NOTE BRÈVE

RED LIST OF BUTTERFLIES (LEPIDOPTERA: HESPERIOIDEA & PAPILIONOIDEA) FOR REPUBLIC OF MACEDONIA

Vladimir T. KRPAČ[1] & Christian DARCEMONT[2]

RÉSUMÉ. — *Liste rouge des papillons* (Lepidoptera: Hesperioidea & Papilionoidea) *en République de Macédoine*. — La République de Macédoine est l'un des quelques pays européens qui n'a pas encore publié de liste rouge des papillons de jour. Le présent article a pour but de définir cette liste rouge, adaptée au contexte du pays, avec deux objectifs: (1) permettre rapidement l'établissement d'un statut de protection pour certaines espèces, afin de protéger leur habitat; (2) définir une liste prioritaire d'espèces qui devront faire l'objet d'un suivi dans les prochaines années. Cette liste rouge se divise donc en deux sous-listes permettant de répondre aux deux objectifs visés. La sélection s'effectue par combinaison de plusieurs critères: l'application des critères UICN au pays, principalement axée sur la mesure de l'état des populations et leur évolution, mais aussi des considérations d'endémisme pour le pays ou bien de limite d'aire. Il en résulte une liste rouge composée de 69 taxa, partagés en sous-liste I de haute importance (12 taxa à protéger et à gérer) et sous-liste II d'espèces prioritaires qui doivent faire l'objet d'un suivi (57 taxa).

The Republic of Macedonia is one of the few countries in Europe without established and published red list of butterflies. Thanks to a large literature on the butterflies of this country and to the collection of data in the Museum of Natural History in Skopje, information is available to draw-up a red list for the country. The aim of this paper is to draw up such a list adapted to the context of the country, with two objectives: (1) allow some species to be protected in a short term, in order to protect their habitats; (2) define a list of species which will require regular survey in the coming years.

The following list, divided in two sub-lists in order to be used as a basis for the two objectives, has been set up in accordance with the recommendation provided in the IUCN guidelines for regional red list (IUCN, 2003) as well to endemic and limit of distribution considerations.

---

[1] N. I. Macedonian Musem of Natural History Boul. Ilinden 86. 1000 Skopje, Republic of Macedonia. E-mail: vkrpach@gmail.com

[2] Groupement d'Études Entomologiques Méditerranée (G.E.E.M.), Hameau de Saint Donat, 240 chemin du Vignaou. F-83440 Callian, France. E-mail: christian.darcemont@geem.org & http://www.geem.org/

MATERIAL AND METHODS

For each species, we have first collected all information available concerning its distribution in the Republic of Macedonia (Drenowski, 1920; Rebel *et al.*, 1931; Thurner, 1938; Silbernagel, 1944; Daniel *et al.*, 1951; Thurner, 1956; Michieli, 1963; Thurner, 1964; Scheider *et al.*, 1989; Sijarić, 1991; Kudrna, 2002; Micevski, 2003; Melovski, 2004; Krpač, 2008), data on the collection in the Museum, the information relative to the status of its populations within the country (Sheljuzhko, 1962; Krpač, 1997; Dinca, 2010; Verovnik *et al.*, 2010), and an evaluation of the potential threats according to the habitat linked to the species and the possible evolution of the habitats in the future by extrapolating some agricultural and pastoral practices by analogy with evolution of other countries in Europe with similar climates.

Then, we have applied the selection criteria per species, for all species of the country, in order to sort the list according to three considerations:

(1) IUCN criteria. The criteria are very well and strictly defined and the application of these criteria is simple, as long as we have appropriate data on the status of the populations within the country. The criteria used are summarized as follows:

A1c: Population reduction observed or estimated over the last 10 years with decline in area of occupancy.

A2c: Population reduction projected over the next 10 years with decline in area of occupancy.

B1: Extent of occurrence reduced and area of occupancy severely fragmented.

B2a: Extent of occurrence reduced and continuing decline.

B2c: Extent of occurrence reduced and reduction of its habitats.

C2a: Population size reduced, in decline, with population structure severely fragmented.

C2b: Population size reduced, in decline, in a single subpopulation.

D: Population size extremely reduced.

(2) Endemism for the Republic of Macedonia, extending the consideration a little bit beyond the borders. We consider a species endemic if more than 40 % of its distribution is located in Republic of Macedonia.

(3) Notion of border of distribution in the country. The populations of the border of the distribution of the species have to be taken into consideration.

Moreover, for some species (such as *P. apollo*), the subspecies has been taken into consideration.

The results have been compared with the red list established in close countries such as Bulgaria (Abadjiev *et al.*, 2007) and Serbia (Jakšić, 2003, 2008) and compared also with the IUCN list (Van Swaay *et al.*, 2010) resulting for Europe and Europe27. These comparisons have been performed in order to be able to understand and explain the discrepancies if any.

Then, the selected butterflies have been divided into two sub-lists, depending of their ecological valence and the potential risk of threat. These two sub-lists are not directly linked to IUCN categories; they are set-up to address the two objectives: immediate protection required for the sub-list I, in order to manage the risk of threat on their habitats, and priority species for survey in coming years, for the sub-list II.

SELECTED BUTTERFLIES

Selected butterflies are listed in Table I.

It should be noted that the IUCN assessment in the table is not the value for IUCN Europe or IUCN E27, but the estimate resulting of application of IUCN criteria, within and limited to, the territory of the Republic of Macedonia.

Three species, never recorded up to now within the borders of the Republic of Macedonia, could be potentially added to the red list. These species are not, and therefore should not appear in the list above. However, as these species are recorded in area close to the Republic of Macedonia (Abadjiev *et al.*, 2007; Jakšić, 2008; Pamperis, 2009), we have mentioned them in a separate table (Tab. II) in case of one of them is discovered in Macedonia in the future. We think that the amount of data reported for the Republic of Macedonia is not enough to ensure that all species flying in the country have been recorded and moreover, due to climate change, we could observe some evolution in the future.

DISCUSSION AND CONCLUSION

The high number of butterflies in the list shows the high entomological interest of the Republic of Macedonia, composed of a high diversity of various biotopes, but also it shows the potential threat for these species in the future.

The aim of the sub-lists is to prioritize protection, active management and monitoring actions:

I: Species and their associated biotopes must be strictly protected in the short term. The highest priority is to ensure that their biotopes will not be threatened by lack of information. A

protection by law is a short term answer and has to be associated with monitoring and active management actions, this last point being uppermost for endemic species.

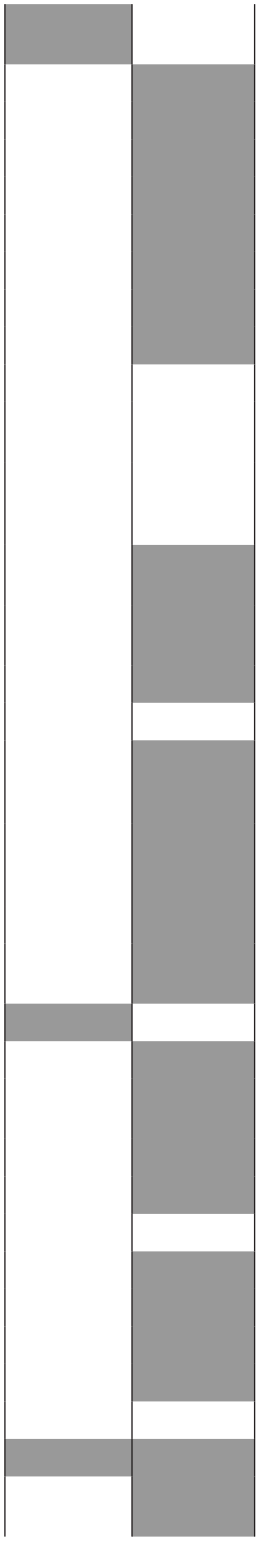
II: Priority species have to be monitored through regular surveys in the coming years. Some of them could be subject to protection by law, at medium term, depending on the conclusions of monitoring.

TABLE I

Selected species among species occurring in the Republic of Macedonia

RED LIST			Criteria for TARGET species			
			IUCN CODE		«Endemic» Distribution	Limit of distribution
				A) Population reduction B) Extent of occurrence C) Population estimated decreasing D) Population very small or restricted	if Macedonia > 40 % of total distribution	Macedonia being a border of distribution
II	*Erynnis marloyi*	(Boisduval, 1834)	NT	C2a		
II	*Carcharodus lavatherae*	(Esper, 1783)	VU	A2c		
II	*Carcharodus flocciferus*	(Zeller, 1847)	NT	A2c		
II	*Spialia phlomidis*	(Herrich-Schäffer, 1845)	NT	A2c		
II	*Syrichtus (=Muschampia) proto*	(Ochsenheimer, 1808)				
II	*Syrichtus (=Muschampia) tessellum*	(Hübner, 1803)	VU	A2c		
I	*Syrichtus (=Muschampia) cribrellum*	(Eversmann, 1841)	EN	B1, B2a		
II	*Pyrgus andromedae*	(Wallengren, 1853)	NT	B1, C2b		
II	*Carterocephalus palaemon*	(Pallas, 1771)				
II	*Gegenes nostrodamus*	(Fabricius, 1793)				
II	*Zerynthia polyxena*	(Denis & Schiffermüller, 1775)	NT	A2c		
II	*Zerynthia cerisyi*	(Godart, 1822)	NT	A2c		
I	*Parnassius apollo*	(Linnaeus, 1758)	NT	A2c		
II	*Parnassius mnemosyne*	(Linnaeus, 1758)	NT	A2c		
II	*Papilio alexanor*	Esper, 1799	NT	B1, B2c		
II	*Anthocharis damone*	Boisduval, 1836	VU	A2c		
II	*Anthocharis gruneri*	Herrich-Schäffer, 1851				
I	*Euchloe penia*	(Freyer, 1851)	VU	B1		
II	*Pieris krueperi*	Staudinger, 1860	NT	A2c		
I	*Pontia chloridice*	(Hübner, 1813)	VU	B1, D		
II	*Colias erate*	(Esper, 1805)				

II	*Colias balcanica (=caucasica)*	Rebel, 1903		
II	*Gonepteryx cleopatra*	(Linnaeus, 1767)		
II	*Gonepteryx farinosa*	Zeller, 1847		
I	*Lycaena dispar*	(Haworth, 1802)	VU	A1c
I	*Lycaena ottomana*	(Lefèbvre, 1830)	VU	A2c, B1
II	*Thecla betulae*	(Linnaeus, 1758)		
II	*Satyrium pruni*	(Linnaeus, 1758)		
II	*Tarucus balkanicus*	(Freyer, 1845)	NT	B2c
I	*Pseudophilotes bavius*	(Eversmann, 1832)	VU	B1
II	*Scolitantides orion*	(Pallas, 1771)	NT	A2c
II	*Maculinea (=Phengaris) arion*	(Linnaeus, 1758)	NT	A2c
II	*Maculinea (=Phengaris) alcon / rebeli*	(Denis & Schiffermüller, 1775) / (Hirschke, 1904)	NT	A2c
II	*Vacciniina (=Plebejus) optilete*	(Knoch, 1781)	VU	A2c
II	*Agriades (=Plebejus) (pyrenaicus) dardanus*	(Boisduval, 1840) (Freyer, 1844)	VU	B1
II	*Polyommatus escheri*	(Hübner, 1823)		
II	*Polyommatus eroides*	(Frivaldszky, 1835)	VU	A2c
II	*Agrodiaetus (=Polyommatus) ripartii*	(Freyer, 1830)		
II	*Agrodiaetus (=Polyommatus) aroaniensis*	Brown, 1976		
II	*Brenthis ino*	(Rottemburg, 1775)		
II	*Boloria pales*	(Denis & Schiffermüller, 1775)		
II	*Boloria graeca*	(Staudinger, 1870)		
II	*Araschnia levana*	(Linnaeus, 1758)		
II	*Nymphalis xanthomelas*	(Esper, 1781)		
I	*Euphydryas maturna*	(Linnaeus, 1758)	VU	A2c
II	*Euphydryas aurinia*	(Rottemburg, 1775)	NT	A2c
II	*Melitaea arduinna*	(Freyer, 1836)	NT	A2c
II	*Mellicta aurelia*	Nickerl, 1850		
II	*Limenitis populi*	(Linnaeus, 1758)	NT	D
I	*Neptis sappho*	(Pallas, 1771)	NT	A2c, B1
II	*Neptis rivularis*	(Scopoli, 1763)		
II	*Apatura metis*	Freyer, 1829	NT	B1
I	*Kirinia climene*	(Esper, 1783)		
II	*Coenonympha glycerion*	(Borkhausen, 1788)		



II	*Erebia (epiphron) roossi*	(Knoch, 1783)				
II	*Erebia aethiops*	(Esper, 1777)	NT	B1		
II	*Erebia alberganus*	(Prunner, 1798)				
II	*Erebia gorge*	(Hübner, 1804)	NT	B1		
II	*Erebia rhodopensis*	Nicholl, 1900	NT	B1		
II	*Erebia pronoe*	(Esper, 1780)				
II	*Erebia pandrose*	(Borkhausen, 1788)				
II	*Melanargia russiae*	(Esper, 1783)	NT	A2c		
II	*Minois dryas*	(Scopoli, 1763)	VU	A2c, B1		
II	*Hipparchia (aristaeus) senthes*	(Fruhstorfer, 1908)				
I	*Pseudochazara geyeri*	(Herrich-Schäffer, 1846)	NT	B1		
II	*Pseudochazara graeca*	(Staudinger, 1870)	VU	B1		
I	*Pseudochazara cingovskii*	Gross, 1973	VU	B1, D		

TABLE II

Selected species among potential new species for Republic of Macedonia

RED LIST			Criteria for TARGET species			
			IUCN CODE		«Endemic» Distribution	Limit of distribution
				A) Population reduction B) Extent of occurrence C) Population estimated decreasing D) Population very small or restricted	if Macedonia > 40 % of total distribution	Macedonia being a border of distribution
II	*Boloria titania*	(Esper,1794)				
II	*Erebia orientalis*	Elwes, 1909	NT	B1		
I	*Pseudochazara orestes*	De Prins & van der Poorten, 1981	VU	B1		

REFERENCES

ABADJIEV, S. & BESHKOV, S. (2007). — *Prime butterfly areas in Bulgaria*. Pensoft Publisher, Sofia.

DANIEL, F., FORSTER, W. & OSTHELDER, L. (1951). — *Beiträge zur Lepidopterenfauna Mazedoniens.* Veröff. Zool. Staatssamml., München.

DINCA, V., KOLEV, Z. & VEROVNIK, R. (2010). — The distribution, ecology and conservation status of the Spinose Skipper *Muschampia cribellum* (Eversmann, 1841) at the western limit of its range I, Europe (Hesperiidae). *Nota Lepidopterologica*, 33: 39-57.

DRENOWSKI, A. (1920). — Zweiter Beitrag zur Lepidopteren-Fauna Bulgariens und zur Lepidopteren-Fauna Mazedoniens. *Zeitschrift für wissenschaftliche Insectenbiologie*, Berlin, 25 (9/10):164-166.

IUCN. (2003). — *Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

JAKŠIĆ, P. (2003). — *Red data book for Serbian butterflies*. Heleta, Beograd.

JAKŠIĆ, P. (2008a). — *Prime butterfly areas: A tool for nature conservation in Serbia*. Habiprot, Beograd.

JAKŠIĆ, P. (2008b). — Developing methods for target species and prime butterfly areas selection criteria in Serbia. *Bull. Nat. Hist. Mus.*, 2008, 1: 205-228

KARSHOLT, O. & RAZOWSKI, J. (1996). — *The Lepidoptera of Europe. A distributional checklist.* ApolloBooks, Stenstrup, Kobenhavn.

KRPAČ, V., LAZAREVSKA, J. & KRPAČ, M (2008). — Check list of butterflies (Lepidoptera: Hesperioidea and Papilionoidea) in Macedonia. *Society for Plant Protection of Republic of Macedonia, Skopje*, 19: 17-24.

KRPAČ, V. & MIHAJLOVA, B. (1997). — *Gonepteryx cleopatra* (Linnaeus 1767), A new species of the butterfly fauna in Macedonia (Lepidoptera: Pieridae). *Act. Entomol. Sloven., Ljubljana,* 5: 113-116.

KUDRNA, O. (2002). — The distribution atlas of European butterflies. *Oedippus*, 20: 1-342.

MELOVSKI, D., (2004). — *Arashnia levana* (L., 1758), a new species for the Macedonian butterfly fauna (Lep.: Nymphalidae). *Entomol. Rec.*, 116: 273-275.

MICEVSKI, N. & MICEVSKI, B. (2002/2003). — Butterfly fauna (Lepidoptera: Papilionidea & Hesperioidea) in the National park Pelister. *Annual Biol. Skopje,* 55-56: 75-98.

MICHIELI, S. (1963). — Beitrag zur Kenntnis der Makrolepidopterenfauna Mazedoniens (NR Makedonija). *Act. Musei Maced. Sci. Natur.*, *Skopje*, IX, 2/78: 15-33.

PAMPERIS, L. (2009). —*The butterflies of Greece.* Koan, Athens.

REBEL, H., & ZERNY, H. (1931). — *Die Lepidopterenfauna Doflein, F. (1921): Mazedonien. Ergebnisse und Beobachtungen eines Naturforschers im Gefolge des deutschen Heeres*. Jena.

SCHEIDER, P. & JAKŠIĆ, P. (1989). — *Die Tagfalter von jugoslawisch Mazedonien Durina (Rhopalocera und Hesperiidae).* Selbsverlag Paul Scheider, Munchen.

SHELJUZHKO, L. (1962a). — Zur Kenntnis der mazedonischen Unterarten in *Parnassius mnemosinae* L. *Entomol. Zeitschr. Stutgart*, 9: 85-108.

SHELJUZHKO, L. (1962b). — Zur Kenntnis der mazedonischen Unterarten in Parnassius mnemosinae L. *Entomol. Zeitschr. Stuttgart*, 12: 117-123.

SIJARIĆ, R. (1991). — Katalog naučne zbirke Lepidoptera (Insecta) donator Bore Mihaljevića iz Sarajeva. *Glasnik Zemaljskog muzeja Bosne and Hercegovine u Sarajevu – Prirodne nauke*, *Sarajevo*, 30: 169-360.

SILBERNAGEL, A. (1944). — Die Schmetterlinge der Ochrid-Gegend in Macedonien. *Z. D. Wiener Ent. Ges.*, 29:29, 43, 93, 124.

THURNER, J. (1938). — Die Schmetterlinge der Ohrid-Gegend in Mazedonien. *Mitt. Königl. Nat.Wiss. Inst. Sofia*, 11: 121-179.

THURNER, J. (1956). — Ein weiterer kleiner Beitrag zur Insectenfauna von Ohrid in Mazdonien. *Fragmenta Balcanica, Mus. Mac. Sci. Nat., Skopje,* I/30: 237-241.

THURNER, J. (1964). — Die Lepidopterenfauna jugoslawisch Mazedoniens. I. Rhopalocera, Grypocera und Noctuidae. *Posebno Izdanie. Acta. Mus. Mac. Sci. Nat., Skopje,* 1: 1-159.

VAN SWAAY, C., CUTTELOD, A., COLLINS, S., MAES, D., LOPEZ MUNGUIRA, M., ŠAŠIĆ, M., SETTELE, J., VEROVNIK, R., VERSTRAEL, T., WARREN, M., WIEMERS, M. & WYNHOF, I. (2010). — *European Red List of Butterfies.* Luxembourg: Publications Office of the European Union.

VEROVNIK, R., MICEVSKI, B., DURIC, M., JAKSIK, P., KEYMEULEN, A., VAN SWAAY, C. & VELING, K. (2010). — Contribution to the knowledge of the butterfly fauna of the Republic of Macedonia (Lepidoptera: Papilionoidea & Hesperioidea). *Act. Entomol. Sloven.,* 18: 31-46.