THE BUTTERFLIES RED LIST (INSECTA: LEPIDOPTERA) COLLECTED FROM DUMBRAVA SIBIULUI FOREST (ROMANIA) DURING 2001-2012

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Abstract. We consider that the current IUCN criteria provide a far more valid assessment of extinction risk than earlier versions and that this new Red List assessment provides an important foundation to define conservation priorities, including those within the Forest "Dumbrava Sibiu". Currently, fauna and ecological analysis of the landscape in which the reserves and Forest "Dumbrava Sibiu" shows a great scientific and practical interest for biological research in Sibiu. The results can contribute substantially to assessing the state of the world of insects and their evolution of the number of species in the studied ecosystem, but also to establish their quantitative and qualitative changes over time. The data obtained by the past research is completed by the collections of personal data between 2001-2012. So, we intend to achieve a more comprehensive study, on the evolution Macrolepidoptera over more than 120 years of research in the area of Forest "Dumbrava Sibiului". For some species have been listed by the IUCN recommended levels of endangerment in 2000 and 2001 Rákosy L.: critically endangered, extinct, taxon vulnerable, near threatened.

Keywords: butterflies, Red List, Forest "Dumbrava Sibiului", IUCN, threatened species.

INTRODUCTION

Entomological biodiversity assessment level, national regional and local levels is an important goal in biological research. Red lists as tools for the protection and conservation of wild fauna and flora began to be drafted in 1960 [21, 25]. They contain valuable and useful information on the species extinct or endangered in various degrees of endangerment, the communities of animals and plants in different types of biota and ecosystems. Red lists shows the current status of biodiversity conservation under anthropogenic impact. In this study we propose a highlight Macrolepidoptera species collected in 2001-2012 in Dumbrava Sibiului Forest and we suggest the first Red list of species from the studied ecosystem. This work fits in this approach is a small part of a comprehensive study started several years ago in Oak Forest "Dumbrava Sibiu". This paper contains a checklist of all 58 butterfly species and their subspecies recorded to date in Romania including a clasification according to different IUCN categories of endangerment. It aims to work towards assessing the status of all native species against standard criteria based on the internationally accepted guidelines developed by the International Union for Conservation of Nature and Natural Resources (IUCN) [5, 6]. The findings in Forest "Dumbrava Sibiu" allows obtaining recent data on the degree of endangerment of species in the studied area Macrolepidoptera but also on the specific structure and foundation of ways of protection and conservation status of "taxon": extinct, critically endangered endangered, vulnerable or potentially threatened. In order to fit in the category of research in this direction, we assumed that classification according to IUCN in 2000 and 2010 [21]. Forest Lepidoptera fauna of the area "Dumbrava Sibiului" began to be studied since 1880, the first species being collected by Daniel Czekelius, and are found in the Collection of Lepidoptera from Transsylvania existence today in the Natural History Museum in Sibiu [11,12, 17,18]. This was followed by other amateur collectors who over time have contributed to more detailed knowledge of species of butterflies around Sibiu. Macrolepidoptere of Eugen Worell Collections (1900-1958) [2,3], Viktor Weindel (1903-1964) [26], Heinrich von Hannenheim Hann (1922-1964), Rolf Weyrauch (1949-1978), constituted a starting point for the present study [17, 23, 24, 25, 27]. Our considerations on the flight periods of Macrolepidoptera collected from Forest "Dumbrava Sibiului" are based on research conducted over many years in this area (2001-2013), and this paper refers only to species that can be included in the classification under the IUCN system. The natural conditions and peculiarities of the investigated area have been presented in several previous works [1, 9-16, 27-45]. There is no doubt that the appearance of butterfly species in different moments in time exist sequences directly or indirectly linked with the climatic conditions of the area. Flight periods of biological features of each expressing lepidopteran species, and these periods are conditioned butterflies feeding activity but also by changes in biotope [7, 8]. Comparisons are facilitated by assessing all taxa to the same standards. This is not without difficulty because species have a variety of life and reproductive strategies. Status assessments are prepared on the basis of the best available information for the group concerned, recognising that this will vary according to the intensity of recording, the majority of data is carried out by own collection.

MATERIALS AND METHODS

To establish correlations between species density and number of samples in the study evaluations were performed by using the entomological collections from March to October during the years 2001-2012[1,14,16,33-35,40-42,44,45]. The collected material was prepared, labeled inclusive with data about sex. The identified species are presented in carried out by preparing and preserving its contents label which determine the sex of each individual, preparation accordance with the taxonomic system

proposed by Laszlo Rakosy, Marian Goia and Zoltan Kovacs (2003). Species listed in table 1 in systematic order belong to 12 families of Macrolepidoptera. In front of each species are listed serial numbers corresponding to the Catalogue of Lepidoptera in Romania, some observations and the degree of endangerment. Following abbreviations were used: **CR-** ***Critically endangered***, it is estimated that the survival of these species in the next 10-20 years is unlikely if not eliminate the factors that have caused this situation and after analysis of quantitative cost a decay rate of the population with at least 50% in the last 10 years. **EN-** ***Endangered***, endangered taxa when there is a critical stage of threat, but shows high risk or threat exctinction critical in the immediate future, it is estimated a probability of about 20% extinction in the next 20 years, **VU-*Vulnerable***, a taxon is vulnerable when it is not in the critical threat or endangered, but have a high risk of exctinction or critical threat in the near future, **NT-*Near threatened***, includes taxa not included in CR, EN or VU but by worsening the degree of threat, it may take one or other of the three categories. This category largely replaces LR variant category IUCN 2000 Red List taxa without interest [4].

RESULTS

Rich material collected from the Macrolepidoptere in Forest "Dumbrava Sibiului" area in 2001-2012 period includes 243 species, grouped into 17 Families and 163 Genera [45]. After the systematic analysis and system according to IUCN on the degree of endangerment in the table below shows the list of species that can be framed in these categ IUCN (Table1). There were identified 34 Near threatened, 13 Vulnerable, 1 Critical endangered and 2 Endangered.

Great diversity of butterfly species in forest "Dumbrava Sibiului" in the period of 2001-2012 years and the presence of a total of 51 locally threatened species, classified in the IUCN system proposed at the national level, enables consideration of forest perimeter as an important biotope for this group of insects that must be protected.

Table 1:

IUCN RED LIST ABOUT LEPIDOPTERA (INSECTA: LEPIDOPTERA) COLLECTED FROM DUMBRAVA SIBIULUI FOREST, DURING 2001-2012

No. Ro*	No. K.&R.**	Taxa	Observations	Degree of endangerment
		FAMILY L A S I O C A M P I D A E		
3317	6742	Genus **M a l a c o s o m a** Hübner, 1820 (sin. Trichodia *Stephens,1827*; Clisiocampa *Curtis,1828*)		
3318	6743	**1.*Malacosoma neustria*** **(**Linnaeu**s,** 1758)		NT
3324	6754	Genus **M a c r o t h y l a c i a** Rambur, 1866		
3325	6755	**2.*Macrothylacia rubi*** (Linnaeus, 1758)		NT
3332	6770	Genus **P h y l l o d e s m a** Hübner, 1820		
3334	6773	**3.*Phyllodesma tremulifolia*** Hübner, 1810		NT
3335	6776	Genus **G a s t r o p a c h a** *Ochsenheimer, 1810*		
3336	6777	**4.*Gastropacha quercifolia*** (Linnaeus, 1758)		NT
3338	6779	Genus **O d o n e s t i s** (Germar, 1812)		
3339	6780	**5.*Odonestis pruni pruni*** (Linnaeus, 1758)		NT
3344	6785	**FAMILY S A T U R N I I D A E**		
3346	6787	Genus **A g l i a** *Oschenheimer*, 1810		
3347	6788	***6.*Aglia tau *(****Linnaeus, 1758)***		
3349	6792	Genus **S a t u r n i a** *Schrank, 1802*		
3350	6793	**7.*Saturnia pyri pyri*** Denis & Schiffermüller, 1775		VU
3351	6794	**8.*Saturnia pavonia pavonia*** (Linnaeus, 1758) (sin. ***carpini*** [Denis & Schiffermüller], 1775)		VU
3356	6803	**FAMILY L E M O N I I D A E**		
3357	6804	Genus **L e m o n i a** Hübner, [1820]		
3360	6808	***9.*Lemonia balcanica** *(Herrich-Schäffer, 1847)*		CR
		FAMILY S P H I N G I D A E		
3374	6829	Genus **A c h e r o n t i a** Laspeyres, 1809		
3375	6830	***10.*Acherontia atropos *(****Linnaeus, 1758)***		VU
3406	6875	**FAMILY H E S P E R I O I D E A**		
3437	6922	Genus **T h y m e l i c u s** Hübner, 1819		
3440	6925	**11.*Thymelicus acteon*** R*ottemburg,1775*		NT
3445	6938	**FAMILY P A P I L I O N I D A E**		
3457	6957	*Genus **I p h i c l i d e s** Hübner, 1819*		
3458	6958	***12.*Iphiclides podalirius podalirius** *Linnaeus, 1758*		VU

3459	6959	*Genus **P a p i l io** Linnaeus, 1758*	
3460	3960	**13.*Papilio machaon machaon*** Linnaeus, 1758	EN
3461	6963	**FAMILY P I E R I D A E**	
3473	6992	Genus **A p o r i a** Hübner, 1819	
3474	6993	**14.*Aporia crataegi crataegi*** (Linnaeus, 1758)	NT
3475	6994	Genus **P i e r i s** Schrank, 1801	
3476	6995	**15.*Pieris brassicae brassicae*** Linnaeus, 1758	VU
3486	7010	Genus **C o l i a s** Fabricius, 1807	
3488	7014	**16.*Colias erate erate*** (Esper, 1805)	VU
3493	7022	**17.*Colias alfacariensis*** Ribbe,1905(sin. **C. australis** Verity, 1911)	NT
3496	7027	**FAMILY L Y C A E N I D A E**	
3501	7033	*Genus **L y c a e n a** Fabricius, 1807*	
3504	7036	**18.*Lycaena dispar*** **(**Haworth, 1802)	VU
3510	7043	**19.*Lycaena thersamon*** **(**Esper, 1784)	VU
3550	7111	Genus **M a c u l i n e a** Ecke, 1915	
3552	7113	**20.*Maculinea telejus*** (Bergsträsser, 1779) (sin. ***euphemus*** Hübner,1800)	EN
3587	7196	**FAMILY N Y M P H A L I D A E**	
3592	7201	Genus **A r g y n n i s** Fabricius, 1807	
3593	7202	**21.*Argynnis paphia paphia*** (Linnaeus, 1758)	NT
3597	7206	**22.*Argynnis niobe niobe*** **(**Linnaeus, 1758) (sin. ***cleodoxa*** Esper, 1789)	NT
3606	7219	Genus **C l o s s i a n a** Reuss, 1920	
3607	7220-	**23.*Clossiana euphrosyne*** (Linnaeus, 1758)	VU
3609		**24.*Clossiana selene*** ([Denis & Schiffermüller], 1775)	NT
3620	7249	Genus **A g l a i s** Dalman, 1816	
3621	7250	**25.*Aglais urticae*** **(**Linnaeus, 1758)	NT
3622	7251	Genus **P o l y g o n i a** Hübner, 1819	
3623	7252	**26.*Polygonia c-album*** (Linnaeus, 1758)	NT
3625	7254	Genus **A r a s c h n i a** Hübner, 1819	
3626	7255	**27.*Araschnia levana*** (Linnaeus, 1758) sin. ***propsa*** Linnaeus,1758	NT
3635	7269	Genus **M e l i t a e a** Fabricius, 1807	
3636	7270	**28.*Melitaea cinxia cinxia*** Linnaeus, 1758	NT
3637	7271	***29.Melitaea phoebe*** ([Denis & Schiffermüller], 1775)	NT
3645	7283	**30.*Melitaea athalia athalia*** (Rottenburg, 1775) (sin. ***athalia mehadiensis*** Gerhard, 1822)	NT
3647	7285	*Genus **L i m e n i t i s** Fabricius, 1807*	
3648	7286	**31. Limenitis populi** *(Linnaeus,1758)*	VU
3655	7296	Genus **A p a t u r a** Fabricius, 1807	
3658	7299	**32.*Apatura iris*** **(**Linnaeus, 1758)	VU
3671	7320	Genus **C a e n o n y m p h a** *Hübner,[1819]*	
3675	7326	**33.*Caenonympha glycerion glycerion*** *Borkhausen, 1788*	NT
3688	7359	Genus **E r e b i a** Dalman, 1816	
3690	7363	**34.*Erebia euryale*** (Esper, 1805) (sin. ***euryale syrmia*** (Fruhstorfer, 1919))	NT
3695	7372	**35.Erebia aethiops aethiops** (Esper, 1777) (sin. ***aethiops fogarasica*** Warren, 1931, ***aethiops jigodini*** Popescu-Gorj, 1955, ***f. mesorubria***, Popescu-Gorj, 1955)	NT

3720	7478	**FAMILY D R E P A N I D A E**	
3726	7484	Genus **T e t h e a** Ochsenheimer, 1816	
3727	7485	***36.*Tethea ocularis** *Linnaeus, 1767*	NT
3728	7486	**37.Tethea or** *Denis & Schiffermüller, 1775*	NT
3729	7487	Genus **T e t h e e l l a** Werny, 1966	
3730	7488	**38.Tetheella fluctuosa** ***(****Hübner, 1803)*	NT
3733		Genus **C y m a t o p h o r i m a** Spuler, 1908	
3734	7492	**39.*Cymatophorima diluta*** ([Denis & Schiffermüller] , 1775)	NT
3747	7506	*Genus **D r e p a n a Schrank, 1802***	
3749	7508	**40.Drepana falcataria** *Linnaeus, 1758*	NT
3755	7514	**FAMILY G E O M E T R I D A E**	
3757	7516	Genus **A r c h i e a r i s** Hübner, [1823]	
3760	7519	**41.*Archiearis puella*** (Esper, 1787)	VU
3850	7664	Genus **A n g e r o n a** Duponchel, 1829	
3851	7665	**42.*Angerona prunaria*** (Linnaeus, 1758)	NT
3855	7673	Genus **L y c i a** Hübner, 1825	
3856	7674	**43.*Lycia hirtaria hirtaria*** (Clerck, 1759)	NT
4007	7968	Genus **G e o m e t r a** Linnaeus, 1758	
4008	7969	**44.*Geometra papilionaria*** (Linnaeus, 1758)	NT
4009	7970	Genus **C o m i b e n a** Hübner, 1823	
4010	7971	**45.*Comibena pustulata*** Hufnagel, 1767 sin. ***C. bajularia*** ([Denis & Schiffermüller, 1775])	NT
4016	7981	Genus **C h l o r i s s a** Stephens, 1831	
4018	7983	**46.*Chlorissa cloraria*** (Hübner, [1813])	NT
4019		**Genus P h a i o g r a m m a** Gumppenberg, 1877	
4020	7984	**47.*Phaiogramma pulmentaria*** Guenée, [1857] sin. ***etruscaria*** (Zeller, 1849)	NT
4031	8011	Genus **C y c l o p h o r a** Hübner, 1822	
4034	8014	**48.*Cyclophora annulata*** Schulze, 1775 Sin. ***annularia*** (Fabricius, 1775), ***C. omicronaria*** [Denis & Schiffermüller], 1775	NT
4037	8018	**49.*Cyclophora ruficiliaria*** (Herrich & Schäffer, 1855)	VU
4040	8022	**50.*Cyclophora punctaria*** *Linnaeus, 1758*	NT
5438	10373	**FAMILY L Y M A N T R I I D A E**	
5467	10415	Genus **A r c t o r n i s** Germar, 1810	
5468	10416	**51.*Arctornis l-nigrum l-nigrum*** (Müller, 1764)	NT

*****Corresponding serial number from the catalog of butterfly species Romania (Rákosy L., Goia M., Kovács Z., 2003)
****** Classification and nomenclature proposed by (Karsholt O., Razowski J., 1996)

DISCUSSIONS

The current assessment is based on the most comprehensive information on the distribution and status of butterflies ever available. The results confirm that butterflies are a highly threatened group of insects in Dumbrava Sibiului forest, with 76% of permanently resident species either, 24% Regionally Extinct or threatened (NT, CR, EN or VU).

A comparison with previous assessments Red List in Romanian butterflies shows that the number of species considered to be threatened has grown steadily as the criteria to assess extinction risk and the data available have improved [19, 20, 29, 32]. The first Red List assessment excluded many species now considered threatened because the IUCN criteria did not then include criteria for rate of decline [22]. In the current assessment, 51 species qualify as threatened or as Near Threatened on this criterion alone. A comparison with previous assessments shows that the number of species considered to be threatened has grown steadily as the criteria to assess extinction risk have been refined [9, 20, 29].

Great diversity of butterfly species in forest "Dumbrava Sibiului" in the period of 2001-2012 years and the presence of a total of 51 locally threatened species, classified in the IUCN system proposed at the national level, enables consideration of forest perimeter as an important biotope for this group of insects that must be protected [45].

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