ISSN 1821-1046
UDK 630

INSTITUTE OF FORESTRY
BELGRADE

INSTITUT ZA ŠUMARSTVO
BEOGRAD

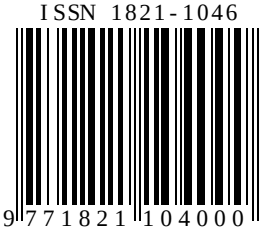
SUSTAINABLE FORESTRY ODRŽIVO ŠUMARSTVO

COLLECTION
TOM 63-64

ZBORNIK RADOVA
TOM 63-64

BELGRADE BEOGRAD
2011.

ISSN 1821-1046



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PROCEEDINGS

ZBORNIK RADOVA

Publisher
Institute of Forestry
Belgrade, Serbia

Izdavač
Institut za šumarstvo
Beograd, Srbija

For Publisher
Ljubinko Rakonjac, Ph.D.

Za izdavača
Dr Ljubinko Rakonjac

Printed in
150 copies

Tiraž
150 primeraka

Printed by
Klik tim DOO
Beograd

Štampa
Klik tim DOO
Beograd

Belgrade, 2011

Beograd, 2011

Cover Page: Author of the Photos Tatjana Ćirković-Mitrović, M.Sc.
Naslovna strana: Autor fotografije mr Tatjana Ćirković-Mitrović

CIP – Каталогизација у публикацији
Народна библиотека Србије, Београд

630

SUSTAINABLE Forestry : collection = Održivo šumarstvo = zbornik radova / chief editor = glavni i odgovorni urednik Snežana Rajković. - 2008, T. 57/58- . - Belgrade (Kneza Višeslava 3) : Institute of forestry, 2008- (Beograd : Klik tim). - 24 cm

Godišnje. - Je nastavak: Zbornik radova - Institut za šumarstvo = ISSN 0354-1894
ISSN 1821-1046 = Sustainable Forestry
COBISS.SR-ID 157148172

SADRŽAJ CONTENTS
TOM 63-64

Vladan POPOVIĆ, Vera LAVADINOVIĆ
DEPENDENCE OF DOUGLAS-FIR MEAN DIAMETER ON GEOGRAPHIC ORIGIN OF CANADIAN PROVENANCES IN SEEDLING NURSERY CONDITIONS 7

Snežana STAJIĆ, Vlado ČOKEŠA, Zoran MILETIĆ, Ljubinko RAKONJAC
CHANGES IN THE GROUND FLORA COMPOSITION OF ARTIFICIALLY ESTABLISHED EASTERN WHITE PINE, DOUGLAS-FIR AND LARCH STANDS AT THE SITE OF HUNAGRIAN OAK AND TURKEY OAK WITH HORNBEAM 17

Milorad VESELINOVIĆ, Dragana DRAZIĆ, Biljana NIKOLIĆ, Suzana MITROVIĆ, Nevena CULE, Marija NESIC
SEED GERMINATION ANALYSIS IN ORDER TO IMPROVE THE PRODUCTION OF SEEDLINGS 27

Svetlana BILIBAJKIĆ, Tomislav STEFANOVIĆ, Radovan NEVENIĆ, Zoran PODUŠKA, Renata GAGIĆ SERDAR, Ilija DJORDJEVIĆ, Goran ČEŠLJAR
THE INTENSITY OF EROSION IN THE CATCHMENT OF THE TORRENT LEŠJANSKI DO 33

Ljiljana BRASANAC-BOSANAC, Tatjana CIRKOVIC-MITROVIC, Nevena CULE
ADAPTATION OF FOREST ECOSYSTEMS ON NEGATIVE CLIMATE CHANGE IMPACTS IN SERBIA 41

Nevena CULE, Ljubinko JOVANOVIC, Dragana DRAZIC, Milorad VESELINOVIC, Suzana MITROVIC, Marija NESIC
INDIAN SHOOT (*CANNA INDICA* L.) IN PHYTOREMEDIATION OF WATER CONTAMINATED WITH HEAVY METALS 51

Radovan NEVENIC, Svetlana BILIBAJKIC, Tomislav STEFANOVIC, Zoran PODUSKA, Renata Gagić SERDAR, Ilija ĐORĐEVIC, Goran ČEŠLJAR
FOREST CONDITION MONITORING: INTENSIVE MONITORING OF AIR POLLUTION IMPACT ON FOREST ECOSYSTEMS AT LEVEL II SAMPLE PLOT KOPAONIK 65

Suzana MITROVIĆ, Milorad VESELINOVIĆ, Dragica VILOTIĆ, Nevena ČULE, Dragana DRAŽIĆ, Biljana NIKOLIĆ, Marija NEŠIĆ
TEMPORARY DEPOSITED OF DEPOSOL AS THE POSSIBLE AREA FOR SHORT ROTATION PLANTATION ESTABLISHMENT – MODEL CASE 77

Miloš KOPRIVICA, Bratislav MATOVIĆ
RELIABILITY OF THE STAND REGRESSION MODELS DEVELOPED ON THE BASIS OF SAMPLE PLOTS 87

Mara TABAKOVIĆ-TOŠIĆ
GYPSY MOTH PREDATORS, PARASITES AND PATHOGENS IN BELGRADE FORESTS IN THE PERIOD 2010-2011 101

Mara TABAKOVIĆ-TOŠIĆ, Dragutin TOŠIĆ, Miroslava MARKOVIĆ, Katarina MLADENOVIĆ, Zlatan RADULOVIĆ, Snežana RAJKOVIĆ
GYPSY MOTH OUTBREAKS IN FOREST COMPLEXES OF THE BELGRADE REGION IN THE PERIOD 1996-2011 113

Miroslava MARKOVIC, Snezana RAJKOVIC, Katarina MLADENOVIC
SIMULTANEUS ATTACK OF *LYMANTRIA DISPAR* L. AND *MICROSPHAERA ALPHITOIDES* GRIFF. ET MAUBL. ON *QUERCUS* SPECIES (*Q. CERRIS, Q. FARNETTO* AND *Q. PETRAEA*) IN CERTAIN PARTS OF SERBIA FROM 2004 TO 2006 123

Katarina MLADENOVIĆ, Bojan STOJNIĆ, Miroslava MARKOVIĆ
SPIDER MITES AND PREDATORY MITES (ACARI: *TETRANYCHIDAE, PHYTOSEIIDAE*) ON OAK TREES IN THE CITY OF BELGRADE AND ITS VICINITY 133

Vesna GOLUBOVIĆ ĆURGUZ, Zoran MILETIĆ
SOIL EXAMINATION FOR THE PURPOSE OF FORECASTING OCCURRENCE OF ENTOMOPATHOGENIC AND BENEFICIAL MICROORGANISMS 141

Ilija DJORDJEVIĆ, Radovan NEVENIĆ, Zoran PODUŠKA, Renata GAGIĆ, Goran ČEŠLJAR, Svetlana BILIBAJKIĆ, Tomislav STEFANOVIĆ
ASSESSMENT OF THE SYSTEM FOR MANAGING PROTECTED AREAS IN THE REPUBLIC OF SERBIA 151

Zoran PODUŠKA, Svetlana BILIBAJKIĆ, Renata GAGIĆ-SERDAR, Goran ČEŠLJAR, Ilija ĐORĐEVIĆ, Tomislav STEFANOVIĆ, Radovan NEVENIĆ
IMPACT OF INNOVATIVENESS ON NEW TECHNOLOGY IMPLEMENTATION IN FORESTRY COMPANIES 161

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SUSTAINABLE FORESTRY **ODRŽIVO ŠUMARSTVO**
COLLECTION 63-64, 2011 ZBORNIK RADOVA 63-64, 2011

UDK 630*453Lymantria dispar:630*411.1(497.11Beograd)"2010/2011" =111
Original scientific paper

GYPSY MOTH PREDATORS, PARASITES AND PATHOGENS IN BELGRADE FORESTS IN THE PERIOD 2010-2011

Mara TABAKOVIĆ-TOŠIĆ[1]

Abstract: *In the autumn 2010, the gypsy moth occupied an area of 4,066.74 hectares and 1,418.95 hectares, respectively, of the Forest Administrations Avala and Lipovica, managed by the Forest Estate Belgrade. Regarding the intensity of the infestation in 2010, the area of 2,066.68 hectares (50.8%) was subject to the moderate infestation, the area of 984.80 hectares (24.2%) was subject to the severe infestation, and the area of 922.37 hectares (22.7%) was subject to the light infestation. A relatively small area, i.e. 92.89 hectares (2.3%), was subject to the very severe infestation, i.e. there was a few hundred egg masses/hectare, which was expected as it is typical for the progradation phase of the outbreak. In the autumn 2011 the considerable decrease in the area infested by the gypsy moth and the considerable lower intensity of the infestation were reported, which reflected the retrogradation phase and implied that the gypsy moth reported in these two forest administrations would be in the latency phase in the following year. The area of 912.67 hectares (64.3%) was subject to the light infestation, the area of 291.66 hectares (20.55%) was subject to the moderate infestation, the area of 94.38 hectares (6.65%) was subject to the severe infestation, and the area of 120.24 hectares (8.5%) was subject to the very severe infestation. The total area infested by the gypsy moth in these two forest administrations was 1,418.95.*

During the observed period, in the gypsy moth population, the activity of 24 natural enemies of this insect - twelve predators, eleven parasites and one pathogen were reported. The egg and larval instars of the gypsy moth were infested by the same number (6 species) of predators. There were 6 parasitic species of the gypsy moth larvae, 2 parasitic species of the gypsy moth eggs, and 3 parasitic species of the gypsy moth pupae. Regarding the density of some species, the most abundant predators were Allotrombium fuliginosum (Hermann) and Calosoma sycophanta Linnaeus, while the most abundant parasites were Anastatus japonicus Ashmead and Oencyrtus kuwanae (Howard). In addition, at some sites

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Translation: Mara Tabaković-Tošić

Lymantrya dispar nucleopolyhedrosis virus had the dominant role in the reduction of the gypsy moth density.

Key words: the gypsy moth, outbreak, natural enemies

PREDATORI, PARASITI I PATOGENI GUBARA U ŠUMAMA BEOGRADSKOG PODRUČJA U PERIODU 2010-2011. GODINE

Izvod: *U jesen 2010. godine u šumama kojima gazduje šumsko gazdinstvo Beograd, Šumske uprave Avala i Lipovica, prisustvo gubara je ustanovljeno na 4066,74 ha, dnosno 1418,95. Kada su u pitanju intenziteti napada, u 2010. Godini na 2066.68 ha (50.8%) je registrovan srednji, na 984.80 ha (24.2%) jak i slab na 922.37 ha (22.7%). Vrlo jak intenzitet, sa više hiljada legala/ha, zabeležen je na relativno maloj površini od 92.89 ha (2.3%), što je i očekivano budući da se radi o progradacionoj fazi gradacije. U jesen 2011 godine evidentirano je značajno umanjenje površina pod napadom, kao i intenziteta napada, što ukazuje na to da je nastupila retrogradaciona faza i da će gubar u narednoj godini u području ove dve šumske uprave ući u fazu latence. Slab intenzitet napada registrovan je na površini od 912.67 ha (64.3%), srednji na 291.66 ha (20.55%), jak na 94.38 (6.65%) i vrlo jak na 120.24 (8.5%) ha. Ukupna napadnuta površina u području navedene dve šumske uprave iznosila je 1418.95 ha.*

U istraživačkom periodu, u populacijama gubara, registrovana je aktivnost 24 vrste njegovih prirodnih neprijatelja i to dvanaest predatora, jedanaest parasita i jedan pathogen. Stadijumi jajeta i larve gubara bili su na udaru jednakog broja (po 6 vrsta) predatora. Parasitskih vrsta larvi gubara je bilo 6, jaja 2, a lutki 3. Za sada je identifikovan samo jedan pathogen. Kada je u pitanju brojnost pojedinih vrsta, najvišu abundanciju od predatora su imali Allotrombium fuliginosum (Hermann) i Calosoma sycophanta Linnaeus, a od parazita Anastatus japonicus Ashmead i Oencyrtus kuwanae (Howard). Takođe, na pojedinim lokalitetima dominantnu ulogu u redukciji brojnosti gubara imao je Lymantrya dispar nucleopolyhedrosis virus.

Ključne reči: gubar, gradacija prirodni neprijatelji

1. INTRODUCTION

The gypsy moth (*Lymantria dispar* L.), insect in the order *Lepidoptera*, is one of the major serious pests of broadleaf forests and orchards. It is characterised by a high reproductive capacity, considerable ecological plasticity and polyphagia. It occurs periodically in high numbers (outbreak). Although it is found on four Continents (North Africa, Asia, Europe, North America), the greatest damage is caused to the forests of the Balkan Peninsula, which have all the favourable environmental conditions for the gypsy moth development, and it often occurs in outbreaks. The outbreaks do not occur in regular intervals.

The damage caused by the gypsy moth is twofold: direct – defoliation or the loss of leaf mass, and indirect, expressed as the consequences. Defoliation caused by caterpillar feeding lead to the loss of increment, absence of fructification, physiological wakening and tree dying, as well as to the creation of favourable conditions for the infestation of phytopathogenic microorganisms, fungi and xilophagous insects, disturbance of the aesthetical appearance, etc.

The integral protection of forest implies the continuous application of the protective measures in the aim of the undisturbed growth and increment of trees, as well as the creation of the wood volume of the best possible quality, which implies the inclusive and maximum protection from the harmful effect of various abiotic and biotic factors (Tabakovic-Tosic, 2006).

For the control of the gypsy moth the expensive bacterial and chemical insecticides, which not only affect the target species, but other representatives of entomofauna as well, were frequently used. The necessity of the reduction of the adverse effect of insecticides and preservation of the biological diversity in the natural ecosystems, have imposed the need for the study and use of the new types of the peculiar biological agents and methods for the control of this and other species of pests (Tabakovic-Tosic *et al*., 2011).

Biological control, as the part of the forest integrated protection, is defined as the use of natural enemies (parasitoids, predators, and pathogens) to regulate or control pests. Various strategies have been used for the deployment of biological control agents.

Recent emphasis on the development of an integrated control program for the gypsy moth has necessitated an understanding of its mortality-causing biological agents. Throughout the holarctic region there is a wide range of natural enemies of this insect. Natural enemies (parasitic and predatory insects, many species of spider, several species of birds and common woodland mammals) play an important role during periods when gypsy moth populations are sparse. Disease caused by viruses, bacteria or fungi contribute to the decline of gypsy moth populations. For example, baculovirus – *Lymantria dispar* nucleopolyhedrosis virus (*Ld*NPV) is specific to the gypsy moth, the most devastating natural diseases, and it causes a dramatic collapse of outbreak populations by killing both the larvae and pupae. Infection by *Ld*NPV is the most common source of mortality in high density populations and *Ld*NPV epizootics usually cause the collapse of host populations.

This paper presents the results of survey of the natural enemies (predators, parasitoids) and pathogens of gypsy moth in the Belgrade forests in the period 2010-2011.

2. MATERIALS AND METHODS

In Belgrade region, forest complexes cover an area of 32,444 hectares **(**www.srbijasume.rs**).** This area is a natural site for broadleaf tree species (*Quercus cerris* L**.,** *Quercus petraea* (Matt.) Lieblein, *Quercus frainetto* Tenore, *Fagus moesiaca* (Domin, Maly) Czeczott., *Carpinus betulus* L., *Fraxinus excelsior* L., *Fraxinus ornus* L. and other), whereas the conifers were introduced in some places and occupy a small area.

During the observed period at some sites in the broadleaf forests in the Forest Administrations Lipovica (Management Units Lipovica, Kosmaj, Košutnjačke šume) and Avala (Management Unit Avala), which belong to the Forest Enterprise Belgrade (Public Enterprise Srbijašume), the gypsy moth density was controlled pursuant to the guidelines of the Report-diagnose-forecast service in the domains of plant protection - forest protection. The gypsy moth density in

forests was controlled by the method of sample plots (25x25 m), as well as by the march-route method. A survey of main predators, parasitoids and pathogens was conducted from May to late November of 2010-2011 in the observed area during studies of the population dynamics and outbreaks of the gypsy moth.

The studies of the presence and density of the main predator species of the gypsy moth were conducted by using the method of hunting, typical for some families to which the insects belong (different kinds of traps, manual method, method of mowing by using the entomological net).

The detailed quantitative and qualitative studies of the parasitisation rate of the sampled egg masses were conducted in the laboratory of the Institute of Forestry, and, depending on the observed parameter, either ocular method or method of the survey by using binocular magnifier was applied. In addition, the dynamics of the emergence of the imago parasitoids of the gypsy moth eggs from 50 (10 from each sample plot) previously analyzed egg masses was observed under the laboratory conditions in February and November 2011. From each egg mass, 100 randomly sampled, previously cleaned eggs, were placed in the specially prepared test tubes (with the distilled water on the bottom and absorbent cotton wool in the middle, aimed at preventing soaking of the eggs).). The test tubes with the sampled gypsy moth eggs were kept in the climate chamber. During the experiment, temperature and light conditions were constant (temperature 19°C, light regime – 10 hours night, 14 hours a day). The emergence was reported every day until the end of the process.

The general technique applied for the study of the parasitisation rate of the gypsy moth in larval and pupae instars consisted of weekly collections of up to 100 larvae or pupae per site from all sites in each area. The larvae were collected from understory and overstory foliage, ground litter, and tree trunks throughout the site. The burlap-band technique involved collecting from one tree, at least 15 cm dbh and part of the overstory, closest to each point marked for sampling. Each of 10 labeled tree per site had a 25-cm-wide burlap band placed around the trunk at breast height. The burlap-bands for the gypsy moth caterpillars at the selected sites were placed in April 2010. Once a week all larvae under each band were collected.

The field-collected larvae were grown under the laboratory conditions in the climate chamber. During the experiment, temperature and light conditions were constant (temperature 21°C, light regime – 8 hours night, 16 hours a day). The larvae were on daily basis fed on the fresh leaves of the main type of the host plant, brought from the sample plots (oak or beech). The field-collected pupae were transferred to 500 g plastic containers (maximum of 10 to a container) and held at room temperature.

Larvae and pupae were examined twice a week, and upon indication of being parasitized were removed from the containers and placed in Petri dishes. The immature and adult stages of the parasites were identified at a later stage.

The studies of the presence of entomopathogenic viruses, bacteria and fungi in the dead gypsy moth larvae were conducted in the field and laboratory conditions. In the field conditions the characteristic symptoms of some diseases were identified by using ocular method, while in the laboratory conditions, they were identified by dissection of the dead larvae and the microscope survey. Prior to

this stage, the dead larvae were placed in Petri dishes with wet filter paper, kept 7 days in the laboratory and then stored in the refrigerator.

3. RESULTS AND DISCUSSION

In August 2010, by the detailed survey of the sample plot, and the application of the march-route method in the forests managed by Forest Estate Belgrade, Forest Administrations Avala and Lipovica, it was reported that the gypsy moth occupied an area of 4,066.74 hectares. Regarding the intensity of the infestation, the area of 2,066.68 hectares (50.8%) was subject to the moderate infestation, the area of 984.80 hectares (24.2%) was subject to the severe infestation, and the area of 922.37 hectares (22.7%) was subject to the light infestation. A relatively small area, i.e. 92.89 hectares (2.3%) was subject to the very severe infestation, which implied a few hundred egg masses/hectare, which was expected, since it is typical for the progradation phase of the outbreak. In the autumn 2011 the considerable decrease in the area infested by the gypsy moth and the considerable lower intensity of the infestation were reported, which reflected the retrogradation phase and implied that the gypsy moth reported in these two forest administrations would be in the latency phase in the following year. The area of 912.67 hectares (64.3%) was subject to the light infestation, the area of 291.66 hectares (20.55%) was subject to the moderate infestation, the area of 94.38 hectares (6.65%) was subject to the severe infestation, and the area of 120.24 hectares (8.5%) was subject to the very severe infestation. The total area infested by the gypsy moth in these two forest administrations was equal to 1,418.95.

It is a rare organism that has no natural enemies, if indeed there are any such. Natural enemy populations have the unique ability of being able to interact with their prey or host populations and to regulate them at lower levels than would occur otherwise. Some are effective at extremely low prey levels, other only at higher levels, such as *Lymantria dispar* nucleopolyhedrosis virus.

In biological control parlance, natural enemies are referred to as parasites, predators or pathogens. Parasites may have one generation to one of the host (univolutine) or two or more generations to one of the host (multivolutine), and they tend to attack only one host stage, although there is also some overlapping in certain cases – adult insects do not serve as hosts very often (Debach, 1974). Predatory insects differ from parasitic ones in that the larvae or nymphs, as the case may be, require several to many prey individuals to attain maturity. Adults of many if not most species are also predatory. There may be one or several generations to one of the prey. Pathogenic micro-organisms attack insects and have life cycles more or less characteristic of similar micro-organisms developing in other groups of animals. Insects are probably subject to as wide a variety of diseases. A number of pathogenic microorganisms – viruses, bacteria, fungi, and microsporidia (for example: *Lymantria dispar* nucleopolyhedrosis virus, *Bacillus thuringiensis* Berliner, *Entomophaga maimaiga* Humber, Shimazu & Soper, *Nosema lymantriae* (Weiser), *Nosema serbica* Weiser*)* – infect the gypsy moth (Stiles *et al*., 1983; Weiser, 1998; Pilarska and Vávra, 1991; Sidor, 1979; Sidor and Jodal, 1983; Tabakovic-Tosic, 2008). The epizootics of them are often spectacular, and mortality is most prevalent during gypsy moth outbreaks.

During the observed period, in the gypsy moth populations, the activity of 24 natural enemies of this insect - twelve predators, eleven parasites and one pathogen -was reported (Table 1). The gypsy moth eggs and larvae were infested by the same number of the predators (6 species).

Table 1. *Natural enemies of gypsy moth in the Belgrade region in the period 2010-2011*

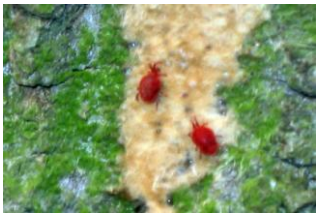
Gypsy moth natural enemies	Taxonomy	Type of the interaction with the gypsy moth	Gypsy moth instar	Significance
Allotrombium fuliginosum (Hermann)	Prostigmata: Trombidiidae	predator	egg	+++
Carabus latus Dejean	Coleoptera: Carabidae	predator	egg	+
Dermestes sp.	Coleoptera: Dermestidae	predator	egg	++
Dermestes erichsoni Ganglbauer	Coleoptera: Dermestidae	predator	egg	++
Megatoma pici Kalik	Coleoptera: Dermestidae	predator	egg	++
Julistes floralis Olivier	Coleoptera: Cantharidae	predator	egg	+
Calosoma sycophanta Linnaeus	Coleoptera: Carabidae	predator	larvae	+++
Carabus coriaceus Linnaeus	Coleoptera: Carabidae	predator	larvae	+
Carabus cancellatus Linnaeus	Coleoptera: Carabidae	predator	larvae	+
Carabus cavernosus Frivaldsky	Coleoptera: Carabidae	predator	larvae	+
Carabus intricatus Linnaeus	Coleoptera: Carabidae	predator	larvae	++
Carabus scabriusculus bulgarus Lapouge	Coleoptera: Carabidae	predator	larvae	+
Anastatus japonicus Ashmead	Hymenoptera: Eupelmidae	parasite	egg	++
Oencyrtus kuwanae (Howard)	Hymenoptera: Encyrtidae	parasite	egg	+++
Apanteles sp.	Hymenoptera: Braconidae	parasite	larvae	++
Cotesia melanoscelus Ratzeburg,	Hymenoptera: Braconidae	parasite	larvae	++
Glyptapanteles liparidis Bouché	Hymenoptera: Braconidae	parasite	larvae	++
Blepharipa pratensis (Meigen)	Diptera: Tachinidae	parasite	larvae	++
Exorista larvarum (Linnaeus)	Diptera: Tachinidae	parasite	larvae	+
Compsilura concinnata (Meigen)	Diptera: Tachinidae	parasite	larvae	+
Theronia atalantae (Poda)	Hymenoptera: Ichneumonidae	parasite	pupae	+
Lymantrichneumon disparis (Poda)	Hymenoptera: Ichneumonidae	parasite	pupae	+
Brachimeria intermedia (Nees)	Hymenoptera: Chalcididae	parasite	pupae	+
*Ld*NPV	baculovirus	pathogen	larvae	+++

Legend:
+ poorly represented species
++ represented species
+++ highly represented species

There were six parasitic species of the gypsy moth larvae, two parasitic species of the gypsy moth eggs, and three parasitic species of the gypsy moth pupae. Only one pathogenic species (*Ld*NPV) has been identified so far, but there are indications that two more species are present. Since the microscope survey of the sampled material has not been completed yet, the possible positive results will be published in the future.

Regarding the density of some predator species, *Allotrombium fuliginosum* (Hermann) and *Calosoma sycophanta* Linnaeus were most abundant ones. At least one imago *A. fuliginosum* was reported in almost all egg masses in autumn. *Calosoma sycophanta*, which regularly occurs during the outbreak of the gypsy moth, was found more frequently than other predator species, and it reduced the population size of the gypsy moth both in the larval and imago instars.

Picture 1. *Allotrombium fuliginosum* (Hermann)



Picture 2. *Calosoma sycophanta* Linnaeus

Table 2. *The laboratory analysis of the gypsy moth egg masses collected in the autumn 2010 and 2011 (the size of the sample plot for each Management Unit: 10 plots x 10 egg masses)*

Management Unit	N %	Average number eggs in egg mass							
		Fertilized				Unfertilized		Total	
		Vital		Parasited					
		2010	2011	2010	2011	2010	2011	2010	2011
Lipovica	N	478.2	368.7	59.2	33.0	3.0	1.1	540.4	402.8
	%	88.5	91.5	11.0	8.2	0.5	0.3	100	100
Košutnjačke šume	N	566.5	291.3	39.0	99.6	2.7	1.6	608.2	392.5
	%	93.2	74.2	6.4	25.4	0.4	0.4	100	100
Kosmaj	N	511.7	392.4	75.5	84.9	6.6	2.5	593.8	479.8
	%	86.2	81.8	12.7	17.7	1.1	0.5	100	100
Avala	N	342.8	503.7	107.8	148.0	3.3	7.5	453.9	659.2
	%	75.5	76.4	23.8	22.5	0.7	1.1	100	100

Average parasitism rate of eggs in egg masses at the study localities ranged from 6.4 to 25.4% (Table 2). The greatest positive change in the activity of the parasites occurred in the Management Unit Košutnjačke šume, from 6.4% in 2010 to 25.4 % in the following year. Given the fact that it refers to only one gypsy moth instars, out of four with their peculiar parasitic species, it can be concluded that such a high parasitism rate can considerably contribute to the ending of the gypsy moth outbreak in this area in 2012.

The dynamics of the emergence of the imago parasites was studied in the special experiment which is described in a great detail in the previous chapter. Regarding the species of egg parasites, in 2010 *Anastatus japonicus* Ashmead (syn. *A. disparis* Ruschka) accounted for 31%, *Oencyrtus kuwanae* (Howard) – 69%. Almost identical condition was reported in 2011 (*Anastatus japonicus* – 30%, *Oencyrtus kuwanae* – 70%). The average parasitism rate should not be taken as the final one, because under these laboratory conditions it is impossible to study all the effects of a range of parasites and predators to which the the egg masses are exposed in the field.

At the selected sites the cocoons of the parasitic species from the families *Braconidae* and *Tachinidae* (Table 2) were regularly found in spring. The determination of them was conducted after they were grown in the laboratory conditions and after the emergence of the imagos. Other species were considerably less frequent and were found individually.

Picture 3. *Gypsy moth larvae killed by LdNPV*

Lymantrya dispar NPV caused the death of about 20% of L_4 gypsy moth instar at one site in the Forest Administration Lipovica (Management Unit Košutnjačke šume). In addition, a large number of the larvae brought from the field and subsequently grown in the laboratory conditions were infested by this pathogenic species.

4. CONCLUSION

In the autumn 2010, the regular monitoring of the gypsy moth population level in some forests in the Forest Administrations Lipovica (Management Units Lipovica, Kosmaj, Košutnjačke šume) and Avala (Management Unit Avala), which belong to the Forest Estate Belgrade (Public Enterprise Srbijašume), was conducted. The gypsy moth occupied an area of 4,066.74 hectares.The largest area were subject to the moderate infestation (2,066.68 hectares or 50.8%), followed by

the area subject to the severe infestation (984.80 hectares or 24.2%), the area subject to the light infestation (922.37 hectares or 22.7%) and finally by the area subject to the very severe infestation (92.89 hectares or 2.3%).

In autumn 2011 the gypsy moth egg masses covered an area of 1,418.95 hectares. The largest area was subject to the light infestation (912.67 hectares or 64.3%), followed by the area under the moderate infestation (291.66 hectares or 20.55%), by the area under the very severe infestation (120.24 hectares or 8.5%) and finally by the area subject to the very severe infestation (94.38 hectares or 6.65%). At some sites the number of oviposited egg masses per unit of area (ha) amounted to several thousand ones.

On the infested areas the increased density of gypsy moth natural enemies (parasites, predators, pathogens) was reported. The activity of 24 natural enemies of this insect - twelve predators, eleven parasites and one pathogen - was reported.

Allotrombium fuliginosum and *Calosoma sycophanta* were the most abundant and active predators, whereas *Oencyrtus kuwanae* and *Anastatus japonicus* were the most abundant and active parasites. Also, the presence of one pathogen, *Lymatrya dispar* NPV, was reported.

ACKNOWLEDGEMENT

The study was partly financed by the Ministry of Science of the Republic of Serbia, the Project 31070 - SUBPROJECT: New technological methods in the integral protection of forests with the focus on the entomopathogenic fungus Entomophaga maimaiga, as the possible solution to the problem of the frequent occurrences of the outbreak of gypsy moth in the forest ecosystems of Serbia.

The author is particularly grateful to the Professor Dr Georgi Georgiev, from the Bulgarian Academy of Sciences – Forest Research Institute, for his great help during the determination of the above parasitic species.

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GYPSY MOTH PREDATORS, PARASITES AND PATHOGENS IN BELGRADE FORESTS IN THE PERIOD 2010-2011

Mara TABAKOVIĆ-TOŠIĆ

Summary

The regular monitoring of the population size of the gypsy moth in the Forest Administrations Lipovica (Management Unit Lipovica, Kosmaj, Košutnjačke šume) and Avala (Management Unit Avala), which belong to the Forest Estate Belgrade (Public Enterprise for Forest Management Srbijašume), was conducted in the autumn 2010. The gypsy moth was reported in the broadleaf forests and it occupied an area of 4,066.74 ha. The greatest area was subject to the moderate infestation 2,066.68 hectares or 50.8%), followed by the area subject to the severe infestation (984.80 hectares or 24.2%), by the area subject to the light infestation (922.37 hectares or 22.7%), and, finally, by the area subject to the very severe infestation (92.89 hectares or 2.3%).

In the autumn 2011 the gypsy moth egg masses covered an area of 1,418.95 hectares. The greatest area was subject to the light infestation (912.67 hectares or 64.3%), followed by the area subject to the moderate infestation (291.66 hectares or 20.55%), by the area subject to the very severe infestation (120.24 or 8.5%), and, finally, by the area subject to the severe infestation (94.38 hectares or 6.65%). At some sites several hundred egg masses per a hectare were found.

In the infested area the increased activity of the natural enemies of the gypsy moth (parasites, predators, pathogens) was reported. The activity of 24 species –twelve predators (*Allotrombium fuliginosum, Carabus latus, Dermestes sp., Dermestes erichsoni, Megatoma pici, Julistes floralis, Calosoma sycophanta, Carabus coriaceus, Carabus cancellatus, Carabus intricatus, Carabus cavernosus, Carabus scabriusculus bulgarus*), eleven parasites (*Anastatus japonicas, Oencyrtus kuwanae, Apanteles* sp., *Cotesia melanoscelus, Glyptapanteles liparidis, Blepharipa pratensis, Exorista larvarum, Compsilura concinnata, Theronia atalantae, Lymantrichneumon disparis, Brachimeria intermedia)* and one pathogen (*Lymatrya dispar NPV)* - was reported. The gypsy moth eggs and larvae were infested by the same number of predators (6 species). Six parasitic species of gypsy moth larvae, two parasitic species of gypsy moth eggs and three parasitic species of gypsy moth pupae were reported.

Allotrombium fuliginosum and *Calosoma sycophanta* were the most abundant and active predators, whereas *Oencyrtus kuwanae* and *Anastatus japonicus* were the most abundant and active parasites. Also, the presence of one pathogen, *Lymatrya dispar* NPV, was reported.

PREDATORI, PARASITI I PATOGENI GUBARA U ŠUMAMA BEOGRADSKOG PODRUČJA U PERIODU 2010-2011. GODINE

Mara TABAKOVIĆ-TOŠIĆ

Summary

Redovna kontrola populacionog nivoa gubara u području šumskih uprava Lipovica (gazdinske jedinice Lipovica, Kosmaj, Košutnjačke šume) i Avala (Gazdinska jedinica Avala), a koje pripadaju Šumskom gazdinstvu Beograd (Javno preduzeće za gazdovanje šumama Srbijašume) obavljena je u jesen 2010. godine. Gubar je konstatovan u lišćarskim šumama na 4066,74 ha. Najveće površine su bile pod srednjim intenzitetom napada (2066.68 ha ili 50,8%), zatim pod jakim (984.80 ha ili 24,2%), slabim (922.37 ha ili 22,7%) i na kraju pod veoma jakim (92.89 ha ili 2,3%).

U jesen 2011. Godine jajna legla gubara su otkrivena na 1418,95 hektara. Najveće površine su bile pod slabim intenzitetom napada (912.67 ha ili 64,3%), zatim pod srednjim (291.66 ha ili 20.55%), vrlo jakim (120.24 ili 8,5%) i na kraju pod jakim (94.38 ili 6,65%). Na nekim lokalitetima bilo je prosečno po nekoliko hiljada jajnih legala na jednom hektaru.

U napadnutom području uočena je pojačana aktivnost prirodnih neprijatelja gubara (parazita, predatora, patogena). Registrovana je aktivnost 24 vrste, i to dvanaest predatora (*Allotrombium fuliginosum, Carabus latus, Dermestes sp., Dermestes erichsoni, Megatoma pici, Julistes floralis, Calosoma sycophanta, Carabus coriaceus, Carabus cancellatus, Carabus intricatus, Carabus cavernosus, Carabus scabriusculus bulgarus*), jedanaest parasita (*Anastatus japonicas, Oencyrtus kuwanae, Apanteles* sp., *Cotesia melanoscelus, Glyptapanteles liparidis, Blepharipa pratensis, Exorista larvarum, Compsilura concinnata, Theronia atalantae, Lymantrichneumon disparis, Brachimeria intermedia)* i jedan pathogen (*Lymatrya dispar NPV)*. Stadijumi jajeta i larve gubara bili su na udaru jednakog broja (po 6 vrsta) predatora. Parasitskih vrsta larvi gubara je bilo 6, jaja 2, a lutki 3.

Od svih nađenih vrsta, najveću brojnost i aktivnost su imali predatori *Allotrombium fuliginosum* i *Calosoma sycophanta*, paraziti *Oencyrtus kuwanae* i *Anastatus japonicus*, kao i jedini pathogen *Lymatrya dispar* NPV.

Reviewer: Ph.D. Jančo Najdenov