BRVKENTHAL. ACTA MVSEI

XVII. 3

MINISTERUL CULTURII

MUZEUL NAŢIONAL BRUKENTHAL

BRVKENTHAL

ACTA MVSEI

XVII. 3

Sibiu / Hermannstadt, 2022

ISSN: 1842-2691

MUZEUL NAȚIONAL BRUKENTHAL

Editura Muzeului Naţional Brukenthal

Începând cu anul 2009, revista a fost indexată în baze de date internaţionale astfel:
2009 − INDEX COPERNICUS http://www.journals.indexcopernicus.com/karta.php?action=masterlist&id=4759
2010 − EBSCOHOST http://www.ebscohost.com/titleLists/tnh-coverage.htm
2012 – SCOPUS http://www.elsevier.com/online-tools/scopus/content-overview
2015 − ERIH PLUS https://dbh.nsd.uib.no/publiseringskanaler/erihplus/periodical/info?id=484924
Începând din anul 2011, publicaţia este vizibilă şi pe platforma editorială **SCIPIO** (http://www.scipio.ro/web/brukenthal.acta-musei).

Starting with 2009, the publication is indexed in the following international date-bases:
2009 − INDEX COPERNICUS:http://www.journals.indexcopernicus.com/karta.php?action=masterlist&id=4759
2010 – EBSCOHOST http://www.ebscohost.com/titleLists/tnh-coverage.htm
2012 – SCOPUS http://www.elsevier.com/online-tools/scopus/content-overview
2015 − ERIH PLUS https://dbh.nsd.uib.no/publiseringskanaler/erihplus/periodical/info?id=484924
Starting with 2011, the publication is to be found on **SCIPIO** editorial platform (http://www.scipio.ro/web/brukenthal.acta-musei).

Orice corespondenţă referitoare la această publicaţie rugăm a se adresa la:
Muzeul Naţional Brukenthal, Piaţa Mare 4-5, 550163, Sibiu. **Tel:** +40/269/217691, **Fax:** +40/269/ 211545;
E-mail: ioan.tausan@ulbsibiu.ro; **Website**: www.brukenthalmuseum.ro
Autorii îşi vor asuma întreaga responsabilitate pentru informaţia de specialitate din materialele trimise, care vor fi supuse procesului de peer review, ale cărui detalii pot fi consultate la http://www.brukenthalmuseum.ro/publicatii/01.htm.
Ghidul pentru autori se regăseşte pe website: http://www.brukenthalmuseum.ro/publicatii/01.htm

Please send any mail or messages regarding this publication at:
Brukenthal National Museum, Piaţa Mare 4-5, 550163, Sibiu. **Phone number**: +40/269/217691; **Fax** +40/269/211545;
E-mail: ioan.tausan@ulbsibiu.ro**; Website**: www.brukenthalmuseum.ro
The entire responsibility for the specialized information of the article's content is to be assumed by the author; all materials will be submitted to a peer review process. The details can be found at http://www.brukenthalmuseum.ro/publicatii_en/01.htm.
The guide for the authors can be found at: http://www.brukenthalmuseum.ro/publicatii_en/01.htm.

TABLE OF CONTENTS

REVIEWERS FOR BRUKENTHAL ACTA MUSEI XVII.3

The Natural History Museum of Sibiu staff is deeply grateful to the following specialists who gave of their time to review manuscripts submitted in 2022 for publication in *Brukenthal Acta Musei* XVII.3:

GLIGOR Felicia, Lucian Blaga" University of Sibiu, Faculty of Medicine, Sibiu, Romania

GRĂDIANU Ionuț, Natural Sciences Museum Piatra Neamț, Romania

IONESCU Silvia, Romanian Society for the History of Pharmacy (SRIF) Sibiu, Romania

POPESCU Aurelian, Museum of Oltenia - Natural sciences, Craiova, Romania

RĂDAC Alexandru, West University of Timișoara, Faculty of Biology, Timișoara, Romania

SITAR Cristian, Zoological Museum, Babes, Bolyai University, Cluj-Napoca, Romania

SOLOMON Alexandru, Department of Natural Sciences, Mureș County Museum, Mureș, Romania

STĂNESCU Mihai, Grigore Antipa National Museum of Natural History, Bucharest, Romania

TÖRÖK Sergiu-Cornel, Municipal Museum, Natural Science Department, Mediaș, Romania

NEW DATA ON THE ROMANIAN LEPIDOPTERA: RESULTS FROM 2020-2021

Levente SZÉKELY*

Abstract. *This work is a contribution to the knowledge of the Romanian Lepidoptera fauna, and it includes data on several very rare and localized species, little known in the fauna of the country. The presence of Dysgonia rogenhoferi (Bohatsch, 1880) and Staurophora celsia (Linnaeus,1758) in Romania is confirmed. Odontognophos dumetata (Treitsche, 1827) is recorded for the first time from Dobrogea. Grammodes bifasciata (Petagna, 1787) and Acontia candefacta (Hübner, [1831]) are reported for the first time from the Danube Delta.Several rare and localized species (not recorded after 1990) are reported again from Romania, such as Episema korsakovi paenulata Christoph, 1885, Agrotis obesa scytha Alphéraky, 1889 and Triodia amasinus (Herrich-Schäffer, 1851). This study also includes certain species that are very rare in Transylvania, namely Catocala puerpera (Giorna, 1791) and Periphanes delphinii (Linnaeus, 1758). Finally, this work also includes a list of species collected and observed in the surroundings of Chilia Veche (Danube Delta) in 2020-2021. This region has not been studied in the past from a lepidopterological point of view.*
Keywords*: Insecta, Lepidoptera, faunistics, Romania.*

Rezumat. *Lucrarea reprezintă o nouă contribuţie la cunoaşterea faunei de lepidoptere din România, conținând date faunistice referitoare la specii foarte rare si localizate, puțin cunoscute în fauna țării. Este confirmată prezenta speciilor Dysgonia rogenhoferi (Bohatsch, 1880) si Staurophora celsia (Linnaeus, 1758) în România. Odontognophos dumetata (Treitsche, 1827) este semnalată pentru prima dată în fauna Dobrogei. Grammodes bifasciata (Petagna, 1787) și Acontia candefacta (Hübner, [1831]) sunt semnalate pentru prima dată din Delta Dunarii. Sunt regăsite unele specii rare și foarte localizate în România (nu au fost semnalate după 1990) precum Episema korsakovi paenulata Christoph, 1885, Agrotis obesa scytha Alphéraky, 1889 și Triodia amasinus (Herrich-Schäffer, 1851). Sunt prezentate de asemenea unele specii foarte rare pentru Transilvania (Catocala puerpera (Giorna, 1791) și Periphanes delphinii (Linnaeus, 1758)). Lucrarea include și o listă a speciilor colectate și observate în localitatea Chilia Veche și împrejurimi (Delta Dunării) în 2020-2021. Această regiune nu a fost studiată în trecut din punct de vedere lepidopterologic.*
Cuvinte cheie*: Insecte, lepidoptere, faunistică, România.*

Introduction

Numerous regions of Romania are still little studied from a lepidopterological point of view. Adding new records at a regional level represents an important step towards a better knowledge of the overall biodiversity of the country.

This work includes data on very rare and localized Lepidoptera species, little known in the fauna of Romania. Many of the findings represent the first records for certain regions of Romania, while other species are known in the country based on very few specimens.

Material and methods

The material was collected using 80 W or 125 W mercury vapour bulbs placed in front of a white sheet, powered by a portable gasoline generator. In parallel, 3-4 light traps with 8W black or white UV tubes were used every night.

An entomological net was used for butterflies

The collecting sites with geographic coordinates are as follows:
Tulcea County:
- Chilia Veche (Danube Delta) 45,4252N/ 29,2920E; 45,4103N/29,2782E
- Enisala 44,8855N/28,8183E
- Babadag Forest 44,8676N/28,6896E

Constanţa County:
-Esechioi Forest /SW-Dobrogea 44,0656N/ 27,2966E
-Canaraua Fetii / SW-Dobrogea 44,0812N/ 27,6423E
-Limanu /SE-Dobrogea 43,8066N/ 28,4861E
-Agigea / E-Dobrogea 44,0902N/28,6424E
-Gura Dobrogei / Central Dobrogea 44,4664N/28,4850E

Braşov County:
- Târlungeni / SE-Transylvania 45,6478N/ 25,7658E
- Codlea / SE-Transylvania 45,6937N/ 25,4570E

* Independent researcher, Braşov, Romania.
levi.szekely@gmail.com

Covasna County:
- Vârghiș Gorges (Cheile Vârghișului) / E - Transylvania 46,2119N/25,5495E

Discussion

Below we present the taxa considered to be of particular significance (rare or very localized) for the Romanian fauna.

The list of species in systematic order:

Abbreviations: ♂ = male; ♀ = female; sp. = specimen

Suprafam. HEPIALOIDEA Stephens, 1829

Fam. HEPIALIDAE Stephens, 1828
Triodia amasinus (Herrich-Schäffer, 1851**)**
Material: Agigea, 22.IX.2021- 2♂, Limanu, 24.IX.2021- 4♂, 2♀, Canaraua Fetii - 1♂ (Fig.15, 30).
Rare and very localized, known in the Romanian fauna only from Dobrogea (especially from the coastal area). All records from the coastal area are old (prior to 1990). A more recent record originates from Greci – Măcin Mountains (Rákosy& Wieser, 2000). Our data include the first records from south-western Dobrogea.

Suprafam. PAPILIONOIDEA Latreille, [1802]

Fam. HESPERIIDAE Latreille, 1809
Heteropterus morpheus (Pallas, 1771)
Material: Chilia Veche, 27.VI.2020 – 4 sp. (leg. L. Csukás), 25.VIII.2021 – 6 sp. (Fig.1).
Eurosiberian element occurring from western Europe to Korea. In Romania it is very localized, mainly present in the western regions (western Transylvania, Banat, Crișana). In the eastern parts of the country it is present in Măcin Mountains (Rákosy & Wieser 2000) and the Danube Delta. From the latter it was known only from Caraorman Forest (Székely 2006).

Fam. **NYMPHALIDAE** Swainson, 1827

Euphydryas maturna (Linnaeus,1758)
Material: Esechioi Forest, 29.V.2021 - 1♂ (leg. R. Görbe).
Species protected at European level (Natura 2000). In Romania it is relatively widespread (Banat, Crișana, western Transylvania, Moldova, Muntenia and Dobrogea), and in some regions it is locally very common. From southern Dobrogea it was known only based on a 1993 record from Canaraua Fetii (Dincă *et al.* 2009). Recently, the species has also been recorded from Oltenia (Stănescu *et al.* 2021).
Apatura metis Freyer, 1829
Material: Chilia Veche, 25.VIII.2021 – over 60 sp. /1 hour (very common)! (Fig.20).
Species protected at European level (Natura 2000). In Romania it is relatively widespread on the lower course of the Danube, Siret and Prut, and especially in the Danube Delta. The latter probably hosts the largest populations of *A. metis* in Europe, a very large habitat where this species is not threatened (Fig. 27).

Suprafam. LASIOCAMPOIDEA Harris, 1841

Fam. LASIOCAMPIDAE Harris, 1841
Lasiocampa quercus (Linnaeus, 1758)
Material: Gura Dobrogei, 27.VIII.2021-1♀ (Fig.2).
A widespread species in Romania, but extremely rare in Dobrogea. From this region, there are only two records, a 1982 one from Hagieni Forest (Rákosy, Székely 1996), and one from Măcin Mountains (Rákosy, Wieser 2000). The female from Gura Dobrogei represents the first record from central Dobrogea.

Suprafam. GEOMETROIDEA Leach, [1815]

Fam. GEOMETRIDAE Leach, [1815]

Eupithecia biornata Christoph, 1867
Material: Chilia Veche, 24.VIII-15.IX.2021– over 20 sp. (Fig.14).
Species distributed in the eastern Balkans, southern Ukraine, Caucasus, Kazakhstan, Asia Minor, and Central Asia. In Romania it is rare and localized, being known only from Dobrogea and the Danube Delta (Rákosy et al. 2003). From the Danube Delta it was known only from Caraorman, Letea, C. A. Rosetii, Sărăturile and Sfântu-Gheorghe.
Odontognophos dumetata (Treitsche, 1827)
Material: Gura Dobrogei, 23.IX.2020 – 9 sp. (Fig.12).
The first record for the fauna of Dobrogea. A rare and localized species in Romania, with few populations reported from Banat, central Transylvania, eastern and southern Moldova. One site is also known in Muntenia (Istrița Hill, Buzău county) (Dincă, 2005).
Selidosema plumaria ([Denis & Schiffermüller], 1775)
Material: Gura Dobrogei, 27.VIII.2021 – 12 sp. (Fig.13).
A very localized species in Romania, reported sporadically from Banat (Băile Herculane, Mehadia), southern Retezat Mountains, and central Transylvania (Turzii Gorges, Tureni Gorges). From Dobrogea it was known only from Cheile Dobrogei (Székely 2011).

Suprafam. NOCTUOIDEA Latreille, 1809

Fam. EREBIDAE (Leach, [1815])

***Dysgonia rogenhoferi* (**Bohatsch, 1880)
Material: Chilia Veche, 20.VII.2021-1 sp., 24-28.VIII.2021 – 10 sp. (Figs. 3, 21).
An unexpected occurrence in the Romanian and European fauna, reported for the first time from Romania in 2020 (Csukás. Székely & Dincă, 2020), and from Ukraine in 2019 (Suchkov, Geryak 2019).
Finding over ten specimens in the summer of 2021 confirms the presence of this species in the Danube Delta. Vast areas with *Tamarix ramosissima* (the larval food plant) and the local climate probably allow the survival of the species (Fig. 26). The climatic conditions (including winter temperatures) from the Danube Delta are not very different from those in the northern Caspian Sea (where most records of *D. rogenhoferi* exist) to western Uzbekistan (Bekchanov, Bekchanova 2020).
Grammodes bifasciata (Petagna, 1787)
Material: Chilia Veche, 25.VIII-15.IX.2021-4sp., Gura Dobrogei, 27.VIII.2021-1sp., Limanu, 24.IX.2021-12sp. (Fig.4).
An invasive, tropical-subtropical species that reached south-eastern Romania over a decade ago. It was published as new for the country based on a photograph made on Grindul Chituc, on 23.VIII.2009 (Rákosy, Mihai 2011), although the first specimens from Romania were collected by István Juhász in August 2007 at Histria fortress. Over the last years it has become relatively frequent in eastern Dobrogea, from August to October. The specimens from Chilia Veche represent the first records from the Danube Delta. Recently, it has also entered Ukraine, crossing the Danube Delta (Y. Khalaim, pers. comm.).
Clytie syriaca (Bugnion, 1837)
Material: Chilia Veche, 20.VII-15.IX.2021- over 20 sp./ night (very common) (Fig.5).
Mediterranean element, widespread in the Balkans, Asia Minor, Cyprus and the Near East. In recent years it has become extremely common in the Danube Delta. Recently, it also entered Ukraine crossing the Danube Delta (Y. Khalaim, pers. comm.).
Catocala puerpera (Giorna, 1791)
Material: Tărlungeni, 13.VIII.2021 - 1♂ (Fig.6).
A West – Asian - Mediterranean element, known in Romania mostly from outside the Carpathians (southern Moldova, Muntenia, Dobrogea, Danube Delta). It is extremely rare and local in Transylvania (Rákosy 1996).

Fam. NOCTUIDAE Latreille, 1809

Periphanes delphinii (Linnaeus,1758)
Material: Codlea, 4.VII.2021- 4 sp. (leg. R. Görbe) (Fig.7).
A xerothermophilous species, associated with steppes. Its presence in south-eastern Transylvania is rather surprising, the species being known from the south of Romania, expecially from Dobrogea and the Danube Delta. It is extremely local and rare in Transylvania (Rákosy 1996).
Acontia candefacta (Hübner, [1831])
Material: Chilia Veche, 24.VIII.2021 - 2sp. (Fig.8).
An invasive species, originating from North America and subsequently introduced to southern Russia (Krasnodar) in order to limit the spread of *Ambrosia artemisiifolia* (an invasive plant). From southern Russia it has expanded west, reaching Romania in 2007-2008 (Székely *et al.* 2011). The current data represent the first record from the Danube Delta.
Mycteroplus puniceago (Boisduval, 1840)
Material: Chilia Veche, 24.VIII-15.IX.2021-12sp. (Fig.19).
A xerothermophilous species associated with steppes. It is a Ponto-Caspian element found from the Balkan Peninsula to northern Iran (Rákosy, 1996). In Romania it is known only from the eastern and south-eastern regions. In the Danube Delta it has been reported only from Letea, Periprava and C. A. Rosetti (Székely 2006).
Cucullia biornata Fischer v. Waldheim, 1840
Material: Enisala, 19.VII.2021 - 1♂ (Fig.9).
A trans-Palearctic species, distributed from the Black Sea coast to the Pacific (Ronkay & Ronkay, 2009). The populations from eastern Bulgaria and south-eastern Romania mark the western distribution limit of this species in Europe (Ronkay, Ronkay 1994).
Cucullia scopariae Dorfmeister, 1853
Material: Chilia Veche, 15.IX.2021 – 2♂ (leg. Levente Csukás) (Fig.10).
A xerothermophilous species typically found in steppes with *Artemisia*. An Eurasian element occurring from Central Europe to Japan. In Romania it is extremely rare and localized, with old data from Ineu (Arad), Galați, and Caraorman - Danube Delta (Rákosy 1996).
Episema korsakovi paenulata Christoph, 1885
Material: Limanu, 24.IX.2021– over 40 sp. (Figs. 17,22,28).
A xerothermophilous species associated with limestone steppes. It is distributed from the Balkan Peninsula to Central Asia (Kara-Kum desert). In Romania it was known only from Hagieni Forest, based on data prior to 1990 (Popescu-Gorj, Drăghia 1967; Rákosy, Székely 1996). However, at that site, the habitat of the species has been compromised due to an inadequate management in

the protected area that led to the steppe being overgrown by shrubs and trees. However, it seems that populations still survive outside the protected area. This subspecies is characterized by a white ground colour of all wings.

Staurophora celsia (Linnaeus,1758)

Material: Vârghișului Gorges (Cheile Vârghișului), 15.IX.2021 - 1♂. (Figs. 11, 23, 25).

An Eurasian element, typically found in central and northern Europe (not occurring in southern Europe). The species' range reaches Central Asia. This moth has been known in Romania based on a single specimen collected by Zoltán Izsák on 30.IX.1985 in Cheile Vârghișului (Rákosy & Izsák, 1988). The capture of a second specimen in 2021 confirms the presence of *S. celsia* in Romania. Cheile Vârghișului represent the only locality for this species in the country.

Meganephria bimaculosa (Linnaeus,1767)

Material: Canaraua Fetii, 25.IX.2021 - 1♂ (leg. Vlad Dincă), Babadag Forest, 14.X.2021- 1♂ (Fig.18).

A Ponto–Mediterranean element, known in Romania only based on few records from Banat, central and southern Transylvania, Moldova (Rákosy, 1996) and northern Muntenia (Dincă, 2005). The first specimens from Dobrogea were reported relatively recently from Esechioi Forest (Székely, 2016). Data from Babadag Forest represent the first record from northern Dobrogea.

Hecatera cappa (Hübner, 1809)

Material: Chilia Veche, 24.VIII-15.IX.2021-6 sp. (Fig.24).

A Holomediterranean element distributed from southern Europe to Iran. In Romania it is relatively frequent in Dobrogea. From the Danube Delta it was known only from Letea, Periprava and Sfântu-Gheorghe.

Agrotis obesa scytha Alphéraky, 1889

Material: Limanu, 24.IX.2021 - 4♂, 1♀, Canaraua Fetii, 25.IX.2021 - 1♂ (Figs.16, 28).

A xerothermophilous species typically found in limestone steppes. A west Asian-Mediterranean element, distributed from the western Balkan Peninsula to Central Asia. In Romania it was known only from southern Dobrogea (data prior to 1990) (Rákosy 1996). The data from Canaraua Fetii represent the first record from south-western Dobrogea.

Other rare species:

Erebidae, Subfam. Arctiinae:
Rhyparia purpurata (Linnaeus, 1758) – Codlea, 25-27.VI.2021 - 2 ♂.
Noctuidae: *Lamprotes c-aureum* (Knoch, 1781) - Cheile Vârghișului, 30.VI.2021 - 2sp. / Căpeni - Covasna County, 27. VII. 2021 - 1 ♂. *Simyra nervosa* ([Denis & Schiffermüller], 1775) – Căpeni - Covasna County, 27. VII. 2021 - 1 ♂.
Geometridae:
Apeira syringaria (Linnaeus, 1758) - Cheile Vârghișului, 30.VI.2021 – 1 ♂.

List of species collected and observed in CHILIA VECHE (Danube Delta)

The Danube Delta has been the subject of several studies on Lepidoptera, especially by Aurelian Popescu-Gorj in 1966-1990, as well as of a synthesis of faunistical data published more recently (Székely 2006). Nevertheless, several regions of the Danube Delta remain very little studied, an example being Chilia Veche, located in the northern part of the delta

The material was collected and observed between 26 – 29 June 2020, 19 – 22 July 2021, 24 – 28 August 2021 and 14-15 September 2021.

Abbreviations:
X = rare (2-5 sp. day/night)
XX = common (6-20 sp. day/night)
XXX = very common (20-100 sp. day/night)
♂ = male; ♀ = female; sp. = specimen

Suprafam. **COSSOIDEA**, Mosher, 1916

Fam. **COSSIDAE** Leach,[1815]
Zeuzera pyrina (Linnaeus, 1761) -X
Phragmataecia castaneae (Hübner, 1790) – XX

Suprafam. **PAPILIONOIDEA** Latreille, [1802]

Fam. **PAPILIONIDAE** Latreille, [1802]
Subfam. **Papilioninae** Latreille, [1802]
Iphiclides podalirius (Linnaeus, 1758)-XX
Papilio machaon (Linnaeus, 1758)-1 sp.
Fam. **HESPERIIDAE** Latreille, 1809
Subfam. **Pyrginae** Burmeister, 1878
Erynnis tages (Linnaeus, 1758) -X
Carcharodus alceae (Esper, 1793) -X
Subfam. **Heteropterinae** Aurivillius, 1925
Heteropterus morpheus (Pallas, 1771) - XX
Fam. **PIERIDAE** Duponchel, [1835]
Subfam. **Coliadinae** Swainson, 1827
Colias erate (Esper, 1805) - XX
Colias croceus (Fourcroy, 1785) - XX
Colias alfacariensis Ribbe, 1905 - XX
Subfam. **Pierinae** Duponchel, [1835]
Pieris brassicae (Linnaeus, 1758) - X
Pieris rapae (Linnaeus, 1758) - XX
Pieris napi (Linnaeus, 1758) - XX
Pontia edusa (Fabricius, 1777) - XXX
Fam. **LYCAENIDAE** [Leach] [1815]
Subfam. **Lycaeninae** [Leach] [1815]

Lycaena dispar rutilus (Werneburg, 1864) - XX
Lycaena thersamon (Esper, 1784) - X
Subfam. **Polyommatinae** Swainson, 1827
Cupido argiades (Pallas, 1771)- 1sp.
Plebejus argus (Linnaeus,1758) - XX
Aricia agestis ([Denis & Schiffermüller], 1775) - X
Polyommatus icarus (Rottemburg, 1775) - XX
Fam. **NYMPHALIDAE** Swainson, 1827
Subfam. **Heliconiinae** Swainson, 1827
Argynnis pandora ([Denis & Schiffermüller] 1775) - X
Issoria lathonia (Linnaeus, 1758) – XX
Subfam. **Apaturinae** Boisduval, 1840
Apatura metis Freyer, 1829 – XXX
Subfam. **Nymphalinae** Swainson, 1827
Vanessa atalanta (Linnaeus, 1758) - X
Vanessa cardui (Linnaeus, 1758) – XX
Subfam. **Satyrinae** Boisduval, [1833]
Coenonympha pamphilus (Linnaeus, 1758) – XX

Suprafam. **DREPANOIDEA** Boisduval, 1828

Fam. **DREPANIDAE** Meyrick, 1895
Cilix glaucata (Scopoli, 1763) – X
Cilix asiatica O. Bang Haas, 1907– X
Fam. **THYATIRIDAE** Smith, 1893
Thyatira batis Linnaeus, 1758– XX

Suprafam. BOMBYCOIDEA Latreille, [1803]

Fam. LASIOCAMPIDAE Harris, 1841
Odonestis pruni (Linnaeus, 1758) - XX
Gastropacha quercifolia (Linnaeus, 1758) - X
Gastropacha populifolia (Esper, 1783) – 1♂
Fam. SPHINGIDAE Latreille, [1802]
Subfam. **Sphinginae** Latreille, [1802]
Agrius convolvuli (Linnaeus, 1758) **–** X
Subfam. **Smerinthinae** Grote & Robinson, 1865
Laothoe populi (Linnaeus, 1758) **–** X
Mimas tiliae (Linnaeus, 1758) **–** XX
Smerinthus ocellata (Linnaeus, 1758) **–** X
Subfam. **Macroglossinae** Harris, 1839
Macroglossum stellatarum (Linnaeus, 1758) **–** XX
Deilephila elpenor (Linnaeus, 1758) - XX
Deilephila porcellus (Linnaeus, 1758) – XXX
Hyles hippophaes (Esper, 1793) -X
Hyles euphorbiae (Linnaeus,1758) - XX
Hyles livornica (Esper, 1780) – X
Hyles gallii (Rottemburg, 1775) 2 sp.

Suprafam. **GEOMETROIDEA** Leach, [1815]

Fam. **GEOMETRIDAE** Leach, [1815]
Subfam. **Geometrinae** Stephens, 1829
Tethidia smaragdaria (Fabricius, 1787) - X
Microloxia herbaria (Hübner, [1813]) – XX
Chlorissa cloraria (Hübner, 1813) – X
Phaiogramma etruscaria (Zeller, 1849) – X
Subfam. **Sterrhinae** Meyrick, 1892
Idaea muricata (Hufnagel, 1767) **–** X
Idaea aversata (Linnaeus, 1758) – XX
Rhodostrophia vibicaria (Clerck, 1759) – XX
Timandra comae Schmidt, 1931– XX
Subfam. **Larentiinae** Duponchel, 1845
Lythria purpuraria (Linnaeus, 1758) – XXX
Eupithecia centaureata ([Denis & Schiffermüller], 1775) - X
Eupithecia biornata Christoph, 1867– XX
Pelurga comitata (Linnaeus, 1758) – X
Subfam. **Ennominae** Duponchel, 1845
Heliomata glarearia ([Denis & Schiffermüller], 1775) - XXX
Isturgia murinaria ([Denis & Schiffermüller], 1775) – XXX
Isturgia arenacearia ([Denis & Schiffermüller], 1775) – XXX
Narraga tessularia kasyi Moucha & Povolny, 1957– XX
Neognopharmia stevenaria (Boisduval, 1840) – 1♂
Chiasmia clathrata (Linnaeus, 1758) - XX
Godonella aestimaria (Hübner, [1809]) – XXX
Eilicrinia cordiaria (Hübner, 1790) – XX
Eilicrinia trinotata Metzner, 1845 – X
Tephronia sepiaria (Hufnagel, 1767) – XX
Ourapteryx sambucaria (Linnaeus, 1758) - 1♂
It is an extremely rare species in the Danube Delta, known based on a single specimen from Letea Forest (Székely, 2006).
Synopsia sociaria (Hübner, 1799) – X
Peribatodes rhomboidaria ([Denis & Schiffermüller], 1775) – XX
Ascotis selenaria ([Denis & Schiffermüller], 1775) – XXX

Suprafam. **NOCTUOIDEA** Latreille, 1809

Fam. **NOTODONTIDAE** Stephens, 1829
Subfam. **Dicranurinae** Duponchel, [1845]
Furcula bifida (Brahm, 1787) – X
Furcula furcula forficula – XX Fischer v. Waldheim, 1820
Stauropus fagi (Linnaeus, 1758) **–** X
Subfam. **Notodontinae** Stephens, 1829
Notodonta ziczac (Linnaeus, 1758) **–** X
Pheosia tremula (Clerck, 1759) **–** 1♀
Pterostoma palpina (Clerck, 1759) **–** XX
Spatalia argentina ([Denis & Schiffermüller], 1775) – XXX
Gluphisia crenata (Esper, 1785) **–** 1♀
Subfam. **Phalerinae** Butler, 1886
Phalera bucephala (Linnaeus, 1758) **–** 1♀
Subfam**. Pygaerinae** Duponchel, [1845]
Clostera curtula (Linnaeus, 1758) **–** XX
Fam**. EREBIDAE** (Leach, [1815])
Subfam **Rivulinae** Grote, 1895

Rivula sericealis (Scopoli, 1763) **–** XX
Subfam. **Eublemminae** Forbes, 1954
Eublemma purpurina ([Denis & Schiffermüller], 1775) **–** X
Eublemma amoena (Hübner, [1803]) – XX
Subfam. **Lymantriinae** Hampson, [1893]
Lymantria dispar Linnaeus, 1758 - XXX
Laelia coenosa (Hübner, 1808) - XXX
Euproctis similis (Fuessly, 1767) - XXX
Subfam. **Arctiinae** Leach, [1815],
Phragmatobia fuliginosa (Linnaeus, 1758) - X
Spilosoma urticae (Esper, 1789) - 1♂
Spilosoma lubricipeda (Linnaeus, 1758) – XX
Hyphantria cunea (Drury, 1773) **–** X
Subfam. **Lithosiinae** Billberg, 1820
Pelosia muscerda (Hufnagel, 1766) **–** XX
Pelosia obtusa (Herrich-Schäffer, [1847]) - X
Eilema caniola (Hübner, 1808) - X
Eilema complana balcanica Daniel, 1939 – XX
Subfam. **Ctenuchinae** Kirby, 1837
Dysauxes famula (Freyer, 1836) – XXX
Subfam. **Catocalinae** Boisduval, [1828]
Lygephila craccae ([Denis & Schiffermüller], 1775) - XX
Dysgonia algira (Linnaeus, 1767) – XX
Dysgonia rogenhoferi **(**Bohatsch, 1880) – X
Grammodes stolida (Fabricius, 1775) - XXX
Grammodes bifasciata (Petagna, 1787) – X
Clytie syriaca (Bugnion, 1837) - XXX
Catocala elocata (Esper,[1787]) – X
Catocala hymenaea ([Denis & Schiffermüller], 1775) – XX
Subfam. **Nolinae** Bruand, 1846
Nycteola asiatica (Krulikovsky, 1904) – 1♂
Earias clorana (Linnaeus, 1758) – XX
Earias vernana (Fabricius, 1787) – XX
Fam. **NOCTUIDAE** Latreille, 1809
Subfam. **Plusiinae** Boisduval, [1828]
Diachrysia chrysitis (Linnaeus,1758) - X
Diachysia nadeja (Oberthür, 1880) – 1♂
Autographa gamma (Linnaeus,1758) - XX
Mcdunnoughia confusa (Stephens, 1850) - XX
Chrysodeixix chalcites (Esper, 1789) **-** 1♂
Plusia festucae (Linnaeus,1758) – X
Subfam. **Acontiinae** Guenée, 1841
Aedia funesta (Esper, 1766) – X
Aedia leucomelas (Linnaeus, 1758) - XXX
Acontia lucida (Hufnagel, 1766) - XXX
Acontia (Emmelia) trabealis (Scopoli, 1763) - XXX
Acontia candefacta (Hübner, [1831]) – 2 sp.
Subfam. **Acronictinae** Heinemann, 1859
Craniophora ligustri ([Denis & Schiffermüller], 1775) – XX
Acronicta rumicis (Linnaeus, 1758) – XX
Acronicta psi (Linnaeus, 1758) – X
Acronicta megacephala ([Denis & Schiffermüller], 1775) – XX
Simyra albovenosa (Goeze, 1781) – X
Subfam. **Metoponinae** Herrich-Schäffer, [1851]
Tyta luctuosa ([Denis & Schiffermüller], 1775) - XXX
Mycteroplus puniceago (Boisduval, 1840) – XX
Subfam. **Cucullinae**
Cucullia absinthii (Linnaeus, 1761) – X
Cucullia scopariae Dorfmeister, 1853 – 2 sp.
Subfam. **Oncocnemidinae** Forbes & Franclemont, 1954
Calophasia opalina (Esper, [1794]) - X
Subfam. **Heliothinae** Boisduval, [1828]
Periphanes delphinii (Linnaeus, 1758) – XX
Protoschinia scutosa ([Denis & Schiffermüller], 1775) - XX
Heliothis viriplaca (Hufnagel, 1766) - XXX
Helicoverpa armigera (Hübner, 1808) – XXX
Subfam. **Bryophilinae** Guenée, 1852
Cryphia algae (Fabricius, 1775) - XX
Subfam. **Xyleninae** Guenée, 1837
Pseudeustrotia candidula ([Denis & Schiffermüller], 1775) - XX
Spodoptera exigua (Hübner, 1808) - XX
Caradrina clavipalpis (Scopoli, 1763) - XX
Caradrina kadenii Freyer,1836 – 2 sp.
Hoplodrina octogenaria (Goeze, 1781) – XX
Chilodes maritima (Tauscher, 1806) - X
Nonagria typhae (Thunberg, 1784) - XX
Subfam. **Hadeninae** Guenée, 1837
Hecatera dysodea ([Denis & Schiffermüller], 1775) – X
Mythimna turca (Linnaeus, 1761) - XX
Mythimna l-album (Linnaeus, 1767) - X
Mythimna vitellina (Hübner, [1808]) - XXX
Myhimna pudorina ([Denis & Schiffermüller], 1775) – XX
Leucania obsoleta (Hübner, [1803]) - X
Pseudaletia unipuncta (Haworth, [1809]) - XX
Mamestra brassicae (Linnaeus, 1758) - X
Lacanobia oleracea (Linnaeus, 1758) - XXX
Lacanobia splendens (Hübner, [1808]) - X
Lacanobia blenna (Hübner, [1824]) - XXX
Lacanobia praedita (Hübner, 1813) - 6♂♂
Hecatera cappa (Hübner, 1809) - 5♂
Hadula trifolii (Hufnagel, 1766) - XXX
Hadula stigmosa (Christoph, 1887) – XX
Cardepia hartigi Parenzan, 1981– XX
Subfam. **Noctuinae** Latreille, 1809
Euxoa segnilis (Duponchel, 1836) - 5♂♂, 2♀♀
Euxoa aquilina ([Denis & Schiffermüller], 1775) – X
Xestia c-nigrum (Linnaeus, 1758) - XXX

Agrotis segetum ([Denis & Schiffermüller],1775) - XXX
Agrotis exclamationis (Linnaeus, 1758) - XX
Agrotis ipsilon (Hufnagel, 1766) - XX
Agrotis bigramma (Esper, 1790) - XXX
Agrotis vestigialis (Hufnagel, 1766) - XX

Microlepidoptera:

Fam. Crambidae Latreille, 1810
Cydalima perspectalis (Walker, 1859) - XXX
Nomophila noctuella ([Denis & Schiffermüller], 1775) – XXX
Scirpophaga praelata (Scopoli, 1763) – XXX
Chilo phragmitella (Hübner, 1805) – XX
Cataclysta lemnata (Linnaeus, 1758) – XXX
Fam. Pyralidae Latreille, 1809
Galleria mellonella (Linnaeus, 1758) – XX
Lamoria anella ([Denis & Schiffermüller], 1775) – X
Ostrinia palustralis (Hübner, 1796) – 2 sp.
Ostrinia nubilalis (Hübner, 1796) – XX
Palpita unionalis (Hübner, 1796) – XX
Fam. Tortricidae Latreille, 1803
Eugnosta lathoniana (Hübner, 1800) – XX

Conclusions

Currently, there is a considerable interest regarding various measures for the protection of lepidopterans and of insects in general. Daily, there are alarmist news about the disappearance and decline of insects. Such news are partially true, as insects are clearly declining in urban areas.

The causes are multiple (light pollution, vegetation removal, converting natural areas into asphalt and concrete etc.).

On the other hand, at least in Romania, the management of many protected areas is not adequate. The decline of entomofauna is noticeable in numerous protected areas (Natura 2000 sites), especially after 2010.

The approximately two decades in which man has not intervened in these protected areas has catastrophic effects.

Many open areas (meadows, steppes) have been overgrown by shrubs and trees and the plantations of black locust (*Robinia pseudacacia*) and pine trees (especially in Dobrogea) played a major role in the decline of Lepidoptera fauna.

One of the best examples is Hagieni Forest (south-eastern Dobrogea) which, during 1960-1980, harboured one of the richest Lepidoptera fauna in Romania. Nowadays, because the steppes in the reserve have almost vanished (Figs. 31, 32), the species of Lepidoptera associated with such habitats have also disappeared.

A similar situation can be found in other protected areas, for example in Canaraua Fetii (south-western Dobrogea) (Fig. 29), Tișiței Gorges in Vrancei Mountains, Mount Tâmpa near Brașov etc.

In conclusion, protecting the Lepidoptera fauna does not necessarily mean leaving their habitats untouched.

Even if the steppes of Hagieni forest would be cleared of shrubs and trees, the recovery of the characteristic flora and fauna would probably need many decades.

Fortunately, it appears that many rare and faunistically valuable species still survive outside protected areas, as exemplified by this study.

Acknowledgements

I am grateful to all the collaborators who helped me perform this research: Robert Görbe, Levente Csukás, Ödön Domokos, Mircea Franc, Ion Militaru, Gyula Keresztény, Miklós Pál, István Urák (Romania), Vlad Eugen Dincă (Finland / Romania) and István Juhász (Hungary). Special thanks to Yevhenii Khalaim (Ukraine) for new data regarding certain species of macrolepidoptera recently reported from Ukraine

..

REFFERENCES

Bekchanov, Bekchanova 2020 — Bekchanov Khudaybergan Urinovich, Bekchanova Mohira Khudaybergan qizi, In: *Noctuid moths (Lepidoptera, Noctuoidea) of the southern part of Karakalpakstan (W-Uzbekistan).* In: *Epra - International Journal of Research and Development*, 5(4), p. 114–118.

Csukás *et al.* 2020 — Csukás Levente, Székely Levente, Dincă Vlad Eugen, *Dysgonia rogenhoferi (Bohatsch, 1880) (Lepidoptera, Erebidae) in the Danube Delta (Romania) westernmost record in Europe,* In: *Entomologica romanica*, 24, p. 33–35.

Dincă 2005 — Dincă Vlad Eugen, *New data regarding several Lepidoptera species little known in Romania*. In: *Studia Universitatis Babeş-Bolyai*, Biologia 50(1), p. 11–16.

Dincă et al. 2009 — Dincă Vlad Eugen, Cuvelier Sylvain, Székely Levente, Vila Roger, *New data on the Rhopalocera (Lepidoptera) of Dobrogea (south- eastern Romania*), In: *Phegea* 37 (1), p. 1–21.

Popescu-Gorj, Drăghia 1967 — Popescu-Gorj Aurelian, Drăghia Ion, *Ord. Lepidoptera. – In: Scobiola-Palade, X. & Popescu-Gorj, A. L'Entomofaune des forêts du sud de Dobroudja.* In: Travaux du Musée d'Histoire naturelle "Grigore Antipa", Bucharest 7, p. 181–212.

Rákosy 1996 — Rákosy László, *Die Noctuiden Rumäniens.* Stapfhia, Linz (1996), 648 pp.

Rákosy *et al.* 2003 — Rákosy László, Goia Marin, Kovács Zoltán, *Catalogul Lepidopterelor României / Verzeichnis der Schmetterlinge Rumäniens.* Societatea Lepidopterologică Română, Cluj-Napoca (2003), 446 pp.

Rákosy, Izsák 1988 — Rákosy László, Izsák Zoltán, *Staurophora celsia* Linne, în fauna R. S. România (Lepidoptera, Noctuidae). În: *A IV-a conf. naţ. ent*., Cluj-Napoca, 29-31 mai 1986: 167-169.

Rákosy, Mihai 2011 — Rákosy László, Mihai Cristian, *Grammodes bifasciata (Petagna, 1787) şi Acontia (Emmelia) candefacta (Hübner, [1831]) (Lepidoptera, Noctuidae) specii nou pătrunse în fauna României.* In: *Buletin de Informare Entomologică*, Cluj-Napoca (2011), 22, p. 11–13.

Rákosy, Székely 1996 — Rákosy László, Székely Levente, *Macrolepidopterele din sudul Dobrogei.* In: *Entomologica Romanica* 1, p. 17– 62

Rákosy, Wieser 2000 — Rákosy László, Wieser Christian, *Das Măcin Gebirge (Rumänien, Nord-Dobrudscha). Ein durch hohe Biodiversität gekennzeichnetes Refugium reliktärer Arten. Fauna und Flora, unter besonderer Berücksichtigung der Schmetterlinge und der Vegetationsverhältnisse.* In: *Carinthia II, Jahrgang*, 190/110, p. 1–115.

Ronkay, Ronkay 2006 — Ronkay Gábor, Ronkay László, *A Magyarországi csuklyás-, szegfü- és földibaglyok atlasza*. In: *Natura Somogyiensis*, Kaposvár (2006), 416 pp.

Ronkay, Ronkay 2009 — Ronkay Gábor, Ronkay László, *Cucullinae I. A taxonomic Atlas of the Eurasian and North African Noctuoidea. Volume 2.* In: *The Witt Catalogue. Heterocera Press*, Budapest (2009), 365 pp.

Stănescu *et al.* 2021 — Stănescu Mihai, Vizauer Tibor Csaba, Iorgu Ionuț Ștefan, Iorgu Elena, *New data on the distribution of the threatened Scarce fritillary, Euphydryas maturna (Lepidoptera: Nymphalidae), in southern Romania,* In: *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* 64 (1), p. 95–100 (2021). doi: 10.3897/travaux. 64. e70022

Suchkov, Geryak 2019 — Suchkov I. Serghei, Geryak M. Yurii, *To the distribution of noctuid moths (Lepidoptera: Noctuoidea) in the North-Western Pryazovia and adjacent regions of the steppe zone of Ukraine.* In: *The Kharkov Entomological Society Gazette* (Известия Харьковского энтомологического общества) (2019), 27(2), p. 23–33.

Székely 2006 — Székely Levente, *Lepidopterele (Fluturii) din Delta Dunării.* — Disz-Tipo, Săcele, 151 p

Székely 2011 — Székely Levente, *Moths of Romania 2 Fluturi de noapte din România 2 - Geometridae – 1- Archiearinae, Ennominae, Alsophilinae, Orthostixinae, Geometrinae.* Disz – Tipo, Săcele, 196 p.

Székely 2016 — Székely Levente, *New and Rare Macrolepidoptera (Insecta) from Romanian Dobrogea (South-East Romania)* In: *Travaux du Muséum National d'Histoire Naturelle «Grigore Antipa»*, Bucharest (2016), 59 (2), p. 195–230.

Székely *et al*. 2011 — Székely Levente, Dincă Vlad Eugen, Juhász István, *Macrolepidoptera from the steppes of Dobrogea (south-eastern Romania).* In: *Phegea* (2011), 39, p. 85-106.

LIST OF ILLUSTRATIONS

Fig. 1 - *Heteropterus morpheus* (ventral) - Chilia Veche, 25.VIII.2021
Fig. 2 - *Lasiocampa quercus* - Gura Dobrogei, 27.VIII.2021
Fig. 3 - *Dysgonia rogenhoferi* - Chilia Veche, 24.VIII.2021
Fig. 4 - *Grammodes bifasciata* - Chilia Veche, 25.VIII.2021
Fig. 5 - *Clytie syriaca* - Chilia Veche, 25.VIII.2021
Fig. 6 - *Catocala puerpera* - Tărlungeni, 13.VIII.2021
Fig. 7 - *Periphanes delphinii* - Codlea, 4.VII.2021
Fig. 8 - *Acontia candefacta* - Chilia Veche, 25.VIII.2021
Fig. 9 - *Cucullia biornata* - Enisala, 19.VII.2021
Fig. 10 - *Cucullia scopariae* - Chilia Veche, 15.IX.2021 (Photo: L. Csukás)
Fig. 11 - *Staurophora celsia* - Vârghișului Gorges, 15.IX.2021
Fig. 12 - *Odontognophos dumetata* - Gura Dobrogei, 23.IX.2020
Fig. 13 - *Selidosema plumaria* - Gura Dobrogei, 27.VIII.2021
Fig. 14 - *Eupithecia biornata* - Chilia Veche, 25.VIII.2021
Fig. 15 - *Triodia amasinus* - Agigea, 22.IX.2021
Fig. 16 - *Agrotis obesa scytha* - Canaraua Fetii, 25.IX.2021
Fig. 17 - *Episema korsakovi paenulata* - Limanu, 24.IX.2021
Fig. 18 – *Meganephria bimaculosa* – Babadag Forest, 14.X.2021
Fig. 19 - *Mycteroplus puniceago* – Chilia Veche, 25.VIII.2021
Fig. 20 - *Apatura metis* - Chilia Veche, 25.VIII.2021
Fig. 21 - *Dysgonia rogenhoferi* - Chilia Veche, 25.VIII.2021
Fig. 22 - *Episema korsakovi paenulata* - Limanu, 24.IX.2021
Fig. 23 - *Staurophora celsia* - Vârghișului Gorges, 15.IX.2021
Fig. 24 - *Hecatera cappa* - Chilia Veche, 25.VIII.2021
Fig. 25 - Habitat of *Staurophora celsia* in Vârghișului Gorges, 15.IX.2021
Fig. 26 - Areas covered by *Tamarix ramosissima* at Chilia Veche, the habitat of *Dysgonia rogenhoferi*, 20.VII.2021

Fig. 27 - Habitat of *Apatura metis* near Chilia Veche, 25.VIII.2021
Fig. 28 - Habitat of *Episema korsakovi* and *Agrotis obesa* near Limanu, 25.IX.2021
Fig. 29 – Meadows destroyed by expanding woody vegetation and shrubs at Canaraua Fetii, 26.IX.2021
Fig. 30 – Habitat of *Triodia amasinus* near Agigea, 22.IX.2021
Fig. 31 - Meadow at Hagieni Forest in August 1980
Fig. 32 - The same meadow at Hagieni Forest in July 2019
Photos: 1 – 9; 11 - 32 - L. Székely; 10 – L. Csukás

LISTA ILUSTRAȚIILOR

Fig. 1 – *Heteropterus morpheus* (ventral) – Chilia Veche, 25.VIII.2021
Fig. 2 – *Lasiocampa quercus* – Gura Dobrogei, 27.VIII.2021
Fig. 3 – *Dysgonia rogenhoferi* – Chilia Veche, 24.VIII.2021
Fig. 4 – *Grammodes bifasciata* – Chilia Veche, 25.VIII.2021
Fig. 5 – *Clytie syriaca* – Chilia Veche, 25.VIII.2021
Fig. 6 – *Catocala puerpera* – Tărlungeni, 13.VIII.2021
Fig. 7 – *Periphanes delphini* – Codlea, 4.VII.2021
Fig. 8 – *Acontia candefacta* – Chilia Veche, 25.VIII.2021
Fig. 9 – *Cucullia biornata* – Enisala, 19.VII.2021
Fig. 10 – *Cucullia scopariae* – Chilia Veche, 15.IX.2021 (Foto: L. Csukás)
Fig. 11 – *Staurophora celsia* – Cheile Vârghișului, 15.IX.2021
Fig. 12 – *Odontognophos dumetata* – Gura Dobrogei, 23.IX.2020
Fig. 13 – *Selidosema plumaria* – Gura Dobrogei, 27.VIII.2021
Fig. 14 – *Eupithecia biornata* – Chilia Veche, 25.VIII.2021
Fig. 15 – *Triodia amasinus* – Agigea, 22.IX.2021
Fig. 16 – *Agrotis obesa scytha* – Canaraua Fetii, 25.IX.2021
Fig. 17 – *Episema korsakovi paenulata* – Limanu, 24.IX.2021
Fig. 18 – *Meganephria bimaculosa* – Pădurea Babadag, 14.X.2021
Fig. 19 – *Mycteroplus puniceago* – Chilia Veche, 25.VIII.2021
Fig. 20 – *Apatura metis* – Chilia Veche, 25.VIII.2021
Fig. 21 – *Dysgonia rogenhoferi* – Chilia Veche, 25.VIII.2021
Fig. 22 – *Episema korsakovi paenulata* – Limanu, 24.IX.2021
Fig. 23 – *Staurophora celsia* – Cheile Vârghișului, 15.IX.2021
Fig. 24 – *Hecatera cappa* – Chilia Veche, 25.VIII.2021
Fig. 25 – Habitat de *Staurophora celsia* în Cheile Vârghișului, 15.IX.2021
Fig. 26 – Zone acoperite de *Tamarix ramosissima* la Chilia Veche, habitatul lui *Dysgonia rogenhoferi,* 20.VII.2021
Fig. 27 – Habitat de *Apatura metis* la Chilia Veche, 25.VIII.2021
Fig. 28 – Habitatul lui *Episema korsakovi* și *Agrotis obesa* la Limanu, 25.IX.2021
Fig. 29 – Pajiști distruse prin invadarea vegetației lemnoase și tufărișurilor la Canaraua Fetii, 26.IX.2021
Fig. 30 – Habitatul lui *Triodia amasinus* la Agigea, 22.IX.2021
Fig. 31 – Pajiște în Pădurea Hagieni în august 1980
Fig. 32 – Aceeași pajiște în Pădurea Hagieni în iulie 2019
Fotografii: 1 – 9; 11 - 32 - L. Székely; 10 – L. Csukás


1


2


3


4


5


6


7


8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

CHANGES IN THE ROMANIAN LEPIDOPTERA FAUNA BETWEEN THE 19th AND 21st CENTURIES, NATURAL AND ANTHROPOGENIC CAUSES

Levente SZÉKELY

Abstract*. The article is a synopsis of the changes in the Romanian Lepidoptera fauna between the 19th and 21st centuries. Faunistic studies are as old as taxonomy, approximately 250 years. Because the first data on the Lepidoptera fauna of the current territory of Romania were published in the mid 19th century, the faunistic structure prior to the 19th century can only be assumed. We tried to identify the natural and anthropogenic factors that have caused these changes. In the 19th century, because of the vast forested areas and wetter climate, many species that today are found only in hilly and mountainous areas lived in lowland, disappearing from there at the end of the 19th century, such as Parnassius apollo, Colias myrmidone, Colias chrysotheme, Lycaena helle, Lycaena hippothoe, Lycaena alciphron, Limenitis camilla, Argynnis laodice, Erebia aethiops, Erebia medusa, Hyponephele lycaon, Euphydryas aurinia, Melitaea diamina, Pyrgus alveus, Hemaris fuciformis, Callimorpha dominula, Lemonia dumi, Euthrix potatoria, Penthophera morio etc. By the end of the 19th century, more species had disappeared from the Romanian fauna than in the 20th century, for example among butterflies: Colias palaeno, Agriades optilete, Aricia anteros, Polygonia egea, Kirinia climene. In the 20th century, especially towards the end of the century, a very strong decline of the Lepidoptera fauna has taken place, primarily in anthropic areas, which included much of the country. Causes of these changes are, on one hand, natural: changes in climate, short-term weather anomalies, species range changes (contraction and expansion), and population-level causes, such as genetic erosion. On the other hand, there have been anthropogenic factors, such as: light pollution, accelerated urbanization, major changes in agriculture, forestry and land use, and penetration of alien species. The decline in species numbers is questionable, considering that in the last 20 years have been reported more than 100 new species for Romania and several species suspected to be extinct were rediscovered after 50 or 100 years. This has certainly been facilitated by more modern methods of investigation, which were not available before year 2000. Species that certainly disappeared from the Romanian fauna in the 20th century can be considered Saturnia spini, Polyommatus damon and Parnassius apollo. Currently, the species that are widely distributed in the country are very common, with a high capacity of adapting to the altered environment. The major threats for the 21st century involve weather anomalies, massive urbanization, light pollution, as well as the natural and anthropogenic afforestation of grasslands (primarily in protected areas*
Keywords*: Lepidoptera, Romania, faunal changes, 19th-21st centuries, natural causes, anthropogenic causes.*

Rezumat. *Articolul este o prezentare în ordine cronologică a modificărilor intervenite în fauna de lepidoptere de pe teritoriul României între secolele XIX-XXI. Studiile faunistice au aceeaşi vârstă cu taxonomia, de aproximativ 250 de ani. Cum primele date referitoare la fauna de lepidoptere de pe teritoriul actual al României sunt publicate pe la mijlocul secolului al XIX-lea, posibila structură a faunei anterior secolului al XIX-lea se poate numai presupune. Am încercat stabilirea factorilor de mediu naturali şi antropici care au cauzat aceste modificări. În secolul al XIX-lea, datorită întinselor zone împădurite şi a climatului mai umed, multe specii care azi se întâlnesc numai în zonele colinare şi montane, trăiau în zone de câmpie, dispărând de acolo pe la sfârşitul secolului al XIX-lea, ca Parnassius apollo, Colias myrmidone, Colias chrysotheme, Lycaena helle, Lycaena hippothoe, Lycaena alciphron, Limenitis camilla, Argynnis laodice, Erebia aethiops, Erebia medusa, Hyponephele lycaon, Euphydryas aurinia, Melitaea diamina, Pyrgus alveus, Hemaris fuciformis, Callimorpha dominula, Lemonia dumi, Euthrix potatoria, Penthophera morio, etc. Până la sfârşitul secolului al XIX-lea, dispar din fauna României mai multe specii decât în secolul al XX-lea, de exemplu dintre fluturii diurni: Colias palaeno, Agriades optilete, Aricia anteros, Polygonia egea, Kirinia climene. În secolul al XX-lea, mai ales spre sfârşitul acestui secol, s-a produs un regres cantitativ uriaş al faunei, în primul rând în zonele antropizate, care au cuprins mare parte din ţară. Cauzele producerii acestor schimbări sunt pe de o parte naturale: schimbările climatice, anomaliile meteorologice pe termen scurt, modificările de areal (regresul şi expansiunea), şi cauze intrapopulaţionale, ca eroziunea sau sărăcirea genetică, şi pe de altă parte antropice, provocate de om, precum: poluarea luminoasă, urbanizarea continuă şi accelerată, modificările majore în agricultură, silvicultură şi în*

utilizarea terenurilor, precum și pătrunderea speciilor alohtone. Regresul speciilor este discutabil, ținând cont că în ultimii 20 de ani au fost semnalate peste 100 de specii noi pentru fauna României, și multe specii considerate extincte au fost regăsite după 50 sau 100 de ani. Bineînțeles aici au contribuit și metodele moderne de investigații, care nu erau accesibile înainte de anul 2000. Specii sigur dispărute din fauna României în secolul al XX-lea, le putem considera pe Saturnia spini, Polyommatus damon și Parnassius apollo. În prezent speciile întâlnite în mare parte din țară sunt cele foarte comune, cu o capacitate de adaptare ridicată față de mediul înconjurător alterat. Amenințările majore pentru secolul al XXI-lea sunt: accentuarea anomaliilor meteorologice, urbanizarea masivă, poluarea luminoasă, și împădurirea naturală și antropogenă a pajiștilor (în primul rând în zonele protejate).
***Cuvinte cheie**: Lepidoptera, Romania, modificări ale faunei, secolele 19-21, cauze naturale, cauze antropogene.*

Introduction

The article is an attempt to demonstrate the speed with which changes in Lepidoptera fauna (but also in the entomofauna in general) have taken and are taking place on Romania's territory. Questions are raised about the causes of these changes, how many of them were determined by human activity, and how many are natural phenomena that have occurred and are occurring without human intervention.

Today we are living in times when alarming news and warnings about the disappearance of Lepidoptera species, the decline of populations and the destruction of their habitats are being released daily. It has become a fashion to alarm the public in this regard, cultivating the idea that people should no longer touch insects or their habitats. Even if these measures are intended to protect them, the effects can often be negative, the protective measures causing them to disappear from their habitat in a shorter or longer time.

During a period of over 45 years, when I observed and studied the Lepidoptera fauna of Romania, I noticed numerous changes in certain regions of the country and based on the historical data of over 200 years of lepidopterology in Romania, I try to demonstrate that changes have occurred permanently, even when the anthropic pressure was much lower than at present.

Changes are closely related to the human intervention on nature, but many are also natural phenomena, which are related to climate factors and population dynamics of different species.

Material and methods

The paper is a chronology of the changes in the Romanian Lepidoptera fauna from the 19th century to present and is based on historical data published in the past, but also on personal observations since 1970.

Therefore, many personal opinions expressed may be questionable.

The structure of Lepidoptera populations varies considerably throughout the distribution range in most species. Of course, there are exceptions, first of all regarding very common species, adapted to all conditions in natural and anthropic environments. Major changes in species' ranges following the last glaciation continue today. Three phenomena determine the modification of the species' geographic ranges: population, depopulation, and repopulation. Depopulation is characteristic of regressive species, and population occurs in expansive species. A species is regressive or expansive if it visibly changes its range within a few years, usually a decade (Rákosy 1999). In a faunistic work done in a short time, we can say about a species that is common or rare. However, by making long observations in a certain geographic area we will see that a common species can become very rare, or a rare species can become very common.

Consequently, the populations of many species of Lepidoptera are unstable, and these instabilities are determined by a number of natural and anthropogenic factors in their environment. Sometimes a population can survive in such a small number of individuals that it does not seem to exist. Of course, in any geographic area, many existing species may disappear, and new species may appear even in short intervals of decades. There are dozens of species of butterflies that were common 30-40 years ago, but today they are very rare or extinct in certain regions. Others, back then, were rare, today they are common.

These changes are determined by the high dispersal capacity of different species of Lepidoptera, and occur without human intervention on nature, but can be influenced by the human factor. In the case of lepidopterans,

* * Independent researcher, Braşov, Romania.
levi.szekely@gmail.com

given their generally good flight capabilities, the changes in distribution can be very rapid, sometimes a decade or a few years are sufficient for visible changes. In the case of several species, these changes show a certain cyclicality, after periods of visible expansion the period of regression appears, or conversely, after the period of regression until the threshold of extinction, expansion may occur.

Results and discussion

Possible structure of the Lepidoptera fauna in Romania before 1800

Lepidopterology and entomology in general, as they are understood today, can be considered sciences from the mid-18th century. Knowledge of the Lepidoptera fauna in Europe is about the same age as taxonomy, slightly over 250 years old. As the first data on Lepidoptera fauna in the present territory of Romania are published in the mid-19th century, the composition of the Lepidoptera fauna prior to the 19th century can only be assumed. But starting from the first published data, it can be admitted that it was quite different from today's, not in species, which were largely the same as those at present, but especially in their spread throughout the country, both horizontally and vertically. First, it appears that the forest species (arboreal) had a much greater spread than at present. This was favoured by the more humid climate, which was also colder due to the Little Ice Age. The wide forested regions, especially in the plains, had a quite different Lepidoptera fauna, and certainly many species once present in the plain forests, today are widespread only in mountainous and hilly areas.

Based on historical data, a possible Lepidoptera fauna can be outlined, at least in the late middleAges (18th century). 2000 years ago, over 75% (18 million hectares) of the Romanian territory was covered by forests, and almost 50% (12 million hectares) in the late Middle Ages (15th-17th centuries) (Giurescu, 1976). The data are sufficient to show that the climate was more humid, due to the presence of large, forested areas. 15000-10000 years ago, in the Late Glacial Interstadial, the forests on the territory of Romania were composed predominantly of pines, present both in the plains and in the mountains, with islands of spruce, larch, birch and willow, corresponding to a colder climate. This was followed by the spruce phase with mixed oak and hazelnut trees (9000-5000 years ago), the hornbeam spruce phase (5000-2700 years), and the spruce, fir and beech phase (2700-present day). In the change of the predominantly wild structure of the territory, besides the human activity, a significant share had the herbivores, like the saiga antelope, the wild horse, the European bison, and the aurochs, which formed flocks of tens of thousands of individuals (Rákosy 2011). The natural steppes were present in the south and east of Dobrogea, south of Muntenia, and in the east of Moldova-Basarabia. Most of the steppe meadows are formed on former man-cleared forests, used as pastures and meadows, hence the name of "secondary steppes" (Rákosy 2011). The changes in the large mammals' fauna, which are recorded in the historical data, hint that the Lepidoptera fauna was different as well. Since between the 15th and 18th centuries, there were present in Romania mammals that are long extinct, such as the saiga antelope (*Saiga tatarica*), the wild horse (*Equus ferus*) and the aurochs (*Bos primigenius*), we must also admit that changes may have also occurred in the entomofauna.

First and foremost was the landscape, well characterized by the European chroniclers of those times who described the places as follows: "Moldova is a mountainous and forested country, difficult to cross" - Blaise de Vigenere (1573), "Muntenia (Romanian Plain) has extensive plains and endless forests"- Bartolomeo Locadello (1641), "Transylvania has large forests with European bison, elk and deer of huge size"- Giovanni Antonio Magini (1598) (Giurescu 1976). Even on the territory of Bucharest there were large forests, like the Codrii Cotrocenilor, in which thieves hid, to which Șerban Cantacuzino refers in 1678 (Giurescu 1976). 300-400 years ago, the forested areas in the North of Dobrogea were larger and were linked to the forests of the Romanian Plain (Codrii Vlăsiei) that stretched to the Carpathians. Certainly, in northern Dobrogea in the 19th century the weather conditions were different, and the larger areas covered by forests were able to maintain locally damper microclimate conditions, where several species that are widespread today only in the mountains and hills still lived there (Rákosy, Wieser 2000).

Thus, the species reported in Dobrogea in the middle and end of the 19th century, and the beginning of the 20th century (Mann 1866; Fleck 1899; Fiebig 1927), which today do not live there, were probably widespread in the plains, for example: *Colias myrmidone, Colias chrysotheme, Lycaena hippothoe, Lycaena alciphron, Limenitis camilla, Argynnis laodice, Erebia aethiops,*

Erebia medusa, Hyponephele lycaon, Euphydryas aurinia, Melitaea diamina, Pyrgus alveus, Hemaris fuciformis, Callimorpha dominula, Lemonia dumi, Penthophera morio etc. Considering that during the last 200 years almost 80% of the wetlands on the Romanian territory have been destroyed and dried up, and taking into account the climatic conditions of that time, it is very possible that the cold-adapted species still reported by Hormuzaki at the end of the 19th century from the north of the country, could have been more widespread, for example: *Colias palaeno, Agriades optilete, Trichosea ludifica* (Hormuzaki, 1894, 1902, 1904; Salay, 1910). We can also hypothesize the much larger presence in the plains of species which at the turn of the 19th and 20th centuries were still surviving there, such as *Lycaena helle, Lycaena hippothoe, Apatura iris, Neptis rivularis, Euthrix potatoria*. For example, they were still present during the period 1880-1920 in the Romanian Plain (Popescu-Gorj 1964). The presence of *Parnassius apollo* in Dobrogea, reported by Mann from Ciucurova in 1865, cannot be totally excluded too. It is not unconceivable that *P. apollo* may have been widespread in the Dobrogea Mountains and in the Southern Carpathians, as well as in hilly areas during that period.

The structure and dynamics of the Romanian Lepidoptera fauna in the 19th century

In the 19th century the foundations of research on the Lepidoptera fauna in Romania were laid. Even though most of the studies were limited to certain regions, by the end of the 19th century, the faunistic list of Romania was already largely outlined. During the period 1800-1900, over 100 papers on the fauna of lepidopterans were published, most of them on the fauna of Banat and Transylvania (Rákosy 2008). From a historical point of view, the south of Banat was considered in the 19th century an "entomological paradise", especially the Băile Herculane - Mehadia area, places visited by many renowned European entomologists (Schwarzott, 1831). As this was the border of the Ottoman Empire, the region was thoroughly researched by many lepidopterists. For example: Johann C. G. von Hoffmannsegg (1793-1794) - reports from here *Erebia melas* and *Kirinia roxelana*, Wincenz Kollar (1820) - reports *Theresimima ampellophaga* and *Apatura metis*, Georg Dahl (1821-1822) - reports *Kirinia climene* (Figs. 11-12), *Coenonympha leander* and *Pyrgus sidae*, Karl Stentz (1820-1840) - reports *Omia cymbalariae* and *Libythea celtis*, Albert Kindermann (1834) - reports *Lithophane merckii*, Imre Frivaldszky (1820, 1829) - discovers *Amphipyra micans*, as a new species for science at the Herculane Baths (Băile Herculane), János Frivaldszky (1853, 1856, 1867,1893), József Haberhauer (1855) - reports on *Polyommatus damon* (Fig. 14), Josef Mann (1865), János Pável (1863), Adalbert Viert (1876, 1881) - reports on *Calocucullia celsiae*, Otto Bohatsch (1879-1881), Wilhelm V. Hedemann (1896), Walter Rotschild (1907), Antal Schmidt (1907-1908) and Hans Rebel (1909-1910) (Rákosy 1996; Székely 2014). According to the literature and the data recorded at that time, it can be seen that species such as *Esperarge (Kirinia) climene* (Figs. 11-12), *Polygonia egea* (Fig. 13) and *Nymphalis vaualbum* were not rare in Băile Herculane, Orșova and Mehadia in the years 1820-1880 (Füle, 1830; Schwarzott, 1831) (Figs. 1, 2, 3). *Polygonia egea* (Fig. 13) was reported in the northernmost point at Oradea (Pável, Horváth 1875). The first catalogue of Transylvanian Lepidoptera was published by Carl Fuss in 1850 and included 965 species and forms collected by Josef von Franzenau in southern Transylvania, in Săcărâmb, Hunedoara County (Fuss 1850). In 1897 Daniel Czekelius from Sibiu publishes the first complete catalogue of Lepidoptera from Transylvania (Czekelius 1897), which he completes with new data from 1900-1935. The research of Josef Mann in the north of Dobrogea in 1865, a territory that was part of the Ottoman Empire (Mann, 1866), can also be considered very important. In 1895 Aristide Caradja publishes the first catalogue of Lepidoptera in Romania, followed by the catalogue of Eduard Fleck and that of Franz Salay (Caradja 1895, 1896; Fleck 1899, 1900, 1902, 1904; Salay 1910).

Based on data from the literature of the time some species reported in the 19th century have disappeared from the fauna of Romania, others only from the fauna of certain regions. It can be suspected that some data published at that time are errors of determination, but their number cannot be large, considering that most of the works have been published by renowned entomologists. Among the species as possible misrepresentations we can include *Tarukus balcanicus* (possible confusion with *Leptotes pirithous*), *Pyronia cecilia* and *Aricia hyacinthus*. The distribution limits of these species are far from Romania, in the southern Balkans and in Asia Minor. Similarly, reports of *Erebia montanus* from Bușteni-Bucegi Mountains could represent

mislabelled specimens, or confusion with *Erebia pronoe* (Székely 1999).

Of course, in a century the fauna of lepidopterans can change quite visibly. Some common and widespread species in the 19th century have declined greatly over 100 years. *Colias myrmidone* was widespread in the 19th century (Pieszczhek 1907; Rotschild 1912), while from the mid-20th century *Colias erate* is widespread. During the years 1845-1850, in the Budapest area, quite common species were *Colias myrmidone, Coenonympha oedippus, Lycaena helle* and *Melanargia russiae.* At the beginning of the 20th century all these species disappeared from there (Bálint 2012).

Natural causes with possible effects on Lepidoptera fauna

Long-term Lepidoptera populations are influenced by several natural factors such as geographical position, relief conditions, vegetation spread and succession, and major climate changes (Székely 1995). However, their action is noticeable over very long intervals, generally between thousands and millions of years. In the short term, however, for decades, the natural factors that caused changes in Lepidoptera fauna were climate change, and certain intrapopulation causes, such as genetic erosion in some species.

Climate change has undoubtedly influenced the Lepidoptera fauna in the 19th century. The period 1700-1860 is considered the end of the Little Ice Age when the warming and aridity of the climate begins, characterized by the decline in the plains of species adapted to colder and more humid climate (Dobrogea and Romanian Plain). Regarding the effect of "short-term weather anomalies", we do not have enough data, but they certainly had an important influence. Historical reports include references to unusual non-periodic climate variations in the 18th-19th centuries, such as the presence of snow in the spring and summer months, mists and night frosts on unusual dates. Examples are snowfall on 3 August 1716, 29 August 1740, 23 September 1784, and 21 September 1805. Certainly, the climate before 1850 was colder and wetter.

Changes in the geographic distribution of many species have been caused largely by climate change, for example:

Many species reported on the territory of Romania in the 19th century, underwent visible changes in distribution until the beginning of the 20th century, such as: *Parnassius apollo, Colias palaeno, Colias myrmidone, Colias chrysotheme, Lycaena helle, Agriades optilete, Eumedonia eumedon, Aricia anteros, Polygonia egea, Kirinia climene, Chazara briseis, Pyronia tithonus, Hyponephele lycaon*, and that is mentioning butterflies only.

Some of them were no longer found in Romania in the 20th century, for example: *Colias palaeno, Agriades optilete, Aricia anteros, Polygonia egea, Kirinia climene* (among butterflies) and *Trichosea ludifica, Menophra abruptaria, Lygephila ludicra, Lygephila procax, Eublemma rosea, Aegle vespertalis, Aedophron rhodites, Omia cymbalariae, Ozarba moldavicola* etc. (among nocturnal species) (Rákosy, 1996; Rákosy, Wieser 2000; Székely 1999).

Others have disappeared from Dobrogea, for example: *Parnassius apollo, Colias myrmidone, Colias chrysotheme, Lycaena hippothoe, Lycaena alciphron, Limenitis camilla, Argynnis laodice, Erebia aethiops, Erebia medusa, Hyponephele lycaon, Euphydryas aurinia, Melitaea diamina, Pyrgus alveus, Hemaris fuciformis, Callimorpha dominula, Lemonia dumi, Penthophera morio* etc. (Rákosy, Wieser 2000). The presence of *Pyronia tithonus* cannot be excluded from the fauna of Dobrogea of the 19th century, being present nowadays along the coast of Bulgaria, south of Balchik.

Among the butterflies reported in the 19th century from Banat region (Rebel 1911), several species have likely disappeared from that area, such as *Pyrgus serratulae, Colias myrmidone, Colias chrysotheme, Lycaena helle, Eumedonia eumedon, Aricia anteros, Polygonia egea, Kirinia climene, Chazara briseis.*

Intrapopulation causes, such as genetic erosion, have led to the decline of some species, such as *Parnassius apollo* in Eastern Europe (Poland, Ukraine, and Romanian Carpathians) since the 19th century. *Parnassius apollo* colonized Europe in the Neogene. Probably the migrations during the interglacial periods have led to its diversification in the subspecies known today, both in the plains and in the mountain areas of Europe. Depending on trophic preferences, populations in Europe can be divided into two main groups "albophagous" - which feed on *Sedum album* and populate the mountain ranges in southern and Western Europe, and "telephiophagous" - which feed on *Sedum telephium and* populate habitats of the plains of north-eastern Europe and the Eastern Carpathians (Nakonieczny *et al.* 2007). The populations of

Parnassius apollo from the Carpathians probably lived after the ice age in the plains, subsequently migrating to the sub-mountain and mountain areas. It seems that the "telephiophagous" group was more vulnerable to environmental changes, and since the 18th century it has been in decline (Nakonieczny *et al.* 2007). The decline and extinction of the species has been and is evident in this part of Europe (Romania, Ukraine, Poland), as compared to the populations in southern and western Europe, which do not appear to be affected as much by climate change and other factors. The populations in the Carpathians of Romania gradually faded away until the end of the 20th century (Fig. 4).

It seems that certain **Lepidoptera migrations** also had different particularities a century ago, especially in the case of migratory species that occur very rarely in Romania (Rákosy 1991). Thus, most reports of *Daphnis nerii* in Romania are from the 19th century, and from the beginning of the 20th century, and *Hippotion celerio* (Fig. 18) and *Utetheisa pulchella* have not been reported in Romania for almost 80 years. Changes in migration routes are possible, but they may also be caused by the increased anthropization of the environment, which has led to diminished food sources.

Anthropogenic causes with possible effects on Lepidoptera fauna

The changes caused by humans on the environment can be favourable and unfavourable for the entomofauna. However, they are usually unfavourable, leading to changes in the habitat structure. Effects on Lepidoptera fauna in the 19th century could have had the massive deforestation to increase the areas of agricultural land (especially in the plains), the transformation of natural steppes into agricultural lands, the drainage of wetlands and grazing.

Massive deforestation to increase the area of agricultural land. If in the Middle Ages (10th-18th centuries) the present territory of Romania was covered by forests in a proportion of 50%, the 19th century and the beginning of the 20th century are characterized by the most massive deforestation. The data show that it has been cleared much more than it is nowadays, the deforestation mainly affecting the forests in the plains, being transformed into agricultural land, especially for the need to grow cereals. After the land reform of Alexandru Ioan Cuza in 1864, the peasants received agricultural land in their property, many of which were plain forests, which were cleared. Massive deforestation also took place after the agrarian reform of 1920, the area of forests in Romania reaching about 35%. Between 1835 and 1935 about 3 million hectares of forest were cleared. These deforestations mainly affected the plains, from where a large part of the Lepidoptera species characteristic of forests have disappeared or declined.

The transformation of natural steppes into agricultural land has led to the spread of Lepidoptera adapted to agroecosystems and to the flourishing of species that have become harmful. During this period most of the natural steppes in Dobrogea disappear. Bărăganului Steppe (in the Romanian Plain) was used as a pasture at the beginning of the 19th century, being transformed into agricultural land after 1850. Romania needed cereals for export, and much agricultural land was needed.

The drainage of wetlands (marshes, marshy forests), started since the first half of the 19th century, has resulted in the disappearance of over 80% of the wetlands in Romania during the last 150 years. The most affected were the wetlands in the plains, from where a large part of the species of Lepidoptera characteristic of these habitats disappeared or declined, for example the populations of *Lycaena helle* and *Euthrix potatoria* from the Romanian Plain.

Grazing must have had some destructive effect, even if we do not have conclusive data. At that time the number of animals was much larger than today, but it is possible that the methods used for grazing were more environmentally friendly. Only 100 years ago in the Land of Bârsa (the surroundings of Brașov), the number of animals was ten times greater than in our days. For example, the number of cattle in the main localities was as follows: Râșnov 3226, Codlea 3118, Cristian 2224, Zărnești 2094, Hălchiu 1946, Dumbrâvița 1628, etc. The inhabitants raised large flocks of sheep and cows; some had 2000 sheep and herds of 70-80 cows (Dunăre 1972).

The urbanization being at the beginning could not have had the devastating effect that was to occur in the 20th century, especially after 1980.

The structure and dynamics of lepidopterofauna from the 20th century

In the 20th century, the number of articles published by Romanian lepidopterists reached almost 1800, most of which referred to the fauna

of the country. In the first part of the century there are the contributions of Aristide Caradja, Constantin Hormuzaki and Daniel Czekelius, and after the Second World War, the contributions of Aurelian Popescu-Gorj, Alexei Alexinschi, Frederic König and Eugen V. Niculescu. The lepidopterological activity intensifies after 1990, with the establishment of the Romanian Lepidopterological Society (SLR), both by faunistic studies in new areas, not studied in the past, as well as by the two periodicals published by SLR, the Entomological information bulletin (since 1990) and Entomologica Romanica (since 1996) (Rákosy 2008; Rákosy *et al.* 2003, Rákosy, Goia 2021).

Natural causes with possible effects on Lepidoptera fauna

Climate change in the 20th century, was largely caused by the human factor by increasing the population of the globe and increasing the consumption of natural resources through mass industrialization. These intensified towards the end of the 20th century, being characterized by the emergence of the phenomenon of climate aridization. Climate aridization is responsible for the changes in distribution ranges both horizontally and vertically of many species of Lepidoptera, causing regresses of some, and expansion of others. Aridization, which was especially pronounced towards the end of the century, led to the complete displacement of populations of species, such as *Colias myrmidone* and *Thecla betulae*, which for example were widespread in south-eastern Transylvania between 1970-1990, being frequently reported from many localities, such as Săcele, Sânpetru, Lempeș Hill, Tâmpa Mountain, Brașov, Târlungeni, Racoș, Rupea, Sfântu-Gheorghe, Araci, Ariușd, Vâlcele etc. Today, these populations have disappeared from these areas, being displaced much more to the north in the colder and wetter intermountain depressions of the Miercurea-Ciuc and Gheorgheni area. Of course, the disappearance of the populations of *Colias myrmidone*, besides climatic aridization, may have also been caused by by other phenomena (the massive migration of *Colias erate* between 1988-1992 to Central Europe, which coincided with the disappearance of most of the populations of *Colias myrmidone* from Romania), and the human factor by land-use changes in areas occupied by *Colias myrmidone* populations after 1990. Before 1990 in Romania, dozens of *Colias myrmidone* populations were known, the majority in Transylvania (in Brașov, Covasna, Sibiu, Hunedoara, Cluj, and Mureș counties), and in the northwest of Romania (Satu Mare). All vanished during the period 1990-2000. Of the populations around Cluj, small parts still survive today. Viable populations currently exist only in the Gheorgheni Basin. Also, on account of climate aridization, many species that were widespread and common prior to 1990, have retreated to higher and wetter mountain areas and even in the subalpine-alpine area, such as *Nymphalis polychloros*, *Vanessa atalanta*, *Aglais io*, *Aglais urticae*, and so on. The composition of local fauna changes rapidly, 10-20 years are sufficient for visible changes. Between 1980 and 1990, *Aglais urticae* and *Arctia caja* were still present in Dobrogea, after which they disappeared completely.

Short-term meteorological anomalies intensified towards the end of the 20th century, characterized by an increased frequency of extreme temperatures and precipitation, such as very intense rain over small areas, the appearance of meteorological phenomena not specific to the climate of Romania (tornadoes), and more frequent catastrophic flooding. Floods are caused primarily by human activities that led to the reduction of the transport capacity of the rivers, by developing localities in the major riverbed of the watercourses. Meteorological anomalies produce the most visible effects on short-term Lepidoptera populations. The cycle of rainy and droughty years influences the population size of most species. Sudden changes from cold to high temperatures and from high humidity to drought, cause changes in both the behavior of species and the dynamics of their populations. Rainy and cold springs can have devastating effects:

- determine the reduction of population sizes by decreasing the number of larvae in the species found in spring at this stage,

- prevent the pollen stock from being collected by species that are in the adult stage with repercussions on reproduction,

- determine the modification (reversal) of the flight periods in the spring species.

Very cold winters can certainly lead to the extinction of species. After the devastating and very cold winter of 1954, the populations of *Perisomena caecigena* (Fig. 17) around Bucharest, Banat and Dobrogea disappear. The disappearance of *Saturnia spini* from Romania, but also from all over Central Europe, most likely also involves a climatic cause. After 1970, the springs become rainier and colder, leading to the

"disappearance of the four seasons", with the sudden passage from winter to summer, and vice versa, as it is known today. Of course, this does not fully explain the cause of *Saturnia spini*'s disappearance.

Geographic distribution changes - the expansion, especially from the east and the south, led to the penetration of many species on the territory of Romania in the 20th century. Thus, after 1920, *Macdounnoughia confusa* spreads in Romania, after 1957 *Colias erate* (Niculescu, 1963). After 1990 many species unknown in the past have entered the territory of Dobrogea, such as *Hyles hippophaes* (from southern Ukraine), *Malacosoma castrensis, Olivenebula (Polyphaenis) subsericata, Neptis sappho, Libythea celtis* (from northern Bulgaria) (Rákosy & Székely, 1996; Székely & Szabó, 1996; Dincă, Cuvelier, Székely & Vila, 2009). In the case of many species, these changes show a certain cyclicality, after periods of expansion the period of contraction appears, and conversely, after periods of contraction until the threshold of extinction, expansion may occur. This is the case of *Hyles hippophaes*, a species described by Esper in 1789 based on material originating from the territory of Romania (Milcov River near Focșani). In the 20th century the species was considered extinct in Romania, having a strong return to the Danube Delta after 1995 (Székely & Szabó, 1996). It probably penetrated from southern Ukraine, subsequently colonizing Dobrogea, Moldova, Muntenia and northwestern Bulgaria. Another species is *Nymphalis vaualbum*, which was relatively widespread in Romania in the first part of the 20th century, after which had a strong decline, especially since 1950-1960, disappearing from most of the country (Niculescu 1965). In the last period it seems that we are witnessing a return of the species in Banat, Crișana and Transilvania.

Intrapopulation causes - genetic erosion (impoverishment), may be the main cause for the disappearance of *Parnassius apollo* (Fig. 4) from Romania. If global warming would have affected this species, then populations occurring south of Romania, such as those in Bulgaria and Greece, would have to disappear. Or these populations remain vigorous even today. In Romania, the number of populations of *Parnassius apollo* decreased permanently, especially after 1950. By 1960 it disappeared from Borsec, after 1970 from the Mureș Valley and from the Călimani Mountains. The last populations that survived until the end of the century were on the Someşului Rece Valley (Răcătău-Mărişel area, whose individuals belonged to the subspecies *Parnassius apollo jaraensis*), and disappeared between 1980-1990, and those from the Eastern Carpathians (the Bicazului Gorges, Lacu Roșu, Zugreni, whose individuals belonged to the subspecies *Parnassius apollo transsylvanicus*), and disappeared between 1990-1997 (Fig. 4). These were the last populations that existed on the territory of Romania. Possible causes of extinction are the natural afforestation of the habitats (Figs. 5-6), and even the over-collecting of individuals.

Anthropogenic causes with possible effects on Lepidoptera fauna

Human intervention on nature produces major changes even over short periods of time, such as a few decades. Towards the end of the 20th century, we began to witness some decline of lepidopterans, but also of entomofauna in general, the main anthropogenic causes being light pollution, the continuous and accelerated urbanization, and the major changes in agriculture, forestry and land use.

Light pollution is a phenomenon that has been overlooked so far, although the negative effect on lepidopterans is catastrophic. The effect of light pollution is like the effect of the "full moon" on nocturnal insects, which do not fly towards light sources on full moon nights.

The light pollution dilutes the darkness of the night to which nocturnal animals are adapted. Where artificial light enters the natural world, biological cycles such as migration, reproduction and feeding are affected. Light is a powerful biological force, and acts as a magnet on many species of animals, but especially on insects. Moths are attracted to artificial light, especially by ultraviolet rays emitted by mercury vapor lamps. The post-1960 appearance is well-known, when these bulbs became dominant in the street lighting in Romania and attracted huge quantities of moths. Many entomologists from the older generation made collections only under the pillars of public lighting and on the walls of houses. With the decline of communism (1980-1990), when in many parts of Romania, it was total darkness, a UV bulb mounted in the right place attracted thousands of moths. UV lamp lighting has led to a drastic reduction in the number of moths over time. The moths gathered around the bulbs are eaten by bats, and by the birds in the morning. The more distant artificial light sources are often reached especially by male specimens, causing a

decrease in the number of males available for mating. But the increased scarcity of the moths can also be an adaptation to the light pollution, which towards the end of the 20th century has grown enormously; from the darkness before 1990, today we have light curtains reflected to the sky even above villages (Figs. 8-9). It is possible that, in areas affected by this pollution, which has grown together with the urbanization, the insects have become accustomed to artificial light, and they are no longer attracted to light as before. Certainly, the Lepidoptera fauna has declined in parallel with the increase of light pollution in urban and rural areas. However, as we move away from the areas affected by this pollution, where the darkness of the night is not so diluted, and the natural conditions are favourable, the nocturnal fauna of Lepidopteran can still be rich and diverse.

The continuous and accelerated urbanization produced effects especially after 1970. 40-50 years ago, the cities were still full of butterflies and moths (in the evening around the light bulbs). *Aglais urticae*, *Aglais io*, *Vanessa atalanta*, *Aporia crataegi*, *Lasiommata megera*, *Pararge aegeria*, species of *Pieris* were seen in large numbers on roads, in gardens, and around the watercourses present in the localities. Of course, the cities looked different, there were houses, orchards, flower gardens and vegetable gardens. The cobbled or dirt roads were heated in the sun differently compared to asphalt. The villages still had many domestic animals, the edges of the roads and ditches were full of hives and animal droppings, the meadows were still full of flowers, but they all disappeared from the landscape towards the end of the 20th century, together with the butterflies. The "natural-cultural" landscape was still widespread in human-inhabited areas. Nature was shaped by humans to a lesser extent, it was transformed more according to subsistence needs. The impact on nature was moderate, ecosystems were modified by traditional, extensive activities, carried out on small areas, and still allowed a high biodiversity (Rákosy 2011). Today, especially in urban areas, butterflies are rarely seen (Rákosy 2014), the major setback being caused by the destruction of their habitats through:

- Demolition of houses with gardens and orchards (especially during the period 1970-1990, in communism) and their replacement with neighbourhoods of concrete blocks of flats.

- Asphalting of roads, concrete, paving of sidewalks.

- Embankment and sewerage of the watercourses inside the localities, filling the riverbeds and natural ditches.

- Reduction of the number of domestic animals in urban and rural areas.

All these human activities have led to a marked decrease of biodiversity in urban as well as rural areas, by destroying the natural habitats that existed in the past.

Major changes in agriculture, forestry and land use have had devastating effects on the Lepidoptera fauna, and have been especially pronounced towards the end of the 20th century, for example:

- The massive chemization in agriculture, the excessive use of DDT, especially after 1950, has diminished entire populations of Lepidoptera, especially those associated with gardens and orchards, such as *Aporia crataegi*, *Pieris brassicae,* and several species of Lasiocampidae, Erebidae and Noctuidae.

- The drainage of wetlands started as early as the 19th century, but the most visible changes took place in the 20th century, especially in the floodplain of the Danube, where during the communist period the Romanian state started a vast program of farmland extension. Before the embankment, the flood zone consisted of natural aquatic ecosystems, natural grasslands, riverside forests, backwaters, and scrubs, which had a much richer and more diverse Lepidoptera fauna.

- Grazing and the use of hay in animal husbandry has produced a visible setback. The effects of grazing were more pronounced in the alpine and subalpine belt, where in parallel with the excessive and uncontrolled tourism they produced disasters, as in the Bucegi and Făgăraș Mountains. But the total lack of grazing was not beneficial either, evident especially after the fall of communism, which led to the natural afforestation of grasslands, which became secondary grasslands (or secondary forests). The use of hay also produced species extinctions, for example in the case of *Polyommatus damon*. The first reports of this species date from the middle of the 19th century, from Turnu Severin from József Haberhauer, data published at the end of the 19th century (Caradja 1895; Salay 1910; Rebel 1911). In the 19th century the species was mentioned as widespread in many areas of Maramureș, Crișana,

Transylvania and Banat (Pável, Horváth 1875; Abafi-Aigner 1911; Keynes, Keynes 1911), however, disappearing in the first half of the 20th century, the last specimen being dated from 1938. In the nineteenth century many horses were still present, since they were needed both in agriculture, forestry and in wars. I do not have data from Banat, but I can argue with data from Brașov region villages. Thus, the number of horses in the main localities of the Bârsa Country in 1885 were: Prejmer 1143, Sânpetru 982, Hărman 884, Feldioara 705, Codlea 650, Bod 612 etc. (Dunăre 1972). During that period in the meadows there were a lot of crackers (*Onobrychis viciifolia* - the host plant of *Polyommatus damon),* so that the mowed hay would be more palatable for animals (the horses liked the cracked hay). The renunciation to these ancient activities in the 20th century, led to the disappearance of very isolated populations of *Polyommatus damon* (Fig. 14) (Zsolt Bálint, pers. com.).

- The changes caused by humans in the composition of the vegetation have produced visible changes in the fauna of Lepidoptera. Due to the black pine plantations in Dobrogea, after 1980-1990 several species that were not present there in the past, have spread in this territory, such as *Bupalus piniarius, Panolis flammea, Sphinx pinastri, Lymantria monacha*. Through the black locust plantations, *Neptis sappho* entered the southwest of Dobrogea after 1998, reaching Cernavodă and Babadag today. Changes in vegetation in urban areas have led to the expansion of some species, for example the *Spiraea* plantations for hedges led to the expansion of *Neptis rivularis* within cities after 1980, for example in Brașov and Cluj where it became an urban species. In other cases, the elimination of ornamental plants in the cities has caused the disappearance of species, for example the clearing of *Colutea* plants in the town of Eforie after 1950, led to the local disappearance of *Iolana iolas*. The destruction of forest curtains on roadsides, started after 1990, has also contributed to the decline of Lepidoptera fauna.

The penetration of alien species (allochthonous) has increased in the middle of the 20th century, through the trade of organic materials (cereals, wood, fruits, vegetables etc.) leading to the spread of species foreign to our fauna. Of course, not all species were maintained under the climatic conditions of Romania, for example *Antheraea yamamai, Antheraea pernyi*. Others, on the other hand, like many species of microlepidoptera (many harmful) and the tiger moth *Hyphantria cunea* from North America, have remained and thrived. *Hyphantria cunea* was extremely common in the period 1970-1990, especially in Dobrogea. At present it seems to be strongly limited by parasites, for example the huge quantities of larvae encountered in 2015 were 99% parasitized.

Trends in the structure and dynamics of Lepidoptera fauna in the 21st century

In the relatively short period of the 21st century, we can admit that we are witnessing the increase of Lepidoptera fauna decline, and the increase of the pressure of the responsible factors. After the year 2000 there is a decrease of the enthusiasm of the lepidopterists in Romania, and the activity of many is directed only towards the protected species (Natura 2000 species). Fewer articles are published, although the quality of publications has considerably improved (Rákosy, 2008). However, this aspect is only partially true: between 2000 and 2016 more than 350 works on the Lepidoptera fauna of Romania have been published, but a part of them have doubtful content. Unfortunately, the possibilities of publishing everything, anywhere and very easily have multiplied, even if some papers are full of erroneous, false, or meaningless data. Thus, over the course of ten years more than 65 papers were published only on the Lepidoptera of a single forest in Romania, which probably represents a world record!

Admittedly, the Lepidoptera fauna has regressed in general, mainly due to the anthropogenic pressure through accelerated urbanization and massive light pollution, which have led to a "quantitative decline". In addition, major changes in agriculture and forestry, primarily by changing land use, have determined a „qualitative decline".

Potential trends of the dynamics of Lepidoptera fauna for the 21st century are:

- The generally accentuated decline of the Lepidoptera - It is the effect that is visible and accepted by the public. It is not possible to contest the decline, but this aspect is mainly characteristic of the anthropic areas, which have expanded considerably. Inhabited areas have entered the heart of nature, cities and villages have expanded, residential neighbourhoods and holiday houses have multiplied, and natural habitats have remained in a few places. Light pollution has an effect almost everywhere. All this has led to a huge quantitative decline of Lepidoptera, especially after 2000. Yet, the decline in number

of species is relative, since after 1990, the Lepidoptera fauna of Romania has been enriched permanently, over 100 new species for the fauna of the country having been reported only in the last two decades. However, the modern sampling possibilities, which were not accessible before 2000, such as portable electricity generators, traps with portable accumulators, UV tubes etc., also played a role. These more modern methods made it possible to investigate the fauna in many areas that were not previously accessible for research, such as the steppes of Dobrogea steppes, the areas with salt vegetation, the sands in coastal areas and other places not easily accessible from various regions of Romania. During communism the areas investigated by lepidopterists were quite limited, and collections were made where there was electricity, for example in Hagieni Forest or in Canaraua Fetii in Dobrogea (and similarly in other regions in Romania). Reference works for the fauna of Romania were made based on such data, for example the fauna of southern Dobrogea included almost exclusively data collected from the electricity sources from Hagieni and Canaraua Fetii (Rákosy, Székely 1996). Of course, certain areas not affected by anthropic pressure still exist, where given very favourable weather conditions, an abundance of lepidopterans can be found, which shows that these insects have a remarkable capacity of survival. And nowadays there are sometimes tens of thousands of moths on the bright screen, of course in isolated cases, such as the nights of 21.VII.2008 (Lacu Roșu), 27-28.X.2009 (Babadag Forest), or 24-25.VIII.2016 (Sarinasuf, Tulcea), where we can see that, locally, the number of species and individuals can still be huge today.

- **The disappearance of species once common in lower areas, and their expansion towards mountains and even in alpine areas** – This phenomenon was accentuated especially after 2000, and species of Nymphalidae formerly common in lower areas became dominant in the high mountain and even alpine areas. The vertical shift is also evident of *Parasemia plantaginis* and *Callimorpha dominula* (before 2000, in the area of Brașov they were still widespread at altitudes of 500 m, at present they occur above 1200 m). An upward expansion is also observed in *Iphiclides podalirius, Minois dryas* and *Phengaris arion*, encountered in recent years in Bucegi Mountains at 1500-1600 m, which before 2000 was unimaginable. In the summer of 2016, on the plateau of the Bucegi, the species of *Erebia* were numerically surpassed by *Aglais io, Vanessa atalanta, Vanessa cardui, Aglais urticae, Issoria lathonia, Fabriciana niobe, Speyeria aglaja, Lasiommata maera, Macroglossum stellatarum* etc.

- **Expansion of very common species that are well-adapted to the altered environment –** Generally speaking, the species that can be found today throughout the country, in overwhelming majority are the very common ones, adapted to various conditions of the natural and anthropic environment. Those considered rare and localized have become exceptional occurrences in most places of potential presence.

- **Occupation of the ecological niche of other species -** It is evident in the case of the population of *Zerynthia cerisy ferdinandi* from Canaraua Fetii (Dobrogea), sometime between 1980-2000 the most vigorous in Romania, with hundreds of individuals observable within a day. After 2005 it appears that the penetration of *Zerynthia polyxena* in the respective habitat caused the strong decline of *Zerynthia cerisy*, which has apparently reached the extinction threshold today.

- **The expansion of southern species from the Balkans, and of steppe species from the east on the Romanian territory** – It has been accentuated in recent years, being characterized by the penetration of Mediterranean and even subtropical elements. *Grammodes bifasciata* was frequently reported from eastern Dobrogea since 2008 and it appears to have established in the coastal strip as a potential effect of climate warming. Another expansion is that of *Leucania punctosa*, a migratory species that entered the east of Dobrogea in 2011 and was later found in 2016. From the east of Romania (Moldova), there are some spectacular steppe elements that recently entered in the fauna of Romania from Ukraine, such as *Xylomoia graminea* (Corduneanu *et al.* 2016), *Schrankia balneorum* (Manci, Sitar 2016) and *Dysgonia rogenhoferi* (Csukás *et al.* 2020). In Banat, it is worth noting the northward expansion of several Mediterranean species from the Balkan Peninsula, such as *Zerynthia cerisy ferdinandi, Libythea celtis, Melitaea arduinna* and *Melanargia larissa* (Groza *et al.* 2015; Groza *et al.* 2020).

- **Increased frequency of occurrence of cosmopolitan and subtropical migratory species,** which were rarer in the past, for example: *Leptotes pirithous, Lampides boeticus, Rhodometra sacraria, Grammodes stolida, Aedia leucomelas, Chrysodeixis chalcites, Cornutiplusia circumflexa, Mythimna unipuncta, Acherontia*

atropos, Hyles livornica, and recently *Thysanoplusia orichalcea* (Székely, Dincă 2020).

- The increase in the number of allochthonous species newly introduced into the fauna of Romania, seems to intensify in this century. *Acontia candefacta*, a North American species introduced and acclimatized in southern Russia in Krasnodar (Poltavsky, Artokhin 2006), entered the fauna of our country after 2007. *Cydalima perspectalis* entered after 2010, probably with the import of *Buxus* shrubs. There are also tropical species that have been accidentally introduced to ornamental plants in greenhouses, such as *Sibine stimulea* and *Cnidocampa flavescens* (Rákosy, Momeu, 2009). Of course, these cannot survive in the wild under the climatic conditions in Romania.

Conclusions

It cannot be concluded that there is a clear decline in the overall number of species of Lepidoptera in Romania. The number of new species for the fauna of the country, discovered after 2000, is much higher than the number of species that disappeared in the 19th and 20th centuries. However, there is a huge quantitative decline of Lepidoptera in anthropic areas, especially in urban areas, where fewer and fewer butterflies and moths are seen. Butterflies have become increasingly rare in cities (Rákosy, 2014). With all the visible regress, however, it seems that the species have remarkable survival capabilities, because species considered extinct, not reported for 50 and even 100 years have been found in recent years, such as *Ocnogyna parasita, Catocala disjuncta, Catocala diversa* and *Plusidia cheiranthi* of the nocturnal species, or *Satyrus férula* (Figs. 15-16), *Polyommatus admetus, Tomares nogelii* and *Iolana iolas,* among butterflies (Groza *et al.* 2015: Groza *et al.* 2020; Rákosy, Craioveanu 2014). By means of the protection measures nowadays it is desired to preserve the present structure of Lepidoptera fauna! But this will not always be possible, nature has its laws, we see currently protected species that are currently expanding, such as *Hyles hippophaes,* which 50 years ago was considered extinct, while others are on the brink of extinction like *Colias myrmidone,* which 50 years ago was common. Of course, proper management in the habitat of a population can prolong its survival, but by no means does this mean a complete halt to how humans have acted there until now.

The major risk factors for Romania's Lepidoptera fauna in the future are:

- Short-term weather anomalies - It is expected that extreme weather events, sudden changes from cold to high temperatures, and from high humidity to drought will increase in the future, producing visible effects on Lepidoptera populations. In the last period we are witnessing an increase in the number of nights with increasingly low temperatures in spring and autumn, and increasingly warm days in the summer, characterized by the almost complete absence of moths. It seems that it is only the absence of the flight, because on warm spring and autumn nights, and in the cooler ones during summer, the number of individuals and species can be abundant.

- Light pollution - It will certainly be accentuated, completely disturbing the activity of the nocturnal species. Increasingly large territories will be affected by the dilution of the dark at night. The nocturnal species will become exceptional occurrences in areas inhabited by humans.

- The natural afforestation of open areas (especially in protected areas) - After 2000 in many protected areas the landscape has undergone radical changes. In the last 20-30 years the grasslands in the reserves began to disappear through natural and anthropogenic afforestation (plantations). The Hagieni forest considered sometime between 1960-1990 "The Paradise of Lepidoptera in Romania" turned into an agglomeration of trees and shrubs, from which the pastures completely disappeared together with the characteristic Lepidoptera fauna (Figs. 9-10). The same thing happened in many protected areas (Tișiței Gorges, Bicazului Gorges (Figs. 5-6), Tâmpa Mountain near Brașov etc.). Today we have more and more protected areas, where humans no longer manage nature. However, the results are predominantly negative, many species of Lepidoptera begin to disappear, phenomenon more easily noticeable for butterflies. The causes are not difficult to explain: if the pasture turns into hay meadow, the pasture species disappear, if the hay meadow turns into forest, the hay meadow species will disappear, and so on. If it is desired that the species declared protected thrive in the future, the maintenance of open areas (meadows, grasslands) in all protected areas must first be legislated.

- Changing the way the land is exploited - The different species of butterflies and moths have survived in certain areas due to the way humans intervened on nature for thousands of years. If this intervention is stopped, the species in question

will disappear after a while. An example is the population of *Colias myrmidone* occurring on the hills near Brașov. Before 1990 when these hills were grazed, butterflies were even common. After 1990, since the pastures were transformed into meadows (by returning them to the owners) *Colias myrmidone* disappeared in 2-3 years. Currently viable populations exist only in Gheorgheni Basin, in areas where grazing is still practiced. Probably when it will not be practiced there, the last populations of *Colias myrmidone* in Romania will also disappear.

The diversity of Lepidoptera, but also of entomofauna in general, may be favoured in the future by traditional agriculture, by maintaining the "natural-cultural" landscape generated by traditional agricultural activities (Fig.7), which have allowed and allow a high biodiversity (Rákosy, 2011). Mechanized agricultural activities produce disastrous effects on the diversity of lepidoptera (Fig. 8). And the total abandonment of human activities in protected areas only contributes to the loss of biodiversity.

Acknowledgements

Thanks to Dr. Zsolt Bálint and Gergely Katona (Budapest Museum of Natural History) for data and literature, as well as to Dr. László Rákosy (UBB - Cluj Napoca) for some suggestions.

REFFERENCES

Abafi-Aigner 1911 — Abafi-Aigner Lajos, *Magyarország pillangói XXXVII.* In: *Rovartani Lapok*. 01 (1911), p. 5-7.

Bálint 2012 — Bálint Zsolt, *Pest-Buda és Budapest lepkepolgárai anno 1845 és 2000* In: http://lepkéskönyvek blog hu.

Caradja 1895 — Caradja Aristide, *Die Großschmetterlinge des Königreiches Rumänien.* In: *Dtsch. Ent. Ztsch*. Iris, Dresden, 8 (1895), p. 1-102.

Caradja 1896 — Caradja Aristide, *Die Großschmetterlinge des Königreiches Rumänien.* In: *Dtsch. Ent. Ztsch*. Iris, Dresden, 9 (1896), p. 1-112

Corduneanu *et al.* 2020 — Corduneanu Constantin, Balan Dumitrel Cătălin, Vasiliţa Cristina, Popovici Ovidiu Alin, *The noctuid moth Xylomoia graminea (Lepidoptera: Noctuidae) new to the Romanian fauna.* In: *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* 63, (2020), p. 255–260.

Csukás *et al.* 2020 — Csukás Levente, Székely Levente, Dincă Vlad Eugen, *Dysgonia rogenhoferi (Bohatsch, 1880) (Lepidoptera, Erebidae) in the Danube Delta (Romania) westernmost record in Europe,* In: *Entomologica romanica,* 24 (2020), p. 33-35.

Czekelius 1897 — Czekelius Daniel, *Kritisches Verzeichnis der Schmetterlinge Siebenbürgens,* In*: Vehr. Mitt. Siebenb. Ver. Naturwiss*, Hermannstadt 47, (1897), p. 1-78.

Dincă *et al.* 2009 — Dincă Vlad Eugen, Cuvelier Sylvain, Székely Levente, Vila Roger, *New data on the Rhopalocera (Lepidoptera) of Dobrogea (south- eastern Romania*), In: Phegea 37 (1), Antwerpen (2009), p. 1-21.

Dincă *et al.* 2017 — Dincă Vlad Eugen, Székely Levente, Bálint Zsolt, Skolka Marius, Török Sergiu, Hebert D. N. Paul. *Improving knowledge of the subgenus Agrodiaetus (Lepidoptera: Lycaenidae) in Eastern Europe: overview of the Romanian fauna*. In: *Eur. J. Entomol*., 114, (2017), p. 179–194.

Dunăre 1972 — Dunăre Nicolae, *Ţara Bârsei.* 475 pp. Ed. Academiei R.S.R., (1972), București.

Fiebig 1927 — Fiebig Wilhelm. *Beitrag zur Schmetterlingsfauna Rumäniens.* In: Deutsche Entomologische Zeitschrift, Iris, Dresden, 41 (1927), p. 101–109.

Fleck 1899 — Fleck Eduard. *Die Macrolepidopteren Rumäniens,* In: *Bulletin de la Société des Sciences,* Bucuresci, 8(6), (1899), p. 682–773.

Fleck 1900 — Fleck Eduard. *Die Makrolepidopteren Rumäniens*, In: *Bul. Soc. Sc. Bucureşti*, 9 (1), (1900), p. 1-200.

Fleck 1902 — Fleck Eduard. *Die Makrolepidopteren Rumäniens,* In: *Nachtrag. I. Bul. Soc. Sc*. Bucureşti, 11(1-2), (1902), p. 15- 177.

Fleck 1904 — Fleck Eduard. *Die Makrolepidopteren Rumäniens,* In: *Nachtrag. II. Bul. Soc. Sc*. Bucureşti, 13(3-4), (1904), p. 288-303.

Fuss 1850 — Fuss Karl. *Verzeichnis der bisjetzt in Siebenbürgen aufgefundenen Lepidopteren*, In: *Ver. Mitt. Siebenb. Ver. Naturwiss*. Hermannstadt, 1, (1850), p. 54-64.

Füle 1830 — Füle András. *Diarium,* In: *Füle András Mehádiai úrnak napló könyve* (manuscript, 30 pp.).

Giurescu 1976 — Giurescu Constantin. *Istoria pădurii Românești din cele mai vechi timpuri pînă astăzi*, Ed. Ceres, București, (1976), 391 p.

Groza *et al.* 2015 — Groza Bogdan, Vodă Raluca, Manci Cosmin Ovidiu, Cuvelier Sylvain, Vila Roger, Vlad Eugen Dincă, *Posibile expansiuni în distribuția speciilor Allancastria cerisyi, Melitaea arduinna și Libythea celtis la nord de Balcani* In*:* http://www.lepidoptera.ro/files/prezentari_SLR_2015.

Groza *et al.* 2020 — Groza Bogdan, Vodă Raluca, Székely Levente, Vila Roger, Vlad Eugen Dincă, *Genetics and extreme confnement of three overlooked butterfy species in Romania call for immediate conservation actions.* In: *Journal of Insect Conservation*, 25, (2020), p. 137–146.

Hormuzaki 1894 — Hormuzaki Constantin, *Untersuchungen über die Lepidopterenfauna der Bukovina, Silvester-Morariu-Andriewicz,* (1894), p. Czernowitz.

Hormuzaki 1902 — Hormuzaki Constantin, *Neuere Macrolepidopteren Funde aus Rumänien*, In: *Vehr. zool.-bot.* Gesel, Wien, 52, (1902), p. 563-566.

Hormuzaki 1904 — Hormuzaki Constantin, *Nachtrage zur Lepidopterenfauna der Bukovina,* In: *Werh. Zool.-bot.* Ges. Wien, 54, (1904), p. 422-447.

Horváth, Pável 1875 — Horváth Géza, Pável János, *Enumeratio Macrolepidopterorum Hungariae.* In: *Magy. Tud. Akad. Math. és Term. Közlemények*. XII, (1875), p. 25-74.

Keynes, Keynes 1911 — Keynes John Neville, Keynes G. L. *Butterflies in Hungary*. In: *The Entomologist's Record* 23, (1911), p. 1-10.

Mann 1866 — Mann Joseph, *Aufzählung der im Jahre 1865 in der Dobrudscha gesammelten Schmetterlinge.* In: *Verhandlungen der k. k. zoologisch-botanischen Gesellschaft* Wien 16, (1866), p. 1–40.

Manci *et al.* 2018 — Manci Cosmin Ovidiu, Sitar Cristian, Rákosy László, *Schrankia balneorum (Alphéraky, 1880) (Lepidoptera, Erebidae) - The first records for Romania.* In: *Entomologica romanica* 22 (2018), p. 57-59, Cluj-Napoca.

Nakonieczny *et* — Nakonieczny Miroslav, Kedziorsky Andrzej, Michalczyk Karolina, *Apollo*

al. 2007 — *Butterfly (Parnassius apollo L.) in Europe - its history, decline and perspectives of conservation.* In: *Funct. Ecosyst. Comm*. 1, (2007), p. 56–79.

Niculescu 1963 — Niculescu V. Eugen, *Fam. Pieridae (Lepidoptera).* In: *Fauna R.P.R.* 11(6), Ed. Academiei R.P.R., (1963), București, 202 p.

Niculescu 1965 — Niculescu V. Eugen, *Fam. Nymphalidae (Lepidoptera).* In: *Fauna R.P.R.* 11(7), Ed. Academiei R.P.R., (1965), p. București, 362 p

Pieszczek 1907 — Pieszczek Adolf, *Colias myrmidone Esp. Die Stammfrom und ihre Abarten in Österreich-Ungarn*. In: *Studien und Zuchtergebnisse bearbeitet in drei Aufsätzen.Österreichische Entomologen*-Verein, Wien, (1907), 68 pp. I-III pls.

Poltavsky, Artokhin 2006 — Poltavsky N. Alexander, Artokhin Konstantin Sergheevich, *Tarachidia candefacta (Lepidoptera: Noctuidae) in the south of European Russia*, In: *Phegea*, 34(2), (2006), p. 41-44.

Popescu-Gorj 1964 — Popescu-Gorj Aurelian, *Catalogue de la colection de lépidoptères" Prof. A. Ostrogovich" du Museum d'Histoire Naturelle,,Grigore Antipa" Bucarest.* Ed. Mus. „Grigore Antipa" Bucarest, (1964), 293 pp., 16 pl.

Rákosy 1991 — Rákosy László, *Migraţia fluturilor.* In: *Bul. inf. Soc. lepid. rom*., 7 (3-4), (1991), p. 5-11. Cluj-Napoca.

Rákosy 1996 — Rákosy László, *Die Noctuiden Rumäniens.* Stapfhia, Linz (1996), 648 pp

Rákosy 1999 — Rákosy László, Fenomenul regresiv şi expansionist la lepidoptere. In: Studii şi cercetări (Biologie), Bistriţa, 5, (1999), p. 179-186.

Rákosy 2008 — Rákosy László, *Bibliografia lepidopterologică din România.* In: Bul. inf. Entomol. 19 (3-4), (2008), p. 5-86, Cluj-Napoca.

Rákosy 2011 — Rákosy László, *Originea şi geneza landschaftului natural-cultural din Transilvania*. In: Rákosy & Momeu 2011, *Prof. Univ. Dr. Bogdan Stugren Volum comemorativ*. Presa Universitară Clujeană, (2011), p. 27-38. Cluj-Napoca.

Rákosy 2014 — *Fluturii diurni din grădina mea (Lepidoptera, Cluj).* In: Bul.inf. Entomol., 24: 58-63, (2014), Cluj-Napoca.

Rákosy, Székely 1996 — Rákosy László, Székely Levente, *Macrolepidopterele din sudul Dobrogei.* In: *Entomologica Romanica* 1, (1996), p. 17– 62.

Rákosy, Wieser 2000 — Rákosy László, Wieser Christian, *Das Măcin Gebirge (Rumänien, Nord-Dobrudscha). Ein durch hohe Biodiversität gekennzeichnetes Refugium reliktärer Arten. Fauna und Flora, unter besonderer Berücksichtigung der Schmetterlinge und der Vegetationsverhältnisse.* In: *Carinthia II*, Jahrgang, 190/110, Klagenfurt (2000), p.1-115.

Rákosy, Craioveanu 2014 — Rákosy László, Craioveanu Cristina, *Redescovering Tomares nogelii dobrogensis Caradja, 1895 in Romania.* În: *Entomologica romanica* 19, (2014), p. 13-16.

Rákosy *et al.* 2003 — Rákosy László, Goia Marin, Kovács Zoltán, *Catalogul Lepidopterelor României / Verzeichnis der Schmetterlinge Rumäniens.* Societatea Lepidopterologică Română, Cluj-Napoca (2003), 446 pp.

Rákosy, Goia 2021 — Rákosy László, Goia Marin, *Lepidopterele din România: lista sistematică şi distribuţie / The Lepidoptera of Romania: a Distributional Checklist*. Presa Universitară Clujeană, Soc. Lepid. Rom., (2021), 367 pp.

Rebel 1911 — Rebel Hans. *Lepidopterenfauna von Herkulesbad und Orşova. Eine zoogeographische Studie.* In: *Ann. k. k. Naturhist. Hofmus*, Wien, 25, (1911), p. 17-430.

Rotschild 1912 — Rotschild Nathaniel Charles. *Beitrag zur Lepidopterenfauna der Mezőség.* In: *Verh. Mitt. Siebenb. Ver. Naturwiss.* Hermannstadt, 62(1), (1912), p. 1-32.

Salay 1910 — Salay Franz. *Katalog der Makrolepidopteren Rumäniens.* In: *Bul. Soc. Sci*. Bucarest, 19, (1910), p. 76-206; 453-516.

Schwarzott 1831 — Schwarzott G. Joseph. *Die Hercules-Bader bei Mehadia, ein monographischer Versuch.* Auf Kosten der Verfassers, (1831), 346 pp. Wien.

Székely 1995 — Székely Levente, *Acţiunea schimbărilor condiţiilor de mediu asupra lepidopterofaunei din România.* In: *Bul. inf. Soc. lepid.rom*. 6 (1-2), (1995), p. 27-32, Cluj-Napoca

Székely 1999 — Székely Levente, *Macrolepidoptere cu statut incert în lista faunistică a României (Lepidoptera, Macrolepidoptera),* In: *Bul. inf. soc. lepid. rom*. 10 (1-4), (1999), p. 71 – 78. Cluj-Napoca

Székely 2014 — Székely Levente, Istoria lepidopterologiei din România, (2014), p. 298 pp. Brașov.

Székely, Szabó 1995 — Székely Levente, Szabó Gyula. *Hyles hippophaes (Esper, 1793), o certitudine pentru fauna României.* In: *Bul. inf. Soc. lepid. rom*.6 (3-4), (1995), p. 189-190. Cluj-Napoca.

Székely, Dincă 2020 — Székely Levente, Vlad Eugen Dincă, *Thysanoplusia orichalcea (Fabricius, 1775) (Lepidoptera, Noctuidae, Plusiinae) found again in Romania after more than 150 years.* In: *Entomologica romanica*, 24, (2020), p. 29-31.

LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

Fig. 9. Pădurea Hagieni în 1980 - imagini din același loc (Foto: Levente Székely)

Fig. 10. Pădurea Hagieni în 2018 - imagini din același loc (Foto: Levente Székely)

Fig. 11-12. *Esperarge (Kirinia) climene* - Mehadia, 1881- (Muzeul de Istorie Naturală Budapesta / Foto: Levente Székely)

Fig. 13. *Polygonia egea* - Orșova, 1890 - (Muzeul de Istorie Naturală Budapesta / Foto: Levente Székely)

Fig. 14. *Polyommatus damon* - Lugoj, 1911 - (Muzeul de Istorie Naturală Budapesta / Foto: Levente Székely)

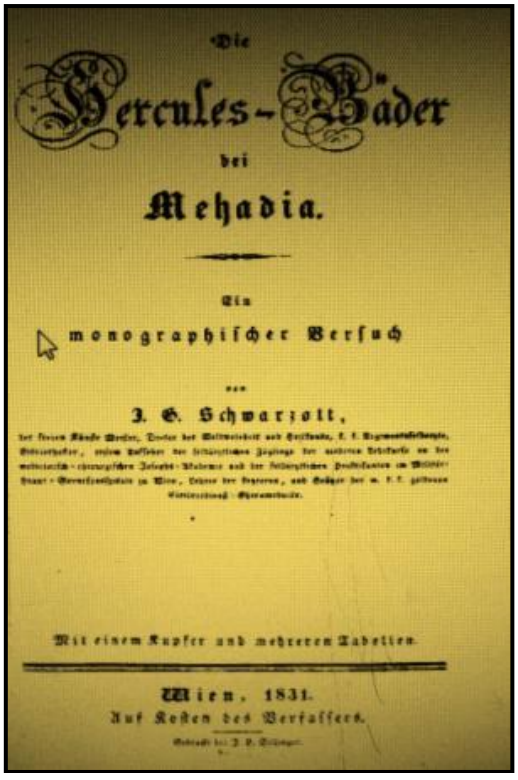
Fig. 15-16. *Satyrus ferula* - Berzasca, 1911 - (Muzeul de Istorie Naturală Budapesta / Foto: Zsolt Bálint)

Fig. 17. *Perisomena caecigena* - Mehadia, 1934 - (Muzeul de Istorie Naturală Budapesta / Foto: Levente Székely)

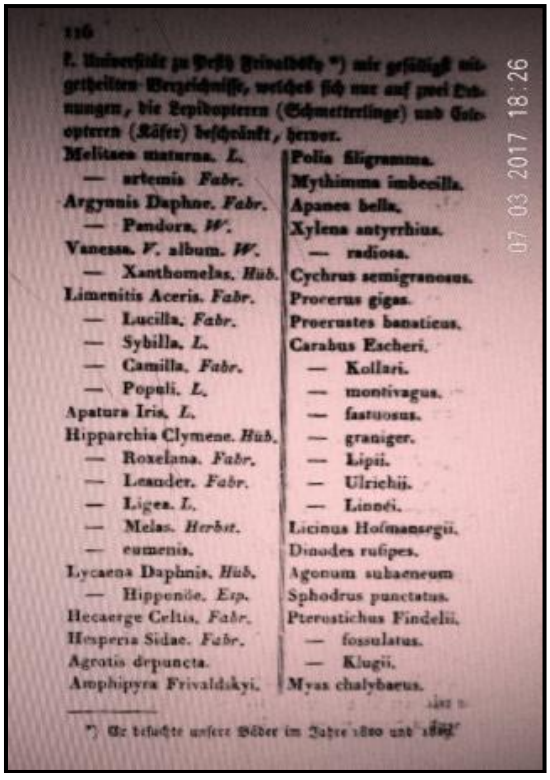
Fig. 18. *Hippotion celerio* - Sibiu, 1931 - (Muzeul Brukenthal - Istorie Naturală, Sibiu / Foto: Levente Székely)


Diarium.
Napló Könyve
Napló Füle András
Mehadiai
1830dik Esztendőbe.

1


Die
Hercules-Bäder
bei
Mehadia.
Ein
monographischer Versuch
von
J. G. Schwarzott,
Mit einem Kupfer und mehreren Tabellen.
Wien, 1831.
Auf Kosten des Verfassers.

2


116
k. Universität zu Pesth Frivaldszky *) mir gefälligst mitgetheilten Verzeichniss, welches sich nur auf zwei Ordnungen, die Lepidopteren (Schmetterlinge) und Coleopteren (Käfer) beschränkt, hervor.
Melitaea maturna. L.
— artemis Fabr.
Argynnis Daphne. Fabr.
— Pandora. W.
Vanessa. V. album. W.
— Xanthomelas. Hüb.
Limenitis Aceris. Fabr.
— Lucilla. Fabr.
— Sybilla. L.
— Camilla. Fabr.
— Populi. L.
Apatura Iris. L.
Hipparchia Clymene. Hüb.
— Roxelana. Fabr.
— Leander. Fabr.
— Ligea. L.
— Melas. Herbst.
— eumenis.
Lycaena Daphnis. Hüb.
— Hipponoë. Esp.
Hecaerge Celtis. Fabr.
Hesperia Sidae. Fabr.
Agrotis depuncta.
Amphipyra Frivaldskyi.
Polia filigramma.
Mythimna imbecilla.
Apamea bella.
Xylena antyrrhius.
— radiosa.
Cychrus semigranosus.
Procerus gigas.
Procrustes banaticus.
Carabus Escheri.
— Kollari.
— montivagus.
— fastuosus.
— graniger.
— Lipii.
— Ulrichii.
— Linnéi.
Licinus Hofmannsegii.
Dinodes rufipes.
Agonum subaeneum
Sphodrus punctatus.
Pterostichus Findelii.
— fossulatus.
— Klugii.
Myas chalybaeus.
*) Er besuchte unsere Bäder im Jahre 1830 und 1831.
07 03 2017 18:26

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

FAUNISTICAL NOTES ON THE STUDY OF LEPIDOPTERA FROM VÂLCEA COUNTY (ROMANIA)

Sergiu-Cornel TÖRÖK[*]
Cărămidă DANIELA[**]
Bianca STAN[**]
Denisa STURZU[**]
Gabriela POPESCU[**]
Daniela Minodora ILIE[**]

Abstract*. As a result of the research carried out in Vâlcea County, 64 Lepidoptera taxa were identified. Among these three species are protected at national level by the Romanian legislation, namely: Neptis sappho (Pallas, 1771), Parnassius mnemosyne (Linnaeus, 1758), şi Lycaena dispar rutila (Werneburg, 1864). Four species are also considered near threatened at national level and these taxa are: Pyronia tithonus (Linnaeus, 1767), Thecla betulae (Linnaeus, 1758), Pieris brassicae (Linnaeus, 1758) and Catocala electa (Vieweg, 1790).*
Keywords*: Lepidoptera, NATURA 2000 species, Lycaena dispar, Parnassius mnemosyne, Vâlcea County*

Rezumat. *Ca rezultat al cercetărilor realizate în judeţul Vâlcea au fost identificate 64 specii de lepidoptere. Printre acestea se numără şi trei specii protejate de lege în România şi anume: Neptis sappho (Pallas, 1771), Parnassius mnemosyne (Linnaeus, 1758), şi Lycaena dispar rutila (Werneburg, 1864). Alte patru specii sunt considerate potenţial-ameninţate conform Listei Roşii a Lepidopterelor din România, acestea sunt: Pyronia tithonus (Linnaeus, 1767), Thecla betulae (Linnaeus, 1758), Pieris brassicae (Linnaeus, 1758) şi Catocala electa (Vieweg, 1790).*
Cuvinte cheie*: Lepidoptera, specii NATURA 2000, Lycaena dispar, Parnassius mnemosyne, judeţul Vâlcea.*

Introduction

Even though the first studies on Romanian Lepidoptera date more than one and half centuries ago, large parts of the country remain poorly investigated, this is also the case of the Romania's southern regions (Rákosy *et al.* 2003; Dincă, Vila 2008). In the past the Lepidoptera from Vâlcea county was studied by numerous entomologists including: Caradja (1901), Fleck (1902), Worell (1951), Alexinschi, König (1963), Bobîrnac *et al.* (1973), Stănoiu (1968, 1971, 1972, 1990), Nemeş (2003, 2004), Stănescu (2005), Weidlich (2005, 2006, 2011), Chimişliu, Goga (2005) and Chimişliu (2006, 2008, 2010, 2012, 2015, 2016). Many of the first records regarding the Lepidoptera from Vâlcea County refer to a larger sampling location, do not give an exact position of the sampling location they refer to, or in many cases the cited collecting localities have suffered drastic changes due to negative human influences.

* Mediaş Municipal Museum, Romania,.torok@yahoo.com
** Lucian Blaga University of Sibiu, Faculty of Sciences, Applied Ecology Research Center, Sibiu, Romania
minodora.ilie@ulbsibiu.ro

These are some of the reasons the recent faunistical records are important, bases on them and some additional data (faunistical data, estimation of the population size and distribution), conservation actions can be started, especially on those taxa which are protected by Romanian law, or on that witch are endangered or critically endangered (Rákosy *et al.* 2021). The main goal of this study is to fill one of the country's gaps and provide recent records regarding the Macrolepidoptera species from Vâlcea County.

Material and methods

The field researches were undertaken between 2018 and 2022, mainly from May to September. Twelve different locations in the Vâlcea County had been studied (Fig. 1.). The entomogical material was collected using insect nets, from different types of habitats (Tab. 1.). For the systematical list we have used the Catalogue of the Romanian Lepidoptera (Rákosy, Goia 2021). The Red List status of our species is the one proposed by Rákosy *et al*. (2021), and it shows the conservation status of Lepidoptera species at national and regional level, the same publication refers to the Romanian legislation regarding the protection of Romanian Lepidoptera (***).

Results and discussions

Altogether we have encountered 64 species of Lepidoptera (Tab. 2.), most of the species are relatively common in Romania. Others like *Pieris brassicae* (Linnaeus, 1758) have become scarcer in the last 30 years, especially due to the extensive use of strong pesticides (Rákosy 2013). From the Romanian Red List point of view, we have found in Vâlcea county four near-threatened species, namely: *Pyronia tithonus* (Linnaeus, 1767), *Thecla betulae* (Linnaeus, 1758), *Pieris brassicae* (Linnaeus, 1758) and *Catocala electa* (Vieweg, 1790). In addition to these taxa, at regional level (Oltenia), *Polyommatus thersites* (Cantener, 1835) is considered data deficient (Rákosy *et al.* 2021). From the 64 species, three, *Parnassius mnemosyne* (Linnaeus, 1758), *Neptis sappho* (Pallas, 1771) and *Lycaena dispar rutila* (Werneburg, 1864) are protected at national level by the Romanian legislation (Rákosy *et al.* 2021). *Lycaena dispar rutila* (Werneburg, 1864) is a NATURA 2000 species in Romania.

Acknowledgments

The authors bring their warmest thanks to all those who helped during our collecting trips. We are also grateful to the anonymous reviewers, which valuable comments have improve the content of the present article.

REFFERENCES

Alexinschi, König 1963 — Alexinschi Alexandru, König Frederic, *Contribuţii la cunoaşterea faunei de lepidoptere din munţii Lotru şi Parâng* In: *Soc. şt. nat. geograf., Com. Zool.* 2, Bucureşti (*1963*), p. 95-103.

Bobârnac *et al.* 1973 — Bobârnac Bogdan, Matei Ioan, Costescu C., Stănoiu Ioan, *Contribuţii la studiul entomofaunei zonei subcarpatice a Olteniei*, In: *Stud. cercet., Subcom. Mon. Nat. C.C.E.S. al judeţului Vâlcea*, Râmnicu Vâlcea (1973), p. 211-217.

Caradja 1901 — Caradja Aristide, *Die Microlepidopteren Rumäniens*, In: *Bul. Soc. Sciences* 10 (1-2), *Bucharest* (1901), p. 110-168.

Chimişliu, Goga 2005 — Chimişliu Cornelia, Goga Claudia, *Catalogul macrolepidopterelor Donaţiei „Ioan Stănoiu", conservată în patrimoniul Secţiei de Ştiinţele Naturii a Muzeului Olteniei Craiova*, In: *Studii şi comunicări. Complexul Muzeal de Ştiinţele Naturii „Ion Borcea"* 20, *Bacău* (2005), p. 103-120.

Chimişliu 2006 — Chimişliu Cornelia, *Lepidoptera (Insecta: Lepidoptera) from Romania preserved in the "Ion Firu" Entomological Collection from the patrimony of the Oltenia Museum Craiova*, In: *Entomologica romanica 11. Societatea Lepidopterologică Română, Cluj-Napoca* (2006), p. 55-68.

Chimişliu 2008 — Chimişliu Cornelia, *Contributions to the knowledge of the diversity of the papilionide (Insecta: Lepidoptera: Papilionoidea: Papilionidae) from Romania's fauna*. In: *Analele Ştiinţifice ale Universităţii „Al. I. Cuza" Iaşi, serie nouă. Lucrările Simpozionului Entomofagii şi rolul lor în păstrarea echilibrului natural*. *Edit. Universităţii "Al. I. Cuza" Iaşi* (2008), p. 169-164.

Chimişliu 2010 — Chimişliu Cornelia, *Contribuţii la cunoaşterea familiei Sphingidae (Lepidoptera, Bombycoidea) din fauna Olteniei, România*. In: *Buletin Ştiinţific. Revista de Etnografie, Ştiinţele Naturii şi Muzeologie (Serie Nouă)* (2010), p. 55-63.

Chimişliu 2012 — Chimişliu Cornelia, *Noi date privind diversitatea familiei nymphalidae (insecta: lepidoptera) în fauna Olteniei, România (II)*, In: *Buletinul ştiinţific al Muzeului Naţional de Etnografie şi Istorie Naturală a Moldovei,* Vol. 16 (29) (2012), p.16 – 26.

Chimişliu 2015 — Chimişliu Cornelia, *The scientific valorization of the entomological patrimony preserved at the Museum of Oltenia Craiova*. In: *Oltenia, Studii şi comunicări. Ştiinţele Naturii* Tom. 31, No. 2, (2015), p. 135-148.

Chimişliu 2016 — Chimişliu Cornelia, *New data about presence of the Zygaenidae family (insecta : Lepidoptera: Zygaenoidea) in the fauna of Oltenia , Romania*. In: *IX-th International Conference of Zoologists "Sustainable use, protection of animal world and forest management in the context of climate change"* (2016), p. 113 – 114.

Fleck 1902 — Fleck Eduard, *Die Makrolepidopteren Rumäniens. Nachtrag I*. In: *Bul. Soc. Sc., Bucureşti* 11 (1-2) (1902), p. 159-177.

Nemeş 2003 — Nemeş Ioan, *Coleophoridae din România (VI)*, In: *Editura Muşatinii, Suceava* (2003).

Nemeş 2004 — Nemeş Ioan, *Coleophoridae din România (VII)*, In: *Editura Muşatinii, Suceava* (2004).

Rákosy 2013 — Rákosy László, *Fluturii diurni din România. Cunoaştere, protecţie, conservare,* In: *Editura Mega, Cluj-Napoca* (2013).

Rákosy *et al*. 2021 — Rákosy László, Corduneanu Constantin, Crișan Andrei, Dincă Vlad, Kovács Sándor, Stănescu Mihai, Székely Levente, *Lista roşie a fluturilor din România/Romanian Red List of Lepidoptera*, In: *Editura Presa Universitară Clujeană, Cluj-Napoca* (2021).

Rákosy, Goia 2021 — Rákosy László, Goia Marin, *Lepidopterele din România: Lista sistematică şi distribuţie*. In: *Editura Presa Universitară Clujeană, Cluj-Napoca* (2021).

Stănescu 2005 — Stănescu Mihai, *The Catalogue Of the "Ioan Lăzărescu" collection Of Lepidoptera (Insecta) from The "Grigore Antipa" National Museum of Natural History (Bucharest)*, In: *Travaux du Muséum National d'Histoire Naturelle «Grigore Antipa»,* Vol. XLVIII (2005), p. 213–288.

Stănoiu 1968 — Stănoiu Ioan, *Noi date asupra microlepidopterelor din Oltenia*, In: *Universitatea Craiova Buletin Ştiinţific,* 10 (1968), p. 695 – 704.

Stănoiu 1971 — Stănoiu Ioan, *Cercetări noi asupra faunei de microlepidoptere (Insecta) din Oltenia*, In: *Subcomunicări Monumentele Naturii Oltenia, Craiova, Studii şi Cercetări* (1971): 161 – 165.

Stănoiu 1972 — Stănoiu Ioan, *Noi contribuţii la studiul Tortricidaelor (Lepidoptera) din Oltenia (II)*, In: *Subcomunicări Monumentele Naturii Oltenia, Craiova* (1972): 155-159.

Stănoiu 1990 — Stănoiu Ioan, *Date noi asupra lepidopterelor din Oltenia*, In: *Analele Banatului, Ştiinţele naturii* 2*, Muzeul Banatului, Timişoara* (1990), p. 64-68.

Weidlich 2005 — Weidlich Michael, *Zum Vorkommen von Eosolenobia manni (Zeller, 1852) in Rumänien mit einem Überblick zur Gesamtverbreitung in Europa (Lepidoptera: Psychidae)*, In: *Entomologica romanica* 10, *Cluj-Napoca* (2005), p. 53-57.

Weidlich 2006 — Weidlich Michael, *Reisseronia arnscheidi sp. n. aus den Südkarpaten Rumäniens (Psychidae)*, In: *Nota lepidopterologica* 28 (3/4) (2006), p. 203–211.

Weidlich 2011 — Weidlich Michael, *Ein Beitrag zur Makrolepidopterenfauna der Munţii Câpâţenei und Munţii Lotrului in den Südkarpaten Rumäniens mit der Erstbeschreibung des Weibchens von Psychidea balcanica (Wehrli, 1933) (Lepidoptera)*, In: *Buletin de Informare Entomologică* 22 (2011), p. 3-4.

Worell 1951 — Worell Eugen, *Contribuţii la cunoaşterea faunei coleopterelor şi lepidopterelor din Transilvania, mai ales din împrejurimile oraşului Sibiu*, In: *Acad. R.P.R. Bul. Şt. Sec. Şt. Biol. Agron. Geolog. Geograf., Bucureşti* 3 (3) (1951), p. 533-543.

*** Romanian Official Monitor no. 262 from 13 april 2011. Law no. 49 from 7 april 2011 for the approval of the emergency ordinance no. 57/2007 on the protected sites status, on conservation of natural habitats, flora and wild fauna.

*** Romanian Official Monitor no. 442 from 29 june 2007. Emergency ordinance no. 57 from 20 june 2007 on the protected sites status, on conservation of natural habitats, flora and wild fauna.

LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

Table 1. Characteristics of the study sites in Vâlcea County

Study sites	GPS coordinates	Locality	Habitat type	Altitude
B1	44°58'9.07"N 24°14'0.75"E	Băbeni	Orchard	205 m
B2	44°58'26.56"N 24°14'56.45"E	Băbeni	Meadow	201 m
B3	44°57'2.34"N 24°13'56.28"E	Băbeni	Forest edge	228 m
DR	44°40'14.52"N; 24°15'18.92"E	Drăgășani	Meadow	167 m
P	45.2674955 N; 29.3356825 E	Păușa	Meadow	373 m
S	45.3017155 N; 24.3397337 E	Păușa (Stânișoara Monastery)	Mountain pasture	745 m
BU	45°19'1.02"N; 24°20'40.83"E	Valea Bulzu	Deciduous forest	1463 m
DÂ	45°17'24.01"N; 24°25'27.16"E	Dângești	Orchard	558 m
VS	45°20'15.86"N; 24°11'49.12"E	Valea lui Stan (Brezoi)	Deciduous forest	596 m
BV	45°13'34.76"N 24° 6'18.40"E	Pătrunsa Monastery	Mountain pasture	975 m
BR	45.3374075 N; 24.2701314 E	Brezoi	Meadow	336 m
CZ	45°16'3.40"N; 24°19'52.85"E	Păușa (Cozia Mountains)	Mountain pasture	683 m

Table 2. List of Lepidoptera recorded in Vâlcea County

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
FAMILY PIERIDAE															
Subfamily Pierinae															
1.	*Pieris napi* (Linnaeus, 1758)	+	+	+	-	-	-	+	+	-		+		LC	LC
2.	*Pieris rapae* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
3.	*Pieris brassicae* (Linnaeus, 1758)	-	-	-	-	+	-	-	-	-	+	+	-	NT	LC/NT
4.	*Aporia crataegi* (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	+	+	+	LC	LC
5.	*Pontia edusa* (Fabricius, 1777)	-	-	-	-	-	-	-	-	-	-	+	-	LC	LC

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
Subfamily Coliadinae															
6.	*Colias hyale* (Linnaeus, 1758)	-	+	-	-	-	-	-	+	-	-	+	-	LC	LC
7.	*Colias croceus* (Fourcroy, 1785)	-	+	-	-	-	-	+	-	-	-	-	-	LC	LC
8.	*Gonepteryx rhamni* (Linnaeus, 1758)	-	-	-	-	+	-	-	-	-	+	+	+	LC	LC
Subfamily Dismorphiinae															
9.	*Leptidea sinapis* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
FAMILY PAPILIONIDAE															
Subfamily Papilioninae															
10.	*Iphiclides podalirius* (Linnaeus, 1758)	-	+	-	-	-	-	-	-	-	-	+	-	LC	LC
11.	*Papilio machaon* Linnaeus, 1758	-	-	-	-	-	-	+	+	+	-	+	-	LC	LC
Subfamily Parnassiinae															
12.	*Parnassius mnemosyne* (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	+	-	-	LC	LC
FAMILY NYMPHALIDAE															
Subfamily Limenitidinae															
13.	*Neptis sappho* (Pallas, 1771)	-	-	+	-	-	-	+	-	-	+	+	-	LC	LC
Subfamily Heliconiinae															
14.	*Argynnis paphia* (Linnaeus, 1758)	-	-	+	-	-	-	+	+	-	-	-	-	LC	LC
15.	*Brenthis daphne* (Bergsträsser, 1780)	-	+	-	-	-	+	-	+	-	-	-	-	LC	LC

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
16.	*Boloria dia* (Linnaeus, 1767)	-	+	-	-	-	-	+	-	+	+	+	+	LC	LC
17.	*Issoria lathonia* (Linnaeus, 1758)	-	-	-	-	-	+		+	-	+	-	-	LC	LC
Subfamily Nymphalinae															
18.	*Vanessa cardui* (Linnaeus, 1758)	-	+	-	-	-	-	-	+	-	+	+	+	LC	LC
19.	*Araschnia levana* (Linnaeus, 1758)	-	-	+	-	-	-	+	+	+	-	-	-	LC	LC
20.	*Polygonia c-album* (Linnaeus,1758)	-	-	+	-	-	-	-	-	-	+	+	+	LC	LC
21.	*Melitaea athalia* (Rottemburg, 1775)	-	-	-	-	+	-	-	-	+	-	-	-	LC	LC
22.	*Melitaea aurelia* (Nickerl, 1850)	-	+	-	-	-	-	+	+	-	-	-	-	LC	LC
23.	*Melitaea phoebe* ([Denis & Schiffermüller], 1775)	-	-	-	-	-	-	-	+	-	-	-	-	LC	LC
24.	*Melitea didyma* (Esper, 1778)	-	+	-	-	-	-	-	-	-	-	-	-	LC	LC
Subfamily Satyrinae															
25.	*Pararge aegeria* (Linnaeus,1758)	-	-	-	-	-	-	+	-	-	+	+	+	LC	LC
26.	*Coenonympha glycerion* (Borkhausen, 1788)	-	+	+	-	+	-	+	+	-	+	+	-	LC	LC
27.	*Coenonympha pamphilus* (Linnaeus,1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
28.	*Pyronia tithonus* (Linnaeus,1767)	-	-	-	-	-	-	+	-	+	-	-	-	NT	NT
29.	*Aphantopus hyperantus* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
30.	*Maniola jurtina* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
31.	*Melanargia galathea* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
32.	*Brintesia circe* (Fabricius, 1775)	-	-	-	-	-	-	+	-	-	-	+	-	LC	LC
33.	*Minois dryas* (Scopoli, 1763)	+	+	+	+	+	+	+	+	+	-	+	-	LC	LC
34.	*Erebia medusa* (Denis & Schiffermüller, 1775)	-	-	-	-	-	-	-	-	-	+	-	-	LC	LC
FAMILY LYCAENIDAE															
Subfamily Lycaeninae															
35.	*Lycaena dispar rutila* (Werneburg, 1864)	-	+		-	-	-	-	-	+	-	-	-	LC	LC
36.	*Lycaena phlaeas* (Linnaeus, 1761)	-	-	-	-	+	+	-	-	-	-	-	-	LC	LC
37.	*Thecla betulae* (Linnaeus, 1758)	-	-	-	-	-	-	+	-	-	-	-	-	NT	NT
38.	*Celastrina argiolus* (Linnaeus, 1758)	-	-	+	-	-	+	-	-	-	+	-	+	LC	LC
39.	*Plebejus argus* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
40.	*Polyommatus icarus* (Rottemburg, 1775)	-	-	-	-	+	-	+	+	-	+	+	+	LC	LC

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
41.	*Polyommatus thersites* (Cantener, 1835)	-	-	-	-	-	-	-	-	+	-	-	-	DD	LC
FAMILY HESPERIIDAE															
Subfamily Pyrginae															
42.	*Erynnis tages* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	LC	LC
Subfamily Hesperiinae															
43.	*Ochlodes sylvanus* (Esper, [1777])	+	-	-	-	-	+	-	-	-	-	-	-	LC	LC
44.	*Thymelicus lineola* (Ochsenheimer, 1808)	-	-	-	-	-	-	-	-	+	-	-	-	LC	LC
FAMILY GEOMETRIDAE															
Subfamily Sterrhinae															
45.	*Idaea rusticata* ([Denis & Schiffermüller], 1775)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
46.	*Scopula immorata* (Linnaeus, 1758)	-	-	-	-	+	-	-	-	-	-	-	-	LC	LC
Subfamily Geometrinae															
47.	*Chlorissa cloraria* (Hübner, [1813])	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
48.	*Siona lineata* (Scopoli, 1763)	-	-	-	-	-	-	-	-	-	+	+	+	LC	LC
Subfamily Larentiinae															
49.	*Xanthorhoe ferrugata* (Clerck, 1759)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
50.	*Colostygia pectinaria* (Knock, 1781)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
Subfamily Ennominae															

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
51.	*Hypomecis punctinalis* (Scopoli, 1763)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
52.	*Ematurga atomaria* (Linnaeus, 1758)	-	-	-	+	-	-	-	-	-	+	+	+	LC	LC
FAMILY EREBIDAE															
Subfamily Lymantriinae															
53.	*Lymantria dispar* (Linnaeus, 1758)	-	-	-	-	-	-	-	+	-	-	-	-	LC	LC
Subfamily Erebinae															
54.	*Catocala electa* (Vieweg, 1790)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC/NT
55.	*Euclidia glyphica* (Linnaeus, 1758)	-	-	-	-	+	-	-	+	-	+	+	+	LC	LC
Subfamily Herminiinae															
56.	*Polypogon tentacularia* (Linnaeus, 1758)	-	-	-	-	-	-	-	-	+	-	-	-	LC	LC
Subfamily Arctiinae															
57.	*Arctia villica (Linnaeus, 1758)*	-	-	-	-	-	-	-	-	-	-	-	+	LC	LC
FAMILY NOCTUIDEA															
Subfamily Hadeninae															
58.	*Tholera decimalis* (Poda, 1761)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
Subfamily Eustrotiinae															
59.	*Protodeltote pygarga* (Hufnagel, 1766)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
Subfamily Acontiinae															

Nr. Crt.	Taxa	SAMPLING POINTS												R.L. OT	R. L.
		B1	B2	B3	DR	P	S	BU	DÂ	VS	BV	BR	CZ		
60.	*Acontia trabealis* (Scopoli, 1763)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
Subfamily Plusiinae															
61.	*Autographa gamma* (Linnaeus, 1758)	-	-	-	-	-	-	+	-	-	+	+	+	LC	LC
FAMILY HEPIALIDAE															
62.	*Triodia sylvina* (Linnaeus, 1761)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
FAMILY CRAMBIDAE															
Subfamily Pyraustinae															
63.	*Anania lancealis* ([Denis & Schiffermüller], 1775)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC
FAMILY PYRALIDAE															
Subfamily Pyralinae															
64.	*Hypsoygia costalis* (Fabricius, 1775)	-	-	-	+	-	-	-	-	-	-	-	-	LC	LC

***** Abreviations: Sampling localities: Băbeni (Orchard) - B1, Băbeni (Meadow) - B2, Băbeni (Forest Edge) - B3, Drăgășani – DR, Păușa – P, Stânișoara Monastery – S, Bulzu – BU, Dângești – DÂ, Valea lui Stan – VS, Buila-Vânturariţa Mountains (Pătrunsa Monastery) - BV, Brezoi - BR, Cozia Mountains - CZ; R.L.OT - Red List from Oltenia (Regional Level), RL. – Red List from Romania: LC – Least Concern, NT – Near Threatened, VU – Vulnerable, DD – Data Deficient.

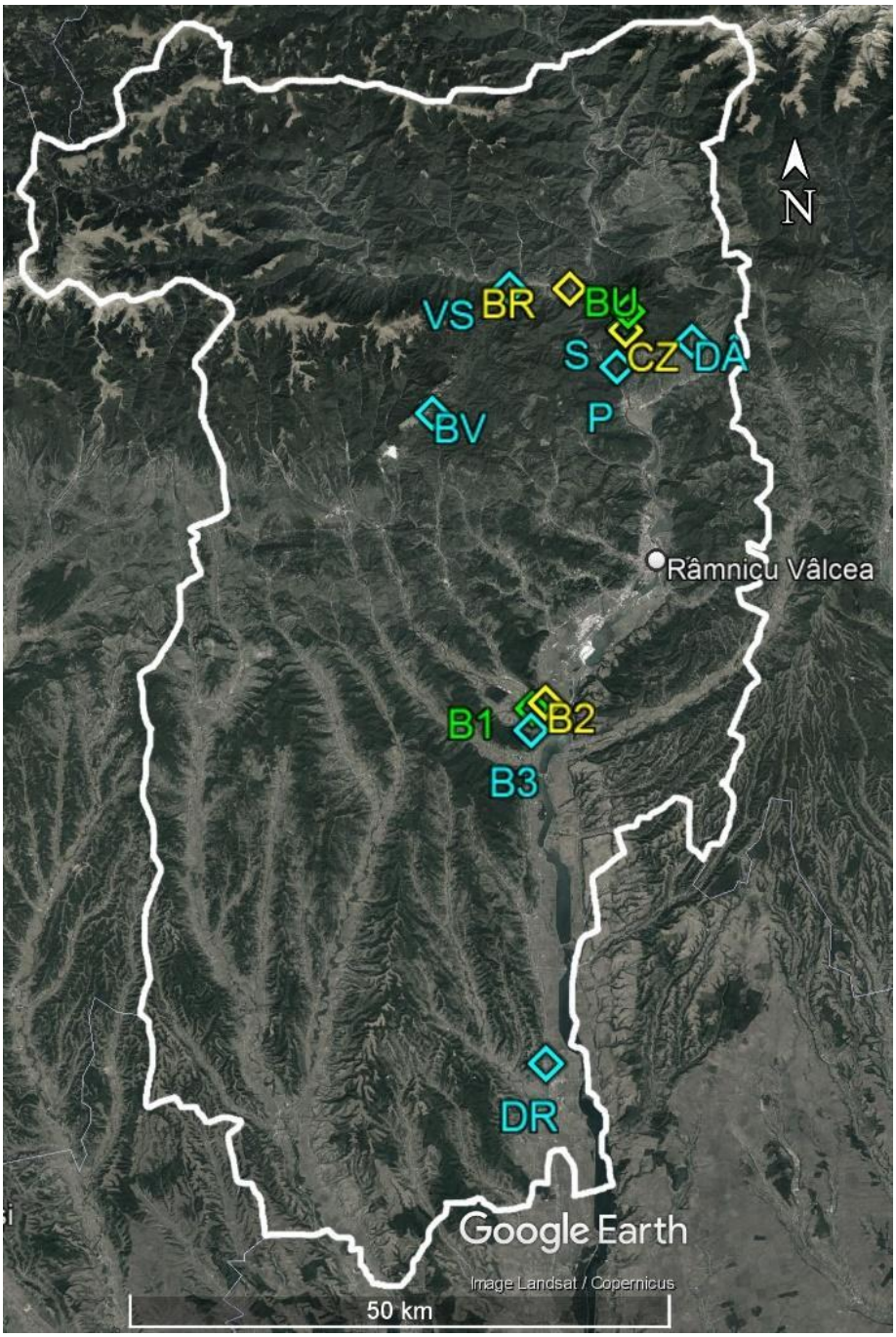


Figure 1. Map of the study area and sampling locations (modified after Google Earth) (codes: : Băbeni (Orchard) - B1, Băbeni (Meadow) - B2, Băbeni (Forest Edge) - B3, Drăgășani – DR, Păușa – P, Stânișoara Monastery – S, Bulzu – BU, Dângești – DÂ, Valea lui Stan – VS, Buila-Vânturariţa Mountains (Pătrunsa Monastery) - BV, Brezoi - BR, Cozia Mountains – CZ)

CONTRIBUTIONS TO THE KNOWLEDGE OF THE BUTTERFLY FAUNA (LEPIDOPTERA: RHOPALOCERA) IN THE ROSCI0020 CÂMPIA CAREIULUI PROTECTED AREA (NORTH-WESTERN ROMANIA)

Florin BUGNER*
Emanuel ENGHIȘ**
Ioan TĂUȘAN*

Abstract. *In the present paper we give insights on the butterfly fauna from Câmpia Careiului protected area. Altogether, we identified 50 butterfly species, most of them common for the Romanian fauna. However, we highlight the presence of Natura 2000 species: Lycaena dispar, Zerynthia polyxena and Euphydryas maturna. In the latter case, we record an impressive metapopulation in a relatively small patch of habitat. The overall biodiversity reaches 71 butterfly species are known to the area.*
Keywords*: Euphydryas maturna, Natura 2000 species, faunistics.*

Rezumat. *În prezenta lucrare sunt oferite date privind fauna de lepidoptere de zi din aria protejată Câmpia Careiului. În total, au fost identificate 50 de specii, cele mai multe fiind comune pentru fauna de fluturi din România. Totuși, reamintim prezența unor specii Natura 2000 precum: Lycaena dispar, Zerynthia polyxena and Euphydryas maturna. În cazul speciei E. maturna, s-a observat o metapopulație impresionantă într-un habitat restrâns ca dimensiune și calitate. În total, biodiversitatea din zonă se ridică la 71 de specii de fluturi de zi cunoscuți.*
Cuvinte cheie*: Euphydryas maturna, specii Natura 2000, faunistică.*

Introduction

Intense efforts are carried out by many lepidopterologists including many amateurs in Romania (see Enghiș, Iacob 2022). With an increase of Citizen Science involvement, we can observe a growing interest in butterfly biology and occurrence in several areas within the country. However, there are still gaps in species distribution and a lack of faunistical data despite recent efforts towards this group of insects (Rákosy, Goia, 2021).

As a rule, protected areas possess a great importance due to their potential in hosting biodiversity and high-quality habitats. However, this is not always the case with some protection systems, such a as Natura 2000.

This system has no attractive compensation strategies for the owners of private land (Grodzinska-Jurczak, Cent 2010).

Therefore, it's highly improbable that local communities may help to preserve the plant and animal from the protected areas.

In the present paper we highlight the butterfly fauna from a protected area in the north-western part of Romania and record an important population of the scarce fritillary *Euphydryas matur*na (Linnaeus 1758), Natura 2000 species.

Study area, material, and methods

The study was carried out in 2020 in the ROSCI Câmpia Careiului protected area. The area is in the North-Western part of Romania in two counties: Satu Mare and Bihor. The area was previous studies by Szabo (1996), Ardealean (1998) and Vizauer (2009).

The surface of the site ROSCI0020 Câmpia Careiului is 23,597 ha and includes 10 types of natural habitats of European interest and 24 species of community interest. The surface of the site overlaps with 4 nature reserves: Urziceni Forest, Vermeș Swamp, Foieni Sand Dunes, *Corynephorus* Pasture from Voievozi.

Three butterflies are known to occur in the protected area and are classified as Natura 2000 species. Namely, *Lycaena dispar, Phengaris teleius* and *Euphydryas maturna.* Based on these three species and other invertebrate species the area was designated as a protected area.

* Lucian Blaga University of Sibiu, Faculty of Sciences, Applied Ecology Research Center, Sibiu, Romania, , ioan.tausan@ulbsibiu.ro.

Several field campaigns were carried out in different areas from the protected area. We selected the following sampling sites (see Figure 1).

Urziceni Pădure site consists of habitats both forest and open ones. The area is relatively dry and thus have a great influence on the butterfly fauna. Vermeș Swamp (Mlaștina Vermeș) site is currently no longer a swamp. The site was highly impacted by human interventions 60 years ago and now the grasslands are quite dry.

Forest of Urziceni (Pădurea Urziceni) site is located near the Urziceni Pădure city and it consists of old oaks.

Mihai's Valley (Valea lui Mihai) site is situated in the South-Western part of the protected area, near the border to Hungary. The habitats are represented by a mosaic of hygromesophile grasslands (Figure 2).

The transect method was used in all these locations. Butterflies were collected, identified, and released on the spot after identification. In the case of species that could not be recognized the material was identified in the laboratory using available keys (Rakosy 2013).

Results and discussions

Altogether, we identified 24 butterfly species, most of them common for Romania (See Table 1). Comparing the data with the previous studies in the area (Szabó, 1996; Vizauer, 2009) we did not find any new species. However, we identified three protected species, namely, *Lycaena dispar* (Fig. 3), *Zerynthia polyxena* (Fig. 4) and *Euphydryas maturna* (Figure 5)

Concerning the family abundance, we observed, as expected, that the Nymphalidae family is the most abundant. Also, in the same scenario, the Papilionidae, which is represented by few species worldwide, is less abundant (Figure 6).

The overall all species composition is a typical one, with no real surprises in terms of faunistics. However, there are some aspects that are worthwhile mentioning. First, is the *Phengaris teleius* species which was previously mentioned from the area, during our survey was not found. Despite the existence of several habitats with the host plant, *Sanguisorba officinalis,* no individuals of *P. teleius* was found. The former habitats where the species was recorded a decade ago, are now highly impacted by overgrazing and intensive agriculture. Thus, the habitats are fragmented and it's highly probable that the species may not occur anymore. This may be the case of other species such as *Colias myrmidone* and *Lopinga achine*.

However, on the 17$^{th\ of}$ May 2020, we encountered a significant population of approximately 200 individuals that occurred in small patch of forest. The exact location is not given due to conservation reasons. Moreover, the area is located near human settlements and the associate impact could have a negative influence towards the population integrity.

Future investigations on the population size are needed alongside conservation measure in order to preserve such an important metapopulation of the protected species, *Euphydryas maturna.*

Acknowledgments
We are in debt to Silviu Țicu, Maria Stănciugelu, Tatiana Barac, Daiana Talpoș and Andreea Mihăescu who assisted us in our numerous field trips. The authors are grateful to Dr. Sergiu Török, for the useful comments, which improved the manuscript.

REFFERENCES

Ardelean, 1998 — Ardelean Gavril, *Fauna județului Satu Mare, Țara Oașului, Culmea Codrului, Câmpia Someșului*, In: "*Vasile Goldiș" University Press* 1998.

Enghiș, Iacob 2022 — Enghiș Emanuel, Iacob Adriana, *Fluturi de zi ai județului Satu Mare*. (2022)

Grodzinska-Jurczak, Cent 2011 — Grodzinska-Jurczak, M., & Cent, J, *Expansion of nature conservation areas: problems with Natura 2000 implementation in Poland?* In: *Environmental management* 47 (2011), p. 11-27.

Rákosy 2013 — Rákosy László, *Fluturii diurni din România. Cunoaştere, protecţie, conservare*. In: *Editura MEGA*, Cluj-Napoca (2013),

Rákosy, Marin 2021 — Rákosy László, Goia Marin, Lepidopterele din România: lista sistematică și distribuție. In: *Presa Universitară Clujeană*, Cluj-Napoca (2021), 369 p

Rákosy *et al*. 2021 — Rákosy László, Constantin Corduneanu, Andrei Crișan, Vlad Dincă, Sándor Kovács, Mihai Stănescu, Levente Székely, *Lista Roșie a fluturilor din România*. In: *Presa Universitară Clujeană*, Cluj (2021), 187 p

Szabó 1997 — Szabó, *Fluturi de zi (Rhopalocera) din judeţul Satu Mare după cercetările autorului din 1972 până în prezent*. In: *St. şi Com., Muz. Jud. Satu Mare*, 13 (1997), p. 427-431

Vizauer 2009 — Vizauer Tibor, *Contribuţii la cunoaşterea faunei de macrolepidoptere din Câmpia Careiului (jud. Satu Mare)*, In: *Bul. Inf. Soc. Lepid. Rom*. 20 (2009), p. 141-163

LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

Table 1 Updated list of butterfly species known to the protected area

	SPECIES	NEW DATA	LITERATURE
	FAMILY HESPERIDAE		
1.	*Erynnis tages* (Linnaeus, 1758)		Vizauer, 2009
2.	*Carcharodus alceae* (Esper, 1780)	**X**	Ardelean , 1998; Vizauer, 2009; Enghiș, 2022
3.	*Pyrgus carthami* (Hübner, [1808-1813])		Ardelean , 1998
4.	*Pyrgus malvae* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
5.	*Pyrgus armoricanus* (Oberthür, 1910)		Ardelean, 1998; Vizauer, 2009
6.	*Thymelicus lineola* (Ochsenheimer, 1808)		Ardelean, 1998
7.	*Hesperia comma* (Linnaeus, 1758)		Vizauer, 2009
8.	*Ochlodes sylvanus* (Esper, 1777)	**X**	Vizauer, 2009; Enghiș 2022
	FAMILY PAPILIONIDAE		
9.	*Zerynthia polyxena* ([Denis & Schiffermüller], 1775)	**X**	Enghiș, 2022
10.	*Papilio machaon* Linnaeus, 1758		Vizauer, 2009; Enghiș, 2022
11.	*Iphiclides podalirius* (Linnaeus, 1758)	X	Enghiș, 2022
	FAMILY PIERIDAE		
12.	*Leptidea sinapis* (Linnaeus, 1758)		Vizauer, 2009; Enghiș 2022
13.	*Anthocharis cardamines* (Linnaeus, 1758)	**X**	Enghiș 2022
14.	*Pieris rapae* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
15.	*Pieris napi* (Linnaeus, 1758)	X	Vizauer, 2009; Enghiș, 2022
16.	*Pontia edusa* (Fabricius, 1777)	**X**	Vizauer, 2009; Enghiș, 2022
17.	*Colias erate* (Esper, 1805)	X	Vizauer, 2009; Enghiș, 2022
18.	*Colias croceus* (Fourcroy, 1785)	**X**	Vizauer, 2009; Enghiș, 2022
19.	*Colias myrmidone* (Esper, 1780)		Szabó, 1996
20.	*Colias hyale* (Linnaeus, 1758)	X	Vizauer, 2009; Enghiș, 2022
21.	*Colias alfacariensis* Ribbe, 1905		Vizauer, 2009
	FAMILY RIODINIDAE		
22.	*Hamearis lucina*		Vizauer, 2009
	FAMILY LYCANIDAE		
23.	*Lycaena phlaeas* (Linnaeus, 1761)	**X**	Vizauer, 2009; Enghiș, 2022
24.	*Lycaena dispar rutila* (Werneburg, 1864)	**X**	Ardelean , 1998; Vizauer, 2009; Enghiș, 2022
25.	*Lycaena tityrus* (Poda, 1761)	**X**	Ardelean , 1998; Vizauer, 2009; Enghiș, 2022

26. *Lycaena alciphron* (Rottemburg, 1775)	**X**	Enghiș, 2022
27. *Lycaena thersamon* (Esper, 1874)		Vizauer, 2009
28. *Thecla betulae* (Linnaeus, 1758)		Vizauer, 2009
29. *Favonius guercus* (Linnaeus, 1758)		Vizauer, 2009
30. *Satyrium acaciae* (Fabricius, 1787)	**X**	Enghiș, 2022
31. *Cupido argiades* (Pallas, 1771)	**X**	Vizauer, 2009; Enghiș, 2022
32. *Cupido decolorata* (Staudinger, 1886)		Vizauer, 2009
33. *Celastrina argiolus* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
34. *Pseudophilotes vicrama* (Moore, 1865)		Vizauer, 2009
35. *Phengaris teleius* (Bergsträsser, 1779)		Vizauer, 2009
36. *Plebejus argus* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
37. *Plebejus idas* (Linnaeus, 1761)		Vizauer, 2009
38. *Plebejus argyrognomon* (Bergsträsser, 1779)	**X**	Szabó, 1996; Vizauer, 2009; Enghiș, 2022
39. *Aricia agestis* ([Denis & Schiffermüller], 1775)	**X**	Vizauer, 2009
40. *Lysandra coridon* (Poda, 1761)		Vizauer, 2009
41. *Polyommatus thersites* (Cantener, 1835)		Vizauer, 2009
42. *Polyommatus icarus* (Rottemburg, 1775)	**X**	Vizauer, 2009; Enghiș, 2022
FAMILY NYMPHALIDAE		
43. *Libythea celtis* (Laicharting, 1782)		Ardelean , 1998; Rákosy, 2013
44. *Argynnis paphia* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
45. *Argynnis pandora* (Denis & Schiffermüller, 1775)	**X**	Enghiș, 2022
46. *Issoria lathonia* (Linnaeus, 1758)	**X**	Ardelean , 1998; Vizauer, 2009; Enghiș, 2022
47. *Boloria selene* ([Denis & Schiffermüller], 1775)	**X**	Vizauer, 2009
48. *Boloria dia* (Linnaeus, 1767)	**X**	Vizauer, 2009; Enghiș, 2022
49. *Neptis sappho* (Pallas, 1771)	**X**	Vizauer, 2009; Enghiș, 2022
50. *Apatura ilia* ([Denis & Schiffermüller], 1775)	**X**	
51. *Nymphalis xanthomelas* (Esper, 1781)	**X**	Enghiș, 2022
52. *Aglais io* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
53. *Vanessa atalanta* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
54. *Vanessa cardui* (Linnaeus, 1758)	**X**	Ardelean, 1998; Vizauer, 2009; Enghiș, 2022
55. *Polygonia c-album* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
56. *Araschnia levana* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022

57. *Melitaea cinxia* (Linnaeus, 1758)	**X**	Enghiș, 2022
58. *Melitaea phoebe* (Denis & Schiffermüller, 1775)	**X**	Vizauer, 2009; Enghiș, 2022
59. *Melitaea athalia* (Rottemburg, 1775)		Vizauer, 2009;
60. *Melitaea aurelia* (Nikerl, 1850)		Vizauer, 2009;
61. *Euphydryas maturna* (Linnaeus, 1758)	**X**	Enghiș, 2022
62. *Pararge aegeria* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
63. *Lasiommata megera* (Linnaeus, 1767)	**X**	Vizauer, 2009; Enghiș, 2022
64. *Lasiommata maera* (Linnaeus, 1758)	**X**	Enghiș, 2022
65. *Lopinga achine* (Scopoli, 1763)		Szabó, 1996
66. *Coenonympha glycerion* (Borkhausen, 1788)	**X**	Ardelean, 1998; Vizauer, 2009; Enghiș, 2022
67. *Coenonympha pamphilus* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
68. *Aphantopus hyperantus* (Linnaeus, 1758)		Vizauer, 2009;
69. *Maniola jurtina* (Linnaeus, 1758)	**X**	Vizauer, 2009; Enghiș, 2022
70. *Melanargia galathea* (Linnaeus, 1758)	**X**	Ardelean, 1998; Enghiș, 2022
71. *Minois dryas* (Scopoli, 1763)	**X**	Ardelean, 1998; Vizauer, 2009; Enghiș, 2022

* Enghiș, 2022 – personal observations

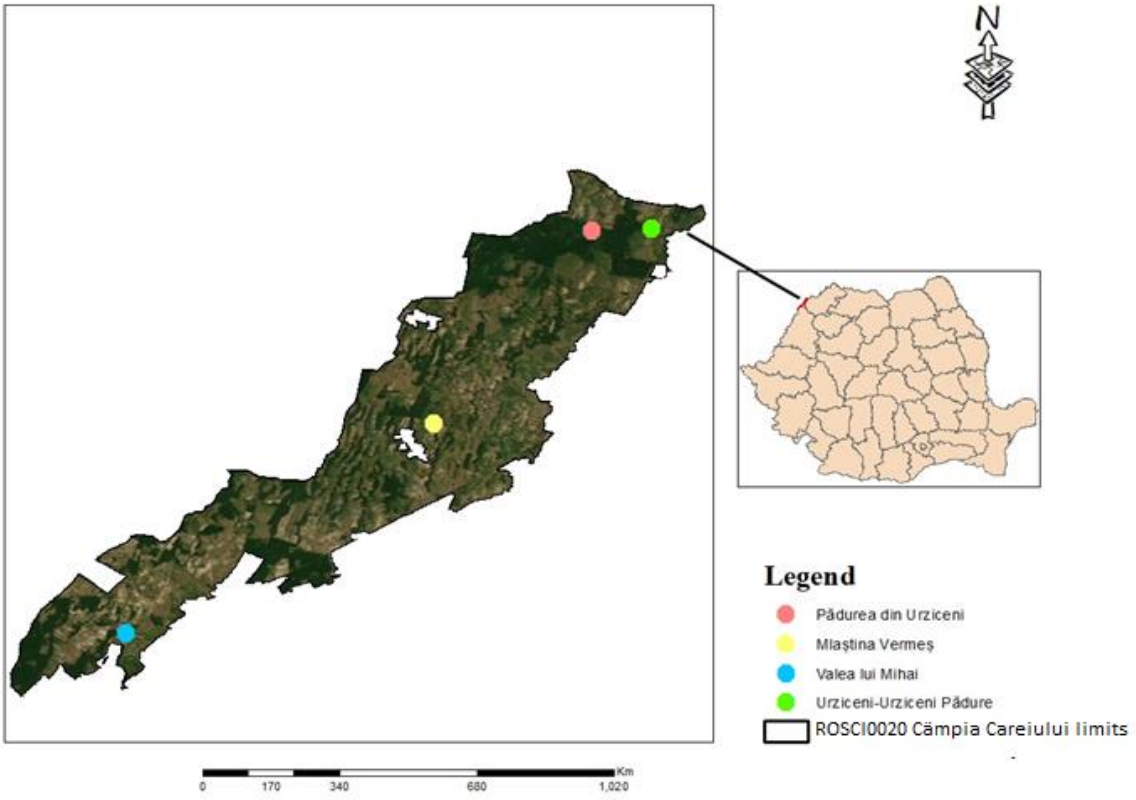


Figure 1 Sampling sites distribution in the protected area

Figure 2 General aspects of the sampling sites

Figure 3 *Lycaena dispar*

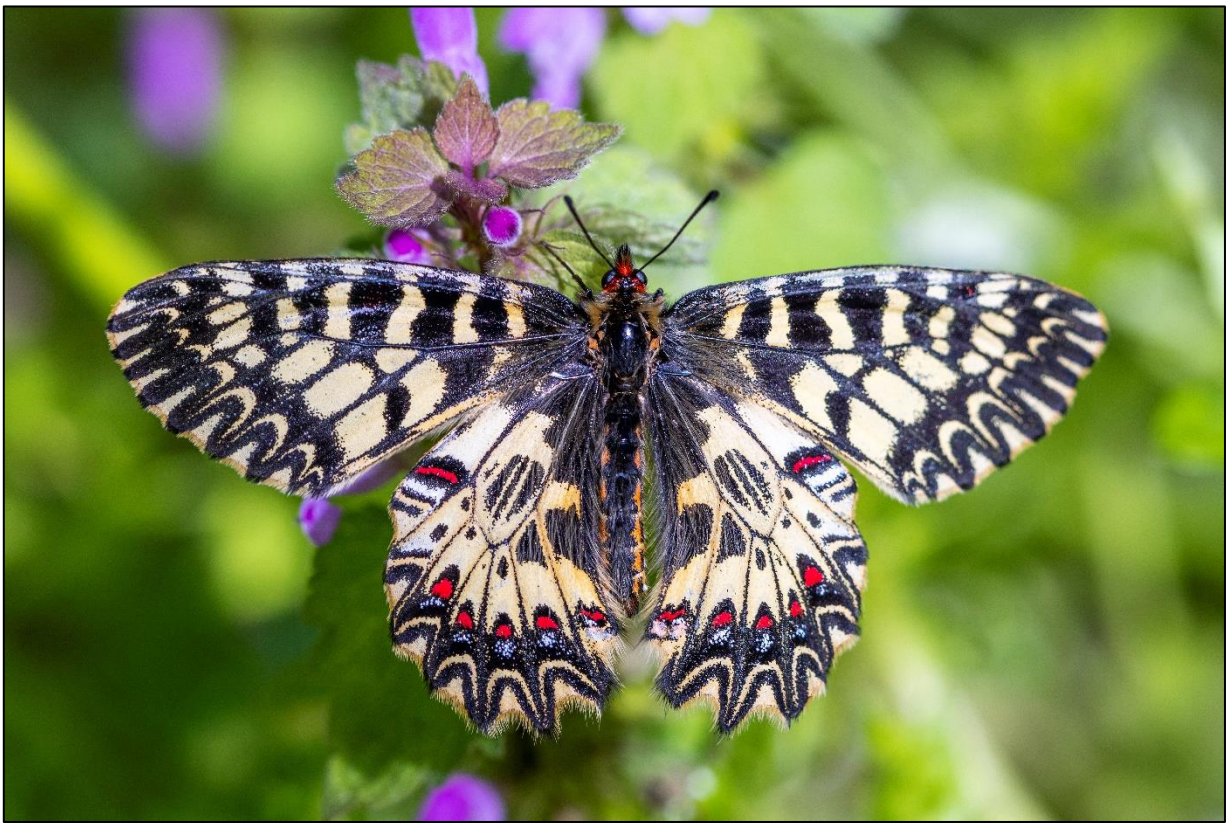


Figure 4 *Zerynthia polyxena* (photo credit: Ionuț Ștefan Iorgu)

Figure 5 *Euphydryas maturna*

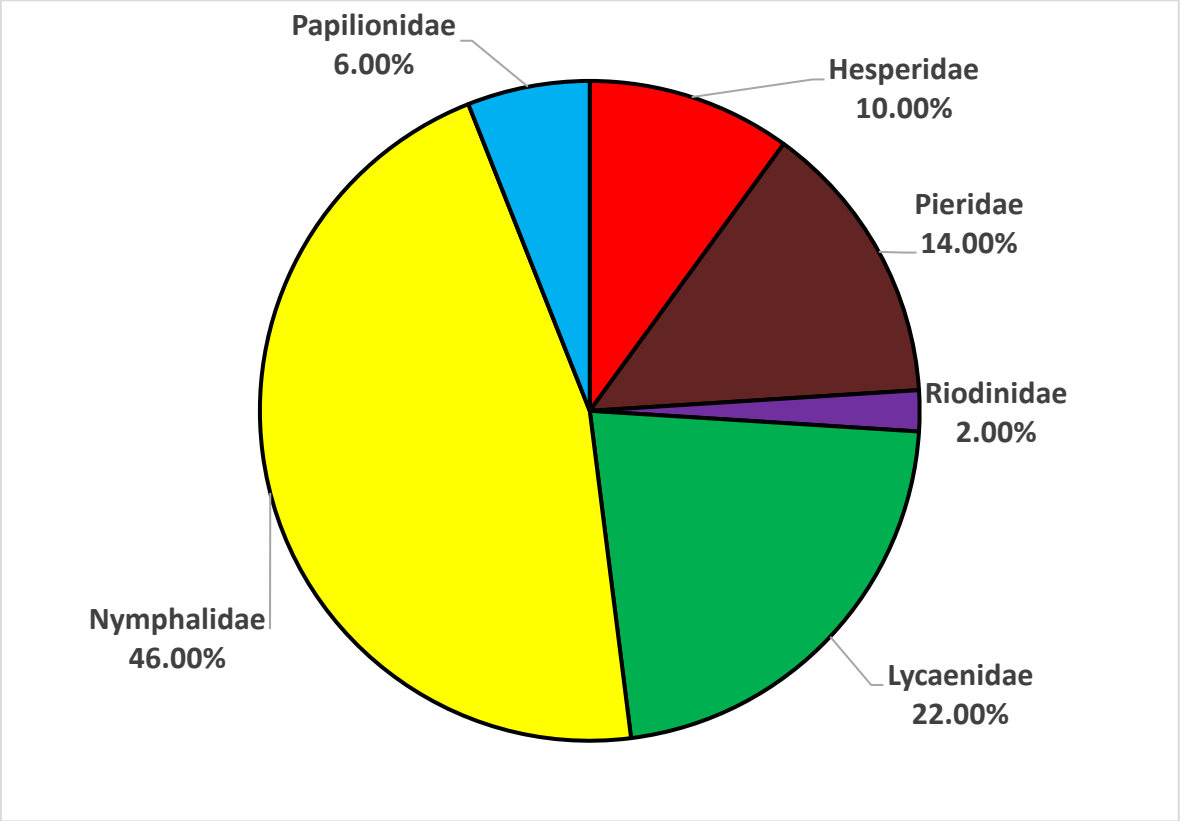


Figure 6 The abundance spectrum of butterfly families

FIRST RECORD OF *Proceratium melinum* (ROGER, 1860) (HYMENOPTERA: FORMICIDAE) IN TRANSYLVANIA (ROMANIA)

Georgiana STĂNICĂ*
Ioan TĂUȘAN*

Abstract. *Proceratium melinum (Roger, 1860) is a hypogaeic ant species that occurs in southern Europe. There is little knowledge about the species ecology and biology. Moreover, scarce data on its distribution is available. Thus, there is a strong need for data in this respect. In Romania, there have been only three previous records. We present the first record of this species in Transylvania and some insights regarding its ecology.*
Keywords*: habitat preferences, hypogaeic ants, new records, wood-pastures.*

Rezumat. *Proceratium melinum (Roger, 1860) este o specie hipogeică care este distribuită în sudul Europei. Se cunosc puține aspecte legate de biologia și ecologia speciei. Mai mult, există puține date privind distribuția acesteia. Astfel, este nevoie de date privind aceste aspecte. În România, se cunosc doar trei semnalări. În prezenta lucrare, oferim date despre ecologia speciei alături de prima semnalare în Transilvania.*
Cuvinte cheie*: furnici hipogeice, noi semnalări, pășuni împădurite, preferințe de habitat.*

Data on the biology of *Proceratium* ants is scarce. This is because they are cryptic and hypogaeic ants. They usually nest in soil or under stones. On rare occasions, one can find the species nesting in rotten wood or tree branches. Up to date, around 30 species are known from the south temperate and tropical zones of the globe (Seifert, 2018).

Most *Proceratium* are relatively rare, but this is not the full explanation for why they are not commonly collected. Colonies of most species are small. Based on anecdotal natural history information from a few species, it was once thought that most *Proceratium* would likely be found to have mature colonies that contain somewhere between 10 and 50 workers. Yet nests with more than 50, and in some cases up to 200, workers have been reported. Besides small colonies, these ants also do not appear to forage in places where they are readily encountered (Baroni Urbani, de Andrade, 2003).

Proceratium melinum (Roger, 1860) is one of the three species of this genus that occurs in Europe. The known distribution of *P. melinum includes* Albania, Austria, Bulgaria, Croatia, Czech Republic, France, Greece, Hungary, Italy, Israel, Malta, Macedonia, Montenegro, Romania, Russia, Slovenia, Spain, Turkey, and Ukraine (see Tăușan, Rădac 2014 for more details).

Although *P. melinum* is recorded all around the southern part of Europe, in Romania the data regarding this species is very scarce. Up to date, the species was previously recorded only from three locations. Two of them from south Romania are very old (over 100 years old), more precisely one worker was collected in Comana Vlasca (Montandon, Santschi, 1910) and two queens were collected in Bucharest in 1897 (Lomnicki, 1922). More recently, one worker and one queen were collected in Satchinez (Western Romania) in 2012 (Tăușan, Rădac, 2014).

Herein we give the fourth record for Romania, highlighting the need for more faunistic data in order to better understand the biology and ecology of different ant species.

One dealate queen (Figure 1) of *Proceratium melinum* was collected by pitfall trap during a myrmecological survey in Platoul Breite reserve (Figure 2, lat. N 46.21287, long. E 24.76703, ca. 400 m a.s.l., Mureș County, Transylvania) on 18.09.2021 (Figure 3). The specimen is deposited in the personal collection of Ioan Tăușan at the Lucian Blaga University of Sibiu, Faculty of Sciences, Sibiu, Romania.

Many published records specify the species' preference for humidity due to frequently sampling from wet habitats (e.g. river valleys, marshes) (Brown 1958 b, Tăușan, Rădac, 2014).

* Lucian Blaga University of Sibiu, Faculty of Sciences, Applied Ecology Research Center, Sibiu, Romania, georgianacristina.stanica@ulbsibiu.ro, ioan.tausan@ulbsibiu.ro.

Seifert (2018), states that *P. melinum* was often found in the humus of rotten tree stems or between tree roots. In the same respect, Klesniaková *et* al. 2016 collected *P. melinum* in litter samples.

However, based on our data, the species may occur also in dry habitats like wood-pastures which offer several microhabitats that are suitable for hypogaeic species.

Almost all the evidence relating to swarming in August and September (Klesniaková *et* al. 2016). Our data, both published and new, confirm the availble data on the species activity.

Nevertheless, most of the species' biology and ecology remain unknown. The species abundance, nest construction, colony demography, population structure and behavior are totally lacking (Seifert, 2018). Therefore, any data is valuable in this regard.

Acknowledgements

The authors are grateful for the help of Adriana Neghină, Andreea Zmaranda, Mădălin Drăghici and Silviu Țicu for the help in the field. We owe our gratitude to dr. Tiberiu Sahlean for the help in compiling the distribution map and dr. Alex Rădăc for his useful comments on the manuscript.

REFFERENCES

Baroni Urbani, de Andrade 2003 — Baroni Urbani Cesare, de Andrade Maria, *The ant genus Proceratium in the extant and fossil record (Hymenoptera: Formicidae).* In: *Museo Regionale di Scienze Naturali Monografie*, Turin 36, (2003), p. 1–492.

Brown 1958a — Brown William, *Predation of arthropod eggs by the ant genera Proceratium and Discothyrea*i In: *Psyche* 64, (1958a), p. 115.

Brown 1958b — Brown William, 1958b. *Contributions toward a reclassification of the Formicidae. II. Tribe Ectatommini (Hymenoptera).* In: *Bulletin of the Museum of Comparative* Zoology 118, (1958b), pp. 173- 362.

Lomnicki 1922 — Lomnicki Jaroslaw, *Przyczynek do opisu królowej mrówki powolnicy europejskiej (Sysphincta europaea For.).* In: *Polskie pismo entomologiczne* 1, (1922), pp. 3–4.

Klesniaková *et* al. 2016 — Klesniaková Mária, Holecová Milada, Pavlíková Alena, *Interesting ant species in the urban greenery of Bratislava*. In: *Folia faunistica Slovaca* 21(3), (2016) pp. 235–238.

Montandon, Santschi, 1910 — Montandon Arnold-Lucien, Santschi Felix, *Contributions á la faune entomologique de la Roumanie. Formicides.* In: *Bulletin de la Société Roumaine des Sciences* 19, (1910), pp. 648–654.

Seifert, 2018 — Seifert Bernhard, *The Ants of Central and North Europe*. In: *lutra Verlags– und Vertriebsgesellschaft*, Tauer, (2018), p. 408

Tăușan, Rădăc 2014 — Tăușan Ioan, Rădac Ioan Alexandru, *Proceratium melinum (Roger, 1860) (Hymenoptera: Formicidae) in Romania: a new record of the species after a century*, In: *Halteres* 5, (2014), pp. 3–10.

LIST OF ILLUSTRATIONS

LISTA ILUSTRAȚIILOR

Figure 1 *Proceratium melinum* queen (photo: Silviu Țicu)

Figure 2 Habitat of *Proceratium melinum*

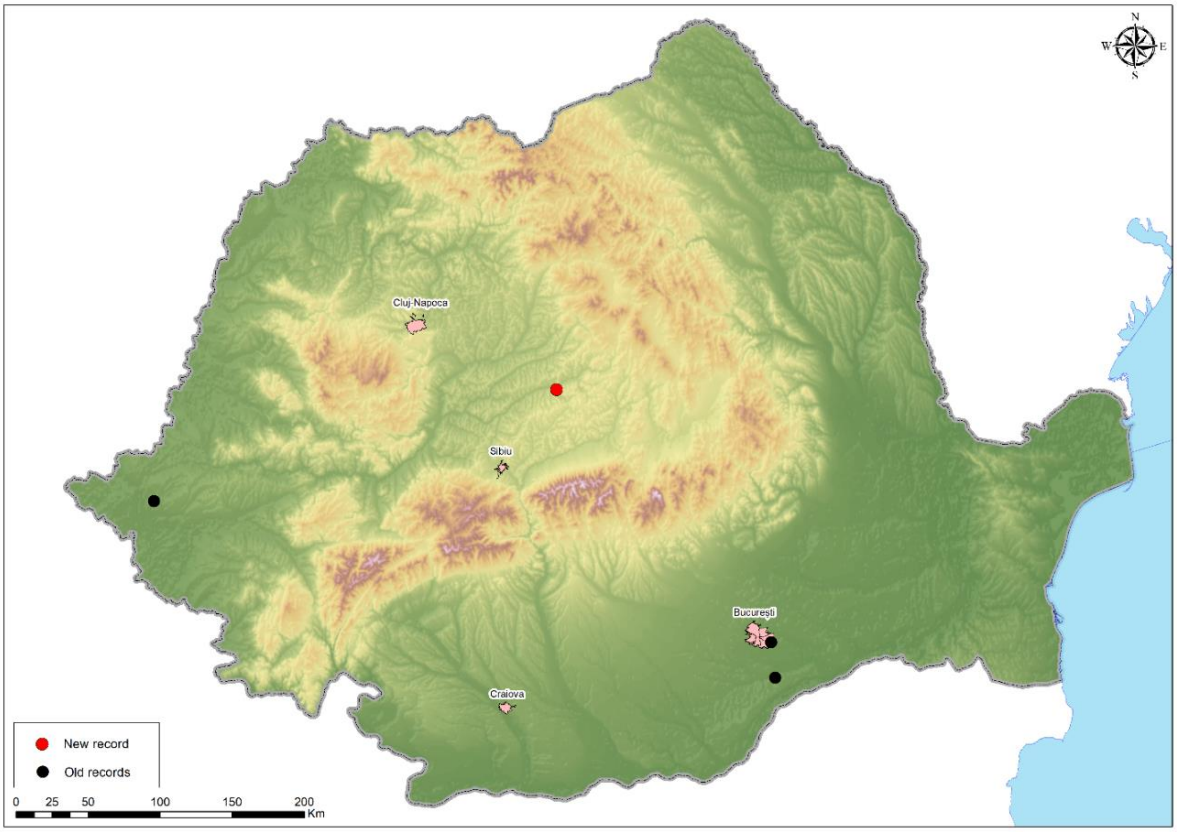


Figure 3 Known distribution of *Proceratium melinum* in Romania

HOMEOPATHIC PORTABLE SETS FROM THE PHARMACY HISTORY MUSEUM COLLECTION IN SIBIU

Ana-Maria PĂPUREANU *
Ghizela VONICA *
Ladislau ROSENBERG **

Abstract*. The paper describes five portable homeopathic sets from the collection of the Pharmacy History Museum in Sibiu. From these sets, 266 remedies were identified according to the original name of the remedy, also establishing the origin of the substances from which they were made. The largest percentages of the remedies were made with plant resources.*
Keywords: *Homeopathy, portable sets, Pharmacy History Museum Sibiu.*

Rezumat. *Lucrarea descrie cinci seturi homeopatice portabile din colecția Muzeului de Istoria Farmaciei din Sibiu. Din cadrul acestor seturi au fost identificate 266 de remedii conform denumirii remediului inițial și stabilindu-se, de asemenea, originea substanțelor din care au fost fabricate. Dintre remediile listate, cel mai mare procent îl ocupă cele din resurse de origine vegetală.*
Cuvinte cheie: *Homeopatie, truse protabile, Muzeul de Istoria Farmaciei din Sibiu.*

Introduction

The Pharmacy History Museum in Sibiu, part of the Brukenthal National Museum, catalogues objects that substantiate the evolution of pharmacy, medicine and homeopaty, all connected to each other. Many pharmacy and medicine museums around the world preserve scientific teaching collections and exhibit them for the general public in rare academic or public exhibitions.

The Pharmacy Museum of the University of Basel, one of the largest and most significant museums of this kind, was established in 1925 by pharmacist and reader in pharmaceutical history Josef Anton Häfliger (1873 – 1954), who collected objects and donated them for scientific research and teaching purposes (Kessler-Oeri & Häner, 2013, 18).

Jarosz (2020, 135 – 136) researched the pharmacy history museum collections in former East European countries and considers that future studies in the fields of medicine and pharmacy history are directly linked to these collections, and we concur with this conclusion.

The history of Homeoapthy is linked to the social history of medicine (Priven-Weisse 2009, 128). The homeopathic collection from the museum in Sibiu is sought after by researchers every year, and the demand has increased lately from homeopath doctors.

The homeopathy collection found in Sibiu is the only one of its type in Romania.

Homeopathy collections are found in other countries and are focal points in the development of local museums.

According to Priven-Waisse (2009, 128), the *Institution for the History of Medicine* (I.G.M.) – *Institute für Geschichte der Medizin der Robert Bosh Stiftung*, was initiated by the Robert Bosch Foundation from Stuttgart (Germany) in 1980. The first objects and documents collected by the Institution belong to Samuel Hahnemann (1755-1843), the inventor of homeopathy. The collection retains over five thousand letters written to Hahnemann by his patiens, Hahnemann's case journal, and other documents. Hahnemann passed away in 1843, and all of his belongins went to his widow, Mélanie d'Hervilly.

In 1932, Mélanie died, and Hahnemann's collection of documents and objects was bought by Robert Bosch (1868 – 1942), who intended to build a museum of heomopathy. Unfortunately, the Second World War started, and the collection was hidden in a salt-mine, not to be destroyed by firebombs. After the war, in 1945, the collection was held at the Robert Bosh Hospital and curated by Heinz Henne (1928-1978).

***** Brukenthal National Museum Sibiu, papureanu.ana@gmail.com, aghizela@gmail.com
** Romanian Society for the History of Pharmacy (SRIF) & Lucian Blaga" University, Sibiu, Faculty of Medicine "Victor Papilian", rosenlaszlo@yahoo.com

In 1978, the Robert Bosh Foundation bought another collection of medical history and thus the I.G.M. was borne. Even since 1960, there have been projects at the Institution that focused on the transcription of Hahnemann's casebooks because of the demand from researchers.

Another object with important historical value for researchers is found at the *University of Californis, San Francisco (U.S.A.) Library*. Here it is stored Hahnemann's original copy of the fifth edition of the *Organon*, with his personal notes written on the margins. The fifth edition of the *Organon* was the last edition, published during Hahnemann's life. Before he died, Hahnemann finished the sixth edition but it was printed only in 1921, eighty years after his death for various reasons explained by Mix and Cameron (2011, 51). The University Library has been preparing since 2011 a digital homeopathy collection for public use, in order to cope with the demand for the book and also to protect for future generations the original work that should be kept under certain conditions of conservation.

The homeopathic medical collection from the Pharmacy History Museum in Sibiu consists of over two thousand objects that have been researched and presented at symposia and published by Ban (2001, 2003a and 2003b), Păpureanu and Rosenberg (2017), Dordea *et al*. (2020), Iordache *et al*. (2020) and Tutelea *et al*. (2020). The objective of this paper is to present the last objects from the collections that were not made public until today, the portable homeopathic medical sets.

These types of objects were widely spread in Europe in the nineteenth century.

Priven-Waisse (2009, 129) presented an image of Hahnemann's first "pharmacy", a portable homeopathic set held at the Robert Bosch Foundation in Stuttgart, similar to the ones held at the museum in Sibiu.

Elaborate homeopathic medicine mahogany chests were made in the U.K. between 1880 and 1920 (Fig. 1). Such an item is held at the *Sir Henry Wellcome's Museum* collection in London (U.K.) or simply the *Wellcome Collection*. The object (inventory number A21810) is a homeopathic medical chest containing homeopathic medicines, a stethoscope, syringes, and other medical utensils. It also has a special compartment for homeopathic books. These types of objects underline the development of homeopathy in the U.K., as in the 1870's there were already eighty homeopathic practitioners in London (Science Museum Group, 2022).

Marckmann (2003, 119 – 138) studied the practice of homeopathic medicine sets used in 1900 in South Jutland (Denmark), specifically the house-chests with instruction manuals. Different types of sets were prepared and distributed in the area, all from the same manufacturer, "Homeopathic Central Pharmacy Dr. Willmar Schwabe" in Leipzig (Germany).

The pharmacologist Carl Emil Willmar Schwabe (1839 – 1917), doctorate in pharmacology from the University of Leipzig, opened in 1865 the *Homeopathic Central-Officin Dr. W. Schwabe*, which delivered homeopathic products to pharmacies in Germany and abroad. By 1900, Schwabe opened fifty branches worldwide (Jäger 2001, 171 – 188).

The objects described in this paper have been donated, according to the museum archive, on October 11, 1950, by pharmacist Traian Puiu, the last pharmacist that worked at the private pharmacy "At the Angel" (*Zum Engel Apotheke*). The private pharmacy became known as State Pharmacy number four from Sibiu because on April 2, 1949, the pharmacy was nationalised.

"At the Angel Pharmacy" (*Zum Engel Apotheke*), the seventh private pharmacy in Hermannstadt (Sibiu today), was the dream of pharmacist Ștefan Czipott (1872 – 1916), but unfortunately, local financial and ethnic disputes did not let him open it, even though he had the authorities' approval since 1903.

Eugen Wittmeyer (1883-1958) purchased a pharmacy with his brother-in-law pharmacist Johann Binder (1888-1963) in 1919 and was granted free practice by the Superior Sanitary Council in 1922. The pharmacy was moved from one location to another.

E. Wittmeyer and J. Binder brought homeopathic resources from Germany, including Schwabe's Central-Officin, and took care of the homeopathic sector of the pharmacy. Homeopathic resources are becoming recognized in the country and the "Angel Pharmacy" from Sibiu supplemented the shortages in other cities, especially Bucharest (Maior, 2014, 476 – 496).

The objects described in this paper are the result of the hard work of local Transylvanian pharmacists in developing a homeopathic practice in this part of the country and not only.

Results

The homeopathic portable sets held in the collection from Sibiu will be described following the order of the inventory numbers.

The sets are dated to the end of the 19th century.

Inventory number F 2344 (previously F 810) (Fig. 2a): the homeopathic set, made to look like a book when closed, of a parallelepiped shape, is made of cardboard covered with black leather – like material on the exterior (Fig. 2b). The margins of the set are bordered bought on the exterior and the interior by golden lines and ornamented with golden abstract floral patterns. On the spine of the book-like set, there are gilded decorations in the form of crosses (Fig. 2c).

The interior of the set is made of wood covered with green waxed paper. It has 100 compartments arranged in five rows. The set contains 86 colorless glass bottles with the original homeopathic preparations inside (Fig. 2d).

A number of 76 vials have a green label, on which is inscribed in gold, the number of the vial.

On the left lid of the set, inside, are written the abbreviated Latin names of the preparations in alphabetical order, corresponding to each number on the bottle. Some vials contain granular preparations and are closed with corks.

The remedies included (complete Latin names following literature of that period (Schwabe, 1934)) are: *Acidum muriaticum, Acidum nitricum, Acidum phosphoricum, Acidum sulphuricum, Aconitum, Agaricus muscarius, Aluminium, Ambra grisea, Ammonium carbonicum, Anacardium orientale, Angustura vera, Antimonium crudum, Arnica, Arsenicum, Asa foetida, Assarum, Baryta corbonica, Belladonna, Bismuth, Bovista lycoperdon, Bryonia alba, Calcarea carbonica, Cannabis, Cantharis vesicatoria, Carbo animalis, Carbo vegetalis, Causticum, Chamomilla, Chelidonium majus, China officinalis, Cicuta virosa, Cina maritima, Cocculus indicus, Colocynthis, Conium maculatum, Crocus sativus, Cuprum, Digitalis purpurea, Drosera rotundifolia, Dulcamara, Euphrasia officinalis, Euphorbia, Ferrum, Filix mas, Graphites, Helleborus niger, Hepar sulphur, Hyoscyamus niger, Jalapa, Ignatia amara, Iodium, Ipecacuanha, Kalium, Ledum palustre, Lycopodium clavatum, Laurocerasus, Manganum, Magnesium carbonicum, Magnesium muriaticum, Mercurius solubilis, Mezereum, Natrium carbonicum, Natrium muriaticum, Natrium sulphuricum, Nitrum, Nux vomica, Oleander, Opium, Petroleum, Phosphorus, Petroselinum sativum, Platina, Plumbum, Psorinum, Prunus spinose, Pulsatilla, Rheum palmatum, Rhododrendron, Rhus toxicodrendron, Sabadilla, Sabina, Sambucus niger, Sepia officinalis, Secale cornutum, Silicea, Solanum nigrum, Scilla maritima, Spigelia, Spongia, Stannum, Staphysagria, Stramonium, Sulphur, Sublimat, Tartaricum acidum, Thuja occidentalis, Valeriana officinalis, Veratrum album, Viola odorata, Zincum.*

Regarding the origin of the resources used for the remedies, the set with the inventory number F 2344 holds 63,63% of remedies of plant origin, 32,32% of mineral or chemical resources and only 5,5% were obtained from animal substances.

Inventory number F 2345 (old inventory number F 811) (Fig. 3a, b, c): the set is made out of cardboard and is enclosed in another cardboard box. The encasing has a stylised golden diamond on the front and, on the back, a golden frame composed of lines with vegetal and geometric patterns (Fig. 3a). On the exterior lid of the set there is a golden rectangle enclosing the inscription *HOM: APOTHEKE:*, meaning homeopathic pharmacy. The book-like shape of the set is enhanced by its margin painted also in gold (Fig. 3b).

Opening the set, we can admire the beautiful design of the lid, a greenish-blue and white background framed by golden palm-like leaves and furrowed by vegetal motifs similar to young fern leaves curling (Fig. 3c).

The interior of the wooden kit, covered in brown plush, has ten compartments. The kit has only forty colorless small glass bottles with homeopathic preparations enclosed with cork.

Of these, thirty-seven have a white label with a black inscription, one vial has an erased inscription and two have no label. Inside the bottles, there are traces of the original remedies.

The remedies included in the set are: *Acidum nitricum, Acidum phosphoricum, Arsenicum, Asa foetida, Aurum, Belladonna, Crocus sativus, Cuprum, Digitalis purpurea, Dulcamara, Ferrum, Graphites, Ignatia amara, Iodum, Ipecacuanha, Ledum, Mezereum, Millefolium, Natrium, Secale cornutum, Sepia officinalis, Silicea terra, Squilla maritima, Spigelia, Stramonium, Sulphur, Taraxacum officinale, Thuja occidentalis, Zincum.*

Inventory number F 2345 has a similar percentage to the previous portable set, meaning 59% of the remedies are of plant origin, 38% mineral origin, and 3% animal sources.

The inventory number F 2347 (old inventory number F 813) (Fig.4a, b, c), also dated at the end of the 19th century, is one of the most complete and well preserved homeopathic portable sets from the Pharmacy History Museum in Sibiu collection.

The box of the set is made out of cardboard wrapped in faux black leather, with no decorations (Fig. 4a). It has a parallelepiped shape. The interior of the set (Fig. 4b) is covered with brown plush and contains 24 compartments, arranged in two rows. On the interior of the lid is written the number"9246" probably a serial number or inventory number of the original owner.

The set contains 23 vials, only one is missing. The small vials (Fig. 4c) are made of colorless glass and closed with corks. The bottles have a white printed label with a black inscription, only the remedy *Apis* is hand written. All the vials contain the original homeopathic preparations in the form of white granules.

The remedies included in the set are: *Aconitum*, *Antimonium crudum*, *Apis mellifica*, *Arnica montana*, *Arsenicum*, *Belladonna*, *Bryonia alba*, *Cannabis*, *Chamomilla*, *Carbo vegetabilis*, *Euphrasia*, *Hepar Sulphur*, *Lachesis*, *Ipecacuanha*, *Mercurius solubilis*, *Nux vomica*, *Pulsatilla*, *Rhus toxicodendron*, *Silicea terra*, *Sulphur*, *Tartaricum acidum*, *Thuja occidentalis*, *Veratrum album.*

Considering the sources of the remedies, the set with the inventory number F 2347 counts 70% of remedies have plant origin, mineral/chemical sources 17% and animal substances 13%, the highest percentage found in a set from the collection.

The last homeopathic portable set presented from the collection is inventory number F 2348 (old inventory number F 814) (Fig.5a, b, c). Like the previous portable set, inventory number F 2347, this one also presents the complete list of vials and, more importantly, the original remedies are found in the set. Inventory number F 2348 is the largest set in the homeopathy collection of the museum in Sibiu.

The cardboard, parallelepiped-shaped box is decorated on the exterior top lid and the exterior margine with rhomboidal shapes of botanical motifs.

The margins of the lid are framed with golden lines, complete at some points. On the bottom of the box is written the name of its original owner, Mag. Carl Pissel. Also marked, are the old inventory numbers Mz. 438/934 and 13530, and the old stamp of the Brukenthal National Museum.

This shows that the homeopathic portable kit was donated initially to the Brukenthal Museum and afterwards was enlisted in the Pharmacy History Museum Collection (Fig. 5a). The lid of the set is coloured in light blue inside and presents a printed table with the names of the remedies in alphabetical order (Fig. 5b).

The set consists of 120 remedies in colorless glass vials containing preparations in the form of white granules (Fig. 5c).

The vials have white labels with black edges, representing the name of each remedy. They are closed with corks, and the corks are numbered from 1 to 120, corresponding with the number on the table list from the lid.

The remedies included in this set are: *Acidum muriaticum, Acidum nitricum, Acidum phosphoricum, Aconitum, Allium sativum, Anacradium, Angustura vera, Antrax, Antimonium crudum, Argentum, Arnica montana, Arsenicum, Asa foetida, Asarum europaeum, Baryta carbonica, Belladonna, Borax, Bovista, Bryonia, Calcarea carbonica, Camphora, Cannabis, Cantharis, Capsicum, Carbo animalis, Carbo vegetalis, Cascarilla, Castoreum, Causticum, Chamomilla, Chelidonium, China, Cicuta virosa, Cina, Clematis, Coccionella, Cocculus, Coffea, Colchicum, Colocynthis, Conium, Copaiva, Crocus sativus, Croton tiglium, Cuprum, Cyclamen europaeum, Digitalis, Drosera, Dulcamara, Euphasia officinalis, Ferrum metallicum, Ferrum muriaticum, Filix mas, Graphites, Helleborus niger, Hepar Sulphur, Hydrophob, Hyoscyamus niger, Jalappa, Ignatia, Indigo, Iodium, Ipecacuanha, Kalium carbonicum, Kreosotum, Lacerta agilis, Lachesis mutus, Lactuca virosa, Ledum, Loleum temulentum, Lycopodium, Magn. carb., Magnesium carbonicum, Menyanthes omeopathi, Mercurius corrosivus, Mercurius solubilis, Mercurius vivus, Mezereum, Moschus, Muriaticum magnesium, Natrium muriaticum, Nitrum, Nux vomica, Odontoneer, Oleum animale, Opium, Petroleum, Petroselinum, Phosphorus, Platina, Plumbum, Psoricum, Pulsatilla, Ranunculus bulbosus, Ranunculus sceleratus, Rheum palmatum, Rhus toxicodendron, Ruta graveolens, Sabadilla, Sabina, Sambucus niger, Silicea, Solanum nigrum, Spigelia, Spongia marina, Squilla, Stannum, Staphysagria, Stramonium, Sulphur, Symphytum, Thuja, Tinctura sulphuricum, Urolithin, Urtica*

urens, Uva ursi, Valeriana, Veratrum album, Viola odorata, Zincum.

As a result of the analysis regarding the sources of the remedies we concluded that 67% are of plant origin, 27% mineral resources and 6%, are of animal origin.

Discussion

Out of the 266 vials analysed in this paper, the majority of the remedies were obtained from plant sources.

Aconite (*Aconitum napellus* L., 1753), family *Ranunculaceae*, native to western and central Europe, is commonly used for homeopathic remedies. Hahnemann and his successors used Aconitum extensively in acute conditions such as severe pain or fever. Even today, it is still used for the same purpose as stated by Loo (2009, 335–341) in combination with allopathic medicine.

In 2015, *Aconitum* was officially listed as a bioactive nutraceutical and dietary supplement in neurological and brain diseases (Artal, 2015, 215 – 219). But it is also included in the list of toxic substances that can cause serious complications if taken without following the specialist doctor's prescription, like cardiovascular problems (Cole, 2018, 1876–1889).

Aconitum is known for its toxicity, Pedanius Dioscorides (40–90 AD), in his De materia medica, mentioned that it was used as a poison for animals.

The tubers of *Aconitum* were used in allopathy, in the 17th to 19th century, for trigeminal neuralgia, rheumatic pain, and cough relief (Oroian, 2011, 364).

Another homeopathic remedy of plant origin found in all the analyzed sets is *Belladonna*, extracted from *Atropa belladonna* L, commonly known as belladonna or deadly nightshade, in the family *Solanaceae*. It is native to Europe, western Asia and North Africa and has been naturalised or introduced in some parts of Canada and the United States.

Because of the toxicity of this plant, the effects of the homeopathic remedy *Belladonna* have been studied exhaustively. Walach *et al*. (2001, 155–160) used *Belladona* 30 CH on healthy volunteers.

In traditional pharmacy, the leaves and roots of the plant were used to combat nausea and vomiting in case of gastritis, intestinal colic.

Today it is found in ophthalmology where drops containing atropine are currently used to dilate the pupil.

In Romania, alkaloids extracted from *Belladonna* root are used to prepare certain medication for digestive disorders: diffuse or localized abdominal pain, vomiting, accelerated intestinal transit; cardiovascular disorders: tachycardia, extrasystoles, slight increases in blood pressure; neuropsychic disorders: dizziness, paresthesias, anxiety neurosis (Oroian, 2011, 561 – 562).

Carbo vegetabilis is present not only in the homeopathic portable sets from the museum but also in the homeopathic general collection, counting twenty-one vials of different dilutions and homeopathic potencies.

In 2017, allopathic medicine and *Carbo vegetabilis* 200 CH were used on an 81-year-old patient from Romania, who did not regain consciousness after the surgery anesthesia, maintaining a deep comatose state for the fourteenth day post-operative. After the administration of the homeopathic remedy, the patient became conscious after two days (Vithoulkas *et al*., 2017, 118–121).

Carbo vegetabilis is used today not only for human treatment but also in agriculture, in the new field of *Agro Homeopathy*, which uses two remedies, *Carbo vegetabilis* and *Silicea Terra*, to improve the water retaining capacity in *Cucumis sativus* L. (Fahmi *et al*., 2021, 42–49).

The remedy *Thuja*, extracted from *Thuja occidentalis* L., *Cupressaceae* family, known as northern white-cedar or arborvitae, is native to eastern Canada and much of the north-central and northeastern United States, cultivated in Europe and Brazil as an ornamental tree (Earle, 2021).

In homeopathy, the mother tincture of *Thuja* is used for psychotic constitutions, in the case of snake bite, small-pox, and vaccination-induced toxicity, respectively, the proliferation of pathological vegetation (Căruntu *et al*., 2020, 4).

In both cases, Naser *et al*. (2005, 69–78), Asha *et al*. (2014, 555–559), and Căruntu *et al*. (2020, 1–15), researched the healing and curative properties of the plant, both in the case of classic pharmaceutical medicine as well as homeopathic and phytotherapeutic ones.

The majority of the remedies analyzed in this paper, regardless of their origin (plant, mineral, or animal sources), are still used today by homeopaths and researched by medical professionals as an alternative therapy.

Homeopathic collections are a source of information regarding past remedies, their use, and origin.

The Pharmacy History Museum from Sibiu, with its 2910 objects related to the field of homeopathy, is a unique museum in Romania and not only.

REFFERENCES

Artal, 2015 — Artal Francisco Javier Carod, *Chapter 23 - Adverse Neurological Effects Caused by the Ingestion of Plants, Seeds, and Fruits*. In: Editor(s): Ronald Ross Watson, Victor R. Preedy, *Bioactive Nutraceuticals and Dietary Supplements in Neurological and Brain Disease*, Academic Press (2015), pp. 215-219.

Asha *et al*., 2014 — Asha R., Nisha P., Suneer Khan, Mythili Arumugam, Shafeeq Hassan A., Selvam Kanesan Panneer, Manikandan Palanisamy, Shobana Coimbatore Subramanian, *In vitro activity of various potencies of homeopathic drug Thuja against molds involved in mycotic keratitis*. In: International Journal of Pharmacy and Pharmaceutical Sciences, vol. 6, issue 10 (2014), pp. 555–559.

Ban, 2001 — Ban Minodora, *Tradiții ale terapiei homeopate minerale prin colecția de istorie a farmaciei din Sibiu*. In: *Studii şi Cercetări. Complexul Muzeal Bistrița Năsăud, Geologie*, vol. 6 (2001), pp. 95–102.

Ban, 2003a — Ban Minodora, *Repertoriul remediilor homeopate din colecția de istorie a farmaciei din Sibiu*. In: *Studii și Comunicări de Istorie Naturală Sibiu 28. Volum omagial 1849–1949 Societatea Ardeleană pentru Științele Naturii din Sibiu*, Sibiu: Hora Verlag Hermannstadt und Arbeitskreis für Siebenbürgische Landeskunde e. V. Heidelberg (2003), pp. 269–285.

Ban, 2003b — Ban Minodora, *Remedii homeopate de origine mineral în colecția Muzeului de Istorie a Farmaciei din Sibiu*. In: *Argesis, Ştiințele Naturale. Muzeul Județean Argeş*, vol. 11 (2003), pp. 299 – 310.

Căruntu *et al*., 2020 — Căruntu Sonia, Ciceu Alina, Olah Neli Kinga, Don Ioan, Hermenean Anca, Cotoraci Coralia, *Thuja occidentalis L. (Cupressaceae): Ethnobotany, Phytochemistry and Biological Activity*. In: *Molecules*, no. 25 (2020), pp. 1-15.

Cole, 2018 — Cole B. Jon, *Cardiovascular Drugs*. In: *Rosen's Emergency Medicine: Concepts and Clinical Practice*, Ninth Edition, Chapter 147, Elsevier, Inc. (2018), pp. 1876-1889.

Dordea *et al*., 2020 — Dordea Daniela-Nicoleta, Deaconu Elena-Nicoleta, Păpureanu Ana-Maria, Rosenberg Ladislau, *Homeopathic remedies of botanical origine from the History of Pharmacy Museum Collection, Brukenthal National Museum from Sibiu*. In: *Bruketnhal Acta Musei*, XV.3 (2020), pp. 537-548.

Earle, 2021 — Earle Christopher J., ed., *Thuja occidentalis*. In: The Gymnosperm Database (2021) https://www.conifers.org/cu/Thuja_occidentalis.php (Accesed January 2022).

Fahmi *et al*., 2021 — Fahmi S. Jameela Lina, Nair V. Aathira, Chandraja C. V., Sisir P. R., Sugathan N. V., Mohan C.K., *Scope of Homoeopathic Medicine Carbo vegetabilis and Silicea Terra to Improve the Water Retaining Capacity in Cucumis Sativus L*. In: *International Journal of Innovative Research in Technology*, Volume 8 Issue 1(2021), pp. 42-49.

Iordache *et al*., 2020 — Iordache Ioana, Păpureanu Ana-Maria, Rosenberg Ladislau, *Homeopathic remedies of animal origine from the History of Pharmacy Museum collection*

in Sibiu (Brukenthal National Museum). In: *Bruketnhal Acta Musei*, XV.3 (2020), pp. 549-560.

Jäger, 2001 — Jäger Volker, *In the service of health. About the history of the Willmar Schwabe company*. In: *Medicine, Society and History*, vol. 10 (2001), pp. 171-188.

Jarosz, 2020 — Jarozs Katarzyna, *The development of Museums pf Pharmacy in Post-Soviet Countries*. In: *History of Pharmacy and Pharmaceuticals*, 62 (3-4) (2020), pp. 135-149.

Kessler-Oeri and Häner, 2013 — Kessler-Oeri Michael and Häner Flavio, *Remedies from bygone eras in the Pharmacy Museum*. In: *UNI NOVA – Research Magasine of the University of Basel*, nr. 122 (2013), pp. 18-19.

Loo, 2009 — Loo May, *Chapter 36 – Fever*. In: Editor(s): May Loo, *Integrative Medicine for Children*, W.B. Saunders (2009), pp. 335-341

Maior, 2014 — Maior Ovidiu, *Contribuții la farmaco-istoria Transilvaniei. Oficinele județului Sibiu*. Editura Echinox, Cluj-Napoca (2014), pp. 476-496.

Marckmann, 2003 — Marckmann Anton, *Glimt fra homøopatiens glanstid. Nordslesvigske (sønderjyske) husapoteker fra 1900-tallets begyndelse [From the glorious time of homeopathy medicine chests in Nord-Schleswing (South Justland) about 1900]*. In: *Dan Medicinhist Arbog* (2003), pp. 119-138.

Mix and Cameron, 2011 — Mix A. Lisa and Cameron Kathleen, *From Hahnemann's hand to your computer screen: building a digital homeopathy collection*. In: *Jorunal of the Medical Library Association*, vol. 99 (1) (2011), p. 51.

Naser *et al*., 2005 — Naser Belal, Bodinet Cornelia, Tegtmeier Martin, Lindequist Ulrike, *Thuja occidentalis (Arbor vitae): A Review of its Pharmaceutical, Pharmacological and Clinical Properties*. In: *eCAM* 2(1) (2005), pp. 69–78

Oroian, 2011 — Oroian Silvia, *Botanică Farmaceutică*. Editura University Press, Târgu Mureș (2011), pp. 364, 561-562,

Păpureanu and Rosenberg, 2017 — Păpureanu Ana-Maria, Rosenberg Ladislau, *From mineral to omeopathic remedy–celebrating 240 years since Samuel Hahnemann (1755 – 1843) came to Sibiu as "medicine candidate and librarian of his excellency Baron Brukenthal" between 1777 and 1779*. In: *Brukenthal Acta Musei*, XII.3 (2017), pp. 547-552.

Priven-Waisse, 2009 — Priven-Weisse Silvia, *History of Homeopathy and Social History of Medicine: The Story of a Successful Marriage*. In: *International Journal of High Dilution Research*, 8 (28) (2009), pp. 128-140.

Schwabe, 1934 — Schwabe Willmar, Homöopathisches Arzneibuch. 2 abgeänderte Auflage. Leipzig: Verlag Dr. Willmar Schwabe (1934), pp. 1- 144.

Tutelea *et al*., 2020 — Tutelea Carmen-Maria, Păpureanu Ana-Maria, Rosenberg Ladislau, *Homeopathic remedies of mineral origin from the History of Pharmacy Museum Collection in Sibiu (Brukenthal Nationl Museum)*. In: *Bruketnhal Acta Musei*, XV.3 (2020), pp. 561-572.

Vithoulkas *et al*., 2017 — Vithoulkas G, Văcăraș V, Kavouras J, Buzoianu AD, Mărginean M, Văcăraș D, Cozma S., *Homeopathic treatment for prolonged postoperative coma: a case report*. In: *Journal of Medicine and Life*. No. 10(2) (2017), pp. 118-121.

Walach *et al*., 2001 — Walach Harald, Köster Horst, Hennig Thomas, Haag Gunther, *The effects of homeopathic belladonna 30 CH in healthy volunteers – a randomized double-blind experiment*. In: *Journal of Psychosomatic Research*, no. 50 (2001), pp. 155-160.

* *Science Museum Group*. Homeopathic medicine chest, London, England, 1880-1920. A21810Science Museum Group Collection Online. Accessed 11 May 2022. https://collection.sciencemuseumgroup.org.uk/objects/co197305/homeopathic-medicine-chest-london-england-1880-1920-medicine-chest.

LIST OF ILLUSTRATIONS

Fig. 1. Homeopathic medicine mahogany chests (inventory number A21810, *Wellcome Collection*, London, U.K.) (Source: https://collection.sciencemuseumgroup.org.uk/objects/co197305/homeopathic-medicine-chest-london-england-1880-1920-medicine-chest).

Fig. 2 (a, b, c, d). Inventory number F 2344 (old inventory number F 810): a. the general appearance of the open set; b. book-like external appearance; c. the gilded decorations; d. the included vials contain the original preparation.

Fig. 3 (a, b, c). Inventory number F 2345 (old inventory number F 811): a. the exterior of the homeopathic portable set; b. book-like edges; c. the inside of the set.

Fig. 4 (a, b, c). Inventory number F 2347 (old inventory number F 813): a. exterior of set; b. interior; c. the vials included in the set.

Fig. 5 (a, b, c). Inventory number F 2348 (old inventory number F 814): a. top and bottom of the portable set; b. interior of the top lid with the list of remedies; c. the aspect of the vials.

LISTA ILUSTRAȚIILOR

Fig. 1. Cutie din lemn de mahon pentru remedii medicale homeopate (numărul de inventar A21810, *Wellcome Collection*, Londra, U.K.) (Sursa: https://collection.sciencemuseumgroup.org.uk/objects/co197305/homeopathic-medicine-chest-london-england-1880-1920-medicine-chest).

Fig. 2 (a, b, c, d). Numărul de inventar F 2344 (numărul de inventar vechi F 810): a. aspectul general al setului deschis; b. aspectul extern asemănător unei cărți; c. decorațiunile aurite; d. flacoanele incluse conțin preparatul original.

Fig. 3 (a, b, c). Numărul de inventar F 2345 (numărul de inventar vechi F 811): a. exteriorul setului portabil homeopathic; b. marginile setului similar unei cărți; c. interiorul trusei.

Fig. 4 (a, b, c). Numărul de inventar F 2347 (numărul de inventar vechi F 813): a. exteriorul setului; b. interiorul trusei; c. flacoanele incluse în trusă.

Fig. 5 (a, b, c). Numărul de inventar F 2348 (numărul de inventar vechi F 814): a. partea superioară și inferioară a cutiei setului; b. interiorul capacului cuprinzând lista de remedii; c. aspectul general al flacoanelor.

Fig. 1.

Fig. 2 a.

Fig. 2 b.

Fig. 2 c.

Fig. 2 d.

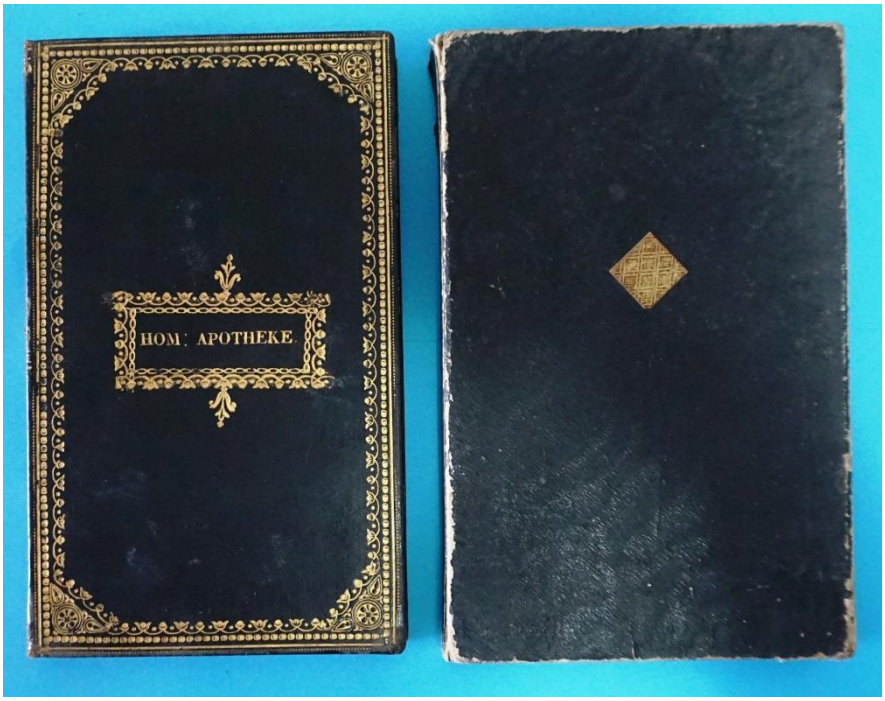


Fig. 3 a.

Fig. 3 b.


Ac. nitri
Ac. phos
Arsenic
Asa
Aur
Bellad.
Calc. c.
Coccul.
Crocus
Cup
Digital.
Dulc.
Ferrum
Graphit
Hepar
Hyosc
Ignatia
Iod
Ipec
Ledum
Mezereu
Millef.
Nosod
Pgoricu
Secal. c.
Sepia
Silic
Squilla
Spig.
Stannum
Staphis
Stramon
Sulphur
Thuja
Zincum

Fig. 3 c.

Fig. 4 a.

Fig. 4 b.


Aconit
Antimon
Arnica.
Arsenic
Bryoni
Carbo v
Chamom
Eupht
Lachesis
Pulsatil
Silicea.
Sulphur
Tartar
Thuja
Veratru
F.
2347

Fig. 4 c.


M 438/934
Ne 13.560

Fig. 5 a.


Homöopathische Handapotheke.
1. Acid. muriat. 21. Camphora. 41. Conium. 61. Indigo. 81. Natr. mur. 101. Sambuc. nig.
2. Acid. nitri. 22. Cannabis. 42 Copaiva. 62. Jodium. 82. Nitrum. 102. Silicea.
3. Acid. phosph. 23. Cantharides. 43. Crocus sat. 63. Ipecacuanha. 83. Nux vomica. 103. Solan. nigr.
4. Aconitum. 24. Capsicum. 44. Croton tigl. 64. Kali carb. 84. Odontonecr. 104. Spigelia.
5. Allium sat. 25. Carbo anim. 45. Cuprum. 65. Kreosot. 85. Oleum anim. 105. Spongia mar.
6. Anacardium. 26. Carbo veget. 46. Cyclamen. 66. Lacerta. 86. Opium. 106. Squilla.
7. Angustura. 27 Cascarilla. 47. Digitalis. 67. Lachesis. 87. Petroleum. 107. Stannum.
8. Anthrax. 28. Castoreum. 48. Drosera. 68. Lactuca vir. 88. Petroselin. 108. Staphysagr.
9. Antim. crud. 29 Causticum. 49. Dulcamara. 69. Ledum. 89. Phosphorus. 109. Stramon.
10. Argentum. 30. Chamomilla. 50. Euphrasia. 70 Lolium tem. 90. Platina. 110. Sulphur.
11. Arnica mont. 31. Chelidonium. 51. Ferrum met. 71. Lycopodium. 91. Plumbum. 111. Symphytum.
12. Arsenicum. 32. China. 52. Ferrum mur. 72. Mang. carb. 92. Psoricum. 112. Thuja.
13. Asa foetida. 33. Cicuta vir. 53. Filix mas. 73. Magnes. carb 93. Pulsatilla. 113. Tinct. sulph.
14. Asarum eur. 34. Cina. 54. Graphites. 74. Men. trif. 94. Ran. bulb. 114. Urolithin.
15. Baryta carb. 35. Clematis. 55. Helleb. nig. 75. Mercur. corr. 95. Ranunc. scel. 115. Urtica urens.
16. Belladonna. 36. Coccionella. 56. Hepar sulph. 76. Mercur. sol. 96. Rheum. 116. Uva ursi.
17. Borax. 37. Cocculus. 57. Hydrophob. 77. Mercur. viv. 97. Rhus toxicod. 117. Valeriana.
18. Bovista. 38. Coffea. 58. Hyoscyamus. 78. Mezereum. 98. Ruta grav. 118. Veratr. alb.
19. Bryonia. 39. Colchicum. 59. Jalappa. 79. Moschus. 99. Sabadilla. 119. Viola odorat.
20. Calcar. carb. 40. Colocynthis. 60. Ignatia. 80. Mur. Magn. 100. Sabina. 120. Zincum met.

Fig. 5 b.

Fig. 5 c.

GOOD OR BAD LUCK? – AN 'OX-BOW' DEPOSIT FROM OARDA DE JOS (ALBA COUNTY, ROMANIA) - PRELIMINARY RESULTS

Alexandru A. SOLOMON[1,2]
Vlad A. CODREA[1,2,3,4]*
Márton VENCZEL[1,3]
Marian BORDEIANU[1]
Nicolae TRIF[5]
Cristina FĂRCAȘ[1]

Abstract. *To date, in SW Transylvania, latest Cretaceous terrestrial deposits that yielded microvertebrates are known from two localities: Oarda de Jos and Petreștii de Jos. Recently, at Oarda de Jos, works for a quarry were undertaken to prepare the field for a new neighborhood (residential area). We continuously surveyed this quarry and, in the spring of 2021, luckily (or not) we identified some stocks with excavated material, which yielded fossils. We sampled these stocks of sediment, and the result was promising. We preliminary report here a rich faunal association of vertebrates, which to date, consist of fish, anurans, squamates, dortokid turtles, crocodiles, sauropods and theropods, completed by various eggshells. Some key remarks about the Maastrichtian paleoenvironments from Oarda de Jos are discussed.*
Keywords: *latest Cretaceous, Transylvania, ox-bow deposit, vertebrates, paleoenvironments.*

Rezumat. *Până în prezent, din sud-vestul Transilvaniei, depozite continentale Cretacic Superioare cu resturi de microvertebrate sunt cunoscute din două localități: Oarda de Jos și Petreștii de Jos. Recent, la Oarda de Jos a fost deschisă o carieră care a avut ca scop pregătirea terenului pentru construirea unui nou cartier (o zonă rezidențială). Noi am cercetat în mod continuu această carieră iar în primăvara anului 2021, din fericire (sau nu), am identificat niște grămezi cu material excavat, care au furnizat fosile. Am probat aceste grămezi de sediment, iar rezultatele au fost promițătoare. Raportăm preliminar, în cadrul acestui studiu, o asociație faunistică bogată de vertebrate, care până în prezent include pești, anure, squamate, țestoase dortokidae, crocodili, sauropode și teropode, însoțite de diverse coji de ouă. Sunt formulate și discutate o serie de observații privitoare la paleomediile maastrichtiene de la Oarda de Jos.*
Cuvinte cheie: *Cretacic terminal, Transilvania, depozit de tip ox-bow, vertebrate, paleomedii.*

Introduction

In Romania, uppermost Cretaceous terrestrial deposits crop out in some sedimentary basins such as the Hațeg Basin, the Rusca Montană Basin and the Transylvanian Basin, in its SW and NW area (i.e. Nopcsa 1914, 1915, 1923; Codrea, Godefroit 2008; Benton *et al*. 2010; Codrea *et al*. 2010, 2012a, b, 2017a, b; Weishampel *et al*. 2010; Vasile, Csiki 2011; Weishampel, Jianu 2011; Smith, Codrea 2015; Csiki-Sava *et al*. 2015, 2016; Solomon *et al*. 2020, 2022 etc.; Fig. 1A-B). These exposures are known as parts of the paleogeographic land known as the „Hațeg Island". In order to explain the small sizes of some dinosaurs that inhabited this emerged area, Nopcsa (1914, 1915, 1923) put forward the idea of insularity. His hypothesis of a former island was accepted by most authors in their recent studies (e.g., Codrea, Godefroit 2008; Benton *et al*. 2010; Codrea *et al.* 2010, 2012a, b; Weishampel *et al.* 2010; Weishampel, Jianu, 2011; Smith, Codrea 2015; Csiki-Sava *et al*. 2015, 2016, 2018; Venczel *et al*. 2016; Solomon *et al*. 2020, 2022), but Krause *et al.* (2020) proposed a different pattern

[1] Babeș-Bolyai University, Faculty of Biology and Geology, Laboratory of Paleotheriology and Quaternary Geology, Cluj-Napoca, Romania
[2] Mureș County Museum, Department of Natural Sciences, Târgu Mureș, Romania
[3] Țării Crișurilor Museum, Department of Natural History, Oradea, Romania
[4] Institute of Speleology 'Emil Racoviță', Bucharest, Romania
[5] Brukenthal National Museum, Natural History Museum, Sibiu, Romania,
* Corresponding author; alex_solomon88@yahoo.com; codrea_vlad@yahoo.fr; mvenczel@gmail.com; marian.bordeianu@outlook.com; nicolae.trif@gmail.com; farcas2002@yahoo.com.

for this area (see details in their paper). However, the „Hațeg Island" is estimated to be ca. 80.000 km^2 (Benton *et al.* 2010), but its true surface and precise location within the European latest Cretaceous archipelago is still under debate (details, in Krause *et al*. 2020). Several accepted opinions consider that this ancient island was part of the western Tethys Archipelago and that it was located at that time in present-day southern Europe (i.e. Dercourt *et al*. 2000; Csontos, Vörös 2004; Csiki-Sava *et al*. 2015).

In south-western Transylvania (Metaliferi sedimentary area; Codrea, Dica 2005; Fig. 1C), latest Cretaceous terrestrial deposits bearing microvertebrate remains are rather scarce, to date being reported only from two localities Oarda de Jos (with two main sites: ODA and ODB) and Petreștii de Jos (Codrea *et al*. 2001, 2010, 2012b, 2013, 2014, 2017b, 2021; Csiki-Sava *et al*. 2012; Vremir *et al*. 2014; Solomon *et al*. 2022). In the last few years, at Oarda de Jos, works for a quarry were undertaken in order to prepare the field for the construction of a new neighborhood (residential area). Our team continuously surveyed this new quarry hoping that the diggings will expose the latest Cretaceous continental succession from the area. The work front of the quarry continued to enlarge very fast, and the workers reached the continental latest Cretaceous strata (Fig. 1D). In the spring of 2021, luckily (or not) we managed to identify some stocks with excavated material (Fig. 2A), which yielded fossils, both vertebrates and invertebrates, but also plant remains (fruits or seeds). Sampling of these sediments subsequently was undertaken (Fig 2B).

The rock which the fossils originate from is a grey-bluish mudstone (Fig. 2A-B). The colors of the vertebrate remains are black or light to dark brown colored. This is indicative for an 'ox-bow' deposit where the fossils were buried in an environment poor in the content of oxygen. Unfortunately, we cannot give the exact location of these mudstones in the local succession from Oarda de Jos as long as this small deposit vanished extremely fast as result of digging machines, but it looks like that at ODA locality (Codrea *et al.* 2010), swamps (or small lakes or ponds) occurred. After ODAN lens, the sediments from the stocks represent the second evidence for such conditions at this locality. However, we may affirm that these sediments originate from the northern part of the quarry. Also, the level from where these sediments originated is now lost, being totally excavated. Obviously, these new fossil-bearing sediments are not from ODAN lens (Codrea *et al.* 2010, 2012b, 2013, 2014; Solomon *et al.* 2020, 2022), as long as at the time of their discovery, the part of the local succession where the ODAN lens is located was not affected by the diggings in the quarry. These sediments are still under study and only preliminary results related to the fossil assemblage are herein given. However, we may report a rather rich faunal association of vertebrates, which to date, consists of fish, anurans, squamates, dortokid turtles, crocodiles, sauropods and theropod dinosaurs together with diverse egg-shells. It is predictable that other groups of vertebrates will be added to this assemblage. Detailed descriptions of the fossils will be presented elsewhere.

Local geological setting

The geological setting of the area was recently subject of different papers, and we will not insist on it. For details, see Codrea *et al*. (2010, 2014, 2017b), Vremir (2010), Csiki-Sava *et al*. (2016). Solomon *et al*. (2020, 2022) etc. Oarda de Jos locality (now part of the city of Alba Iulia) is located along the right riverbank of the Sebeș River, in the southwestern part of the Transylvanian Basin (Fig. 1C). It consists of two main outcrops: ODA and ODB (Codrea *et al.* 2001, 2010). Both outcrops yielded fossil vertebrates. These exposures from Oarda de Jos belong to the Șard Formation (= Sebeș Formation in Csiki-Sava *et al*. 2016). The strictly continental Maastrichtian Șard Formation exposes in dominance *red beds* of fluvial origin. Sometimes, locally, pond-like (or small lakes) environments are recognized (Codrea *et al.* 2001, 2010, 2014; see also Solomon *et al.* 2022, for details). Other lacustrine episodes were identified by Mészáros *et al*. (1969) near Bărăbanț in the top of the succesion. For this study, ODA is of main interest.

Material and methods

The material available for this study was collected from Oarda de Jos A (Alba County), in Transylvania (Romania). The material is the result of screen-washing of around 200 kg of sediments recovered from two stocks from Oarda de Jos quarry. Vertebrates, invertebrates, and plant remains (fruits or seeds) were preliminarily identified until now. We briefly report here several fossils from these assemblages.

The materials are still under study. Some of them still need preparation and strengthening with various professional polymers. The preparation process is in progress at the Laboratory of

Paleotheriology and Quaternary Geology, Babeș-Bolyai University of Cluj-Napoca.

Currently, the specimens are stored in the collections of the above-mentioned laboratory. After preparation and prior final publication of the entire fossil assemblage, part of the resulted materials/specimens will be deposited at Babeș-Bolyai University of Cluj-Napoca and part of it, at the Mureș County Museum. Due to the fact that this study is just a preliminary report, we won't use inventory numbers for the herein figured specimens.

Photographs on the specimens were taken with a D7000 Nikon camera mounted on a 20-80x Nikon binocular. We produced extended-focus images for each specimen using photo stacking technique.

Preliminary results

The preparation of some specimens is finished and some of them are identified at the level of the group. Several specimens were identified at the genus level only. As noted above, this is a preliminary report of this important latest Cretaceous fauna and we won't develop detailed descriptions or comparisons of the specimens.

Systematic paleontology

Fish

Most fish remains are represented by isolated teeth and scales. To date, at least the presence of Lepisosteidae (gar fish) is documented from the stocks, but there are also some indeterminate pharyngeal teeth which we assign only to Actinopterygii indet.

Class Actinopterygii Klein, 1885
Family Lepisosteidae Cuvier, 1825
Lepisosteidae indet.

The teeth assigned to Lepisosteidae indet. (e.g. Fig. 3A) are conical and they are exposing parallel vertical ridges on the enamel surface. The top of teeth is pointed and transparent, while the crown is dark-colored.

The scales (Fig. 3B-C) are quasi-rhomboidal and thick. They have a shiny surface (Fig. 3B), which is covered by a layer of ganoine, and a dull surface (Fig. 3C). Their sizes are variable (from less than 1 mm to more than 1 cm long) and their position on the fish body is extremely difficult to be established.

Remarks. Similar teeth and scales were recovered from the area of ODAN lens and preliminary described by Codrea, Jipa (2011). They remarked several morphotypes of teeth which they consider belonging to lepisosteids. Lepisosteidae are a family of fish which flourished in the Mesozoic, so they were contemporaneous also with the dinosaurs, and managed to reach our days (for example, there are several extant species of the genera *Atractosteus* and *Lepisosteus*). Likely, these freshwater fish, able to make incursions in brackish and, very rarely, even in marine waters (Nelson *et al*. 2016), were autochthonous dwellers of the fluvial paleoenvironment from Oarda de Jos.

Class Actinopterygii Klein, 1885
Infraclass Teleostei Müller, 1844
Teleostei indet.

Besides the more abundant teeth which are clearly assigned to Lepisosteidae, two teeth are very specific for teleost fish (Fig. 3D-E). These teeth are asymmetrical and strongly flattened laterally. They have a general „hook" shape suggesting that they may represent pharyngeal teeth which are found in many fish species (*cf*. Trif, Codrea 2022).

Remarks. Recently, Trif, Codrea (2022) described some new fish teeth unearthed from the Maastrichtian rocks in Transylvania. Two of them (Trif, Codrea 2022, fig. 4) are similar with the teeth recovered from the stocks. Thus, based on comparisons with the ones from Trif, Codrea (2022) we consider our teeth as being teleostean pharyngeal teeth. The above-mentioned authors remarked that despite the fact that a large amount of sediment was screen-washed from the deposits of the „Hațeg Island", their two teeth were the sole teeth of that type (morphotype 2 of Trif, Codrea 2022). Surprisingly, after screen-washing only about 200 kg of sediment from the stocks, we also have two teeth of that morphotype. Thus, our new specimens double the known record of fish pharyngeal teeth from the latest Cretaceous of the „Hațeg Island".

Anura

Several cranial and postcranial elements belonging to amphibians were recovered proving the presence at least of one anuran group.

Class Amphibia Linnaeus, 1758
Order Anura Duméril, 1806
Anura indet.

A fragmentary anuran maxilla (Fig. 3F) is here recorded. The specimen preserves the anteriormost part of a rounded and anteriorly tapering horizontal lamina. The preserved tooth positions are closely spaced with their apices

strongly worn or missing. The morphology of the preserved part is reminiscent of alytid frogs. However, more material is needed to confirm the above presumption.

Remarks. Anurans were widely spread on the landmasses of the former „Hațeg Island" (e.g., Grigorescu *et al*. 1999; Folie, Codrea 2005; Codrea, Solomon 2012). Recently, Venczel *et al*. (2016) reviewed the anuran (lissamphibian) fossil localities from the „Hațeg Island" and described several materials from these localities (see details in their study).

Squamata

Several cranial elements (e.g. Fig. 3G-I) are documenting the presence of lizards in the fossil assemblage from the stocks.

Order Squamata Oppel, 1811
Squamata indet. morphotype 1

A dentary specimen (Fig. 4G) is provided with a low dental parapet and with widely spaced tooth positions. The subdental shelf is narrow and the Meckel's groove is open ventrally. However, there are no teeth preserved in the dentary fragment and the alveoli are filled by sediment. Nevertheless, several other specimens, still in preparation (not figured here), bear slightly tricuspid teeth that may be indicative of the presence of the family Barbatteiidae (Codrea *et al*. 2017b) in the fossil assemblage from the stocks.

Squamata indet. morphotype 2

Two fragmentary maxillae of minute size (e.g. Fig. 3H-I) bearing monocuspid teeth represent another morphotype different by the above mentioned one. The teeth are conical with a sharp apex. Their general morphology is reminiscent of gekkotan lizards.

Remarks. Together with amphibians, lizards are a quite common component of the fossil fauna recorded from the „Hațeg Island". However, the discovery of *Barbatteius vremiri* (Venczel, Codrea 2016) and *Oardasaurus glyphis* (Codrea *et al*. 2017b) were of great progress in the knowledge of Transylvanian latest Cretaceous lizards. Based on these two genera, a new family was coined, Barbatteidae (Codrea *et al*. 2017b) which, to date is restricted to the latest Cretaceous of the Transylvanian landmass. *Oardasaurus* type locality is the lens ODAN from Oarda de Jos. Thus, we may assume that some lizard material originating from the stocks could belong to one of these genera. But further studies are needed in order to confirm or infirm this assumption.

Chelonians

Turtle remains are represented by a lot of carapace and plastron fragments, but also by several appendicular remains.

Class Reptilia Laurenti, 1768
Order Testudines Linneus, 1758
Suborder Pleurodira Cope, 1865
Family Dortokidae De Lapparent & Murelaga, 1996
Dortokidae indet.

Small carapace fragments (e.g. Fig. 4A) can be assigned to dortokid turtles based on their ornamentation with a microreticular texture.

Remarks. Similar ornamentation was reported in dortokids from Spain (De Lapparent, Murelaga 1999). Dortokids were already reported from the „Hațeg Island" (e.g. De Lapparent *et al*. 2009; Vremir, Codrea 2009; Rabi, Vremir 2011; Codrea, Solomon 2012; Codrea *et al*. 2013; Augustin *et al*. 2021). The only dortokid species described to date from the „Hațeg Island" is the small-sized aquatic *Dortoka vremiri* (Augustin *et al*. 2021). However, the preference of these turtles for pond-like environments, such the ones from Oarda de Jos or Pui, was already pointed out by Codrea, Solomon (2012) and Codrea *et al*. (2013).

Crocodiles

Several isolated teeth (Fig. 3J-M) confirm the presence of crocodiles in the fossil assemblage. Besides teeth, there are also postcranial elements (e.g. caudal vertebra) belonging to (yet) indeterminate crocodilians.

Class Reptilia Laurenti, 1768
Superorder Crocodyliformes Hay, 1930
Order Crocodylia Owen, 1842
Clade Eusuchia Huxley, 1875
Family Allodaposuchidae Narváez et al., 2015
Allodaposuchus Nopcsa, 1928
Allodaposuchus sp.

The presence of the eusuchian *Allodaposuchus* is attested by several isolated teeth (e.g. Fig. 3J-K). These teeth have a conical crown, are slightly medially twisted. They bear also small distal and mesial keels which are indicative for the genus *Allodaposuchus*. Such teeth were already reported from the area (e.g. Codrea *et al*. 2013), but, moreover, from Oarda de Jos was described an *Allodaposuchus* skull with some *in situ* teeth (Delfino *et al*. 2008), which is now the neotype of

the species (Narváez *et al*. 2017, 2020). The new teeth bear the same general pattern as the ones from the above-mentioned skull.

?Clade Ziphosuchia Ortega et al., 2000
?Doratodon Seeley, 1881

There are several teeth which bear *Doratodon*-like morphology (e.g. Fig. 3L). The apex of the teeth is highly worn. The crown is triangular. The crown is almost as wide as tall. In *Doratodon* the anterior teeth are taller than wider, whereas the posterior ones are wider than tall. As such, our tooth could be one of the last anterior teeth.

?Family Atoposauridae Gervais, 1871
?*Aprosuchus* Venczel & Codrea, 2019

Other teeth (e.g. Fig. 3M) resemble the „low-crowned" morphotype of *Aprosuchus ghirai* (Venczel, Codrea 2019). The crown is compressed labiolingually as in the holotype of *A. ghirai*, and the crown seems to be wider than taller. We preliminary assign this tooth to the family Atoposauridae (Gervais 1871).

Remarks. Codrea *et al*. (2013) remarked a high number of crocodile fossils originating from ODAN lens. Also, they reported at least three types of crocodiles. As such, they considered Oarda de Jos as a place „infested by crocodiles if considering the frequency of such remains as well as the signs of their presence, as numerous bite-marks" (Codrea *et al*. 2010, 2013). It looks like *Allodaposushus* was one of the apex predators from the „Hațeg Island", but also other crocodiles were reported from this landmass. As such several crocodile taxa (i.e. Grigorescu *et al*. 1999; Martin *et al*. 2006, 2010, 2014; Delfino *et al*. 2008; Codrea, Solomon 2012, Codrea *et al*. 2013, Vasile, Csiki 2011; Csiki-Sava *et al*. 2016; Venczel, Codrea 2019) shared the environments during the latest Cretaceous in this area. The discovery of *A. ghirai* (Venczel, Codrea 2019) was of great step forward in the knowledge of latest Cretaceous Transylvanian crocodiles. This taxon bears several morphotypes of teeth and as such, future studies should take this into account when dealing with isolated teeth. Also, a re-evaluation of the already published isolated teeth could take to o less rich diversity of crocodiles if we take into account the morphotypes known in *Aprosuchus* (at least four *cf*. Venczel, Codrea 2019).

Sauropods

Sauropod dinosaurs are documented by several postcranial elements such as caudal vertebrae (e.g. Fig. 4B), or fragmentary limb bones (e.g. Fig. 4C).

Dinosauria Owen, 1842
Sauropoda Marsh, 1878
Macronaria Wilson & Sereno, 1998
Titanosauria Bonaparte & Coria, 1993
Lithostrotia Upchurch *et al*., 2004
Lithostrotia indet.

One posterior caudal vertebra (Fig. 4B) shows lithostrotian titanosaur affinities. We won't describe this specimen because it is already the subject of an ongoing study which will be published elsewhere.

Dinosauria Owen, 1842
Sauropoda Marsh, 1878
Macronaria Wilson & Sereno, 1998
Titanosauria Bonaparte & Coria, 1993
Titanosauria indet.

Besides the caudal vertebra, a light-brown femur shaft (Fig. 4C) is documenting the presence of titanosaurs in the stocks from Oarda de Jos. The bone is expanded towards its proximal end (Fig. 5C1-C2). The distal part is missing, while the proximal part is damaged and was filled by sediment (Fig. 5C1). The cross-section of the shaft is oval-shaped (Fig. 5C3) and a lot of cracks can be seen on the bone surface (Fig. 5C1-C2).

Remarks. Two sauropod titanosaurs were described from the latest Cretaceous of Transylvania: *Magyarosaurus dacus* (von Heune 1932) and *Paludititan nalatziensis* (Csiki *et al*. 2010b). However, the number of the Romanian sauropods might have been higher than thought previously (VAC personal observation, work in progress). As such, until a clearer systematics will be established for these sauropods, the assignment of isolated bones to one or another taxon will be very difficult.

Theropods

To date, theropods are documented by a single tooth, but a more accurate study may reveal that some of yet unstudied postcranial elements could belong to this group.

Class Reptilia Laurenti, 1768
Dinosauria Owen, 1842
Theropoda Marsh, 1881

The sole tooth (Fig. 3N) has a high lanceolate and slightly recurved crown being close in morphology to *Richardoestesia*-type (Currie *et al*. 1990). However, for instance we just assign this tooth to Theropoda indet.

Remarks. There are two theropod genera named from the „Hațeg Island": *Elopteryx nopcsai*

(Andrews 1913) and *Balaur bondoc* (Csiki *et al*. 2010a). Both are defined based on postcranial remains. Moreover, Mayr *et al*. (2020a, b) recorded the presence of a *Gargantuavis*-like taxon in the „Hațeg Island" based on a fragmentary pelvis. As such, it is very difficult to assign isolated teeth to a specific theropod. Hopefully, future research and finds will elucidate the appurtenance of the theropod teeth from the Transylvanian landmass.

Eggshells

Various small eggshells fragments were recovered from the sediment of the stocks. Until recently, most small eggshells which were not assigned to the oogenus *Megaloolithus* (Mikhailov 1991), where considered to represent geckonoid morphotype, but Choi *et al*. (2020) concluded that these eggshells belong to maniraptoran theropods.

Invertebrates

Small-sized freshwater gastropods are the most frequent invertebrates recovered from the stocks. Besides these small mollusks some oval-shaped ostracod valves were recovered (e.g. Fig. 5A).

Remarks. Small-sized freshwater gastropods are often common in association with microvertebrates. In fact, the presence of freshwater mollusks in the sediment is a good indicative for the possible presence of microvertebrates. Similar indeterminate (until now) mollusks were reported from the Metaliferi sedimentary area from Oarda de Jos (ODAN and ODBL; Codrea *et al*. 2013, 2021). The most relevant study regarding the gastropods from „Hațeg Island" was made two decades ago by Pană *et al*. (2002) which recognized „about 30 different genera, belonging to 14 families". Another study on fossil gastropods from the „Hațeg Island" was made by Vasile, Csiki-Sava (2012). They reported freshwater and terrestrial gastropods from Fărcădeana (Rusca Montană Basin) which are quite similar with the ones from the stocks. For the moment, we just reported the presence of such invertebrates in these sediments, while detailed studies could represent an aim for our future research.

The only ostracod taxon identified from the „Hațeg Island" is *Globotalicypridea mirabilis* (Silye *et al*. 2014). It was defined from Pui from the same „Pui Depozit" (Codrea, Solomon 2012) and it was based on a rich sample consisting of both complete carapace and valve (Silye *et al*. 2014). The ostracod material recovered from the stocks is by far less rich compared to the one from „Pui Depozit". Preliminary analyses indicate the possible presence of a different taxon at Oarda de Jos, with a less ornamented carapace/valve. But due to the low number of specimens we avoid any clear conclusion. Moreover, the less ornamented valves from Oarda de Jos could be an artifact of fossilization. Thus, until a richer sample is available, we avoid any clear conclusions about the systematic position of the ostracods from Oarda de Jos.

Plant remains

The plant remains are represented exclusively by small seeds or fruits (Fig. 5B-H) of various shapes. These remains are dark-colored and their sizes vary a lot, some of them having the maximum diameter less than 1 mm, while others have more than 3 mm.

Remarks. Intriguing, from the ODAN lens, from where approximatively 3 tons of sediment were screen-washed (Codrea *et al*. 2010, 2013, 2014, 2017b; Solomon *et al*. 2020, 2022) seeds or fruits are not a common component of the fossil association. In that lens, charophytes are abundant. To date, no charophytes were found in the sediment from the stocks. Moreover, there are no such plant remains in the ODBL lens (Codrea *et al*. 2021). As such, from the point of view of the plant remains, the sediment from the stocks is different by the one from the ODAN and ODBL lenses.

Similar fruits or seeds were recovered by screen-washing sediment from „Pui Depozit" (Codrea, Solomon 2012), but there are still unstudied.

Lindfors *et al*. (2010) described similar fruits and seeds from Budurone, Hațeg basin. They described 19 taxa of angiosperm fruits and seeds. The size of their sample is quite similar with the ones from the stocks. However, a more in-depth study is necessary in order to make correct determination on the fossil flora from the stocks from Oarda de Jos. The size of the fruits and seeds from Budurone, led Lindfors *et al*. (2010) to the conclusion that the „plants grew in typical Late Cretaceous open vegetation perhaps under a seasonally dry climate". Based on preliminary data, it is predictable that the situation was the same at Oarda de Jos, at least in the moment of accumulation of the sediments from the stocks.

Discussions

In the south-western area of the Transylvanian Basin (Metaliferi sedimentary area), latest

Cretaceous microvertebrate-bearing deposits are rather rare. The stocks from the quarry from Oarda de Jos are the third occurrence of such deposits from the area of this locality. Unfortunately, due the fact that they were not *in situ* (bad luck) we cannot give their precise position within the local succession. We can assume that these invertebrate and vertebrate remains accumulated in a pond or a small lake, in a low-oxygenated environment, but future research will elucidate other aspects of knowledge related to the Maastrichtian paleoenvironments at Oarda de Jos. As such, there were some ox-bow conditions when these sediments accumulated, similar to those of ODAN, ODBL, „Pui Islaz", „Pui Depozit" and „Pui Gater" (Codrea *et al*. 2010, 2013, 2021; Codrea, Solomon 2012). We may assume that these sediments from the stock were accumulated in something like a small depression where the water input of the braided fluvial system was ephemeral (or seasonal).

Regarding the fossil assemblage recorded from the stocks of sediment we may say that it resembles the ones from ODAN and ODBL. Although, our report represents a preliminary study we may remark the lack (or low number) of ornithopod remains in the stocks. Ornithopods, especially remains of *Zalmoxes* are very common in the fossil assemblages from ODAN and ODBL lenses. Moreover, till now, no mammals or pterosaurs were recovered from the stocks from the quarry. Also, we have to remark a high number of fruits and seeds recovered from the stocks, while in the ODAN and ODBL lenses these elements are scare or even absent.

If we take a look to the fossilization type, the fossils recovered from the stocks are more similar to the ones from the ODAN lens.

Conclusions

The present paper put forward new vertebrate-bearing sediments from the south-western part of the Transylvanian Basin. We have to say that it was a lucky find (good luck), but at the same time there were disadvantages regarding it. The sediments were dug out quickly by excavators and thus we had no control on the extractions of fossils (bad luck). In this way several (probably more complete) specimens were broken.

Six different vertebrate groups (fish, anurans, squamates, dortokid turtles, sauropods and theropods) are clearly documented from these sediments together with invertebrates and plant remains (fruits and seeds). All these fossils were accumulated in a low-oxygenated paleoenvironment (ox-bow deposit). Ongoing work will elucidate the Maastrichtian paleoenvironments from the Metaliferi sedimentary area and especially from that of Oarda de Jos and could also add some other groups to the fossil assemblage. Obviously, we have to draw the attention of the importance of continuous monitoring of continental latest Cretaceous sites in Romania.

Acknowledgements

The authors are grateful to all the colleagues (too numerous to be mentioned here) involved over a decade in the field missions in the outcrops documenting the "Hațeg Island". We are also grateful to the head and workers of the quarry who provided access in the quarry and also great help. The authors thank both anonymous reviewers for their critical reading of the manuscript and for their suggestions. This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS-UEFISCDI, project number PN-III-P1-1.1-PD-2019-0723, within PNCDI III (To AAS).

REFERENCES

Andrews 1913 — Andrews Charles William, *On some bird Remains from the Upper Cretaceous of Transsylvania*. In: *Geological Magazine* 10, (1913), p. 193-196.

Augustin *et al.* 2021 — Augustin Felix J., Csiki-Sava Zoltán, Matzke Andreas T., Botfalvai Gábor, Rabi Márton, *A new latest Cretaceous pleurodiran turtle (Testudinata: Dortokidae) from the Haţeg Basin (Romania) documents end-Cretaceous faunal provinciality and selective survival during the K-Pg extinction*. In: *Journal of Systematic Palaeontology* 19(15), (2021), p. 1059-1081.

Benton *et al*. 2010 — Benton Michael James, Csiki Zoltán, Grigorescu Dan, Redelstorff Ragna, Sander P. Martin, Stein Koen, Weishampel David Bruce, *Dinosaurs and the island rule: the dwarfed dinosaurs from Haţeg Island*. In: *Palaeogeography, Palaeoclimatology, Palaeoecology* 293, (2010), p. 438-454.

Bonaparte, Coria 1993 — Bonaparte José Fernando, Coria Rodolfo A., *Un nuevo y gigantesco sauropodo titanosaurio de la Formacion Rio Limay (Albiano-Cenomaniano) de la Provincia del Neuquen, Argentina*. In : *Ameghiniana* 30(3), (1993), p. 271-282.

Choi *et al*. 2020 — Choi Seung, Moreno-Azanza Miguel, Csiki-Sava Zoltán, Prondvai Edina, Lee Yuong-Nam, *Comparative crystallography suggests maniraptoran theropod affinities for latest Cretaceous European 'geckoid' eggshell*. In: *Papers in Palaeontology* 6(2), (2020), p. 265-292.

Codrea, Dica 2005 — Codrea Vlad, Dica Paul, *Upper Cretaceous-Lowermost Miocene lithostratigraphic units exposed in Alba Iulia-Sebeş-Vinţu de Jos area (SW Transylvanian Basin)*. In: *Studia Universitatis Babeş-Bolyai Geologia* 50(1–2), (2005), p. 19-26.

Codrea, Godefroit 2008 — Codrea Vlad, Godefroit Pascal, *New Late Cretaceous dinosaur findings from northwestern Transylvania (Romania)*. In: *Comptes Rendus Palevol* 7, (2008), p. 289-295.

Codrea, Jipa 2011 — Codrea Vlad, Jipa Cătălin, *New data on the Maastrichtian fishes (Lepisosteidae and Characiformes) from Transylvania*. In: *9th Annual Meeting Heraklion*, Program and Abstracts held on June 14th-19th, (2011) Crete, Greece (2011), p. 19.

Codrea, Solomon 2012 — Codrea Vlad Aurel, Solomon Alexandru, *Peculiar fossilization and taphonomy in Maastrichtian terrestrial deposits of Pui (Haţeg Basin, Romania).* In: *Studii şi cercetări Geology-Geography* 17, (2012), p. 51-69.

Codrea *et al*. 2012a — Codrea Vlad, Godefroit Pascal, Smith Thierry, *First discovery of Maastrichtian (Latest Cretaceous) terrestrial vertebrates in Rusca Montană Basin (Romania)*, In: Godefroit Pascal, *Bernissart Dinosaurs and Early Cretaceous Terrestrial Ecosystems* (2012a), p. 571-581.

Codrea *et al*. 2001 — Codrea Vlad, Hosu Alexandru, Filipescu Sorin, Vremir Matei, Dica Paul, Săsăran Emanoil, Tanţău Ioan, *Aspecte ale sedimentaţiei cretacic superioare din aria Alba Iulia - Sebeş (jud. Alba)*. In: *Studii şi cercetări Geology-Geography* 6, (2001), p. 63-68.

Codrea *et al*. 2012b — Codrea Vlad, Smith Thierry, Venczel Márton, Solomon Alexandru, Fărcaş Cristina, *Maastrichtian multituberculates from Oarda de Jos, Metaliferi sedimentary area (Transylvania, Romania).* In: *4th International Geologica Belgica Meeting*, Moving Plates and Melting Ice Caps. Processes and Forcing Factors in Geology, Abstracts held on September 11th-14th, (2012), Brussels, Belgium (2012), p. 153.

Codrea *et al*. 2013 — Codrea Vlad, Solomon Alexandru, Fărcaș Cristina, Barbu Ovidiu, *On some local restricted Maastrichtian environments of the "Haţeg Island" (Transylvania, Romania)*. In: *Bulletin of the Geological Society of Greece* XLVII, (2013), p. 82-91.

Codrea *et al*. 2014 — Codrea Vlad Aurel, Solomon Alexandru-Adrian., Venczel Márton, Smith Thierry, *A new kogaionid multituberculate mammal from the Maastrichtian of the Transylvanian Basin, Romania*. In: *Comptes Rendus Palevol* 13, (2014), p. 489-499.

Codrea *et al*. 2017a — Codrea Vlad, Solomon Alexandru-Adrian, Venczel Márton, Smith Thierry, *First mammal species identified from the Upper Cretaceous of the Rusca Montană Basin (Transylvania, Romania)*. In: *Comptes Rendus Palevol* 16, (2017a), p. 27-38.

Codrea *et al*. 2017b — Codrea Vlad Aurel, Venczel Márton, Solomon Alexandru, *A new family of teiioid lizards from the Upper Cretaceous of Romania with notes on the evolutionary history of early teiioids*. In: *Zoological Journal of the Linnean Society* 181(2), (2017b), p. 385-399.

Codrea *et al*. 2010 — Codrea Vlad, Vremir Matei, Jipa Cătălin, Godefroit Pascal, Csiki Zoltán, Smith Thierry, Fărcaș Cristina, *More than just Nopcsa's Transylvanian dinosaurs: a look outside the Haţeg Basin*. In: *Palaeogeography, Palaeoclimatology, Palaeoecology* 293, (2010), p. 391-405.

Codrea *et al*. 2021 — Codrea Vlad Aurel, Venczel Márton, Solomon Alexandru-Adrian, Bordeianu Marian, Fărcaș Cristina, Trif Nicolae, *A new rich upper Cretaceous level with terrestrial vertebrates at Oarda de Jos (Alba County, Romania)*. In: *Belvedere Matteo, Díez Díaz Verónica, Mecozzi Beniamimo, Sardella Raffaele*, Abstract book of the XVIII annual conference of the European Association of Vertebrate Palaeontologists, Palaeovertebrata 44 held On-line on July 5th-9th (2021), Benevento – On-line (2021), p. 58.

Cope 1865 — Cope Edward Drinker, *Third Contribution to the Herpetology of Tropical America.* In: *Proceedings of the Academy of Natural Sciences of Philadelphia* 17(4), (1865) p. 185-198.

Csiki *et al*. 2010a — Csiki Zoltán, Vremir Mátyás, Brusatte Stephen Louis, Norell Mark Allen, *An aberrant island-dwelling theropod dinosaur from the Late Cretaceous of Romania*. In: *Proceedings of the National Academy of Sciences of the United States of America* 107(35), (2010a), p. 15357-15361.

Csiki *et al*. 2010b — Csiki Zoltán, Codrea Vlad, Jipa-Murzea Cătălin, Godefroit Pascal, *A partial titanosaur (Sauropoda, Dinosauria) skeleton from the Maastrichtian of Nălaţ-Vad, Haţeg Basin, Romania*. In: *Neues Jahrbuch für Geologie und Paläontologie–Abhandlungen* 258(3), (2010b), p. 297-324.

Csiki-Sava *et al*. 2012 — Csiki-Sava Zoltán, Bălc Ramona, Brusatte Stephen Louis, Dyke Gareth., Naish Darren, Norell Mark Allen, Vremir M. Mátyás, *Petreşti-Arini (Transylvanian Basin, Romania) a very important but ephemeral Late Cretaceous (Early Maastrichtian) vertebrate site*. In: *Royo-Torres Rafael, Gascó Francisco, Alcalá Luis*, 10th Annual Meeting of the European Association of Vertebrate Palaeontologists, Fundamental 20 held on June 19th-24th (2012), Teruel (2012), p. 53-55.

Csiki-Sava *et al*. 2015 — Csiki-Sava Zoltán, Buffetaut Eric, Ősi Attila, Pereda-Suberbiola Xabier, Brusatte Stephen Louis, *Island life in the Cretaceous – faunal composition, biogeography, evolution, and extinction of land-living vertebrates on the Late Cretaceous European archipelago*. In: *ZooKeys* 469, (2015), p. 1-161.

Csiki-Sava *et al*. 2016 — Csiki-Sava Zoltán, Vremir Mátyás, Vasile Ștefan, Brusatte Stephen Louis, Dyke Gareth, Naish Darren, Norell Mark Allen, Totoianu Radu, *The East Side Story–The Transylvanian latest Cretaceous continental vertebrate record and its implications for Cretaceous–Paleogene boundary events*. In: *Cretaceous Research* 57, (2016), p. 662-698.

Csiki-Sava *et al*. 2018 — Csiki-Sava Zoltán, Vremir Mátyás, Meng Jin, Brusatte Stephen Louis, Norell Mark Allen, *Dome-headed, small-brained island mammal from the Late Cretaceous of Romania*. In: *Proceedings of the National Academy of Sciences of the United States of America* 115(19), (2018), p. 4857-4862.

Csontos, Vörös 2004 — Csontos László, Vörös Attila, *Mesozoic plate tectonic reconstruction of the Carpathian region*. In: *Palaeogeography, Palaeoclimatology, Palaeoecology* 210, (2004), 1-56.

Currie *et al*. 1990 — Currie Philip John, Rigby John Keith, Sloan Robert Evan, *Theropod teeth from the Judith River Formation of southern Alberta, Canada*. In: Currie Philip John, Carpenter Kenneth, *Dinosaur Systematics: Perspectives and Approaches*. Cambridge University Press, Cambridge (1990), p. 107-125.

Cuvier 1825 — Cuvier George, *Recherches sur les ossemens fossiles, où l'on rétablit les caractères de plusieurs animaux dont les révolutions du globe ont détruit les espèces 3rd ed., vol. 3*, In: *Dufour Gabriel, d'Ocagne Edmond*, Paris, 412 pp, (1825).

Delfino *et al*. 2008 — Delfino Massimo, Codrea Vlad, Dica Paul, Folie Annelise, Godefroit Pascal, Smith Thierry, *A complete skull of Allodaposuchus precedens Nopcsa, 1928 (Eusuchia) and a reassessment of the morphology of the taxon based on the Romanian remains*. In: *Journal of Vertebrate Paleontology* 28, (2008), p. 111-122.

Dercourt *et al*. 2000 — Dercourt Jean, Gaetani Maurizio, Vrielynck Bruno, Barrie E., Biju-Duval Bernard, Brunet Michel, Cadet Jean-Paul, Crasquin Sylvie, Săndulescu Mircea (eds.), *Atlas peri-Tethys, palaeogeographical maps*. In: *CCGM/CGMW*, Paris, 269 pp, (2000).

Duméril 1805 — Duméril André Marie Constant, *Zoologie analytique, ou méthode naturelle de classification des animaux, rendue plus facile à l'aide de tableaux synoptiques*. In: *Paris (Allais), '1806'*, i–xxxiii + p. 1-544, (1805).

Folie, Codrea 2005 — Folie Annelise, Codrea Vlad, *New lissamphibians and squamates from the Maastrichtian of Haţeg Basin, Romania*. In: *Acta Palaeontologica Polonica* 50, (2005), p. 57-71.

Gervais 1871 — Gervais Paul, *Remarques au sujet des Reptiles provenant des calcaires lithographiques de Cerin, dans le Bugey, qui sont conserves au Musee de Lyon*. In: *Comptes Rendus des seances de l'Academie de Sciences* 73, (1871), p. 603-607.

Grigorescu *et al*. 1999 — Grigorescu Dan, Venczel Márton, Csiki Zoltán, Limberea Romeo, *New latest Cretaceous microvertebrate fossil assemblages from the Haţeg Basin (Romania)*. In: *Geologie en Mijnbouw* 78, (1999), p. 301-314.

Hay 1930 — Hay Oliver Perry, *Second Bibliography and Catalogue of the Fossil Vertebrata of North America. vol. 390*. In: *Carnegie Institution of Washington*, p. 1-1074 (1930).

Huxley 1875 — Huxley Thomas Henry, *On Stagonolepis robertsoni, and the evolution of the Crocodilia*. In: *Quarterly Journal of the Geological Society* 31, (1875), p. 423-431.

Klein 1885 — Klein Adolf Von, *Beiträge zur Bildung des Schädels der knochenfische*, In: *2. Jahr. Vereins Vaterländischer naturkunde in Württemberg* 42, (1885), p. 205-300.

Krause *et al*. 2020 — Krause David W., Hoffmann Simone, Hu Yaoming, Wible John R., Rougier Guillermo W., Kirk Christopher, Groenke Joseph R., Rogers Raymond Robert, Rossie James B., Schultz Julia Ann, Evans Alistar Robert, von Koenigswald Wighart, Rahantarisoa Lydia J., *Skeleton of a Cretaceous mammal from Madagascar reflects long-term insularity*. In: *Nature* 581, (2020), p. 421-427.

Lapparent, Murelaga 1999 — Lapparent de Broin France de, Murelaga Xabier, *Turtles from the Upper Cretaceous of Laño (Iberian Peninsula)*. In : *Estudios del Museo de Ciencias Naturales de Alava* 14, (1999), p. 135-211.

Lapparent *et al*. 2009 — Lapparent de Broin France de, Codrea Vlad Aurel, Smith Thierry, Godefroit Pascal, *New turtle remains (Kallokibotionidae, Dortokidae) from the Upper Cretaceous of Transylvania (Romania).* In : *The 7th International Symposium of Paleontology*, Abstract Volume held in Cluj-Napoca (2009), p. 68-69.

Laurenti 1768 — Laurenti Josephi Nicolai, *Specimen Medicum, Exhibens Synopsin Reptilium Emendatam cum Experimentis circa Vienna*. In : *Typis Joan. Thomae nob. de Trattnern*, Vienna, 214 pp., (1768).

Lindfors *et al*. 2010 — Lindfors Sandra May, Csiki Zoltán, Grigorescu Dan, Friis Else Marie, *Preliminary account of plant mesofossils from the Maastrichtian Budurone microvertebrate site of the Haţeg Basin, Romani*a. In: *Palaeogeography, Palaeoclimatology, Palaeoecology* 293(3-4), (2010), p. 353-359.

Linnaeus 1758 — Linnaeus Carl, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Volume 1: Regnum animale. Editio decimal reformata*. In: *Laurentii Salvii*, Stockholm (1758).

Marsh 1878 — Marsh Othniel Charles, *Principal characters of American Jurassic dinosaurs. Part I*. In: *American Journal of Science and Arts* 16(95), (1878), p. 411-416.

Marsh 1881 — Marsh Othniel Charles, *Principal characters of American Jurassic dinosaurs. Part V*. In: *The American Journal of Science and Arts 3.* 21(125), (1881), p. 417–423.

Martin *et al*. 2006 — Martin Jeremy Emiland, Csiki Zoltán, Grigorescu Dan, Buffetaut Eric, *Late Cretaceous crocodilian diversity in Haţeg Basin, Romania*. In: *Hantkeniana* 5, (2006), p. 31-37.

Martin *et al*. 2010 — Martin Jeremy Emiland, Rabi Márton, Csiki Zoltán, *Survival of Theriosuchus (Mesoeucrocodylia: Atoposauridae) in a Late Cretaceous archipelago: a new species from the Maastrichtian of Romania*. In: *Naturwissenschaften* 97, (2010), p. 845-854.

Martin *et al*. 2014 — Martin Jeremy Emiland, Rabi Márton, Csiki-Sava Zoltán, Vasile Ștefan, *Cranial morphology of Theriosuchus sympiestodon (Mesoeucrocodylia, Atoposauridae) and the widespread occurrence of Theriosuchus in the Late Cretaceous of Europe*. In: *Journal of Paleontology* 88, (2014), p. 444-456.

Mayr *et al*. 2020a — Mayr Gerald, Codrea Vlad, Solomon Alexandru, Bordeianu Marian, Smith Thierry, *A well-preserved pelvis from the Maastrichtian of Romania suggests that the enigmatic Gargantuavis is neither an ornithurine bird nor an insular endemic*. In: *Cretaceous Research* 106, (2020), 104271.

Mayr *et al*. 2020b — Mayr Gerald, Codrea Vlad, Solomon Alexandru, Bordeianu Marian, Smith Thierry, *Reply to comments on "A well-preserved pelvis from the Maastrichtian of Romania suggests that the enigmatic Gargantuavis is neither an ornithurine bird nor an insular endemic"*. In: *Cretaceous Research* 112, (2020): 104465.

Mikhailov 1991 — Mikhailov Konstantin E., *Classification of fossil eggshells of amniotic vertebrate*s. In: *Acta Palaeontologica Polonica* 36(2), (1991), p. 193-238.

Mészáros *et al*. 1969 — Mészáros Nicolae, Băluţă Crișan, Speck R., *Stratigrafia şi fauna de moluşte a depozitelor paleogene din regiunea Alba Iulia*. In: *Buletinul Societăţii de Ştiinţe Geologice din R.S. România* XI, (1969), p. 311-320.

Müller 1844 — Müller Johannes Peter, *Über den Bau and die Grenzen der Ganoiden, and über das natürliche System der Fische*. In: *Physikalisch-Mathematische Abhandlungen der koniglichen Akademie dei Wissenschaften zu Berlin* 1845, (1844), 117-216.

Narváez *et al*. 2015 — Narváez Iván., Brochu Cristopher, Escaso Fernando, Pérez-García Adán, Ortega Francisco, *New crocodyliforms from southwestern Europe and definition of a diverse clade of european Late Cretaceous basal eusuchians*. In: *PLOS ONE* 10(11), (2015), e0140679.

Narváez *et al*. 2017 — Narváez Iván, Brochu Cristopher, de Celis Ane, Delfino Massimon, Escaso Fernando, Pérez-García Adán, Rabi Márton, Ortega Francisco, *Case 3743 —Allodaposuchus precedens Nopcsa, 1928 (Crocodyliformes: Eusuchia: Allodaposuchidae): proposed designation of a neotype*. In: *Bulletin of Zoological Nomenclature* 74 (2017), p. 95-101.

Narváez *et al*. 2020 — Narváez Iván., Brochu Cristopher, de Celis Ane, Codrea Vlad, Escaso Fernando, Pérez-García Adán, Ortega Francisco, *New diagnosis for Allodaposuchus precedens, the type species of the European Upper Cretaceous clade Allodaposuchidae*, In: *Zoological Journal of the Linnean Society* 189(2), (2020), p. 618-634.

Nelson *et al*. 2016 — Nelson Joseph S., Grande Terry C., Wilson Mark V.H., *Fishes of the World*. In: Wiley, Hoboken (2016), 707 pp.

Nopcsa 1914 — Nopcsa Francisc, *Über das Vorkommen der Dinosaurier in Siebenbürgen*. In: *Verhandlungender zoologische-botanischen Gesellschaft* Wien 54, (1914): p. 12-14.

Nopcsa 1915 — Nopcsa Francisc, *Die Dinosaurier der siebenbürgischen Landesteile Ungarns*. In: *Mitteilungen aus dem Jahrbuche der Königlisch Ungarischen Geologische Reichsanstalt* 24, (1915), p. 1–24.

Nopcsa 1923 — Nopcsa Francisc, *On the geological importance of the primitive reptilian fauna of the uppermost Cretaceous of Hungary; with a description of a new tortoise (Kallokibotium)*. In: *Quarterly Journal of the Geological Society of London* 79, (1923), p. 100-116.

Nopcsa 1928 — Nopcsa Francisc, *Paleontological notes on Reptilia. 7. Classification of the Crocodilia*. In: *Geologica Hungarica, Series Palaeontologica* 1, (1928), p. 75-84.

Ortega *et al*. 2002 — Ortega Francisco, Gasparini Zulma Brandoni de, Buscalioni Angela Delgado, Calvo Jorge Orlando, *A new species of Araripesuchus (Crocodylomorpha, Mesoeucrocodylia) from the Lower Cretaceous of Patagonia (Argentina)*. In: *Journal of Vertebrate Paleontology* 20(1), (2000), p. 57-76.

Oppel 1881 — Oppel Nicolaus Michael, *Die Ordnungen, Familien, und Gatungen der Reptilien als prodromeiner naturgeschichte derselben*. In: *Joseph Lindauer Verlag* München (1881).

Owen 1842 — Owen Richard, *Report on British Fossil Reptiles. Part II*. In: *Report of the Eleventh Meeting of the British Association for the Advancement of Science* held at Plymouth in July 1841, (1842): p. 60-240.

Pană *et al*. 2002 — Pană Ioana, Grigorescu Dan, Csiki Zoltán, Costea Constantin, *Paleoecological significance of the continental gastropod assemblages from the Maastrichtian dinosaur beds of the Haţeg Basin*. In: *Acta Paleontologica Romaniae* 3, (2002), p. 337-343.

Rabi, Vremir 2011 — Rabi Márton, Vremir Mátyás, *Evolution of dortokid turtles in the Late Cretaceous - Paleogene of Europe*. In: *9th Annual Meeting Heraklion*, Program and Abstracts held on June 14th-19th, (2011) Crete, Greece (2011), p. 48-49.

Seeley 1881 — Seeley Harry Govier, *The reptile fauna of the Gosau Formation preserved in the Geological Museum of the University of Vienna*. In: *Quarterly Journal of the Geological Society of London* 37(148), (1881), p. 620-707.

Silye *et al*. 2014 — Silye Lóránd, Colin Jean-Paul, Codrea Vlad, *Globotalicypridea mirabilis sp. nov. –the first non-marine ostracod taxon from the Upper Cretaceous of the Haţeg Basin, Romania*. In: *Annales de Paléontologie* 100, (2014), p. 273-280.

Smith, Codrea 2015 — Smith Thierry, Codrea Vlad, *Red Iron-Pigmented Tooth Enamel in a multituberculate Mammal from the Late Cretaceous Transylvanian "Haţeg Island"*. In: *PLoS ONE* 10(7), (2015), e0132550.

Solomon *et al*. 2020 — Solomon Alexandru-Adrian, Codrea Vlad Aurel, Venczel Márton, Grellet-Tinner Gerald, *A new species of large-sized pterosaur from the Maastrichtian of Transylvania (Romania)*. In: *Cretaceous Research* 110, (2020), 104316.

Solomon *et al*. 2022 — Solomon Alexandru-Adrian, Codrea Vlad Aurel, Venczel Márton, Smith Thierry, *New data on Barbatodon oardaensis, the smallest Late Cretaceous multituberculate mammal from Europe*. In: *Comptes Rendus Palevol* 21(13), (2022), p. 253-271.

Trif, Codrea 2022 — Trif Nicolae, Codrea Vlad Aurel, *New data on Maastrichtian fishes of the 'Haţeg Island'*. In: *Geoloski anali Balkanskoga poluostrva* 83(1), (2022), p. 1-12.

Upchurch *et al*. 2004 — Upchurch Paul, Barrett Paul, Dodson Peter, *Sauropoda*. In: Weishampel David Bruce, Dodson Peter, Osmolska Halszka, *The Dinosauria, second ed*., Berkeley, University of California Press (2004), p. 259-324.

Vasile, Csiki 2011 — Vasile Ştefan, Csiki Zoltán, *New Maastrichtian microvertebrates from the Rusca Montană Basin (Romania)*. In: *Oltenia. Studii şi comunicări. Ştiinţele Naturii* 27(1), (2011), p. 221-230.

Vasile, Csiki-Sava 2012 — Vasile Ștefan, Csiki-Sava Zoltán, Maastrichtian continental gastropods from Fărcădeana (Rusca Montană Basin, Romania). In: *Oltenia. Studii şi comunicări. Ştiinţele Naturii* 28(2), (2012), p. 203-210.

Venczel, Codrea 2016 — Venczel Márton, Codrea Vlad Aurel, *A new teiid lizard from the Late Cretaceous of the Haţeg Basin, Romania and its phylogenetic and palaeobiogeographical relationships*. In: *Journal of Systematic Palaeontology* 14, (2016), p. 219-237.

Venczel, Codrea 2019 — Venczel Márton, Codrea Vlad Aurel, *A new Theriosuchus-like crocodyliform from the Maastrichtian of Romania*. In: *Cretaceous Research* 100, (2019), 24-38.

Venczel *et al.* 2016 — Venczel Márton, Gardner James D., Codrea Vlad Aurel, Csiki-Sava Zoltán, Vasile Ștefan, Solomon Alexandru-Adrian, N*ew insights into Europe's most diverse Late Cretaceous anuran assemblage from the Maastrichtian of western Romania*. In: *Gardner James D., Přikryl Thomas. Contributions in honour of Zbyněk Roček*. *Palaeobiodiversity and Palaeoenvironments* 96, (2016), p. 61-95.

Vremir 2010 — Vremir Mátyás, *New faunal elements from the Late Cretaceous (Maastrichtian) continental deposits of Sebeș area (Transylvania)*. In: *Acta Musei Sabesiensis* 2, (2010), p. 635-684.

Vremir, Codrea 2009 — Vremir Matei, Codrea Vlad, *Late Cretaceous turtle diversity in Transylvanian and Haţeg basins (Romania)*. In: *The 7th Romanian Symposium of Palaeontology*, Bucur Ioan, Săsăran Emanoil, Pop Dana, Abstract Volume held in Cluj-Napoca, Romania (2009), Presa Universitară Clujeană, Cluj-Napoca (2009): p. 122-124.

Vremir *et al*. 2014 — Vremir Mátyás, Bălc Ramona, Csiki-Sava Zoltán, Brusatte Stephen Louis, Dyke Gareth, Naish Darren, Norell Mike Allen, *Petrești-Arini - An important but ephemeral Upper Cretaceous continental vertebrate site in the southwestern Transylvanian Basin, Romania*. In: *Cretaceous Research* 49, (2014), p. 13-38.

Weishampel, Jianu 2011 — Weishampel David Bruce, Jianu Coralia, *Transylvanian dinosaurs*. In: *Baltimore, Johns Hopkins University Press*, 301 pp (2011).

Weishampel *et al*. 2010 — Weishampel David Bruce, Csiki Zoltán, Benton Michael James, Grigorescu Dan, Codrea Vlad, *Palaeobiogeographic relationships of the Haţeg biota – between isolation and innovation*. In: *Palaeogeography, Palaeoclimatology, Palaeoecology* 293, (2010), p. 419-437.

Wilson, Sereno 1998 — Wilson Jeffrey A., Sereno Paul Callistus, *Early Evolution and Higher-Level Phylogeny of Sauropod Dinosaurs*. In: *Journal of Vertebrate Paleontology* 18(sup002), (1998), p. 1-79.

LIST OF ILLUSTRATIONS

Fig. 1 Location of the studied area. **A.** Localization of Romania (grey) on the map of Europe; **B.** Map of Romania with the main areas where latest Cretaceous terrestrial deposits are cropping out; red star indicates the position of the SW part of the Transylvanian Basin (Metaliferi sedimentary area); **C.** Geological map and location of the Metaliferi sedimentary area (modified after Codrea *et al*. 2010 and Solomon *et al.* 2020); red star indicates the area where the stocks of sediments were found; **D.** General view of the quarry from Oarda de Jos; Note the stocks of sediment from the background of the image.

Fig. 2 The stocks of sediment that yielded vertebrate remains. **A.** The two stocks of sediment marked with the red outlines; Note the sauropod remains (humerus for „Stock 1" and caudal vertebra for „Stock 2") which were the first remains recovered from the stocks; **B.** Two of us (VAC and MB) sampling the stocks of sediment.

Fig. 3 Vertebrates recovered from the stocks from the quarry from Oarda de Jos. **A.** Lepisosteidae indet., isolated tooth; **B-C.** Lepisosteidae indet., isolated scales; **D-E.** Teleostei indet., isolated pharyngeal teeth; **F.** Anura indet., fragmentary maxilla; **G.** Squamata indet. morphotype 1, fragmentary dentary; **H-I.** Squamata indet. morphotype 2, fragmentary maxilla; **J-K.** *Allodaposuchus* sp., isolated teeth; **L.** *Doratodon*-like, isolated tooth; **M.** *Aprosuchus*-like, isolated tooth; **N.** Theropoda indet., isolated tooth. Scale bar equals 1 mm.

Fig. 4 Vertebrates recovered from the stocks from the quarry from Oarda de Jos. **A.** Dortokidae indet., carapace fragment; **B.** Sauropoda: Lithostrotia indet., posterior caudal vertebra; **C**. Titanosauria indet., femur shaft in ?caudal (**C1**) and ?cranial (**C2**) views and cross-section of the shaft (**C3**). Scale bar equals 1 cm for A and 5 cm for B-C.

Fig. 5 Examples of invertebrates (**A**. ostracod valve) and plant remains (**B-H.** fruits and seeds) recovered from the stocks of sediment from the quarry of Oarda de Jos. Scale bar equals 1 mm.

LISTA ILUSTRAȚIILOR

Fig. 1 Localizarea zonei studiate. **A.** Localizarea României (gri) pe harta Europei; **B.** Harta României cu indicarea principalelor zone în care aflorează depozite continentale Cretatic Superioare; steluța roșie indica poziția părții de SV a Bazinului Transilvaniei (Aria de sedimentare Metaliferi); **C.** Harta geologică și localizarea Ariei de sedimentare Metaliferi (modificată după Codrea *et al*. 2010 și Solomon *et al*. 2020); steluța roșie indică locul în care grămezile de sediment au fost descoperite; **D.** Privire generală asupra carierei de la Oarda de Jos; Observați grămezile de sediment din planul îndepărtat al imaginii.

Fig. 2 Grămezile de sediment care au furnizat resturile de vertebrate. A. Cele două grămezi de sediment marcate prin contururile roșii; De notat sunt resturile de sauropode (humerus din „Grămada 1" și vertebra caudală din „Grămada 2") care reprezintă primele resturi recuperate din aceste grămezi; **B.** Doi membrii ai echipei (VAC și MB) în timp ce colectează probe de sediment.

Fig. 3 Vertebrate recuperate din grămezile din cariera de la Oarda de Jos. **A.** Lepisosteidae indet., dinte izolat; **B-C.** Lepisosteidae indet., solzi izolați; **D-E.** Teleostei indet., dinți faringieni izolați; **F.** Anura indet., maxilar fragmentar; **G.** Squamata indet. morfotip 1., mandibulă fragmentară; **H-I.** Squamata indet. morfotip 2, maxilar fragmentar; **J-K.** *Allodaposuchus* sp., dinte izolat; **L**. Dinte izolat de tipul *Doratodon*; **M.** Dinte izolat de tipul *Aprosuchus*; **N.** Theropoda indet., dinte izolat. Scara 1 mm.

Fig. 4 Vertebrate recuperate din grămezile din cariera de la Oarda de Jos. **A.** Dortokidae indet., fragment de carapace; **B.** Sauropoda: Lithostrotia indet., vertebră caudală posterioară; **C**. Titanosauria indet., femur fragmentar în vedere ?caudală (**C1**) și ?cranială (**C2**) și secțiunea transversală a fragmentului de femur (**C3**). Scara 1 cm pentru A și 5 cm pentru B-C.

Fig. 5 Example de nevertebrate (**A**. valvă de ostracod) și resturi de plante (**B-H.** fructe și semințe) recuperate din grămezile de sediment din cariera de la Oarda de Jos. Scara 1 mm.

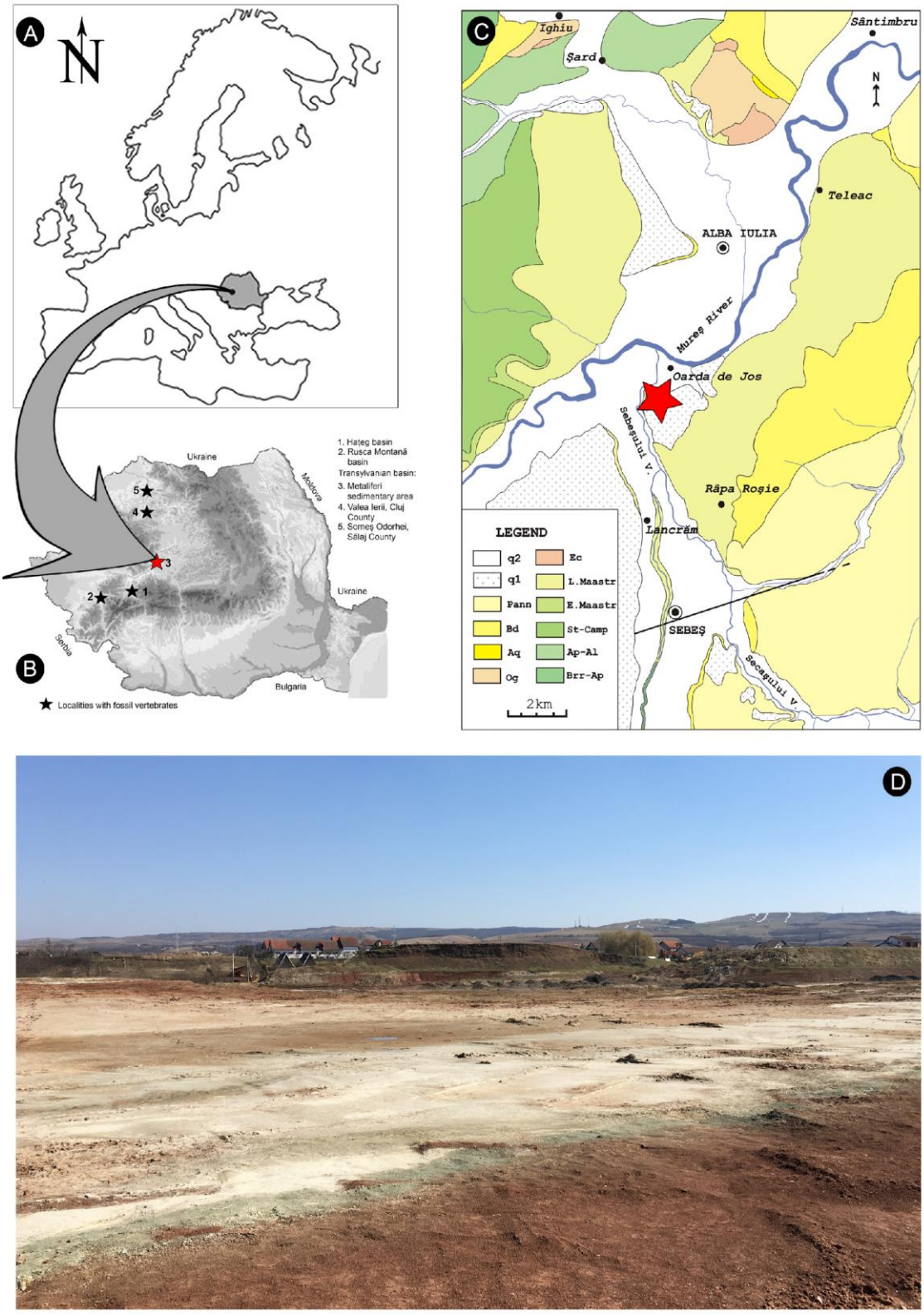


Fig. 1. Location of the studied area. **A.** Localization of Romania (grey) on the map of Europe; **B.** Map of Romania with the main areas where latest Cretaceous terrestrial deposits are cropping out; red star indicates the position of the SW part of the Transylvanian Basin (Metaliferi sedimentary area); C. Geological map and location of the Metaliferi sedimentary area (modified after Codrea *et al*. 2010 and Solomon *et al.* 2020); red star indicates the area where the stocks of sediments were found; D. General view of the quarry from Oarda de Jos; Note the stocks of sediment from the background of the image.

Fig. 2. The stocks of sediment that yielded vertebrate remains. **A.** The two stocks of sediment marked with the red outlines; Note the sauropod remains (humerus for „Stocks 1" and caudal vertebra for „Stocks 2") which were the first remains recovered from the stocks; **B.** Two of us (VAC and MB) sampling the stocks of sediment.

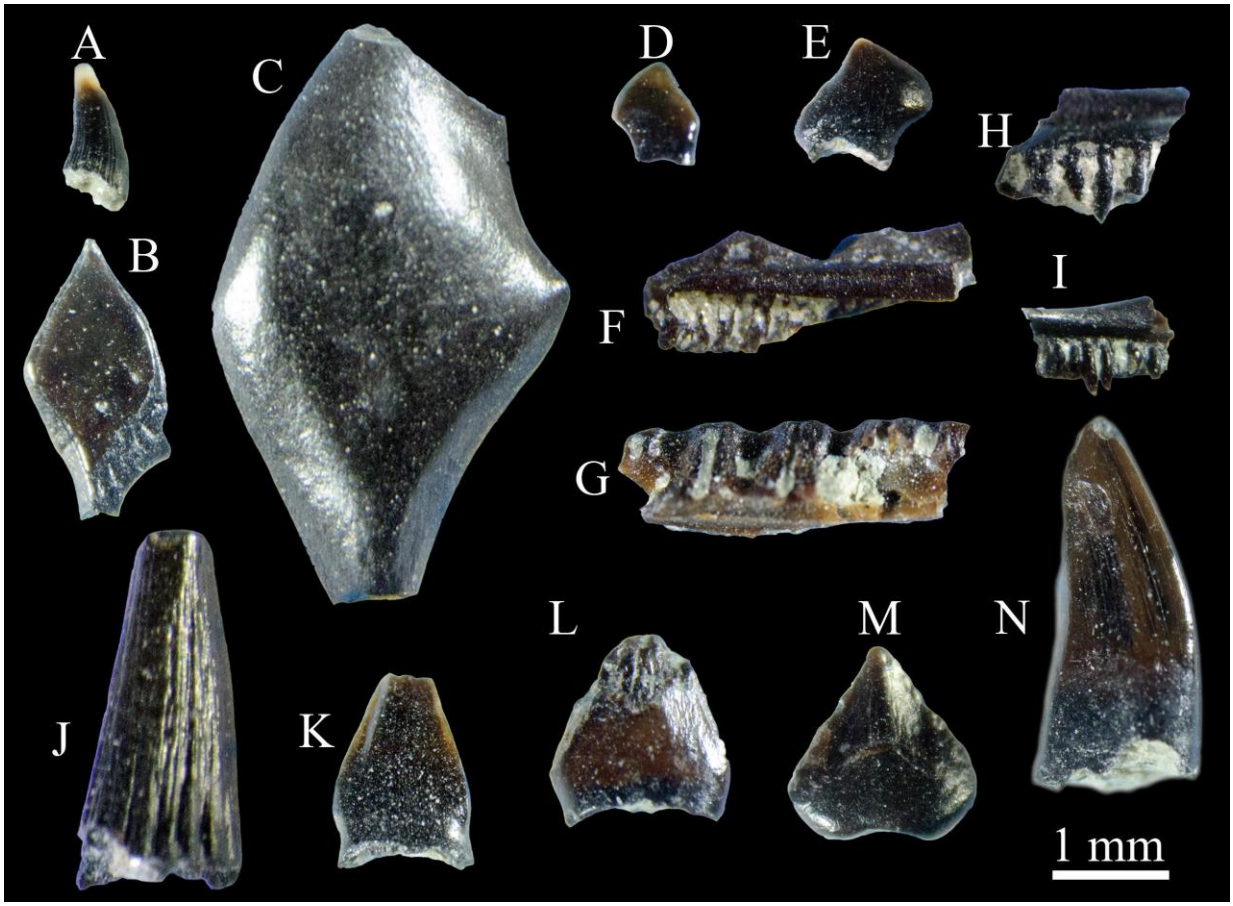


Fig. 3. Vertebrates recovered from the stocks from the quarry from Oarda de Jos. **A.** Lepisosteidae indet., isolated tooth; **B-C.** Lepisosteidae indet., isolated scales; **D-E.** Teleostei indet., isolated pharyngeal teeth; **F.** Anura indet., fragmentary maxilla; **G.** Squamata indet. morphotype 1, fragmentary dentary; **H-I.** Squamata indet. morphotype 2, fragmentary maxilla; **J-K.** *Allodaposuchus* sp., isolated teeth; **L**. *Doratodon*-like, isolated tooth; **M.** *Aprosuchus*-like, isolated tooth; **N.** Theropoda indet., isolated tooth. Scale bar equals 1 mm.

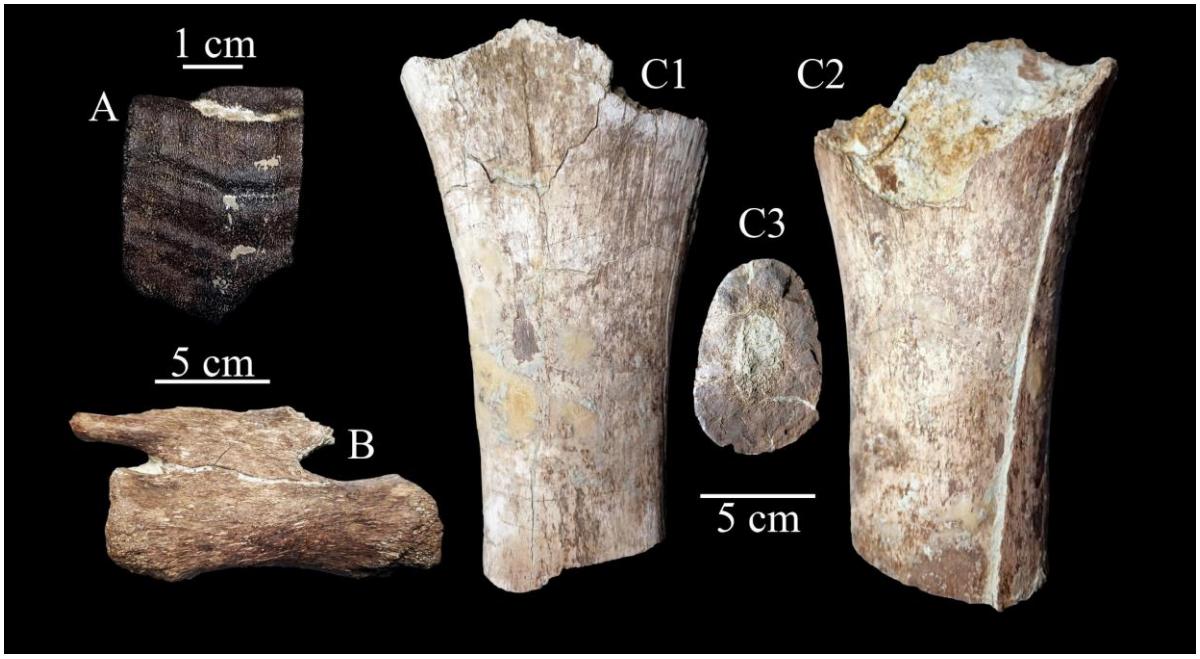


Fig. 4. Vertebrates recovered from the stocks from the quarry from Oarda de Jos. **A.** Dortokidae indet., carapace fragment; **B.** Sauropoda: Lithostrotia indet., posterior caudal vertebra; **C**. Titanosauria indet., femur shaft in ?caudal (**C1**) and ?cranial (**C2**) view and cross-section of the shaft (**C3**). Scale bar equals 1 cm for A and 5 cm for B-C.

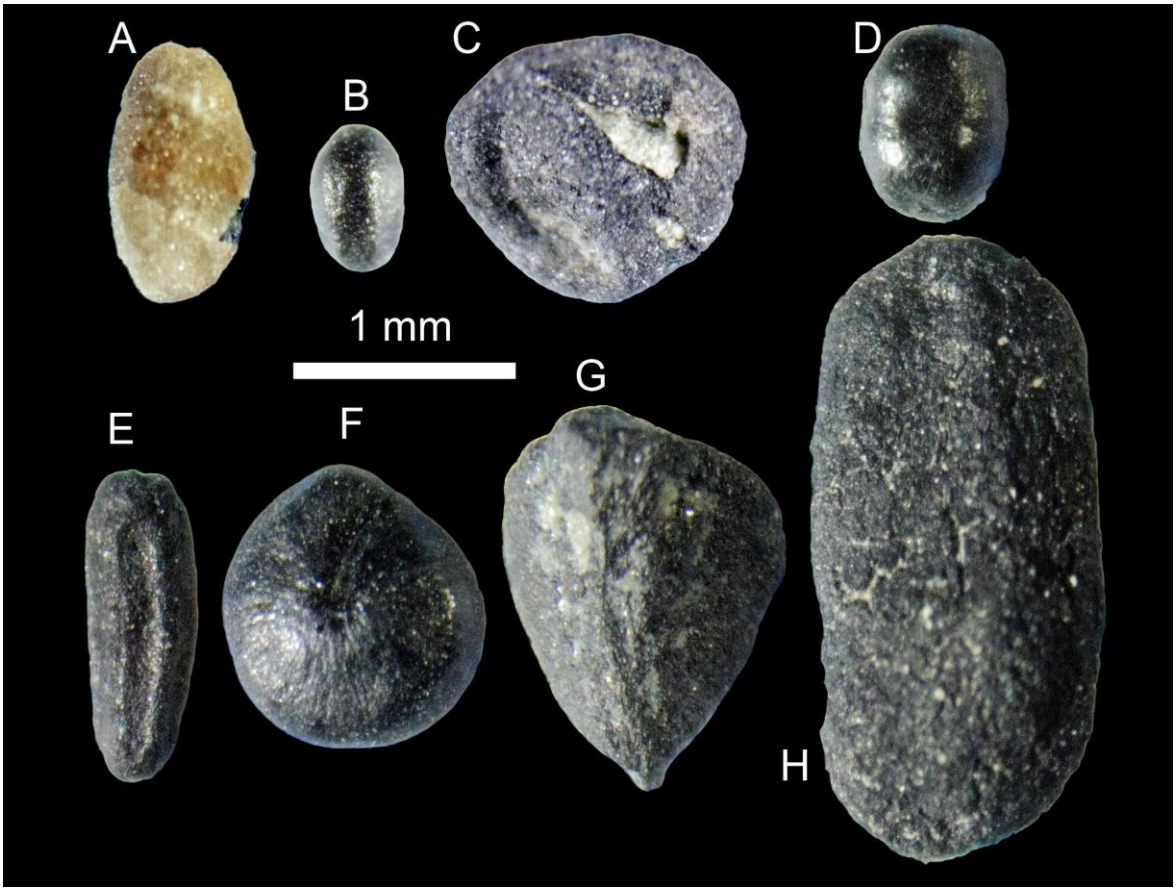


Fig. 5. Examples of invertebrates (**A**. ostracod valve) and plant remains (**B-H**. fruits and seeds) recovered from the stocks of sediment from the quarry of Oarda de Jos. Scale bar equals 1 mm.

FIRST REPORT OF THE ORDER ALBULIFORMES (ACTINOPTERYGII) IN THE EOCENE OF TURNU ROȘU (TRANSYLVANIAN BASIN), ROMANIA

Nicolae TRIF *

Abstract. *The well-known Richard Brekner collection curated at the Museum of Natural History in Sibiu (Romania) still contains lesser-known taxa. Of these, we describe and illustrate in here the species Albula eppsi. The species is reported for the first time in Romania, being an important addition to the list of fossil fauna of the country. Some key issues related to the taxonomy, morphology and paleoecology of this species are also discussed.*
Keywords*: bony fish, Albula eppsi, museum collection, first report*

Rezumat. *Cunoscuta colecție Richard Brekner a Muzeului de Istorie Naturală din Sibiu (România) conține încă taxoni mai puțin cunoscuți. Dintre aceștia descriem și ilustrăm în acest articol specia Albula eppsi. Specia este pentru prima oară semnalată în România fiind o importantă adăugire la lista de faună fosilă din țară. De asemenea, sunt discutate unele aspecte cheie legate de taxonomie, morfologie și paleoecologia acestei specii.*
Cuvinte cheie: *pește osos, Albula eppsi, colecții muzeale, prima semnalare*

Introduction

The Eocene deposits from Turnu Roșu (Sibiu county) are well known since the middle of the 19th century when the first works regarding this locality were published by researchers interested in the geology of the area: Neugeboren, (1850, 1851), Akner (1854), Hauer & Stache (1863), Vutskits, (1883) or Koch (1894).

The site is very rich in various groups of fossils. Both invertebrates and vertebrates are known from this site. With few exceptions these are *ex-situ* fossils, found by geologists as a result of erosion on the slopes of the hills near the locality or, their stratigraphic situation is unknown or has not been specified in detail by the authors. The invertebrate fauna includes: calcareous algae (Bucur & Ianoliu, 1987), foraminifera (Bombiță, 1963; Mészáros & Ianoliu, 1973), cephalopods (Șuraru, 1963), gastropods and bivalves (Mészáros, 1960), brachiopods (Dulai et al. 2021), crabs (Hyžný & Trif 2021), sea urchins (Koch, 1885; Șuraru et al., 1967; Carassco & Trif, 2021).

Although vertebrate remains such as crocodiles, turtles and marine mammals are known from Turnu Roșu (Akner, 1854; Codrea & Fărcaș, 2002; Codrea & Venczel, 2020), the fossil ichtyofauna is the one that made this locality famous among paleontologists. The publications of Neugeboren (1850, 1851) regarding the fossil sharks are now among the classic works of paleontology from Transylvania. The research on fossil fish from this locality continued after more then 150 years with a series of articles that focused, again, on sharks (Ciobanu, 1994, 1995, 1996, 1997, 1998, 2000, 2002, 2006 - for a complete series of references see Trif & Codrea, 2018). Only after 2011 researchers started to approach groups of fish other then sharks: eotrigonodontidae (Ciobanu, 2011), diodontidae (Ciobanu & Trif, 2012), labridae (Ciobanu, 2013), pycnodontidae (Ciobanu & Trif, 2013) and some fish with a more uncertain position - Cylindracanthus Leidy, 1856 (Ciobanu & Trif, 2016). With few exceptions, most of the described specimens come from the old collections of the Museum of Natural History from Sibiu. This research continues the work on the icthyofauna from these collections.

Geological settings

The Turnu Roșu locality is situated in the southern part of the Transylvanian Basin, central part of Romania (Fig. 1). Although, the Eocene age was established from the first studies (Neugeboren, 1850, 1851; Akner, 1854; Hauer & Stache, 1863) a progress in a more precise determination of age, stratigraphy and correlation with the deposits from the other parts of the Transilvanian basin was very slow. Several works

* Natural History Museum, Brukenthal National Museum, Sibiu, nicolae.trif@gmail.com

from the 20th century suggested that the Turnu Roșu deposits include a Ypresian-Lutetian interval (Bombiță, 1963), a Lutetian-Priabonian sequence (Tătărâm, 1967) or a Ypresian-Priabonian interval with a sedimentation gap for the Bartonian stage (Bucur & Ianoliu, 1987).

On the other hand, a continuous sedimentary sequence from Ypresian to Priabonian was indicated by other researchers (Mészáros & Ianoliu, 1971, 1972, 1973; Mészáros, 1996). The definition of a stratigraphic group and of three formations at Turnu Roșu by Mészáros (1996) did not offer the much waited clarity in the correlation with the rest of the basin. He provided few data in the description of formations: i.e. the lack of upper or lower limits and the stratigraphy is very synthetic Also, the publication type where these formations were described does not meet the minimal criteria for the publication of stratigraphical units such as established by Murphy & Salvador (1999).

Material and methods

Two isolated teeth belonging to Albuliformes are available for study (inventory numbers 34522 and 34523 - see Plate 1). Both teeth come from the Richard Breckner Collection, part of the Paleontological Collections of the Natural History Museum in Sibiu, Romania (herein abbreviated NHMS). As for the rest of the fauna described from the Breckner Collection, we consider these teeth to have an Eocene age.

The teeth were photographed with a Nikon D90 camera and a Sigma 105 mm lens. For the systematic paleontology of Albulidae we follow Ebersole et al., (2019).

Systematic paleontology

Order Albuliformes Greenwood Rosen, Weitzman
and Myers, 1966
Family Albulidae Bleeker, 1859
Genus Albula Gronow, 1763
Albula eppsi White, 1931

Description

The teeth are small, with a circular or sub-circular occlusal outline (Pl. 1b, e). The occlusal surface is flat (Pl. 1b, e). Heavy functional wear is present on this surface but also in the upper-lateral part of the teeth (Pl. 1 a, b, d, e). In lateral view the teeth are slightly convex (Pl. 1 a, d). The tooth base is almost flat with a circular basal cavity (basal pulp cavity; Pl. 1c, f).

Remarks

Two species belonging to the genus *Albula* (Gronow, 1763) are considered to be valid in the Eocene, namely *A. eppsi* White, 1931 and *A. oweni* Owen, 1845. A third species, *A. bellovoyei* Priem, 1908 has a more complex story as it is described based only on otoliths, while the other two are based on teeth and cranial fragments. An interesting discussion in Ebersole et al., (2019) regarding the validity of the species *A. bellovoyei* indicates that *A. eppsi* could be a junior synonim of *A. bellovoyei* as suggested by Nolf (2013) who compared the otoliths of the two species. However, it is not certain that the otoliths attributed to *A. eppsi* by White (1931) belong indeed to *A. eppsi*. White himself brings some doubts regarding this: "These otoliths almost certainly belong to the fish described from the dentition, etc., on p. 83... They resemble the otoliths of the recent species, *A. vulpes*" (White, 1931, p. 105). If beyond-the-doubt material of associated teeth and otoliths of *A. eppsi* will be discovered and the otoliths are to be similar to *A. eppsi*, then this species will be nothing else than a junior synonym of *A. bellovoyei* according to the priority of the name (*A. bellovoyei* Priem, 1908 *VS*. *A. eppsi* White, 1931). Until then, considering that *A. oweni* is present in the same deposits as *A. eppsi* and the otoliths of *A. oweni* are yet unknown only these two species are considered valid.

The teeth of *A. eppsi* differ from the ones of *A. oweni* mostly in the shape of the lateral profile. If *A. eppsi* has a straight to convex lateral profile, *A. oweni* has, in general, a conical one, strongly tapering towards the base.

Albula is a common presence in the Eocene of many localities from USA (Ebersole et al., 2019; Weems, 2020), France (Priem, 1908) and UK (White, 1931). In Romania, the genus was reported as *Albula* sp. (?) by Codrea et al., (1997) from the Priabonian of Cluj-Napoca, at Someș Dam, and as *Albula oweni* by Trif et al., (2021) from the Bartonian of Călățele.

The genus *Albula* has a few extant species, among which *A. vulpes* is the best known. In fact, this species, based on morphologic homogeneity, was for a long time classified as a single pantropical species. More recent studies (Whitehead, 1986; Colborn et al., 2001), that are based on DNA analysis, showed that the global species *A. vulpes* (Linnaeus, 1758) is actually formed from quite a large number of species, at least seven being recognized. The extant *Albula* spp. are migrant

species, found usually in open waters, but are benthic and epibenthic, feeding at the bottom. They also use shallow sandy flats spaces as a refuge from sharks (Colborn et al., 2001).

Conclusions

The present paper describes and illustrates yet another species of fossil fish from the Eocene of Turnu Roșu in the Transilvanian Basin, Romania. Although the genus *Albula* was previously known from the north-western part of this basin (Cluj region) this is the first time the species *A. eppsi* is reported from Romania.

Acknowledgements

The author thanks both reviewers (Ionuț Grădianu and one anonymous reviewer) for their critical reading of the manuscript and for their suggestions.

.

REFERENCES

Akner, 1854 — Akner Michael Johann, *Beitrag zur Geognosie und Petrefaetenkunde des südöstlichen Siebenbürgens, vorzüglich der schichten aus dem bereich des Hermannstaedter Bassins*. In: *Verhandlungen der Kaiserlichen Leopoldinisch-Carolinischen Akademie der Naturforscher*, 24(2), (1854), p. 899-936.

Bleeker, 1859 — Bleeker Peter, *Enumeratio specierum piscium hucusque in Archipelago Indico observatarum.* Typis Langii & Soc., Batavia, (1859), 276 pp.

Bombiță, 1963 — Bombiță George, *Contribuții la corelarea eocenului epicontinental din România*. Editura Academiei, București, (1963), 113 pp.

Bucur, Ianoliu, 1987 — Bucur I. Ioan, Ianoliu Constantin, L'Eocene de Turnu Roșu-Porcești. *Considerations sur les algues calcaires*. In: Petrescu I. and Ghergari L., (Eds.), In: *The Eocene from the Transylvanian Basin, Romania*. University of Cluj-Napoca, Cluj-Napoca, (1987), p. 37-42.

Carassco, Trif, 2021 — Carassco José Francisco, Trif Nicolae, *The Eocene echinoid fauna from Turnu Roșu (Transylvanian Basin), Romania*. In: Brukenthal Acta Musei, 16(3), (2021), p. 741-756.

Ciobanu, 1994 — Ciobanu Rodica, *Addition to the Eocene Selachian fauna of Turnu Roşu (Porceşti)*. In: *Studia Universitatis "Babeş-Bolyai", Geologie,* 4, (1994), p. 299-309.

Ciobanu, 1995 — Ciobanu Rodica, *Noi date privind selacienii eoceni de la Turnu Roșu (Porcești): fam. Lamnidae, Cretoxyrhinidae și Odontaspidiae*. In: *Comunicări și referate, Muzeul de Științele Naturii Ploiești*, 7, (1995), p. 113-138.

Ciobanu, 1996 — Ciobanu Rodica, *Evaluări paleoecologice pe baza rechinilor fosili*. In: *Comunicări şi referate, Muzeul Judeţean de Stiinţele Naturii Ploieşti*, 14, (1996), p. 59-62.

Ciobanu, 1997 — Ciobanu Rodica, *Zusammensetzung der bearbeiten Hai un Rochen Fauna aus dem Eozän von Turnu Rosu (Rümanien)*, In: *Naturwissenschaftliche Forschung uber Siebenburgen I. Beitrage zur Geographie, Botanik, Zoologie und Palaontologie. Siebenburgiches Archiv*, 33, (1997), p. 18-22.

Ciobanu, 1998 — Ciobanu Rodica, *Colecţia de selacieni - Richard Breckner*. In: *Studii şi comunicări, Muzeul Brukenthal*, 27, (1998), p. 115–119.

Ciobanu, 2000 — Ciobanu Rodica, 2000, *Angaben zur hai- und rochenfauna aus dem eozän von Turnu Roşu (Rumänien).* In: *Naturwissenschaftliche Forschung uber Siebenburgen VI. In: Beitrage zur Geographie, Botanik, Zoologie und Palaontologie. Siebenburgiches Archiv*, 36, (2000), p. 265–270.

Ciobanu, 2002 — Ciobanu Rodica, *Selacienii paleogeni din România*, Editura Universităţii Lucian Blaga, Sibiu, (2002), 216pp.

Ciobanu, 2006 — Ciobanu Rodica, *Evaluări paleoecologice pe baza patrimoniului muzeal*. Studiu de caz: Turnu Roşu. In: *Marisia. Studii şi materiale, Târgu Mureş*, 28, (2006), p. 70–79.

Ciobanu, 2011 — Ciobanu Rodica, *Eotrigonodon (Osteichthyes, Plectognatii) - pharyngeal teeth - in Richard Breckner's Collection (Natural History Museum Sibiu)*. In: *Oltenia, Studii şi comunicări de ştiinţele naturii*, 27(2), (2011), p. 203-209.

Ciobanu, Trif, 2012 — Ciobanu Rodica, Trif Nicolae, *Diodontidae (Osteichthyes) from the Turnu Roşu Eocene Limestone Reserve*. In: *Brukenthal Acta Musei*, 7(3), (2012), p. 631-642.

Ciobanu, 2013 — Ciobanu Rodica, 2013, *Labridae (Osteichthyes) from "Turnu Roşu (Romania) Eocene Limestone" Reserve*. In: *Brukenthal Acta Musei*, 8(3), (2013), p. 615-625.

Ciobanu, Trif, 2013 — Ciobanu Rodica, Trif Nicolae, *The pycnodont, Phacodus Dixon, 1850, In the Late Eocene of the fossil area Turnu Roşu (Romania)*. In: *Brukenthal Acta Musei*, 9(3), (2013), p. 587-601.

Ciobanu, Trif, 2016 — Ciobanu Rodica, Trif Nicolae, *Cylindracanthus (Leidy, 1856) in the collections of the natural History Museum, Sibiu*. In: *Acta Palaeontologica Romaniae*, 12(1), (2016), p. 25-31.

Codrea, Fărcaș, 2002 — Codrea Vlad, Fărcaș Cristina, 2002. *Principalele asociații de tetrapode continentale paleogene din Transilvania. Distribuție stratigrafică și semnificații ambientale*. Armonii Naturale, 4: 80-92.

Codrea, Venczel, 2020 — Codrea Vlad, Venczel Márton, 2020. *The fossil record of Palaeogene crocodilians in Romania: preliminary data*. Nymphaea. Folia naturae Bihariae, 46/47: 67-82.

Codrea et al., 1997 — Codrea Vlad, Vremir Mátyás, Dica Paul, *Calcarul de Cluj de la Someş-Dig (Cluj-Napoca): semnificaţii paleoambientale şi impactul activităţilor antropice asupra aflorimentului*. In: *Complexul Muzeal judeţean Bistriţa-Năsăud, Studii şi Cercetări*, 3, (1997), p. 31-39.

Colborn et al., 2001 — Colborn Jeff, Crabtree Roy E., Shaklee James B., Pfeiler Edward, Bowen Brian W., *The evolutionary enigma of bonefishes (Albula spp.) - cryptic species and ancient separations in a globally distributed shorefish*. In: *Evolution*, 55, (2001), p. 807-820. https://doi.org/10.1111/j.0014-3820.2001.tb00816.x

Dulai et al., 2021 — Dulai Alfred, Trif Nicolae, Bălc Ramona, *Eocene brachiopods from Turnu Roşu (Transylvanian Basin, Romania)*. In: *Fragmenta Palaeontologica Hungarica* - (2021), 37, (2021), p. 49-64.

Ebersole et al., 2019 — Ebersole Jun A., Cicimurri David J., Stringer Gary L., *Taxonomy and biostratigraphy of the elasmobranchs and bony fishes (Chondrichthyes and Osteichthyes) of the lower-to-middle Eocene (Ypresian to Bartonian) Claiborne Group in Alabama, USA, including an analysis of otoliths*. In: *European Journal of Taxonomy*, 585, (2019), p. 1-274. https://doi.org/10.5852/ejt.2019.585

Greenwood et al., 1966 — Greenwood, P. Humprey, Rosen Donn E., Weitzman Stanley H., Myers George S., *Phyletic studies of the teleostean fishes, with a provisional classification of living forms*. In: *Bulletin of the American Museum of Natural History*, 131(4), (1966), p. 339-456.

Gronow, 1763 — Gronow Laurentius Theodorius, *Zoophylacii Gronoviani fasciculus primus exhibens animalia quadrupeda, amphibia atque pisces, quae in museo suo adservat, rite examinavit, systematice disposuit, descripsit atque iconibus illustravit Laur. Theod. Gronovius*, Samuelem & Johannem Luchtmans, Batavia, (1763), 136 pp.

Hauer, Stache, 1863 — Hauer Franz R., Stache Guido, *Geologie Siebenbürgens - nach den aufnahmen der k. k. geologischen reichsanstalt und literarischen hülfsmitteln*. Herausgegeben von dem Vereine für Siebenbürgische Landeskunde, Wilhelm Braumuler, Wien, (1863), 636 pp.

Hyžný, Trif, 2021 — Hyžný, Matúš, Trif, Nicolae*, Decapod crustaceans from the Eocene of Turnu Roşu (Transylvanian Basin), Romania*. In: *Neues Jahrbuch für Geologie und Paläontologie - Abhandlungen*, 301(1), (2021), p. 1-8.

Koch, 1885 — Koch Anton, *Die alttertiären Echiniden Siebenbürgens*. In: *Mittheilungen aus dem Jahrbuche der Königlich ungarischen Geologischen Anstalt*, 7, (1885), p. 47-132.

Koch, 1894 — Koch Anton, *Die Tertiarbildungen des Beckens der Siebenburgischen Landestheile. I. Palaogene Abtheilung*. In: *Mittheilüngen aus dem Jahrbuche der Königlichen Ungarischen Geologischen Anstalt*, 10, (1894), p. 179-397.

Linnaeus, 1758 — Linnaeus, Carl, *Systema Naturae per regna tria naturae, regnum animale, secundum classes, ordines, genera, species, cum characteribus differentiis synonymis, locis*. Stockholm, (1758), 824 pp.

Mészáros, 1960 — Mészáros Nicolae, *Stratigraphie und Molluskenfauna der Eozänablagerungen von Porcești (Kreis Sibiu-Hermannstadt, Rumänien)*, In: Neues Jahrbuch für Geologie und Paläontologie, 5, (1960), 227-236.

Mészáros, 1996 — Mészáros, Nicolae, *Stratigrafia regiunii Turnu Roșu-Porcești*. In: *Convergențe transilvane*, 4, (1996), p. 42-45.

Mészáros, Ianoliu, 1971 — Mészáros Nicolae, Ianoliu Constantin, *Macrofauna eocenă de la Turnu Roșu - Porcești (1)*. In: *Muzeul Brukenthal. Studii și Comunicări, Științele Naturii*, 17, (1971), 21-30.

Mészáros, Ianoliu, 1972 — Mészáros Nicolae, Ianoliu Constantin, *Macrofauna eocenă de la Turnu Roșu - Porcești (2).* In: *Muzeul Brukenthal. Studii și Comunicări, Științele Naturii*, 18, (1972), p. 13-21.

Mészáros, Ianoliu, 1973 — Mészáros Nicolae, Ianoliu, Constantin 1973. *Contribuții la problema limitei Eocen-Oligocen în regiune Turnu Roșu (Porcești)*, In: *Studii și Comunicări, Muzeul Brukenthal, Științe Naturale*, 16, (1973), p. 29-36.

Murphy, Salvador, 1999 — Murphy Michael A., *Salvador Amos, International Stratigraphic Guide - An abridged version*, In: *Episodes*, (22)4, (1999), p. 255-271.

Neugeboren, 1850 — Neugeboren Johann Ludwig, *Die vorweltlichen Squaliden-Zähne aus dem Großkalke bei Portsesd am Altfluß unweit Talmats*. In: *Archiv des Vereins für Siebenbürgische Landeskunde*, 2, (1850), p. 1-44.

Neugeboren, 1851 — Neugeboren Johann Ludwig, *Die vorweltlichen Squaliden-Zähne aus dem Großkalke bei Portsesd am Altfluße unweit Talmats*. In: *Archiv des Vereins für Siebenbürgische Landeskunde*, 3, (1851), p. 151-213.

Nolf, 2013 — Nolf Dirk, *The Diversity of Fish Otoliths, Past and Present*. Operational directorate "Earth and History of Life" of the Royal Belgian Institute of Natural Sciences, Brussels, (2013), 222 pp.

Owen, 1840-1845 — Owen Richard, *Odontography of a treatise on the comparative anatomy of the teeth*. Hippoyte Bailliere, London, (1840-1845), 655 pp.

Priem, 1908 — Priem M. Fernard, *Etude des poissons fossiles du Bassin Parisien*. In: *Annales de Paléontologie*, (1908), p. 1-144.

Şuraru, 1963 — Şuraru Nicolae, *Asupra prezenţei unor rincholite în Eocenul de la Porceşti-Sibiu*. In: *Studia Universitatis Babeş-Bolyai Cluj-Napoca, Seria Geologia-Geographia*, 1, (1963), p. 45-50.

Șuraru et al., 1967 — Șuraru Nicolae, Gabos L., Șuraru Maria, *Contribuții la cunoașterea clipeastridelor eocene*. In: *Studii și cercetări de Geologie, Geofizica si Geografie; Seria Geologie*, 12(1), (1967), p. 193-199.

Trif, Codrea, 2018 — Trif Nicolae, Codrea Vlad, *Critical overview on the odontological researches of the Mesozoic and Cenozoic fishes from Romania*. In: *Brukenthal Acta Musei. Sibiu*. 13(3), (2018), p. 497-516.

Trif et al., 2021 — Trif Nicolae, Arghius Viorel, Seitz Jason, Codrea Vlad, Bălc Ramona, Bindiu-Haitonic Raluca, *Integrated paleontological investigation of a new mid-late Bartonian fish fauna from Călata area, Transylvanian Basin, Romania*. In: *Historical Biology*, 33(10), (2021), p. 1-29.

Tătărâm, 1967 — Tătărâm Nița, *Date noi asupra Paleogenului de la Turnu - Roșu (Porcești).* In: *Analele Universității București, Seria Geologie-Geografie*, 16(2), (1967), p. 65-71.

Vutskits, 1883 — Vutskits György, *Erdély nummulitjeiről általában*. In: *Orvos-Termeszettudomanyi*, 5(2), (1883), p. 6-142.

Weems, 2020 — Weems Robert E., *Additions to the bony fish fauna from the early Eocene Nanjemoy Formation of Maryland and Virginia (U.S.A.)*. In: *The Mosasaur,* 11, (2020), p. 117-152.

White, 1931 — White Errol Ivor, *The vertebrate faunas of the English Eocene. I. From the Thanet Sands to the Basement Bed of the London Clay*. Trustees of the British Museum, (1931), 121 pp.

Whitehead, 1986 — Whitehead, P.J.P., *The synonymy of Albula vulpes (Linnaeus, 1758) (Teleostei, Albulidae)*. In: *Cybium*, 10(3), (1986), p. 211-230.

LIST OF ILLUSTRATIONS

Fig. 1 Location of the studied locality on the map of Europe (**a**), respectively on the map of Romania (**b**).

Plate 1 *Albula eppsi* White, 1931, from Turnu Roșu specimen NHMS 34522: **a** - lateral view; **b** - occlusal view; **c** - basal view and specimen NHMS 34523: **d** - lateral view; **e** - occlusal view; **f** - basal view.

LISTA ILUSTRAȚIILOR

Fig. 1 Poziția localității studiate pe harta Europei (a) și, respectiv pe harta României (b).

Planșa 1 *Albula eppsi* White, 1931, de la Turnu Roșu specimenul NHMS 34522: **a** - vedere laterală; **b** - vedere ocluzală; **c** - vedere bazală și specimenul NHMS 34523: **d** - vedere laterală; **e** - vedere ocluzală; **f** - vedere bazală.

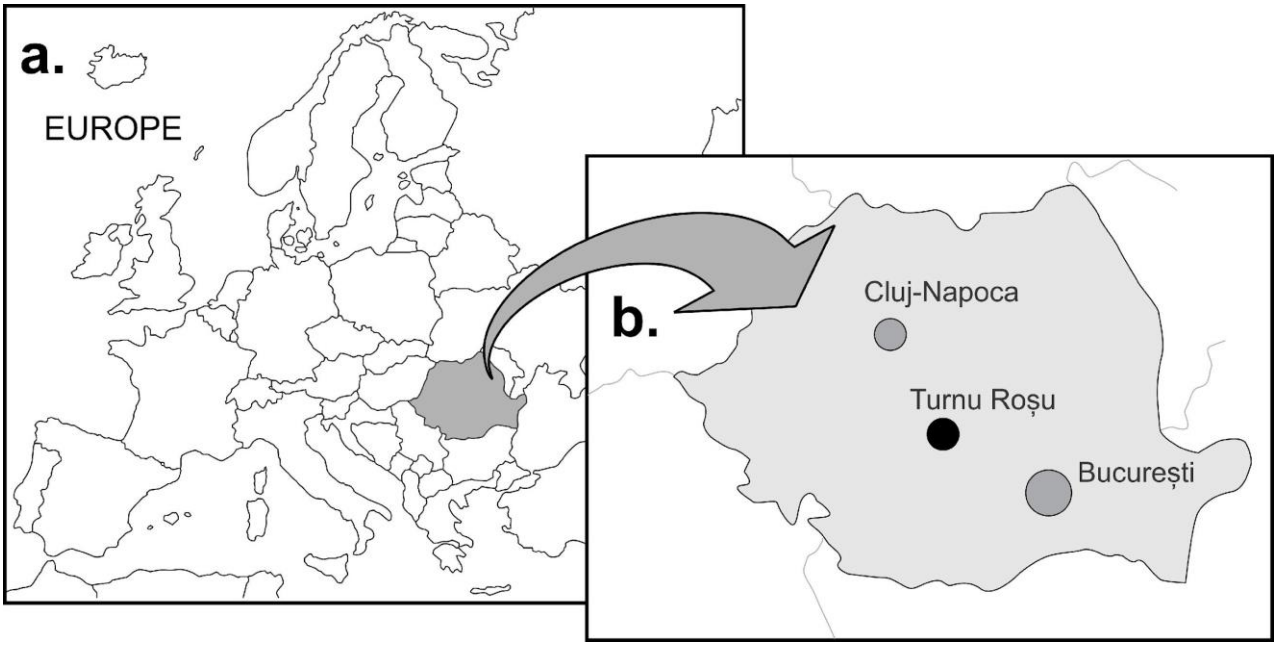


Figure 1. Location of the studied locality on the map of Europe (**a**), respectively on the map of Romania (**b**).

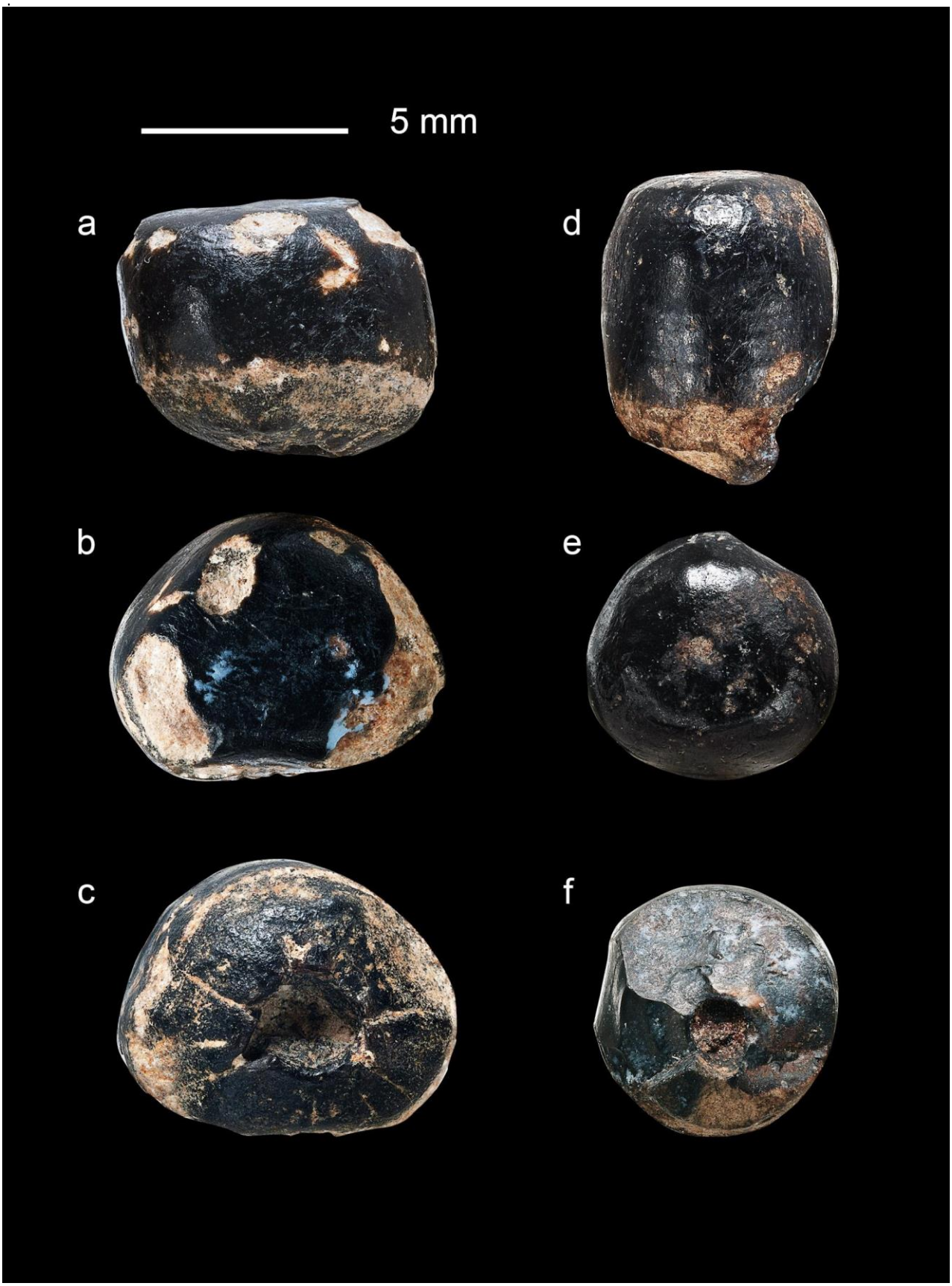
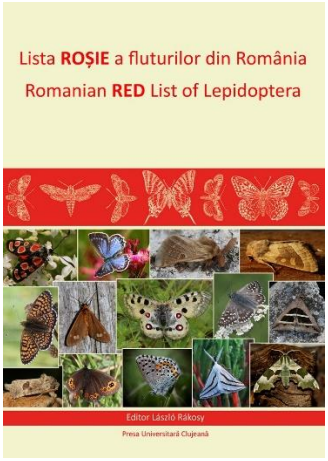


Plate 1. *Albula eppsi* White, 1931, from Turnu Roșu, specimen NHMS 34522; a - lateral view; b - occlusal view; c - basal view and specimen NHMS 34523; d - lateral view; e - occlusal view; f - basal view.

László Rákosy (eds) *LISTA ROȘIE A FLUTURILOR DIN ROMÂNIA / ROMANIAN RED LIST OF LEPIDOPTERA*

Silviu ȚICU*



On October 5, 1948, IUCN (International Union for Conservation of Nature), the first environmental union in the world, was founded in France. One of the greatest achievements of this organization was the founding of the IUCN Red List in 1964, an indicator of the health of global biodiversity and a tool for establishing the threat degree of species of plants, animals, fungi, and more.

Over time the number of assessed species has increased, data have been collected and assessments have been made, thus lists focusing on certain systematic groups in certain areas of the globe have been devised. One such example is the "Romanian RED List of Lepidoptera".

The book "Romanian RED List of Lepidoptera" was published in 2021 by Presa Universitară Clujeană by a team consisting of the following authors: László Rákosy (also editor of the book), Constatntin Corduneanu, Andrei Crișan, Vlad Dincă, Sándor Covács, Mihai Sănescu, Levente Székely in collaboration with Marian Goia, Bogdan Groza, Zoltán Kovács, Cosmin- Ovidiu Manci, Cristian Sitar, Marius Skolka, Tibor-Csaba Vizauer.

The book sums up years of hard work by Romanian lepidopterologists regarding the study of butterflies in Romania, their ecology, distribution, threats and especially the conservation status. The red list sums up the species whose populations in Romania have faced the most serious decline in the last century due to various causes, especially anthropogenic ones, which have few populations or are sensitive to any disturbance of the habitat.

The publication is structured in two distinct parts: the first contains the list of the 1565 species and subspecies of lepidoptera from Romania; and the second part includes 101 emblematic taxa, generally endangered. The structure of the presentations is relatively uniform, following the same elements.

When writing this book, the authors used the table of species and the data on their distribution in Romania from the Catalog of Lepidoptera of Romania (Rákosy *et. al* 2003) to which additions and corrections were made. The table does not include all lepidoptera families from Romania, because there is too little information for a correct evaluation of some of them. The species for which a minimum assessment could be carried out received qualifications based on the IUCN criteria and presenting a general situation of the lepidoptera grup in each historical region of Romania. There is also a table inside the book, quite important, namely that of protected lepidoptera from Romania.

The species distribution maps are simple, white, with a different coloring of the areas representing altitudes above 700 m (the Carpathian Arch); their markings are shown on the map using a code of points of different shapes and colors, each symbolizing a certain interval in which they have been made.

* Brukenthal National Museum, Natural History Museum & Lucian Blaga University of Sibiu, Faculty of Sciences, giorgiansilviu@gmail.com

The publication is bilingual (Romanian – English), which I consider an advantage because this type of structure increases accessibility for the public, the work being thus understandable for both Romanian and English speakers.

As I stated previously, the text for the emblematic taxa has a uniform structure, with essential elements being captured, namely the wingspan, habitat, biology, protection and conservation, and the distribution of the species, with increased focus on the one in Romania.

In my opinion, another very good segment of the book is represented by the table containing the "List of Lepidoptera from Romania protected by law", where we can have a better view on the species protected by Romanian legislation as well as the annex to the directive in which they are framed. In scientific studies where the author proposes an inventory of lepidopteran species from one or more areas, with emphasis on protected species, such a table would be a substantial help especially for a student or hobbyist at the beginning of his taxonomic studies.

As for the external appearance of the book, the cover, from my point of view, has a very representative appearance for the purpose of the publication. The front cover shows the title, the name of the publisher and the publishing house along with some images of representative butterflies and graphic elements that depict butterflies, as for the colors - a tone of yellow and red letters are used.

This review also comes with a series of subjective observations and recommendations.

First, as the author points out, the study represented by the Romanian Red List of Butterflies does not cover all lepidoptera families in the country, for 53 of them there are no studies that provide the data needed for an evaluation as close as possible to reality. This also comes with the premise that there are still many aspects that need to be investigated concerning the lepidoptera-fauna of Romania.

Secondly, while writing a book that presents taxonomical groups that have many species, with a very high morphological and etological diversity, such as butterflies, an essential role is played by the imagery used and, in this case, there is a high number of factors which must be considered. An important factor is the uniformity of the type of pictures used and what they present. In the book "RED List of Romanian Butterflies" for each species are used between 2 and 4 images, in addition to the map. In the 2 - 4 pictures, aspects such as the habitus of the adult butterfly, with a dorsal or ventral view of the wings, images of the larva, with the host plant, different types of habitats characteristic of the species are captured. However, there is no regularity between which pictures are used, as demonstrated by the fluctuating number of pictures allocated to each species. It is known that often there is a lack of a certain type of picture, or its purchase create difficulties especially when we talk about each species, or that a certain type of picture is more important in terms of understanding one species than another. But a standardization would allow the reader to follow the content more easily, plus, the appearance of the book could be more homogeneous.

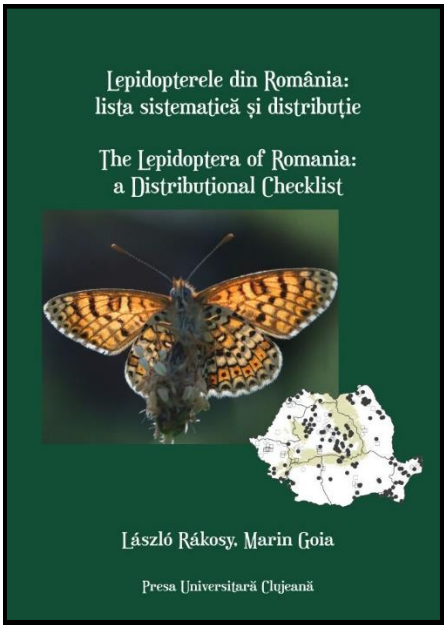
Also, the printing part of a book is an essential step and among the last before the work reaches the reader's arms. In the case of this work, small errors have been made in the printing process regarding the printing of the text on the paper. Normally in the printing process several pigments are used. They are printed on the page according to a certain algorithm to create images, for the text that has a black background only black pigment is used to avoid the possible imprecise overlap with other pigments. Thus, some of the pages of the book contain text that shows superficial traces of yellow pigment, but this is not very visible

However, the present work represents a landmark for all Romanian entomologists and not only, who want to study the butterflies of Romania because it synthesizes and establishes a clear list of species of urgent conservation interest. It can also represent, like any red list, a tool to raise awareness of the importance and urgency of applying butterfly-friendly attitudes and policies, by political factors and the public, which are the main reasons why I recommend this book.

The book by Rákosy *et al.* like those previously published, represents an important step in the conservation of biodiversity in general and butterfly fauna in particular, a richness for which we are morally responsible and which we must preserve for future generations.

László Rákosy, Marin Goia, *LEPIDOPTERELE DIN ROMÂNIA: LISTA SISTEMATICĂ ȘI DISTRIBUȚIE / THE LEPIDOPTERA OF ROMANIA: A DISTRIBUTIONAL CHECKLIST*

Florin BUGNER*



The Lepidoptera of Romania: a Distributional Checklist it's the second edition of the Checklist of Lepidoptera in Romania, which is published 18 years after the first one (Rákosy *et al.* 2003), is a completely revised and updated work, both in terms of taxonomy and nomenclature, but also in terms of species status and subspecies from the eight historical regions of Romania and the whole territory of the country.

For the newly included or excluded species, explanatory comments were made. Since the publication of the first edition, there have been major changes in the systematics and taxonomy of some species, genera, and families, taken over in this paper as they are published.

The checklist provides not only faunistic data for the period 1850-2020 but also an image of the fauna dynamics of the eight historical provinces during this time. There ar also included 192 photos, which represent most of the families of moths and butterflies.

The book is divided into two parts, the first one includes the first five chapters.

The first chapter is the introduction that presents the increase of the level of understanding of the services represented and offered by biodiversity and the decrease in insect biomass and number of species.

The second chapter presents the methods used in gathering the information used in writing the book and the objectives of the book, which are: establishing the species reported with certainty from the Romanian fauna, the distribution of species in the eight historical regions of Romania, delimitation in time of reports.

The third chapter includes the systematics and nomenclature and, in this edition, those are based on the online version of "Fauna Europaea" (https://fauna-eu.org/)

In the fourth chapter there are species listed that were excluded after the revision of the first edition.

In the fifth chapter the results are presented. An impressive 184 new species have been included in this new edition and 78 erroneously reported species and subspecies have been removed, and the situation of the species by families and the distribution in the eight historical regions of Romania were summarized in the first table.

* Lucian Blaga University of Sibiu, Faculty of Sciences, floringheorghe.bugner@ulbsibiu.ro

The second part of the book it it's represented by the checklist of the lepidoptera of Romania and includes the next twelve chapters.

In chapter six we find tables of distribution for all the species and subspecies of butterflies and the distribution in the eight historical regions, and an explication for the abbreviation and terms used.

Chapter seven presents the acknowledgements and collaborators. Chapter eight contains comments regarding locations where each specie was reported or collected. Chapter nine consists in a list of new species recorded after 2003.

Chapter ten consists in a list of species deleted from the Checklist of the Lepidoptera of Romania from 2003.

Ib chapter eleven there are comments regarding the reasons why those species were exluded.

In chapter twelve the author presents a short list of uncertain records that were not included in the checklist.

In chapter thirteen the authors present their reasons on why some species were not included

Chapter fourteen consist of a list of nine species that have not yet been accepted by experts.

In chapter fifteen are presented images of representative species for each family of the lepidoptera order. The comprehensive book ends with a rich bibliography.

Nevertheless, the book ends with an species index.

Each chapter begins with a brief introduction which offers insights about the following chapter. The authors are experts in their research field; therefore, the reviews have a great scientific quality.

All in all, I consider this book a crucial step in understanding butterflie distribution. Moreover, I strongly recommend the book for all those young epidopterist interested in this field of expertise.

REFERENCES

Rákosy *et al.* 2003 — Rákosy László, Goia Marin, Kovács Zoltán, *Catalogul Lepidopterelor României / Verzeichnis der Schmetterlinge Rumäniens.* Societatea Lepidopterologică Română, Cluj-Napoca (2003), 446 pp

BRUKENTHAL NATIONAL MUSEUM IN 2021: A CHRONICLE OF NATURAL HISTORY EXHIBITIONS AND EVENTS

Dana Roxana HRIB*

Abstract: *The present study is a synthetic presentation of Brukenthal National Museum's cultural offer in the field of natural history during 2021.*
Keywords: *Brukenthal National Museum, natural history, 2021.*

Rezumat: *Articolul de față constituie o prezentare sintetică a ofertei culturale a Muzeului Național Brukenthal în domeniul istoriei naturale, pe parcursul anului 2021.*
Cuvinte cheie: ***M****uzeul Național Brukenthal, istorie naturală, 2021****.***

Three Brukenthal Centuries – the message of Prof. Sabin Adrian Luca, Director-General of Brukenthal National Museum:

„Born in 1721, Baron Samuel von Brukenthal – Governor of the Grand Principality of Transylvania (1877 – 1887) – remained in the collective memory not so much through the political and administrative role that history has given him, but through the cultural achievements he has assumed.

First of all, von Brukenthal is the founder of the first public museum opened in today's Romania territories – the Brukenthal Museum, an institution whose bicentennial activity we celebrated in 2017.

The accomplishment of his work as a collector brings together over 1,000 paintings (15th – 18th centuries), about 1,000 prints (16th – 18th century European engraving) and 2,000 plates included in albums, a book fund of about 16,000 volumes, impressive collections of numismatics, minerals and antiques given to the public, which he considered his spiritual heir.

Protector of local artistic circles, from painters to musicians, Samuel von Brukenthal set the patterns of the Sibiu cultural environment that would materialize, in 2007, in the first European Capital of Culture in our country.

The standardization of human survival, in modern times, concerns indicators related to the physical and social quality of life. The survival of cultural values, produced by the great spirits of mankind, is due to personalities such as Samuel von Brukenthal, through whose care we can speak today in Romania of Titian, Veronese, Cranach, Van Eyck, Brueghel and Memling, to name just a few of the masters who can be admired in exhibitions.

The vast legacy left by Baron Samuel von Brukenthal urges us to pay homage, in 2021, to the importance of his work as a collector and founder of cultural institutions, on the occasion of three centuries anniversary of his birth."

1. Temporary exhibitions[1]

Out of the 27 temporary exhibitions that were organized at the Museum's premises during 2021, 2 exhibitions displayed selections of exhibits in various fields of natural history.

_Nature in the collections of Baron Samuel von Brukenthal (1721-1803): The Mineral Collection – aesthetic accents (Natural History Museum Sibiu, Multimedia Room, 5.05-30.09.2021): the Museum of Natural History in Sibiu is the custodian of the mineral-petrographic collection of Baron Samuel von Brukenthal (1721-1803) that was initiated in 1780. The collection comprises samples collected or purchased mostly from the "Gold Quadrangle" from the Apuseni Mountains (Săcărâmb, Baia de Arieș, Măgura-Toplița, Băița Crăciunești, Roșia Montana etc.), the Trascăului Mountains, the Poiana Ruscă Massif, the metallogenetic area of Băii Mari, the Rodna deposit but also from other geographical areas on the current day Romanian territory. The collection was enriched by the custodian Josef Carl Eder (1760-1810) until the death of the baron. Among the collected items, a special place is given by samples of rhodochrosite, gold-silver

* Brukenthal National Museum / Muzeul Național Brukenthal, dana.hrib@brukenthalmuseum.ro

[1] The short descriptions of temporary exhibitions are selected from the texts given by the curators for public information.

telluriums (silvanite, krennerite, nagyagit) discovered for the first time in the world, in Romania, at Baia de Arieș and Săcărâmb. The scientific and documentary-historical patrimonial value of the collection is indisputable.
On the occasion of the exhibition, the visitors had the opportunity to see 120 items from this unique collection on display, available only at the commemorative events dedicated to Baron Brukenthal.
The exhibition focused less on diversity but more on aesthetics, many samples been exhibited for the first time.
_*Medical naturalists from Sibiu* (Museum of Natural History Sibiu, Multimedia Room, 1.10.2021-30.04.2022): in 1849, the Transylvanian Society for Natural Sciences in Sibiu – Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt was founded. Among the members of the society were also doctors passionate about natural sciences and eager to study and develop collections of natural history. Thus, combining passion with the profession, on December 20, 1887, 21 doctors signed the status of the Medical Section of the Transylvanian Society for Natural Sciences in Sibiu – Der Medizinischen Sektion des Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt. The Medical Section of the Transylvanian Society of Natural Sciences contributed to the eradication of the typhoid fever epidemic in the region in 1904. Also, the measures implemented by the Medical Section and awareness activities at local government level led to numerous improvements in the local health system and hygienic-sanitary means in the region.
The exhibition presented entomological specimens (insect collection) by doctor D. Czekelius, the 1938 Romanian State decorations "Star of Romania" officer rank, "Sanitary Merit" Cross first Class and the "Crown of Romania" officer rank of Brigadier General Doctor Eugen Worell (1884-1961), medical objects that belonged to the doctor Viktor Weindel (1887-1966), the herbarium of Doctor Josepho Sadler, made between 1823 and 1827, etc. aiming tat paying tribute to the work and dedication of Sibiu naturalists' doctors, dedication for their profession, for the natural sciences and for the development of the local community, of the city in which they lived.

2. Projects

_*Sibiu Pharmaceutical Traditions*
Since 2016, Brukenthal National Museum, through the Pharmacy Museum, is partner of the Romanian Society of Pharmacy History (Sibiu) in the development of the cultural and educational project "Sibiu Pharmaceutical Traditions". Thematic lectures and various activities were held monthly in the Multimedia Room of the Museum of Natural History or within the Museum of Pharmacy.
_*Proiect: UniverCity – Strategic Partnership of Higer Education for Community – Erasmus* + (1.10.2021 – 31.05.2023)
Coordinator: Bulgaria Univ. St. Kliment Ohridski Sofia, Psiquadro Societa Cooperativa Italia, Research of Training Point - Foundation Bulgaria, Universitatea Lucian Blaga Sibiu

3. Scientific symposia

In 2021, Brukenthal National Museum organized 6 online scientific symposia, 3 of which were on the subject of natural history:
_*Aromatherapy – past and present* (26.07.2021)
Partners: Romanian Society for the History of Sibiu Pharmacy and "Lucian Blaga" University of Sibiu
_*In the footsteps of Hahnemann* (8.10.2021)
Partners: Romanian Society for the History of Sibiu Pharmacy and "Lucian Blaga" University of Sibiu
_*Brukenthalia Naturae* (14.10.2021)
Partners: Romanian Society of Pharmacy History, Sibiu Section and "Lucian Blaga" University of Sibiu

REFERENCES

_Raport Muzeul National Brukenthal 2021 http://www.brukenthalmuseum.ro/despre_noi/rapoarte.html
_http://www.brukenthalmuseum.ro/index2.php/virtuale
_http://www.brukenthalmuseum.ro/index2.php/ro/expo
_http://www.brukenthalmuseum.ro/publicatii/index.html