

NOCTURNAL LEPIDOPTERA IN THE VICINITY OF NOVI SAD (NORTHERN SERBIA)

TATJANA KEREŠI and RADMILA ALMAŠI

University of Novi Sad, Faculty of Agriculture, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia
E-mail: keresi@polj.uns.ac.rs, almasi@polj.uns.ac.rs

Abstract

The main objective of this paper is to summarize data and evaluate unpublished information on the fauna of nocturnal Lepidoptera in the vicinity of Novi Sad (northern Serbia). From 1981-1991 during the months of April to September, moths were regularly captured there by light traps.

A total of 179,031 specimens belonging to 177 species and 14 families were collected. Diversity was greatest in the Noctuidae family (99 species), followed by Geometridae (14), Sphingidae (11), Arctiidae and Notodontidae (nine species each). The most abundant species belonged to the Noctuidae (54.9%), Pyralidae (27.4%), Geometridae (8.3%) and Arctiidae (6.1%) families.

Typical of agricultural habitats, the dominant Noctuids were the *Xestia c-nigrum* (Linnaeus, 1758), *Autographa gamma* (Linnaeus, 1758), *Discestra trifolii* (Hufnagel, 1766), *Mythimna pallens* (Linnaeus, 1758), *Emmelia trabealis* (Scopoli, 1763), *Lacanobia oleracea* (Linnaeus, 1758), *Lacanobia suasa* (Denis et Schiffermüller, 1775) and *Axylia putris* (Linnaeus, 1761). The species *Hyssia cavernosa* (Eversmann, 1842) was registered as a new member of the Serbian Owllet moths fauna. Within Pyralids, the dominant species were *Ostrinia nubilalis* (Hübner, 1796) and *Margaritia sticticalis* (Linnaeus, 1761); within Geometrids, *Tephрина arenacearia* (Denis et Schiffermüller, 1775), *Chiasmia clathrata* (Linnaeus, 1758) and *Ascotis selenaria* (Denis et Schiffermüller, 1775); and among Arctiids, *Phragmatobia fuliginosa* (Linnaeus, 1758) and *Hyphantria cunea* (Drury, 1773).

The other 10 families were represented by 48 species, but only 3.3% specimens.

KEY WORDS: Lepidoptera, light trapping, agricultural habitat, Serbia.

Introduction

Although the fauna of night Lepidoptera is relatively well-known in Serbia (ZEČEVIĆ, 1996, 2002; VASIĆ, 2002; TOMIĆ *et al.* 2002; DODOK, 2003, 2006), certain regions have been inadequately examined.

The first data regarding Lepidoptera in Vojvodina Province (northern Serbia) can be found in the results of research at the end of 18th century by foreign authors (Hungary, Austria), and which, according to VAJGAND (2000), was continued during the 19th century and the beginning of the 20th. Between the two world wars there were some investigations of Lepidoptera in Novi Sad and Fruška Gora Mountain; this collection is stored in the Natural History Museum in Belgrade, but the results have not been published. Recently, ZEČEVIĆ (2002) compared some data from that collection with his own results about the fauna of Lepidoptera of Timočka krajina.

After the Second World War, several authors provided a review of Lepidoptera (especially Noctuids) in some parts of Vojvodina. An example which is quite well-known is the Noctuids fauna of the Deliblato sands (PETRIK & JOVANIĆ, 1952; PETRIK, 1958, 1975; GRADOJEVIĆ, 1963; VASIĆ, 1969 and VASIĆ & TOMIĆ, 1980). Also, there are results about Owllet moths fauna in the vicinity of Zrenjanin (KOSOVAC AND JOVANIĆ, 1967), in the surroundings of Zemun (HADŽISTEVIĆ, 1969), on the Fruška Gora Mt. (VASIĆ & JODAL, 1976) and in the vicinity of Sombor (VAJGAND, 2000). Recently, data about Noctuids and Geometrids at Fruška Gora Mt. were reported by STOJANOVIĆ (2005, 2009) and STOJANOVIĆ *et al.* (2007, 2007a).

Within the framework of the Forecast in Plant Protection Service in Vojvodina Province, since 1978 monitoring of the seasonal dynamics of 10 major harmful Lepidoptera in field and vegetable crops has been done at a dozen localities (including Novi Sad) by light trapping; the results have been used for forecasting and warning for control of those species. At the locality Novi Sad all Lepidoptera were recorded, but results were only partly published (KEREŠI & ALMAŠI, 2007). This article will give complete data about the fauna of nocturnal moths in the vicinity of Novi Sad over a period of 11 years (1981-1991).

Material and Methods

Moths were caught by a stationary light trap located within the meteorological station 11 km north of the city Novi Sad (84 m a.s.l., and 34TDR01 at UTM destination of Serbia). It is a central part of Vojvodina Province, which consists of flat agricultural landscape, cultivated mainly by field and vegetable crops. Along the nearest regional road, there is a row of Siberian elms (*Ulmus pumila* L.), bushes and weeds, while there are some false acacia, arborvitae and fruit-bearing trees near the light trap. The light trap used was the Bečej type (modified Jermy-type trap), powered by a 250 W mercury lamp, set at a height of 2.5 m and on from dusk to dawn.

Monitoring of Lepidoptera was done during the period of 1981-1991. Every morning, from the 1st of April to the 30th of September, insects were removed from the cage beneath the lamp, put into cardboard boxes and transported to the entomological laboratory of the Faculty of Agriculture University of Novi Sad. Determination of species was based on wing drawings as per FORSTER & WOHLFAHRT (1980). Part of the material was prepared and stored. The taxonomic review and species nomenclature are given according to KARSHOLT & RAZOWSKI (1996).

The results of monitoring were shown as absolute and as relative catch (dominance within families) of moths. The categories of dominance were as follows: eudominant (more than 10% specimens of all family), dominant (over 5%), subdominant (1.1-5%), recedent (0.5-1%), subrecedent (0.1-0.5%) and remaining species (less than 0.1% specimens). Zoogeographical belonging and trofic structure were given for the Noctuidae family. According to VASIĆ (2002), zoogeographical belonging (ZB) of the Noctuid species is categorized as: E-a = Eurasian, M-a = Mediterranean-Asian, H = Holarctic, C = Cosmopolitan, A-m =Atlantic-Mediterranean and mid E = mid Europe, while within trophic structure (TS) the categories are: H=herbiculous, P=polyphagous, A=arboricolous and O=others.

The climate of Vojvodina Province is characterized by hot summers and cold winters. The average annual total precipitation in the 1966-1995 period was 611 mm, 363 mm during the vegetative period, and the average temperature in the vegetative period was 17.7°C. Within the period observed, in four years (1982, 1986, 1988 and 1990) the vegetative period was draughty, often with very high air temperatures in July and August, while the three other years (1981, 1987 and 1991) had much more humidity than average.

Results and Discussion

During the period of 1981-1991, using the light trap in Novi Sad surroundings, a total of 179,031 Lepidoptera specimens were collected (Table I). On average, 16,275 specimens were caught each year (from 10,151 in 1990 to 31,774 in 1982). A total of 14 families, 136 genera and 177 species were noted. The largest number of species belonged to the Noctuidae family (99 or 56% of the total number of species registered), followed by Geometridae (14 or 7.9%), Sphingidae (11 or 6.2%), Arctiidae and Notodontidae (9 or 5.1%). The most abundant species belonged to the Noctuidae family as well (98,261 specimens), followed by Pyralidae (48,961), Geometridae (14,830) and Arctiidae (10,973). Far fewer species and specimens belonged to the Lasiocampidae, Lymantriidae and Cossidae families, and even fewer to the Drepanidae, Hepialidae, Nolidae and Saturniidae families. The lowest number of species (one) and specimens (19) were found in the family Yponomeutidae.

The Noctuidae family (55% moths collected) had the greatest number of lower systematic units: 11 subfamilies, 69 genera and 99 species (Table II). Within it, the largest number of species was found in the subfamilies Hadenninae, Noctuinae and Plusiinae (52, 16 and 7, respectively), and the majority of specimens was noted in the same subfamilies, in the same order (41,575, 25,218 and 17,253, respectively). This presence of subfamilies (especially the first two) is similar to the results for the Noctuids fauna of Serbia (VASIĆ, 2002) and of Sombor (VAJGAND, 2000). A much smaller number of species and specimens was found in the subfamilies Acontiinae, Catocalinae, Heliolithinae, Eustrotiinae and Acronictiinae, and the smallest in the subfamilies Cuculiinae, Hypeninae and Calpinae.

The list of all registered Noctuids in the vicinity of Novi Sad, and their total number and percent share within family and subfamilies are shown in Table II. Their zoogeographic belonging (ZB) and trophic structure (TS) are also given.

According to VASIĆ (2002), 805 Lepidoptera species are registered in Vojvodina Province; 325 of those species belong to the Noctuidae family. In comparison, the total number of Lepidoptera species (177) and Noctuid species (99) captured in Novi Sad is about 4.5 and 3.3 times smaller (respectively). However, bearing in mind that investigations in the Novi Sad area were not primarily faunistic and that this is only one locality with a modest number of host plant species with a strong influence by the anthropogenic factor

(intensive use of mineral fertilizers and pesticides), the number of species found was not small at all. In comparison to data from earlier investigations in the Vojvodina area (75 species on average), the number of Noctuid species captured in the vicinity of Novi Sad is larger or similar, but compared to the newest results (STOJANOVIĆ, 2009) from Fruška Gora Mt. (204 species), it is two times smaller.

Table I. The structure of nocturnal moths in the vicinity of Novi Sadduring the period 1981-1991.

Families	Species		Specimens	
	No.	%	No.	%
Hepialidae	3	1.69	107	0.06
Yponomeutidae	1	0.56	19	0.01
Cossidae	3	1.69	1,128	0.63
Pyralidae	7	3.95	48,961	27.35
Lasiocampidae	6	3.39	834	0.47
Saturniidae	2	1.13	62	0.03
Sphingidae	11	6.21	1,244	0.69
Drepanidae	4	2.26	648	0.36
Geometridae	14	7.91	14,843	8.29
Notodontidae	9	5.08	1,068	0.60
Noctuidae	99	55.93	98,271	54.89
Lymantriidae	7	3.95	734	0.41
Nolidae	2	1.13	139	0.08
Arctiidae	9	5.08	10,973	6.13
Total	177	100.00	179,031	100.00

The most numerous, i.e. eudominant Owlet moths, were *Xestia c-nigrum* Linnaeus, 1758 (11,698 specimens) and *Autographa gamma* Linnaeus, 1758 (10,188 specimens), making up 22% of all Noctuids (Table III). In the literature they are known as the most common - or at least a common - species, migratory, periodically very numerous and, since their caterpillars are polyphagous, harmful to agriculture.

Six Noctuid species (in descending sequence) were dominant: *Discestra trifolii* (Hufnagel, 1766), *Mythimna pallens* (Linnaeus, 1758), *Emmelia trabealis* (Scopoli, 1763), *Lacanobia oleracea* (Linnaeus, 1758), *Lacanobia suasa* (Denis et Schiffmüller, 1775) and *Axylia putris* (Linnaeus, 1761), constituting about 42% of all specimens belonging to the Noctuidae family.

Ten species were subdominants (24% from all Noctuids), among which the most numerous were *Macdunnoughia confusa* (Stephens, 1850), *Agrotis segetum* (Denis et Schiffmüller, 1775) *Diachrysis chrysitis* (Linnaeus, 1758), *Tyta luctuosa* (Denis et Schiffmüller, 1775) *Hoplodrina ambigua* (Denis et Schiffmüller, 1775) and *Mamestra brassicae* (Linnaeus, 1758).

Table II. Review of Noctuidae species in Novi Sad surroundings during the period 1981-1991

No.	Subfamily and species	No. of specimens	Share in % in		ZB	TS
			family	sub-family		
Acronictinae						
1	<i>Acronicta psi</i> Linnaeus, 1758	30	0.03	5.92	E-a	A
2	<i>Acronicta megacephala</i> Denis et Schiffermüller, 1775	112	0.11	22.09	E-a	A
3	<i>Acronicta rumicis</i> Linnaeus, 1758	341	0.35	67.26	E-a	P
4	<i>Simyra albovenosa</i> Goeze, 1781	24	0.02	4.73	E-a	H
Total		507	0.52	100.00		
Catocalinae						
5	<i>Minucia lunaris</i> Denis et Schiffermüller, 1775	1	0.00	0.04	M-a	A
6	<i>Lygephila pastinum</i> Treitschke, 1826	129	0.13	4.68	E-a	H
7	<i>Aedia funesta</i> Esper, 1786	51	0.05	1.85	M-a	H
8	<i>Tyta luctuosa</i> Denis et Schiffermüller, 1775	2,576	2.62	93.43	E-a	H
Total		2,757	2.80	100.00		
Calpinae						
9	<i>Scoliopteryx libatrix</i> Linnaeus, 1758	6	0.01	100.00	H	A
Total		6	0.01	100.00		
Hypeninae						
10	<i>Hypena proboscidalis</i> Linnaeus, 1758	1	0.00	0.73	E-a	H
11	<i>Rivula sericealis</i> Scopoli, 1763	136	0.14	99.27	E-a	H
Total		137	0.14	100.00		
Plusiinae						
12	<i>Diachrysia chrysitis</i> Linnaeus, 1758	2,742	2.79	15.89	E-a	H
13	<i>Diachrysia chryson</i> Esper, 1789	13	0.01	0.08	E-a	H
14	<i>Macdunnoughia confusa</i> Stephens, 1850	3,791	3.86	21.97	E-a	H
15	<i>Plusia festucae</i> Linnaeus, 1758	155	0.16	0.90	E-a	O
16	<i>Autographa gamma</i> Linnaeus, 1758	10,188	10.37	59.05	C	P
17	<i>Autographa bractea</i> Denis et Schiffermüller, 1775	1	0.00	0.01	E-a	H
18	<i>Abrostola asclepiadis</i> Denis et Schiffermüller, 1775	363	0.37	2.10	M-a	H
Total		17,253	17.55	100.00		
Acontiinae						
19	<i>Emmelia trabealis</i> Scopoli, 1763	7,032	7.16	95.53	E-a	H
20	<i>Acontia lucida</i> Hufnagel, 1766	329	0.33	4.47	E-a	H
Total		7,361	7.49	100.00		

No.	Subfamily and species	No. of specimens	Share in % in		ZB	TS
			family	sub-family		
Eustrotiinae					(Table II – continued)	
21	<i>Deltote bankiana</i> Fabricius, 1775	73	0.07	11.25	E-a	H
22	<i>Pseudeustrotia candidula</i> Denis et Schiffermüller, 1775	564	0.57	86.90	E-a	H
23	<i>Eublemma purpurina</i> Denis et Schiffermüller, 1775	12	0.01	1.85	M-a	H
Total		649	0.66	100.00		
Cuculiinae						
24	<i>Cucullia fraudatrix</i> Eversmann, 1837	2	0.00	0.76	E-a	H
25	<i>Cucullia artemisiae</i> Hufnagel, 1766	3	0.00	1.14	E-a	H
26	<i>Cucullia balsamitae</i> Boisduval, 1840	201	0.20	76.14	E-a	H
27	<i>Shargacucullia verbasci</i> Linnaeus, 1758	4	0.00	1.52	E-a	H
28	<i>Calophasia lunula</i> Hufnagel, 1766	54	0.05	20.45	H	H
Total		264	0.27	100.00		
Heliothinae						
29	<i>Heliothis maritima</i> Graslin, 1855	1,504	1.53	59.12	E-a	H
30	<i>Pyrrhia umbra</i> Hufnagel, 1766	971	0.99	38.17	H	P
31	<i>Periphanes delphinii</i> Linnaeus, 1758	69	0.07	2.71	M-a	H
Total		2,544	2.59	100.00		
Hadeninae						
32	<i>Caradrina morpheus</i> Hufnagel, 1766	1,890	1.92	4.55	E-a	H
33	<i>Platyperigea kadenii</i> Freyer, 1836	38	0.04	0.09	M-a	H
34	<i>Paradrina flavirena</i> Guenée, 1852	485	0.49	1.17	M-a	H
35	<i>Hoplodrina octogenaria</i> Goeze, 1781	405	0.41	0.97	E-a	H
36	<i>Hoplodrina blanda</i> Denis et Schiffermüller, 1775	33	0.03	0.08	E-a	H
37	<i>Hoplodrina ambigua</i> Denis et Schiffermüller, 1775	2,505	2.55	6.03	M-a	H
38	<i>Charanyca trigrammica</i> Hufnagel, 1766	32	0.03	0.08	M-a	P
39	<i>Dypterygia scabriuscula</i> Linnaeus, 1758	34	0.03	0.08	E-a	H
40	<i>Trachea atriplicis</i> Linnaeus, 1758	351	0.36	0.84	E-a	H
41	<i>Euplexia lucipara</i> Linnaeus, 1758	51	0.05	0.12	E-a	P
42	<i>Phlogophora meticulosa</i> Linnaeus, 1758	224	0.23	0.54	M-a	H
43	<i>Auchmis detersa</i> Esper, 1787	11	0.01	0.03	M-a	A
44	<i>Eucarta amethystina</i> Hübner, 1803	149	0.15	0.36	E-a	H
45	<i>Eucarta virgo</i> Treitschke, 1835	14	0.01	0.03	E-a	P
46	<i>Ipimorpha subtusa</i> Denis et Schiffermüller, 1775	10	0.01	0.02	E-a	A
47	<i>Cosmia trapezina</i> Linnaeus, 1758	175	0.18	0.42	M-a	A
48	<i>Atethmia centrago</i> Haworth, 1809	5	0.01	0.01	M-a	A
49	<i>Aporophila lutulenta</i> Denis et Schiffermüller, 1775	1	0.00	0.00	A-m	H
50	<i>Xylena exsoleta</i> Linnaeus, 1758	1	0.00	0.00	E-a	H

No.	Subfamily and species	No. of specimens	Share in % in		ZB	TS
			family	sub-family		
Hadeninae		(Table II – continued)				
51	<i>Apamea lithoxylaea</i> Denis et Schiffermüller, 1775	2	0.00	0.00	E-a	H
52	<i>Oligia strigilis</i> Linnaeus, 1758	264	0.27	0.64	E-a	H
53	<i>Mesapamea secalis</i> Linnaeus, 1758	98	0.10	0.24	E-a	H
54	<i>Rhizedra lutosa</i> Hübner, 1803	59	0.06	0.14	E-a	H
55	<i>Hydraecia micacea</i> Esper, 1787	18	0.02	0.04	H	O
56	<i>Nonagria typhae</i> Thunberg, 1784	61	0.06	0.15	E-a	O
57	<i>Archana sparganii</i> Esper, 1790	29	0.03	0.07	E-a	H
58	<i>Discestra trifolii</i> Hufnagel, 1766	9,502	9.67	22.86	H	H
59	<i>Lacanobia w-latinum</i> Hufnagel, 1766	92	0.09	0.22	E-a	H
60	<i>Lacanobia oleracea</i> Linnaeus, 1758	5,800	5.90	13.95	E-a	H
61	<i>Lacanobia thalassina</i> Hufnagel, 1766	108	0.11	0.26	E-a	A
62	<i>Lacanobia suasa</i> Denis et Schiffermüller, 1775	5,450	5.55	13.11	E-a	H
63	<i>Hada plebeja</i> Linnaeus, 1761	9	0.01	0.02	E-a	H
64	<i>Aetheria bicolorata</i> Hufnagel, 1766	1	0.00	0.00	E-a	H
65	<i>Hadena bicruris</i> Hufnagel, 1766	237	0.24	0.57	E-a	H
66	<i>Hadena luteago</i> Denis et Schiffermüller, 1775	71	0.07	0.17	M-a	O
67	<i>Melanchna persicariae</i> Linnaeus, 1761	2	0.00	0.00	E-a	P
68	<i>Mamestra brassicae</i> Linnaeus, 1758	2,338	2.38	5.62	E-a	H
69	<i>Polia bombycina</i> Hufnagel, 1766	9	0.01	0.02	E-a	H
70	<i>Mythimna turca</i> Linnaeus, 1761	587	0.60	1.41	E-a	H
71	<i>Mythimna albipuncta</i> Denis et Schiffermüller, 1775	551	0.56	1.33	M-a	H
72	<i>Mythimna vitellina</i> Hübner, 1808	162	0.16	0.39	M-a	H
73	<i>Mythimna pallens</i> Linnaeus, 1758	8,172	8.32	19.66	E-a	H
74	<i>Mythimna obsoleta</i> Hübner, 1803	475	0.48	1.14	E-a	O
75	<i>Mythimna comma</i> Linnaeus, 1761	13	0.01	0.03	H	H
76	<i>Mythimna flammea</i> Curtis, 1828	69	0.07	0.17	midd E	-
77	<i>Mythimna l - album</i> Linnaeus, 1767	443	0.45	1.07	E-a	H
78	<i>Orthosia incerta</i> Hufnagel, 1766	324	0.33	0.78	E-a	P
79	<i>Orthosia gothica</i> Linnaeus, 1758	23	0.02	0.06	E-a	P
80	<i>Orthosia munda</i> Denis et Schiffermüller, 1755	15	0.02	0.04	E-a	A
81	<i>Hyssia cavernosa</i> Eversmann, 1842	28	0.03	0.07	-	-
82	<i>Egira conspicularis</i> Linnaeus, 1758	88	0.09	0.21	M-a	H
83	<i>Tholera decimalis</i> Poda, 1761	61	0.06	0.15	E-a	H
Total		41,575	42.31	100.00		
Noctuinae						
84	<i>Axylia putris</i> Linnaeus, 1761	5,259	5.35	20.87	E-a	H
85	<i>Ochropleura plecta</i> Linnaeus, 1761	1,352	1.38	5.36	H	H
86	<i>Diarsia brunnea</i> Denis et Schiffermüller, 1775	2	0.00	0.01	H	H

No.	Subfamily and species	No. of specimens	Share in % in		ZB	TS
			family	sub-family		
Noctuidae					(Table II – continued)	
87	<i>Noctua pronuba</i> Linnaeus, 1758	759	0.77	3.01	E-a	H
88	<i>Noctua orbona</i> Hufnagel, 1766	43	0.04	0.17	M-a	H
89	<i>Noctua fimbriata</i> Schreber, 1759	43	0.04	0.17	M-a	P
90	<i>Xestia c-nigrum</i> Linnaeus, 1758	11,698	11.91	46.42	E-a	H
91	<i>Xestia triangulum</i> Hufnagel, 1766	44	0.04	0.17	E-a	H
92	<i>Xestia xanthographa</i> Denis et Schiffermüller, 1775	8	0.01	0.03	M-a	H
93	<i>Peridroma saucia</i> Hübner, 1808	7	0.01	0.03	C	H
94	<i>Euxoa aquilina</i> Denis et Schiffermüller, 1775	230	0.23	0.91	E-a	H
95	<i>Euxoa temera</i> Hübner, 1808	18	0.02	0.07	H	H
96	<i>Agrotis crassa</i> Hübner, 1803	434	0.44	1.72	E-a	H
97	<i>Agrotis ipsilon</i> Hufnagel, 1766	475	0.48	1.88	C	H
98	<i>Agrotis exclamationis</i> Linnaeus, 1758	1,665	1.69	6.61	E-a	H
99	<i>Agrotis segetum</i> Denis et Schiffermüller, 1775	3,181	3.24	12.62	E-a	H
Total		25,218	25.66	100.00		
Total Noctuidae		98,271	100.00			

Table III. Dominance of the Noctuid species in the Novi Sad surroundings (1981-1991).

Categories	Species		Specimens	
	No.	%	No.	%
Eudominant	2	2.02	21886	22.27
Dominant	6	6.06	41215	41.94
Subdominant	10	10.10	23544	23.96
Recedent	5	5.05	3432	3.49
Subrecedent	24	24.24	6704	6.82
The rest	52	52.53	1490	1.52
Total	99	100.00	98271	100.00

Five were recedent, two subrecedent, and more than half of all species (52) belonged to the rest, very sparse Noctuids (20 of them were noted with less than 10 specimens). The least numerous species were *Minucia lunaris* (Denis et Schiffermüller, 1775), *Hypena proboscidalis* (Linnaeus, 1758), *Autographa bractea* (Denis et Schiffermüller, 1775), *Aporophila lutulenta* (Denis et Schiffermüller, 1775), *Xylena exsoleta* (Linnaeus, 1758) and *Aetheria bicolorata* (Hufnagel, 1766), with only one specimen noted in each.

According to available literature, the species *Hyssia cavernosa* (Eversmann, 1842) had not been previously registered in Serbia so it should be noted as new in the Noctuids fauna of Serbia. During the first five years of investigation, 28 specimens of this species were found (8, 9, 3, 5 and 3, respectively), mostly from the middle of July till the middle of August. Unfortunately, in the last six years of investigation (1986-1991) not a single specimen of this species was caught; reasons for such a change in number were not clear. In the Red Book of the Moscow area (www.geogr.msu.ru/rb/docs/list_KKMO_11.05.08.doc), the species *H. cavernosa* is listed as rare, while in the lists of Moths and Butterflies of Europe and North Africa (www.leps.it), Butterflies and moths of Netherlands (www.leps.nl), UK moths (www.ukmoths.org.uk) and Czeckian Atlas motýlů (NOVAK & POKORNÝ, 2003), it does not exist.

According to zoogeographical belonging, in the Noctuids fauna of the Novi Sad vicinity (Fig. 1), Eurasian (65%) and Mediterranean-Asian (20%) species dominated, while the number of Holarctic (9%) and cosmopolitan (3%) was much lower, and the lowest were the Atlantic-Mediterranean and European species of Noctuids. This is quite similar to the Noctuids fauna in Serbia (VAŠIĆ, 2002) and Fruška Gora Mt. (STOJANOVIĆ, 2009).

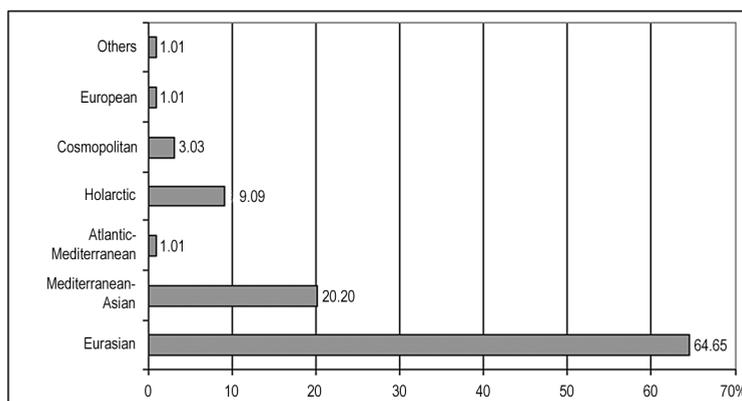


Figure 1. Zoogeographical belonging of Noctuid species in the Novi Sad vicinity during the period 1981-1991.

Regarding diet (Fig. 2), most Noctuids specimens collected (73%) are herbivorous (residents of low, herbaceous flora), far fewer (10% each) are polyphagous (residents of both herbaceous and woody plants) and arboricolous (live on forest trees, fruit trees and bushes), and the smallest proportion (7%) feeds on other plants. Many of these species are prone to overpopulation, so they may cause grave damage to agricultural crops, and also to some forest tree species. Among them there are seven species of Noctuids, whose number was observed primarily in order to forecast this phenomenon: *Autographa gamma* L., *Mamestra brassicae* L., *Lacanobia oleracea* L., *Agrotis segetum* D. et S., *A. exclamationis* L., *A. ypsilon* Hfn. and *Xestia c-nigrum* L.

The latest overpopulation of harmful leaf Noctuids in agricultural crops in Vojvodina Province was registered in 1985 (KEREŠI & ALMAŠI, 1995), due to an increased number of Cabbage moth (*M. brassicae*) and Tomato moth (*L. oleracea*), and in 1991, due to a large number of Silver Y (*A. gamma*). It is interesting to mention that the Cotton bollworm (*Helicoverpa armigera* Hübner, 1808) was not noticed at the light trap in the Novi

Sad surroundings during the whole investigation period (1981-1991), but since 1993 it has registered regularly, with calamity occurrence in 2003 (ČAMPRAK *et al.*, 2004).

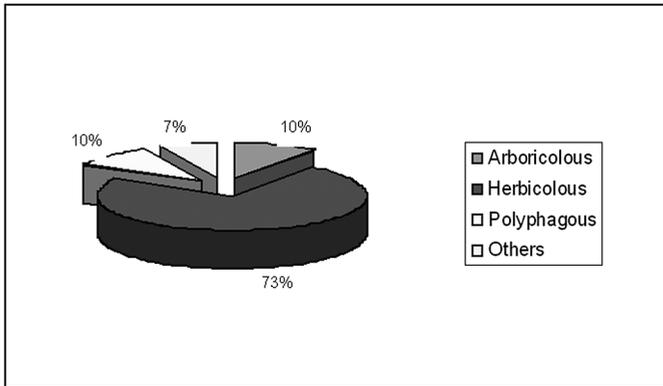


Figure 2. Trophic structure of Noctuid species in the Novi Sad surroundings during the period 1981-1991.

Quality composition and abundance of the families of 13 other nocturnal moths in the Novi Sad surroundings during the period 1981-1991 are shown in Table IV.

Within the most numerous family, Pyralidae (27% of total moths caught), at least seven genera and seven species were identified (mostly because of damage about 15% specimens from this family was not identified). A high number of collected specimens from this family was registered due to very numerous *Ostrinia nubilalis* Hübner, 1796 (European corn-borer), absolutely the most abundant of all registered moths (36,159 specimens or 20% of total moths caught, and 74% in Pyralidae family). *Margaritia sticticalis* Linnaeus, 1761 (Meadow moth), was very numerous, too, especially in the draughty year 1988 (2,646 specimens), as well as in total (3,086). *O. nubilalis* and *M. sticticalis* were, apart from the Noctuids and American white moth, among ten species that were monitored in order to forecast their occurrence. Keeping in mind that corn is the most frequent crop in Vojvodina Province as well as in fields near the light trap, a large number of European corn-borer is not surprising at all; it is rather to be expected.

Second in number of species, and third in number of specimens was the family Geometridae (8.3% of total moths caught). Within it, 13 genera and 14 species were found, among which the most numerous were *Tephрина arenacearia* Denis et Schifferrmüller, 1775 (4,261 specimen or 28.7% within the family), *Chiasmia clathrata* Linnaeus, 1758 (3,517 or 23.7%), *Ascotis selenaria* Denis et Schifferrmüller, 1775 (3,387 or 22.8%) and *Timandra comae* A. Schmidt, 1931 (2,167 or 14.6%). In comparison to the 354 Geometridae species (TOMIĆ ET AL., 2002) which have so far been registered in Serbia, this is a very modest number. The explanation would be similar to those for moths in general and Noctuids: a single locality and a narrow choice of feeding plants (uniform agricultural habitat) near the lamp trap.

The majority of these species (93%) are Eurasian, and only one (7%) is Mediterranean-Asian. Regarding diet, among the Geometridae collected, herbivorous and arborivorous species were equally represented (43% each), and polyphagous species were the least numerous (14%), which is very similar to the presence of the first two species groups in the total Geometridae fauna of Serbia (TOMIĆ *et al.*, 2002). On the other hand, regarding the number of specimens, there was absolute domination of herbivorous species (four

above-mentioned species accounted for almost 90% of the total Geometridae population). During the same investigation period, the moths *Tephрина arenacearia* D. et S. and *Chiasmia clathrata* L. were caught most often during daytime collection of insects by sweep net in alfalfa fields in the Novi Sad surroundings, while caterpillars and moths of *Ascotis selenaria* D. et S. were found on soybean crops all over Vojvodina Province (author's observation).

Table IV. Review of other Lepidoptera (besides Noctuidae) in the vicinity of Novi Sad during the period 1981-1991.

No.	Family / Species	No. of moths	Share (%) in family
Hepialidae			
1	<i>Korscheltellus lupulina</i> L.	46	42.99
2	<i>Triodia sylvina</i> L.	39	36.45
3	<i>Hepialus humuli</i> L.	22	20.56
Yponomeutidae			
4	<i>Yponomeuta malinellus</i> Zell.	19	100.00
Cossidae			
5	<i>Cossus cossus</i> L.	78	6.91
6	<i>Zeuzera pyrina</i> L.	246	21.81
7	<i>Phragmataecia castanea</i> Hbn.	804	71.28
Pyrilidae			
8	<i>Ostrinia nubilalis</i> Hbn.	36,159	73.85
9	<i>Pyralis farinalis</i> L.	14	0.03
10	<i>Margaritja sticticalis</i> L.	3,086	6.30
11	<i>Hypsopygia costalis</i> Fabr.	122	0.25
12	<i>Pleuroptya ruralis</i> Scop.	1,732	3.54
13	<i>Oncocera semirubella</i> Scop.	299	0.61
14	<i>Eurrhpara hortulata</i> L.	2	0.00
	The rest of Pyralidae	7,547	15.41
Lasiocampidae			
15	<i>Lasiocampa quercus</i> L.	80	9.59
16	<i>Macrothylacia rubi</i> L.	47	5.64
17	<i>Malacosoma neustria</i> L.	47	5.64
18	<i>Odonestis pruni</i> L.	588	70.50
19	<i>Gastropacha quercifolia</i> L.	39	4.68
20	<i>Gastropacha populifolia</i> D-S.	33	3.96
Saturniidae			
21	<i>Saturnia pyri</i> D-S.	45	72.58
22	<i>Eudia pavonia</i> L.	17	27.42

No.	Family / Species	No. of moths	Share (%) in family
Sphingidae		(Table IV – continued)	
23	<i>Mimas tiliae</i> L.	21	1.69
24	<i>Laothoe populi</i> L.	325	26.13
25	<i>Smerinthus ocellata</i> L.	66	5.31
26	<i>Agrius convolvuli</i> L.	131	10.53
27	<i>Hyles euphorbiae</i> L.	282	22.67
28	<i>Hyles livornica</i> Esp.	9	0.72
29	<i>Acherontia atropos</i> L.	4	0.32
30	<i>Proserpinus proserpina</i> Pall.	7	0.56
31	<i>Macroglossum stellatarum</i> L.	2	0.16
32	<i>Deilephila elpenor</i> L.	141	11.33
33	<i>Deilephila porcellus</i> L.	256	20.58
Drepanidae			
34	<i>Watsonalla binaria</i> Hfn.	3	0.46
35	<i>Thyatira batis</i> L.	44	6.79
36	<i>Tethea ocularis</i> L.	560	86.42
37	<i>Habrosyne pyritoides</i> Hfn.	41	6.33
Geometridae			
38	<i>Abraxas grossulariata</i> L.	24	0.16
39	<i>Lomaspidis marginata</i> L.	72	0.49
40	<i>Chiasmia clathrata</i> L.	3,517	23.69
41	<i>Tephрина arenacearia</i> D-S.	4,261	28.71
42	<i>Ennomos autumnaria</i> Wern.	57	0.38
43	<i>Ennomos alniaria</i> L.	9	0.06
44	<i>Selenia lunularia</i> Hbn.	10	0.07
45	<i>Angerona prunaria</i> L.	1	0.01
46	<i>Biston betularia</i> L.	210	1.41
47	<i>Ascotis selenaria</i> D-S.	3,387	22.82
48	<i>Ematurga atomaria</i> L.	418	2.82
49	<i>Thalera fimbrialis</i> Scop.	40	0.27
50	<i>Timandra comae</i> A-S.	2,167	14.60
51	<i>Lithostege farinata</i> Hfn.	670	4.51
Notodontidae			
52	<i>Notodonta ziczac</i> L.	82	7.68
53	<i>Notodonta tritophus</i> D-S.	78	7.30
54	<i>Pheosia tremula</i> Cl.	349	32.68
55	<i>Furcula furcula</i> Cl.	1	0.09
56	<i>Furcula bifida</i> Brahm.	180	16.85
57	<i>Pterostoma palpina</i> Cl.	172	16.10
58	<i>Phalera bucephala</i> L.	43	4.03

No.	Family / Species	No. of moths	Share (%) in family
Notodontidae		(Table IV – continued)	
59	<i>Clostera curtula</i> L.	143	13.39
60	<i>Cerura erminea</i> Esp.	20	1.87
Lymantriidae			
61	<i>Leucoma salicis</i> L.	236	32.24
62	<i>Lymantria dispar</i> L.	156	21.31
63	<i>Euproctis chrysothoea</i> L.	27	3.69
64	<i>Dicallopera fascelina</i> L.	233	31.83
65	<i>Calliteara pudibunda</i> L.	2	0.27
66	<i>Calliteara abietis</i> D-S.	55	7.51
67	<i>Penthopha morio</i> L.	23	3.14
Nolidae			
68	<i>Pseudoips prasinana</i> L.	104	74.82
69	<i>Earias clorana</i> L.	35	25.18
Arctiidae			
70	<i>Lithosia quadra</i> L.	87	0.79
71	<i>Phragmatobia fuliginosa</i> L.	4,575	41.69
72	<i>Spilosoma lutea</i> Hfn.	663	6.04
73	<i>Spilosoma lubricipeda</i> L.	1,751	15.96
74	<i>Spilosoma urticae</i> Esp.	65	0.59
75	<i>Diaphora mendica</i> Cl.	38	0.35
76	<i>Diacrisia sannio</i> L.	3	0.03
77	<i>Arctia caja</i> L.	549	5.00
78	<i>Hyphantria cunea</i> Drury	3,242	29.55

Next by number was the family Arctiidae (6.1% of total moths caught), with seven genera and nine species (18% of 49 generally known in Serbia, according to ZEČEVIĆ, 1996). Most abundant were the species *Phragmatobia fuliginosa* Linnaeus, 1758 (4,575 specimens or 41.7% within the family), *Hyphantria cunea* Drury, 1773 (3,242 or 29.6%), *Spilosoma lubricipeda* Linnaeus, 1758 (1,751 or 16%), *Spilosoma lutea* Hufnagel, 1766 (663 or 6%) and *Arctia caja* Linnaeus, 1758 (549 or 5%).

Another 10 families were represented by 48 species (27% of the total number), but only 3.3% specimens. Among those, most species were from the Sphingidae (11), Notodontidae (nine), Lymantriidae (seven) and Lasiocampidae (six) families, while most specimens belonged to the Sphingidae (1,244), Cossidae (1,128) and Notodontidae (1,068) families.

Within the Sphingidae family the most abundant species were the *Laothoe populi* Linnaeus, 1758, *Hyles euphorbiae* Linnaeus, 1758 and *Agrius convolvuli* Linnaeus, 1758 and within the Notodontidae family *Pheosia tremula* Clerck, 1759, *Furcula bifida* Brahm, 1787, *Pterostoma palpinum* Clerck, 1759 and *Clostera*

curtula Linnaeus, 1758 were dominant. The most abundant species of Lymantriidae family were *Leucoma salicis* Linnaeus, 1758, *Dicallomera fuscifera* Linnaeus, 1758 and *Lymantria dispar* Linnaeus, 1758, while among the Lasiocampidae family *Odonestis pruni* Linnaeus, 1758 and *Lasiocampa quercus* Linnaeus, 1758 dominated.

Acknowledgements

The authors express their gratitude first to their professors, Dr Dušan ČAMPBRAG and Dr Radosav SEKULIĆ, the initiators of the Report and Forecast Service in plant protection of Vojvodina (which includes these studies), and especially to the late Dr Jelena ĐURKIĆ, who was the first to determine the moths collected in the vicinity of Novi Sad and trained the authors of this paper and experts from agricultural services to be able to do so.

For regularly collecting moths, we are grateful to the staff of the meteorological station at Rimski Šančevi (manager Mirko MIHALJICA), and especially to the technical staff of the entomological laboratory of the Faculty of Agriculture in Novi Sad, Jozef MILER and Gordana KATANČEVIĆ, who did the rough determination. Data were partly processed by the undergraduate students, Dušanka MARJANOVIĆ, Jelena MAŽIĆ, Mirjana KOZAROV, Nataša ZETKOVIĆ and Nenad LAZAREVIĆ, and we are thankful to them, too.

References

- ČAMPBRAG, D., SEKULIĆ, R., KEREŠI, T. & BAČA, F., 2004. Corn Earworm (*Helicoverpa armigera* Hübner) and Measures of Integrated pest Management. Faculty of Agriculture, Novi Sad, 183 pp. [in Serbian w. English s.]
- DODOK, I., 2003. Noctuidae (Lepidoptera) of the Užice region (western Serbia). *Acta entomologica serbica*, 8(1/2): 1-13.
- DODOK, I., 2006. The fauna of Gemetridae (Lepidoptera) in the region of Užice in western Serbia. *Acta entomologica serbica*, 11(1/2): 61-75.
- FORSTER, W. & WHOLFHART, T.A., 1980. Die Scmetterlinge Mitteleuropas, IV – Noctuidae. Franckh'sche verlagshandlung. Stuttgart, 329 pp.
- GRADOJEVIĆ, Z., 1963. Arthropod communities of grassy cenoses on Deliblato sands and their succession. PhD Thesis (manusc.), University of Belgrade, Faculty of Sciences and Mathematics, Belgrade, 215 pp. [in Serbian]
- HADŽISTEVIĆ, D., 1969. Contribution a la connaissance des especes de Noctuelles dans les environs de Zemun. *Plant Protection*, 103: 59-64. [in Serbian, with French s.]
- KARSHOLT, O. & RAZOWSKI, J., 1996. The Lepidoptera of Europe. A Distributional Check list. Apollo Books, Stenstrup, 380 pp.
- KEREŠI, T. & ALMAŠI, R., 1995. Flight dynamics of Owllet moths (*Mamestra* spp. and *Plusia gamma*) in southern Bačka during 1981-1994 and possibility of forecast. *Plant Doctor*, 4: 401-406. [in Serbian]
- KEREŠI, T. & ALMAŠI, R., 2007. Nocturnal moths in Novi Sad surroundings during 1988-1991. In: Tomanović, Ž. (ed.): Symposium of entomologists of Serbia, Plenary lectures and abstracts, Užice, p. 37. [in Serbian]
- KOSOVAC, V. & JOVANIĆ, M., 1967. Noctuidae species and the number of adults in the area of Zrenjanin in 1963, 1964 and 1965. *Contemporary agriculture*, 4: 385-390, Novi Sad. [in Serbian, with English s.]
- NOVAK, I., POKORNY, V., 2003. Atlas of Lepidoptera. Paseka, Praha-Litomyšl, 268 pp. [in Czech]
- PETRIK, A., 1958. Entomofauna of Deliblato sands. *Articles of Vojvodina Museums*, VII: 83-113. [in Serbian]
- PETRIK, A., 1975. Entomofauna of Deliblato sands. MSc Thesis (manusc.), University of Belgrade, Faculty of Agriculture, Zemun, 132 pp. [in Serbian]

- PETRIK, A. & JOVANIĆ, M., 1952. Contribution to the knowledge of Noctuidae in Vojvodina. Zbornik Matice srpske, 3: 119-132. [in Serbian, with English s.]
- STOJANOVIĆ, D., 2005. Contribution to the knowledge of harmful Owlet moths in the National Park Fruška Gora. *In*: Tomanović, Ž. (ed.): VII conference of plant protection. Book of abstracts, Soko Banja, pp.:140-141. [in Serbian]
- STOJANOVIĆ, D., BRAJKOVIĆ, M. & ČURČIĆ, B., 2007. The knowledge of Owlet moths (Lepidoptera: Noctuidae) in the National Park Fruška Gora. *In*: Tomanović, Ž. (ed.): Symposium of entomologists of Serbia. Plenary lectures and abstracts, Užice, p. 37. [in Serbian]
- STOJANOVIĆ, D., PLUŽAREVIĆ, K. & ĐAKIĆ, Ž., 2007A. Contribution to the knowledge of harmful Geometridae in the National Park Fruška Gora. *In*: Tomanović, Ž. (ed.): XIII symposium with conference for plant protection. Book of abstracts, Zlatibor, pp.: 143-144. [in Serbian]
- STOJANOVIĆ, D., 2009. Fauna of Owlet moths (Lepidoptera, Noctuidae) of Fruška Gora Mt.. MSc Thesis (manusc.), University of Belgrade, Faculty of Biology, Belgrade, 280 pp. [in Serbian]
- TOMIĆ, D., ZEČEVIĆ, M., MIHAJLOVIĆ, L.J. & GLAVENDEKIĆ, M., 2002. Fauna of Geometrids (Lepidoptera: Geometridae) in Serbia. Zbornik radova o fauni Srbije, Book 6. Serbian Academy of Science and Arts, Belgrade, pp.: 73-164. [in Serbian, with English s.]
- VAJGAND, D., 2000. The fauna of Owlet Moths (Noctuidae, Lepidoptera) in Sombor with the population dynamics of the most numerous species. MSc Thesis (manusc.), University of Novi Sad, Faculty of Agriculture, Novi Sad, 122 pp. [in Serbian, with English and German s.]
- VASIĆ, K., 1969. Contribution to the knowledge of the Fauna of Lepidoptera, Noctuidae on Deliblato sands. Deliblatski pesak, Vol. I, Belgrade, pp.: 199-214. [in Serbian]
- VASIĆ, K., 2002. Fauna of Noctuids (Lepidoptera: Noctuidae) in Serbia. *In*: Zečević, M., Tomić, D. & Mihajlović, Lj. (eds.): Zbornik radova o fauni Srbije, Book 6. Serbian Academy of Science and Arts, Belgrade, pp.: 165-293. [in Serbian, with English s.]
- VASIĆ, K. & JODAL, I., 1976. Noctuids (Lepidoptera: Noctuidae), caught in the light trap installed on Fruška gora Mt. during 1975. Archives of biological sciences, 28(3-4): 119-126. [in Serbian]
- VASIĆ, K. & TOMIĆ, D., 1980. Harmful forestry entomofauna on Deliblato sands and their specifics. Deliblatski pesak, Vol. IV, Pančevo, pp.: 113-122. [in Serbian]
- ZEČEVIĆ, M., 1996. The Overview of Butterflies Fauna of Serbia. Institute of agricultural research Serbia, Belgrade, 157 pp. [in Serbian]
- ZEČEVIĆ, M., 2002. The Lepidopteran fauna of the Timočka krajina (East Serbia). DŠIP "Bakar" Bor and Public Museum Zaječar, Zaječar, 307 pp. [in Serbian]

НОЋНИ ЛЕПТИРИ У ОКОЛИНИ НОВОГ САДА

ТАТЈАНА КЕРЕШИ и РАДМИЛА АЛМАШИ

Извод

У овом раду се приказују резултати праћења ноћних лептира у околини Новог Сада, као дела активности некадашње Извештајно-прогнозне службе у заштити биља Војводине. Током 1981-1991. године, у периоду вегетације (април-септембар), на светлосној клопци на Римским Шанчевима, укупно је сакупљено око 179.000 лептира из 14 фамилија и 177 врста. Најразноврсније су биле фамилије Noctuidae (56% од укупно уловљених врста), Geometridae (7,9%), Sphingidae (6,2%), Arctiidae и Notodontidae (по 5,1%), а најбројније фамилије Noctuidae, Pyralidae, Geometridae и Arctiidae.

Сакупљени примерци из фамилије Noctuidae се сврставају у 11 потфамилија, 69 родова и 99 врста. Најразноврсније и најбројније су биле потфамилије Hadenninae, Noctuinae и Plusiinae. Еудоминантне су биле врсте *Xestia c-nigrum* (Linnaeus, 1758) и *Autographa gamma* (Linnaeus, 1758), чинећи заједно око 22% од совица. Доминантно је било шест врста совица (у опадајућем низу): *Discestra trifolii* (Hufnagel, 1766), *Mythimna pallens* (Linnaeus, 1758), *Emmelia trabealis* (Scopoli, 1763), *Lacanobia oleracea* (Linnaeus, 1758), *Lacanobia suasa* (Denis et Schiffermüller, 1775) и *Axyليا putris* (Linnaeus, 1761), које су заједно чиниле око 42% од фамилије. Субдоминантно је било 10 врста (24% од свих совица), међу којима су најбројније биле *Macdunnoughia confusa* (Stephens, 1859), *Agrotis segetum* (Denis et Schiffermüller, 1775), *Diachrysis chrysitis* (Linnaeus, 1758), *Tyta luctuosa* (Denis et Schiffermüller, 1775), *Hoplodrina ambigua* (Denis et Schiffermüller, 1775) и *Mamestra brassicae* (Linnaeus, 1758). Рецедентно је било пет, субрецидентно две, а преко половине врста (52) је спадало у малобројне совице. Према доступној литератури, врста *Hyssia cavernosa* (Eversmann, 1842) до сада није утврђена у фауни совица Србије, па је треба сматрати новом. У оквиру фамилије Pyralidae, најбројније од осталих 13 фамилија, апсолутно најзаступљенији су били кукурузов пламенац (*Ostrinia nubilalis* Hbn.) и метлица (*Margaritita sticticalis* L.). Од 14 врста фамилије Geometridae, најбројније су биле хербиколне земљомерке *Tephрина arenacearia* Denis et Schiffermüller, *Chiasmia clathrata* L., *Ascotis selenaria* Denis et Schiffermüller и *Timandra comae* A. Schmidt. Од девет врста фамилије Arctiidae, најбројније су биле *Phragmatobia fuliginosa* L., *Hуphantria cunea* Drury (dudovac), *Spilosoma lubricipeda* L., *Spilosoma lutea* Hfn. и *Arctia caja* L. Осталих 10 фамилија било је заступљено са 48 врста (27% од укупног броја), али свега 3,3% јединки. Међу њима су најразноврсније биле фамилије Sphingidae, Notodontidae Lymantriidae и Lasiocampidae, а најбројније фамилије Sphingidae, Cossidae и Notodontidae.

С обзиром на то да истраживања нису била примарно фаунистичка, затим, да је у питању само један локалитет са скромним избор биљака домаћина у близини, уз велики утицај антропогеног фактора, број регистрованих врста није мали, па овај рад представља први комплетан прилог о фауни ноћних лептира у околини Новог Сада.