IUFRO 7.03.10. Methodology of forest insect and disease survey in Central Europe 16-20 September 2019, Suceava, Romania: Recent Changes in Forest Insects and Pathogens Significance...

Book · September 2019

66 authors, including:

Mihai-Leonard Duduman
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Universitatea Ştefan cel Mare Suceava

Meeting of IUFRO WP 7.03.10

Methodology of forest insect and disease survey in Central Europe

Book of abstracts

Recent Changes in Forest Insects and Pathogens Significance

Suceava, Romania
16-20 September, 2019

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IUFRO 7.03.10.

Methodology of forest insect and disease survey in Central Europe

Meeting 2019

Recent Changes in Forest Insects and Pathogens Significance

16 – 20 September 2019

Suceava, Romania

BOOK OF ABSTRACTS

Edited by:

Mihai-Leonard Duduman, Daniela Lupaștean, Sergiu-Andrei Horodnic, Ciprian Palaghianu

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Welcome address!

Dear colleagues,

Welkome to the International Conference "Recent Changes in Forest Insects and Pathogens Significance". This is part of the series of meetings of the IUFRO working party 7.03.10. – Methodology of forest insect and disease survey in Central Europe.

After 19 years, Romania has the second time the oportunity to organize this meeting. Thus, the Forestry Faculty from the "Ștefan cel Mare" University of Suceava, has the honour to organise this important conference, in Suceava, in the main town of the Romanian part of historical province Bucovina, famous for the Princely Fortress and the medieval painted monasteries, included on the list of the world heritage UNESCO, as for its beautiful nature.

The goal of this meeting is to bring together forest researchers and practitioners who are concerned about pests and diseases specific to European forests, but not only. The principal themes of this conference are: *Pests and diseases occurrence in Central Europe*; *The non-native organisms and the importance of sharing information on distribution and spreading*; *The risk assessment of actual and introduced pests and diseases*; *Diagnostic tools and evidence systems for forest pests and diseases* and *The pest and disease controls in the certificated forests (FSC or PEFC)*.

We are convinced that at this meeting there will be presented numerous significant scientific contributions about the forest pests and diseases. So, selected publications from the conference will be published in the special issue of the international journal *Annals of Forest Research* (ISI Web of knowledge IF:1.576).

Thank you for your contributions to this meeting, and we look forward the exciting next days of oral and poster presentations, and the field trip to the two old growth forests (Zamostea Luncă and Giumalău) and Moldovița Monastery.

We hope you will enjoy this meeting, both the high scientific level but also the experiences and momments in this beautiful part of Romania.

On the behalf of the organizing committee,

Mihai-Leonard DUDUMAN

"Ștefan cel Mare" University,
Forestry Faculty

Meeting programme (overview)

Monday, 16 September 2019

13:00 – 19:00	**Arrival**
17:00 – 19:00	**Registration**
19:30	**Dinner**

Tuesday, 17 September 2019

07:30 – 08:30	***Breakfast* and registration**
09:00 – 09:40	**Conference welcome and opening**
09:40 – 10:00	**Phytosanitary situation of Suceava County forests**
10:00 – 11:20	**Meeting Session 1: Oral presentations (4 presentations) (hotel conf. hall)**
11:20 – 11:40	***Coffee break***
11:40 – 13:00	**Meeting Session 2: Oral presentations (4 presentations) (hotel conf. hall)**
13:00 – 14:00	***Lunch break***
14:00 – 15:40	**Meeting Session 3: Oral presentations (5 presentations) (hotel conf. hall)**
15:40 – 16:00	***Going to "Ștefan cel Mare" University***
16:00 – 17:30	**Poster session (*coffee break included*) (University E Building hall)**
17:30 – 19:30	**Free time (optional short Suceava City tour)**
19:30	***Dinner***

Wednesday, 18 September 2019

07:30 – 08:30	**Breakfast**
08:30	**Field trip**

Thursday, 19 September 2019

07:30 – 08:30	***Breakfast***
09:00 – 10:40	**Meeting Session 4: Oral presentations (5 presentations) (hotel conf. hall)**
10:40 – 11:00	***Coffee break***
11:00 – 12:40	**Meeting Session 5: Oral presentations (5 presentations) (hotel conf. hall)**
12:40 – 14:00	***Lunch break***
14:00 – 15:40	**Meeting Session 6: Oral presentations (5 presentations) (hotel conf. hall)**
15:40 – 16:00	***Coffee break***
16:00 – 17:40	**Meeting Session 7: Oral presentations (5 presentations) (hotel conf. hall)**
17:40 – 18:30	**Workgroup meeting, Closing conference (hotel conf. hall)**
19:30	***Conference dinner***

Friday, 20 September 2019

07:30 – 08:30	***Breakfast***
09:00 – 13:00	***Visit to the Princely Fortress of Suceava and Bukovina Village Museum***
13:00 – 14:00	***Lunch break***
14:00	***Departure***

Meeting programme (detailed)

Monday, 16 September 2019

13:00 – 19:00	***Arrival***
17:00 – 19:00	***Registration***
19:30	***Dinner***

Tuesday, 17 September 2019

07:30 – 08:30	***Breakfast and registration***
09:00 – 09:40	**Conference welcome and opening** **Valentin Popa**, *Rector of "Ștefan cel Mare" University of Suceava* **Miloš Knížek**, *Coordinator of IUFRO WP 7.03.10 Methodology of forest insect and disease survey in Central Europe* **Gheorghe Flutur**, *President of Suceava County Council* **Gheorghe Mihăilescu**, *Director of National Forest Administration ROMSILVA*
09:40 – 10:00	Phytosanitary situation of Suceava County forests **Daniela Lupaștean**, *"Ștefan cel Mare University" of Suceava, Forestry Faculty, Romania*

Session 1: Information platform on pests occurrence in Europe

Chair: **Mihai-Leonard Duduman/ Daniela Lupaștean**

10:00 – 10:20	Bark beetle community changes in north **Bjørn Økland**, *Norwegian Institute of Bioeconomy Research (NIBIO), Norway*
10:20 – 10:40	Occurrence of forest damaging agents in 2018 in Czechia **Miloš Knížek**, *Forestry and Game Management Research Institute, Czechia*
10:40 – 11:00	The first reported outbreak of *Cephalcia abietis* (L.) (Hymenoptera: Pamphiliidae) in Romania **Nicolai Olenici**, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*
11:00 – 11:20	Biodiversity and insect pests - a study from south-eastern Poland **Wojciech Grodzki**, *Forest Research Institute, Poland*
11:20 – 11:40	***Coffee break***

Session 2: Information platform on diseases occurrence in Europe

Chair: **Dănuț Chira**

11:40 – 12:00 Ophiostomatoid fungi associated with bark beetles on Scots pine in Ukraine
Kateryna Davydenko, *Ukrainian Research Institute of Forestry & Forest Melioration, Ukraine*

12:00 – 12:20 The Pine Wilt Disease threat to the European conifers: Lessons from 20 years containment experience in Portugal and recent research developments
Luis Bonifácio, *National Institute of Agricultural and Veterinary Research, Portugal*

12:20 – 12:40 Powdery mildew fungi on trees and shrubs in forests of Azerbaijan
Dilzara Aghayeva, *Institute of Botany, Azerbaijan National Academy of Sciences, Azerbaijan*

12:40 – 13:00 The occurrence of the pathogenic fungi *Cryptostroma corticale*, *Prosthecium pyriforme* and *Eutypella parasitica* on *Acer pseudoplatanus* from 2017 to 2019 in Slovakia
Andrej Kunca, *National Forest Centre – Forest Protection Service, Slovakia*

13:00 – 14:00 ***Lunch break***

Session 3: The pest and disease controls in the certificated forests

Chair: **Miloš Knížek**

14:00 – 14:20 Development of semiochemical based bark beetle management methods for spruce stands
Rastislav Jakus, *Institute of Forest Ecology, Slovak Academy of Sciences, Slovakia*

14:20 – 14:40 Integrated Pest Management of the Pine Weevil (*Hylobius abietis*)
Frauke Fedderwitz, *Crop Research Centre, Ireland*

14:40 – 15:00 Biological approach for another newcomer pest within Romanian spruce forests: *Cephalcia abietis* (L.) (Hymenoptera: Pamphiliidae)
Marius Paraschiv, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

15:00 – 15:20 Sanitation methods for landings of bark beetle infested wood
Petr Zahradník, *Forestry and Game Management Research Institute, Czechia*

15:20 – 15:40 Integrated control methods for the most important lethal invasive pathogens
Danut Chira, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

15:40 – 16:00 ***Going to "Ștefan cel Mare" University for Poster Session***

Poster Session: Forest Pests and Diseases – Monitoring – Risk Assessment – Control

Location: "Ștefan cel Mare" University, E Building, the Large Hall

Chair: Daniela Lupaștean, Mihai-Leonard Duduman

16:00 – 17:30 **Poster presentations – the details of titles and authors of the posters are listed at the end of the programme.**

17:30 – 19:30 **Free time (optional short Suceava City tour)**

19:30 ***Dinner***

Wednesday, 18 September 2019

07:30 – 08:30 ***Breakfast***

08:30 – 21:00 **Field trip**

- Zamostea old growth forest: *Fraxinus excelsior* diseases and other aspects;
- Voroneț Monastery - Sistine Chapel of the East (UNESCO - World Heritage sites);
- Field lunch;
- Valea Putnei location: Bark beetle foci in mountain Norway spruce forests (*Ips typographus, Ips duplicatus etc.*);
- Giumalău spruce old growth forest: biodiversity and stability
- Field dinner: Valea Putnei Forest House.

Thursday, 19 September 2019

07:30 – 08:30 ***Breakfast***

Session 4 Non-native organisms - network for sharing information on distribution and spreading

Chair: **Wojciech Grodzki**

09:00 – 09:20 The oak lace bug (*Corythucha arcuata*) in Hungary – many questions but only few answers so far
Marton Jozsef Paulin, *NARIC Forest Research Institute, Hungary*

09:20 – 09.40 Preliminary results on the presence of *Hymenoscyphus fraxineus* in Western and North-Western Romania
Ecaterina Fodor, *University of Oradea, Faculty of Environmental Protection, Forestry and Forest Engineering Department, Romania*

09:40 – 10:00 *Ips typographus* in the UK - Establishment and Eradication
Max Blake, *Forest Research, United Kingdom*

10:00 – 10:20 Wild Spotter: Engaging and empowering citizen science volunteers to protect against invasive species
G. Keith Douce, *University of Georgia, USA*

10:20 – 10:40 Population growth and overwintering potential of the invasive ambrosia beetle *Xylosandrus germanus* in the West Carpathians, Central Europe
Peter Zach, *Institute of Forest Ecology, Slovak Academy of Sciences, Slovakia*

10:40 – 11:00 ***Coffee break***

Session 5 Diagnostic tools and evidence systems for forest pests and diseases

Chair: **Andrej Kunca**

11:00 – 11:20 Ten years of monitoring in declining oak woodland
Nathan Brown, *Rothamsted Research, United Kingdom*

11:20 – 11:40 Distribution and behaviour of the northern bark beetle (*Ips duplicatus*) in Austria
Bernhard Perny, *Federal Research Centre for Forest (BFW), Austria*

11:40 – 12:00 'Oak bodyguards' citizen science program: Can school children contribute to ecological research by playing with modelling clay?
Elena, Valdes-Correcher, *INRA UMR Biogeco, France*

12:00 – 12:20 Emerald ash borer in European part of Russia: 2019 situation update
Yuri Baranchikov, Sukachev Institute of Forest FRC KSC, Russian Academy of Sciences, Russia

12:20 – 12:40 Case study concerning the *Leucaspis* genus in Romania
Gabriela-Aurora Isaia, *Transilvania University of Brasov, Faculty of Silviculture and Forest Engineering, Romania*

12:40 – 14:00 ***Lunch break***

Session 6 Risk assessment of actual and introduced pests and diseases

Chair: **Bjørn Økland**

14:00 – 14:20 Assessment and prediction of biotic risks in the forests of Ukraine
Valentyna Meshkova, *Ukrainian Research Institute of Forestry & Forest Melioration, Ukraine*

14:20 – 14:40 Development of the mobile application for assessment and management of bark beetle infestation
Alexander Mraz, *Czech University of Life Sciences Prague, Czechia*

14:40 – 15:00 Insect traps are an excellent way to survey for fungal pathogens
Jean Bérube, *Canadian Forest Service, Canada*

15:00 – 15:20 Historical herbaria collections are treasure troves for the study of forest pest invasions
Natalia Kirichenko, *Sukachev Institute of Forest FRC KSC, Russian Academy of Sciences, Russia*

15:20 – 15:40 The distribution and spread of the non-native *Ips amitinus* in Sweden
Dragoș Cocoș, *Swedish University of Agricultural Sciences, Sweden*

15:40 – 16:00 ***Coffee break***

Session 7 Forest pest and diseases: ecology and control

Chair: **Valentyna Meshkova**

16:00 – 16:20	The quantification of alleles of a resistance gene encoding leucoanthocyanidin reductase (PaLAR3) from Norway Spruce **Kashif Muhammad**, *Natural Resources Institute Finland (LUKE), Finland*
16:20 – 16:40	Are Mediterranean climate conditions suitable for *Lecanosticta acicola* establishment and spreading? **Giorgio Maresi**, *Foundazione Edmund Mach, Italy*
16:40 – 17:00	Analysis and next-year forecast of beetle, borer, and drought-induced tree mortality in California **Jason Maxfield**, *Portland State University, USA*
17:00 – 17:20	Seasonal response of bark and wood boring insects to (-) α pinene and ethanol in three resinous forests **Daniela Lupaștean**, *"Ștefan cel Mare University" of Suceava, Forestry Faculty, Romania*
17:20 – 17:40	The influence of principal weather parameters of the *Ips duplicatus* flight activity **Mihai-Leonard Duduman**, *"Ștefan cel Mare University" of Suceava, Forestry Faculty, Romania*
17:40 – 18:30	**Workgroup meeting, Closing conference**
19:30	***Conference dinner***

Friday, 20 September 2019

07:30 – 08:30	***Breakfast***
09:00 – 13:00	***Visit the Princely Fortress of Suceava and Bukovina Village Museum***
13:00 – 14:00	***Lunch break***
14:00	***Departure***

Poster Session (*coffee break included*) – "Ștefan cel Mare" University, E Building, the Large Hall
Tuesday, 17 September, between 16:00 – 17:30

Chair: Daniela Lupaștean/ Mihai-Leonard Duduman

Note: All posters are positioned in alphabetically order, after the name of first author

1. Distribution of the oak lace bug, *Corythucha arcuata* (Say.) (Hemiptera: Tingidae), in Romania
Flavius Balacenoiu, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

2. Micological complex, associated with the four-eyed fir bark beetle *Polygraphus proximus* Blandford in its secondary range and its role in beetle/tree communications
Yuri Baranchikov, *Sukachev Institute of Forest FRC KSC, Russian Academy of Sciences, Russia*

3. Possibilities of using global positioning system (GPS) in the aerial treatments application against forest defoliators insects in Romania
Andrei Buzatu, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

4. The regression of epidemic diseases by alien fungi: *Seiridium cardinale* as case study
Paolo Capretti, *Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Italy*

5. *Ceresa bubalus* (Hemiptera: Membracidae) in oak plantations in north – eastern Romania
Constantin Ciornei, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

6. Romanian Beauveria bassiana strain with potential for biological control of the invasive oak splendour beetle, *Agrilus biguttatus*
Daniel Cojanu, *Research-Development Institute for Plant Protection, Romania*

7. Field experience of *Beauveria brongniartii* application in the control of white grubs in nurseries and forest plantations in Moldova region
Ana-Cristina Fătu, *Research-Development Institute for Plant Protection, Romania*

8. *Pityogenes chalcographus* (Coleoptera: Scolytidae) in unmanaged and managed forests of Apuseni Natural Park, Romania
Ciprian George Fora, *Banat`s University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Romania*

9. Preliminary results on forest protection ecosystem services of red wood ant (*Formica rufa* group) and birds (Aves) in oak (*Quercus* sp.) forests of Hungary
Agnes Fürjes-Mikó, *NARIC Forest Research Institute, Department of Forest Protection, Hungary*

10. Monitoring of non-native insect species in forests of Slovakia
Andrej Gubka, *National Forest Centre – Forest Protection Service, Slovakia*

11. New diagnostic techniques for Pine wilt disease caused by pine wood nematode (*Bursaphelenchus xylophilus*)
Hyerim Han, *National Institute of Forest Science, Republic of Korea*

12. Influence of thermal-humidity and snow conditions on winter mortality of developmental stages of *Pityogenes chalcographus* (L.) under field and laboratory studies
Magdalena Kacprzyk, *University of Agriculture in Cracow, Institute of Forest Ecosystems Protection; Department of Forest Protection, Entomology and Forest Climatology*

13. The Last Tree Standing: a pilot study of spruce surviving bark beetle outbreak in the Bohemian Forest Mountains
Nataliya Korolyova, *Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Czechia*

14. Late flushing trees avoid attack by moth larvae
Jan Kulfan*, Institute of Forest Ecology, Slovak Academy of Sciences, Slovakia*

15. Attraction of trap trees for *Ips duplicatus* Sahlb., *Ips typographus* L. and *Pityogenes chalcographus* L. (Coleoptera: Curculionidae) trapping
Jan Lubojacký, *Forestry and Game Management Research Institute, Czechia*

16. Future hormonal control method for a well-known problem
Ioan Andrei Manea, *Forest Research, United Kingdom*

17. The favorability of the oak forests in Romania for *Acrobasis tumidana* Denis & Schiffermuller, 1775 (Pyralidae, Lepidoptera) outbreak
Constantin Nețoiu, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

18. Seasonal dynamics of *Xylosandrus germanus* (Coleoptera: Curculionidae, Scolytinae) flight and attack in the northern part of the Eastern Carpathians (Romania) - preliminary results. National Institute for Research and Development in Forestry "Marin Drăcea", Romania
Nicolai Olenici, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

19. Development and application of Loop-Mediated Isothermal Amplification for a simple and precise detection of the pinewood nematode *Bursaphelenchus xylophilus* in Korea
Lee Sang-Hyun, *National Institute of Forest Science, Republic of Korea*

20. Dynamics of a bark beetle community in a Norway spruce forest in the High Tatra Mountains, Slovakia
Nick Schafstall: *Czech university of Life Sciences in Prague, Czechia*

21. Identification of Forest Deceases by Combination of Baiting method and PCR
Tatiana Surina, *All-Russian Plant Quarantine Center, Russia*

22. Monitoring pathogens present in forest cultures in the current climate context
Ioan Tăut, *National Institute for Research and Development in Forestry "Marin Drăcea", Romania*

23. *Brenneria* and *Lonsdalea* species in Europe
Imola Tenorio-Baigorria, *National Agricultural and Research Innovation Centre, Forest Research Institute, Department of Forest Protection, Hungary*

24. Combination of Verbenone and MCH pheromone repellents for the management and control of *Ips typographus*
Ștefania Tötös, *Raluca Ripan Institute for Research in Chemistry, Babes-Bolyai University, Romania*

25. Associational effects of European beech (*Fagus sylvatica*) on pine weevil damage received by Norway spruce (*Picea abies*)
Amelia Augusta Tudoran, Swedish University of Agricultural Sciences, Sweden

26. Vertical transmission of the *Beauveria bassiana* between the double-spined bark beetle *Ips duplicatus*
Jozef Vakula, *National Forest Centre – Forest Protection Service, Slovakia*

27. Processes are the same: case study of bark beetles in national park zones with different intervention
Hana Vanická, *Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Czechia*

28. Synthesis, formulation and field test of synthetic sex pheromone of *Lymantria monacha* L. (Lepidoptera: Lymantriidae)
Iuliana Vasian, *Raluca Ripan Institute for Research in Chemistry, Babes-Bolyai University, Romania*

Organisation

Organizing institutions:

IUFRO, WG7.03.10 Methodology of forest insect and disease survey in Central Europe

Forestry Faculty, "Stefan cel Mare" University of Suceava, Romania

Society for Silviculture and Environment, Suceava, Romania

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- **Mihai-Leonard Duduman**
- **Daniela Lupaștean**
- **Sergiu Andrei Horodnic**
- **Ciprian Palaghianu**

Suceava – short presentation

Suceava is a 100,000 inhabitant town and the capital of Suceava County. It is located at 450 km North of Bucharest, in the Suceava Plateau, on the bank of the river bearing the same name, in the historical province Bucovina famous for its monasteries and beautiful nature. Suceava is also known as a former capital of Moldavia principality (between 1388 and 1564). During the 15th century, under the reign of Ştefan cel Mare (Stephan the Great), Suceava developed as a strong citadel, with an important trading and custom center, with many warehouses. During that time, Suceava was closely resembling, from a demographic perspective, with important cities in Central Europe, as Leipzig or Dresda. The importance of German and Armenian communities in economic and social life made Suceava very attractive in the region. After the Turks ravaged the city in the 16th century, it began to decline in importance. In 18th century (1775), the Turks ceded Suceava (with an important part of North-West of Moldavia) to Austrian Empire, and this new territory is named Bucovina, in order to differentiate it culturally from the region it was part of until then, Moldavia. The city was marked by the influence of diverse population coming from the North-East (Ukrainians, Poles, Germans, Jews), from the West (Romanians, as well as Hungarians and Germans from Transylvania). There have been established important communities, and the city gained a cosmopolitan character until after the Second World War. Under Austrian administration, the city changed and some of the public buildings can be seen today, housing The Justice Palace, The Prefecture, The „Ştefan cel Mare" National College, The History Museum. In 1918 the region and the city were annexed again to Romania.

During the period after WWII, and mainly after 1960, the population has tenfold increased because of the development of industry and the changes in administrative and political regime. After the 1989 Revolution, the city return to a free demographic dynamic and the functional profile changes, the industry being replaced by trade and services. In the present, the local industry is based on glass production, wood processing, textiles, mechanical parts and construction materials.

The tourist attraction in Suceava includes historic buildings, museums, and religious venues.

The History Museum. The permanent exhibition of the History Museum is hosted by a historic building, constructed in a neo-classical style at the beginning of the 20th century, and was designed as a description of the local history, combined with the national history.

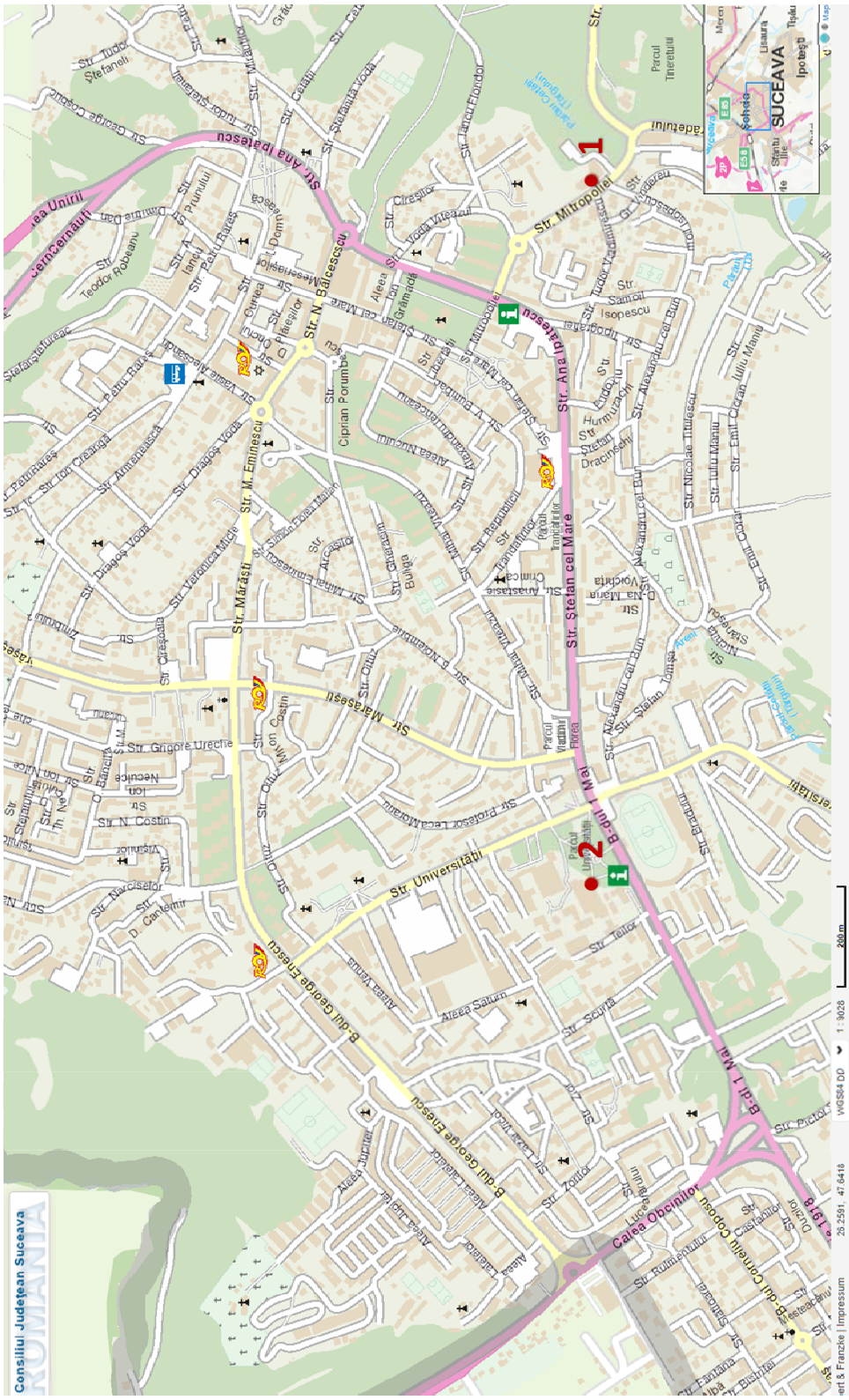
The *Princely Fortress of Suceava* built at the end of the 14th century near the Suceava medieval city had been the main residence of Moldavia's rulers for almost 200 years. It is located in eastern edge of the city, on the terminal heel of a plateau, 70 m above the plains of Suceava and it offers a perfect view over the entire Suceava Valley. Today, the medieval architectonic assembly comprising the castle and the protection walls is an important national historic monument. The protection walls were built during the reign of Ștefan cel Mare, whose equestrian statue stands in the nearby park. In the fortress, are organized exhibitions and cultural events, the most spectacular being the, Ștefan cel Mare Medieval Art Festival which takes place every year in August.

The Bukovina Village Museum. Situated close to the Princely Fortress of Suceava, the general image of Bukovina Village Museum reflects the organization and the complex activity of the traditional village, the vernacular architecture of the households and of the community constructions, of the technical facilities which illustrate the occupations and crafts in the area and the way of life of the Bucovina dwellers. The novelty of this museum is given by the representation of the peasant's spiritual life, marked by passing rituals.

The Museum of Natural Science. The museum is situated in the Central Park of the Suceava Municipality. The permanent exhibition includes the most valuable species of flowers existing in the museum heritage, leaf prints, as well as the fragments of the disappeared animals, and dioramas.

The Princely Inn offers an image of the culture and civilization in Bukovina by the uniqueness and the heritage value of the museum ethnographical collections.

The *Monastery "Sfântul Ioan cel Nou"*. The orthodox monastery was built during 1514-1522 and the church „Sf. Gheorghe", enclosed in the monastery, was included in UNESCO World Heritage list of painted churches from Bucovina.



Suceava map:

1- Hotel Gloria;

2 – "Ștefan cel Mare" University of Suceava, E - Building

About Forestry Faculty of Suceava*

Suceava Faculty of Forestry is committed to offer sound training program for forest engineers, keeping up the scientific and cultural values of traditional forestry in the vision of continuous search for improved knowledge.

The Faculty of Forestry provides 4-years BSc degree in "Forestry", 3-years BSc degree in "Ecology and Environmental Protection", 2-years MSc degree and also PhD programmes.

Undergraduate studies cover the field of Forestry in two types of educational programmes: full time learning (4 years) and long distance learning (4 years). The students are trained to become forest engineers with complex qualifications in land measurement and remote sensing, forest ecosystem management (e.g. dendrology, ecology, silviculture, entomology, game management etc.), wood harvesting technologies, and primary timber processing, ecological restoration and watershed management, as well as in forest economy and legislation. The two master programmes run by the faculty focus on "Biodiversity Conservation and Ecosystem management" and on "Management of Forestry Activities". The emphasis of the first one is on forest conservation, while the latter is focused on providing appropriate management knowledge and skills necessary in forest harvesting and wood processing. Master degree students were involved up to now in three Erasmus projects regarding the innovation in forest sector.

Potential employers are the forest districts, public or private, research institutions, private companies of wood harvesting and processing, forest management planning companies, local public administrations, firms specialized in geomatics and so on. The curriculum is updated whenever needed in order to be on line with the new trends in forestry and forest-based sector. The Faculty also provides opportunities for those interested in acquiring a PhD degree in forestry. In 2009 a new BSc specialization started, focused on "Ecology and Environmental Protection" to train specialists ready to answer to the new challenges of national environmental-related policies.

History: The University of Suceava was created in 1990 as a follower of the first high schools issued in the historical Moldavia, such as Putna Academy, the Theological Institute and the Academy of Cernauti. The history of this institution started in 1963 when the three-year Pedagogical Institute was established. The present University was reshaped on the former Institute of Suceava by the Governmental Decision 225/07.03.1990. The Faculty of Forestry appeared in 1990 to continue the forestry academic tradition initiated in the northern part of the country more than a century ago. Here, the high-level forestry school was created in Fr t ui (Suceava) in 1883. The reorganization of the forestry educational system led to establishing the Institute for Silviculture, Harvesting, Timber Processing and Transportation in 1948 in Câmpulung Moldovenesc, Bucovina. In 1956 the entire high-level education in forestry was centralized in Brasov.

The changes in the political realm related to forestry after 1990, the forest resource endowment of Suceava County, the economic importance of timber industries in this region and the historical tradition in forestry education in Bucovina have been preconditions in supporting the initiative of re-establishing the former Faculty of Forestry, created in Câmpulung Moldovenesc half a century ago. The Faculty of Forestry and the University of Suceava were created at the same time. The governmental acts issued after the Governmental Decision 225/07.03.1990 have confirmed that the Faculty of Forestry is accredited for long term training of engineers in forestry.

*) silvic.usv.ro

Usefull informations**

Official language:
The official language of the meeting is English.

Local language:
Romanian is the official language but English is widely spoken.

Local currency:
Romanian leu: 1 Leu = 0.21 – 0.22 Euro

Accommodation
Balada Hotel: https://www.hotel-balada.ro/en/

Transportation

Air

Suceava Stefan cel Mare International Airport(SCV)
Telephone: 0230 529.999
office@aeroportsuceava.ro
www.aeroportsuceava.ro
The airport is located 12 km East of Suceava city center.

Trains

Suceava Station - Burdujeni *(Gara Suceava)*
Address: Str. Nicoale Iorga 7
Telephone: 0230 517.117

To check schedules for domestic and international trains from/ to Suceava please visit:
www.romaniatourism.com/transportation.html

SNCFR's Advance Booking Office (*Agentia de Voiaj SNCFR Suceava*)
Address: Str. Balcescu 8
Telephone: 0230 214.335
Open: Mon. - Fri. 7:00 a.m. – 8:00 p.m.; Closed Sat. & Sun.
You can get train schedule information and make reservations up to 24 hours in advance at this office. Tickets for same-day travel can only be purchased at the station.

Suceava Intercity Bus

Suceava Main Bus Station *(Autogara Suceava)*
Address: Str. Vasile Alecsandri 2
Daily domestic bus service from/to:
Arad, Bacau, Botosani, Brasov, Bucharest, Campulung Moldovenesc, Constanta, Falticeni, Gura Humorului, Iasi, Piatra Neamt, Putna, Radauti, Siret, Solca, Timisoara, Vatra Dornei

Public Transportation

Several busses, and maxi taxi routes connect Suceava's main areas and tourist attractions.
Telephone: 0330 401 442
www.tpl-sv.ro/trasee-autobuze-microbuze/harta-trasee

Taxi companies

CSV: 0230 522.222
Cristaxi: 0230 533.333

Car rental

Autonom
Address: Str. Nicolae Balcescu 2 and Suceava Airport
Telephone: 0230 521.101 or 0748 295.660
www.autonom.ro

EuroCars Romania
Address: km 12 E58, Salcea (Suceava Airport)
Tel: 0727 37 37 99
www.eurocars.ro

Rent a Car Suceava
Telephone: 0741 644.169
www.RentaCarSuceava.com

Tourist Info
Suceava Tourist Information Center
(Centrul Judetean de Informare Turistica InfoTurism Suceava)
Address: Str. Stefan cel Mare 36
Telephone: 0230 551.241
Email: infoturism@cjsuceava.ro
Open: Mon. – Fri. 8:00 a.m. – 4:00 p.m.; Closed Sat. & Sun.
The Tourist Information Center provides maps, brochures and information on accommodations, restaurants and transportation.

**) http://romaniatourism.com/suceava.html

Suceava Weather Forecast

www.accuweather.com/en/ro/suceava/...

Postal Service & Telephone

Post offices display a postal horn symbol and the word *Posta*.

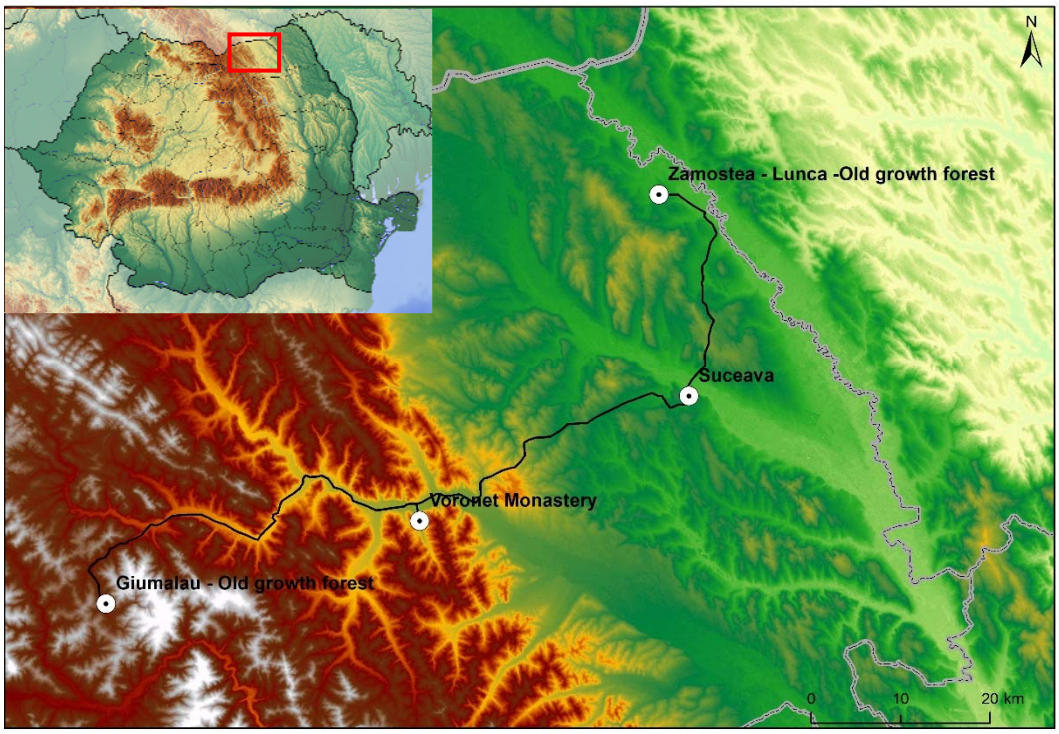
Main Post Office
Address: Str. Dimitrie Onciu 1
Telephone: 0230 512.222

Telephoning Suceava from Abroad
International Access Code +40 (country code) + 230 or 330 (area code) + telephone number

Suceava - Useful Telephone Numbers Suceava

Area Code *(Prefix Suceava)* 230 & 330
Ambulance *(Ambulanta)* – 112
Police *(Politia)* – 112
Fire Department *(Pompierii)* – 112
Local & County Archives *(Arhivele locale)* – 0230 203.726, Address: Str. Stefan cel Mare 33 Suceava 720023
City Hall *(Primaria)* – 0230 212.696
Better Business Bureau *(Oficiul pentru Protectia Consumatorilor)* – 0230 530.876
Suceava Emergency Hospital (*Spitalul Judetean de Urgenta)* – 0230 222.098, Address: Blvd. 1 Decembrie 1918, nr. 21

Field trip overview



Field trip programme Wednesday, September 18th.

Starting point: Balada Hotel Parking, 8:30 AM;

8:30 – 9:30 Travel to Zamostea

9:30 – 11:00 Visiting the reservation Zamostea Luncă Old Growth Forest

11:00 – 12:20 Travel between Zamostea and Voroneț Monastery

12:20 – 13:20 Visiting the Voroneț Monastery

13:20 – 14:00 Field lunch – Clematis Pension – Voroneț

14:00 – 15:00 Travel between Voroneț and Valea Putnei

15:00 – 15:30 Valea Putnei: Bark beetle foci in mountain Norway spruce

15:30 – 15:45 Travel to Giumalău spruce Old Growth Forest

15:45 – 17:45 Visiting the reservation Giumalău Old Growth Forest

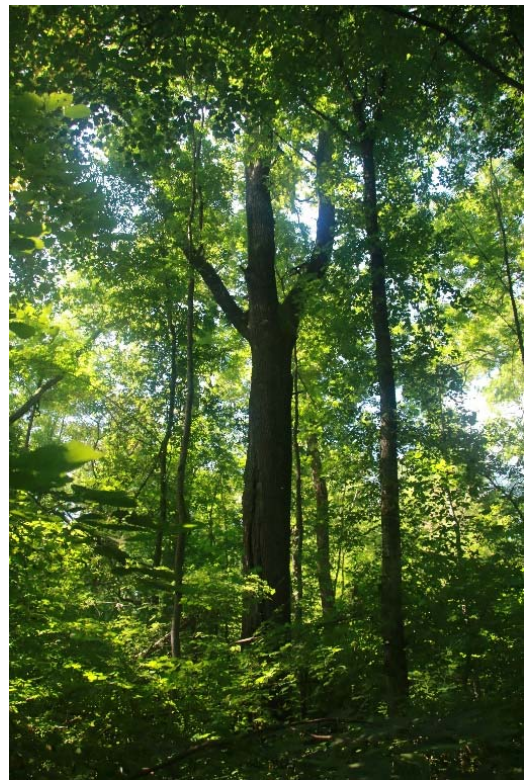
18:00 – 20:00 Field dinner: Valea Putnei Forest House

20:00 – 21:20 Travel to Suceava

Zamostea Luncă Old Growth Forest

- Founding year of reservation: 1973;
- Located in Siret River meadow, 47°56', Lat N, 25°35', Long E, 280-285 m altitude;
- alluvial soils;
- Protected objectives: the meadow vegetal association dominated by Quercus *robur*, with population of *Fraxinus excelsior*, *Carpinus betulus*, *Tilia cordata*, *Prunus avium*, *Acer platanoides*, *Populus tremula*, *Galanthus nivalis*, *Leucojum vernum*, *Scilla bifolia*, *Convalaria majalis*, *Fritillaria meleagris*, etc.;
- Protected area: 107.6 ha;
- The forest age: more than 100 years, isolated oak specimensmore than 200 years old.
- The forest was never cultivated only the dead wood was utilised by the local population.
- The common ash (*Fraxinus excelsior*) population is strongly debilited by *Hymenosciphus fraxineus* attack.

Zamostea Luncă limits (google.maps.com)



Old oak tree in Zamostea Luncă Reserve

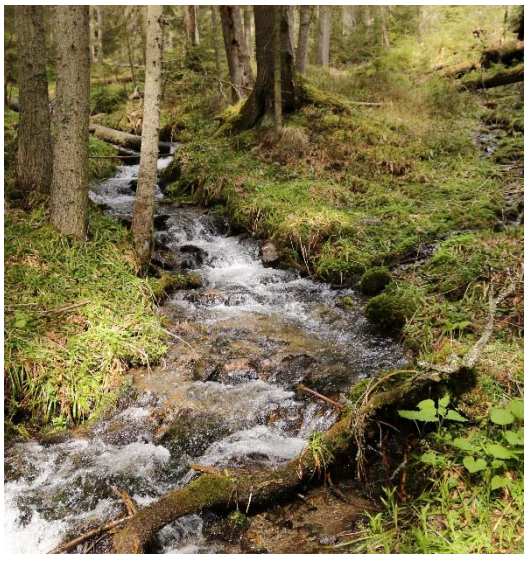
Pe

***Fraxinus excelsior* trees affected by *Hymenosciphus fraxineus* attack.**

Giumalău Old Growth Forest

- Founding year of reservation: 1941;
- Located in Giumalău Mountains, 47°26', Lat N, 25°29', Long E, 1200-1650 m altitude;
- 25° slope;
- deep soils;
- Protectect objectives: Norway spruce forest typical for the belt of boreal forests in the mountains.
- Protected area: 309.5 ha;
- Composition: *Picea abies* (100%), *Sorbus aucuparia* (disseminated), *Acer pseudoplatanus* (disseminated)
- Density index – 90%
- Tree age: 20-200 years;
- Volume: 517m3 /ha;
- Active regeneration with Norway spruce in gaps of different areas caused mainly by wind.

Giumalău Reserve limits (google.maps.com)



Giumalău Forest reserve aspects

ORAL PRESENTATIONS

Bark beetle community changes in north

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The populations sizes of *Ips typographus* in Norway have been monitored since the last big outbreak period in the 1970s. By now, the monitoring programme includes about 500 pheromone-baited trap records for each of the last 40 years. Normally, *Ips typographus* has been the only species of major concern in northern bark beetle outbreaks, and trapping records have served as a warning when the over-wintering population sizes are large. In contrast to Central Europe, the regional trend in northwest is that rainy weather tend to slow down the bark beetle populations in many years, whereas stormfelling episodes of spruces, snowbreaks and warm and dry seasons in certain years favour *Ips typographus* and other bark beetle species. Recent observations indicate that other less aggressive bark beetle species may play a more important role during severe drought periods that follow rainful seasons with low production of *Ips typographus*. It is likely that an increased frequency of extreme weather events may have unexpected effects on what bark beetles become abundant during the course of the outbreaks. Furthermore, the warm years seem to be especially favourable for the *Ips typographus* at the northernmost latitudes. In addition, a new bark beetle species for Scandinavia, *Ips amitinus*, is expanding its range and may become a participant in future bark beetle outbreaks in this region.

Occurrence of forest damaging agents in 2018 in Czechia

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A report on forest pest conditions in Czechia is annually produced by the Forest Protection Service (LOS), Forestry and Game Management Research Institute (FGMRI). The report is based on data received from forest managers, covering about 70 % of the forest area. Results of field and laboratory examinations conducted by LOS are involved.

From forest protection point of view, the year 2018 was one of very unfavourable years, similarly as previous years. From regional point of view, there were again big differences between Moravia (including Silesia) and Bohemia, even though the complicated situation developed also in south-east, south and south-west Bohemia. The whole country is affected by drought in several last years. The main harmful factors are still similar, wind and draught (abiotic factors) and spruce bark beetles and *Armillaria* – also dominantly in spruce stands (biotic agents). The recorded volume of **salvage felling** was 14.9 mil. m^3. Felling due to **abiotic factors** covered ca 6.4 mil. m^3 and due to **biotic agents** increased and reached approximately 8.5 mil. m^3. Higher volume of felling due to biotic agents than due abiotic factors was recorded again in 2018.

Spruce wood infested by **bark boring insects** has increased again in 2018 and was recorded at a total volume of more than 8.4 mil. m^3, new highest record in the history (12 mil. m^3 if calculated to the whole surface, 18 mil. m^3 if standing infested trees are included). Increased to mass outbreak stage of bark beetles occurred in the whole country; the average volume of bark beetle infested wood per one hectare of spruce stands was nearly 8.91 m^3/ha, approximately 45 times more than endemic state. Infestation belonged to *Ips typographus* mainly, but *Ips duplicatus* is also still in epidemic stage. High increase in infestation by bark and wood boring insect was also recorded in pine and other forest stands.

Defoliating insects was reported again in relatively low stage in 2018, even though the local outbreaks of *Panolis flammea* and *Lymantria dispar* occurred. Increase in population density could be expected in following years.

From the phytopathological point of view the year 2018 was again less favorable. The most serious problems were again **wood-destroying fungi** on conifers, first of all *Armillaria ostoyae*. Continuous problems are with drying of pine trees caused by drought and by activation of fungal pathogens, *Diplodia sapinea* mainly, ash and alder decline caused by fungi.

It is evident, that in 2019, similarly as in the previous years, is possible to expect deterioration of forest stands health condition due unfavourable weather conditions with consequent influences of extreme drought in 2015 and 2018 (with regional differences). Abiotic damages are not possible to predict, but the weather conditions on the beginning of vegetation period in 2019 is very weakening the forest stands. Actual stage of spruce bark beetles is necessary to suggest as catastrophic, and not only in northeastern part of Czechia, but also in other regions (western Moravia, southern and western Bohemia). Situation with outbreak of bark beetles in coniferous stands, particularly in spruce, will be depending on weather conditions mainly (unfavourable weather in spring in 2019), but also on ability of forest practice in application of protection methods with maximal attention to investigation of freshly infested trees and their proper sanitation. Also, as a consequence of dry periods, escalation of problems in pine stands is continuing. Developing situation with *Lymantria monacha* is necessary to observe carefully.

The first reported outbreak of *Cephalcia abietis* (L.) (Hymenoptera: Pamphiliidae) in Romania

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[2]National Institute for Research and Development in Forestry, "Marin Dracea", Braşov Station, Cloşca, 13. Ro-500040, Braşov, Romania
[3]National Forestry Agency – Romsilva, Forest Direction Harghita, Márton Áron nr. 78, Miercurea Ciuc, Romania.
E-mail: *olenicifp@yahoo.com*

Defoliation of Norway spruce (*Picea abies* (L.) H. Karst.) trees, caused by *Cephalcia abietis* (L.) has been reported in the autumn of 2015 for the first time in Romania. About 66 ha of pure, 45-95 year-old spruce stands, located at 700-810 m a.s.l. in the Eastern Carpathians (Ciuc Depression) have been affected.

During the next years (2016-2018), the wasp population has been monitored to gather the necessary data for defoliation forecasting. A network of 59 monitoring points, evenly distributed over the entire area, was established in the spring of 2016. A representative tree (as size and degree of defoliation) was selected in each point. In each spring and autumn, a pit of 30 cm x 33 cm x 20 cm was made in the crown projection area of each representative tree. All insects found in the soil were collected and analysed at the laboratory. Male and female flight activity was monitored in 2017 and 2018 using 10 yellow sticky traps and 10 Geolas® collar traps.

Overall, 2015 tree defoliation was slight and very unevenly distributed. Population density of the insects in the soil was also very uneven, and the frequency distribution of samples with different insect numbers was best fitted by the negative binomial distribution type 2. It decreased between April 2016 and April 2018 by 66.1%, mainly due to the mortality caused by various factors. In the spring of 2016, 2017 and 2018, the proportion of pro-nymphs was 0.2%, 18.1% and 83.7%, respectively, suggesting that most individuals needed three years to complete their development. *C. abietis* adults were trapped mainly in June, but also during the first half of July. Although in 2018 it was expect a more intense flight than in 2017, it has been much weaker, most probably due to the very abundant rainfall in June. Very slight, moderate and very heavy defoliation was predicted for 2016, 2017 and 2018, respectively, but it was only very slight every year.

Biodiversity and insect pests - a study from south-eastern Poland

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E-mail: *W.Grodzki@ibles.waw.pl*

The forests in Poland, dominated by the Scots pine *Pinus sylvestris* L. growing on poor sites, is characterised by generally low biodiversity level. Contrarily, the south-eastern part of the country is known as a region of very high biodiversity of forest ecosystems. This diversity results from high physiographic variability of this area – from low mountains (northern edge of the Carpathians) in the south to upland/lowland in the north, as well as from related species composition of forest stands, both managed and remaining under nature protection.

In 2016-2018 an intensive project of inventory of natural features in the forests was completed in cooperation of State Forests administration and scientific institutions. The inventory was based on a system of sampling plots established in the regular grid 1 x 1 km on the area of 18 forest districts and 2 national parks, managing the total area of about 313 thous. ha. Within the inventory procedure the pitfall traps containing water diluted ethylene glycol were installed on 1561 plots (each second plot) and checked in one-month intervals during the growing seasons 2016 and 2017. All collected insect were stored in conservation liquid and then the ground beetles (Carabidae) and rove beetles (Staphylinidae) in total number of 162 437 specimens (138 812 and 24 623, respectively) were determined.

The descriptive data (number of individuals/taxa) and calculated specific indices (Shannon-Wiener, Margalef), as well as the basic stand features (tree species diversity derived from the forest management plans) were used as the indicators reflecting the variability of forest biodiversity in the studied area. This part of Poland is also known as the forest area affected by insect pests at relatively low level. The data concerning the occurrence of insect pests, collected by the State Forests and stored in the databases in the Forest Research Institute for forecasting purposes, were used to depict the supposed relationship between the analysed features of forest diversity and the occurrence of main insect pests in this area.

Ophiostomatoid fungi associated with bark beetles on Scots pine in Ukraine

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Bark beetles (Coleoptera: Curculionidae, Scolytinae) are among the most destructive pests of pine forests, and can devastate both managed and natural forests. Among them, *Ips acuminatus*, *Ips sexdentatus*, *Tomicus minor* and *T. piniperda* (Coleoptera: Curculionidae: Scolytinae) are affecting Scots pine (*Pinus sylvestris*) throughout Europe (Borkowski, 2017; Davydenko et al., 2017; Meshkova, 2017). Most pine bark beetles colonize weak or dying pine trees but some of them are able to cause mortality of healthy ones (Six and Wingfield 2011). For many years both *I. acuminatus* and *Ips sexdentatus* had been considered of minor significance, however recently these bark beetles have been reported as commonly causing extensive damage to forest stands of *P. sylvestris* (Siitonen, 2014; Meshkova, 2017). Bark beetles are known to live in close association with fungal species, especially of ophiostomatoid fungi, several of which cause a blue stain in wood, and some are serious forest pathogens. However, very little is known regarding the fungal associates of bark beetle in Ukraine as well as fungus and bark beetle interactions.

The aim of this study was to increase the knowledge regarding bark beetle-associated fungi in Ukraine with special emphasis on the ophiostomatoid fungi. Fungi associated with four different bark beetle species, infesting Scots pine in Ukraine, were isolated and identified from the study forest sites. At each site, ninety six - one hundred forty four adults of *Ips acuminatus*, *I. sexdentatus*, *Tomicus minor and T. piniperda* were collected from stem randomly selected living trees attacked by the bark beetles. The fungal identifications were based on morphological characteristics and DNA sequence comparisons. Richness of fungal taxa from different sites was compared using chi-squared tests. Shannon diversity indices and quantitative Sorensen similarity indices were used to characterise the diversity and composition of fungal communities (Shannon, 1948; Magurran, 1988). The Simpson diversity index (Simpson 1949) was used to indicate dominance in fungal diversity.

A total number of 489 fungal isolates including 68 species were obtained for four bark beetle species, including both aggressive and nonaggressive species. In this study, seventeen ophiostomatoid species were found in association with the four investigated bark beetle species and all the bark beetle were frequently associated with a complex of ophiostomatoid fungi.

Sorensen index and Shannon diversity indices ranged between 1.3 – 2.9 and 2.9 and 4.9 while Simpson diversity index varied between 2.7 and 3.3. Overall, the fungal community was composed of 80.7% Ascomycota, 10.4% Basidiomycota and 3 % Mucoromycotina. The rest of the species were unidentified. The most commonly detected fungi were *Entomocorticium* sp. *Ophiostoma ips*, *Diplodia sapinea*, *Sydowia polyspora*, *Ophiostoma minus*, *O. bicolor*.

The Pine Wilt Disease threat to the European conifers: Lessons from 20 years containment experience in Portugal and recent research developments

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[1]Instituto Nacional de Investigação Agrária e Veterinária, IP. Quinta do Marquês, 2780-159 Oeiras, Portugal.
[2]Centro de Estudos do Ambiente e do Mar (CESAM Lisboa), Faculdade de Ciências da Universidade de Lisboa (FCUL), Centro de Biotecnologia Vegetal (CBV), Departamento de Biologia Vegetal (DBV), C2, Campo Grande, 1749-016, Lisboa, Portugal.
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The Pine Wilt Disease (PWD), caused by the pinewood nematode (PWN) *Bursaphelenchus xylophilus*, is considered the worst threat to conifer trees worldwide, and after it has been accidentally introduced into Japan, China, Korea and Taiwan, through the international trade of infected wood, in 1999 was detected in Portugal affecting maritime pine (*Pinus pinaster*), the only relevant affected pine species. During the almost 20 years of presence in Portugal, thousands of maritime pine trees were killed every year, in spite of the efforts to contain its spread, based on the eradication of symptomatic and dead pine trees and trapping of the unique insect-vector present (*Monochamus galloprovincialis*).

The timely felling of the dead and symptomatic tree infected by the PWN allows simultaneously the elimination of the nematodes and also prevents the increase of the insect-vector populations, while they are in immature stages. Another very important issue is the survey of non-affected areas, with special attention to both sides of the border with Spain. If the PWN is introduced in Central Europe, it will find conifer forests that include more diverse susceptible species such as Scots pine and Spruces, and also more potential insect-vectors (*M. sator* and *M. sutor*), which increases significantly the speed of spreading and the complexity of the control. For all these reasons strong effort must be made on the survey for early detection.

To improve the survey efficiency, the development of innovative early detection methods is of extreme importance and was one of the main goals of the research contract NEMATRANSFER. This project allowed identifying the main chemical compounds of the insect cuticle. The blend of these compounds, as well as individual main components, will now be assessed for their attractiveness to the nematode. This will be highly valuable in trying to determine the compounds that are used as clues by the nematode, in the first stage exit the wood of the decaying pine to enter de insect-vector and, in a second stage, exit the insect-vector to enter the healthy host pine, thus completing the infection cycle. These experiments may be the basis for a nematode trap useful tool for quick identification of infection in symptomatic trees.

This study partially supported by Fundação para a Ciência e a Tecnologia (FCT) under CESAM UID/AMB/50017-POCI-01-0145-FEDER-007638, PIDDAC, FEDER PT2020-Compete 2020 and research contract PTDC/AGR-FOR/4391/2014 - NEMATRANSFER.

Powdery mildew fungi on trees and shrubs in forests of Azerbaijan

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Institute of Botany, Azerbaijan National Academy of Sciences, Badamdar 40, Baku, Azerbaijan
E-mail: *a_dilzara@yahoo.com*

Forests occupy 12% of the territory of Azerbaijan and about 435 woody plant species were recorded in natural growing and planted areas. Powdery mildews (PMs) are widely distributed plant pathogens of angiosperms, which cause significant physiological and phenological changes during vegetation period. Specimens kept at the Mycological herbarium of the Institute of Botany, ANAS and materials collected in 2014-2018 were involved to the current research. Morphological analysis was carried out under the light microscope using latest monographs on this group and rRNA genes (18S/ITS1/5.8S/ITS2/28S) were analysed only for new fungal samples. Altogether 32 PMs belonging to the genera *Erysiphe*, *Podosphaera*, *Phyllactinia*, *Sawadaea* are parasitize on 39 woody plant species. The 14 PMs were detected on the shrubs of the families Berberidaceae (*Berberis – E. berberidis* var. *berberidis*, var. *asiatica*), Betulaceae (*Corylus – E. corylacearum*, *Ph. guttata*), Cornaceae (*Cornus – E. tortilis*, *Ph. corni*), Grossulariaceae (*Ribes – P. mors-uvae*), Rhamnaceae (*Frangula – E. divaricata*; *Rhamnus – E. friesii* var. *friesii*; *Paliurus – Ph. paliuri*), Rosaceae (*Crataegus – P. clandestina* var. *clandestina*, *Ph. mali*; *Rosa – P. pannosa*; *Cotoneaster – Ph. pyri-serotinae*). Forest trees exceed shrubs in host and pathogen number, of which 18 PMs were identified on tree species of the families Betulaceae (*Alnus – Ph. alnicola*; *Carpinus – E. arcuata*, *Ph. carpini*), Fagaceae (*Castanea – E. alphitoides*, *E. azerbaijanica*, *E. quercicola*; *Fagus – Ph. orbicularis*; *Quercus – E. alphitoides*, *Ph. roboris*), Oleaceae (*Fraxinus – E. fraxinicola*, *Ph. fraxini*), Platanaceae (*Platanus – E. platani*), Salicaceae (*Populus – Ph. Populi*; *Salix – E. adunca* var. *adunca*), Sapindaceae (*Acer – Ph. marissalii*, *S. bicornis*), Ulmaceae (*Ulmus – E. ulmi* var. *ulmi*, *E. ulmi* var. *ulmi-foliaceae*, *Ph. nivea*). *E. alphitoides, E. arcuata*, *E. quercicola, E. corylacearum P. pannosa*, *S. bicornis* were frequently encountered species.

The occurrence of the pathogenic fungi *Cryptostroma corticale*, *Prosthecium pyriforme* and *Eutypella parasitica* on *Acer pseudoplatanus* from 2017 to 2019 in Slovakia

Andrej Kunca[1], *Milan Zúbrik*[1], *Christo Nikolov*[1], *Roman Leontovyč*[1], *Juraj Galko*[1], *Jozef Vakula*[1], *Andrej Gubka*[1], *Slavomír Rell*[1], *Valéria Longauerová*[1], *Michal Lalík*[1,2]

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Acer pseudoplatanus is a native forest tree species in Slovakia and together with other maple tree species (*A. campestre*, *A. platanoides*) they cover 2.0 % of forest land (40 th. ha). In 2017 three new fungi were discovered on *A. pseudoplatanus* in Slovak forests: *Cryptostroma corticale*, *Prosthecium pyriforme* and *Eutypella parasitica*. The most dangerous seems to be *C. corticale*. It was found for the first time in the forest (not in a park or a linage greenery) in western Slovakia (Chtelnica) in the summer 2017. The trees were infected not only with *C. corticale*, but also with *P. pyriforme*. While the first one occurred on the trunk (lower part of trees), the second one infected twigs in the crown (upper part of trees). Anyway, both induced a rot of heart wood, the first one on the base of the trunk and the second one on twigs. These rots looked very similar, and the more from the base of the trunk or peripheral twigs, the less visible rot. At that site about 2 ha of *Acer* trees died or were with dieback symptoms. Few weeks later the same year 2017 *P. pyriforme* was found in eastern part of Slovakia (Veľaty), however, there were no signs of *C. corticale*. Anyway, trees were dying as in the previous case. During the inspection of several localities where *Acer* trees were planted, a tree infected with *E. parasitica* was found. The locality was situated in the northern Slovakia, by the river Dunajec, at the border with Poland. When pictures of that tree was filed in the folder dedicated to *Acer*, it was found out that that tree with the *E. parasitica* disease on the trunk was photographed in 2005, thus 13 years ago. In 2018, new locality with *C. corticale* was inspected in western Slovakia (municipal park in Trenčín), and in 2019 in Trenčín again, but in lineage greenery by the city roads, there were many trees infected by *P. pyriforme*. It seems that the *Acer* is going to suffer from fungal diseases much more than up to now.

Development of semiochemical based bark beetle management methods for spruce stands

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We aim to develop smart semiochemical based bark beetle management methods. Methods will include short and medium term diagnostics and forecasting of tree resistance, allowing well-planned sanitary cuts to remove low health trees preventively. New active semiochemicals are in the pipeline, mainly anti-attractants for better management of *Ips typographus*. We plan to bring to application a unique combination of diagnosis and blends of non-host volatiles and pheromones, allowing active protection of longer-term resistant stands. We develop new protection methods for stands critically endangered by bark beetle attacks (newly exposed forest edges) via decreasing host suitability (artificial semiochemical diversity) and lower local beetle density. “We don’t aim to protect trees, but to help trees protect themselves.” Results from tree protection experiments in Eastern part of Czech Republic will be presented.

Integrated Pest Management of the Pine Weevil (*Hylobius abietis*)

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Integrated Pest Management (IPM) seeks to manage pests by combining silvicultural practices with physical, biological and chemical protection methods. In Ireland it is common to treat seedlings with insecticides before planting and, if necessary, in the field, too. This is mostly done to protect seedlings against damage by the large pine weevil (*Hylobius abietis*). The pine weevil is the most important reforestation pest in Europe. The adult weevil feeds on the bark of young conifer seedlings, which can cause high seedling mortality on recently replanted clear-cuts. The pine weevil is distributed over large parts of Europe and is causing high economic losses in several countries, e.g. Ireland, the UK and Sweden. Although the problems are similar, management of the pine weevil differs between countries. Some of these differences are connected to general forestry practices, which need to be taken into consideration when selecting protection methods.

To date there is still no single non-chemical protection method available for forestry that is as effective as insecticides to prevent damage of the pine weevil. The most commonly used insecticide in Ireland and the UK, cypermethrin, is being phased out in compliance with sustainable forest management certification and being replaced with acetamiprid. Still, alternative methods for protecting seedlings are required; especially in connection with sustainable forest management certificates and an increasing concern for workers' health and impact on natural systems.

In this project we review tools available as components of an IPM system against pine weevil. Each method is evaluated for its strength, weaknesses and applicability in Ireland based on scientific literature and stakeholder experience. For example, in Sweden more conifer seedlings were treated with alternative protection methods than with insecticides in the years 2016-2018. However most of the alternative protection methods used in Sweden have been developed for containerised seedlings and cannot easily be adapted to bare-rooted seedling production, which is common in Ireland. The information generated by this project will in the future allow foresters to make informed decision on the selection of pine weevil protection based on their specific conditions. Selection of appropriate methods can be supported by decision making systems.

Biological approach for another newcomer pest within Romanian spruce forests: *Cephalcia abietis* (L.) (Hymenoptera: Pamphiliidae)

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Cephalcia abietis is a defoliator of Norway spruce (*Picea abies*) widespread in western and central Europe but almost unknown in the southeastern part of the continent. In 2015, the first outbreak of this pest was reported in Romania, in a pure spruce stand on an area of approximately 70 ha. The damages produced were significant, soil surveys conducted at that time revealing a population level of 450-470 eonymphs / sq.m. Due to the limitations imposed by forest certification and the fact that the area is part of the Natura 2000 network, it was not possible to make chemical interventions to limit defoliators activity. However, in the following years, consistent laboratory tests have been made in order to assess the effect of biological insecticides and entomopathogenic preparations on *C. abietis* eonymphs and pronymphs. In this study we present the results obtained by treating the larvae with *Cinnamomum zaylanicum* extract solutions - 70%; vegetable oils (40% Neem); vegetable oils and potassium salt (50%); Spinosad bioproducts (*Saccharopolyspora spinosa*) and *Paecilomyces fumosoroseus* biopreparations with different concentrations and doses under controlled temperature, humidity and light conditions, inside the microclimate chamber (fitotron).

Observations at different treatment intervals revealed significant differences between mortality rates, ranging from 8% for those treated with vegetable oils and potassium salts and 23.2% for those treated with cinnamon extract after 4 days from treatment to 46.5% for vegetable oils, 8 days after treatment. Also, satisfying and encouraging results were obtained with *P. fumosoreus*, and, for the first time, the colonization of the eonymphs and pronymphs of *C. abietis* with this entomopathogenic agent was recorded.

Sanitation Methods for Landings of Bark Beetle Infested Wood

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The current bark beetle outbreak with at least 6 mil. m^3 of affected spruce stands in 2017 and approximately 12-15 mil. m^3 in 2018 poses a difficult challenge for foresters: to carry out sanitation of large volumes of affected wood in a short time. Standard methods of individual sanitation (debarking, chemical treatment of individual trunks) which were applicable during previous outbreaks not exceeding volumes of 2 mil. m^3 per year are effective, but given the extent of the current outbreak and a lack of workers in forest management, they can only be used marginally either for areas where the outbreak did not start fully or for sanitation of isolated affected trees. The main emphasis is put on large-scale sanitation of landings with volumes of tens or hundreds of m3 and exceptionally even more.

As early as in 2015, sanitation of landings with the use of the Storanet® insecticide nets was introduced. The affected landing is covered with the net and as beetles fly out of the logs, they die after touching the net. There is also an important multifunctional effect as the nets can also be used for protection of non-affected wood, and with the use of pheromone dispensers also as a trap for extermination of flying European spruce bark beetles.

The MERCATA technology was introduced in 2018. It is based on the insecticide treatment of the whole surface of the landing and its subsequent covering with a non-woven geotextile material. Beetles biting through the treated part of the landing get contaminated and then die due to the feed effect of the insecticide. Those biting through the untreated inner part of the landing get contaminated during their attempt to leave – as they move on the treated surface of the landing, they are affected by the contact effect of the insecticide.

Another specific sanitation method is fumigation with the use of the EDN gas (ethanedinitrile). The landing is not only covered with a foil, but the foil also has to be placed underneath. Subsequently, EDN is applied. After 24 hours, the landing can be uncovered and sanitation is carried out. However, this method does not have a long-term effect, i.e. if there are some attractive logs left at the landing, they can get infested. This method is suitable for landings with volumes of thousands of m3.

Timely sanitation of all affected wood can only be achieved with the combination of all these methods with regard to their advantages, disadvantages and other limitations.

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Integrated control methods for the most important lethal invasive pathogens

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Invasive pathogens produced severe dieback of the European and American forest species in the last century. Asian fungi *Cryphonectria parasitica* and *Ophiostoma novo-ulmi* strongly reduced the importance of elms and chestnuts in actual forestry. Many research programs have searched for genetic, silvicultural and protection preventive and curative control methods.

The positive results of several decades of Romanian trials have been integrated into the strategies of controlling the invasive pathogens.

Cryphonectria parasitica has been controlled using CHV1 virus inoculation in the first phase, when EU12 was the dominant strain of the forest pathogen. No to very limited natural tolerance of *Castanea sativa* was recorded in Romanian forests and orchards, but horticultural collections and trials showed high resistance to blight of the interspecific hybrids between *C. sativa* and *C. crenata*. Silvicultural system may also help the sensitive sweet chestnut forests to survive to virulent infections.

No efficient (biological or chemical) method to control *Ophiostoma novo-ulmi* has been proved till now, therefore the researches were focused on elm resistance. Local Romanian populations of *Ulmus laevis* are highly resistant and several trees of *U. minor* and *U. glabra* proved good tolerance to Dutch elm disease in a 26 years trial.

The oak lace bug (*Corythucha arcuata*) in Hungary – many questions but only few answers so far

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The oak lace bug (*Corythucha arcuata*), native to North America, was first found in Italy (spring 2000) and two years later in Switzerland and Turkey. After a decade of "latency", it started an exuberant expansion, likely from Turkey. Up until autumn 2018, it had been recorded in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Iran, Romania, Russia, Slovakia, Slovenia, Serbia. In Hungary it was first recorded at two distant (140 km in straight line) locations (Szarvas and Vácrátót) almost at the same time (spring 2013). It expanded its area throughout almost the entire country, except three North-Western counties. The estimated outbreak areas exceeded 30 thousand hectares in Hungary (mainly South and South-East Hungary).

To predict its potential host range, more than 40 oak species were checked in arboreta and botanical gardens between 2013 and 2018. More than 20 species of Eurasian oaks (both in section Quercus and section Cerris) were accepted as host plants. No species belonging to section *Lobatae* (red oaks) or *Ilex* group were accepted as hosts. Based on these findings, we predict that the lack of suitable hosts will not restrict the oak lace bug's further area expansion either in the North, West or East, and the invasion of the species will continue across Europe in addition to the species also expanding in Asian oak forests in the near future.

The overwintering success of the oak lace bug was first studied after winter 2016/2017 and of 2018/2019, at five different locations in Hungary from South to North (more than 10,000 in two years). Far more than 50% of the bugs survived the winter.

The long-term impact of the OLB damage is not yet known, but there are good reasons to assume that the "chronic" infestations will have significant negative effects on the growth, health status and fecundity of the oak stands that already suffer from both direct and indirect effects of climate change. The heavily attacked leaves lose most of the chlorophyll in the upper leaf surface, and the photosynthetic activity decreases significantly (unpublished results). It is safe to assume that these changes in long term will have a significant negative effect on the fecundity, growth, health conditions of the infested oaks.

It is also still unknown how the mass presence of oak lace bug will influence the extremely species-rich herbivore insect communities thriving on European oaks. Only in Hungary, at least 650 herbivore insect species were recorded feeding on oaks and more than 40% of them are strictly oak specialists.

Our present experiments are intended to clarify these questions concerning these direct and indirect impacts on oaks and the oak related communities.

Preliminary results on the presence of *Hymenoscyphus fraxineus* in Western and North-Western Romania

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The causative agent of ash dieback, *Hymenoscyphus fraxineus* (T.Kowalski) Baral, Queloz & Hosoya, was detected in several broadleaved mixed forest stands with *Fraxinus excelsior* and *F. angustifolia* in Western and North-Western Romania, during 2018 vegetation season. Extended crown dieback, the presence of shoot/branch cankers, necrotic areas on leaflets, petioles and fruits of mature trees and necroses on leaflets and shoots of saplings indicated the possible infection with *Hymenoscyphus fraxineu*s. Petioles and rachises in the leaf litter presented characteristic white apothecia of *Hymenoscyphus fraxineus*. Cultivation on PDA supplemented with gentamycin of peeled bark from areas presenting cankers confirmed the presence of the pathogen in it is anamorphic stage, *Chalara fraxinea*.

Ips typographus in the UK - Establishment and eradication

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Ips typographus is one of the most significant pests of spruce throughout its native range in Europe. As the UK relies on spruce (primarily Sitka and Norway) for a large portion of its forestry industry, a genus which is not native to the UK in this interglacial, but has never had *Ips typographus* as part of its fauna, the UK has a Protected Zone set up within the EU to protect against the establishment of European *Ips* which have not yet established here. Since the early 90's, pheromone traps in ports and pheromone-baited billet traps have been used to monitor any *Ips typographus* establishment.

Though numbers of *Ips typographus* have been collected in port traps, establishment (breeding within the UK) has never been detected, until the end of the 2018 trapping season. A number of hibernating adults were found in Kent (the most south easterly part of England, closest to France) in November 2018, and a follow up survey revealed that there was an established breeding population in a restricted woodland setting. Other surveys in spruce woodland in south east England have failed to pick up any additional *Ips typographus* populations, though survey work is ongoing. The woodland is now part of an eradication program, led by Forestry Commission England and Forest Research, which aims to eradicate *Ips typographus* from the UK and prevent any potential spread of the species further through the UK. Following significant works to reduce any breeding substrate on the woodland, work over the following seasons will attempt to trap out adults form the site, as well as monitoring other areas using pheromone traps. Successful eradications of bark beetles are rare in a world-wide context, therefore this eradication attempt will serve as a case study highlighting areas of success (and failure) with the aim of helping other bark beetle eradications.

Wild Spotter: Engaging and empowering citizen science volunteers to protect against invasive species

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Wild Spotter (https://wildspotter.org/) is a U.S.-wide effort to complete a comprehensive map and survey of prioritized aquatic and terrestrial invasive species across the 193-million acre National Forest System (NFS). Wild Spotter was and is being developed and operated by The University of Georgia – Center for Invasive Species and Ecosystem Health (www.bugwood.org) in conjunction with: Wildlife Forever and The USDA Forest Service to engage and empower citizen science volunteers to provide critical scientific support to better address the expanding threat of aquatic and terrestrial invasive species. Wild Spotter is based upon the framework of the web- and smartphone based EDDMAPs (www.eddmaps.org) system that is used in more than 45 U.S. states and a wide array of federal, state and volunteer/NGO organizations across the U.S.

Wild Spotter networks people and organizations to help manage invasive species through on-the-ground, community-based projects, partnerships, and volunteer citizen science support that increases capacity for conserving our nation's natural resources. Wild Spotter creates partnerships with public and private organizations at all levels and across all landownerships.

Wild Spotter aims to build citizen science volunteer capacity to protect America's wild places from harmful invasive plants, vertebrates, invertebrates, microbes, algae, and fungi that outcompete our nation's native species and threaten the biodiversity and health of aquatic and terrestrial ecosystem through: Promoting Awareness; Engaging the Public; and to Defeat Invasives.

Volunteers use the FREE Wild Spotter Mobile App, and learn to identify, map, and prevent the spread of these invaders in order to protect our rivers, mountains, forests, and all wild places for future generations.

Wild Spotter has had more than 20 partners join the project with 12 National Forests participating since it was released in July 2018. Wild Spotter applications are available for Android and iPhone devices.

An overview of the project and its' successes will be highlighted and discussed during the presentation.

Population growth and overwintering potential of the invasive ambrosia beetle *Xylosandrus germanus* in the West Carpathians, Central Europe

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Ability of a non-native insect species to increase in number and to withstand adverse winter weather conditions are indicative of its successful establishment in a particular area. We studied temporal changes in the population of the ambrosia beetle *Xylosandrus germanus* (Blandford) (Scolytinae) in the West Carpathians in Slovakia, Central Europe, since the first record of this successful invader and timber pest in 2010 and thereafter until 2014. The catches of dispersing females (beetles caught in ethanol baited traps set in the same oak stand repeatedly over time) exhibited an exponential increase over this time period characterized by successive mild winters, with the growth rate 2.0 between 2010 and 2012, and the growth rate 3.7 between 2012 and 2014. After the cold winter of 2016/2017 (coldest January since 1985, minimum air temperatures reaching -30 °C) the catches of *X. germanus* in southern Slovakia during May – June 2017 were significantly lower than the catches during the previous growing season (2016). In the more northerly areas, however, the mean number of individuals did not show any significant decrease. Our results suggest the ability of *X. germanus* to increase rapidly in number and to withstand cold winter with varying success depending on the area, local topography and specific climate. Studies supported by manipulative field experiments are needed to reveal the causal effects of freezing air temperatures and other factors on the abundance and temporal dynamics of *X. germanus* in the Central European forests.

Ten years of monitoring in declining oak woodland

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Trees are facing ever increasing threats from individual pest and disease species, often due to introduced species, although a changing climate is also enabling endemic species to have increased impact. In this moving context, monitoring is an important first step in detecting problems and mitigating their impacts. For example, understanding how distributions of pests and diseases, dieback and tree recruitment change over time can reveal causal mechanisms and enable mitigation measures to be planned. For Oak in Great Britain, modelling studies suggest that impact of future climate change will vary across the country, with areas of improved yield in the uplands, but worsening suitability in southern England. Empirical data are needed to assess the validity of these predictions and ensure that current trends are understood, with long term datasets vital to objectively assess change. Across southern and central England an emerging complex disease, Acute Oak Decline (AOD), is of particular concern. Affected oak are characterised by weeping stem lesions and larval galleries of the native buprestid *Agrilus biguttatus*.

Detailed monitoring of sites affected by AOD has taken place annually for the last 10 years, with 1200 trees assessed across 8 sites. This work has revealed important aspects of symptom development and indicated a predisposing role for environmental factors. Over the last decade the rates at which new AOD infections occur has fluctuated each year, in almost exact opposition to the rate at which trees heal. In some years we find many more new trees are affected and in some years many more trees heal. Similar patterns can be seen in the number of D-shaped emergence holes, although interestingly peak years are not always synchronised. Perhaps surprisingly, the hot weather in 2018 did not cause a large jump in the number of trees with stem bleeds, although it was by far the worst year for mildew and insect defoliation. We are currently investigating the mechanisms that drive AOD outbreaks focusing on how the number of symptomatic trees correlates with weather patterns. In 2019, a new initiative under the direction of “Action Oak” has set out to assess the underlying health of oak at a national scale. This work will use 85 ICP Forests sites level 1 sites (previously monitored from 1989 to 2007) as its foundations and aims to couple detailed phenotypic descriptions with modern analytical techniques. Ultimately, the network will be expanded to include a wider set of study sites and will integrate monitoring by land owners and citizen scientists.

Distribution and behaviour of the northern bark beetle (*Ips duplicatus*) in Austria

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Ips duplicatus is considered a boreo-alpine species, originally described from Finland as *Bostrichus duplicatus* by Sahlberg. Only sporadic records existed from Central Europe until a few decades ago. The presence of *I. duplicatus* is listed for 15 EU Member States (AT, BE, BG, CZ, DE, EE, FI, HR, HU, LT, LV, PL, RO, SE, SK) and 5 other countries (BY, NO, RS, RU, UA). Greece, Ireland and the United Kingdom, are free from the pest and classified as protected zones.

For Austria, numerous publications cite its presence; however, these refer only to a single specimen and appear questionable in the context of historical literature. At the end of the 20th century, forest health experts from the Austrian Research Centre for Forests (BFW) found *I. duplicatus* in Austria frequently on storage yards of industry processing imported timber and adjacent areas. Since 2013, *I. duplicatus* was regularly caught in pheromone traps in forests in Lower Austria at considerable distance from timber storage. Consequently, the distribution of *I.duplicatus* in Austria was examined with bark beetle traps baited with the species-specific pheromone lure. *I. duplicatus* was present in the traps in all examined federal provinces of Austria.

The flight phenology of *I. duplicatus* seems to be similar to the one of *I. typographus, but the total number in the traps were much lower.*

In 2018 during the monitoring of *Ips typographus* in trap trees in lower Austria, galleries of *I. duplicatus* were detected too. The galleries were quite dense in the parts with thinner bark*. I. duplicatus* occurred either alone or in combination with *I. typographus* or *Pityogenes chalcographus*. On another location in Lower Austria overwintering *I. duplicatus* also was found in the basic trunk region of few infested trees, in this case together with *I. typographus.*

'Oak bodyguards' citizen science program: Can school children contribute to ecological research by playing with modelling clay?

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1. Scientific knowledge in the field of ecology is increasingly based on data acquired by the general public participating in citizen science programs, initiated by professional scientists. Yet, doubts remain about the reliability of such data, in particular when citizen science programs involve school children.

2. We built upon an ongoing citizen science program - Oak bodyguards - to assess the ability of European school children to accurately estimate the strength of biotic interactions in terrestrial ecosystems. We used standardized protocols to estimate predation rate on artificial larvae and insect herbivory on oak leaves and compared estimates made by school children, trained scientists and untrained scientists (i.e., professional scientists with no previous expertise in predation or herbivory assessment).

3. School children overestimated predation rate, with less accuracy, when compared to assessments made by trained scientists. Untrained scientists also slightly overestimated predation rate, but their estimates were more reliable than those made by school children.

4. School children also overestimated insect herbivory, as well as untrained scientists did, but school children's assessments were surprisingly more accurate than assessments made by untrained scientists.

5. Unsurprisingly, our findings indicate that ecological data acquired by school children participating in citizen science programs require several quality checks and their interpretation must be cautious. Importantly, this recommendation also holds true for large multi-partners research programs as bias can also be detected in data collected by professional scientists. Thus, data acquired by school children should not be deemed to be of granted less valuable than data collected by untrained professional scientists. However, it is highly valuable that school children do collect the data, format them, and share them with scientists, as this clearly contributes to their understanding of ecology and the nature of science in general. There are numerous individual and societal benefits to school children participating in citizen science programs; we hope our results will encourage researchers to keep engaging the public - especially the youngest ones - with science.

Emerald ash borer in European part of Russia: 2019 situation update

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EAB or emerald ash borer *Agrilus planipennis* Fairmaire (Coleoptera, Buprestidae) – an aggressive Far Eastern invader was registered in Moscow in 2003 with its' taxonomic identification in 2005. Nowadays in Europe EAB infests ash trees in 15 administrative regions of the Russian Federation. For a moment its secondary range there occupies approximately 250 thousand km^2 (~ ½ of territory of France) and spreads from the city of Yaroslavl at the North (57°37' N) to the Southern border of Voronezh District at the South (50°12') and from the city of Talovaya, Voronezh District (40°43' E) at the East to the city of Smolensk (32°02') at the West. The most Western locations of EAB are at 70 km from the border with Belorussia and just on the border with Ukraine, so the pest for sure crossed the Russian border and can be found in Lugansk District of Ukraine. Unfortunately the tuff political situation at this region made it difficult to prove this from the Ukrainian side.

By methods of dendrochronological cross dating we found that the pest was introduced in the city of Moscow at 1990-1992 the latest (the first tree with EAB galleries died at 1997). An EAB outbreak took place at 2005-2007 in the northern and central regions of Moscow megapolis and in 2008-2012 in its' southern regions. The last ash trees were killed in these regions at 2013 and at 2014 accordingly. During last 5 years EAB disappeared from the city and from Moscow suburbs although many damaged ashes are still alive and are regenerating successfully. Existing data demonstrated that EAB outbreak collapse was caused in major extent by local polytrophic parasitoid *Spathius polonicus* Niezabitowski (Hymenoptera: Braconidae) who has switched to the new abundant host.

The rapid crash of EAB population at the epicenter of its secondary range in Europe is an outstanding event deserving separate deep investigation. We have now a unique example when local biota only during a quarter of a century assimilated populations of the aggressive invader – emerald ash borer. It generates some optimistic expectations about the future of ash species in Europe.

The work was supported by the Russian Foundation for Fundamental Research (grant 17-04-01486).

Case study concerning the *Leucaspis* genus in Romania

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Due to drought periods, a significant infestation with scale insects appeared in Scots pine stands situated in areas with degraded and superficial soil. *Leucaspis species*, *Leucaspis lowi* Colv., *Leucaspis pusilla* Löw and *Leucaspis pini* (Hart.) were the most common identified. One of the purposes of the paper was to present the variation in the frequency and intensity of the attack of *Leucaspis* scales in time, with the tree age and along the crown, the branch and the needle. In some stands it was observed a large enough frequency of *Leucaspis* scales and at the same time it was also registered a large number of scales per needle, which could favor the appearance of then secondary pests from *Scolytinae*. Another research direction was to determine how the three *Leucaspis* species were associated, namely to establish the most common combinations of them at the level of a tree, and at the level of the branch and even the needle. Last but not least, the paper aims to analyze the mortality rate, which indicates the level of the activity of the natural enemies.

Assessment and prediction of biotic risks in the forests of Ukraine

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As of January 1, 2019 the total area of forest decline in Ukraine is about 440 thousand hectares, including 243 thousand hectares *Pinus sylvestris*, 26 thousand hectares *Picea abies*, 107 thousand hectares of *Quercus robur* and 64 thousand hectares of other tree species. Spread and severity of forest decline is connected with: forest site conditions and tree species composition as well as climate change; anthropogenic loading, especially forest management practice, which sudden changes the forest microclimate and provides large amount of substrate for forest pests; immigration and maintenance the adventive forest pests; imperfection of forest management legislation, which prevents in time detection of forest decline and harvesting timber before it turns into firewood.

The agents of biotic damage include insects and pathogens of foliage, stem, roots in unclosed plantations and forests of different age classes.

Severity, frequency and duration of outbreaks of foliage browsing insects were evaluated for different natural zones. Their dependence on insect seasonal development is studied. The critical density was evaluated for the main foliage browsing insects in oak, pine and ash stands considering foliage mass per tree and its dependence on tree health condition.

A score for attractiveness of certain forest subcompartments for the most common foliage browsing insects was developed and tested. It gives the possibility to predict the crown damage in separate forest subcompartments using forest inventory data, to build thematic maps of threat level, to evaluate potential focus area considering forest age, relative density of stocking, tree species composition. The forest subcompartments for first-priority monitoring were compiled for respective forest enterprises.

Study of seasonal development and spread for leaf miners and leaf beetles was started.

Rating system has been developed to predict the threat for unclosed pine plantations from insects and pathogens. Numerical score was suggested for prediction of pine bark bug spread and area of potential focus considering forest site conditions and stand age.

Spread and development of the most abundant stem insects of oak, pine and birch have been investigated. Numerical score was given to their injuriousness, considering their ability to colonize viable trees, to damage them during maturating feeding, to vector the pathogens and to decrease timber quality. Prediction of bark beetles foci spread considers forest site conditions, stand characteristics and the change of land category of neighboring subcompartments. Preventing measures have been developed.

Development of the mobile application for assessment and management of bark beetle infestation

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Climatic anomalies, such as frequent and intensive heavy winds and prolonged periods with low amounts of precipitation, have led to exploding population levels of the destructive bark beetle species. Currently, the Czech Republic is experiencing one of the worst infestations of the century. Such infestations create a demanding task on limited resources dealing with containing the outbreaks and, therefore, it is important to manage their deployment efficiently. The goal of the presented work was to develop an application using ESRI ArcGIS Online and Collector for ArcGIS suite for assessing and monitoring bark beetle outbreaks by detecting and localizing trees under bark beetle infestation. A digital form was implemented to allow users to enter a location for each individual tree using orthophoto generated from drone images or GNSS signal from mobile phones, the extent, and selected mitigation efforts. The application was designed to work both in online and offline mode to allow the data collection in areas with no mobile internet connection. The developed application has been used by the research team for monitoring bark beetle infestation and its spread in Cukrak forest located South of Prague. Management of bark beetle infestation through the implementation of mobile mapping applications provides a state-of-the-art method for early detection, continuous monitoring of the invasive species spread, and cost-effective and efficient management of human resources assigned for mitigating the outbreaks.

Insect traps are an excellent way to survey for fungal pathogens

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Black, Lindgren 12-funnel traps commonly used for surveillance of exotic wood-boring insects, were tested for their efficacy at collecting spores of forest fungal pathogens. The liquid (50% propylene glycol in water) used to drown and preserve captured insects in the trap was collected weekly and filtered to collect fungal spores. Results were compared with those from aerial spore traps in close proximity. Total DNA were extracted and PCR amplified for the fungal barcoding ITS gene. Amplicons were sent for Illumina sequencing and analysed bioinformatically and yielded a data set of 7.8 million DNA sequences representing more than 200 fungal species. Insect traps gave a higher yield than traditional aerial spore traps, on average three times more spores. The most common fungus present was *Candida pseudorhagii*, a yeast well known for infecting insects, found in large numbers in the trap liquids, but almost never on the aerial spore slides. Similarly, *Cystobasidium minutum*, another yeast not previously mentioned on insects was found only in insect trap preservative fluids. Forest pathogens were also very common in the data set. *Ceratocystis tetropii*, a typical blue stain/pathogen, and other genera such as *Capronia*, *Taphrina* and *Sydowia*, were also found in trap liquids but rarely in aerial spore traps. Insect trap preservative fluids are an excellent capture method to collect aerial fungal spores and are particularly efficient for collecting fungi carried by insects.

Historical herbaria collections are treasure troves for the study of forest pest invasions

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Historical herbarium collections have great value to science and serve an important data source not only for botanists but also for phytopathologists and entomologists. Herbarium samples collected in different parts of the world store unique data on past diversity and abundance of various organisms developing on leaves and twigs, and subsequently preserved with herborized material. Using modern genetic approaches, early distribution of invasive organisms can be tracked back and, thus, their invasion histories can be clarified.

Examination of herbaria specimens allowed to ascertain time when the invasive pathogenic Ascomycete fungus *Hymenoscyphus fraxineus* Baral et al. (Helotiales: Helotiaceae) causing chronic and severe disease of European ashes, appeared in Europe and explore its early distribution in East Asia – its putative primary range (Drenkhan et al., 2016, 2017).

Data obtained from historical herbarium collections also played a crucial role in confirming the Balkan origin of an invasive horse-chestnut leaf miner, *Cameraria ohridella* Deschka and Dimić (Lepidoptera: Gracillariidae) and significantly contributed in reconstruction of its past range in Europe (Lees et al., 2011).

Our study is focused on another invasive gracillariid pest – the lime leafminer *Phyllonorycter issikii* (Kumata). It is one of the intriguing examples of fast invasions among leaf mining micromoths in Europe. During the last three decades, this East Asian species has invaded most territory of Europe and become a pest of limes, *Tilia* spp. (Malvales: Malvaceae). So far, it is the only *Phyllonorycter* species known to develop solely on limes in the Palearctic. Our recent phylogeographic analysis revealed unexpectedly high *P. issikii* genetic diversity in Europe (invasion region) vs. East Asia (putative native range), questioning the hypotheses about its expansion and the region of origin (Kirichenko et al., 2017).

Here we will discuss the results, obtained through examination of the world biggest herbarium collections dated back as early as the 18th century, confirming invasive status of *P. issikii* in Europe and its long-term presence in East Asia, including the regions from where the insect has not been known factually.

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The distribution and spread of the non-native *Ips amitinus* in Sweden

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Invasive forest insects are one of the biggest threats to forestry and biodiversity. The small spruce bark beetle, *Ips amitinus*, is one example of an insect spreading to new areas. The species original distribution is the mountainous forests of central Europe. Over the past 100 years, it has spread north and was discovered in southern Finland during the 1950s and is now spread throughout Finland. In 2012 it was discovered in Northern Sweden, near the border to Finland. The species reproduce in both spruce and pine. We use *I. amitinus* as a model species for studying how to delimit distribution areas and the spread of non-native bark beetles. The aims were: (1) to develop a fast method of delimiting the distribution area, (2) to study how the proportion of colonized locations, and objects per locality, change when approaching the distribution limit. The current distribution area of *I. amitinus* in Sweden was determined by inventorying the occurrence of attacks on fresh logging residues of spruce and pine during 2017. The survey was conducted by driving around along forest roads and searching for areas with freshly cut material. Clear-cuts, thinnings, cut trees along roads and wind-felled trees were all included as possible locations. In each location objects were checked until the species was detected (maximum of 30 objects per location). To study the proportion of colonized locations and number of colonized objects per locality, a more standardized survey was adopted in 2018. Thus, we only included clear-cuts and the number of objects per location was set to 30. We have found that the small spruce bark beetle is now established over large parts of Northern Sweden and that the species will most likely continue to spread south. We have also found that most of the checked clear-cuts within the distribution area were colonized and that there was no strong trend in the number of colonized objects towards the distribution limit. The abrupt range limit could be the result of strong Allee effects.

The occurrence of alleles of a resistance gene encoding leucoanthocyanidin reductase (PaLAR3) from Norway Spruce

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The fungal species complex of *Heterobasidion annosum* s.l. includes some of the most destructive pathogens in the boreal conifer forests of northern hemisphere. These pathogens cause root and butt rot infection in conifers and ultimately cause huge annual economic losses exceeding €50 and €800 million in Finland and Europe, respectively. Scots pine (*Pinus sylvestris*) is mainly infected by *Heterobasidion annosum* s.s., and Norway spruce (*Picea abies*) in Northern Europe is heavily infected by *Heterobasidion parviporum*. Despite several efforts of implementing different control strategies to restrict the disease in practical forestry, including silviculture or biocontrol methods, however the economic loss remains significant. Therefore, it is necessary to introduce alternate environment friendly biological control measures to protect forest trees against *Heterobasidion* infection. Resistance or tolerance of spruce trees (*P. abies*) against *H. annosum* considered as a quantitative trait that includes several quantitative trait loci (QTL). This disease resistance has been found to be related to a gene *PaLAR3* encoding leucoanthocyanidin reductase which is a QTL including alleles show variation in fungal growth in sapwood (FGS). Previous research studies showed that there are two PaLAR3 allelic lineages (A and B alleles) in Norway spruce (*P. abies*) of which allele B significantly restricts fungal growth as FGS. In this research study, the screening results of PaLAR3 gene in breeding lines of *P. abies* seedlings showed the presence of both allelic lineages (A and B alleles). Altogether, in this study of 53 (~1600 seedlings) families of breeding lines (Norway spruce), 927 seedlings were found positive for A allele and 518 for both AB allele and B allele was found only in 147 seedlings. The result shows that B allele found with low frequency from combined homo/heterozygous genotypes (BB/AB) as low as 23% (1:10 ratio). Furthermore, the resistance seems not to be genetically correlated with any of the traits selected for in breeding (mainly growth rate in spruce). The results also suggest that in the future, breeders would be able to simultaneously improve both traits.

Are Mediterranean climate conditions suitable for *Lecanosticta acicola* establishment and spreading?

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The ascomycete fungus *Lecanosticta acicola* (Thümen) H. Sydow. (formerly *Mycosphaerella dearnessii* M.E. Barr), is one of the most important pathogens responsible for pine leaf diseases (*Pinus* spp.). The microorganism is found in natural forest ecosystems as well as in exotic plantations. In Europe, defoliation mostly occurs at northern latitudes or in alpine areas. In the latter region, the diseases of conifers and in particular those related to *Pinus mugo* Turra, are often associated with climatic conditions characterized by cold winters, persistent snow for several months, cool and humid summers.

In some cases, however, some pathogenic fungi may occasionally find opportunities to colonize their hosts under very different conditions. This is the case of *Lecanosticta acicola*, responsible for brown spot needle blight, which occurred on *Pinus mugo* in a botanical garden near the Garda Lake (Northern Italy), where, the mild weather conditions in summer and winter allow different tree species to vegetate for a long time. Similarly, with regard to the climate, a report in the literature described the damage in southern Italy on *Pinus radiata*, in a particularly humid area.

Symptoms compatible with infection of the fungus, which consist of the formation of red bands on the needles, can sometimes be confused with those caused by insects [(*Haematoloma dorsatum*, (Arhens)]. For this reason, confirmation of pathogen occurrence was assessed not only with traditional methods but also by molecular approaches, after DNA extraction from needles, and fungal detection with specific probes.

Results of a recent survey, at more than fifteen years from the first report of *Lecanosticta acicola* in northern Italy, on *Pinus mugo* needles, show that the pathogen has become rare, and difficult to be observed. The reasons, probably related to the recurrence of hot and dry summers which made fungal survival extremely difficult, are discussed in the present contribution.

Analysis and next-year forecast of beetle, borer, and drought-induced tree mortality in California

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The level of drought, insect outbreak, and resulting tree mortality has been described as a unparalleled during the last decade in California. Forest managers would greatly benefit from early warning of where and how much tree mortality to expect in the very near future, in order to plan and prioritize hazard tree removal, fuels reduction treatments, infer location of funding needs, as well as plan access for firefighting. To answer these needs, we developed an empirically-based forecast model for expected tree mortality for an upcoming year based on previous years tree mortality as observed in late summer; previous years hydrologic year precipitation levels; and site characteristic including amount of available host. Using this approach, initial forecasts for the next growing season were and can be developed by late fall for the following late summer. We demonstrated the application of this model by developing a forecast for the state of California for 2017. The explanatory variables in the California model accounted for ~43% of the variability in tree mortality. Overall, the model failed to forecast high levels of mortality in approximately 5% of forested or woodland locations for the state of California. Locations with more mortality than expected in 2015 and 2016 were mostly associated with new outbreaks of insects, some shifting from a secondary to a primary mortality agent; land use changes; and margins of prescribed- or wildfires not initially attributed. The forecasts may also be useful to natural resource and land managers in locating novel behavior or exotic insects. We developed a forecast of location and level of tree mortality for California, based on prior year mortality, annual precipitation, and site characteristics. Greater observed (<5%) vs. forecast tree mortality was due to new or novel insect behavior; land use changes; and margins of fires not initially assigned.

Seasonal response of bark and wood boring insects to (-) α pinene and ethanol in three resinous forests

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In the resinous forests are living numerous species of insects that are developing in weaken or recently dead trees. This species use for identification of hosts a series of olfactory signals released by the favourable material for matting (fresh logs, fresh stumps, debilitated trees etc.). For resinous species (in present case for spruce), the (-) α pinene and ethanol represent two of the main components of natural volatiles used for identification by bark and wood boring insects. Using the synthetic lures with (-) α pinene and ethanol, we proposed to identify of the insect species which respond to this combination of attractants during one vegetation season. Thus, between April 28 and October 02 2016, we installed 30 Intercept® traps in three locations (Argel, Breaza, Crucea – Suceava County –Romania), along of fresh spruce forest edges. This traps were baited with (-) α pinene lure (polyethylene bags, 500 mg/day release rate at 20°C) and ethanol lure (polypropylene vials, 1300 mg/day release rate at 20°C). The captured insects were collected weekly. In collected material were identified 19 species from different genus (*Ips typographus, I. duplicatus, Hylastes ater, Dryocoetes autographus, Pityogenes chalcographus, Pityokteines curvidens, Trypodendron lineatum, Hylobius abietis, Archopalus rusticus, Callidium violaceum, Clytus lama, Oxymirus cursor, Tetropium castaneum, Rhagium sp., Agriotes lineatus, Sirex gigas, Sirex juvencus, Xeris spectrum, Thanasimus formicarius*). The majority of species was captured especially in May-July period, but some species responded to attractants until September: *I. typographus, I. duplicatus, H. ater, D. autograpfus, P. chalcographus, S. gigas, S. juvencus, A. rusticus, O. cursor, T. formicarius*). The most important captures (more to 100 insects/ trap) consisted in specimens of *I. typographus, P. chalcographus, T. lineatum, T. castaneum, T. formicarius, A. lineatus.* Certainly are more insect species responding to the two resinous components, but it's possible that these to be attracted to other release rates or ratio of volatile components. Further researches are needed.

The influence of principal weather parameters of the *Ips duplicatus* flight activity

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The Northern spruce bark beetle *Ips duplicatus* (Sahlberg) (Coleoptera, Curculionidae: Scolytinae) is one of the most important pest of Norway spruce, native in Eurasian Boreal region. In Europe this species is currently widespread in numerous forests with spruce, especially in Central and South-Eastern regions, where is invasive. The outbreak potential for *I. duplicatus* is very high, especially in spruce stands situated outside of natural areas. In context in which this species is still more present, for its management it is necessary to know as much as possible about the limiting weather parameters that can affect its activity. Thus, for understand the influence of air temperature, air humidity, wind speed, atmospheric pressure on the flight activity of *I. duplicatus*, we installed in the field three automatic pheromonal traps and one weather station. The data about beetle traps and weather was recorded at 15 minutes' interval, to data loggers. The study was developed between 21 April and 06 October 2016, in the vicinity of pure spruce forest affected by *I. duplicatus* outbreak.

Ips duplicatus beetles start the flight when the air temperature is at least 15.5°C. Between 22°C - 28.5°C, the flight activity is very intense, in this temperature interval the bark beetle fly in swarm. After this threshold, the flight intensity strongly decreased until 32°C, after which the flight activity was stopped. The air humidity and pressure does not affect significantly the flight activity. The wind speed more to 2 m/s leads to reducing the *I. duplicatus* flight activity, and the speed that is higher than 4 m/s stops the flight activity. On the other hand, as in the case to similar bark beetle species, the flight activity stopped during to rain periods.

POSTERS

Distribution of the oak lace bug, *Corythucha arcuata* (Say.) (Hemiptera: Tingidae), in Romania

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Corythucha arcuata, also known as oak lace bug, is an alien invasive species from North America and was reported for the first time in Europe in 2000, in Italy. In Romania was reported for the first time in 2015 in Arad, Timișoara, Denta and Bucharest, even though was known since 2013, according to the experts from forestry pratice. Having in consideration the damage caused to the trees in the places where these was reported in Romania and neighboring countries, that species should be considered as potentially damage pest for our forests. Due to this reason it's very important to track spread of the oak lace bug across the country.

To mapped the geographic distribution of the *Corythucha arcuata* species on the map of Romania's oak forests, all the stands where the pest was present had to be identified. For this purpose, had been performed field trips starting at the points where the specie was first reported (and their proximity) and continuing until all potential stands with the presence of the oak lace bug have been covered.

That species has experienced a very rapid spread in Romania, in only two years covering almost entirely the South and West of the Romania and partly the East of the country. At the present time the species has covered most of the oak stands from the south and west of the country, however, it spread even more over the Carpatian area where it was sporadically identified all the way to Iasi county. There were no damages found in the forest. The strongest damages where located at the common oak located in the forest around Bucharest such as Ilfov, Călărași, Giurgiu and Teleorman.

Micological complex, associated with the four-eyed fir bark beetle *Polygraphus proximus* Blandford in its secondary range and its role in beetle/tree communications

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Four-eyed fir bark beetle (FFBB - *Polygraphus proximus* Blandford, Coleoptera, Curculionidae) - an invasive pest of Siberian fir *Abies sibirica* brought from the Russian Far East six ophiostomal fungi to its secondary range: Southern Siberia (from Altay Mountains to the lake Baikal) and Republic of Udmurtiya and Moscow District at European Russia.

Fungi *Grosmania aoshimae* and *Ophiostoma nikkoense* demonstrated high phytopathogenic activity after inoculation into phloem of Siberian fir. The strains of *G. aoshimae* and *O. subalpinum* produced extensive necroses in artificially inoculated stems of Siberian larch *Larix sibirica*. In general, *G. aoshimae* is the main fungal associate of *P. proximus*, considering the frequency and stability of its occurrence in samples, as well as its aggressiveness toward Siberian coniferous species. Only *Picea obovata* and *Pinus sibirica* were proved to be resistant. There is a high possibility of *P. proximus* mycobiota enrichment with a complex of fungi, connected with fir sawyer beetle *Monochamus urussovi* Fisch., an aboriginal pest of fir in Siberia.

Active mycelium of *Grosmannia* in minilogs placed into pheromone traps as lures dramatically increased number of FFBB beetles of both sexes in traps. In laboratory experiment beetles, exposed to minilogs with fast and slow growing strains of *G.aoshimae* preferred to bore along places with growing mycelium. The role of ophiostomal fungi in FFBB/fir communication in the forest is discussed.

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Possibilities of using global positioning system (GPS) in the aerial treatments application against forest defoliators insects in Romania

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Generally, oak forest ecosystems in Romania, are regularly affected by outbreaks of defoliator insects. In order to avoid the economic, environmental and social consequences caused by these insects, over the years, have been applied aerial treatments. The classic signalling system for polygons and flight paths, known in Romania for over 50 years, is an outdated and provides a low efficacy of treatments. In this paper are presented the possibilities of using modern GIS (Geographic Information System) technologies for the optimization of constitution of the polygons and flight paths, as well as the use of the Global Positioning System (GPS) for orientation and tracking of the flight lines. By implementing and perfecting these modern systems, a high accuracy of treatments can be obtained and a flight report on which can be made the reception of work.

The regression of epidemic diseases by alien fungi: *Seiridium cardinale* as case study

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Cypress canker disease by *Seiridium cardinale* has been reported in Mediterranean area since the '940 (France, Italy , Spain, Greece, Turkey,) . The epidemic spread of the fungus caused serious impact in the forests but also in the landscape however eradication of the disease was considered too costly or ineffective due to the conducive climatic and environmental conditions; the canker fungus Seiridium cardinale, Coelomycetes, is associated with seed insect vectors *Megastigmus wachtli* (*Hymenoptera Torymidae*) and *Orsillus maculatus* (*Heteroptera Lygaeidae*).

Therefore, protection through chemicals was mainly concentrated in the nurseries and sanitation, by cutting and removing adult infected trees, was focused mainly on parks, gardens, small plantations.

After almost 70 years from its first occurrence, the impact of the disease on the territory, at least in central Italy, seems less evident. Despite this, the comparison between the monitoring performed 30 years ago with more recent data reveal that the disease is still present.

Among the factors contributing to apparently exhausted the epidemic spread of cypress canker and less visible damage in the landscape could be listed: the reduction "or disappearance" of the most susceptible individuals and the changing of the climate conditions favorable to the appearance of infections.

Ceresa bubalus (Hemiptera: Membracidae) in oak plantations in north – eastern Romania

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he North American membracid *Ceresa bubalus* Fabricius, 1794 (Hemiptera: Membracidae, syn. *Stictocephala bubalus*, *Membracis bubalus*), known by the common name, buffalo treehopper, is an invasive species. During last 100 years *C. bubalus* has expanded its range in many regions of the world and invaded new territories. Since then, this species has been introduced to the western part of USA, Hawaii, Europe, North Africa, even to the Caucasus region and Central Asia. In Romania, the insect is considered a dangerous pest in orchards and vineyards. First severe attacks in forests occurred in autumn 2017 in young oak plantations (primarily, sessile oak), in north – eastern Romania (Suceava district), managed by Greengold Est SRL Private Forest District. The attacks (longitudinal incisions on stems and lateral branches) were recorded on a total area of 91.5 ha (66.5 ha in PU I Amelina and 25.0 ha in PU XII Iași South). Heavy infestations occurred on 37.8 ha, the density of incisions was of 58/dm on stem and 21/dm on branches, with 3 – 7 eggs/incision. In order to prevent new attacks on seedlings, winter spraying was done using CONFIDOR OIL SC 004 (dose 7.5l/ha). No subsequent infestations were recorded after spraying. The monitoring of the pest continues, especially in the new plantations.

Romanian *Beauveria bassiana* strain with potential for biological control of the invasive oak splendour beetle, *Agrilus biguttatus*

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Agrilus biguttatus Fabricius (Coleoptera: Buprestidae) is considered to be a forest pest that plays an important role in the complex oak drying process because it causes tree damage, either directly or indirectly, opening the way for mycotic infections and finally causing them to die. Due to the fact that it can only grow on specimens weakened like many other saproxlyc and phytophagous beetles, *A. biguttatus* is considered devastating. Under normal circumstances, the damage caused by *A. biguttatus* is negligible, but in 2018 the damage caused in the some forest districts (M. Eminescu, Botosani and IRI) was marked by a volume of more than 10,000 cubic meters of dried trees during the vegetation season. During 2015, the first dried sessile oaks (*Quercus petraea*) were reported as solitary trees; in the following years around these dried and unexploited trees, drying of others trees was recorded, the outbreaks extending from year to year. In 2018, an area of 24.9 ha was affected. During 2018, a private area of 398 ha belonging to Stânceşti (Botosani Forest District) was affected; a volume of 1885 cm of dried oak trees, attacked by *A. biguttatus* was exploited. The forest stands had the same characteristics as those from M. Eminescu Forest district, the areas being adjacent. The two parcels consisted of over 70% oak forest and the rest of the mixture of European hornbeam (*Carpinus betulus*) and lime bushes (*Tillia* sp.). The age of the tree was 60 years old and it comes from sprouts. From M. Eminescu Forest District (UP III Corni, u.a. 123 and 124B), oaks samples infested with *A. biguttatus* were collected. In laboratory, the oak samples infected with *A. biguttatus* were treated with *Beauveria bassiana* conidia (strain Bb2450) initially isolated from *Ips typographus*. The insects were treated by gentle rolling over a 20 days *B. bassiana* colony so as to see that the conidia adhered to the insect cuticle. Also the aqueous suspension of conidia (1x109 UFC/ml) was applied in galls. *A. biguttatus* larvae and pupae showed susceptibility to *B. bassiana* strain Bb2450; the mortality was recorded 5 days after the application of the treatment; the following 48-72 hours revealed the saprophytic phase of fungal infection characterized by the emergence of hyphae, first at the intersegmental areas of dead insects, then completely covering the mummified larvae and pupae with a sporulated mycelial mat. Under laboratory conditions, experiments were carried out to assess the biotechnological potential of the strain Bb2450 as a biological control agent of *A. biguttatus*. In the paper are presented results regarding the capacity of Bb2450 strain to use different nutritive substrates, the optimal parameters of multiplication and conidiogenesis that will non affect the insecticide potential.

Field experience of *Beauveria brongniartii* application in the control of white grubs in nurseries and forest plantations in Moldova region

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Since whitegrub infestation continues to be a problem in FSC certified nurseries and forest plantations in the context of a lack of chemical alternatives, efficacy tests of BioMelCon bioinsecticide as barley kernels covered by entomopathogenous fungus *Beauveria brongniartii* have been carried out (autochthonous strain). The treatment was carried out annually starting in 2016, in various nurseries belonging to Bacău Forest District and Neamț Forest District (N-E of Romania) with strong whitegrubs infestations (*Melolontha melolontha, Anomala dubia, Amphimallon solstitialis* and *Rhizotrogus aestivus*). Treatments were performed with doses of bioinsecticide between 150 and 200 kg / ha / year in April-May to bare soil (without growing plants) by incorporation into the first 30 cm of soil. In the autumn of the second year of treatment with *B. brongniartii*, there was a considerable reduction of larval density, especially *M. melolontha* and *R. aestivus*, which recorded very large initial densities (>4 insects / sqm) before the first application of the bioinsecticide in 2016. The populations of *A. dubia* and *A. solstitialis* were affected to a small extent, since they were not specific hosts for *B. brongniartii*. However, *R. aestivus*, another non-specific host for *B. brongniartii*, showed susceptibility to fungal attack. In one of the treated surfaces (Lunca lui Pall nursery), the first two years of *B. brongniartii* application led to eradication of *M. melolontha* population, but not of *Anomala* sp. After the chemical treatment performed in 2018, the density of *Anomala* sp. recorded a mortality of only 62,1 %.
In this study, the effects of BioMelCon treatment in the third year of treatment on whitegrub infestation in nurseries belonging to Bacau Forest District and Neamt Forest District were investigated.

Pityogenes chalcographus (Coleoptera: Scolytidae) in unmanaged and managed forests of Apuseni Natural Park, Romania

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Apuseni Natural Park is a protected area in Western Romanian Carpathians and is covered more than 70% by the spruce forests. Time to time, dangerous outbreaks of the forest insects are major agents of the trees mortalities and contribute to the changing of the forest ecosystem on smaller or larger surfaces. Beside of spruce bark beetle *Ips typographus*, six-toothed spruce bark beetle *Pityogenes chalcographus* is part of the group of insects that can have impact on referred forests. The both species are the most destructive bark beetles on spruce forests in Europe and in the last decades caused damages to Romanian spruce stands.

The abundance of *P. chalcographus* has been assessed during 3 years, in the vegetation period, in 24 spruce forest stands on altitude between 900 and 1500 m, 2/3 of them in unmanaged area and 1/3 of them in managed area. Traps type Theysohn baited with aggregative pheromone Chalcogran (PC Ecolure Tubus Mega) has been used.

The statistical analysis of the results was ensured by applying the Duncan test for multiple comparison.

Preliminary results on forest protection ecosystem services of red wood ant (*Formica rufa* group) and birds (*Aves*) in oak (*Quercus* sp.) forests of Hungary

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Predation is one of the most important ecological functions through its community-structuring effects. The lack of predators such as ants and birds can alter the total abundance and the diversity of the prey species. The natural control of the defoliating species is one of the most important ecosystem service that can be utilized in forestry. Red wood ants and birds may play a significant role in forest protection. They prey on many insects, which can significantly influence forest health. They obtain their food mainly from tree canopies, so they can effectively reduce the herbivore pressure. Therefore the main goal of our ongoing 4 years term project is to quantify the effects of red wood ants and birds on abundance of herbivorous insects, mainly defoliating caterpillars. We conducted our study in two habitats: first where we were able to study the lack of red wood ant (*Formica rufa* group) and second where is no natural nesting possibility for insectivorous birds such as great tit (*Parus major*), Eurasian blue tit (*Cyanistes caeruleus*) and collared flycatcher (*Ficedula albicollis*). Here we placed nest boxes to maximize the abundance of nesting birds in contrast to the control area. We quantified the abundance of the most important defoliating insect group (Lepidoptera) with frass collecting from spring to summer, and the abundance and the diversity of them with sticky belt traps on the trunks from autumn until early spring. The lack of red wood ants had no significant effect to the frass amount. We have found significant difference in winter moth abundances between the trees close and far from ant hills, but there was no significant difference in case of birds, but this result can be misleading, because this was the first year when the nest boxes were on their place. In our ongoing project we keep quantifying herbivore prey items carried by ant foragers via monitoring ant routes using small video cameras. By this examination we hope to count the abundance and identify prey species.

Monitoring of non-native insect species in forests of Slovakia

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Forest protection service in Banská Štiavnica is performing various monitoring programs aimed on non-native insect pests in Slovakian forests. We are performing long-lasting (with some gaps) monitoring of *Ips duplicatus* from 1997. First mention about possible presence of this bark beetle comes from 1920, but first time was trapped in 1996. In 1997 starts monitoring of this pest in border regions near Poland and Czech Republic. Later was monitoring extended to all areas with significant amount of spruce forests.

From 2015 we are involved in National program of survey of selected harmful organisms of Slovak republic. Program is funded from EU and is established in more European countries. This program is aimed on various insect species based on directive 2000/29/EC and pests which represents emerging risk for Union territory. Monitored pests are *Agrilus anxius, auroguttatus and planipennis, Dendrolimus sibiricus,* non-European *monochamus and pissodes species, Anoplophora chinensis* and *glabripennis, Polygraphus proximus* or *Xylosandrus crassiusculus*. Non of these pests were found in Slovakia till this time. In 2015 also *Aproceros leucopoda* was involved in National survey program. First occurrence in Slovakia is from 2007 and 2009, but our monitoring shows its distribution in Southern and western parts of Slovakia. All together 101 plots were monitored and at 31 plots were recorded presence of *A. leucopoda*. Mostly attacked tree species was *Ulmus minor*, and some records are also from *Ulmus leavis* but no attacks on *Ulmus glabra*.

In 2010 was first time noticed presence of *Xylosandrus germanus*. In 2016 starts monitoring in wood warehouses and forests in Slovakia with result that from 2010 to 2016 has spread through entire Slovak territory up to elevations 1000 a.s.l.

In 1017 starts monitoring of presence of Corythucha arcuata in Slovakia. On June 20, 2018, C. arcuata was observed in the vicinity of Mužla, a village near the Danube River in south western part of Slovakia. Then, on August 10, 2018, a second plot attacked by C. arcuata was observed in the eastern part of the country in the forest area near Čičarovce village.

New diagnostic techniques for Pine wilt disease caused by pine wood nematode (*Bursaphelenchus xylophilus*)

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Pine wilt disease (PWD) is caused by pine wood nematode, *Bursaphelenchus xylophilus*. Most East Asian countries and Portugal and Spain have been suffered by PWD and incurred serious economic losses. PWD has a wide host range on coniferous trees and is mediated by beetles of insect vectors. Diagnosis of PWD is based on detection of pine wood nematode from infected tree and various methods from morphological identification and molecular characterization have been applied. Accurate identification of pine wood nematode is a prerequisite to diagnose and control PWD. Recently, in Korea, new diagnostic methods for PWD approached through PWD research project which is based on DNA marker and monoclonal antibody from pine wood nematode, and gene expression patterns of pine host. As DNA based work, LAMP (Loop-mediated isothermal amplification) and RPA (Recombinase Polymerase Amplification) methods were applied which markers were designed from IGS and ITS2 of rDNA in respectively. For antigen-antibody based diagnosis, we first conducted genomic and proteomic analyses of pine wood nematode to get species specific antigens. Finally two antigens, “GaLectin” and “ExpansinB3” were confirmed to be specific antigens for pine wood nematode and generated monoclonal antibodies having high specificity and reactivity to the antigens. For the early detection of PWD on *Pinus densiflora*, we identified differentially expressed genes (DEGs) among the samples (water, pathogenic and non-pathogenic PWN inoculated trees) using the newly assembled transcriptome as a reference. 991 genes as reliable DEGs were identified which involved at biological processes related to phenylpropanoid biosynthesis, flavonoid biosynthesis, oxidation-reduction, and plant type hypersensitive response. The differences in transcriptome between pathogenic and non-pathogenic PWN pines might be used for diagnosis of the PWD in early stage.

Influence of thermal-humidity and snow conditions on winter mortality of developmental stages of *Pityogenes chalcographus* (L.) under field and laboratory studies

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Pityogenes chalcographus (L.) is a cambiophagous insect pest of a high importance as a producer of deadwood in Norway spruce (*Picea abies* L. Karst.) stands. The knowledge of *P. chalcographus* bioecology is quite extensive, however, issues related to the bark beetle overwintering and resistance to microclimatic conditions in winter, determining its potential outbreak are still unknown.

There were three main goals of this study: (1) to investigate in field conditions the mortality of *P. chalcographus*, overwintering on spruce branches deposited on the forest floor, depending on the temperature, relative humidity of the air and the thickness of the snow cover during the winter season, (2) to compare in field conditions the mortality of *P. chalcographus*, overwintering on spruce branches in crowns of trees and deposited on the forest floor, depending on air and material thermal-humidity conditions and (3) to determine in laboratory critical low temperatures for developmental stages of *P. chalcographus* at a given relative air humidity and temperature exposure time.

Research material in a form of branches infested by *P. chalcographus* came from selected spruce stands, located in the Silesian Beskids (southern Poland), above 600 m above sea level. Data were collected in three winter seasons from 2011 to 2014. In field part of the experiment mortality analysis of developmental stages of *P. chalcographus* in each year was performed twice, during winter and early spring after snowfall. During two winter seasons, 2012/2013 and 2013/2014 the survival of *P. chalcographus* under controlled conditions was analyzed, using a low temperature chamber, by subjected specimens excavated from galleries to four temperature variants: -20ºC, -25ºC, -30ºC and -35ºC.

P. chalcographus overwintering either on branches left at the bottom of the forest and in crowns of trees, in the form of larvae, pupae and imagines has been proven. In both field and laboratory experiments, the highest resistance to adverse thermal and moisture conditions was demonstrated by larvae, while the most sensitive stage were pupae. Layer of snow at least 40 cm thick, covering spruce branches lying on the forest floor, where *P. chalcographus* hibernated in galleries, maintained the temperature in the range from -2ºC to 2ºC, and relative humidity of the air at the level of over 95%. Such conditions caused that the average mortality of the bark beetle developmental stages overwintering in galleries was up to 30%. It was shown, that *P. chalcographus* is able to survive winter period at a relatively high level, usually exceeding 50%, both in humid and relatively warm conditions, prevailing in the forest floor, kept under the snow layer, as well as in dry and frosty conditions, occurring in the crowns of trees. Obtained results indicate that leaving colonized by *P. chalcographus* standing trees and logging residues until the spring swarm, may threaten to increase the population of the pest.

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The Last Tree Standing: a pilot study of spruce surviving bark beetle outbreak in the Bohemian Forest Mountains

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Conifer forests around Europe and North America are facing one of the most devastating bark beetle outbreaks in the history. Epidemic populations of herbivores, triggered by changing climate and severe windfalls, destroy huge amounts of wood, deteriorate landscapes and afflict damage to the ecosystems of vast regions. However, sometimes in a beetle-killed stand there remains a certain minute proportion of trees that weather disruptive outbreaks. These surviving individuals or ‚Last Trees Standing' (LTS), possess a wealth of information about the reasons of their resistance, which can be heritable. Using LTS as primary seed source could have a potential to establish stands resilient to bark beetle attacks in the future. In the Bohemian Mountain Forest in Austria, Germany and Czech Republic, on 6 plots highlighted by their locality, 184 Norway spruce (*Picea abies*) individuals that survived massive bark beetle (*Ips typographus*) outbreak and correspond to a designed set of criteria (age, physical condition, location, surrounding) were mapped. LTS characteristics were measured or estimated using Google Earth Pro software. Contrary to expectations, preliminary results of basic statistical analysis of LTS characteristics revealed only small differences between the values of parameters in the managed and unmanaged areas. In Plechý (Czech Republic) the most resistant LTS can be expected, since in this locality the highest median distance to the nearest surviving living mature tree was observed. The 'oldest' LTS (10-12 years since all trees around them had been killed) were recorded in Austrian Hochficht. Relatively long life of LTS in this locality could be explained by the protection of the stand against the wind by the mountainous landscape. Median distance to the nearest surviving living mature tree appeared to be an important characteristic to estimate the density or frequency of LTS occurrence in the forest. It can also serve as a predictor of free from impurity LTS needed for further genetic analysis.

Late flushing trees avoid attack by moth larvae

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Many lepidopteran species (forest pests) develop in the temperate forests in Central Europe shortly after the tree budburst (the "brumata-viridana species complex"). In May 2015 and May 2016 we investigated moth larvae (Lepidoptera) within the given species complex on young and mature trees of late flushing *Quercus cerris* and early flushing *Q. pubescens* in southern Slovakia. Although *Q. cerris* yielded fewer species (40 species) than *Q. pubescens* (47 species), the expected (rarefied) number of species suggested a similar number of species on mature trees of both oak species. The total number of moth larvae and the abundance of dominant species were significantly lower on *Q. cerris* than *Q. pubescens.* The results suggest the release of *Q. cerris* with delayed budburst from heavy infestations by folivorous moth larvae within the "brumata-viridana species complex". Knowledge obtained can be applied in silvicultural and horticultural practices aimed to protect and maintain forest, fruit, and ornamental trees.

Attraction of trap trees for *Ips duplicatus* Sahlb., *Ips typographus* L. and *Pityogenes chalcographus* L. (Coleoptera: Curculionidae) trapping

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Protection of spruce stands against *Ips duplicatus* is rather complicated. One of the specific features in ethology of this species is, that *Ips duplicatus* infests wood laying on the ground only very rarely. Foresters of Třebíč forest district, the place with strong gradation of *Ips duplicatus*, recorded high infestation of laying trap trees by this bark beetle species in 2015. Therefore the study of different variants of trap trees for selected species of bark beetles was conducted. Attractiveness of five trap trees variants for *Ips duplicatus*, *Ips typographus* and *Pityogenes chalcographus* were tested in 2016: (L1) covered (with branches), not underlaid, (L2) covered, underlaid, (L3) not covered, not underlaid, (L4) not covered, underlaid and (L5) trap tree with no cut branches. All these variants were installed on five localities on each of two forest districts of LČR, s.p. (Třebíč and Opava - the areas with long term high population density of *Ips duplicatus*) during the second half of March. Trap trees infestations were evaluated in the end of May and beginning of June. Particular galleries of *Ips duplicatus*, *Ips typographus* and *Pityogenes chalcographus* were calculated on each of four 50 cm wide debarked sections of each trunk: (i) at the distance up to 3 m from the trunk bottom, (ii) halfway between the first section and the beginning of the crown, (iii) at the beginning of the crown and (iv) in the middle of the crown trunk part. Attractiveness of particular variants of trap trees was statistically evaluated by STATISTICA using one factor ANOVA with the significance level $\alpha = 0.05$. Infestation of *Ips typographus* and *Pityogenes chalcographus* on each section was recorded also at the same time. The results showed that the trap trees infestation density (regardless of the trap tree variant) was very low, if any, even though the population density of *Ips duplicatus* was very high in both studied forest districts. Therefore differences between the infestations of particular trap tree variants were not possible to evaluate. Incomparably higher infestation by *Ips typographus* and *Pityogenes chalcographus* of installed trap trees was recorded. Differences in infestation of these two species were not statistically significant. Our study confirmed previous results of similar studies of other authors, that *Ips duplicatus* doesn't infest the laying wood and utilization of trap trees for this bark beetle species is not effective, even in areas with high population density.

Future hormonal control method for a well-known problem

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An acute need of 'greener'control agents is became imperative now in a changing environment where insecticide resistance become a well known problem. This aspect offered an oportunity to go on a new path of research wich has as target selective nature of neuropeptide signalling pheromones for controlling pest insects of agriculture, horticulture and forestry, whilst remaining inofensive to other beneficial insects. Neuropeptides are produced by the nervous sistem and regulate all critical processes in insects that include reproduction, behaviour, water balance and even energy metabolism, and is recognised as a great potential in an integrated pest management context. Forest Research chosen as a model insect the large pine weevil *Hylobius abietis* (L.) (Coleoptera: Curculionidae) because is is a major pest of plantation forestry throughout Europe and many studies have been conducted to find appropiate ways to prevent injuries caused by feeding adults on transplanted samplings but woefully a solving to this problem hasn't been found. Few other methods have been tested to a much lesser extent for an integrated pest management, among others soil preparation before planting and feeding bariers being most trialled. Following insect lifecycle, larvae and pupae are likely to be more susceptible and grouped but are well protected. On the other hand, adults are dispersed and hardier, but they can be lured. Forest Research and Eu-funded consortium explored the potential of this cutting edge approach for the control of forest pests which are chemically controlled.

The main research objective was to assess the influence of mimetic chosen hormones that could induce a changing behaviour of pine weevils. Previous experiments suggests that Drome-DH44 and Drome-CAPA could be an endogenous regulator for Malpighian tubule secretion rate and water homeostasis. Hopeful results on food intake have been obtained using different analogs from SK (sulfakinin) family and AKH (adipokinetic hormone) been tested and is likely involved in the mobilization of carbohydrates in weevils hemolymph. The technology and principles of the project will be outlined, and our experimental approach discussed.

The favorability of the oak forests in Romania for *Acrobasis tumidana* Denis & Schiffermuller, 1775 (Pyralidae, Lepidoptera) outbreak

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Acrobasis tumidana is a species of insect fauna in oak forests in Romania, which over time has not produced outbreaks. Symptoms specific to the damage caused by this species were reported each year, however, the frequency and intensity of attacks were very weak. This paper presents the distribution of infestations in the last two years, when the insect has developed a slight multiplication, in oak forest from southern Romania and relationship with environmental factors. The insect preferred pure turkey oak forests, located in sunny areas without much underwood. It is hoped this study will inform practitioners about identification and surveillance of future populations.

Seasonal dynamics of *Xylosandrus germanus* (Coleoptera: Curculionidae, Scolytinae) flight and attack in the northern part of the Eastern Carpathians (Romania) - preliminary results.

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Xylosandrus germanus (Blandford 1894), a new species for Romania's fauna, is already present in most of the country. Because it is potentially harmful to forestry, orchards and vineyards, the research purpose was to investigate the dynamics of flight and attack activities of this species. Four study areas were selected in the northern part of the country, at 520-895 m above sea level (a.s.l.), in tree stands mainly composed of European beech (*Fagus sylvatica* L.). Eighteen bottle-traps and three flight-interception traps, primed with 96% ethanol, were installed in each study area. Flight dynamics was monitored between April 3 and September 18, 2018. The insects were collected weekly. The attack dynamics was studied in the area located at 775 m a.s.l. Three successive series (16.04, 1.05 and 29.06) of beech stem segments (length of 30 cm, diameter of 2-4 cm), pretreated with ethanol, were placed there. They were checked weekly and new entries marked. Temperature in the four areas was recorded with HOBO Pro v2 data loggers, and the precipitation data was extracted from the E-OBS 0.25° x 0.25° dataset. Over 141 thousand females of *X. germanus* were captured during the survey period, the first on April 11-12, and the last ones during the week before the study cessation. Howevere, intense flight was recorded between mid-April and mid-July, depending on altitude, with some interruptions due to bad weather, and with peak swarming activity in June. The flight shall be triggered after daily maximum temperatures of more than 20 °C have been recorded for at least 2 days. 12,365 *X. germanus* entries were marked on the studied wood segments and the attack dynamics coincided with that of the flight. The species has only one generation per year in the study region.

Development and application of Loop-Mediated Isothermal Amplification for a simple and precise detection of the pinewood nematode *Bursaphelenchus xylophilus* in Korea

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The pinewood nematode (PWN), *Bursaphelenchus xylophilus* (Nematoda: Aphelenchoididae), is one of the invasive forest pests responsible for widespread pine wilt disease (PWD), which results in severe ecological and economic losses in coniferous forests worldwide. Infection to the host trees by the PWN leads to the death of host trees in less than one year under appropriate environmental conditions. Since its first report in 1988 in South Korea, the PWD has spread across the country and has so far affected approximately 9 million pine trees, mainly to *Pinus densiflora* and *P. thunbergii*, which are two of the major species, comprising Korean conifer forest. To effectively control the PWD, a suitable detection tool supported with a rapid, cost-effective and efficient assay are required, ultimately for the early implementation of risk assessments for the forest pests and diseases. In this regard, we developed a loop-mediated isothermal amplification (LAMP) assay, which facilitates a simple, specific and rapid detection for the PWD in the field. Two sets of primers and a single loop primer were designed, and evaluated for the specificity and sensitivity against the PWN. The results showed that the primer sets designed in this study detected only from samples infected with the PWN, and the LAMP assay enabled detection from which the wood samples infected with the PWN. It is consequently indicated that the LAMP assay is successfully developed and can be applied as a useful tool for the accurate and reliable detection of the PWN in the field.

Dynamics of a bark beetle community in a Norway spruce forest in the High Tatra Mountains, Slovakia

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Norway spruce is a dominant keystone species in the montane coniferous forests in central Europe, with important ecological and commercial value. Natural disturbances such as wind throws and bark beetle outbreaks have caused major losses in these forests in the last few decades and are becoming more frequent and severe. Holeksa et al. (2016) created a dendroecological dataset from the High Tatra Mountains in Slovakia, which shows several large disturbance events occurred in this region over the last two centuries. Comparing dendroecological data with fossil beetle records from sedimentary archives can provide more specific information on the nature of these disturbances. Reconstructed long-term disturbance patterns can then provide information for improved nature conservation and forest management, as they can make use of these natural factors of dynamics and resilience of the forest. From a forest hollow in the High Tatra Mountains in Slovakia, 12 cores were retrieved for a quantitative study on subfossil beetles (Coleoptera), covering the last 1000 years. Correlation and integration of the adjacent profiles was underpinned by repeatable down-core µXRF geochemical stratigraphy (airfall Pb and other elements). Fossil pollen and charcoal records, obtained from a parallel core, together with the fossil Coleoptera, provide a record of past disturbances that can be compared to the disturbance events recorded in the dendroecological data. A diverse community of beetles was recovered, including many species of bark beetles such as *Ips typographus* and other saproxylic taxa characteristic of dead wood habitats. The fossil record of Diera Hollow shows a shift from a stable forest ecosystem to a disturbed landscape with dominance of tree-killing bark beetles. Anthropogenic influences, coming from a distant village, are clearly visible in this record as well. Changes in the forest beetle community over the last 1000 years and their relation to disturbance events in the High Tatra Mountains in Slovakia are discussed.

Holeksa, J., Zielonka, T., Zywiec, M. and Fleischer, P., 2016. Identifying the disturbance history over a large area of larch–spruce mountain forest in Central Europe. Forest Ecology and Management 361: 318-327.

Identification of Forest Deceases by Combination of Baiting method and PCR

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Phytopathological monitoring allows for timely assessment of the state of natural plantations, making a preliminary forecast of development of pests and preventing the development of epiphytothies. Reliable diagnostics is an integral part of monitoring to identify pathogens. Classical biological methods of pathogen identification are quite time-consuming and not always reliable. The combination of modern and traditional methods increases the specificity of diagnostics, reduces the analysis time.

We conducted surveys in the Kedrovaya Pad State Nature Reserve of the Far East Branch of the Russian Academy of Sciences and the Botanical Garden and Institute of the Far East Branch of the Russian Academy of Sciences in Vladivostok on the territory of the Primorsky Krai. The plantations were surveyed using the route method. The plants were examined along the computation paths and routes or evenly across the forest. At the same time, deceased trees with signs of wilting and drying were recorded and the soil samples near roots were taken. Laboratory studies were carried out by the baiting method, isolation on the nutrient medium (V8, PDA), microscopy and morphometry, as well as molecular genetic methods (PCR with universal primers, sequencing, bioinformatics analysis of the obtained sequences of the diagnostic genome regions (Partial Ras-related protein gene (Ypt1) and internal transcribed spacers (ITS)).

During the survey in the Kedrovaya Pad National Nature Reserve, we observed trees of the *Alnus* genus with wet brown spots on the bark in the pre-root part of the stem. Laboratory tests by the baiting method from soil samples taken near alder roots resulted in successful extraction and identification of two species of the *Phytopythium* genus (*Phytopythium chamaehyphon* and *Phytopythium cf. citrinum*). The species were identified on the basis of decoding of the nucleotide sequences of the internal transcribed spacers (ITS) region.

Phytopythium (*Peronosporales*) genus has been described fairly recently and complete taxonomic and morphological characteristics of this group are not yet presented. According to researchers, *Phytopythium* is morphologically intermediate between *Phytophthora* and *Pythium* genera. It is unique in the presence of papillae, internal reproducing sporangia and cylindrical or lobar anteridia. These two species are associated with wood plants. For example, *Phytopythium cf. citrinum* was detected in Poland during survey of oak groves.

Trees of the *Quercus* genus with dieback and drying up of individual shoots and branches were observed on the territory of the Kedrovaya Pad Nature Reserve. The following species were identified from soil samples taken near oak roots with signs of drying up: P*hytophthora plurivora*, *Phytophthora citricola*, *Phytophthora occultans*.

In the plantations of different *Rhododendron* species in the Botanical Garden and Institute of the Far East Branch of the Russian Academy of Sciences, Vladivostok, focal wilting of plants was recorded, leaves were characterized by brown coloration, shoot apexes of plants were slightly wilted and growth suppression was observed. Soil samples were taken near the roots of different rhododendron species with signs of wilting. The following species were identified in the soil samples: *Pythium dissotocum, Pythium cylindrosporum, Pythium macrosporum, Phytopythium vexans, Phytophthora plurivora, Phytophthora inflate, Phytophthora citricola*.

According to the research conducted it was found that the use of the baiting method allows to isolate oomycetes representatives from the soil in a short period of time (3-5 days). The decoding of the nucleotide sequences of the diagnostic genome regions ensures reliable and quick identification of pathogens to the species. Pathogenic oomicetes of natural *Alnus*, *Quercus*, *Rhododendron* plantations were identified in Russia for the first time. The obtained cultures of pathogens were deposited into the mycological collection of FGBU "VNIIKR".

Monitoring pathogens present in forest cultures in the current climate context

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The current Romanian system for forest monitoring includes a set of measures for the detection, forecasting, prevention and control of biotic (cryptogamic) and abiotic (caused by harmful environmental factors - drought, floods, pollution, etc.). The growing pressure of phytopathogenic agents (phytosanitary, invasive or particularly dangerous) overlaps with the aggressive impact of fluctuations / climate change, leading to more and more frequent debilitations of forest ecosystems. Modern methodology for identifying / monitoring infectious agents based on molecular analysis, compatibility tests / GIS technology, etc., respectively impact interpretation are not implemented in forestry, this study provides a qualitative leap from this point of view for forest protection.

Restricting the range of phytosanitary chemicals usable in natural ecosystems as a result of European directives to rules on forest certification and protected areas requires rethinking the current forest protection system.

Monitoring of pathogens present in nurseryes, plantings and natural regenerations must be carried out every year and throughout the growing season, which involves performing analyzes, identifying and establishing appropriate measures to control identified pathogens.

Increasingly extreme climatic variations make the forest species subject to additional stress, which may benefit the secondary biotic agents (opportunists), who become more virulent under the circumstances. The spectrum of pathogens, although generally known, without a thorough analysis of the environmental conditions and the condition of the woody plants, respectively without knowing the optimal measures, applied in due course, can cause significant damage until the culture disappears.

The data presented in this paper, it refers to phytopatological analyzes of the nutrient bed, seeds, plants and affected seedlings. Correlations between the evolution of infections and local topo-pedo-climatic factors or links between disease and stand / biocenosis factors were also analyzed. For their control, new products and methods (treatment techniques) have been tested to provide adequate solutions for healthy cultures, while the recorded losses do not exceed the damage threshold.

Analyzes made on resinous plantule have shown that the most dangerous pathogens belong to the genus *Fusarium*, *Pythium*, *Rhizoctonia*, *Botrytis* and under strong infestation conditions, *Alternaria* genus, although a saprophyte, contributes to the debilitation of the crops.

In resinous plantations and crops from nurseryes, the predominat foliar parasites are the following: *Phoma piceae*, *Lophodermium macrosporium*, *Mycosphaerella tulasnei* and *Diplodia pinea.*

The following pathogens were identified in deciduous crops: *Coccomyces hyemalis* on wild cherry, *Microsphaera* sp., *Roselinia quercina*, *Taphrina coerulescens* in oak, *Dotichiza populea* and *Cytospora* sp. at the black and hybrid poplar.

Experimental techniques for the control of these pathogens required the use of broad spectrum fungicides, which, by their combined use, acted on the entire spectrum of pathogens presented.

Brenneria and *Lonsdalea* species in Europe

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Species of the *Brenneria* and *Lonsdalea* genus are widely distributed pathogens in the world. *Brenneria* genus consists of eight species (*Brenneria salicis*, *B. nigrifluens*, *B. rubrifaciens*, *B. alni*, *B. goodwinii*, *B. roseae*, *B. populi* and *B. corticis*) and five subspecies, the genera *Lonsdalea* includes five species (*Lonsdalea britannica*, *L. iberica*, *L. populi* and *L. quercina*). Some species of *Brenneria* and *Lonsdalea* genus are reported in Europe as well: Great Britain, Belgium, French, Hungary, Italy, Netherlands, Serbia and Spain. These bacteria affect *Alnus*, *Juglans*, *Populus*, *Salix* and *Quercus* species. These diseases are characterized by similar symptoms: on the bark longitudinal streaks and vertical cracks, necrosis on inner bark, on the trunk irregularly shaped cankers can develop. The infected shoots and branches are wilting and dying. When the climatic conditions are favourable for bacteria during summer and autumn, from cracks and cankers different coloured, watery fluid (black, brown, red or white) is oozing. In some cases it seems like the stem is bleeding ("bleeding canker"). If there are warm and humid conditions the bacterial exudation is intensive and running down on the bark of the stem. The weather is changing in the last few years, there were long lasting, hot summers, warm and humid autumns which were increasing the possibility for the bacteria to spread and infect the trees. These could be some of the reasons why in Hungary from 2008 similar symptoms were observed like *Brenneria* and *Lonsdalea* species can cause. From the affected *Betula*, *Ulmus* and *Populus* trees samples were collected from infected bark or exudates. Bacteria were isolated from samples and were analyzed by conventional (determination of biochemical and morphological properties, Gram test, hypersensitive response, pathogenicity test) and molecular (16S rDNA, housekeeping genes – atpD, gyrB, rpoB) methods to identify the pathogens. It is important attend to these bacterial pathogens because they could provoke serious losses. It is known if *Brenneria nigrifluens* appears on *Juglans regia* trees, can cause notable decline in timber production or another example is AOD (Acute Oak Decline) on *Quercus* species. AOD is a complex disease; there are several biotic factors which could have a role in decay of oak trees. Among others *Brenneria goodwnii*, *Brenneria roseae* subsp. *roseae*, *Lonsdalea britannica*, *Phytophthora* species and *Agrilus biguttatus* has been related with the oak decline.

Combination of Verbenone and MCH pheromone repellents for the management and control of *Ips typographus*

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Verbenone and MCH are natural pheromones with anti-aggregation or repellent properties that arrests additional mountain pine beetle attacks on a tree. These anti-aggregation compounds are insect-produced as a signal to adult beetles to stay away because the resource is fully utilized by the insects already present. Different and various studies with synthetically obtained verbenone or MCH (3-methylcyclohex-2-en-1-one) have been made and some products based on verbenone or MCH were developed to protect trees from mountain pine beetle.

The spruce bark beetle *Ips typographus* is one of the most aggressive and serious pest in Romania. Our studies conducted between 2010 and 2015 revealed that the combination of both compounds verbenone and MCH reduce the attraction of *Ips typographus* much better that the verbenone or MCH alone. Based on this result a lot of combination ratios were further tested between 2015 and 2018 in order to find the best formulation. The experiments showed that the optimal verbenone/MCH ratio is 1:1. Also different support materials for the release of the compounds to the environment were tested: cigarettes, fasal and PES felt in PE bags. The best results were obtained with the PES felt in PE bags. All experimental tests were conducted in two different ways: the first device containing traps baited with the pheromone combination, and the second device consisted of spruce logs baited with the pheromone combination. At this point, for *Ips typographus* the anti-aggregant effect of the combination of verbenone and MCH was proved.

Associational effects of European beech (*Fagus sylvatica*) on pine weevil damage received by Norway spruce (*Picea abies*)

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The pine weevil, *Hylobius abietis* L., is a severe pest of economic importance causing damage to newly planted seedlings in European and Asian forests. Different plant protection methods include insecticides, physical barriers and silvicultural practices, while ecological means of decreasing damage to seedlings have received little attention. Associational resistance, the association of herbivore-resistant plant species with herbivore-susceptible species to reduce the damage on the susceptible plant, could provide an effective way of mitigating pine weevil damage. Field observations in Romania, where mixed culture from natural regeneration is promoted over planted monocultures, suggest that focal Norway spruce plants (*Picea abies*) may receive less damage by pine weevils when they occur together with beech plants (*Fagus sylvatica*). We therefore, investigated the potential of utilizing beech to mediate increased associational resistance against the pine weevil. We set up circular arenas in the lab where pine weevils were released and able to choose among a 1) spruce plant planted in pair with a beech, 2) or with another spruce plant, or 3) two beech plants. We recorded pine weevil behavior and total feeding damage received by each plant. Our results show that spruce plants in the mixed treatment tend to receive less damage than plants in the treatment with only spruce. Thus, the association of the two species has the potential to mitigate damage caused by the pine weevil to Norway spruce seedlings. This opens up possibilities for utilizing beech-mediated effects as a method to increase the likelihood of seedling survival under the regeneration, especially in countries that practice reforesting with one focal species.

Vertical transmission of the *Beauveria bassiana* between the double-spined bark beetle *Ips duplicatus*

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The vertical transmission of the entomopathogenic fungus *Beauveria bassiana* (Bals.) Vuill. (Ascomycota, Hypocreales) between adults of the double-spined bark beetle *Ips duplicatus* Sahlberg (Coleoptera: Curculionidae: Scolytinae) was examined in both, external and laboratory conditions. In the experiments, the tested strain of *Beauveria bassiana* (DSM 32081) obtained from the Western Carpathian population of *Ips typographus* (Barta et al., 2018) was called Ips, and the strain of *B. bassiana* (without number yet) isolated from *Hylobius abietis* was called Hylobius.

A total of 6 spruce logs were used in the external conditions. Two spruce logs (i) were sprayed with a water solution containing the strain Ips with the conidia concentrations of 1.0×10^8, two spruce logs (ii) were sprayed with solution of strain Hylobius with the conidia concentration of 1.0×10^8 and two spruce logs (iii) were untreated (control). After the spraying, each of the logs was put separately into rearing box that was placed in the external insectarium. Then 40 individuals of *I. duplicatus* obtained from pheromone traps (one day old catchings) were put into each of rearing boxes.

After 60 days of the rearing, the logs were debarked and beetles of the F1 generation were collected. The parental beetles (F0 generation) were already dead, moreover they were visibly infected with *B. bassiana*. The F1 generation of beetles were alive, with no signs of the infection. Nevertheless, the beetles of the F1 generation (25 beetles of each spruce log) were subsequently reared in Petri dishes (diameter of 55 mm) with a fresh piece of spruce bark (30 x 30 mm). There was just one beetle in one Petri dish. The visual control of *B. bassiana* infection was performed after 10, 20 and 30 days. The mortality and the infection signs of beetles was controlled.

From the results, it was found that the *B. bassiana* infection sings appeared on the surface of reared beetles already after 10 days. Keeping rearing on did not change the infection rate. Better results were achieved with strain Ips (the infection rate of F1 generation reaching 76 %) than with the strain Hylobius (the infection rate reached 42 %). On the other hand, one infected beetle was also found in the untreated variant (the control), which was the 2 % rate.

The results of the experiment showed that F0 parental beetles have established F1 generation that successfully completed its own development. The rearing of F1 generation proved that conidia of *B. bassiana* were able of their successful vertical transition from parental F0 onto F1 generation. However, it was not explained why conidia were able to infect beetles of F1 generation only in Petri dishes, not in the galleries under the bark. It happened due to changed light or humidity conditions or due to changed beetle's susceptibility? Anyway, more research is needed.

Processes are the same: case study of bark beetles in national park zones with different intervention

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Defining of forest management is especially difficult. Management systems applied to forest can be distinguished based on intensity of direct intervention (harvesting, sanitary felling etc.) from non-intervention to intensive management. Natural processes and disturbance regimes are main drivers of ecosystem dynamic in non-managed forest stands. This study investigated potential impact of different intervention regimes on bark beetles populations in central European mountains.

During 2014-2017 we investigated the difference in predation and pathogens levels of bark beetles between intervention and non-intervention zones in two national parks in High Tatra mts. - Tatrzanski Park Narodowy (Poland) and The Tatra National Park (Slovakia). Severe windthrows damaged forest occurred in the area in 2004 and 2014, with both intervention and non-intervention being affected.

Each year fresh spruce logs were used as traps in both zones. Trap logs were installed before the beginning of *Ips typographus* flight activity and left there until August, when they were debarked and examined. Bark beetle species, ectoparasitoid and predation levels were documented, adults of *I. typgraphus* were collected and dissect in laboratory for pathogens presence.

I. typographus was found at every sample log, *Ips amitinus* and *Pityogenes chalcographus* were also found at both locations and zones. No significant differences between intervention and non-intervention zones were found in study parameters of bark beetles population (bark beetle species, ectoparasitoid, predation and pathogen levels). Both pathogen and ectoparasitoid levels were extremely low on both localities, with *Chytridiopsis typographi* and *Gregarina typographi* found only in non-intervention zones in 2015. *Mattesia schwenkei* was the most common pathogen in both zones.

Bark beetle population was steadily increasing during studied period (2014-2017), as shown by both number of beetles in pheromone traps and the volume of sanitary harvest in intervention zones. Very low pathogen and ectoparasitoid levels don't have any significant effect on bark beetles reproduction rate in the study area with no difference between intervention and non-intervention zones.

Synthesis, formulation and field test of synthetic sex pheromone of *Lymantria monacha* L. (Lepidoptera: Lymantriidae)

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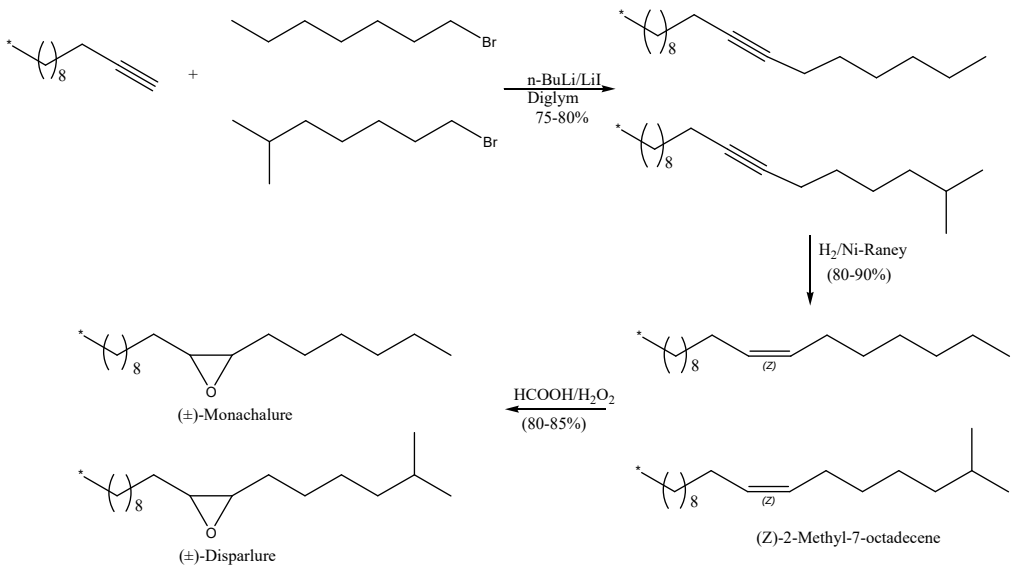
Moth nun *Lymantria monacha* L. is the most important defoliator of coniferous and deciduous forests, respectively. This paper work involves a new way to synthesize all the compounds of the *Lymantria monacha* lepidopteran pheromone composition. An original cross-coupling method was carried out using lithium iodide as catalyst. Scheme 1. Several variants of attractive pheromone mixtures have been developed for field testing to achieve a maximum attractiveness composition. This testing revealed that the composition proposed by Gries et al. 1996, (±)-Disparlure:(±)-Monachalure:(*Z*)-2-Methyl-7-octadecene = 10:10:1 has the greatest attraction capacity.



Scheme 1. (±)-Disparlure and (±)-monachalure synthesis

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