Hg.

Nepticula assimilella Z.

Nepticula confusella Wood.

Nepticula marginicolella Stt.
Nepticula microtheriella Stt.
Nepticula obliquella Hein.
Nepticula plagicolella Stt.
Nepticula pomella Vaugh.
Nepticula salicis Stt.
Nepticula sp. (*Ae. flava* Ait.)
Nepticula speciosa Frey
Nepticula tityrella Stt.
Nepticula trimaculella Hw.
Stigmella aceris Frey
Stigmella ariella H.S.
Stigmella atricapitella Hw.
Stigmella caradjai Hg.
Stigmella carpinella Heyd.
Stigmella catharticella Stt.
Stigmella desperatella Frey
Stigmella glutinosae Stt.
Stigmella hemargyrella Koll.
Stigmella malella Stt.
Stigmella mali Hg.
Stigmella nigrosparsella Klim.
Stigmella nylanderiella Tgstr.
Stigmella prunetorum Stt.
Stigmella pseudoplatanella Weber
Stigmella pyri Glitz.
Stigmella pyricola Wck.
Stigmella rhamnella H.S.
Stigmella samiatella Z.
Stigmella sp. (*Carpinus* spp.)
Stigmella sp. (*Carpinus* spp.)
Stigmella sp. (*Quercus* sp.)
Stigmella subtrimaculella Duftr.
Stigmella tiliae Frey
Stigmella torminalis Wood
Stigmella ulmiphaga Preiss.
Stigmella ulmivora Fol.
Stigmella viscerella Stt.
Stigmella zimmiernanni Hg.

Gracillariidae

Callisto coffeella Ztt.
Callisto denticulella Thnbg.
Caloptilia alchimiella Sc.
Caloptilia fidella Rtti.
Caloptilia roscipennella Hb.
Caloptilia semifascia Hw.
Caloptilia stigmatella F.
Caloptilia syringella F.
Cameraria ohridella Deschka & Dimić
Parectopa robiniella Clem.
Parornix anguliferella Z.
Parornix devoniella Stt.
Parornix betulae Stt.
Parornix carpinella Frey
Parornix fagivora Frey
Parornix finitimella Z.
Parornix torquillella Z.
Phyllonorycter agilella Z.
Phyllonorycter blancardella F.
Phyllonorycter cerasicolella H.S.
Phyllonorycter comparella Dp.
Phyllonorycter corylifoliella Hb.
Phyllonorycter cydoniella F.
Phyllonorycter geniculella Rag.
Phyllonorycter lautella Z.
Phyllonorycter maestingella Müll.
Phyllonorycter mespilella Frey
Phyllonorycter nicellii Stt.
Phyllonorycter pastorella Z.
Phyllonorycter platani Stgr.
Phyllonorycter populifoliella Tr.
Phyllonorycter quercifoliella Z.
Phyllonorycter quinnata Gffr.
Phyllonorycter roboris Z.
Phyllonorycter sagitella Bjk.
Phyllonorycter schreberella F.
Phyllonorycter sorbi Frey

- Phyllonorycter* sp. (*Quercus* spp.)
Phyllonorycter sp. (*Salix* sp.)
Phyllonorycter sp. (*Sorbus* spp.)
Phyllonorycter sylvella Hw.
Phyllonorycter tenerella Joann
Phyllonorycter ulmifoliella Hb.
- Eriocraniidae*
Dyseriocrania subpurpurella Haw.
- Lyonetiidae*
Bucculatrix albedinella Z.
Bucculatrix frangulella Goeze
Bucculatrix ulmifoliae Hg.
Leucoptera scitella Z.
Lyonetia clerkella L.
Lyonetia prunifoliella Hb.
- Coleophoridae*
Coleophora hornigi Toll.
Coleophora kroneella Fuchs
- Coleophora limosipinnella* Dp.
Coleophora milvipennis Zell.
Coleophora sp. (*Malus* spp.)
Coleophora sp. (*Malus* i *Prunus* spp.)
Coleophora sp. (*Quercus* spp.)
Tischeriidae
Tischeria decidua Wck.
Tischeria dodonaea Stt.
Tischeria ekebladella Bjck.
Tischeria guanacella Dp.
- Phyllocnistidae*
Phyllocnistis saligna Zell.
Phyllocnistis unipunctella Stph.
Phyllocnistis xenia Hg.
- Gelechiidae*
Recurvaria nanella Hb.
- Yponomeutidae*
Prays fraxinella Bjck.

Moths (114) were represented by species of 9 families and 19 genera. The moth families with the largest number of species were *Nepticulidae* (48 species or 42.11%) and *Gracillariidae* (43 species or 37.72%). The representatives of those two families thus account for most of the total number of species (79.83%). The other families included *Coleophoridae* (7 species or 6.14%), *Lyonetiidae* (6 species or 5.26%) and another five families (10 species or 8.77%).

LEAF MINERS PER PLANT GENUS

- Acer*
Caloptilia semifascia Hw. (*Lepid.*)
Etainia sphendarni Hg. (*Lepid.*)
Heterarthrus aceris Kltb. (*Hym.*)
Hinatara recta Thoms. (*Hym.*)
Nepticula speciosa Frey (*Lepid.*)
Phyllonorycter geniculella Rag. (*Lepid.*)
Phyllonorycter sylvella Hw. (*Lepid.*)
- Stigmella aceris* Frey (*Lepid.*)
- Aesculus*
Cameraria ohridella Deschka & Dimić (*Lepid.*)
Nepticula sp. (*Lepid.*)
- Alnus*
Stigmella glutinosae Stt. (*Lepid.*)

Betula

- Nepticula confusella* Wood (*Lepid.*)
Parornix betulae Stt. (*Lepid.*)
Phyllonorycter ulmifoliella Hb. (*Lepid.*)
Scolioneura betulae Zdd. (*Hym.*)
Trachys minutus L. (*Col.*)

Carpinus

- Coleophora milvipennis* Zell. (*Lepid.*)
Parornix carpinella Frey (*Lepid.*)
Phyllonorycter quinnata Gffr. (*Lepid.*)
Phyllonorycter tenerella Joann. (*Lepid.*)
Stigmella carpinella Heyd. (*Lepid.*)
Stigmella sp. (*Lepid.*)
Stigmella sp. (*Lepid.*)

Castanea

- Tischeria decidua* Wck. (*Lepid.*)
Tischeri ekebladella Bjk. (*Lepid.*)

Celtis

- Caloptilia fidella* Rtti. (*Lepid.*)

Cerasus

- Phyllonorycter cerasicolella* H.S. (*Lepid.*)
Phyllonorycter corylifoliella Hb. (*Lepid.*)

Corylus

- Coleophora milvipennis* Zell. (*Lepid.*)
Nepticula microtheriella Stt. (*Lepid.*)

Parornix devoniella Stt. (*Lepid.*)

Phyllonorycter nicellii Stt. (*Lepid.*)

Cydonia

- Coleophora hornigi* Toll. (*Lepid.*)
Nepticula pomella Vaugh. (*Lepid.*)
Parornix anguliferella Z. (*Lepid.*)
Phyllonorycter corylifoliella Hb. (*Lepid.*)
Phyllonorycter cydoniella F. (*Lepid.*)
Phyllonorycter mespilella Frey (*Lepid.*)
Recurvaria nanella D.-Sch. (*Lepid.*)

Fagus

- Nepticula tityrella* Stt. (*Lepid.*)
Parornix fagivora Frey (*Lepid.*)
Phyllonorycter maestingella Müll. (*Lepid.*)
Rhynchaenus fagi L. (*Col.*)
Stigmella hemargyrella Koll. (*Lepid.*)

Fraxinus

- Caloptilia syringella* F. (*Lepid.*)
Prays fraxinella Bjk. (*Lepid.*)

Juglans

- Caloptilia roscipennella* Hb. (*Lepid.*)

Malus

- Callisto denticulella* Thnbh. (*Lepid.*)
Coleophora hornigi Toll. (*Lepid.*)
Coleophora sp. (*Lepid.*)
Coleophora sp. (*Lepid.*)
Ectoedemia pulverosella Stt. (*Lepid.*)
Leucoptera scitella Z. (*Lepid.*)

- Lyonetia clerkella* L. (Lepid.)
Lyonetia prunifoliella Hb. (Lepid.)
Nepticula pomella Vaugh. (Lepid.)
Phyllonorycter blancardella F. (Lepid.)
Phyllonorycter corylifoliella Hb. (Lepid.)
Ramphus oxyacanthae Mrsh. (Col.)
Recurvari nanella Hb. (Lepid.)
Stigmella despretella Frey (Lepid.)
Stigmella malella Stt. (Lepid.)
Stigmella mali Hg. (Lepid.)
- Oreoherzogia*
Bucculatrix frangulella Goeze (Lepid.)
Stigmella catharticella Stt. (Lepid.)
Stigmella rhamnella H.S. (Lepid.)
- Ostrya*
Phyllonorycter tenerella Joann. (Lepid.)
- Platanus*
Phyllonorycter platani Stgr. (Lepid.)
- Populus*
Caloptilia stigmatella F. (Lepid.)
Ectoedemia turbidella Zell. (Lepid.)
Heterarthrus ochropoda Kl. (Hym.)
Messa sp. (Hym.)
Nepticula assimilella Z. (Lepid.)
Nepticula trimaculella Hw. (Lepid.)
Phyllocnistis unipunctella Stph. (Lepid.)
Phyllocnistis xenia Hg. (Lepid.)
Phyllonorycter comparella Dp. (Lepid.)
- Phyllonorycter populifoliella* Tr. (Lepid.)
Phyllonorycter sagitella Bjk. (Lepid.)
Phytagomyza populi Kltb. (Dipt.)
Phytagomyza populicola Hardy (Dipt.)
Rhynchaenus populi F. (Col.)
Stigmella subtrimaculella Dufr. (Lepid.)
Zeugophora flavicollis Mrsh. (Col.)
- Prunus*
Coleophora hornigi Toll. (Lepid.)
Coleophora sp. (Lepid.)
Ectoedemia spinosella Joann. (Lepid.)
Leucoptera scitella Z. (Lepid.)
Nepticula plagicolella Stt. (Lepid.)
Parornix finitimella Z. (Lepid.)
Parornix torquillella Z. (Lepid.)
Phyllonorycter cerasicolella H.S. (Lepid.)
Phyllonorycter corylifoliella Hb. (Lepid.)
Ramphus oxyacanthae Mrsh. (Col.)
Recurvaria nanella Hb. (Lepid.)
Stigmella prunetorum Stt. (Lepid.)
Tischeria gaunacella Dp. (Lepid.)
- Pyrus*
Coleophora kroneella Fuchs (Lepid.)
Leucoptera scitella Z. (Lepid.)
Parornix anguliferella Z. (Lepid.)
Phyllonorycter corylifoliella Hb. (Lepid.)
Phyllonorycter mespilella Frey (Lepid.)

- Ramphus oxyacanthae* Mrsh. (Col.)
Recurvaria nanella Hb. (Lepid.)
Stigmella pyri Glitz. (Lepid.)
Stigmella pyricola Wck. (Lepid.)
Trachys minutus L. (Col.)
- Quercus*
Caloptilia alchimiella Sc. (Lepid.)
 Diptera, nedet.
Dyseriocrania subpurpurella Haw. (Lepid.)
Ectoedemia quinquella Bed. (Lepid.)
Phyllonorycter lautella Z. (Lepid.)
Phyllonorycter quercifoliella Z. (Lepid.)
Phyllonorycter roboris Z. (Lepid.)
Phyllonorycter sp. (Lepid.)
Profenus pygmaea Kl. (Hym.)
Rhynchaenus subfasciatus Gyllh. (Col.)
Stigmella atricapitella Hw. (Lepid.)
Stigmella caradjai Hg. (Lepid.)
Stigmella nigrosarsella Klim. (Lepid.)
Stigmella samiatella Z. (Lepid.)
Stigmella sp. (Lepid.)
Stigmella zimmermanni Hg. (Lepid.)
Tischeria dodonaea Stt. (Lepid.)
Tischeria ekebladella Bjk. (Lepid.)
- Rhamnus*
Bucculatrix frangulella Goeze (Lepid.)
Stigmella catharticella Stt. (Lepid.)
Stigmella rhamnella H.S. (Lepid.)
- Robinia*
Parectopa robiniella Clem. (Lepid.)
- Salix*
Callisto coffeella Ztt. (Lepid.)
Heterarthrus microcephala Kl. (Hym.)
Lyonetia clerkella L. (Lepid.)
Nepticula obliquella Hein. (Lepid.)
Nepticula salicis Stt. (Lepid.)
Phyllocnistis saligna Zell. (Lepid.)
Phyllonorycter pastorella Z. (Lepid.)
Phyllonorycter sp. (Lepid.)
Phytagromyza langei Hg. (Dipt.)
Phytagromyza tridentata Lw. (Dipt.)
Rhynchaenus populi F. (Col.)
- Sambucus*
Liriomyza amoena Mg. (Dipt.)
- Sorbus*
Leucoptera scitella Z. (Lepid.)
Lyonetia clerkella L. (Lepid.)
Phyllonorycter corylifoliella Hb. (Lepid.)
Phyllonorycter sorbi Frey (Lepid.)
Phyllonorycter sp. (Lepid.)
Ramphus oxyacanthae Mrsh. (Col.)
Recurvaria nanella Hb. (Lepid.)
Stigmella ariella H.S. (Lepid.)
Stigmella nylanderella Tgstr. (Lepid.)
Stigmella torminalis Wood (Lepid.)
- Syringa*
Caloptilia syringella F. (Lepid.)
- Tilia*
Parna tenella Klug. (Hym.)
Stigmella tiliae Frey (Lepid.)
Trachys minutus L. (Col.)

Ulmus

Bucculatrix albedinella Z. (Lepid.)
Bucculatrix ulmifoliae Hg. (Lepid.)
Coleophora limosipennella Dp. (Lepid.)
Kaliopenusa (Fenusa) ulmi Sund. (Hym.)

Nepticula marginicolella Stt. (Lepid.)
Phyllonorycter agilella Z. (Lepid.)
Phyllonorycter schreberella F. (Lepid.)
Stigmella ulmiphaga Preiss. (Lepid.)
Stigmella ulmivora Fol. (Lepid.)
Stigmella viscerella Stt. (Lepid.)
Trachys minutus L. (Col.)

The largest number of leaf miners in the region of Belgrade infested plants of the following genera: *Quercus* (18), *Malus* (16), *Populus* (16), *Prunus* (13), *Salix* (11), *Ulmus* (11), *Pyrus* (10), *Sorbus* (10), *Acer* (9), *Carpinus* (7), *Cydonia* (7), *Betula* (5), and *Fagus* (5). Other plant genera were infested by between one and four miner species. All plant species within a genus are not inhabited by the same miner species (e.g. *Acer*, *Aesculus*, *Quercus*, etc.). Leaf miners are rarely polyphagous. Some miner species are characteristically associated with specific plants alone (species and genera), i.e. miners are mostly monophagous or oligophagous. Consequently, they make highly reliable plant determinators.

Based on the evaluation of infestation intensity and injury, it can be concluded that some of the registered species of leaf miners involve very high economic cost and various other negative side effects regarding the main function of greenery in urban surroundings, including the aesthetic aspect.

Most of the miners (126) were for the first time registered in this investigation as new species in the Serbian region. Some leaf miners (e.g. *Trachys minutus* L. on birch) were found for the first time on other plant species as well (new hosts, plant sustainers). We also registered quite different positions and shapes of mines on the leaf than usual (e.g. *Phyllocnistis saligna* Z. on the front and reverse sides of the weeping willow leaf, etc.), which is important for reliable identification of miner species. The species *Etainia sphenamni* Hg. (*Nepticulidae*) found in the Belgrade region mines the alar nut of the maple fruit, rather than its leaf as other species do. The collected samples also contained several leaf miner species that have not yet been identified. For example, an unidentified and hitherto undescribed leaf miner of the *Nepticulidae* family was found on the yellow American horse chestnut (*Aesculus flava* Ait.).

Despite evident damage, which involves some other negative effects as well, measures of protecting trees from leaf miners have not yet been carried out in this region. Only one method has been exceptionally developed for protecting horse chestnut from leaf miners. (DIMIĆ & MIHAJLOVIĆ, 1994; DIMIĆ, 1995a, 1995b,...).

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ЕНТОМОФАУНА МИНЕРА ЛИСТА НА ДЕНДРОФЛОРИ
ЗЕЛЕНИХ ПОВРШИНА БЕОГРАДА И ОКОЛИНЕН. ДИМИЋ, Љ. МИХАЛЛОВИЋ, С. КРЊАЈИЋ,
П. ПЕРИЋ И М. ЦВЕТКОВИЋ

И з в о д

Сакупљање и истраживање минера листа дрвећа обављено је на 636 локалитета, у ширем региону Београда.

Испитивањима, су обухваћене све дрвенасте врсте, а минери листа су утврђени на 113 биљки из 14 фамилија и 29 родова.

На дендрофлори у подручју Београда утврђено је и научно обрађено 135 врста минера листа. Највећи број установљених врста (114 врста, или 84,45%) припада реду Lepidoptera. Преостале врсте спадају у редове: Hymenoptera (9 или 6,67%), Diptera (6 или 4,44%) и Coleoptera (такође, 6 врста, или 4,44%). Лептири су заступљени са врстама из 9 фамилија и 19 родова. Врстама најбројније фамилије лептира су: Nepticulidae (48 врста, или 42,11%) и Gracillariidae (43 врсте, или 37,72%). Затим слиједи: Coleophoridae (7, или 6,14%), Lyonetiidae (6 или 5,26%), итд.

Највећи број минера листа на подручју Београда насељава биљке из родова: *Quercus* (18), *Malus* (16), *Populus* (16), *Prunus* (13), *Salix* (11), *Ulmus* (11), *Pyrus* (10), *Sorbus* (10), *Acer* (9), *Carpinus* (7), *Cydonia* (7), *Betula* (5) и *Fagus* (5).

Поједине од утврђених врста имају веома изражен привредни значај и значај за естетске функције зеленила. Већина врста (121), се први пут региструје за подручје Србије. До сада су биле познате (10,37%) следеће врсте: *Cameraria ohridella* Deschka & Dimić, *Leucoptera scitella* Z., *Lyonetia clerkella* L., *Phyllonorycter blancardella* F., *Phyllonorycter corylifoliella* Hb., *Phyllonorycter platani* Stgr., *Phyllonorycter populifoliella* Tr., *Phyllonorycter maestingella* Müll., *Phyllonorycter quercifoliella* Z., *Phyllonorycter comparella* Zell. *Stigmella aceris* Frey, *Stigmella atricapitella* Hw., *Stigmella malella* Stt. и *Tischeria ekebladella* Bjk. Утврђени су и нови домаћини (биљке хранитељке), положаји и облици мина, итд.

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