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RELATION BETWEEN CLIMATE AND BAT FAUNA IN EUROPE

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Abstract. From northern Africa to northern Scandinavian Peninsula there are several climatic areas: Mediterranean, temperate, continental, hemiboreal, milder. A certain structure and abundance of the cheiropterological fauna correspond to each of them. Basing on these correlations, the chiropteran species of Europe are divided in three groups: strongly thermophilic species; species adapted to milder climatic conditions; species of cold climate. From the three groups, those of milder climate have a larger distribution latitudinally, in the West of the Palaearctic Region.

Résumé. Depuis le nord de l'Afrique et jusqu'au nord de la Péninsule Scandinave on peut identifier plusieurs zones climatériques: méditerranéenne, tempérée, continentale, hémiboreale, modérée. A chacune de ces zones correspond une certaine structure et abondance de la faune de chiroptères. Sur la base de ces corrélations on divise les espèces de chiroptères d'Europe en trois groupes: - espèces fortement thermophiles; - espèces adaptées à des conditions climatériques modérées; - espèces de climat froid. De ces trois groupes, les espèces de climat modéré ont une répartition latitudinale plus grande dans l'ouest de la région Paléarctique.

Key words: cilmate, bat fauna, group of families, latitudinal transect, gradient.

INTRODUCTION

In the western Palearctic there are several climatic zones, ranging from dry and hot in the southern Mediterranean to cold in Scandinavia. Bats are strongly dependent on climate conditions and a number of bat species declines markedly northwards.

The aim of this paper is to investigate a gradient in the bat species number along a latitudinal transect from northern Africa through central Europe to Scandinavia.

METHODS

Transect from northern Africa through central Europe to Scandinavia was divided into six regions according to general climatic conditions (Fig. 1). *Region I* (Algeria, Tunisia, Libya) is characterized by the Mediterranean climate on the coast and dry-hot conditions in the deserts; *region II* (Italy, Balkans, Bulgaria, and Greece) – Mediterranean climate; *region III* (Romania, Hungary, Czech Republic, and Slovakia) – temperate climate; *region IV* (southern Poland) – continental climate; *region V* (Lithuania, Latvia, Estonia, Finland) hemiboreal climate; *region VI* (Sweden) – specific, milder climate, as influenced by the warm Gulf Stream.

The occurrence of 45 bat species from 7 families was analysed. Species distribution data was taken from publications listed in references.

RESULTS

Family, genus and species abundance is shown in figure 2.

In *region I* bats occur mostly on the coast and in the mountains in the deserts (Fig. 3). Bats from this region belong to the two groups of families: tropical

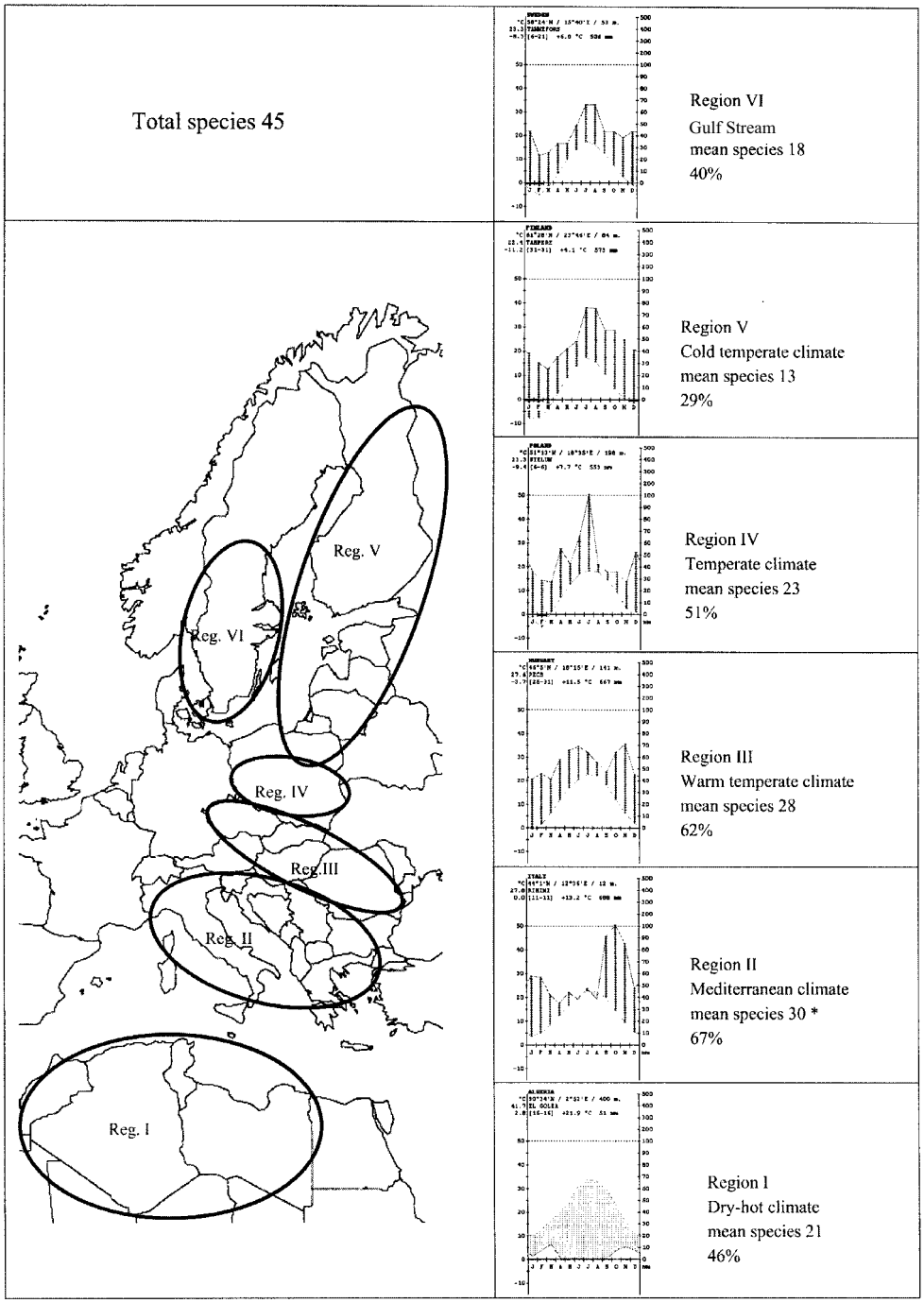


Fig. 1 – Left - subdivision of the transect in the 6 regions considered. Right - mean number of species present in each region and relative thermopluviometric diagram (*approximate because information for Balkans is lacking).

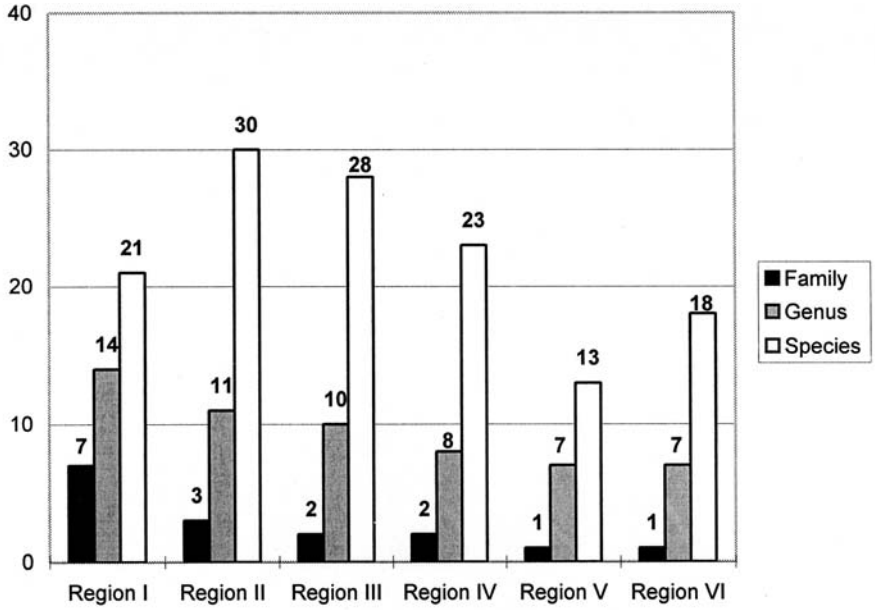
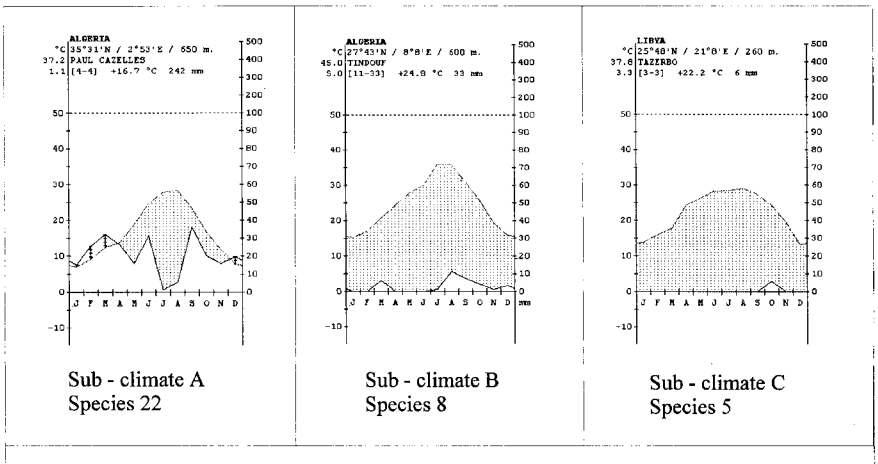


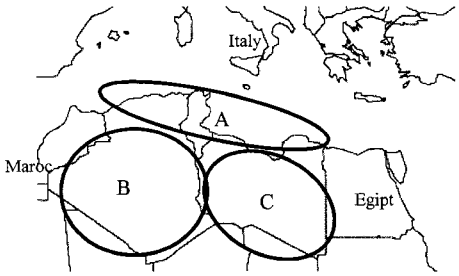
Fig. 2 – Variation in numbers of families, genera and mean number of species in the six regions distinguished.

(Emballonuridae, Nycteridae, Hipposideridae, Rhinopomatidae, Molossidae) (Kowalski & Rzebik-Kowalska, 1991) and temperate zone (Rhinolophidae, Vespertilionidae). Bats from the family Molossidae reach their range limits in *region II*, while those from the subfamily Miniopterinae (Simmons, 2005) in *region III*. The range of bats from the family Rhinolophidae extends further to the North, to *region IV* (Tab. 2).

DISCUSSIONS

In *region V* (western Scandinavia), as the result of the Gulf Stream influence, the climate is much milder than in the eastern *region VI* at the same latitude. Therefore, in Sweden there occur three species preferring higher temperatures (*Plecotus austriacus, Myotis bechsteinii, Myotis myotis*). The presented analysis allows the author to divide European bat species into three groups depending on their climatic requirements. Strongly thermophilous species (eg. *Rhinolophus clivosus, Pipistrellus deserti, Pipistrellus hanaki, Pipistrellus rueppelli, Otonycteris hemprichii*, and *Tadarida teniotis*) and those preferring cold climate (eg. *Eptesicus nilssonii, Myotis dasycneme, Myotis daubentonii*) have a relatively narrow latitudinal range of distribution. Species adapted to moderate conditions have a much wider geographical range along the south-to-north transect and represent only the Vespertilionidae family (eg. *Eptesicus serotinus, Vespertilio murinus, Myotis nattererii, Myotis daubentonii, Myotis mystacinus, Nyctalus leisleri, Nyctalus noctula, Pipistrellus pipistrellus, Pipistrellus nathusii, Plecotus auritus*) (Tab. 1).





A	B	C
Asellia tridens	*Taphozus nudiventris*	*Nycteris thebaica*
Tadarida teniotis	*Asellia tridens*	*Asellia tridens*
Rhinolophus blasii	*Rhinophoma hardwickej*	*Rhinilophus clivosus*
Rhinolophus clivosus	*Tadarida aegyptica*	*Pipistrellus deserti*
Rhinolophus euryale	*Rhinolophus clivosus*	*Otonycteris hemprichi*
Rhinolophus ferrumequinum	*Pipistrellus deserti*	
Rhinolophus hipposideros	*Pipistrellus rueppelli*	
Rhinolophus mehelyi	*Otonycteris hemprichi*	
Eptesicus serotinus		
Hypsugo savii		
Myotis emarginatus		
Myotis nattereri		
Myotis blythii		
Myotis capaccinii		
Nyctalus leisleri		
Nyctalus noctula		
Nyctalus lasiopterus		
Pipistrellus pipistrellus		
Pipistrellus hanaki		
Pipistrellus kuhlii		
Plecotus austriacus		
Otonycteris hemprichi		
Miniopterus schreibersii		

Fig. 3 – Northern Africa 3 sub-climates considered and relative list of species.

Table 1

Frequency of Vespertilionidae species in the six regions distinguished.

VESPERTILIONIDAE	%	FREQ. ASS. 6	SUB-FAMILY
Eptesicus nilssonii	83	5	EPTESICINI
Eptesicus serotinus	100	6	
Hypsugo savii	50	3	VESPERTILIONINI
Vespertilio murinus	83	5	
Myotis alcathoe	33	2	MIOTINI
Myotis aurascens	17	1	
Myotis dasycneme	83	5	
Myotis emarginatus	67	4	
Myotis nattereri	100	6	
Myotis bechsteinii	67	4	
Myotis blythi	67	4	
Myotis myotis	50	3	
Myotis mystacinus	83	5	
Myotis brandtii	83	5	
Myotis daubentonii	83	5	
Myotis capaccinii	50	3	
Nyctalus leisleri	100	6	
Nyctalus noctula	100	6	
Nyctalus lasiopterus	67	4	
Pipistrellus deserti	17	1	PIPISTRELLINI
Pipistrellus pipistrellus	100	6	
Pipistrellus pygmaeus	100	6	
Pipistrellus hanaki	83	5	
Pipistrellus nathusii	83	5	
Pipistrellus kuhlii	50	3	
Pipistrellus rueppelli	17	1	
Barbastrella barbastrellus	83	5	PLECOTINI
Plecotus auritus	83	5	
Plecotus austriacus	83	5	
Plecotus macrobullaris	17	1	
Plecotus kolombatovici	17	1	
Otonycteris hempirichi	17	1	
Miniopterus schreibersii	50	3	MINIOPTERINAE

RELAȚIA DINTRE CLIMĂ ȘI FAUNA DE LILIECI DIN EUROPA

REZUMAT

Din nordul Africii până în nordul Peninsulei Scandinave pot fi identificate mai multe zone climatice: mediteraneană, temperată, continentală, hemiboreală, moderată. Fiecăreia din ele îi corespunde o anumită structură și abundență a faunei chiropterologice. Pe baza acestor corelări sunt împărțite speciile de chiroptere din Europa, în trei grupe: specii puternic termofile; specii adaptate la condiții climatice moderate; specii de climat rece. Din cele trei grupe, cele de climat moderat au o mai largă răspândire latitudinală, în vestul regiunii palearctice.

Table 2

Presence (p.) of bats in different countries on the transect.

Climatic region	I dry-hot			II Mediterranean									III temperate warm				IV temperate	V temperate cold					VI Gulf Stream
Species \ Country	Algeria	Tunisia	Libya	Bulgaria	Serbia and Montenegro	Macedonia	Albania	Bosnia and Herzegovina	Croatia	Slovenia	Italy	Greece	Czech Republic	Slovakia	Romania	Hungary	S. Poland	Finland	Latvia	Lithuania	Estonia	N-E Poland	Sweden
EMBALLONURIDAE																							
Taphozous nudiventris Cretszschmar, 1830	p.																						
NYCTERIDAE																							
Nycteris thebaica E. Geoffroy, 1818	p.		p.																				
HIPPOSIDERIDAE																							
Asellia tridens (E. Geoffroy, 1813)	p.	p.	p.																				
RHINOPOMATIDAE																							
Rhinopoma hardwickei Gray, 1831	p.	p.																					
MOLOSSIDAE																							
Tadarida aegyptiaca (E. Geoffroy, 1818)	p.																						
Tadarida teniotis (Rafinesque, 1814)	p.		p.	p.		r	p.	p.	p.		p.	p.											
RHINOLOPHIDAE																							
Rhinolophus blasii Peters, 1867	p.	p.		p.	p.	r	p.	p.	r		?	p.			p.								
Rhinolophus clivosus Cretzschmar, 1828	p.	p.	p.																				
Rhinolophus euryale Blasius, 1853	p.	p.		p.	p.	p.	r	p.	p.	p.	p.	p.		p.	p.	p.							
Rhinolophus ferrumequinum (Schreber, 1774)	p.	p.		p.	p.	p.	p.	p.	p.	p.	p.	p.	r	p.	p.	p.	p.						
Rhinolophus hipposideros (Bechstein, 1800)	p.	p.		p.	p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.						
Rhinolophus mehelyi Matschie, 1901	p.	p.	p.	p.	p.	r		p.	p.		p.	p.			p.								

Table 2 (continued)

VESPERTILIONIDAE																							
Vespertilioninae																							
Eptesicini																							
Eptesicus nilssonii (Keyserling & Blasius, 1839)				p.		r			r		p.		p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.
Eptesicus serotinus (Schreber, 1774)	p.	p.	p.	p.	p.	r	r	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.			p.		p.	p.
Vespertilionini																							
Hypsugo savii (Bonaparte, 1937)	p.	p.		p.	p.	r	p.	p.	p.	p.	p.	p.	r	p.	p.	p.							
Vespertilio murinus Linnaeus, 1758				p.	p.	r	p.	p.	r	p.	p.	p.	r	p.	p.	p.	p.	p.	p.	m.	m.	p.	p.
Miotini																							
Myotis alcathoe Helversen & Heller, 2001												r	p.	p.		p.							
Myotis aurascens Kuzyakin, 1935				p.	p.				p.		p.	p.											
Myotis dasycneme (Boie, 1825)				p.	p.				r		?		r	p.	p.	p.	p.	p.	p.	m.	p.	p.	r
Myotis emarginatus (E. Geoffroy, 1806)	p.	p.		p.	p.	p.	p.	p.	p.	p.	p.	p.	r	p.	p.	p.	p.						
Myotis nattereri (Kuhl, 1818)	p.	p.		p.	p.	r	p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.	r	p.	m.	r	p.	r
Myotis bechsteinii (Kuhl, 1818)				p.	p.		p.		r	p.	p.	p.	r	p.	p.	p.	p.						r
Myotis blythii (Tomes, 1857)	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	r	p.	p.	p.	p.						
Myotis myotis (Borkhausen, 1797)				p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.						
Myotis mystacinus (Kuhl, 1819)				p.	p.	r	p.	p.	p.	p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.	r	p.	p.
Myotis brandtii (Eversmann, 1845)				p.	p.				p.	p.	p.		p.	p.	p.	p.	p.	p.	p.	m.	p.	p.	p.
Myotis daubentonii (Kuhl, 1819)				p.	p.	r	r		p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.
Myotis capaccinii (Bonaparte, 1837)	p.	p.		p.	p.	p.	p.	p.	p.	p.	p.	p.			p.								
Pipistrellini																							
Nyctalus leisleri (Kuhl, 1818)	p.	p.	p.	p.	p.	r	p.	p.	p.	p.	p.	p.	r	p.	p.	p.	p.			m.		p.	p.
Nyctalus noctula (Schreber, 1774)	p.			p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	m.	m.	m.	p.	p.
Nyctalus lasiopterus (Schreber, 1780)			p.	p.			p.	r	p.	p.	p.	p.	r	p.	p.	p.	p.						
Pipistrellus deserti Thomas, 1902	p.		p.																				
Pipistrellus pipistrellus (Schreber, 1774)	p.	p.		p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	m.	m.	p.	m.
Pipistrellus pygmaeus Leach, 2001				p.	p.				p.		p.	p.	p.	p.	p.	p.	p.		p.	m.		p.	m.
Pipistrellus hanaki Benda & Hulva, 2004			p.																				
Pipistrellus nathusii (Keyserling & Blasius, 1839)				p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	m.	p.	m.	p.	p.

Table 2 (continued)

Pipistrellus kuhlii (Natterer, 1819)	p.	p.	p.	p.	p.	r	p.	p.	p.	p.	p.	p.	r		p.	p.						
Pipistrellus rueppelli (Fischer, 1829)	p.																					
Plecotini																						
Barbastrella barbastrellus (Schreber, 1774)				p.	p.	r			r	p.	p.	p.	p.	p.	p.	p.	p.		p.	m.		p.	p.
Plecotus auritus (Linnaeus, 1758)				p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.
Plecotus austriacus (Fischer, 1829)	p.	p.	p.	p.	p.	r	p.	p.	r	p.	p.	p.	p.	p.	p.	p.	p.						r
Plecotus macrobullaris Streikov, 1965									p.		p.												
Plecotus kolombatovici Dulic, 1980									p.			p.											
Otonycteris hemprichi Peters, 1859	p.	p.	p.																				
Miniopterinae																							
Miniopterus schreibersii (Kuhl, 1819)	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.	p.		p.	p.	p.							
TOTAL NUMBER OF SPECIES: 45	27	20	15	32	29	26	24	24	34	25	31	31	26	27	30	28	23	11	13	15	11	15	17

Additional data: r - rare species, m - migratory species.

LITERATURE CITED

AELLEN, V., 1966 - Notes sur *Tadarida teniotis* (Raf.). I. Systématique, paleontologie et peuplement, répartition geographique. Revue Suisse de Zoologie, 73 (1/6): 10-159.

AELLEN, V., P. STRINATI, 1969 - Liste des Chiropteres de la Tunisie. Revue Suisse de Zoologie, 76 (2): 421-431.

AELLEN, V., P. STRINATI, 1970 - Chauves-souris cavernicoles de Tunisie. Extr. Mammalia, 34 (2): 228-236.

AULAGNIER, S., P. MEIN, 1985 - Note sur la présence d'*Otonycteris hemprichi* (Peters, 1859) au Maroc. Mammalia, 49 (4): 582-584.

BEAUCOURNU, J. C., D. BACH-HAMBA, Y. H. LAUNA, H. HELLAL, C. CHASTEL, 1983 - Deux Chiropteres peu connus de Tunisie. Mammalia, 47 (1): 127-128.

BENDA, P., I. HORAÈEK, 1998 - Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 1. Review of distribution and taxonomy of bats in Turkey. Acta Societatis Zoologicae bohemoslovaciae, 62: 255-313.

BENDA, P., M. RUEDI, M. UHRIN, 2003 - First record of *Myotis alcathoe* (Chiroptera: Vespertilionidae) in Slovakia. Folia zoologica, 52 (4): 359-365.

BENDA, P., T. IVANOVA, I. HORAÈEK, V. HANAK, J. ERVENY, J. GAISLER, A. GUEORGUIEVA, B. PETROV, V. VOHRALIK, 2003 - Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 3. Review of bat distribution in Bulgaria. Acta Societatis Zoologicae bohemoslovaciae, 67: 245-357.

BENDA, P., P. HULVA, J. GAISLER, 2004 - Systematic status of African populations of *Pipistrellus pipistrellus* complex (Chiroptera: Vespertilionidae), with a description of a new species from Cyrenaica, Libya. Acta Chiropterologica, 6 (2): 193-217.

BENDA, P., M. RUEDI, S. AALAGNER, 2004 - New data on the distribution of bats (Chiroptera) in Morocco. Vespertilio, 8: 13-44.

BENDA, P., A. KIEFER, V. HANAK, M. VEITH, 2004 - Systematic status of African populations of long-eared bats, genus *Plecotus* (Mammalia: Chiroptera). Monograph Folia zoologica**,** 53 (1): 47.

BROSSET, A., 1963 - *Myotis nattereri*, Chiroptere nouveau pour l'Afrique du Nord. Mammalia, 27: 440-443.

BROSSET, A., 1966 - La biologie des Chiropteres. Masson et Cie, Paris.

CARUSO, D., G. COSTA, 1978 - Fauna cavernicola di Sicilia. Animalia, 5 (1/3): 423-513.

DECU, V., D. MURARIU, V. GHEORGHIU, 2003 - Chiroptere din Romania. Edit. Institutul de Speologie „Emil Racoviță", București. xxii+521 pp. (in Romanian)

DELEUIL, R., 1957 - Une nouvelle chauve-souris pour la Tunisie *Otonycteris hemprichi* (Peters, 1860). Mammalia, 21: 190.

DIETZ, C., O. von HELVERSEN, 2004 - Illustrated identification key to the bats of Europe. Electronic publication. 72 pp. www.uni-tuebingen.de

DJULIC, B., 1961 - Contribution à l'étude de la répartition et de l'écologie de quelques chauves-souris cavernicols de Dalmatie. Extr. Mammalia, 25 (3): 287-313.

DJULIC, B., 1963 - Étude écologique des chauves-souris cavernicoles de la Croatie occidentale (Yougoslavie). Mammalia, 27: 385-485.

DORST, J., F. PETTER, 1959 - Présence en Afrique du Nord d'une chauve-souris du genre *Tadarida.* Mammalia, 23: 560-561.

DUMITRESCU, M., J. TANASACHI, T. ORGHIDAN, 1962-1963 - Răspândirea chiropterelor în R. P. Romania. Edit. Academia Republici Populare Romîne, Institutul de Speologie „Emil Racoviță", 1-2: 570-575. (in Romanian)

GAISLER, J., 1983 - Nouvelles données sur les Chiropteres du nord algerien. Mammalia**,** 47 (3): 359-369.

GAISLER, J., J. DUNGEL, 2002 - Atlas Savcu, Ceske a Slovenske republiky. Edit. Academie ved Ceske Republiky. Praha. 152 pp. (in Czech)

GAISLER, J., K. KOWALSKI, 1986 - Results of the netting of bats in Algeria (Mammalia: Chiroptera). Vestnik Ceskoslovenske spolecnosti zoologicke, 50: 161-173.

GAISLER, J., G. MADKOUR, J. PELIKAN, 1972 - On the bats (Chiroptera) of Egypt. Acta Scientiarum Naturalium Brno, 6 (8): 1-40.

GHEORGHIU, V., A. PETCULESCU, V. IAVORSCHI, 2001 - Contribution to the knowledge of the Chiroptera distribution from Romanian sector of the Carpathian Mountains. Studia Chiropterologica, 2: 17-46.

GRASSÉ, P.-P., 1955 - Mammifères, les ordres: anatomie, ethologie, systématique. *In*: Traité de Zoologie, anatomie, systématique, biologie, 17. Edit. Masson et Cie, Paris.
HANAK, V., A. ELGADI, 1984 - On the bat fauna (Chiroptera) of Libya. Vestnik Ceskoslovenske spolecnosti zoologicke, 48: 165-187.
HANAK, V., J. GISLER, 1983 - *Nyctalus leisleri* (Kuhl, 1818), une espèce nouvelle pour le continent africain. Mammalia, 47 (4): 585-587.
HANAK, V., P. BENDA, M. RUEDI, I. HORAÈEK, T. S. SOFIANDOU, 2001 - Bats (Mammalia:Chiroptera) of the Eastern Mediterranean. Part 2. New records and review of distribution of bats in Greece. Acta Societatis Zoologicae bohemoslovacia, 65: 279-346.
HARRISON, D. L., 1963 - Observations on the North African Serotine bat, *Eptesicusa Serotinus Isabellinus* (Temminck, 1840) (Mammalia: Chiroptera). Zoologische Mededelingen, 38 (12): 207-212.
HARRISON, D. L., 1964 - The Mammals Arabia. Ernest Benn Limited, London, 1: xx+192.
HORAÈEK, V., V. HANAK, J. GAISLER, 2000 - Bats of the Paleartic Region: A Taxonomic and Biogeographic Review. Proceeding of the VIII European bat research symposium, Approches to Biogeography and Ecology of Bats, 1: 11-157. Krakow.
HUTSON, A. M., S. P. MICKLEBURGH, P. A. RACEY, 2001 - Microchiropteran Bats. Edit. Information press, Oxford. ix+259 pp.
JARZEMBOWSKI, T., M. CIECHANOWSKI, A. PRZESMYCKA, 2000 - Zimowanie nietoperzy na Pomorzu Gdanskim w latach 1989-1999. Studia Chiropterologica, 1: 29-42.
KOWALSKI, K., B. RZEBIK-KOWALSKA, 1991 - Mammals of Algeria. Polska Akademia Nauk, Wrocław - Warszawa - Kraków.
KRYSTUFEK, B., 1991 - Sesalci Slovenije. Prirodoslovni muzej Slovenije, Ljublijana: vi+294.
KRYSTUFEK, B., V. VOHRALIK, J. FLOUSK, S. PETKOVSKI, 1992 - Bats (Mammalia: Chiroptera) of Macedonia, Yugoslavia. Prague Studies in Mammalogy: 93-111.
KRZANOWSKI, A., 1980 - Nietoperze. Wiedza Powszechna, Warszawa. 235 pp.
KUNZ, T. H., 1982 - Ecology of Bats. Plenum Publishing Corporation, New York. 425 pp.
LEMBERK, V., 2004 - Netopyri (Chiroptera) vychodnich Cech. Lynx, 35: 49-118.
MITCHELL-JONES, A. J., G. AMORI, W. BOGDANOWICZ, B. KRYSTUFEK, P. J. H. REIJNDERS, F. SPITZENBERGER, M. STUBBE, J. B. M. THISSEN, V. VOHRALIK, J. ZIMA, 1999 - The Atlas of European Mammals. Academic Press, London. xi-484 pp.
MURARIU, D., 2003 - Mammals (Mammalia) from the southern area of Piatra Craiului National Park (Romania). Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa", 45: 381-393.
MURARIU, D., 2004 - New reports on the distribution of three bat species (Mammalia: Chiroptera) of Romania. Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa", 46: 271-279.
PALMEIRIM, J. M., 1982 - On the presence of *Nyctalus lasiopterus* in North Africa (Mammalia:Chiroptera). Mammalia, 46 (3): 401.
PAVLINIC, I., N. TVRTKOVIC, 2004 - Altitudinal distribution of four *Plecotus* species (Mammalia, Vespertilionidae) occurring in Croatia. Natura Croatica, 13 (4): 395-401.
QUMSIYEH, M. B., 1983 - Occurrence and zoogeographical implications of *Myotis blythii* (Tomes, 1857) in Libya. Mammalia, 47 (3): 429-430.
QUMSIYEH, M. B., A. SCHLITTER, 1982 - The bat fauna of Jabal Al. Akhdar Northeast Libya. Annals of Carnegie Museum, 51 (19): 377-389.
RĂDULEȚ, N., 2003 - Contributions to the morphological study of the coxal bone of 11 bat species (Mammalia: Chiroptera) from Romania. Travaux du Muséum National d'Histoire Naturelle „Grigore Antipa", 45: 373-380.
SACHANOWICZ, K., M. CIECHANOWSKI, 2005 - Nietoperze Polski. Multico, Warszawa. 160 pp.
SCHLITTER, D. A., L. W. ROBBINS, 1973 - Presence of *Tadarida* in the central Sahara. Mammalia 37: notes.
SCHOBER, W., E. GRIMMBERGER, 1997 - The bats of Europe & North America. T. F. H. Publications, Inc., Neptune City.
SIMMONS, N. B., 2005 - Order Chiroptera. Pp: 312-529. *In*: D. E. Wilson & D. M. Reeder, Mammal Species of the World; A Taxonomic and Geographical Reference (third edition). John Hopkins University Press, Baltimore. 2142 pp.

SPITZENBERGER, F., 1992 - The Lesser Noctule (*Nyctalus leisleri* Kuhl, 1818) in Austria. Prague Studies in Mammalogy: 189-192.
TVRTKOVIC, N., H. DRASKO, B. JALZIC, 2001 - The pond bat *Myotis dasycneme* in Croatia. Natura Croatica, 10 (3): 221-227.
VAUGHAN, T. C., E. L. COCKRUM, P. J. VAUGHAN, 1997 - Four Vespertilionid bats new to the fauna of Tunisia. Mammalia, 41 (4): 517-522.
VERNIER, E., 1993 - Lo strano caso del *Pipistrello albolimbato*, una specie di chirottero in espansione. Ambiente Risorse Salute, n.s., N.16: 54-56.
VERNIER, E., 1997 - Manuale pratico dei Chirotteri italiani. Societa' Cooperativa Tipografica, Padova. 157 pp.
WOŁOSZYN, B. W., 2001 - Nietoperze Polski, występowanie, środowisko, status ochronny. C.I.C., Kraków. 63 pp.
WOŁOSZYN, B. W., A. T.-V. BASHTA, 2001 - Nietoperze Karpat, Centrum Informacji Chiropterologicznej. Kraków. 168 pp.
ZAGOROSNIUK, I., V. TYSHCHENKO, Y. PETRUSHENKO, 2000 - Horseshoe bats (*Rhinolophus)* in the Dnister region as the most north-eastern part of their range in Europe. Studia Chiropterologica, 1: 115-132.
ZBYTOVSKY, P., M. ANDERA, V. HANAK, 2004 - Drobni savci jizni casti Ceskomoravske vrchoviny (Insectivora, Chiroptera, Rodentia). Lynx, 35: 141-245.

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