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## **XIII. 3**



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**XIII. 3**

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# NEW AND INTERESTING RECORDS OF LEPIDOPTERA FROM ROMANIA (INSECTA, LEPIDOPTERA)

Levente SZÉKELY\*

**Abstract:** This work is a contribution to the knowledge of the Romanian Lepidoptera fauna, and it includes data on very rare and local species, little known in the fauna of the country. The collecting and observations from the past years, especially from the period 2016-2017, are included. Some of the species presented have not been observed in Romania for several decades, such as *Catocala dilecta* (Hübner, 1808). Other species are reported for the first time in several regions of the country, such as: *Euthrix potatoria* (Linnaeus, 1758), *Rhyparia purpurata* (Linnaeus, 1758), *Eucarta amethystina* (Hübner, [1803]), *Eucarta virgo* (Treitschke, 1835), *Neptis sappho* (Pallas, 1771). Others are confirmed from several regions of Romania, after 50-100 years without any data: *Chersotis margaritacea* (De Villers, 1789), *Callopietria juvenina* (Stoll, 1782), *Mormo maura* (Linnaeus, 1758). The study also includes many rare species in Romania, known in the past based on very few specimens, such as: *Catopta thrips* (Hübner, 1818), *Lemonia taraxaci* ([Denis & Schiffermüller], 1775), *Drymonia velitaris* (Hufnagel, 1766), *Eublemma porphyrina* (Freyer, 1845), *Ocnogyna parasita* (Hübner, 1790), *Grammodes bifasciata* (Petagna, 1787), *Clytie syriaca* (Bugnion, 1837), *Cucullia biornata* Fischer v. Waldheim, 1840, *Cucullia asteris* ([Denis & Schiffermüller], 1775), *Schranksia taenialis* (Hübner, [1789]), *Cervyna cervago* (Eversmann, 1844), *Leucania punctosa* (Treitschke, 1825), *Saragossa siccanorum* (Staudinger, 1870), *Perigrapha i-cinctum* ([Denis & Schiffermüller], 1775), *Agrotis desertorum* (Boisduval, 1840), etc. The work also includes a list of species collected on the sands of Corbu, on the Black Sea coast (Constanța County), one of the few coastal beaches left in natural state. These sands have not been studied in the past from a lepidopterological point of view.

**Key words:** Insecta, Lepidoptera, faunistics, Romania.

**Rezumat:** Lucrarea este o nouă contribuție la cunoașterea faunei de lepidoptere din România, și conține câteva date faunistice referitoare la specii foarte rare și localizate, puțin cunoscute în fauna țării. În mai multe cazuri aceste date reprezintă primele semnalări pentru anumite regiuni din țară. Sunt cuprinse rezultate de colectări și observații din ultimii ani, în special din perioada 2016-2017. Sunt prezentate specii care nu au fost colectate și observate de câteva decenii, de exemplu: *Catocala dilecta* (Hübner, 1808). Alte specii sunt semnalate pentru prima dată în câteva regiuni din țară, de unde nu erau cunoscute în trecut, ca: *Euthrix potatoria* (Linnaeus, 1758), *Rhyparia purpurata* (Linnaeus, 1758), *Eucarta amethystina* (Hübner, [1803]), *Eucarta virgo* (Treitschke, 1835), *Neptis sappho* (Pallas, 1771). Altele sunt reconfirmate din câteva regiuni ale României, unde nu au mai fost semnalate de peste 50-100 de ani, ca: *Chersotis margaritacea* (De Villers, 1789), *Callopietria juvenina* (Stoll, 1782), *Mormo maura* (Linnaeus, 1758). De asemenea sunt incluse numeroase specii foarte rare în România, cunoscute până în prezent în puține exemplare, ca: *Catopta thrips* (Hübner, 1818), *Lemonia taraxaci* ([Denis & Schiffermüller], 1775), *Drymonia velitaris* (Hufnagel, 1766), *Eublemma porphyrina* (Freyer, 1845), *Ocnogyna parasita* (Hübner, 1790), *Grammodes bifasciata* (Petagna, 1787), *Clytie syriaca* (Bugnion, 1837), *Cucullia biornata* Fischer v. Waldheim, 1840, *Cucullia asteris* ([Denis & Schiffermüller], 1775), *Schranksia taenialis* (Hübner, [1789]), *Cervyna cervago* (Eversmann, 1844), *Leucania punctosa* (Treitschke, 1825), *Saragossa siccanorum* (Staudinger, 1870), *Perigrapha i-cinctum* ([Denis & Schiffermüller], 1775), *Agrotis desertorum* (Boisduval, 1840), etc. Lucrarea include și o listă a speciilor colectate pe nisipurile litorale de la Corbu (Județul Constanța), una din puținele plaje litorale rămase în stadiu natural. Aceste nisipuri nu au fost studiate în trecut din punct de vedere lepidopterologic.

**Cuvinte cheie:** Insecte, lepidoptere, faunistică, România.

## Introduction

The history of lepidopterological research in Romania is rather long, since the first faunistic studies were published about two centuries ago

(Mann, 1866; Czekelius, 1897). Despite these long term efforts, the Romanian Lepidoptera fauna still cannot be regarded as being very well-known, because large areas suffer from an almost complete lack of data. Even relatively intensively studied regions such as Dobrogea and Banat,

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continue to provide new species for the Romanian fauna. Following the year 1990, almost 100 species were reported as new for the country, among them even several Macrolepidoptera (Rákosy, Wieser, 2000; Rákosy, Mihai, 2011; Székely, Dincă, 2012; Székely, 2016b). New records at a regional level are also contributing to a better knowledge of the overall biodiversity of the country.

The work is a contribution to the knowledge of the Romanian Lepidoptera fauna, and it includes data on very rare and local species, little known in the fauna of the country. 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 and white UV tubes were used every night (Fig. 33). An entomological net was used for butterflies.

The collecting sites with geographical coordinates are as follows (Map.1):

Tulcea County:

- Babadag Forest (Fig. 19)  
(44°53'36"N, 28°42'43"E) - It is located in the central - eastern part of Tulcea County (in the North-Dobrogea Plateau) on the southern territory of Babadag town. The dominating tree species are oaks (*Quercus robur*, *Q. pedunculiflora*, *Q. pubescens*), as well as *Tilia tomentosa*, *Fraxinus ornus*, and *Carpinus orientalis*.

- Enisala (Enisala Fortress) (Fig. 20)  
(44°52'42"N, 28°49'7"E) - Located between Babadag Lake in the west and Razim Lake in the east. The most remarkable results come from the immediate vicinity of Enisala Fortress, investigated with light traps.

- Izvoarele (Figs. 22-23)  
(45°3'56"N, 28°31'28"E) - It is a commune in Tulcea County, consisting of the villages Alba, Iulia and Izvoarele (residence). The area consists of hills, mostly with steppe vegetation, shrubs and rocks. The most imposing is the Consul Hill. In the area there is the most important population of *Catopta thrips* (Hübner, 1818) in Dobrogea.

- Creasta Cardonului (Fig. 31)  
(45°7'4"N, 28°23'38"E) - Situated between Hamcearca and Balabancea villages, in the south-eastern part of Măcin Mountains. The site is

characterized by steppe vegetation and forests dominated by thermophilous oak (*Quercus robur*, *Q. pedunculiflora*, *Q. pubescens*).

- Sarinasuf - Plopul (Fig. 21)  
(45°1'19"N, 29°7'45"E) - Sarinasuf and Plopul (Beibugeac) are two villages of the commune of Murighiol in Tulcea County, Dobrogea, north of Razim Lake. The land around the lake is dominated by extensive meadows with *Artemisia*. It is the ideal habitat for very local species, like *Cucullia biornata* Fischer v. Waldheim, 1840, *Cucullia argentina* (Fabricius, 1787), *Saragossa siccanorum* (Staudinger, 1870), etc. (Figs 11, 15, 16).

Constanța County:

- Corbu Beach (Fig. 24)  
(44°24'32"N - 28°39'30"E) - It is one of the most important wild beaches that have remained on the Romanian Black Sea coast. It is characterized by psammophile and halophile vegetation, with few species strictly adapted to the ecological conditions, such as *Elymus arenarius*, *Medicago marina*, *Silene pontica*, *Eryngium maritimum*, *Ephedra distachya*, *Crambe maritima*, etc. It is part of the Danube Delta Biosphere Reserve.

Brașov County:

- Șercaia, Vad Forest (Fig. 25)  
(45°46'21"N, 25°6'9"E) - Also known as the Narcissus Glade (Poiana Narciselor), it is a protected area of national interest. The natural reserve, with an area of 394.90 ha, consists mainly of oak forest and wet meadows.

- Prejmer Forest (Fig. 32)  
(45°44'59"N, 25°41'09"E) - It is an important natural reserve of Brașov County, consisting of 252 hectares of forest and 6 hectares of marshland.

Covasna County:

- Ilieni - Hetea (Fig. 30)  
(45°49'28"N, 25°41'38"E) - Hetea (Hete) is a village in Vâlcele commune in Covasna County, Transylvania. It is located in the Baraolt Mountains. The area consists mainly of deciduous forests, shrubs and meadows.

Harghita County:

- Vlăhița (Fig. 26)  
(46°21'0"N, 25°31'48"E) - Vlăhița is a town in Harghita County, Transylvania, consisting of the localities Homorod, Lueta and Vlăhița (Szentegyháza). The area is dominated by deciduous forests, shrubs and meadows. "Vlăhița daffodil clearing" is a protected area of national interest, located in the western part of Lueta village.

Vrancea County:

- Tișiței Gorges / Cheile Tișiței (Fig. 28-29)

(45°54'45"N, 26°32'30"E) – This is a protected area of national interest and represents one of the largest protected areas in Vrancea County. The natural reserve is at 850 m altitude, and is 9 km long. It encompasses the valley created by the river Tișița, which separates the peak of Râpa Caprei from the peak of Tisaru Mare.

Prahova County:

- Muntele Roșu/ Ciucaș Mountains, 1350 m (Fig. 27)

(45°29'20"N, 25°56'34"E) – Muntele Roșu is part of the Ciucaș Mountains, and it is famous for its protected *Rhododendron* area (*Rhododendron kotschyi*), a monument of nature.

## Discussion

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

### The list of species in systematic order:

**Abbreviations:** ♂ = male; ♀ = female; sp. = specimen; R = rare (3-5 specimens per collecting day or night); C = common (6-29 specimens per collecting day or night); V.C. = very common (30-100 specimens per collecting day or night); leg. = legit (collected by); ex larva = specimens in larval stage; Suprafam. = Suprafamily; Fam. = Family; Subfam. = Subfamily.

### Suprafam. COSSOIDEA

#### Fam. COSSIDAE

*Catopta thrips* (Hübner, 1818)

Material: Izvoarele, 31.VII.2017 – 14♂♂ (leg. P. Haneschlager), 3.VIII.2017 - 2♂♂. Very local species in Romania with sporadic reports from the Transylvanian Plain and North-eastern Moldova. According to the current knowledge, at Izvoarele is the most abundant population in Dobrogea. This species is protected according to Annex 2 - Habitats Directive (Natura 2000).

### Suprafam. BOMBYCOIDEA Latreille, [1803]

#### Fam. LASIOCAMPIDAE Harris, 1841

*Lasiocampa eversmanni* (Eversmann, 1843)

Material: Corbu Beach, 27.VI.2015 - ex larva.

The western distribution limit of the taxon is North-eastern Dobrogea and the Danube Delta. In Dobrogea it was only known from Histria until now (Székely, 2010).

*Gastropacha populifolia* ([Denis & Schiffermüller], 1775)

Material: Sarinasuf-Plopul, 6.VIII.2017 - 1♂.

Rare and quite local species in Romania, sporadically reported especially in Transylvania, Banat and northern Moldova. Very rare in Dobrogea.

*Malacosoma neustria* (Linnaeus, 1758)

Material: Muntele Roșu, Ciucaș Mountains, 1350 m, 10.VIII.2017 - 1♂.

It is generally a common species in Romania, but its appearance at 1350 m is quite surprising, since it usually prefers lower areas.

*Euthrix potatoria* (Linnaeus, 1758) (Fig. 2)

Material: Prejmer Forest, 18.VII-2.VIII.2014 - 2♂♂, 1♀.

Quite local species in Romania, with some populations known in Satu-Mare, Maramures, northern Moldavia and southern Transylvania (Székely, 2010). It can be locally common.

### Fam. BRAHMAEIDAE Swinhoe, 1892

*Lemonia taraxaci* ([Denis & Schiffermüller], 1775) (Fig. 1)

Material: Vlăhița, 2.IX.2017 - 2♂♂.

Widespread from Western Europe (France) to the steppes in southern Russia (Vojnits, Uherkovich, Ronkay & Peregovits, 1991). Very local throughout the area, as is the case in Romania, where all known populations are in Transylvania, especially in the Alba, Mureș, Harghita and Covasna counties (Székely, 2010). Recently found in Moldova (Székely, 2012).

*Lemonia balcanica* (Herrich-Schäffer, 1847)

Material: Izvoarele, 27-28.IX.2017 - 8♂♂, 3♀♀.

Dobrogea hosts relatively large and viable populations of this species, although this region represents the northern distribution limit of *L. balcanica* in Europe. It is missing north of the Danube, in Ukraine, likely because the females of this species are unable to cross the large Danube.

### Suprafam. GEOMETROIDEA Leach, [1815]

#### Fam. GEOMETRIDAE Leach, [1815]

#### Subfam. Ennominae Duponchel, 1845

*Chiasmia aestimaria* (Hübner, [1809])

Material: Corbu Beach, 15-18.VIII.2013, 12-17.VIII.2014, 16-10.VIII.2017 - C.

Generally rare, with local populations in Romania. It seems that the coastal sands are a very favorable habitat, the species being common in the area of Corbu.

### Suprafam. NOCTUOIDEA Latreille, 1809

#### Fam. NOTODONTIDAE Stephens, 1829

#### Subfam. Notodontinae Stephens, 1829

***Drymonia velitaris*** (Hufnagel, 1766) (Fig. 3)

Material: Șercaia, Vad Forest, 10.VII.2016, 1♂.

This species occurs from Europe to Central Asia, but it is very rare throughout its range. It is a typical inhabitant of oak forests (Vojnits, *et al.*, 1991). Very rare in Romania, where it is known from several sites in Transylvania, Banat and North Moldova (Székely, 2010).

**Fam. EREBIDAE** (Leach, [1815])

**Subfam. Hypenodinae** Forbes, 1954

***Schranksia taenialis*** (Hübner, [1789]) (Fig. 8)

Material: Tișiței Gorges, 26.VIII.2017- 2♂♂.

Mediterranean species that extends from England to southeast Russia. Rarely found in Romania and known only from the following sites (all represent old data): Ineu-Arad, Brașov, Tecuci, Iași, Măgura-Târnița and the Danube Delta (Rákósy, 1996).

**Subfam. Eublemminae** Forbes, 1954

***Eublemma porphyrina*** (Freyer, 1845)

Material: Sarinasuf - Plopu, 26.VIII.2016 - 3 sp. Siberian – Mediterranean species, known from Turkmenistan, Kazakhstan, southeastern European part of Russia, Southern Ural, Russian Altai, Western Mongolia (Fibiger *et al.*, 2010; Nupponen, Fibiger 2002; Sinev, 2008; Volynkin, 2012), and Ukraine, Zaporozhje ([www.noctuidae.de](http://www.noctuidae.de)). Recently reported in Romania from Enisala (Székely, 2016 b).

***Eublemma polygramma*** (Duponchel, [1842])

Material: Corbu Beach, 15-18.VIII.2013, 12-17.VIII.2014, 16-10.VIII.2017 - R., Sarinasuf - Plopu, 26.VIII.2016 - 3sp. Izvoarele, 3.VIII.2017 - 2sp., Enisala, 25.VIII.2016, 4.VIII.2017 - R.

Ponto-Mediterranean species, widespread in southern Europe, the Middle East, Iran, Afghanistan, Turkmenistan, Kirghisia, Uzbekistan and Kazakhstan. Southern Romania represent the northern distribution limit of its range in Europe (Hacker, 2001). It was considered rare in Romania in the past.

**Subfam. Arctiinae** Leach, 1815

***Ocnogyna parasita*** (Hübner, 1790) (Figs 9-10)

Material: Enisala Fortress, 24-25.III.2017 - 10♂♂.

The population of *O. parasita* from Enisala was discovered only very recently (Székely, 2016a). Prior to this finding, *O. parasita* had been collected for the last time in Romania in 1965 (Timișoara), and the only report until 2016 was a photograph of a female specimen found in Central

Dobrogea (Gura Dobrogei) (Manci, Rákósy 2013).

***Rhyparia purpurata*** (Linnaeus, 1758)

Material: Ilieni, Hetea, 18.VI-15.VI., 2013-2016 - R.

A relatively common but quite local species in Romania, it is mainly known from Banat, Central Transylvania, northern Moldova and Dobrogea. The species occurs mostly in plains and hills and it is very local in mountain areas. First record from southeast Transylvania.

**Subfm. Catocalinae** Boisduval, 1828

***Catocala dilecta*** (Hübner, 1808) (Fig. 5)

Material: Babadag Forest, 24.VIII.2016 - 1♀.

It is one of the very rare species of *Catocala* of the Romanian fauna. Data from Romania is mostly old, and from Dobrogea it has not been reported for more than 80 years (Caradja, 1930).

***Grammodes bifasciata*** (Petagna, 1787) (Fig. 6)

Material: Sarinasuf-Plopu, 1.X.2016 - 1♂.

Afro-tropical element, extending as north as the Mediterranean Basin. It was recently reported as new species in the fauna of Romania, based on a photo of the Danube Delta (Rákósy & Mihai, 2011). The first specimens were collected in Romania in 2011 and originated from Histria, Constanța County (Székely, 2016b).

***Drasteria caucasica*** (Kolenati, 1846) (Fig. 7)

Material: Izvoarele, 3.VIII.2017 - 2♂♂, Corbu Beach, 16-20.VIII.2017 - C.

Western Asian xerothermophilous species reaching its western distribution limit in the eastern Balkans. Characteristic for semi-desert and sandy biotopes. In Romania it is very local, known from the Danube Delta, Dobrogea, southern Moldova and northern Muntenia (Rákósy, 1996, Ungureanu, 2010).

***Clytie syriaca*** (Bugnion, 1837) (Fig.4)

Material: Izvoarele, 3.VIII.2017 - 1♂, Corbu Beach, 16-20.VIII.2017- 4♂♂, 1♀.

Mediterranean element, widespread in the Balkans, Asia Minor, Cyprus and the Near East (Hacker, 2001). The species reaches its northern distribution limit in Romania (Dobrogea and the Danube Delta).

**Subfam. Nolinae** Bruand, 1846

***Nola chlamitulalis*** (Hübner, 1813)

Material: Corbu Beach, 16-20.VIII.2017 – 2 sp.

Eurasian species, distributed from Western Europe to Japan. Rare and local in Romania, known only from Banat and Dobrogea (Rákósy, 1996; Rákósy, Székely, 1994).

**Fam. NOCTUIDAE** Latreille, 1809**Subfam. Plusiinae***Euchalcia consona* (Fabricius, 1787)

Material: Izvoarele, 31.VII.2017- 1♂ (leg. P. Haneschlager).

Ponto-Caspian – western Siberian species, distributed from central and eastern Europe, the Balkans and the Caspian steppe, to the Altai Mountains and western Siberia (Ronkay *et al.*, 2008). Rare and very local in Romania. In Dobrogea was rarely found, being only reported from southern Dobrogea and from the Măcin Mountains (Rákósy, 1996; Rákósy, Wieser, 2000).

**Subfam. Acronictinae** Heinemann, 1959*Oxicesta geographica* (Fabricius, 1787)

Material: Corbu Beach, 18.VIII.2017- 1♂.

Rare and local species in Romania. Most records are from Dobrogea, where it is more widespread.

**Subfam. Cucullinae** Herrich-Schäffer, 1850*Cucullia biornata* Fischer v. Waldheim, 1840 (Fig. 11)

Material: Sarinasuf-Plopul, 25.VIII.2016 – 1♂, Creasta Cardonului, 18.V.2017 – 1♂.

Trans-Palaearctic species, distributed from the Black Sea Coast to the Pacific region (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 santonici* (Hübner, [1813])

Material: Babadag Forest, 19.V.2017- 2♂♂.

Eurasiatic species, distributed from the Alpes Maritimes to the Tien Shan and the Pamir (Ronkay, Ronkay, 2009). In Romania, it was reported from Banat, Moldova (old data), Dobrogea and the Danube Delta (Rákósy, 1996). In recent years it is found more and more frequently in Dobrogea.

*Cucullia asteris* ([Denis & Schiffermüller], 1775)

Material: Sarinasuf-Plopul, 6.VIII.2017 - 1♂.

Eurasiatic species, distributed over large areas of Europe and western Asia, more sporadically in Siberia and Mongolia (Ronkay, Ronkay, 2009). Rare and local in Romania, known only from Banat, Moldova, Dobrogea and the Danube Delta (Rákósy, 1996; Rákósy *et al.*, 2003).

**Subfam. Condictinae** Poole, 1995*Eucarta amethystina* (Hübner, [1803]) (Fig.13)

Material: Prejmer Forest, 15.VI.2014 - 1♂, Șercaia, Vad Forest, 10.VII.2016, 20.VII.2017 – 6 sp.

Eurasiatic species, distributed from Central Europe to Japan. In Romania, it is distributed in Banat, northern Moldova and western Transylvania (Rákósy, 1996). First records from eastern Transylvania.

*Eucarta virgo* (Treitschke, 1835) (Fig.14)

Material: Prejmer Forest, 22.V.2014 - 2♂♂, 7.VII.2016 - 1♂.

Eurasiatic species, distributed from Europe to Korea and Japan. In Romania, it is known from Banat, Moldova, Dobrogea, the Danube Delta and western Transylvania (Rákósy, 1996). First record from the eastern part of Transylvania.

**Subfam. Eriopinae** Herrich-Schäffer, 1851*Callopietria juvenina* (Stoll, 1782) (Fig. 12)

Material: Șercaia, Vad Forest, 10.VII.2016, 20.VII.2017 - 4sp.

Eurasiatic species, distributed from the British Isles to Japan. In Romania, it is mainly mentioned in Banat, northern Moldova and Transylvania (Rákósy, 1996). From other regions there are only data that are over 50-100 years old. It has not been reported from southeastern Transylvania for more than 120 years (Czekelius, 1897).

**Subfam. Xyleninae** Guenée, 1837*Mormo maura* (Linnaeus, 1758)

Material: Tișitei Gorges, 26.VIII.2017, 1♂.

Very rare in Romania, most records are from Transylvania and Banat. The species has been not recorded from Moldova for more than 50 years. First record from western Moldova.

*Cervyna cervago* (Eversmann, 1844)

Material: Enisala, Izvoarele, 25.VIII - 3.X. 2016-2017 – R.

Mediterranean - Turanian element, spread in Asia Minor, the eastern part of the Balkan Peninsula, Ukraine, Armenia, Turkmenistan and Southern Russia (Hacker, 2001). Rare and local in Romania, present only in Dobrogea and southern Moldova.

**Subfam. Hadeninae** Guenée, 1837*Leucania punctosa* (Treitschke, 1825)

Material: Sarinasuf-Plopul, 25.VIII.2016 - 6♂♂.

Holo-Mediterranean-Iranian species, largely distributed in the Mediterranean Basin, occurs in North Africa, southern Europe, southern Ukraine, Turkey, Near East, Middle East and Turkmenistan. In 2011 the species was reported as new in the Romanian fauna based on material

originating from Sarinasuf-Plopul (Székely, Dincă, 2012). The confirmation of the species indicates that there likely are stable populations in Dobrogea, and the massive records of 2011 (hundreds of specimens) were not the result of an occasional migration.

***Saragossa siccanorum*** (Staudinger, 1870) (Fig. 15)

**Material:** Sarinasuf-Plopul, 25.VIII.2016 - 2♂♂. Turano-Eremic species that reaches in Dobrogea its western distribution limit in Europe. *Saragossa siccanorum* is very rare in Romania and in Europe.

***Polia cherrug*** Rákósy & Wieser, 1997

**Material:** Creasta Cardonului, 18.V.2017 – C.

This species has one of the most restricted distributions of any European Noctuidae (Dincă, 2010). It is known only from northern Dobrogea (North-Dobrogea Plateau), from Greci and Horia (Rákósy & Wieser, 2000,) and Babadag Forest (Dincă, 2010). Creasta Cardonului is a new locality for this species. It is likely that it is more widespread in northern Dobrogea than previously assumed. Based on the observations from recent years, it seems a common species in northern Dobrogea, probably present in several places with favorable habitats.

***Perigrapha i-cinctum*** ([Denis & Schiffermüller], 1775)

**Material:** Prejmer Forest, 22-29.III.2013-2016 – 4sp.

Eurasiatic species, distributed from Central Europe to Southern Russia. Extremely local in Romania, known only from the following sites: Baci (Cluj), Sibiu (Sibiu) and Vlădeni (Braşov) (Rákósy, 1996).

**Subfam. Noctuidae** Latreille, 1809

***Chersotis margaritacea*** (De Villiers, 1789) (Fig. 18)

**Material:** Tişitei Gorges, Ciuta, 14.IX.2017 - 4♂♂, 2♀♀.

West Palearctic - Central Asian species, widely distributed from northwestern Africa, throughout the southern part of Europe, Asia Minor, Caucasus, Transcaucasia, Iran, Turkmenistan, Kazakhstan and Altai Mountains (Varga, Gyulai, Ronkay & Ronkay, 2013). Local species in Romania, most records are from Central Transylvania and Banat (Rákósy 1996). It has not been reported from Moldova for more than 100 years, with only one very old record from Iaşi (Salay, 1910; Rákósy *et al.*, 2003). First record for western Moldova.

### Other new species for Tişitei Gorges area:

Noctuidae: *Brachionycha nubeculosa* (Esper, 1785) - 2.III.2017; *Atethmia centrargo* (Haworth, [1809]), *Xanthia sulphurago* ([Denis & Schiffermüller], 1775), *Tiliacea aurago* ([Denis & Schiffermüller], 1775), *Mesogona oxalina* (Hübner, [1803]) - 14.IX.2017.

Geometridae: *Thera britannica* (Turner, 1925) - 14.IX.2017, *Epirrita christyi* (Allen, 1906) - 19.X.2017.

Thus, the number of Macrolepidoptera reported in the Tişitei Gorges area reaches 600 species, compared to 591 known in 2012 (Székely, 2012).

***Agrotis desertorum*** (Boisduval, 1840) (Fig. 17).

**Material:** Corbu Beach, 16-20.VIII.2017 – C.

Ponto-Mediterranean element, the exact distribution is uncertain because of confusion with *Agrotis ripae* (Hübner, [1823]). The distribution in Europe is limited to Romania (Dobrogea), Bulgaria, Ukraine and the European part of Russia (Hacker, 2001). After Beshkov (2000), the populations occurring in Romania and Bulgaria would belong to *A. ripae* (Beshkov, 2000). In Romania, it was considered as a rare species, reported only from the Danube Delta and from Dobrogea, on the Black Sea coast (Eforie, Agigea) (Rákósy, 1996).

### Fam. NYMPHALIDAE Swainson, 1827

#### Subfam. Limenitinae Behr, 1864

***Neptis sappho*** (Pallas, 1771)

**Material:** Babadag Forest, 5.VIII.2017 – 2 sp.

*Neptis sappho* has not been reported in northern Dobrogea for more than 150 years (Mann, 1866). The species was, however, found in 2006 in the southern part of Dobrogea (Canaraua Fetii), probably penetrated from northern Bulgaria (Dincă, Cuvelier, Székely & Vila, 2009). It is quite clear that *N. sappho* is expanding northward in Dobrogea, because in 2015 it was found in Cernavodă (Central Dobrogea) (Székely, 2016b). The species also seems to be expanding in other parts of Romania.

### List of species collected at Corbu Beach (Constanţa county)

These beaches are characterized by a combination of psammophile and halophile vegetation with species strictly adapted to the particular ecological conditions, such as: *Elymus arenarius*, *Crambe maritima*, *Medicago marina*, *Eryngium maritimum*, *Ephedra distachya*, *Silene pontica*, etc. To fix the sand on the beaches and to prevent

the degradation of the slopes, various species of trees and shrubs were planted near this area: *Pinus nigra*, *Eleagnus argentea*, *Robinia pseudoacacia*, *Tamarix ramosissima*, *Crataegus monogyna* and *Salix caprea*. In the vicinity there are many agricultural lands. Most of the material was collected between August 15-18, 2013, August 12-17, 2014, and August 16-20, 2017. The list of species is only preliminary, since it covers only of the month of August. New research is needed, covering the period April to October.

#### 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) - 1♂

*Phragmataecia castaneae* (Hübner, 1790) - X

#### Suprafam. BOMBYCOIDEA Latreille, [1803]

##### Fam. LASIOCAMPIDAE Harris, 1841

*Lasiocampa eversmanni* (Eversmann, 1843) – ex larva.

##### Fam. SPHINGIDAE Latreille, [1802]

###### Subfam. Sphinginae Latreille, [1802]

*Agrius convolvuli* (Linnaeus, 1758) - X

###### Subfam. Macroglossinae

*Macroglossum stellatarum* (Linnaeus, 1758) - X

*Hyles hippophaes* (Esper, 1793) - X

*Hyles euphorbiae* (Linnaeus, 1758) - 2 sp.

*Hyles livornica* (Esper, 1780) - 1♂

*Deilephila elpenor* (Linnaeus, 1758) - 1sp.

*Deilephila porcellus* (Linnaeus, 1758) - X

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

##### Fam. GEOMETRIDAE Leach, [1815]

###### Subfam. Geometrinae Stephens, 1829

*Tethidia smaragdaria* (Fabricius, 1787) - X

*Microloxia herbaria* (Hübner, [1813]) - X

###### Subfam. Sterrhinae Meyrick, 1892

*Idaea elongaria* (Rambur, 1833) - 2sp.

*Idaea subsericeata* (Haworth, 1809) – X

*Idaea muricata* (Hufnagel, 1767) - X

###### Subfam. Larentiinae Duponchel, 1845

*Eupithecia centaureata* ([Denis & Schiffermüller], 1775) - X

*Eupithecia simplicata* (Haworth, [1809]) - X

###### Subfam. Ennominae Duponchel, 1845

*Heliomata glarearia* ([Denis & Schiffermüller], 1775) - X

*Isturgia murinaria* ([Denis & Schiffermüller], 1775) – XXX

*Isturgia arenacearia* ([Denis & Schiffermüller], 1775) - XX

*Neognopharmia stevenaria* (Boisduval, 1840) - X

*Chiasmia clathrata* (Linnaeus, 1758) - X

*Chiasmia aestimaria* (Hübner, [1809]) - XX

*Therapis flavicaria* ([Denis & Schiffermüller], 1775) - 1sp.

*Synopsia sociaria* (Hübner, 1799) - X

#### Suprafam. NOCTUOIDEA Latreille, 1809

##### Fam. EREBIDAE (Leach, [1815])

###### Subfam. Eublemminae Forbes, 1954

*Eublemma purpurina* ([Denis & Schiffermüller], 1775) - 1sp.

*Eublemma amoena* (Hübner, [1803]) - XX

*Eublemma polygramma* (Duponchel, [1842]) - X

*Eublemma ostrina* (Hübner, [1808]) - 1 sp.

###### Subfam. Catocalinae Boisduval, [1828]

*Lygephila cracca* ([Denis & Schiffermüller], 1775) - XX

*Dysgonia algira* (Linnaeus, 1767) - X

*Grammodes stolidia* (Fabricius, 1775) - XX

*Grammodes bifasciata* (Petagna, 1787) - 5♂♂, 1♀

*Drasteria caucasica* (Kolenati, 1846) - XX

*Clytie syriaca* (Bugnion, 1837) - 4♂♂, 1♀

###### Subfam. Nolinae Bruand, 1846

*Nola chlamitulalis* (Hübner, 1813) - 2sp.

*Nola cristatula* (Hübner, 1793) - 3sp.

*Earias clorana* (Linnaeus, 1758) - 3sp.

###### Subfam. Arctiinae Leach, [1815],

*Phragmatobia fuliginosa* (Linnaeus, 1758) - X

*Spilosoma urticae* (Esper, 1789) - 1♂

*Pelosia obtusa* (Herrich-Schäffer, [1847]) - X

*Eilema caniola* (Hübner, 1808) - X

*Eilema complana balcanica* Daniel, 1939 - XX

*Dysauxes famula* (Freyer, 1836) - XX

###### Subfam. Lymantriinae Hampson, [1893]

*Lymantria dispar* Linnaeus, 1758 - XX

*Laelia coenosa* (Hübner, 1808) - XXX

*Euproctis similis* (Fuessly, 1767) – XXX

#### Fam. NOCTUIDAE Latreille, 1809

###### Subfam. Plusiinae Boisduval, [1828]

*Autographa gamma* (Linnaeus, 1758) - XX

*Macdunnoughia confusa* (Stephens, 1850) - XX

*Chrysodeixis chalcites* (Esper, 1789) - 1♂

###### Subfam. Acontiinae Guenée, 1841

*Acontia lucida* (Hufnagel, 1766) - X

*Acontia trabealis* (Scopoli, 1763)XX

*Acontia candefacta* (Hübner, [1831]) - 1sp.

*Aedia leucomelas* (Linnaeus, 1758) - XX

**Subfam. Acronictinae** Heinemann, 1859

*Oxicesta geographica* (Fabricius, 1787) - 1♂

*Acronicta rumicis* (Linnaeus, 1758) - 3sp.

**Subfam. Metoponinae** Herrich-Schäffer, [1851]

*Tyta luctuosa* ([Denis & Schiffermüller], 1775) - X

**Subfam. Oncocnemidinae** Forbes &

Franclemont, 1954

*Calophasia opalina* (Esper, [1794]) - X

**Subfam. Heliothinae** Boisduval, [1828]

*Periphanes delphinii* (Linnaeus, 1758) - 1♂

*Protoschinia scutosa* ([Denis & Schiffermüller], 1775) - XX

*Heliothis viriplaca* (Hufnagel, 1766) - XXX

*Helicoverpa armigera* (Hübner, 1808) - XXX

**Subfam. Bryophilinae** Guenée, 1852

*Cryphia algae* (Fabricius, 1775) - X

**Subfam. Xyleninae** Guenée, 1837

*Spodoptera exigua* (Hübner, 1808) - X

*Caradrina clavipalpis* (Scopoli, 1763) - XX

*Caradrina kadenii* Freyer, 1836 - 2sp.

*Hoplodrina blanda* ([Denis & Schiffermüller], 1775) - XX

*Hoplodrina ambigua* ([Denis & Schiffermüller], 1775) - X

*Athetis furvula* (Hübner, 1808) - 1sp.

*Nonagria typhae* (Thunberg, 1784) - X

*Mesapamea secalis* (Linnaeus, 1758) - 2sp.

**Subfam. Hadeninae** Guenée, 1837

*Mythimna turca* (Linnaeus, 1761) - 2sp.

*Mythimna l-album* (Linnaeus, 1767) - X

*Mythimna vitellina* (Hübner, [1808]) - XXX

*Mythimna pudorina* ([Denis & Schiffermüller], 1775) - XX

*Mythimna impura* (Hübner, [1808]) - 2sp.

*Leucania comma* (Linnaeus, 1761) - X

*Leucania obsoleta* (Hübner, [1803]) - X

*Pseudaletia unipuncta* (Haworth, 1809) - 2♂♂, 1♀

*Mamestra brassicae* (Linnaeus, 1758) - 2sp.

*Lacanobia oleracea* (Linnaeus, 1758) - XXX

*Lacanobia splendens* (Hübner, [1808]) - 4sp.

*Lacanobia blenna* (Hübner, [1824]) - 6♂♂

*Hecatera cappa* (Hübner, 1809) - 1♂

*Hadula trifolii* (Hufnagel, 1766) - XXX

*Hadula stigmosa* (Christoph, 1887) - XX

**Subfam. Noctuinae** Latreille, 1809

*Euxoa segnilis* (Duponchel, 1836) - 5♂♂, 2♀♀

*Xestia c-nigrum* (Linnaeus, 1758) - X

*Agrotis desertorum* (Boisduval, 1840) - XX

*Agrotis segetum* ([Denis & Schiffermüller], 1775) - XX

*Agrotis exclamationis* (Linnaeus, 1758) - XX

*Agrotis ipsilon* (Hufnagel, 1766) - XX

*Agrotis bigramma* (Esper, 1790) - X

*Agrotis vestigialis* (Hufnagel, 1766) - X

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

**Fam. PAPILIONIDAE** Latreille, [1802]

**Subfam. Papilioninae** Latreille, [1802]

*Papilio machaon* (Linnaeus, 1758) - X

**Fam. PIERIDAE** Duponchel, [1835]

**Subfam. Coliadinae** Swainson, 1827

*Colias croceus* (Fourcroy, 1785) - X

*Colias alfacariensis* Ribbe, 1905 - X

**Subfam. Pierinae** Duponchel, [1835]

*Pieris napi* (Linnaeus, 1758) - X

*Pieris rapae* (Linnaeus, 1758) - X

*Pontia edusa* (Fabricius, 1777) - X

**Fam. LYCAENIDAE** [Leach] [1815]

**Subfam. Polyommatae** Swainson, 1827

*Leptotes pirithous* (Linnaeus, 1758) - 2sp.

*Aricia agestis* ([Denis & Schiffermüller], 1775) - X

*Polyommatus icarus* (Rottentburg, 1775) - X

**Fam. NYMPHALIDAE** Swainson, 1827

**Subfam. Heliconiinae** Swainson, 1827

*Argynnis pandora*

([Denis & Schiffermüller], 1775) - X

*Issoria lathonia* (Linnaeus, 1758) - X

**Subfam. Nymphalinae** Swainson, 1827

*Vanessa atalanta* (Linnaeus, 1758) - X

*Vanessa cardui* (Linnaeus, 1758) - X

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[noctuidae.de](http://noctuidae.de) (Kompendium zu Noctuidae)

## LIST OF ILLUSTRATIONS

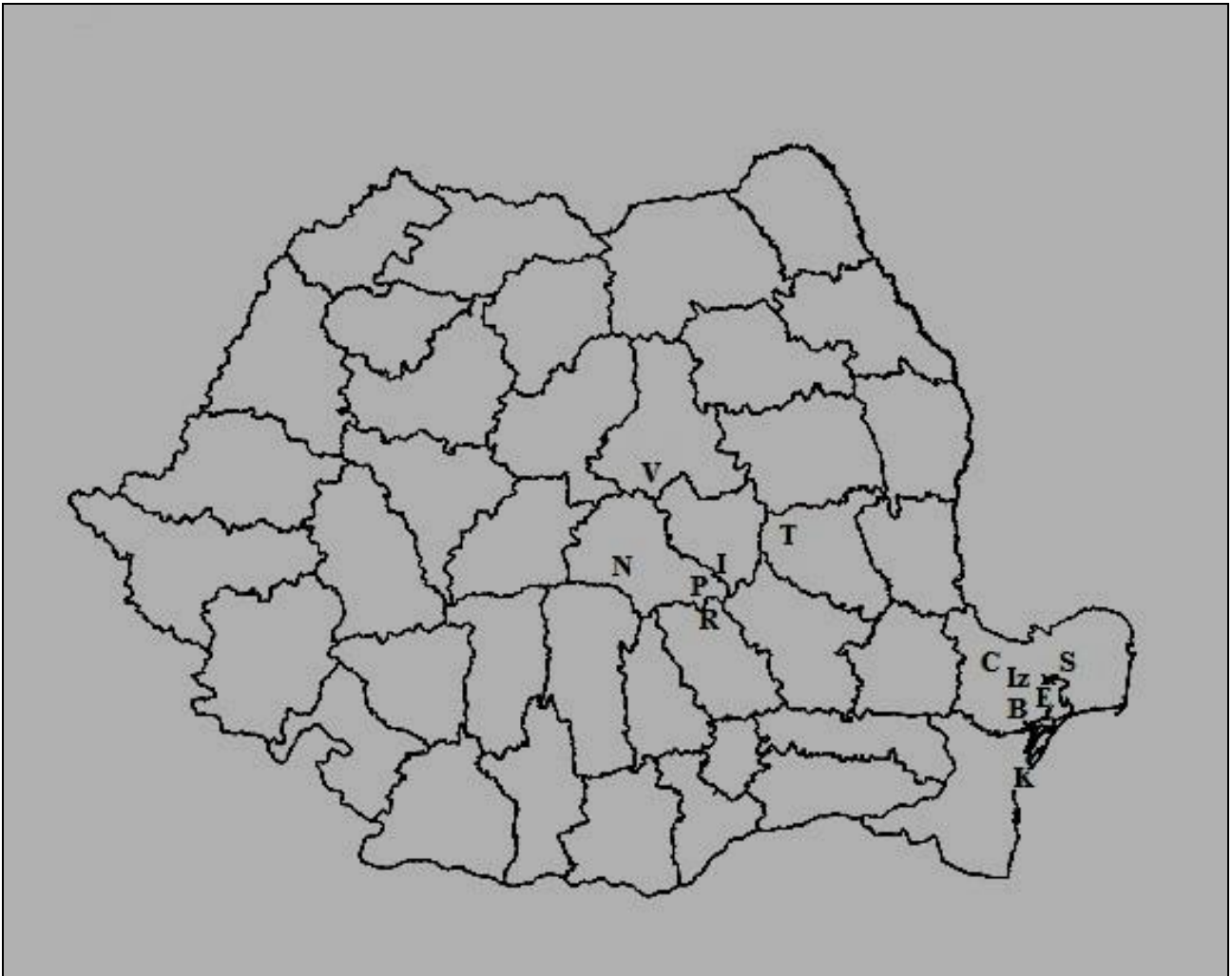
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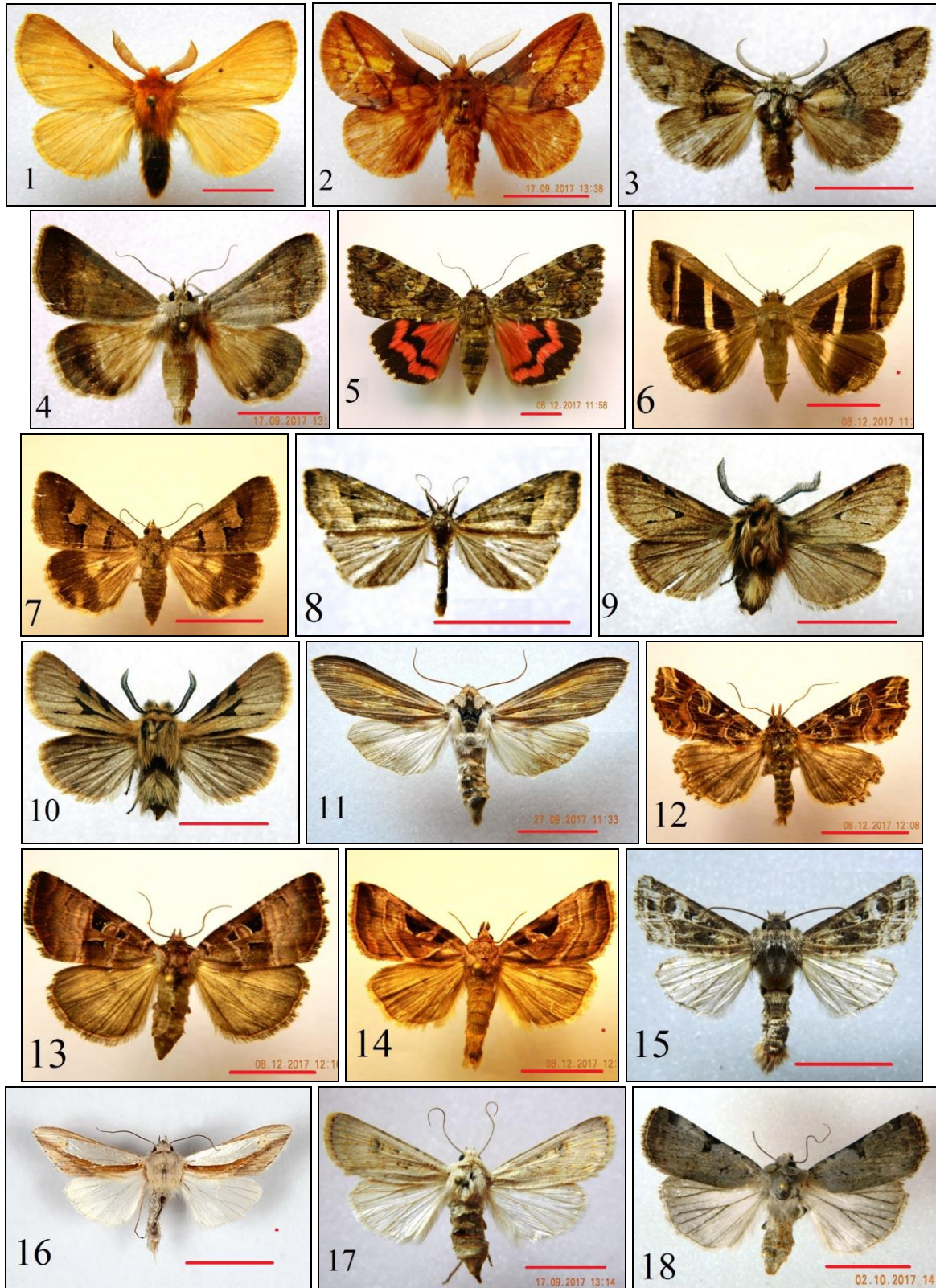


Fig. 1-18 - Lepidoptera species

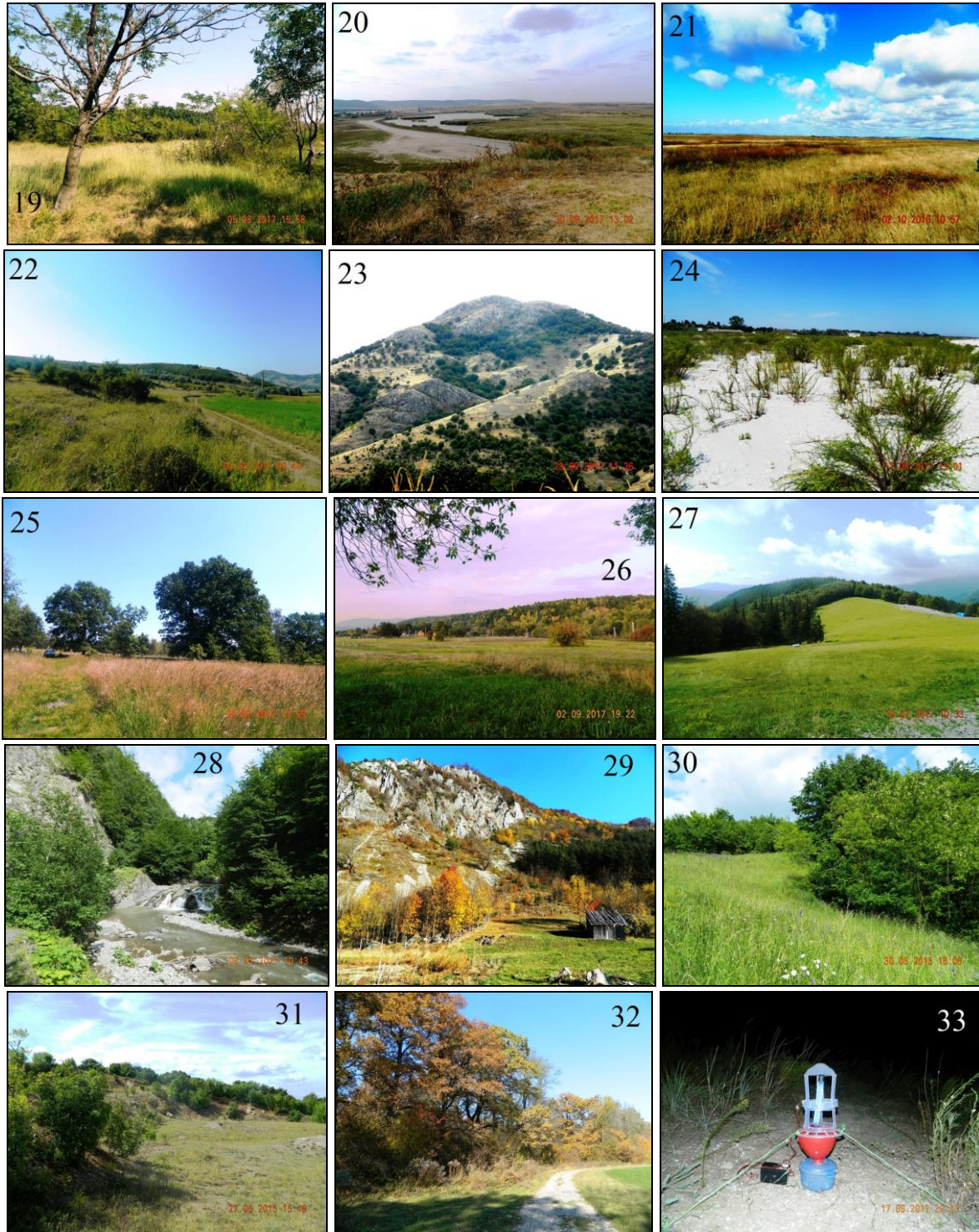


Fig. 19-33 - Habitats

# CONTRIBUTIONS TO THE KNOWLEDGE OF THE BUTTERFLIES AND MOTHS FAUNA (LEPIDOPTERA) IN THE SIETE AGUAS MUNICIPALITY AND SURROUNDINGS (VALENCIAN COMMUNITY – SPAIN)

Levente SZÉKELY\*

**Abstract:** We report 295 species of Lepidoptera, collected, in the Valencian Community, Spain (Siete Aguas and surroundings) between 15-30 May 2008 and 15-30 June 2017. Even though it is a work that only refers to the Lepidoptera fauna in this area, it still brings some important data for the Lepidoptera Fauna from the Iberian Peninsula. Some rare, localized and little known species are reported, for example: *Lophoterges millierei* (Staudinger, 1870), *Hadena wehrlii* Draudt, 1934, *Euxoa* (*Pleonectopoda*) *nevadensis* Corti, 1928, *Psilogaster loti* (Ochsenheimer, 1810), *Nychiodes notarioi* Exposito-Hermosa 2005, *Heliothea discoidaria* Boisduval 1840, etc.

**Key words:** Lepidoptera, Spain, Valencia, faunistics, new records.

**Rezumat:** 295 de specii de lepidoptere, colectate între 15-30 mai 2008 și 15-30 iunie 2017, sunt listate din Comunitatea Valenciană, Spania (Siete Aguas și împrejurimi). Chiar dacă este o lucrare care se referă doar la fauna de lepidoptere din această zonă, totuși aduce câteva date importante pentru fauna de lepidoptere din Peninsula Iberică. Sunt semnalate câteva specii rare, localizate și puțin cunoscute, de exemplu: *Lophoterges millierei* (Staudinger, 1870), *Hadena wehrlii* Draudt, 1934, *Euxoa* (*Pleonectopoda*) *nevadensis* Corti, 1928, *Psilogaster loti* (Ochsenheimer, 1810), *Nychiodes notarioi* Exposito-Hermosa 2005, *Heliothea discoidaria* Boisduval 1840, etc.

**Cuvinte cheie:** Lepidoptera, Spania, Valencia, faunistica, noi date.

## Introduction

The Lepidoptera fauna of Spain is of a remarkable diversity at European scale, and includes 4263 species (Karsholt, Razowski, 1996), of which about 500 species are found exclusively in the Iberian Peninsula. The Valencian Community is a typical Mediterranean area, harbouring a variety of habitats. The first reports of Lepidoptera fauna in the Valencia region are attributed to Boscá Seytre (1916) and Pardo García (1920), but only a few records of moths are mentioned in these works. The most complete work of Lepidoptera in the area is due to Torres Sala (1962), but devoted mainly to butterflies. The most active period in terms of faunistic studies corresponds to the 1970s and 1980s. After 1980, many European lepidopterists repeatedly visited Spain and also collected in the province of Valencia. Numerous data have been published (Bolland, 1978, 1984, Hacker, Wolf, 1982, 1983, Hoegh-Guldberg, 1986 a, b., Huemer, Wieser, 2006, 2010). Several Spanish lepidopterists also added notable lists and records (Calle, 1977, 1982, 1983; Calle, Blat Beltrán, 1976, etc.).

Today the Lepidoptera fauna of the Valencian Community is relatively well studied, especially the diurnal species (butterflies). The comprehensive work by Montagud, García Alamá (2010) is devoted to butterflies. The nocturnal species, and especially the so-called micro-lepidoptera, are still very little known in many areas, as in the case of the studied area (Siete Aguas and surroundings - Fig. 1).

Siete Aguas, a village with long history and ancient traditions, is located at 39° 28' 17" latitude and 2° 46' 20" longitude (39°28.0002' N 0°55.0002' W), in the middle of the Mediterranean area (Map 1). To the north, it borders with the municipalities of Gestalgar and Chera, to the East with those of Chiva and Buñol, to the south with Buñol and to the west with Requena. Its municipality covers an area of 109 km<sup>2</sup>. It lies 52 km west from Valencia, and is located at an average altitude of 700 metres above sea level. Siete Aguas takes pride in its mountain climate, which makes its summers among the freshest of the Valencian inland. But undoubtedly, the municipality's great treasures are the numerous springs scattered throughout its terrain and its natural areas. The terrain is very rugged with heights of up to 1118 m (Pico de la Nevera) and

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1000 m (Los Tres Cerros). The relief of the term of Siete Aguas includes to the northwest the sierras of Santa María, Burgal and Tejo, and to the south the Malacara mountain range with the Pico de la Nevera (1118 m), which is the natural boundary with the term of Buñol. The vegetation is dominated by pine (*Pinus halepensis*) forests on acid soil, oak forest (*Quercus coccifera*, *Q. ilex*, *Q. faginea*) and by rather well represented Mediterranean vegetation with *Cistus*, *Rosmarinus*, *Erica*, etc.

### Material and methods

The material was collected and the observations were made in two periods: 15-30 May 2008, and 15-30 June 2017. One light trap was used in 2008, and two light traps in 2017, with black and purple light UV tubes, powered by batteries (Fig. 6). On several occasions, material was also collected on a white screen with 125 W light bulbs. Local weather conditions were not very favorable. In May 2008 it was quite cold and rainy, and in June 2017 extremely hot and dry. The light traps were mostly placed near the Siete Aguas village (Papan's fountain / Fuente el Papan - Figs. 2, 3, 4), often at greater distances (Venta Mina - Fig. 5). The most remarkable results come from 2017, when two light traps were used. During this period, the number of captured specimens was over 2000, half of which were Microlepidoptera. Most of the problems were in the determination of the material, because I do not know the fauna of Spain as well as the Romanian one. The books used for specimen identification (Leraut, 2006, 2009; Calle, 1982, Higgins *et al.*, 1991, Tshikolovets, 2011, Montagud, García Alamá, 2010, Redondo *et al.*, 2009, www.noctuidae.de.) were not sufficient, and a part of the material could not be determined without the help of my Hungarian colleagues, to whom I am grateful. Despite all efforts, many of the Microlepidoptera have remained undetermined. That is also due to the fact that specimens caught in the light traps were partially damaged.

### Results

The most remarkable species identified among the collected specimens are mentioned below.

- *Lophoterges millierei* (Staudinger, 1870) (Fig. 22) - Atlanto-Mediterranean species, is well distributed in the Iberian Peninsula, although scarce, sometimes in two generations (Calle, 1982). The species is known from: Huelva, Jaén,

Roblehondo (Andalusia), Gerona (Catalonia), Cercedilla (Madrid), Guadalajara (Castille La Mancha) (Ronkay, Ronkay, 1997; Ronkay, 2005). Closer to Valencia it was reported from Sierra Espadan (Castellón), and from Sierra Calderona (Valencia) (Huemer, Wieser, 2006). The nominative species is present in Spain, while in France and southern Switzerland is present *Lophoterges millierei fibigeri* Ronkay & Ronkay, 1995 (Ronkay, 2005).

- *Hadena wehrlii* Draudt, 1934 (Fig.23) - Described from a single specimen of the Sierra Nevada, and also known from Morocco under the ssp. *rolleti* Lajonquiere, 1969 (Calle, 1982). Present in the southern Balkans, Asia Minor, Iran and southern Russia (ssp. *frequens* Hacker, 1996). In Spain it is known from Sierra Nevada (Granada) and Jaén (Andalusía) (Hacker *et al.*, 2002).

- *Euxoa* (Pleonectopoda) *nevadensis* Corti, 1928 (Fig.24) - Previously considered as endemic to Sierra Nevada (Granada), from 2000 m (Calle, 1982). Surprising appearance in Siete Aguas (Valencia), at altitudes of 600-700 m.

Other generally rare and very localized species are: *Hoyosia codeti* (Oberthür, 1883), *Maculinea arion* (Linnaeus, 1758) - (Fig.8), *Euphydryas desfontainii* (Godart, 1819) - (Fig.9), *Pachypasa limosa* (de Villiers, 1827) - (Fig. 13), *Psilogaster loti* (Ochsenheimer, 1810) - (Fig.10), *Phyllodesma suberifolia* (Duponchel, 1842) - (Fig.11), *Phyllodesma kermesifolia* (Lajonquiere, 1960) - (Fig.12), *Crocallis dardoinaria* Donzel, 1840, *Nychiodes notarioi* Exposito-Hermosa, 2005 - (Fig.19), *Menophra harterti thuriferaria* (Zerny, 1927) - (Fig.21), *Ecleora solieraria* (Rambur, 1834) - (Fig.20), *Adactylotis gesticularia* (Hübner, 1817) - (Fig.18), *Kuchleria insignata* Hausmann, 1995 - (Fig.16), *Bustilloxia saturata* (Bang-Haas, 1906) - (Fig.17), *Heliothea discoidaria* Boisduval 1840 (Fig.14), *Tethidia plusiaria* Boisduval, 1840 (Fig.15), *Brachyglossina hispanaria* (Püngeler, 1913), *Idaea rhodogrammaria* (Püngeler, 1913), etc. In processing the 2008 collecting results (Székely, 2011), several taxa were determined and published incorrectly, and are corrected here, for example: *Watsonalla binaria* (Hufnagel, 1767) = *Watsonalla uncinula* (Borkhausen, 1790), *Pingasa lahayeii* (Oberthür, 1887) = *Pseudoterpnia coronillaria* (Hübner, 1799), *Phytometra luna* Zerny, 1927 = *Phytometra sanctiflorentis* (Boisduval, 1834), *Alvaradoia numerica*

(Boisduval, 1840) = *Alvarodoia disjecta* (Rotschild, 1920), *Diorictria abietella* ([Denis & Schiffermuller], 1775) = *Diorictria mendacella* (Staudinger, 1859), *Heterogynis paradoxa* Rambur, 1837 = *Heterogynis penella* (Hübner, 1819).

### Conclusions

The results obtained in a relatively short period of time (May and June only) suggest that this area has a high diversity of lepidopteran species, including numerous rare and very local taxa. There is a need for extensive future studies covering the entire year to accurately assess the Lepidoptera richness of this area. Of course, this diversity is caused by the great variety of relief

and flora, determined by the very favorable geographic position and climate conditions.

### Acknowledgements

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### LIST OF ILLUSTRATIONS

- Tab. 1** Faunistic list of Lepidoptera (Abbreviations: \* **X** = rare (2-5 sp./day/night); **XX** = common (6-20 sp.day/night); **XXX** = very common (20-100 sp. day/night); **P** = Papan's fountain and surroundings. **V**= Venta Mina and surroundings; ♂ = male; ♀ = female; sp. = specimen, leg. = legit (collected by); det. = identified by
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- Fig. 14** *Heliothea discoidaria* (photo: L. Székely) scale (red line) = 1 cm
- Fig. 15** *Tethidia plusiaria* (photo: L. Székely) scale (red line) = 1 cm
- Fig. 16** *Kuchleria insignata* (photo: L. Székely) scale (red line) = 1 cm
- Fig. 17** *Bustilloxia saturata* (photo: L. Székely) scale (red line) = 1 cm
- Fig. 18** *Adactylotis gesticularia* (photo: L. Székely) scale (red line) = 1 cm
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- Fig. 21** *Menophra harterti thuriferaria* (photo: L. Székely) scale (red line) = 1 cm
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- Fig. 23** *Hadena wehrlii* (photo: L. Székely) scale (red line) = 1 cm
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### LISTA ILUSTRĂȚILOR

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**Fig. 18** *Adactylotis gesticularia* (foto: L. Székely) scara (linia roșie) =1 cm  
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Taxons	15- 22.V. 2008	23- 30.V. 2008	15- 22.VI. 2017	23- 30.VI. 2017	P	V	Observations
Suprafam. <b>TINEOIDEA</b> Latreille, 1810							
Fam. <b>TINEIDAE</b> Latreille, 1810							
<i>Tinea murariella</i> Staudinger, 1859			X	X		+	det. Cs. Szabóky
Suprafam. <b>YPONOMEUTOIDEA</b> Stephens, 1829							
Fam. <b>YPONOMEUTIDAE</b> Stephens, 1829							
<i>Yponomeuta plumbella</i> ([Denis & Schiffermuller],1775)			X	X	P	V	det. Cs. Szabóky
Suprafam. <b>GELECHIOIDEA</b> Stainton, 1854							
Fam. <b>AUTOSTICHIDAE</b> Le Marchand, 1947							
<i>Symmoca signatella</i> Herrich-Schaffer,1854			1sp.	1sp.	P		det. Cs. Szabóky
<i>Symmoca</i> sp.			1sp.		P		det. Cs. Szabóky
<i>Stibaromacha ratella</i> (Herrich-Schaffer,[1854])			X	X	P		det. Cs. Szabóky
Fam. <b>LECITHOCERIDAE</b> Le Marchand, 1947							
<i>Eurodachta pallicornella</i> (Staudinger, 1859)			X	X	P		det. Cs. Szabóky

<i>Odites kollarella</i> (O. Costa, 1832)			2sp.		P		det. Cs. Szabóky
Fam. <b>OECOPHORIDAE</b> Bruand, 1850							
<i>Epicallima mercedella</i> (Staudinger, 1859)			1sp.	1sp.	P		det. Cs. Szabóky
<i>Pleurota aristella</i> (Linnaeus, 1767)			X	X	P		det. Cs. Szabóky
<i>Pleurota honorella</i> (Hübner, 1813)			2sp.		P		det. Cs. Szabóky
<i>Pleurota planella</i> (Staudinger, 1859)				1sp.	P		det. Cs. Szabóky
<i>Goidanichiana jourdheuillega</i> (Ragonot, 1878)			1sp.	1sp.	P		det. Cs. Szabóky
Fam. <b>ELACHISTIDAE</b> Bruand, 1850							
<i>Agonopterix scopariella</i> (Heinemann, 1870)				2sp.	P		det. Cs. Szabóky
<i>Agonopteryx</i> sp.			X	X	P		det. Cs. Szabóky
<i>Depressaria douglasella</i> Stainton, 1849			1sp.		P		det. Cs. Szabóky
<i>Depressaria</i> sp.			X	X	P	V	det. Cs. Szabóky
<i>Ethmia bipunctella</i> (Fabricius, 1775)			1sp.		P	V	det. Cs. Szabóky
Fam. <b>SCYTHRIDIDAE</b> Rebel, 1901							
<i>Scythris elegantella</i> (D. Lucas, 1956)				1sp.	P		det. Cs. Szabóky
<i>Enolmis seeboldiella</i> (Agenjo, 1951)			XX	X	P		det. Cs. Szabóky
Fam. <b>GELECHIIDAE</b> Stainton, 1854							
<i>Aristotelia ericinella</i> (Zeller, 1839)			X	X	P		det. Cs. Szabóky
<i>Isophrictis invisella</i> (Constant, 1885)			1sp.		P		det. Cs. Szabóky
<i>Eulamprotes atrella</i> ([Denis & Schiffermuller], 1775)				1sp.	P		det. Cs. Szabóky
<i>Mirificarma cytisella</i> (Treitsche, 1833)			2sp.		P		det. Cs. Szabóky
<i>Gelechia sabinellus</i> (Zeller, 1839)			1sp.		P		det. Cs. Szabóky
Fam. <b>COLEOPHORIDAE</b> Hübner, 1825							
<i>Coleophora vicinella</i> Zeller, 1849				3sp.	P		det. Cs. Szabóky
<i>Coleophora eupreta</i> Walsingham, 1907				2sp.	P		det. Cs. Szabóky
<i>Coleophora helichrysella</i> Krone, 1909				2sp.	P		det. Cs. Szabóky
<i>Coleophora albilinella</i> Toll, 1960				1sp.	P		det. Cs. Szabóky
Suprafam. <b>ALUCITOIDEA</b> Leach, 1815							
Fam. <b>ALUCITIDAE</b> Leach, 1815							
<i>Alucita palodactyla</i> Zeller, 1847			1sp.		P		det. Cs. Szabóky
Suprafam. <b>PTEROPHOROIDEA</b> Latreille, 1802							

Fam. <b>PTEROPHORIDAE</b> Latreille, 1802							
<i>Calyciphora adamas</i> (Constant, 1895)			1sp.		P		det. Cs. Szabóky
Suprafam. <b>TORTRICOIDEA</b> Latreille, 1803							
Fam. <b>TORTRICIDAE</b> Latreille, 1803							
<i>Diceratura roseofasciana</i> (Mann, 1855)			1sp.		P		det. Cs. Szabóky
<i>Pelochrista fulvostrigana</i> (Constant, 1888)				1sp.	P		det. Cs. Szabóky
<i>Eucosma albarracina</i> Hartig, 1941				1sp.	P		det. Cs. Szabóky
<i>Rhyocionia bouliana</i> ([Denis & Schiffermuller], 1775)			1sp.		P		det. Cs. Szabóky
<i>Cydia fagiglandana</i> (Zeller, 1841)			X	X	P	V	det. Cs. Szabóky
<i>Clepsis siciliana</i> (Ragonot, 1894)				3sp.	P	V	det. Cs. Szabóky
<i>Cacoecimorpha pronubana</i> (Hübner, 1799)				2sp.	P		det. Cs. Szabóky
Suprafam. <b>COSSOIDEA</b> , Mosher, 1916							
Fam. <b>COSSIDAE</b> Leach, [1815]							
<i>Zeuzera pyrina</i> (Linnaeus, 1761)			1♂	4♂♂	P	V	
<i>Dyspessa ulula</i> (Borkhausen, 1790)		1♀				V	
Fam. <b>SESIIDAE</b> Boisduval, 1828							
<i>Synanthedon stomoxiformis</i> (Hubner, 1790)		1♀			P		
Suprafam. <b>ZYGAENOIDEA</b> Latreille, 1809							
Fam. <b>HETEROGYNIDAE</b> Rambur, 1866							
<i>Heterogynis penella</i> (Hübner, 1819)	X	XX			P	V	
Fam. <b>LIMACODIDAE</b> Duponchel, 1845							
<i>Hoyosia codeti</i> (Oberthür, 1883)			2sp.			V	det. L. Ronkay
Fam. <b>ZYGAENIDAE</b> Latreille, 1809							
<i>Zygaena lavandulae</i> (Esper, 1783)	X	X			P		
Suprafam. <b>PAPILIONOIDEA</b> Latreille, [1802]							
Fam. <b>PAPILIONIDAE</b> Latreille, [1802]							
Subfam. <b>Papilioninae</b> Latreille, [1802]							
<i>Iphiclides feisthamelii</i> (Duponchel, 1832)			X	XX	P	V	
<i>Papilio machaon</i> (Linnaeus, 1758)			XX	X	P	V	
Fam. <b>HESPERIIDAE</b> Latreille, 1809							
Subfam. <b>Pyrginae</b> Burmeister, 1878							
<i>Erynnis tages</i> (Linnaeus, 1758)	X	X			P		
<i>Carcharodus alceae</i> (Esper, 1790)	XX	X	X	X	P		
<i>Carcharodus baeticus</i> (Rambur, 1839)	X	X	X	X	P		
<i>Spialia sertorius</i> (Hofmannsegg, 1804)	XX	XX			P	V	
<i>Muschampia proto</i> (Ochsenheimer, 1808)			XX	XX	P		
Subfam. <b>Hesperinae</b> Latreille, 1809							
<i>Thymelicus sylvestris</i> (Poda, 1761)	X	XX			P		
<i>Thymelicus acteon</i> (Rottemburg, 1775)	XX	XX			P	V	
Fam. <b>PIERIDAE</b> Duponchel, [1835]							
Subfam. <b>Coliadinae</b> Swainson, 1827							
<i>Colias croceus</i> (Fourcroy, 1785)	X	X	XXX	XXX	P	V	
<i>Colias alfacariensis</i> Ribbe, 1905			XX	XXX	P	V	

<i>Gonepteryx cleopatra</i> (Linnaeus, 1767)		X	XX	X	P	V	
Subfam. <b>Dismorphiinae</b> Schatz, [1886]							
<i>Leptidea sinapis sinapis</i> (Linnaeus, 1758)			XXX	XXX	P	V	
Subfam. <b>Pierinae</b> Duponchel, [1835]							
<i>Pieris napi</i> (Linnaeus, 1758)	XX	XX	X	X	P	V	
<i>Pieris rapae</i> (Linnaeus, 1758)	XX	XX	X	X	P	V	
<i>Pontia daplidice</i> (Linnaeus, 1758)	X	X	XXX	XXX	P	V	
<i>Euchloe crameri</i> Butler, 1869	XX	XX			P		
Fam. <b>LYCAENIDAE</b> [Leach] [1815]							
Subfam. <b>Lycaeninae</b> [Leach] [1815]							
<i>Lycaena phlaeas</i> (Linnaeus, 1761)					1sp.	P	
Subfam. <b>Theclinae</b> Swainson, 1831							
<i>Satyrrium spini</i> ([Denis & Schiffermüller], 1775)			X	X	P		
<i>Satyrrium esculi</i> (Hübner, 1804)	X	X	X	X	P		
Subfam. <b>Polyommatainae</b> Swainson, 1827							
<i>Lampides boeticus</i> (Linnaeus, 1758)		X	XXX	XX	P	V	
<i>Leptotes pirithous</i> (Linnaeus, 1758)			XX	XX	P	V	
<i>Cacyreus marshalli</i> Butler, 1898	XX	X			P	V	Fig. 7
<i>Cupido argiades</i> (Pallas, 1771)	X	X			P		
<i>Cupido minimus</i> (Fuessly, 1775)	X	X			P		
<i>Aricia cramera</i> Erscholtz, 1821			XX	X	P		
<i>Plebejus argus</i> (Bergstrasser, 1779)	X	X			P		
<i>Maculinea arion</i> (Linnaeus, 1758)		3sp.			P		Fig. 8
<i>Polyommatus icarus</i> (Rottemburg, 1775)	X	X	XXX	XXX	P	V	
<i>Polyommatus thersites</i> (Cantener, 1835)				2♂♂, 1♀	P		
<i>Lysandra bellargus</i> (Rottemburg, 1775)			XX	X	P	V	
Fam. <b>NYMPHALIDAE</b> Swainson, 1827							
Subfam. <b>Heliconiinae</b> Swainson, 1827							
<i>Argynnis pandora</i> ([Denis & Schiffermüller], 1775)			X	X	P	V	
<i>Issoria lathonia</i> (Linnaeus, 1758)			2sp.		P		
Subfam. <b>Nymphalinae</b> Swainson, 1827							
<i>Euphydryas desfontainii</i> (Godart, 1819)	X	X			P		Fig. 9
<i>Melitaea parthenoides</i> Keferstein, 1851	X	X			P		
<i>Melitaea phoebe occitanica</i> Staudinger, 1861		X	XX	XXX	P		
<i>Melitaea didyma occidentalis</i> Staudinger, 1861	XXX	XXX	X	X	P		
<i>Melitaea deione</i> (Geyer, 1832)	XX	XX			P		
<i>Aglais io</i> (Linnaeus, 1758)			1sp.		P		
<i>Vanessa atalanta</i> (Linnaeus, 1758)				1sp.	P		
<i>Vanessa cardui</i> (Linnaeus, 1758)	X	X	XX	XX	P	V	
Subfam. <b>Satyrinae</b> Boisduval, [1833]							
<i>Parage aegeria aegeria</i> (Linnaeus, 1758)		X	XX	XXX	P	V	
<i>Coenonympha dorus</i> (Esper, 1782)		2sp.			P		
<i>Pyronia batsheba</i> (Fabricius, 1793)	XXX	XXX	XX	XX	P	V	
<i>Pyronia cecilia</i> (Vallantin, 1894)			X	X	P		
<i>Lasiommata megera</i> (Linnaeus, 1758)		2sp.	XX	XX	P	V	
<i>Lasiommata maera</i> (Linnaeus, 1758)			X	X	P		
<i>Maniola jurtina hispulla</i> (Esper, 1805)	X	XX	XX	XX	P	V	
<i>Melanargia occitanica</i> (Esper, 1793)	XX	XX			P		
<i>Melanargia ines</i> (Hofmannsegg, 1804)	XX	XX			P		
<i>Melanargia lachesis</i> (Hübner, 1790)			XXX	XXX	P	V	



<i>Satyrus actaea</i> (Esper, 1781)		X	1♂		P		
<i>Hipparchia semele</i> (Linnaeus, 1758)		X			P		
<i>Brintesia circe</i> (Linnaeus, 1758)				1♂	P		
Suprafam. <b>PYRALOIDEA</b> Latreille, 1809							
Fam. <b>PYRALIDAE</b> Latreille, 1809							
<i>Synaphe bombicalis</i> ([Denis & Schiffermuller], 1775)	X	X			P		
<i>Pyralis farinalis</i> (Linnaeus, 1758)			1sp.			V	
<i>Aglossa rabatalis</i> (Joannis, 1923)				2sp.	P		det. Cs. Szabóky
<i>Stemmatophora vulpecalis</i> Ragonot, 1891			XXX	XXX	P		det. Cs. Szabóky
<i>Stemmatophora combustalis</i> (Fischer v. Roslerstamm, 1842)			XX	XX	P	V	det. Cs. Szabóky
<i>Stemmatophora borgialis</i> (Duponchel, 1832)			XX	XX	P		det. Cs. Szabóky
<i>Hypsopygia costalis</i> (Fabricius, 1775)			1sp.		P		det. Cs. Szabóky
<i>Lamoria zelleri</i> (De Joannis, 1932)				1sp.		V	det. Cs. Szabóky
<i>Pempelia genistella</i> (Duponchel, 1836)			3sp.		P	V	det. F. Slamka
<i>Pempelia palumbella</i> ([Denis & Schiffermuller], 1775)			XX	XX	P		det. Cs. Szabóky
<i>Phycita roborella</i> ([Denis & Schiffermuller], 1775)			1sp.	1sp.	P		det. Cs. Szabóky
<i>Diorictria mendacella</i> (Staudinger, 1859)	X	X	XX	XX		V	det. Cs. Szabóky
<i>Etiella zinckenella</i> (Treitschke, 1832)			X	X	P		
<i>Oxybia transversella</i> (Duponchel, 1836)			X	X	P	V	det. Cs. Szabóky
<i>Ancylosis oblitella</i> (Zeller, 1848)			XX	XX	P		det. Cs. Szabóky
<i>Ephestia kuehniella</i> Zeller, 1879			1sp.		P		det. Cs. Szabóky
<i>Ephestia welseriella</i> (Zeller, 1848)				1sp.	P		det. Cs. Szabóky
<i>Ematheudes punctella</i> (Treitschke, 1833)			X	X	P	V	det. Cs. Szabóky
<i>Epischnia prodromella</i> (Hübner, [1799])			2sp.		P		det. Cs. Szabóky
<i>Acrobasis consociella</i> (Hübner, [1813])			1sp.		P		det. Cs. Szabóky
<i>Sitochroa verticalis</i> (Linnaeus, 1758)	X	X			P	V	
<i>Loryma egregialis</i> (Herrich-Schäffer, 1838)			3sp.	1sp.	P	V	
Fam. <b>CRAMBIDAE</b> Latreille, 1810							
<i>Chrysoteuchia culmella</i> (Linnaeus, 1758)			2sp.	1sp.	P	V	det. Cs. Szabóky
<i>Agriphila straminella</i> ([Denis & Schiffermuller], 1775)				1sp.	P		det. Cs. Szabóky
<i>Catoptria pinella albarracinella</i> (Agenjo, 1954)			X	X	P	V	det. Cs. Szabóky
<i>Evergestis frumentalis</i> (Linnaeus, 1761)	X	X			P	V	

<i>Evergestis desertalis</i> (Hübner, [1813])				X	P		det. Cs. Szabóky
<i>Ecpyrrhorrhoe rubiginalis</i> (Hübner, [1796])			2sp.		P	V	det. Cs. Szabóky
<i>Pyrausta gutturalis</i> Staudinger, 1880			2sp.		P		det. Cs. Szabóky
<i>Pyrausta sanguinalis</i> (Linnaeus, 1767)			X	X	P	V	det. Cs. Szabóky
<i>Pyrausta despicata</i> (Scopoli, 1763)			2sp.		P		det. Cs. Szabóky
<i>Aporodes floralis</i> (Hübner, 1809)				2sp.	P		
<i>Uresiphita gilvata</i> (Fabricius, 1794)			1sp.		P		det. Cs. Szabóky
<i>Anania terrealis</i> (Treitschke, 1829)				1sp.	P		det. Cs. Szabóky
<i>Udea ferrugalis</i> (Hübner, [1796])			X	X	P		det. Cs. Szabóky
<i>Sitochroa verticalis</i> (Linnaeus, 1758)	X	X			P	V	
<i>Metasia cuencalis</i> Ragonot, 1894			1sp.	1sp.	P		det. Cs. Szabóky
Suprafam. <b>DREPANOIDEA</b> Boisduval, 1828							
Fam. <b>DREPANIDAE</b> Boisduval, 1828							
<i>Watsonalla uncinula</i> (Borkhausen, 1790)		1♀	X	X	P		
Suprafam. <b>LASIOCAMPOIDEA</b> Harris, 1841							
Fam. <b>LASIOCAMPIDAE</b> Harris, 1841							
<i>Dendrolimus pini iberica</i> Schawerda, 1926		2♂♂	XX	XX		V	
<i>Pachipasa limosa</i> (de Villers, 1827)		1♂	X	X		V	Fig. 13
<i>Psilogaster loti</i> (Ochsenheimer, 1810)			1♂	1♀	P		Fig. 10
<i>Phyllodesma suberifolia</i> (Duponchel, 1842)			1♂			V	Fig. 11
<i>Phyllodesma kermesifolia</i> (Lajonquiere, 1960)				4♂♂	P	V	Fig. 12
Suprafam. <b>BOMBYCOIDEA</b> Latreille, [1803]							
Fam. <b>SPHINGIDAE</b> Latreille, [1802]							
Subfam. <b>Sphinginae</b> Latreille, [1802]							
<i>Agrius convolvuli</i> (Linnaeus, 1758)			1♂			V	
Subfam. <b>Smerinthinae</b> Grote & Robinson, 1865							
<i>Smerinthus ocellata</i> (Linnaeus, 1758)			1♂			V	
Subfam. <b>Macroglosiinae</b> Harris, 1839							
<i>Macroglossum stellatarum</i> (Linnaeus, 1758)	X	X	X	X	P	V	
<i>Hyles livornica</i> (Esper, 1780)			1♂			V	
Suprafam. <b>GEOMETROIDEA</b> Leach, [1815]							
Fam. <b>GEOMETRIDAE</b> Leach, [1815]							
Subfam. <b>Ennominae</b> Duponchel, 1845							
<i>Itame vincularia</i> (Hübner, 1813)		2♂♂	X	X	P	V	
<i>Pachycnemia hippocastanaria</i> (Hübner, 1799)	XXX	XXX	XX	XX	P	V	
<i>Toulgoetia cauteriata</i> (Staudinger, 1859)			1sp.		P		
<i>Crocallis dardoinaria</i> Donzel, 1840			1♂		P		
<i>Hylaea fasciaria</i> (Linnaeus, 1758)			1♂		P		
<i>Adalbertia castiliaria</i> (Staudinger, 1900)		1♂, 1♀	X	X	P	V	
<i>Odontognophos perspersata</i> (Treitschke, 1827)		X	XXX	XXX	P	V	
<i>Charissa mucidaria</i> (Hübner, 1799)	X	X	X	X	P	V	det. G. Petrányi
<i>Dyscia penulataria</i> (Hübner, 1819)	XX	XX			P	V	

<i>Dyscia lentiscaria</i> (Donzel,1837)	XX	X			P		
<i>Nychiodes notarioi</i> Exposito-Hermosa, 2005				3♂♂	P		Fig. 19 det. B. Tóth
<i>Menophra nyctemeraria</i> (Geyer,1831)	XX	XX			P	V	
<i>Menophra harterti thuriferaria</i> (Zerny, 1927)				1♂	P		Fig. 21
<i>Ecleora solieraria</i> (Rambur, 1834)			XX	XX	P	V	Fig. 20
<i>Peribatodes rhomboidaria</i> ([Denis &Schiffermüller],1775)	X	XX	X	X	P	V	
<i>Peribatodes ilicaria</i> (Geyer,1831)	XXX	XXX	X	X	P	V	
<i>Peribatodes umbraria</i> (Hübner,1809)			XX	XX	P	V	
<i>Adactylotis gesticularia</i> (Hübner,1817)			3♂♂	2♂♂	P	V	Fig. 18
<i>Tephronia codetaria</i> (Oberthür,1881)	XX	XX	XX	XX	P	V	det. B. Tóth
<i>Tephronia sepiaria</i> (Hufnagel,1767)	X	X				V	
<i>Tephronia oranaria</i> Staudinger, 1892			XX	XX	P	V	det. B. Tóth
<b>Subfam. Geometrinae Stephens, 1829</b>							
<i>Pseudoterpna coronillaria</i> (Hübner,1799)			XX	X	P	V	
<i>Tethidia plusiaria</i> Boisduval, 1840			XX	X	P		Fig. 15
<i>Phaiogramma etruscaria</i> (Zeller, 1849)			3sp.		P	V	det. B. Tóth
<i>Chlorissa viridata</i> (Linnaeus,1758)	X	X				V	
<i>Kuchleria insignata</i> Hausmann, 1995			1sp.		P		Fig. 16 det. B. Tóth
<i>Microloxia herbaria</i> (Hübner,[1813])				2sp.	P		
<i>Bustilloxia saturata</i> (Bang-Haas, 1906)			2sp.		P		Fig. 17 det. B. Tóth
<i>Heliothea discoidaria</i> Boisduval 1840	2♂♂	4♂♂			P		Fig. 14
<b>Subfam. Sterrhinae Meyrick, 1892</b>							
<i>Idaea sardonata</i> (Homberg, 1912)			X	X	P		det. B. Tóth
<i>Idaea ochrata</i> (Scopoli, 1763)			1sp.		P		det. B. Tóth
<i>Idaea mediaria</i> (Hübner, 1819)			X	X	P	V	det. B. Tóth
<i>Idaea filicata</i> (Hübner,1799)		X				V	
<i>Idaea mustelata</i> (Gumpfenberg, 1892)			X	X	P	V	det. B. Tóth
<i>Idaea obsoletaria</i> (Rambur, 1833)			2sp.		P		det. B. Tóth
<i>Idaea camparia</i> (Herrich-Schäffer, 1852)			X	X	P		det. B. Tóth
<i>Idaea rhodogrammaria</i> (Püngeler, 1913)			1sp.		P		det. B. Tóth
<i>Idaea infirmaria</i> (Rambur, 1833)			X	X	P		det. B. Tóth
<i>Idaea carvalhoi</i> Herbulot, 1979				2sp.	P		det. B. Tóth
<i>Idaea albarracina</i> (Reisser, 1934)				1sp.	P		det. B. Tóth
<i>Idaea seriata</i> (Schrank,1802)	X	XX			P	V	
<i>Idaea exilaria</i> (Guenée, 1857)				1sp.	P		det. B. Tóth
<i>Idaea ostrinaria</i> (Hübner,1813)	XXX	XXX	XXX	XXX	P	V	
<i>Idaea straminata</i> (Borkhausen, 1794)				1sp.	P		det. B. Tóth
<i>Idaea degeneraria</i> (Hübner,1799)	X	XX	X	X	P	V	
<i>Idaea deversaria</i> (Herrich-Schaffer,1847)		X	1sp.		P	V	
<i>Brachyglossina hispanaria</i> (Püngeler, 1913)			X	X	P		det. B. Tóth
<i>Scopula decorata</i> ([Denis & Schiffermüller],1775)	X	XX			P	V	
<i>Scopula submutata</i> (Treitschke, 1828)	X	X	XX	XX	P		det. B. Tóth
<i>Scopula marginepunctata</i> (Goeze,1781)	X	X	XX	XX	P	V	det. B. Tóth
<i>Scopula imitaria</i> (Hübner,1799)			1sp.		P		
<i>Scopula turbidaria</i> (Hübner,1819)			1sp.	1sp.	P		
<i>Rhodostrophia calabra</i> (Petagna,1786)	X	XX			P	V	
<i>Rhodostrophia pudorata</i> (Fabricius, 1794)				1♂		V	det. B. Tóth

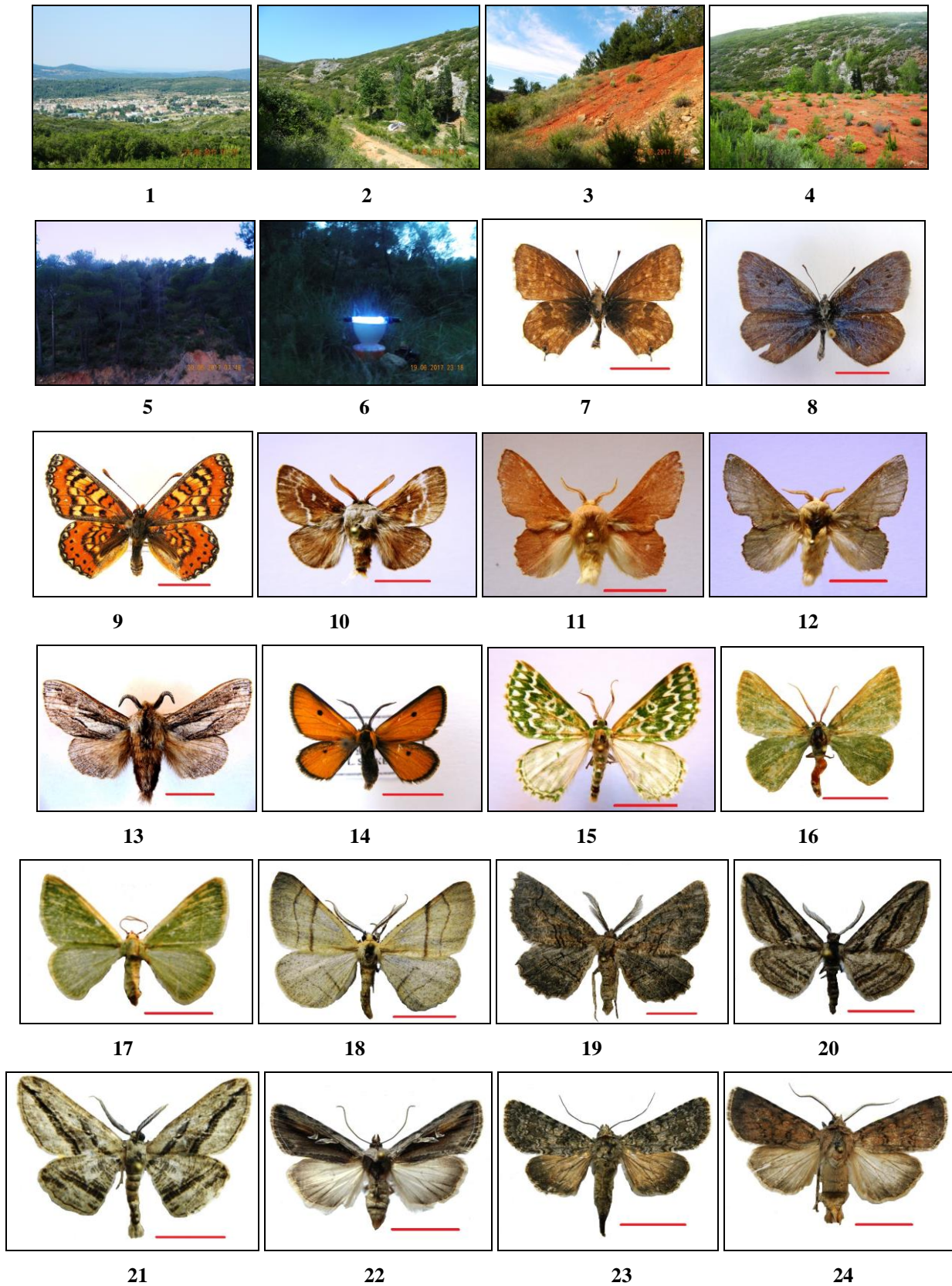
<i>Rhodometra sacraria</i> (Linnaeus, 1767)			X	X	P	V	
<i>Cyclophora pupillaria</i> (Hübner, 1799)	XX	X	X	X	P	V	
<i>Cyclophora lennigaria</i> (Fuchs, 1883)				1sp.	P		
<i>Cyclophora hyponoea</i> (Prout, 1935)			X	X	P		
Subfam. <b>Larentiinae</b> Duponchel, 1845							
<i>Almeria kalischata</i> (Staudinger, 1870)			1sp.		P		det. B. Tóth
<i>Nebula ibericata</i> (Staudinger, 1871)				1sp.	P		
<i>Gymnoscelis ruffifasciata</i> (Haworth, 1809)			1sp.	1sp.	P		det. B. Tóth
<i>Eupithecia extremata</i> (Fabricius, 1787)					P	V	
<i>Eupithecia centaureata</i> ([Denis & Schiffermüller], 1775)			X	X	P	V	
<i>Eupithecia santolinata</i> Mabille, 1871				1sp.	P		det. B. Tóth
<i>Aplocera efformata</i> (Guenee, 1852)			X	X	P	V	
Suprafam. <b>NOCTUOIDEA</b> Latreille, 1809							
Fam. <b>NOTODONTIDAE</b> Stephens, 1829							
Subfam. <b>Thaumetopeinae</b> Aurivillius, 1889							
<i>Thaumetopoea pityocampa</i> ([Denis & Schiffermüller], 1775)			XX	XX	P	V	
Subfam. <b>Notodontinae</b> Stephens, 1829							
<i>Furcula furcula f. atlantica</i> Daniel, 1965			1♂			V	
Subfam. <b>Heterocampinae</b> Lafontaine & Fibiger, 2006							
<i>Harpyia milhauseri</i> (Fabricius, 1775)			X	X		V	
Fam. <b>EREBIDAE</b> (Leach, [1815])							
Subfam. <b>Rivulinae</b> Grote, 1895							
<i>Zebeeba falsalis</i> (Herrich-Schäffer, 1839)				2sp.	P		
Subfam. <b>Eublemminae</b> Forbes, 1954							
<i>Eublemma parva</i> (Hübner, 1808)			XXX	XXX	P	V	
<i>Eublemma candidana</i> (Fabricius, 1794)			XXX	XXX	P	V	
<i>Eublemma purpurina</i> ([Denis & Schiffermüller], 1775)			1♂		P		
<i>Eublemma polygramma</i> (Duponchel, [1842])			X	X	P	V	
<i>Eublemma ostrina</i> (Hübner, 1808)			X	X	P	V	
<i>Eublemma pura</i> (Hübner, [1809-1813])			XX	X	P	V	det. P. Gyulai
<i>Odice jucunda</i> (Hübner, 1813)			XX	XX	P	V	
<i>Odice pergrata</i> (Rambur, 1858)			X	X	P	V	
<i>Rhypagla lacernaria</i> (Hübner, 1813)				1♂	P		det. P. Gyulai
<i>Metachrostis velox</i> (Hübner, [1809-1813])				2♂♂	P		det. P. Gyulai
Subfam. <b>Phytometrinae</b> Hampson, 1913							
<i>Phytometra viridaria</i> (Clerck, 1759)	X	X	X	X	P	V	
<i>Phytometra sanctiflorentis</i> (Boisduval, 1834)	X	X	X	X	P	V	
<i>Raparna conicephala</i> (Staudinger, 1870)			X	X	P		
Subfam. <b>Euteliinae</b> Grote, 1882							
<i>Eutelia adulatrix</i> (Hübner, 1813)			X	X	P	V	
Subfam. <b>Catocalinae</b> Boisduval, [1828]							
<i>Catocala conversa</i> (Esper, 1783)			X	X	P		
<i>Catocala nymphagoga</i> (Esper, 1783)			X	X	P		
<i>Catocala mariana</i> Rambur, 1858			1♂	4♂♂	P	V	
<i>Ophiusa tirhaca</i> (Cramer, 1777)			1♂			V	
<i>Dysgonia algira</i> (Linnaeus, 1767)			1♂	2♂♂	P		
<i>Dysgonia torrida</i> (Guenee, 1852)				1♂	P		
<i>Drasteria cailino</i> (Lefebvre, 1827)				1♂	P		
<i>Callistege mi</i> (Clerck, 1759)	1♂	1♂			P		

<i>Lygephila cracca</i> ([Denis & Schiffermüller], 1775)			XX	XX	P	V	
<i>Autophila dilucida</i> (Hübner, 1808)				1♂	P		
Subfam. <b>Nolinae</b> Bruand, 1846							
<i>Nola chlamitulalis</i> (Hübner,[1813])		1♂				V	
<i>Meganola gigantula</i> (Staudinger, 1879)			1♂	3♂♂	P		
Subfam. <b>Arctiinae</b> Leach, [1815],							
<i>Coscinia cribraria</i> (Linnaeus,1758)	XX	XX	XXX	XXX	P	V	
<i>Eilema lurideola</i> (Zincken, 1817)	X	XX				V	
<i>Eilema complana</i> (Linnaeus,1758)	X	X	XXX	XXX	P	V	
<i>Eilema caniola</i> (Hübner,1808)	XX	XX	XX	XX	P	V	
Subfam. <b>Lymantriinae</b> Hampson, [1893]							
<i>Ocneria rubea</i> ([Denis & Schiffermüller],1775)		1♀	1♂	2♀♀		V	
<b>Fam. NOCTUIDAE</b> Latreille, 1809							
Subfam. <b>Plusiinae</b> Boisduval, [1828]							
<i>Cornutiplusia circumflexa</i> (Linnaeus, 1767)				2♂♂	P		
<i>Autographa gamma</i> (Linnaeus,1758)	X	X	X	X	P	V	
<i>Macdunnoughia confusa</i> (Stephens,1850)	X	X				V	
Subfam. <b>Eustrotiinae</b> Grote, 1882							
<i>Pseudozarba bipartita</i> (Herrich-Schäffer, 1850)			1sp.	2sp.	P		
Subfam. <b>Acontiinae</b> Guenée, 1841							
<i>Acontia lucida</i> (Hufnagel, 1766)			X	X	P	V	
Subfam. <b>Acronictinae</b> Heinemann, 1859							
<i>Acronicta rumicis</i> (Linnaeus,1758)			X	X	P	V	
Subfam. <b>Metoponiinae</b> Herrich-Schäffer, [1851]							
<i>Alvaradoia disjecta</i> (Rotschild, 1920)		2sp.	XXX	XXX	P	V	
<i>Synthimia fixa</i> (Fabricius,1787)	X	XX	XX	X	P	V	
<i>Tyta luctuosa</i> ([Denis & Schiffermüller], 1775)			X	X	P	V	
Subfam. <b>Cuculliinae</b> Herrich-Schäffer, [1850]							
<i>Shargacucullia caninae</i> (Rambur,1833)		1♂				V	det. L. Ronkay
<i>Shargacucullia erythrocephala</i> Wagner, 1914			1♂		P		
Subfam. <b>Oncocnemidinae</b> Forbes and Franclemont, 1954							
<i>Calophasia platyptera</i> (Esper, 1788)			X	X	P	V	
<i>Lophoterges millierei</i> (Staudinger, 1870)				1♂	P		Fig. 22
<i>Epimecia ustula</i> (Freyer, 1835)			XX	XX	P	V	
<i>Amephana aurita</i> (Fabricius,1787)	X	X	1♂		P	V	det. L. Ronkay
<i>Recophora canteneri</i> (Duponchel, 1833)			XXX	XX	P	V	det. P. Gyulai
Subfam. <b>Amphipyrinae</b> Guenée, 1837							
<i>Amphipyra tetra</i> (Fabricius, 1787)			1♂			V	
<i>Bryonicta pineti</i> (Staudinger,1859)		2sp.	XX	XX	P	V	
Subfam. <b>Heliothinae</b> Boisduval, [1828]							
<i>Heliothis peltigera</i> ([Denis & Schiffermüller], 1775)			XX	XX	P	V	
Subfam. <b>Bryophilinae</b> Guenée, 1852							
<i>Bryophila raptricula</i> ([Denis & Schiffermüller], 1775)			X	X	P		det. P. Gyulai
<i>Bryoleuca ravula ereptriculoides</i> Boursin, 1952			XX	XX	P	V	det. P. Gyulai
<i>Cryphia pallida</i> (Bethune-Baker, 1894)			X	X	P		det. P. Gyulai
<i>Cryphia algae</i> (Esper, 1789)			XX	X	P	V	det. P. Gyulai

<i>Cryphia vandalusiae</i> (Duponchel, 1832)			X	X	P		det. L. Ronkay
Subfam. <b>Xyleninae</b> Guenée, 1837							
<i>Spodoptera exigua</i> (Hübner, 1808)			X	XX	P	V	
<i>Caradrina germainii</i> (Duponchel, 1835)	XX	XX	X		P	V	det. L. Ronkay
<i>Caradrina clavipalpis</i> (Scopoli, 1763)	X	XX	X	X	P	V	det. L. Ronkay
<i>Caradrina noctivaga</i> Bellier, 1863			X	X	P		det. P. Gyulai
<i>Caradrina aspersa</i> Rambur, 1834			X	X	P	V	det. P. Gyulai
<i>Hoplodrina ambigua</i> ([Denis & Schiffermüller], 1775)	XX	XX			P	V	det. L. Ronkay
<i>Cloantha hyperici</i> ([Denis & Schiffermüller], 1775)			1♂	2♂♂	P		
<i>Polyphaenis sericata</i> (Esper, 1787)			XX	XX	P	V	
Subfam. <b>Hadeninae</b> Guenée, 1837							
<i>Hecatera dysodea</i> ([Denis & Schiffermüller], 1775)				1♂	P		
<i>Hadena andalusica</i> (Staudinger, 1859)	X	X				V	det. L. Ronkay
<i>Hadena magnolii</i> (Boisduval, 1839)	X	XX			P	V	det. L. Ronkay
<i>Hadena wehrlii</i> Draudt, 1934				1♀	P		Fig. 23 det. P. Gyulai
<i>Mythimna l-album</i> (Linnaeus, 1767)	XX	XX	X		P	V	
<i>Pseudaletia unipuncta</i> (Haworth, 1809)			X	X	P		
Subfam. <b>Noctuinae</b> Latreille, 1809							
<i>Peridroma saucia</i> (Hübner [1808])	1♂					V	
<i>Xestia c-nigrum</i> (Linnaeus, 1758)			X	X	P	V	
<i>Euxoa</i> (Pleonectopoda) <i>nevadensis</i> Corti, 1928			1♂	2♂♂	P		Fig. 24 det. P. Gyulai
<i>Agrotis segetum</i> ([Denis & Schiffermüller], 1775)	XX	XX	X	X	P	V	
<i>Agrotis exclamationis</i> (Linnaeus, 1758)	X	X	X		P		
<i>Agrotis ipsilon</i> (Hufnagel, 1766)				1♂	P		
<i>Agrotis trux</i> (Hübner, 1824)			1♂		P		det. P. Gyulai
<i>Lycophotia erythrina</i> (Herrich-Schäffer, 1852)	XX	XX	XX	XX	P	V	



Map 1. Location of Siete Aguas / Localizarea zonei Siete Aguas



Figs. 1-24 - Habitats and Lepidoptera species

# SUPERFAMILY PAPILIONOIDEA (INSECTA: LEPIDOPTERA) IN THE ENTOMOLOGICAL COLLECTION OF NATURAL SCIENCES MUSEUM COMPLEX GALAȚI (ROMANIA)

Mihaela CRISTESCU \*

**Abstract:** In this paper we analyzed data of the diurnal Lepidoptera which belongs to the entomological collection of the Natural Sciences Museum Complex Galați. The material comes from field research made by the museum specialists between 1963-2017, in different areas, like: Galați, Vrancea, Constanța, Tulcea, Neamț, Alba and Piatra Craiului Mountains. In the present paper we investigate data for 1039 specimens from 80 species that belong to 5 families of butterflies (Superfamily Papilionoidea). This article can be a reference point to those who need to know the entomological heritage of the museum in order to use the faunistic data for further research.

**Key words:** entomological collection, Papilionoidea, Natural Sciences Museum Complex Galați.

**Rezumat:** În această lucrare au fost analizate date ale lepidopterelor diurne din colecția entomologică a Complexului Muzeal de Științele Naturii Galați. Materialul provine din cercetarea de teren realizată de către specialiștii muzeului între anii 1963-2017, în zone diferite, precum: Galați, Vrancea, Constanța, Tulcea, Neamț, Alba și Munții Piatra Craiului. În această lucrare am valorificat datele a 1039 de exemplare din 80 de specii ce aparțin la 5 familii de fluturi (Suprafamilia Papilionoidea). Acest articol poate fi un punct de referință pentru cei care au nevoie să cunoască patrimoniul entomologic al muzeului în vederea utilizării datelor faunistice pentru cercetări viitoare

**Cuvinte cheie:** colecție entomologică, Papilionoidea, Complexul Muzeal de Științele Naturii Galați.

## Introduction

The scientific heritage of the Natural Sciences Museum Complex of Galați includes more than 70.800 pieces that belong to the entomological collection. Lepidoptera Order represents 30% from the entomological collections.

The analysed species were gathered between 1963 and 2017, in different ecosystems like forests (Gârboavele Forest, Galați, Adam Forest, Galați, Rareș Forest, Galați, Buciumeni Forest, Galați, Breana Roșcani Forest, Galați, Babadag Forest, Tulcea), mountain meadows (Vrancea Mountains, Măcin Mountains, Piatra Craiului Mountains, Piatra Secuiului, Trascăului Mountains), wet meadows (Lower Prut Flood Plain, Galați, Cotu Pisicii, Danube meadow), the edge of a pond ecosystem (Cătușa Lake and Brateș Lake and Potcoava-Braniștea Pond, Galați), calcareous ecosystems (Dobrogea Keys, Constanța) and urban ecosystem (Botanical Garden, Galați).

An important part of the museum's Lepidoptera patrimony was published in 2002 (Marcu & Rákósy, 2002).

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## Material and methods

The species are presented with the data and place of collection and the number of specimens. Their name was updated according to Fauna Europaea and the protection status to all species according to "Verzeichnis der Schmetterlinge Romäniens" (Rákósy *et al.* 2003).

The species were collected during a period of 54 years in different areas like is listed in Table 1.

## Results

We analyzed 1039 specimens of butterflies from 80 species that belong to 5 families: Hesperidae Family, Papilionidae Family, Pieridae Family, Lycaenidae Family and Nymphalidae Family. The best represented is Nymphalidae Family with 463 specimens from 39 species (see in table 2).

Regarding the protection status, the species present different degrees of endangerment:

### Critical Endangered (CR):

*Tomares nogelii dobrogensis* (Caradja, 1895).

### Endangered (EN):

*Papilio machaon* (Linnaeus, 1758);



*Zerynthia polyxena* (Denis & Schiffermüller, 1775);  
*Nymphalis polychloros* (Linnaeus, 1758);  
*Phengaris teleius* (Bergsträsser, 1779);  
*Heteropterus morpheus* (Pallas, 1771);  
*Hyponephele lycaon* (Rottemburg, 1775).

**Vulnerable (VU):**

*Iphioides podalirius* (Linnaeus, 1758);  
*Pieris brassicae* (Linnaeus, 1758);  
*Colias erate* (Esper, 1805);  
*Apatura iris* (Linnaeus, 1758);  
*Apatura metis* (Freyer, 1829);  
*Argynnis pandora* (Denis & Schiffermüller, 1775);  
*Brenthis daphne* (Bergsträsser, 1780);  
*Brenthis hecate* (Denis & Schiffermüller, 1775);  
*Boloria euphrosyne* (Linnaeus, 1758);  
*Euphydryas maturna* (Linnaeus, 1758);  
*Melitaea aurelia* (Nickerl, 1850);  
*Nymphalis antiopa* (Linnaeus, 1758);  
*Hipparchia volgensis* (Mazochin-Porshnjakov, 1952);  
*Neptis sappho* (Pallas, 1771);  
*Lycaena alciphron* (Rottemburg, 1775);  
*Lycaena dispar rutila* (Werneburg, 1864);  
*Lycaena hippothoe* (Linnaeus, 1761);  
*Lycaena thersamon* (Esper, 1784);  
*Carcharodus floccifera* (Zeller, 1847).

**Near threatened (NT):**

*Parnassius mnemosyne* (Linnaeus, 1758);  
*Aporia crataegi* (Linnaeus, 1758);  
*Argynnis adippe* (Denis & Schiffermüller, 1775);  
*Argynnis paphia* (Linnaeus, 1758);  
*Melitaea athalia* (Rottemburg, 1775);  
*Melitaea phoebe* (Denis & Schiffermüller, 1775);  
*Melitaea trivialis* (Denis & Schiffermüller, 1775);  
*Aglais urticae* (Linnaeus, 1758);  
*Araschnia levana* (Linnaeus, 1758);  
*Polygonia c-album* (Linnaeus, 1758);  
*Coenonympha glycerion* (Borkhausen, 1788);  
*Erebia ligea* (Linnaeus, 1758);  
*Brintesia circe* (Fabricius, 1775);  
*Hipparchia semele* (Linnaeus, 1758);  
*Minois dryas* (Scopoli, 1763);  
*Phengaris arion* (Linnaeus, 1758);  
*Plebejus idas* (Linnaeus, 1761).

**Data Deficient (DD):**

*Hipparchia syriaca* (Staudinger, 1871);  
*Polyommatus thersites* (Cantener, 1835).

Some species are species of Community interest, protected by the European legislation (Habitats Directive, Bern Convention) and Romanian legislation (Ordin no.1198/2005) as it follows:

**Order No. 1198/2005 (Annex 3B):**

*Heteropterus morpheus* (Pallas, 1771).

**Habitats Directive:**

*Lycaena dispar rutila* - Annex 2, 3A;  
*Neptis sappho* - Annex 3B, 4B;  
*Tomares nogelii dobrogensis* - Annex 3B, 4B;  
*Lycaena hippothoe* - Annex 3B, 4B.

**Habitats Directive and Bern Convention:**

*Apatura metis* - Annex 3A, 3 B, 4A, 4B;  
*Euphydryas maturna* - Annex 2, 4A;  
*Zerynthia polyxena* - Annex 3A, 4A;  
*Parnassius mnemosyne* - Annex 3A, 4A;  
*Phengaris arion* - Annex 2, 3A, 4A;  
*Phengaris teleius* - Annex 2, 3A, 4A.

The species list is presented below:

**SUPERFAMILY PAPILIONOIDEA****FAMILY PAPILIONIDAE****Subfamily Papilioninae****Tribe Graphiini**

*Iphioides podalirius* (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 1 spec., Babadag, Tulcea, 16.VII.2001, leg. P.G. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

**Tribe Papilionini**

*Papilio machaon* (Linnaeus, 1758): 6 specs., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 1 spec., Constanța, 30.VII.1995, leg. M.A. **Protection status:** Endangered (Rákósy *et al.* 2003).

**Subfamily Parnassiinae****Tribe Luehdorfiini**

*Zerynthia polyxena* (Denis & Schiffermüller, 1775): 1 spec., Piatra Secuiului, Alba, 25.IV.2004, leg. M.M. **Protection status:** Endangered (Rákósy *et al.* 2003), Habitats Directive Annex 3A,4A, Bern Convention.

**Tribe Parnassiini**

*Parnassius mnemosyne* (Linnaeus, 1758): 1 spec., Valea Bârsei, Piatra Craiului, 25.V.2004, leg. M.M. **Protection status:** Near threatened (Rákósy *et al.* 2003), Habitats Directive Annex 3A,4A, Bern Convention.

**FAMILY PIERIDAE****Subfamily Pierinae****Tribe Anthocharini**

*Anthocharis cardamines* (Linnaeus, 1758): 1 spec., Nemțișoru, Neamț, 22.VI.2004, leg. M.M.;

1 spec., Piatra Secuiului, Alba, 25.IV.2004, leg. M.M.; 2 spec., Breana Roșcani, Galați, 13.V.2009, leg. C.M.; 1 spec., Breana Roșcani, Galați, 6.V.2009, leg. C.M.; 4 spec., Breana Roșcani, Galați, 27.IV.2010, leg. C.M.; 1 spec., Hanu Conachi, Galați, 29.IV.2010, leg. C.M.

#### Tribe Pierini

*Aporia crataegi* (Linnaeus, 1758): 2 spec., Gârboavele Forest, Galați, 5.VII.1974, leg. M.A.; 1 spec., Agapia, Neamț, 23.VI.2004, leg. M.M.

**Protection status:** Near threatened (Rákosy *et al.* 2003).

*Pieris brassicae* (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galați, 24.VII.2004, leg. M.M.; 1 spec., Galați, 25.VI.2009, leg. C.M.; 1 spec., Breana Roșcani, Galați, 27.IV.2010, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

*Pieris napi* (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galați, 8.IV.2004, leg. M.M.; 2 spec., Breana Roșcani, Galați, 15.VI.2009, leg. C.M.; 1 spec., Breana Roșcani, Galați, 10.VI.2010, leg. C.M.; 2 spec., Hanu Conachi, Galați, 31.V.2016, leg. P.M.; 2 spec., Măcin, Tulcea, 30.VI.2016, leg. C.M.

*Pieris rapae* (Linnaeus, 1758): 7 spec., Brateș, Galați, 22.IX.1965, leg. M.A.; 4 spec., Brateș, Galați, 28.IX.1965, leg. M.A.; 10 spec., Brateș, Galați, 8.IX.1966, leg. M.A.; 5 spec., Brateș, Galați, 12.IX.1966, leg. M.A.; 11 spec., Gârboavele Forest, Galați, 19.VII.1966, leg. M.A.; 4 spec., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 14.VI.1966, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 8.IX.1966, leg. M.A.; 1 spec., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M.; 1 spec., Breana Roșcani, Galați, 16.IX.2009, leg. P.M.; 1 spec., Breana Roșcani, Galați, 10.VI.2010, leg. C.M.; 1 spec., Adam Forest, Galați, 21.VI.2010, leg. C.M.

*Pontia edusa* (Fabricius, 1777): 1 spec., Gârboavele Forest, Galați, 8.IV.2004, leg. M.M.; 3 spec., Breana Roșcani, Galați, 16.IX.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 15.VII.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 25.VI.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.IX.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Ghimia, Galați, 25.VI.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Mața Rădeanu, Galați, 8.VI.2010, leg. C.M.; 3 spec., Breana Roșcani, Galați, 10.VI.2010, leg. C.M.; 1 spec.,

Cotu Pisicii, Galați, 12.IV.2012, leg. C.M.; 1 spec., Buciumeni, Galați, 27.VI.2017 leg. C.M.

#### Subfamily Coliadinae

##### Tribe Coliadini

*Colias croceus* (Fourcroy, 1785): 5 spec., Brateș, Galați, 28.IX.1965, leg. M.A.; 1 spec., Brateș, Galați, 22.IX.1965, leg. M.A.; 19 spec., Brateș, Galați, 26.X.1966, leg. M.A.; 16 spec., Brateș, Galați, 8.IX.1966, leg. M.A.; 2 spec., Brateș, Galați, 26.X.1966, leg. M.A.; 2 spec., Brateș, Galați, 12.IX.1966, leg. M.A.; 2+4 spec., Brateș, Galați, 14.XI.1967, leg. M.A.; 1 spec., Brateș, Galați, 30.IX.1968, leg. M.A.; 1 spec., Brateș, Galați, 9.X.1968, leg. M.A.; 1 spec., Brateș, Galați, 24.VII.1968, leg. M.A.; 1 spec., Mila 23, Danube Delta, 29.IX.1968, leg. M.A.; 10 spec., Gârboavele Forest, Galați, 30.IX.1969, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 1 spec., Brateș, Galați, 22.VII.1973, leg. M.A.; 2 spec., Brateș, Galați, 27.VII.1973, leg. M.A.; 1 spec., Histria, Constanța, 14.VI.2004, leg. M. M.; 1 spec., Gârboavele Forest, Galați, 14.IX.2004, leg. C.M.; 1 spec., Lower Prut Flood Plain, Ghimia, Galați, 25.VI.2009, leg. C.M.; 3 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 2 spec., Lower Prut Flood Plain, Șovârca, Galați, 27.VII.2016, leg. C.M.; 2 spec., Măcin, Tulcea, 30.VI.2016, leg. C.M.; 1 spec., Buciumeni, Galați, 27.VI.2017, leg. P.M.

*Colias erate* (Esper, 1805): 1 spec., Brateș, Galați, 26.X.1966, leg. M.A.; 5 spec., Brateș, Galați, 28.IX.1965, leg. M.A.; 4 spec., Brateș, Galați, 22.IX.1965, leg. M.A.; 1 spec., Brateș, Galați, 15.X.1968, leg. M.A.; 1 spec., Brateș, Galați, 12.IX.1966, leg. M.A.; 1 spec., Brateș, Galați, 8.IX.1966, leg. M.A.; 1 spec., Brateș, Galați, 30.IX.1968, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 15.X.1968, leg. M.A.; 2 spec., Greci, Tulcea, 15.IX.2004, leg. P. G.; 1 spec., Gârboavele Forest, Galați, 14.IX.2004, leg. C.M.; 1 spec., Breana Roșcani, Galați, 15.VI.2009, leg. C.M.; 2 spec., Breana Roșcani, Galați, 16.IX.2009, leg. C.M.; 2 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 2 spec., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.IX.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Vlădești, Galați, 18.IX.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Șovârca, Galați, 30.IX.2009, leg. C.M.; 2 spec., Lower Prut Flood Plain, Șovârca, Galați, 27.VII.2016, leg. C.M.; 2 spec., Măcin, Tulcea, 30.VI.2016, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

*Colias hyale* (Linnaeus, 1758): 1 specs., Brateș, Galați, 8.IX.1966, leg. M.A.; 1 specs., Brateș, Galați, 12.IX.1966, leg. M.A.; 3 specs., Brateș, Galați, 27.VII.1973, leg. M.A.; 1 specs., Brateș, Galați, 30.IX.1968, leg. M.A.; 6 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 14.VII.1975, leg. M.A.; 3 specs., Brateș, Galați, 11.X.1973, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 20.VII.2004, leg. M.M.; 2 specs., Hanu Conachi, Galați, 21.VII.2004, leg. M.M.

*Gonepteryx rhamni* (Linnaeus, 1758): 1 specs., Gârboavele Forest, Galați, 20.VI.1963, leg. M.A.; 5 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 34 specs., Gârboavele Forest, Galați, 6.VI.1966, leg. M.A.; 8 specs., Gârboavele Forest, Galați, 14.VI.1966, leg. M.A.; 15 specs., Gârboavele Forest, Galați, 17.VI.1967, leg. M.A.; 46 specs., Gârboavele Forest, Galați, 10.VI.1968, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 12.IV.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 23.VII.1968, leg. M.A.; 5 specs., Gârboavele Forest, Galați, 18.VI.1969, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 45 specs., Gârboavele Forest, Galați, 1.XI.1969, leg. M.A.; 5 specs., Gârboavele Forest, Galați, 22.VI.1973, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 16.VI.1975, leg. M.A.; 8 specs., Gârboavele Forest, Galați, 14.VII.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 26.VI.1975, leg. M.A.

#### Subfamily Dismorphiinae

##### Tribe Leptideini

*Leptidea sinapis* (Linnaeus, 1758): 1 specs., Vultur, Vrancea, 20.VIII.2004, leg. C.M.; 2 specs., Piatra Secuiului, Alba, 25.IV.2004, leg. M.M.; 2 specs., Breana Roșcani, Galați, 6.V.2009, leg. C.M.; 1 specs., Buciumeni Forest, Galați, 13.VI.2012, leg. C.M.; 1 specs., Breana Roșcani, Galați, 27.IV.2010, leg. C.M.; 1 specs., Hanu Conachi, Galați, 29.IV.2010, leg. C.M.; 2 specs., Adam Forest, Galați, 21.VI.2010, leg. C.M.; 2 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M.

#### FAMILY HESPERIIDAE

##### Subfamily Hesperinae

*Ochlodes sylvanus* (Esper, 1777): 5 specs., Gârboavele Forest, Galați, 6.VI.1966, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 24.VI.1968, leg. M.A.; 2 specs., Bădălan, Galați, 20.V.2012, 07.VI.2012, leg. C.M.; 1 specs. Cătușa Lake, Galați, 14.VII.1973, leg. M.A.; 1 specs. Brateș Lake, Galați, 27.V.1968, leg. M.A.

*Thymelicus lineola* (Ochsenheimer, 1808): 1 specs., Zboina-Lepșa, Vrancea, 8.VII.2009, leg. C. M.; 1 specs., Poiana Budescu-Lepșa, Vrancea, 8.VII.2009, leg. C. M.

##### Subfamily Heteropterinae

*Heteropterus morpheus* (Pallas, 1771): 2 specs., Lower Prut Flood Plain, Galați, 25.VI.2009, leg. C.M. **Protection status:** Endangered (Rákosy *et al.* 2003), Order No. 1198/2005 (Annex 3B).

##### Subfamily Pyrginae

*Carcharodus floccifera* (Zeller, 1847): 1 specs., Lower Prut Flood Plain, Galați, 25.VI.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Pochina, Galați, 4.IX.2009, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

*Erynnis tages* (Linnaeus, 1758): 1 specs., Hanu Conachi, Galați, 29.IV.2010, leg. C.M.; 1 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.

*Pyrgus malvae* (Linnaeus, 1758): 2 specs., Gârboavele Forest, Galați, 30.VII.1968, leg. M.A.

#### FAMILY LYCAENIDAE

##### Subfamily Lycaeninae

##### Tribe Lycaenini

*Lycaena alciphron* (Rottentburg, 1775): 1 specs., Funduri, Neamț, 24.VI.2004, leg. M.M.; 1 specs., Agapia, Neamț, 23.VI.2004, leg. M.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

*Lycaena dispar rutila* (Werneburg, 1864): 2 specs., Lower Prut Flood Plain, Vlădești, Galați, 27.V.2010, leg. C.M.; 1 specs., Lower Prut Flood Plain, Mața Rădeanu, Galați, 8.VI.2010, leg. C.M.; 1 specs., Lower Prut Flood Plain, Vlășcuța, Galați, 6.V.2010, leg. C.M.; 3 specs., Bădălan, Galați, 20.V.2012, leg. C.M.; 2 specs., Lower Prut Flood Plain, Vlădești, Galați, 18.IX.2009, leg. C.M.; 4 specs., Brateș, Galați, 7.IX.1987, leg. M.A. **Protection status:** Vulnerable (Rákosy *et al.* 2003), Habitats Directive Annex 2, 3A.

*Lycaena hippothoe* (Linnaeus, 1761): 2 specs., Agapia, Neamț, 23.VI.2004, leg. M.M.; 1 specs., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003), Habitats Directive Annex 3B, 4B.

*Lycaena phlaeas* (Linnaeus, 1761): 1 specs., Breana Roșcani, Galați, 19.VIII.2010, leg. C.M.; 2 specs., Lower Prut Flood Plain, Galați, 25.IV.2009, leg. C.M.; 2 specs., Lower Prut Flood Plain, Vlădești, Galați, 18.IX.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.IX.2009, leg. C.M.; 2 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 3 specs.,

Măcin, Tulcea, 30.VI.2016, leg. C.M.; 1 specs., Cerna, Măcin, Tulcea, 21.VI.2017, leg. C.M.

*Lycaena thersamon* (Esper, 1784): 1 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 2 specs., Botanical Garden, Galați, 3.V.2005, leg. P.M.; 1 specs., Grădina Botanică, Galați, 11.V.2005, leg. C.M. **Protection status:** Vulnerable (Rákossy *et al.* 2003).

### Subfamily Polyommatae

#### Tribe Polyommataini

*Aricia agestis* (Denis & Schiffermüller, 1775): 1 specs., Breana Roșcani, Galați, 13.V.2009, leg. C.M.; 1 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.

*Celastrina argiolus* (Linnaeus, 1758): 1 specs., Lower Prut Flood Plain, Galați, 25.IV.2009, leg. C.M.

*Phengaris arion* (Linnaeus, 1758): 1 specs., Buciumeni, Galați, 13.VI.2012, leg. C.M.; 1 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M. **Protection status:** Near threatened (Rákossy *et al.* 2003), Habitats Directive Annex 2, 3A, 4A, Bern Convention.

*Phengaris teleius* (Bergsträsser, 1779): 1 specs., Funduri, Neamț, 24.VI.2004, leg. M.M. **Protection status:** Endangered (Rákossy *et al.* 2003), Habitats Directive Annex 2, 4A, Bern Convention.

*Plebejus argus* (Linnaeus, 1758): 4 specs., Gârboavele Forest, Galați, 6.V.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 23.VII.1968, leg. M.A.; 1 specs., Brateș, Galați, 27.V.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.; 8 specs., Hanu Conachi, Galați, 1987, leg. M.A.

*Plebejus argyrognomon* (Bergsträsser, 1779): 1 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 23.VII.1968, leg. M.A.

*Plebejus idas* (Linnaeus, 1761): 4 specs., Valea Teilor, Tulcea, 30.VI.2017 leg. C.M. **Protection status:** Near threatened (Rákossy *et al.* 2003).

*Polyommatus bellargus* (Rottemburg, 1775): 1 specs., Gârboavele Forest, Galați, 23.VII.1966, leg. M.A.; 1 specs., Brateș, Galați, 8.IX.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 19.VII.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 30.VII.1968, leg. M.A.

*Polyommatus icarus* (Rottemburg, 1775): specs., Brateș Lake, Galați, 22.IX.1965, leg. M.A.; 4 specs., Brateș Lake, Galați, 8.IX.1966, leg. M.A.; 6 specs., Brateș Lake, Galați, 12.IX.1966, leg. M.A.; 3 specs., Gârboavele Forest, Galați,

11.VII.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 23.VII.1978, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 5.VI.1974, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 30.VII.1978, leg. M.A.; 1 specs., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M.; 1 specs., Dobrogea Keys, Constanța, 14.VI.2004, leg. M.M.; 3 specs., Agapia, Neamț, 23.VI.2004, leg. M.M.; 1 specs., Breana Roșcani, Galați, 19.VIII.2010, leg. C.M.; 1 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 1 specs., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.XI.2009, leg. C.M.; 3 specs., Adam Forest, Galați, 5.IX.2011, leg. C.M.; 1 specs., Valea Teilor, Tulcea, 30.VI.2017 leg. C.M. *Polyommatus thersites* (Cantener, 1835): 1 specs., Breana Roșcani, Galați, 15.VI.2009, leg. C.M. **Protection status:** Data Deficient (Rákossy *et al.* 2003).

### Subfamily Theclinae

#### Tribe Eumaeini

*Callophrys rubi* (Linnaeus, 1758): 3 specs., Piatra Secuiului, Alba, 25.IV.2004, leg. M.M.; 1 specs., Funduri, Neamț, 24.VI.2004, leg. M.M.; 1 specs., Valea Bârsei, Piatra Craiului, 25.V.2004, leg. M.M.

*Satyrrium acaciae* (Fabricius, 1787): 1 specs., Gârboavele Forest, Galați, 25.VI.1974, leg. M.A.

*Satyrrium ilicis* (Esper, 1779): 1 specs., Gârboavele Forest, Galați, 25.VI.1974, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 16.VI.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 5.VII.1974, leg. M.A.

*Satyrrium spini* (Denis & Schiffermüller, 1775): 3 specs., Gârboavele Forest, Galați, 26.VI.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 5.VII.1974, leg. M.A.; 1 specs., Dobrogea Keys, Constanța, 14.VI.2004, leg. M.M.; 5 specs., Breana Roșcani, Galați, 15.VI.2009, leg. C.M. **Protection status:** Near threatened (Rákossy *et al.* 2003).

#### Tribe Tomarini

*Tomares nogelii dobrogensis* (Caradja, 1895): 10 specs., Gârboavele Forest, Galați, 5.VI.1974, leg. M.A.; 3 specs., Gârboavele Forest, Galați, 16.VI.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 1.VII.1975, leg. M.A. **Protection status:** Critical Endangered (Rákossy *et al.* 2003), Habitats Directive Annex 3B, 4B.

## FAMILY NYMPHALIDAE

### Subfamily Apaturinae

#### Tribe Apaturini

*Apatura iris* (Linnaeus, 1758): 1 specs., Zboina-Lepșa, Vrancea, 23.VII.2011, leg. P. G.; 1 specs.,

Zboina-Lepșa, Vrancea, 8.VII.2009, leg. C. M.  
**Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Apatura metis* (Freyer, 1829): 3 specs., Lower Prut Flood Plain, Șivița, Galați, 25.VI.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Cotu Chiului, Galați, 12.VI.2009, leg. C.M.; 1 specs., Pietra Fetei, Tulcea, 21.VI.2017, leg. P.M.  
**Protection status:** Vulnerable (Rákósy *et al.* 2003), Habitats Directive Annex 3A, 3B, 4A, 4B, Bern Convention.

### Subfamily Heliconiinae

#### Tribe Argynnini

*Argynnis adippe* (Denis & Schiffermüller, 1775): 3 specs., Agapia, Neamț, 23.VI.2004, leg. M.M.; 1 specs., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M.; 1 specs., Funduri, Neamț, 24.VI.2004, leg. M.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Argynnis paphia* (Linnaeus, 1758): 1 specs., Babadag, Tulcea, 13.VIII.2003, leg. C.M.; 1 specs., Buciumeni Forest, Galați, 13.VI.2012, leg. C.M.; 1 specs., Poiana Budescu-Lepșa, Vrancea, 8.VII.2009, leg. C.M.; 1 specs., Cerna, Măcin, Tulcea, 21.VI.2017, leg. C.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Argynnis pandora* (Denis & Schiffermüller, 1775): 4 specs., Gârboavele Forest, Galați, 16.VI.1972, leg. M.A.; 3 specs., Hanu Conachi, Galați, 21.VII.2004, leg. M.M.; 1 specs., Breana Roșcani, Galați, 16.IX.2009, leg. C.M.; 1 specs., Hanu Conachi, Galați, 29.V.2014, leg. P.M.; 3 specs., Rareș Forest, Galați, 15.VII.2014, leg. P.M.; 1 specs., Bădălan, Galați, 07.VI.2012, leg. C.M.; 1 specs., Greci, Tulcea, 15.IX.2004, leg. C.M.; 2 specs., Hanu Conachi, Galați, 28.V.2010, leg. I.C.; 3 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 2 specs., Țuțuiatu, Măcin, 31.V.2016, leg. P.M.; 2 specs., Hanu Conachi, Galați, 31.V.2016, leg. P.M.; 4 specs., Cerna, Măcin, Tulcea, 21.VI.2017, leg. C.M. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Brenthis daphne* (Bergsträsser, 1780): 2 specs., Buciumeni, Galați, 13.VI.2012, leg. C.M. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Brenthis hecate* (Denis & Schiffermüller, 1775): 1 specs., Poiana Budescu-Lepșa, Vrancea, 8.VII.2009, leg. C. M. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Boloria dia* (Linnaeus, 1767): 1 specs., Breana Roșcani, Galați, 16.V.1975, leg. M.A.; 1 specs., Pietra Secuiului, Alba, 25.IV.2004, leg. M.M.; 2

specs., Buciumeni, Galați, 13.VI.2012, leg. C.M.; 2 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M.; 1 specs., Gârboavele Forest, Galați, 15.VI.2017, leg. P.M.

*Boloria euphrosyne* (Linnaeus, 1758): 1 specs., Funduri, Neamț, 24.VI.2004, leg. M.M.; 1 specs., Nemțșoru, Neamț, 22.VI.2004, leg. M.M. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Issoria lathonia* (Linnaeus, 1758): 2 specs., Gârboavele Forest, Galați, 6.VI.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 17.VI.1967, leg. M.A.; 7 specs., Gârboavele Forest, Galați, 15.X.1968, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 12.IV.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 14.VIII.1973, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 22.VI.1970, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 23.V.1973, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 25.VI.1974, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 10.VI.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 18.VI.1969, leg. M.A.; 1 specs., Brateș Lake, Galați, 27.V.1968, leg. M.A.; 1 specs., Brateș Lake, Galați, 11.X.1973, leg. M.A.; 2 specs., Hanu Conachi, Galați, 20.VIII.1973, leg. M.A.; 1 specs., Hanu Conachi, Galați, 23.V.1975, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 18.V.1982, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 14.VIII.1984, leg. M.A.; 1 specs., Măcin, Tulcea, 13.VI.2004, leg. M.M.; 7 specs., Gârboavele Forest, Galați, 20.VII.2004, leg. M.M.; 1 specs., Gârboavele Forest, Galați, 8.IV.2004, leg. M.M.; 2 specs., Gârboavele Forest, Galați, 14.IX.2004, leg. C.M.; 1 specs., Slava Rusă, Tulcea, 13.VI.2004, leg. M.M.; 1 specs., Hanu Conachi, Galați, 3.IX.2004, leg. P.M.; 2 specs., Breana Roșcani, Galați, 19.VIII.2010, leg. C.M.; 3 specs., Breana Roșcani, Galați, 15.VI.2009, leg. C.M.; 1 specs., Breana Roșcani, Galați, 10.VI.2010, leg. C.M.; 2 specs., Adam Forest, Galați, 21.VI.2010, leg. C.M.; 2 specs., Hanu Conachi, Galați, 29.IV.2010, leg. C.M.; 2 specs., Lower Prut Flood Plain, Cotu Chiului, Galați, 12.VI.2009, leg. C.M.; 1 specs., Bădălan, Galați, 12.IV.2012, leg. C.M.; 2 specs., Hanu Conachi, Galați, 31.V.2016, leg. P.M.; 3 specs., Măcin, Tulcea, 30.VI.2016, leg. P.M.

### Subfamily Limenitidinae

#### Tribe Limenitidini

*Neptis sappho* (Pallas, 1771): 1 spec., Breana Roșcani Forest, Galați, 10.VI.2010, leg. C.M.

**Protection status:** Vulnerable (Rákósy *et al.* 2003), Habitats Directive Annex 3B, 4B.

### Subfamily Melitaeinae

#### Tribe Melitaeini

*Euphydryas maturna* (Linnaeus, 1758): 1 spec., Breana Roșcani, Galați, 10.VI.2009, leg. C.M.

**Protection status:** Vulnerable (Rákósy *et al.* 2003), Habitats Directive Annex 2A, 4A, Bern Convention.

*Melitaea aurelia* (Nickerl, 1850): 1 spec., Gârboavele Forest, Galați, 23.V.1973, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 11.VI.1972, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 24.IX.1973, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 14.VIII.1973, leg. M.A.; 4 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Melitaea athalia* (Rottemburg, 1775): 1 spec., Poiana Budescu-Lepșa, Vrancea, 8.VII.2009, leg. C.M.; 4 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Melitaea didyma* (Esper, 1778): 1 spec., Breana Roșcani, Galați, 16.V.1976, leg. M.A.

*Melitaea phoebe* (Denis & Schiffermüller, 1775): 1 spec., Gârboavele Forest, Galați, 22.VI.1970, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 5.VI.1974, leg. M.A.; 1 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 3 specs., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.IX.2009, leg. C.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Melitaea trivia* (Denis & Schiffermüller, 1775): 5 specs., Măcin, Tulcea, 13.VI.2004, leg. M.M.; 1 spec., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A. **Protection status:** Near threatened (Rákósy *et al.* 2003).

### Subfamily Nymphalinae

#### Tribe Nymphalini

*Aglais urticae* (Linnaeus, 1758): 1 spec., Agapia, Neamț, 23.VI.2004, leg. M.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Aglais io* (Linnaeus, 1758): 1 spec., Gârboavele Forest, Galați, 15.VI.1973, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 26.VII.1975, leg. M.A.; 1 spec., Hanu Conachi, Galați, 20.VIII.1973, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 8.IV.2004, leg. M.M.; 1 spec., Zboina-Lepșa, Vrancea, 8.VII.2009, leg. C.M.

*Araschnia levana* (Linnaeus, 1758): 2 specs., Hanu Conachi, Galați, 18.VI.1977, leg. M.A.; 1 spec., Hanu Conachi, Galați, 2.VIII.1988, leg. M.A.; 4 specs., Adam Forest, Galați, 21.VI.2010,

leg. C.M.; 3 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Nymphalis antiopa* (Linnaeus, 1758): 1 spec., Lower Prut Flood Plain, Șivița, 25.VI.2009, leg. C.M.; 1 spec., Zboina, Vrancea, 30.VIII.1974, leg. M.A. **Protection status:** Vulnerable (Rákósy *et al.* 2003).

*Nymphalis polychloros* (Linnaeus, 1758): 1 spec., Greci, Măcin, Tulcea, 13.VI.2004, leg. M.M.; 1 spec., Potcoava, Braniște, Galați, 5.VI.2012, leg. C.M. **Protection status:** Endangered (Rákósy *et al.* 2003).

*Polygonia c-album* (Linnaeus, 1758): 1 spec., Breana Roșcani, Galați, 19.VIII.2010, leg. C.M.; 1 spec., Adam Forest, Galați, 27.V.2012, leg. C.M.; 1 spec., Hanu Conachi, Galați, 31.V.2016, leg. P.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Vanessa atalanta* (Linnaeus, 1758): 3 specs., Brateș Lake, Galați, 26.X.1966, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 15.X.1968, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 9.X.1968, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 1.IX.1969, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 26.VI.1975, leg. M.A.; 2 specs., Hanu Conachi, Galați, 1987, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 26.V.1975, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 20.VII.2004, leg. M.M.; 1 spec., Hanu Conachi, Galați, 29.V.2014, leg. P.M.; 1 spec., Botanical Garden, Galați, 23.VI.2016, leg. P.M.; 1 spec., Hanu Conachi, Galați, 31.V.2016, leg. P.M.; 1 spec., Buciumeni, Galați, 27.VI.2017, leg. P.M.

*Vanessa cardui* (Linnaeus, 1758): 4 specs., Brateș Lake, Galați, 8.IX.1966, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 10.VI.1968, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 1968, leg. M.A.; 1 spec., Gârboavele Forest, Galați, 30.IX.1969, leg. M.A.; 3 specs., Brateș Lake, Galați, 14.VIII.1984, leg. M.A.; 1 spec., Agapia, Neamț, 23.VI.2004, leg. M.M.; 1 spec., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M.; 1 spec., Lower Prut Flood Plain, Vlășcuța, Galați, 15.VII.2009, leg. C.M.; 1 spec., Lower Prut Flood Plain, Ghimia, Galați, 25.VI.2009, leg. C.M.

### Subfamily Satyrinae

#### Tribe Coenonymphini

*Coenonympha arcania* (Linnaeus, 1761): 5 specs., Breana Roșcani, Galați, 25.VI.2009, leg. C.M.; 3 specs., Adam Forest, Galați, 21.VI.2010, leg. C.M. *Coenonympha glycerion* (Borkhausen, 1788): 1 spec., Nemțișoru, Neamț, 22.VI.2004, leg. M.M.; 2 specs., Schitul Vovidenia, Neamț, 22.VI.2004,

leg. M.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Coenonympha pamphilus* (Linnaeus, 1758): 7 specs., Gârboavele Forest, Galați, 6.VII.1966, leg. M.A.; 7 specs., Gârboavele Forest, Galați, 30.VII.1968, leg. M.A.; 3 specs., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 5.VII.1974, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 23.VII.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 5.X.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 8.VIII.1969, leg. M.A.; 1 specs., Hanu Conachi, Galați, 21.VII.2004, leg. M.M.; 1 specs., Agapia, Neamț, 23.VI.2004, leg. M.M.; 1 specs., Schitul Vovidenia, Neamț, 22.VI.2004, leg. M.M.; 1 specs., Nemțișoru, Neamț, 22.VI.2004, leg. M.M.; 1 specs., Valea Bârsei, Piatra Craiului, 25.V.2004, leg. M.M.; 4 specs., Lower Prut Flood Plain, Șovârca, Galați, 27.VII.2016, leg. C.M.; 2 specs., Lower Prut Flood Plain, Cotu Chiului, Galați, 6.V.2010, leg. C.M.; 2 specs., Lower Prut Flood Plain, Vlășcuța, Galați, 6.V.2010, leg. C.M.; 1 specs., Breana Roșcani, Galați, 15.IX.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Mața Rădeanu, Galați, 4.IX.2009, leg. C.M.; 1 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 1 specs., Bădălan, Galați, 20.V.2012, leg. C.M.; 1 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M.

#### Tribe Elymniini

*Lasiommata megera* (Linnaeus, 1767): 1 specs., Greci, Tulcea, 16.IX.2004, leg. P.G.; 2 specs., Breana-Roșcani, Galați, 6.V.2009, 16.IX.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Șovârca, Galați, 30.IX.2009, leg. C.M.; 1 specs., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 2 specs., Botanical Garden, Galați, 3.V.2005, leg. P.M.; 1 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 2 specs., Măcin, Tulcea, 30.VI.2016, leg. C.M.; 1 specs., Adam Forest, Galați, 5.IX.2011, leg. C.M.

#### Tribe Erebiini

*Erebia ligea* (Linnaeus, 1758): 6 specs., Lepșa, Vrancea, 8.VII.2009, leg. C. M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

#### Tribe Maniolini

*Aphantopus hyperantus* (Linnaeus, 1758): 5 specs., Poiana Budescu-Lepșa, Vrancea, 8.VII.2009, leg. C. M.

*Hyponephele lycaon* (Rottemburg, 1775): 10 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 3 specs., Gârboavele Forest, Galați,

23.VII.1968, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 24.VI.1968, leg. M.A.; 3 specs., Gârboavele Forest, Galați, 14.VII.1969, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 18.VI.1969, leg. M.A.; 3 specs., Gârboavele Forest, Galați, 7.VII.1969, leg. M.A.; 2 specs., Gârboavele Forest, Galați, 24.IX.1973, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 14.VIII.1973, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A. **Protection status:** Endangered (Rákósy *et al.* 2003).

*Maniola jurtina* (Linnaeus, 1758): 1 specs., Gârboavele Forest, Galați, 27.VII.1970, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 24.IX.1973, leg. M.A.; 3 specs., Gârboavele Forest, Galați, 5.VI.1974, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 16.V.1975, leg. M.A.; 1 specs., Breana-Roșcani, Galați, 16.V.1975, leg. M.A.; 1 specs., Dobrogea Keys, Constanța, 14.VI.2004, leg. M.M.; 1 specs., Slava Rusă, Tulcea, 13.VI.2004, leg. M.M.; 5 specs., Breana Roșcani, Galați, 15.VI.2009, leg. C.M.; 3 specs., Breana Roșcani, Galați, 19.VIII.2010, leg. C.M.; 1 specs., Breana Roșcani, Galați, 10.VI.2010, leg. C.M.; 6 specs., Adam Forest, Galați, 22.VI.2010, leg. C.M.; 1 specs., Adam Forest, Galați, 25.VIII.2010, leg. C.M.; 3 specs., Adam Forest, Galați, 21.VI.2010, leg. C.M.; 2 specs., Lower Prut Flood Plain, Galați, 25.VI.2009, leg. C.M.; 2 specs., Lower Prut Flood Plain, Vlășcuța, Galați, 16.VII.2009, leg. C.M.; 2 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M.; 2 specs., Gârboavele Forest, Galați, 15.VI.2017, leg. P.M.; 3 specs., Cerna, Măcin, Tulcea, 21.VI.2017, leg. C.M.

#### Tribe Melanargiini

*Melanargia galathea* (Linnaeus, 1758): 16 specs., Gârboavele Forest, Galați, 6.VI.1966, leg. M.A.; 1 specs., Gârboavele Forest, Galați, 12.VII.1966, leg. M.A.; 19 specs., Gârboavele Forest, Galați, 7.VII.1969, leg. M.A.; 30 specs., Gârboavele Forest, Galați, 5.VII.1974, leg. M.A.; 9 specs., Gârboavele Forest, Galați, 26.VII.1975, leg. M.A.; 4 specs., Gârboavele Forest, Galați, 16.VI.1975, leg. M.A.; 6 specs., Gârboavele Forest, Galați, 11.VII.1975, leg. M.A.; 3 specs., Buciumeni, Galați, 27.VI.2017, leg. C.M.

#### Tribe Satyrini

*Brintesia circe* (Fabricius, 1775): 1 specs., Cerna, Măcin, Tulcea, 21.VI.2017, leg. P.M. **Protection status:** Near threatened (Rákósy *et al.* 2003).

*Hipparchia semele* (Linnaeus, 1758): 5 specs., Greci, Măcin, Tulcea, 13.VI.2004, leg. M.M.; 2 specs., Slava Rusă, Tulcea, 13.VI.2004, leg. M.M.

**Protection status:** Near threatened (Rákosy *et al.* 2003).

*Hipparchia syriaca* (Staudinger, 1871): 2 specs., Greci, Măcin, Tulcea, 13.VI.2004, leg. M.M.; 1 specs., Greci, Măcin, Tulcea, 15.IX.2004, leg. P.G.; 4 specs., Țuțuiatu, Măcin, 30.VI.2016, leg. C.M. **Protection status:** Data Deficient (Rákosy *et al.* 2003).

*Hipparchia volgensis* (Mazochin-Porshnjakov, 1952): 1 specs., Cerna, 6.VI.2005, leg. C.M. **Protection status:** Vulnerable (Rákosy *et al.* 2003).

*Minois dryas* (Scopoli, 1763): 10 specs., Hanu Conachi, Galați, 16.VII.1984, leg. M.A.; 1 specs., Letea, Tulcea, 27.VII.2004, leg. M.A. **Protection status:** Near threatened (Rákosy *et al.* 2003).

### Conclusions

Most of the species had been collected in various ecosystems from Galați, during a long period of time, 54 years and reflects the butterfly fauna of this part of the country. The oldest record is *Gonepteryx rhamni* (Linnaeus, 1758) collected at

Gârboavele Forest, Galați, 1963. There were investigated different types of ecosystems within Galați county, like: forest edges, wet meadows, the edge of a pond ecosystem and urban ecosystems and were recorded 60 species of butterflies.

The other species have been identified on the territory of other counties like: Tulcea, Vrancea, Alba, Neamț.

Within Gârboavele Forest, Galați there was a population of *Tomares nogelii dobrogensis* (Caradja, 1895), that is currently considered extinct. In the entomological collection of the museum there are some specimens collected during the years 1974 and 1975 by the museum specialists and also other specimens included in "Vladimir Olaru" entomological collection that come from the same place and were collected during the years 1970, 1971 and 1972 (Marcu, Rákosy, 2002).

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\*\*\*Ordinul nr. 1.198/25 noiembrie 2005, pentru actualizarea Anexelor nr. 2, 3, 4, 5 la O.U.G. nr. 236/2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și faunei sălbatice.

\*\*\*Bern Convention - Convention for the conservation of wildlife and natural habitats in Europe adopted at Bern on 19 September 1979.



**LIST OF ILLUSTRATIONS**

**Tab. 1** The list of the investigated areas and the period of study (The following abbreviations were used; leg. C.M.: Cristescu Mihaela; leg. M.M: Mihai Mihaela; leg. P.G: Patriche Gabriela; leg. P.M: Popescu Mariana; leg. M.A.: Marcu Aurora; leg. I.C. Irincu Carmen)

**Tab. 2** Distribution of specimens by families

**LISTA ILUSTRĂȚILOR**

**Tab. 1** Lista zonelor investigate și perioada de studiu (următoarele prescurtări au fost utilizate: (leg. C.M.: Cristescu Mihaela; leg. M.M: Mihai Mihaela; leg. P.G: Patriche Gabriela; leg. P.M: Popescu Mariana; leg. M.A.: Marcu Aurora; leg. I.C. Irincu Carmen)

**Tab. 2** Distribuția pe familii a speciemenelor

**Table 1.** The list of the investigated areas and the period of study

Crt. no	Investigated area	County	Years of investigation	Leg.
1	Gârboavele Forest	Galați	1963, 1966, 1967, 1968, 1969, 1970, 1972, 1973, 1974, 1975, 1978, 1982, 1984, 2004, 2017	M.A., M.M., P.M.
2	Brateș Lake	Galați	1965, 1966, 1967, 1968, 1973, 1987, 1973, 1975, 1984	M.A.
3	Mila 23	Danube Delta	1968	M.A.
4	Cătușa Lake	Galați	1973	M.A.
5	Hanu Conachi	Galați	1973, 1977, 1984, 1987, 1988, 2004, 2010, 2014, 2016	M.A., M.M., P.M., I.C.,C.M.
6	Zboina-Lepșa	Vrancea	1974, 2009, 2011	M.A.,C.M., P.G.
7	Breana Roșcani	Galați	1975,1976,2009, 2010	M.A.,C.M.,P.M.
8	Constanța	Constanța	1995	M.A.
9	Babadag	Tulcea	2001, 2003	P.G., C.M.
10	Piatra Secuiului	Alba	2004	M.M.
11	Valea Bârsei	Piatra Craiului Mts	2004	M.M.
12	Nemțișoru	Neamț	2004	M.M.

13	Schitul Vovidenia	Neamț	2004	M.M.
14	Funduri	Neamț	2004	M.M.
15	Agapia	Neamț	2004	M.M.
16	Vulturu	Vrancea	2004	C.M.
17	Dobrogea Keys	Constanța	2004	M.M.
18	Histria	Constanța	2004	C.M.
19	Greci	Tulcea	2004	P.G., M.M.
20	Slava Rusă	Tulcea	2004	M.M.
21	Letea	Tulcea	2004	M.A.
22	Slava Rusă	Tulcea	2004	MM.
23	Botanical Garden	Galați	2005 ,2016	P.M.
24	Cerna	Tulcea	2005, 2017	C.M., P.M.
25	Galați	Galați	2009	C.M.
26	Lower Prut Flood Plain (Pochina, Șivița, Cotu Chiului, Vlășcuța, Mața Rădeanu, Ghimia, Șovârca, Vlădești)	Galați	2009, 2010,2016	C.M.
27	Poiana Budescu-Lepșa	Vrancea	2009	C.M.
28	Lepșa	Vrancea	2009	C.M.
29	Adam Forest	Galați	2010, 2011	C.M.
30	Potcoava, Braniștea	Galați	2012	C.M.
31	Bădălan	Galați	2012	C.M.
32	Cotu Pisicii	Galați	2012	C.M.
33	Buciumeni	Galați	2012, 2017	C.M., P.M.
34	Rareș Forest	Galați	2014	P.M.
35	Măcin	Tulcea	2016	C.M., P.M.
36	Țuțuiatu	Tulcea	2016	C.M., P.M.
37	Valea Teilor	Tulcea	2017	C.M.
38	Piatra Fetei	Tulcea	2017	P.M.

**Table 2. Distribution of specimens by families**

<b>Crt. no</b>	<b>Family</b>	<b>Number subfamilies</b>	<b>Number of species</b>	<b>Number of specimens</b>
1	Hesperiidae Family	3	6	21
2	Papilionidae Family	2	4	11
3	Pieridae Family	3	11	413
4	Lycaenidae Family	3	20	131
5	Nymphalidae Family	6	39	463
<b>TOTAL</b>			<b>80</b>	<b>1039</b>

# UPDATED DISTRIBUTION OF THE VELVETY TREE ANT *LIOMETOPUM MICROCEPHALUM* (PANZER, 1798) (HYMENOPTERA: FORMICIDAE) IN ROMANIA

Ioan TĂUȘAN \*

**Abstract.** The genus *Liometopum* Mayr, 1861 (Formicidae: Dolichoderinae) includes more than 700 extant species. Amongst them, *Liometopum microcephalum* (Panzer, 1798) has an ecological importance and a major step in understanding its biology and ecology is by knowing its distribution. The present paper aims to highlight insights regarding the distribution of the rare velvety tree ant *Liometopum microcephalum* in Romania, based on both published data and new records.

**Keywords:** ants, oak, arboricolous species, new records, faunistics.

**Rezumat.** Genul *Liometopum* Mayr, 1861 (Formicidae : Dolichoderinae), include peste 700 de specii. Printre ele se numără și *Liometopum microcephalum* (Panzer, 1798), care prezintă o importanță ecologică deosebită, iar un pas important în înțelegerea biologiei și ecologiei speciei este prin cunoașterea distribuției acesteia. Astfel, în prezenta lucrare oferim date privind distribuția speciei arboricole *Liometopum microcephalum* în România, pe baza datelor existente și a semnalărilor noi.

**Cuvinte cheie:** furnici, stejar, specii arboricole, noi semnalări, faunistică.

## Introduction

The genus *Liometopum* Mayr, 1861 belongs to the subfamily Dolichoderinae, which includes 707 extant species in 28 genera, 134 fossil species and 20 fossil genera (Bolton 2016). The genus *Liometopum* is generally considered to be a rather ancient one (Petráková, 2016). Only seven extant species of the genus *Liometopum* are considered valid: *Liometopum apiculatum* Mayr, 1870, *L. lindgreeni* Forel, 1902, *L. luctuosum* Wheeler, 1905, *L. microcephalum* (Panzer, 1798), *L. occidentale* Emery, 1895 and *L. sinense* Wheeler, 1921. The remaining species (20) are recognized as fossil ones (Del Toro *et al.* 2009; Bolton 2016; Petráková, 2016).

In Romania, the Dolichoderinae subfamily is represented by five species: *Dolichoderus quadripunctatus* (Linnaeus, 1771), *Tapinoma erraticum* Latreille, 1798, *T. subboreale* Seifert, 2012, *Bothriomyrmex corsicus* Santschi, 1923 (Seifert 2012a; 2012b). In addition, only one *Liometopum* species is present, namely *L. microcephalum* (Markó *et al.* 2006).

*L. microcephalum* is considered to be a rare arboricolous ant, having a Pontomediterranean distribution in Europe and the Middle East (Petráková, Schlaghamerský 2011).

However, there are many aspects of the species' biology that remain unknown due to its scattered occurrence and bad nest accessibility (Petráková, Schlaghamerský, 2011).

Thus, the species possess ecological importance and a major step in understanding its biology, behaviour and ecology is knowing its distribution.

No detailed information about the distribution of *L. microcephalum* in Romania has been published so far. In the present study we give an updated distribution of *L. microcephalum* in Romania.

## Ecology

*Liometopum microcephalum* is a thermophilous ant being strictly associated with large trees, occurring both in forests as well as in open areas (Makarevich 2003). We encountered the species also in younger forests where no large trees were available. All in all, we observed the species only on oak (Fig. 1).

The species forms large, sometimes polydomous, colonies of high ecological importance and behavioural dominance within ant communities (Petráková, Schlaghamerský 2011).

According to Petráková, Schlaghamerský (2011) *L. microcephalum* is a dominant species. Its territories are defended by aggressive workers against other ants, affecting the distribution and structure of invertebrate communities (Petráková, Schlaghamerský 2011).

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They are predators with very good visual orientation (preying on Hexapoda, Myriapoda, Araneae, Lumbricidae), scavengers, and tending aphids (Makarevich 2003, Schlaghamerský *et al.* 2013). Mating occurs from May to July (Seifert 2007).

### Material

We analysed the available literature on the occurrence of *Liometopum microcephalum* in Romania. In addition, unpublished records are given in the present study. All the data are compiled in a map. The material presented as new records is deposited in the personal collection of Ioan Tăușan.

### Distribution

The species is known from several locations. In Transylvania Gallé *et al.* (2005) collected specimens from Secusigiu (Arad County), Markó (2008) collected the species from Foieni (Satu Mare County). Petráková (2016) has recorded the species from Tășnad (Satu Mare County) and from Bihor County. Also, a report from 2016 gives a record of the species from Huseni (Sălaj County). In Moldova, there is only one record of the species, from Galați (Cârdei, Bulimar 1965). In the southern part, records from Comana Vlasca (Montandon, Santschi 1910) and Târgu Jiu

(Petráková 2016) are currently known. From Dobrogea, the record from Oltina (Constanța County) is until now the only record from this region.

In addition, we found the species in other regions in Romania. In Dobrogea, we collected specimens from Techirgiol, Cerna, Enisala (Tulcea County) Furnica and Esehioi (Constanța County). From Banat, specimens were collected from Satchinez (Timiș County).

A detailed map of all the data is given in Fig. 2. Based on our data, it seems that the species avoids the mountain area, preferring only the lower regions, being distributed from west to east as a belt around the mountain area. It is very likely that the species is more common, than the data shows.

### Acknowledgments

I would like to thank the following friends and colleagues who provided locations for *Liometopum microcephalum*: Ionuț Ștefan Iorgu, Liviu Moscaliuc, Alexandru Pıntilioaie and Cosmin Turceanu. Alex Rădac is acknowledged for his help with the distribution map. Last but not least, I am grateful for the usefull comments of Sergiu Török, which improved the manuscript.

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**Fig. 1.** Habitat of *Liometopum microcephalum* in Enisala Forest (Dobrogea)

**Fig. 2.** Known distribution of *Liometopum microcephalum* in Romania (black circles – new records; white squares – published data)

## LISTA ILUSTRĂȚILOR

**Fig. 1.** Habitatul speciei *Liometopum microcephalum* în Pădurea Enisala (Dobrogea)

**Fig. 2.** Distribuția cunoscută a speciei *Liometopum microcephalum* în România (cercuri negre – semnalări noi; pătrate albe – date publicate)



Fig. 1 Habitat of *Liometopum microcephalum* in Enisala Forest (Dobrogea) (photo: I. Ş. Iorgu)

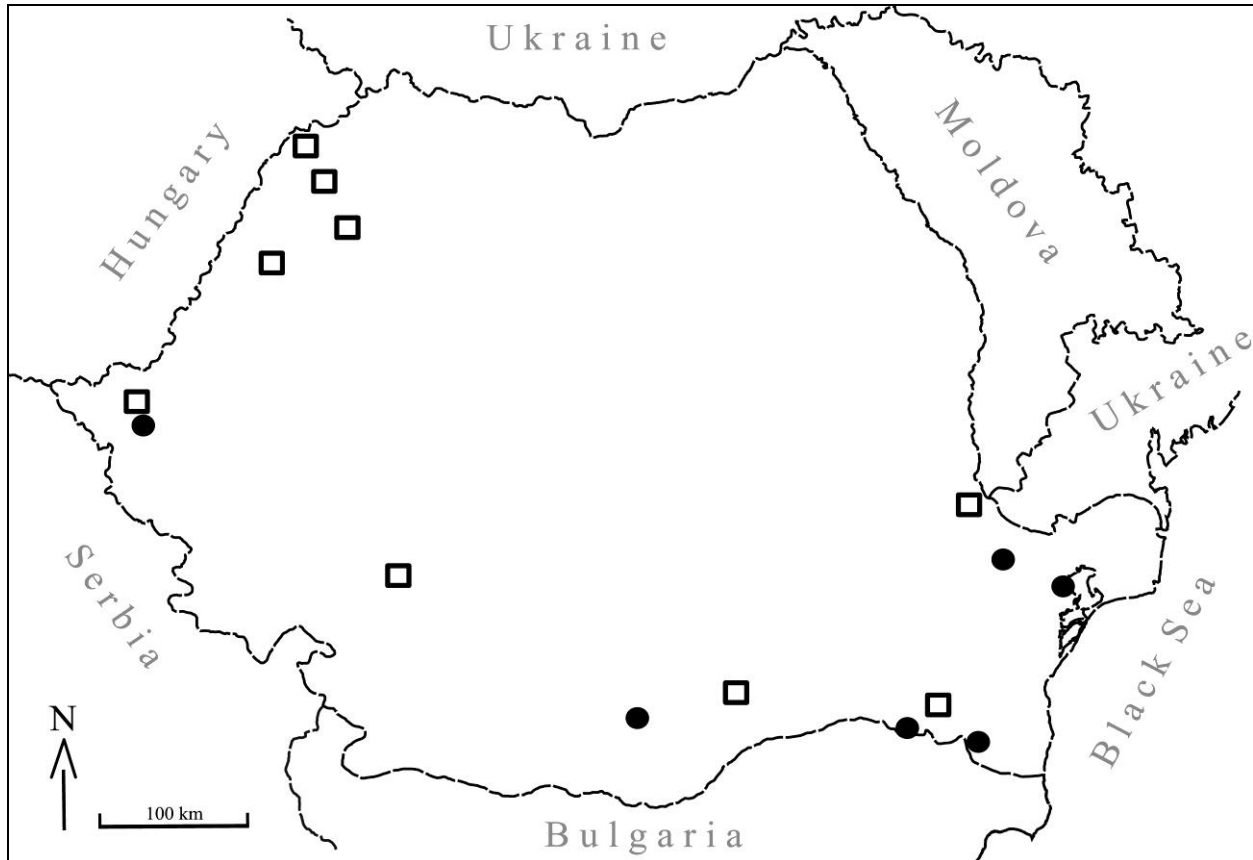


Fig. 2 Known distribution of *Liometopum microcephalum* in Romania (black circles – new records; white squares – published data)

# AQUATIC AND SEMIAQUATIC BUGS (HETEROPTERA: NEPOMORPHA, GERROMORPHA) OF SFÂNTA ANA VOLCANIC LAKE AND MOHOȘ OLIGOTROPHIC SWAMP (HARGHITA, ROMANIA)

Alexandra FLORIAN \*

**Abstract.** Nine species included in six genera, and five families are recorded from Sfânta Ana volcanic lake and Mohoș oligotrophic swamp. *Ilyocoris cimicoides cimicoides* Linnaeus, 1758, *Notonecta glauca glauca* Linnaeus, 1758, *N. viridis* Delcourt, 1909, *Hebrus pusillus* (Fallén, 1807), and *Microvelia reticulata* (Burmeister, 1835) are here recorded for the first time from Harghita County.

**Key words.** True bugs, Sfânta Ana, Mohoș, volcanic lake, oligotrophic swamp, Carpathians.

**Rezumat.** Nouă specii, cuprinse în șase genuri și cinci familii sunt semnalate în premieră din Lacul Sfânta Ana și Tinovul Mohoș. *Ilyocoris cimicoides cimicoides* Linnaeus, 1758, *Notonecta glauca glauca* Linnaeus, 1758, *N. viridis* Delcourt, 1909, *Hebrus pusillus* (Fallén, 1807) și *Microvelia reticulata* (Burmeister, 1835) sunt semnalate în premieră din județul Harghita.

**Cuvinte cheie.** Ploșnițe, Sfânta Ana, Mohoș, lac vulcanic, mlaștină oligotrofă, Carpați.

## Introduction

Aquatic and semiaquatic bugs of the suborder Heteroptera (Nepomorpha, Gerromorpha) are known to occur in a wide variety of habitats from streams to lakes, ponds, swamps, while a minor part of them are adapted to marine life (Andersen 1982; Polhemus, Polhemus 2008).

Twelve families, with 24 genera and about 70 species are known to occur nowadays in Romania (Paina 1975; Davideanu 1999; Berchi 2011, 2013; Berchi, Kment 2015; Berchi *et al.* 2012, 2016; Kment *et al.* 2016; Berchi *et al.* 2018).

The focus area of this study is represented by two volcanic calderas from Ciumatul Massif (central part of Harghita Mountains – eastern Carpathians), one almost completely silted hosting an oligotrophic swamp – Tinovul Mohoș (Fig. 1), and the other partially silted, hosting the Sfânta Ana Lake (Fig. 2). Both are exclusively fueled through rainfalls; therefore, mineralization degree of the water is low for this reason (Szakács, Seghedi 1995; Frunzeti, Baciú 2012; Karátson *et al.* 2013).

The aim of this paper is to provide a preliminary list of aquatic bugs, from this unique ecosystem in Romania.

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## Material and methods

Material has been collected in August 2017 from both Sfânta Ana volcanic lake and Mohoș oligotrophic swamp. Specimens were sampled along the shores of the target habitats by using an entomological net with a 500 μm mesh. To identify specimens, the works of Poisson (1957), Tamanini (1979), and Soós *et al.* (2009) have been used. The system and nomenclature follow Aukema & Rieger (1995). Whenever needed, males were dissected for an accurate identification. Specimens are preserved in ethanol 97%, in the private collection of the author (Cluj-Napoca, Romania).

Details on the sampling sites (name, type of habitat, geographical coordinates, altitude, date, collector, collection): Sfânta Ana: volcanic lake, 46.13598°N 25.90148°E, 951 m a.s.l., 11.viii.2017, leg. & det. A. Florian; Tinovul Mohoș: oligotrophic swamp, 46.13608°N 25.90153°E, 1045 m a.s.l., 11.viii.2017, leg. & det. A. Florian.

Abbreviations used for the wing morphs: ap = apterous, br = brachypterous, ma = macropterous.

## Results and discussion

In total, 27 specimens were collected. They belong to five families, six genera, and nine species as shown in Table 1.



The distribution of the backswimmers (Notonectidae), water crickets (Veliidae), water treaders (Mesoveliidae), water striders or pond skaters (Gerridae), and velvet water bugs (Hebridae) has been recently revised in Romania (Berchi 2013; Berchi, Kment 2015; Berchi *et al.* 2016, 2018; Kment *et al.* 2016).

However, *Ilyocoris cimicoides cimicoides* Linnaeus, 1758, *Notonecta glauca glauca* Linnaeus, 1758, *N. viridis* Delcourt, 1909, *Hebrus pusillus* (Fallén, 1807), and *Microvelia reticulata* (Burmeister, 1835) are here recorded for the first time from Harghita County.

Nevertheless, the family Corixidae was not yet addressed recently, although represents the largest group within the aquatic and semiaquatic bugs (Nepomorpha, Gerromorpha) of Romania, comprising about 25 taxa (Micronectidae not included) (cf. Paina 1975; Davideanu 1999). Some of the corixids have single records, therefore their occurrence in our country is in need of confirmation. It is the case of *Glaenocoris propinqua propinqua* Fieber, 1860, known in Romania only from Sfânta Ana Lake, in Harghita County (cf. Horváth 1897; Szilády 1904; Popescu-Gorj, Costea 1961; Soós 1963). I did not

succeed to find this taxon during my research in the area. *G. p. propinqua* is recorded in the neighboring countries only in Ukraine, in the L'vov and Sumy provinces (cf. Putshkov, Putshkov 1996). Future research is thus needed to confirm the occurrence of this taxon in Romania.

Other taxa that have been recorded in the past from Sfânta Ana Lake are *Aquarius paludum paludum* (Fabricius, 1794) and *Gerris lacustris* (Linnaeus, 1758) (both Gerridae) (cf. Benedek, 1970; Paina, 1975; Davideanu, 1999). Both species were also collected during this study. No taxa have been recorded in the past from Mohoş oligotrophic swamp.

Thus, the taxa found in Sfânta Ana Lake and Mohoş oligotrophic swamp are mostly common, but future research is needed in order to have a clear picture about the water bug fauna composition of these unique habitats in Romania.

#### Acknowledgements

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**Fig. 1.** Mohoș oligotrophic swamp

**Fig. 2.** Sfânta Ana Lake

**Tab. 1** List of taxa and material examined from Sfânta Ana volcanic lake and Mohoș oligotrophic swamp, and the bibliographic records (I—Horváth 1897; II—Szilády 1904; III—Popescu-Gorj, Costea 1961; IV—Soós 1963; V—Benedek 1970). For details on the sampling sites see material and methods.

### LISTA ILUSTRĂȚILOR

**Fig. 1** Tinovul Mohoș

**Fig. 2** Lacul Sfânta Ana

**Tab. 1** Lista taxonilor și a materialului analizat din Lacul vulcanic Sfânta Ana și mlaștina oligotrofă Mohoș și semnalările bibliografice (I—Horváth 1897; II—Szilády 1904; III—Popescu-Gorj, Costea 1961; IV—Soós 1963; V—Benedek 1970). Pentru detalii, a se vedea stațiile de colectare din secțiunea material și metodă.



**Fig. 1.** Mohoș oligotrophic swamp



**Fig. 2.** Sfânta Ana Lake

**Tab. 1.** List of taxa and material examined from Sfânta Ana volcanic lake and Mohoş oligotrophic swamp, and the bibliographic records (I—Horváth 1897; II—Szilády 1904; III—Popescu-Gorj, Costea 1961; IV—Soós 1963; V—Benedek 1970). For details on the sampling sites see material and methods.

Taxa	Sfânta Ana	Mohoş	References
Infraorder NEPOMORPHA Popov, 1968			
Family CORIXIDAE Leach, 1815			
Genus <i>Glaenocorisa</i> Thomson, 1869			
? <i>Glaenocorisa propinqua propinqua</i> Fieber, 1860	–	–	I, II, III, IV.
Family NAUCORIDAE Leach, 1815			
Genus <i>Ilyocoris</i> Stål, 1861			
<i>Ilyocoris cimicoides cimicoides</i> Linnaeus, 1758	2 larvae	–	–
Family NOTONECTIDAE Latreille, 1802			
Genus <i>Notonecta</i> Linnaeus, 1758			
<i>Notonecta glauca glauca</i> Linnaeus, 1758	–	1 ♂ 1 ♀	–
<i>Notonecta viridis</i> Delcourt, 1909	–	1 ♂ 1 ♀	–
Infraorder GERROMORPHA Popov, 1971			
Family HEBRIDAE Amyot & Serville, 1843			
Genus <i>Hebrus</i> Curtis, 1833			
<i>Hebrus pusillus</i> (Fallén, 1807)	1 ♀ (ma)	–	–

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Family VELIIDAE Brullé, 1836			
Genus <i>Microvelia</i> Westwood, 1834			
<i>Microvelia reticulata</i> (Burmeister, 1835)	3 ♂♂ 1 ♀ (ap)	1 ♀ (ap)	–

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Family GERRIDAE Leach, 1815			
Genus <i>Aquarius</i> Schellenberg, 1800			
<i>Aquarius paludum paludum</i> (Fabricius, 1794)	1 ♂ (ma) 1 ♂ 1 ♀ (br)	–	V.
Genus <i>Gerris</i> Fabricius, 1794			
<i>Gerris lacustris</i> (Linnaeus, 1758)	–	1 ♀ (br)	V.
<i>Gerris odontogaster</i> (Zetterstedt, 1828)	1 ♂ (ma) 1 ♂ 1 ♀ (mi)	4 ♂♂ 1 ♀ (ma)	–
<i>Gerris thoracicus</i> Schummel, 1832	–	1 ♂ 2 ♀♀ (ma)	–

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# DISTRIBUTION OF *DROBACIA BANATICA* (ROSSMÄSSLER, 1838) OVER TIME AND SPACE (GASTROPODA: STYLOMMATOPHORA: HELICIDAE)

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**Abstract:** Fossil and living distributional data of the protected and Natura 2000 indicator species land snail *Drobacia banatica* were collected from museum and private collections and literature. Several new extant localities, and a new and important fossil record (Súgó/Șugău Cave, Harghita County, Romania) are reported. We concluded that *Drobacia banatica* is a relict species which were distributed in the Miocene and Pleistocene in a much wider area than today. In the last 100–150 years we have no evidence to state that the number of populations declines, although some populations surely became extinct along with the human spreading. Therefore, as a characteristic and relatively well-known Carpathian species, it should be protected in all countries where it occurs.

**Key words:** Natura 2000 indicator species, protected species, relict, distribution.

**Rezumat:** Datele referitoare la distribuția actuală și a formelor fosile ale speciei indicatoare Natura 2000 *Drobacia banatica*, au fost centralizate din colecții muzeale și particulare precum și din literatură. Sunt raportate câteva localități noi pentru distribuția actuală a speciei și o nouă locație fosilă importantă (Peștera Șugău, Județul Harghita). Din datele analizate reiese faptul că *Drobacia banatica* este o specie relictă care ocupa în Miocen și Pleistocen un areal mult mai larg decât actual. În ultimii 100-150 de ani nu există dovezi care să demonstreze declinul numeric al populațiilor, cu toate că, unele populații au dispărut în mod cert ca urmare a dezvoltării așezărilor umane. Ca urmare, în calitate de specie carpatică caracteristică și relativ bine cunoscută, aceasta ar trebui protejată în toate țările în care este prezentă.

**Cuvinte cheie:** Specie indicatoare Natura 2000, specie protejată, relict, distribuție

## Introduction

*Drobacia banatica* (Rossmässler, 1838) (Fig. 1) is a large bodied land snail species which belongs to

the helicid subfamily Ariantinae (Schileyko 2013, Groenenberg *et al.* 2016). It is a protected species in Ukraine, Hungary and Romania, and it is a Natura 2000 indicator species in the European Union (both Annex II and Annex IV). Moreover, this species is assessed as Critically Endangered for the entire Carpathians (Witkowski *et al.* 2003) and officially protected in Ukraine (Shcherbak 1994, Akimov 2009) with recent assess as Endangered by IUCN criteria on the national level (Balashov 2016). The latest IUCN report (Falkner *et al.* 2013) evaluated the species as DD (Data Deficient) because the species' population size, population trend and distribution are unknown. *Drobacia maeotica* is also evaluated as DD due to the uncertain systematic position (Páll-Gergely 2011). The aim of the present paper is to compile all available locality information (both fossil and recent) of the species and present a

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complete distribution map of *Drobacia banatica* based on private and museum collections and literature. Based on these, we aim to evaluate the trends in terms of extent of the distributional area over time of *Drobacia banatica*.

#### Systematic position

Two living species have been assigned to the genus *Drobacia* Brusina 1904, namely *D. banatica* and *D. maeotica* Wenz, 1926 by former authors. The latter species have originally been described as a Maeotian (late Miocene) fossil taxon from southern Romania (Jud. Prahova, Isvorul Chirului S of Vai de El [= Tătaru], and valley W of Fundui lui Stan S of Tisa). Lupu (1966) identified the specimens collected at Sfîna de Vale (Apuseni Mountains) with *D. maeotica*. Grossu (1983) verified the validity of the two species based on the morphology of their genital anatomy, and named the differences in their shells as the follows: *Drobacia banatica*: shell rounded-discoid, large, 24–30 mm; *D. maeotica*: shell rounded, spire more elevated, diameter reaches 24 mm. However, there are intermediate forms between the two species (Lengyel, Páll-Gergely 2010), and the shell shape becomes more rounded in correlation with the decrease of the diameter (Domokos, 2016). Therefore, *Drobacia maeotica* is considered as a synonym of *D. banatica* in some recent publications (e.g. Welter-Schultes 2012, Domokos 2016).

In the phylogeny of Groenenberg *et al.* (2016) *Drobacia banatica* and *D. cf. maeotica* were handled as two distinct species. One specimen of each "species" were used for molecular analysis, namely a *D. banatica* from "Rumania, Brasov, Bran", and a *D. maeotica* from "Rumania, Komitat Bihor, Stana de Vale". The two specimens are relatively divergent in terms of molecular sequences, and the estimated divergence between the two specimens were 8.7–7.8 MYA. However, the limited number of specimens is insufficient to understand whether the two morphological forms truly represents two species, or *D. banatica* is just an old species with high intraspecific diversity. For sake of simplicity and the lack of extensive molecular and anatomical data, we rely on the overlapping morphometric information of the shells, and handle all of our distribution data to a single species, *Drobacia banatica*. Thus, *Drobacia* is a monotypic species having no close relatives. *Drobacia* formed a single clade with the genera *Delphinatia* P. Hesse, 1931 and *Vidoviccia* Brusina, 1904, and the most recent common ancestor of

these genera might have lived 59.1–53.3 MYA years ago (Groenenberg *et al.* 2016).

Some of the fossil records of this species were published under the name *Helix canthensis* Beyrich, 1854 until Kormos (1909) synonymized it with *Helix banatica*.

#### Materials and Methods

The preparation of the geodata and the creation of the map was carried out using an open source QGIS program (<https://qgis.org>). When creating the map, the following data were used: borders of countries, rivers and seas — Natural Earth data, source relief data — ETOPO1 (Amante, Eakins 2009). In order to produce the most complete distribution map of *Drobacia banatica*, we examined all relevant museum collections, but data of some private collection have also been examined and their data were used. One of the authors (T. Deli) observed living specimens and shells at several places in Hungary without collecting them. In those cases we marked the observer as "observed by" instead of "leg". We list locality data according to countries, and group them into counties in Romania and Hungary. Because many label data are not precise enough, we list the samples of the SMF and the NHMS separately. The written information on labels are in most cases copied here without translation. For the material from NHMS the current name of the localities is used, instead of the original Hungarian name or the German translation most often found on the labels, in order to simplify their identification on the map. In the case of the labels that specify only the locality name, without any other detail, the localities centre is marked on the map.

We also performed a literature survey, especially in case of fossil data. While producing the map, we distinguished specimen data collected after and before 1950. Specimens from old collections were mainly housed by the NHMS and mainly due to exchanges, by the SMF. We also used information for the literature; Hungary (Bielz 1867, Bába 1969, Gaskó 1999, Domokos 1992, Fintha *et al.* 1993, Domokos 2001, Pintér, Suara 2004, Domokos *et al.* 2005, Deli, Farkas 2006, Deli 2007); Slovakia (Šteffek 2007), Romania (Kimakowicz 1890, Wagner 1941, 1942, 1943, Bába, Kovács 1975, Bába, Kondorossy 1995, Domokos, Vánca 2006, Domokos, Deli 2007, Vánca 2007, Varga, Mészáros 1999, Fehér *et al.* 2008, Domokos, Lennert 2007, 2009, Domokos *et al.* 2010, Lengyel, Páll-Gergely 2010, Cameron *et*

al. 2011, Gheoca 2015, Eröss, Ardelean 2017), Ukraine (Baidashnikov 1985, 1989, Shcherbak 1994, Akimov 2009, Balashov, Gural-Sverlova 2012, Balashov 2016). Information on the distribution during the Tertiary and the Quaternary were gained mainly from the following publications: Germany (Wolterstorff 1896, Zeißler 1958, 1967); Ukraine (Kunitsa 1969, Łomnicki 1886); Czech Republic and Slovakia (Babor 1904, Kormos 1911, Petrbok 1922, Ložek 1954, 1963, 1971); Hungary (Sümegehy 1923, Soós 1932, 1934, 1943, Krolopp 1964, 1970, 1985, Domokos 1986, Hír 1988, 1989, Domokos *et al.* 1989, Jánossy, Krolopp 1994, Fűköh *et al.* 1995); Poland (Beyrich 1854, Geppert 1854, Stworzewicz 1981, Alexandrowicz, Alexandrowicz 2010), Austria (Döppes, Rabeder 1996); Romania (Kormos 1909, Gaál 1910, Krejci, Wenz 1926, Wenz 1942, Marinescu 1974).

#### Abbreviations

AV: Private collection of A. Varga, Gyöngyöshalász (Hungary)  
 DOT: Private collection (after 2004) of T. Domokos, Békéscsaba (Hungary)  
 GHV: Private collection of V. Gheoca, Sibiu (Romania)  
 GYH: Private collection of H. Gyurkovics, Szeged (Hungary)  
 MÁFI (currently MGSZ): Mining and Geological Survey of Hungary (Budapest, Hungary)  
 HNHM: Hungarian Natural History Museum, Budapest (Hungary)  
 IZAN: I.I. Schmalhausen Institute of Zoology of National Academy of Sciences of Ukraine (Kiev, Ukraine)  
 MMGY: Mátra Museum, Gyöngyös (Hungary)  
 MMB: Munkácsy Mihály Museum, Békéscsaba (Hungary)  
 NHMS: Natural History Museum, Sibiu (Romania)  
 NHMSB: Collection of the Transylvanian Society for Natural Sciences (Bielz Collection) in the Natural History Museum, Sibiu (Romania)  
 NHMSK: Kimakowicz collection in the Natural History Museum, Sibiu (Romania)  
 PÁM: Mollusca Collection of the Pásztoi Múzeum, Pásztó (Hungary)  
 PGB: Collection Barna Páll-Gergely, Mosonmagyaróvár (Hungary)  
 SMF: Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main (Germany)  
 SNHM: State Natural History Museum of National Academy of Sciences of Ukraine (Lvov, Ukraine)

TMM: Tarisznyás Márton Múzeum/Muzeul Tarisznyás Márton (Gheorgheni, Romania)  
 ZIN: Zoological Institute of Russian Academy of Sciences (Saint-Petersburg, Russia)  
 ZMMU: Zoological Museum of Moscow University (Russia)

## Results

### Recent localities

#### ROMANIA

**Alba county:** ► Trascău Mts., Rimetea (2 km N of the settlement), deposit of the Rimetea stream, leg. Sarkadi, 11.08.2006., DOT/4; ► Trascău Mts., Rimetea, Piatra Secuiului, leaf litter in a beech (*Fagus*) forest, leg. Domokos, 26.07.1995., MMB 00806/4; ► Trascău Mts., Rimetea, north slope of hill Ciblok, on both side of a little stream (~ 5 km from the settlement), leg. Domokos, 10.07.2014., DOT/5; ► Rimetea, Salas, humid leaf litter in a beech (*Fagus*) forest, 1 km W of the settlement, 750 m asl, leg. Domokos, 10.07.2014., DOT/6; ► Bihorului Mts., Gârda de Sus, Ghețarul de la Scărișoara, west-facing side of depression, rock vegetation, leg. Domokos, 05.04.2007., DOT/16; ► Same data, 25.4.2010., DOT/24; ► Bihorului Mts., Gârda de Sus, Ordâncușa gorge, rock vegetation, leg. Domokos, 07.10.1984., MMB 00796/2; ► Trascău Mts., Rimetea, 1 km W of the settlement, humid leaf litter, leg. Domokos, 15.06.2009., DOT/6; ► Bihorului Mts., Vanvuțești, Cascada Vârciorog, rocks covered by bramble (*Rubus*), leg. Domokos, 05.11.2010., DOT/3; ► Colțești, open and shady biotope on both sides of the stream, 4 km from settlement, at the intersection of red tourist mark and the stream, 700 m asl, leg. Domokos, 15.06.2009., DOT/5; ► Colțești, near to the bridge of the Snowy stream (~3 km from settlement), alder spot on either stream side with march-vegetation, leg. Domokos, 15.06.2009., DOT/1; ► Trascău Mts., Cheile Caprei, 46°8'34.4"N, 23°16'54.12"E, leg. Gheoca, 20.05.2015, GHV/5; ► Bihorului Mts., Cheile Ordâncușei, leg. Sîrbu, 23.09.2005, GHV/1; ► Bihorului Mts., Cheile Ordâncușei, 46°28'23.15"N, 22°50'50.32" E, leg. Gheoca, 23.05.2014, GHV/7; ► Bihorului Mts., Lunșoara Valley, leg. Sîrbu, 24.09.2005, GHV/; ► Bihorului Mts., Gârda de Sus, Ghețarul de la Scărișoara, near the entrance of the cave, leg. Gheoca, 24.05.2014, GHV/2; ► Alba county, between Șugag and Vîrtoape, left sidebrook of Sebeș River, 45°42'12.7", 23°35'20.7", 725 m, leg. T. Kovács & G. Magos, 09.11.2014, MMGY 74598.



**Arad county:** ► Codru-Moma Mts., Moneasa, Moneasa Quarry (red Jurassic limestone), grassy biotope, leg. Papp, 21.08.2005., DOT/1; ► Codru-Moma Mts., Moneasa, downhill from the public baths, leg. Domokos, 22.07.1984., MMMB 00794/14; ► Codru-Moma Mts., Moneasa, stone wall behind the Moneasa Hotel, leg. Domokos, 06.10.1984., MMMB 00795/3; ► Codru-Moma Mts., Dezna, deposit of the stream Moneasa near the bridge, leg. Domokos, 01.10.2005., DOT/5; ► Arad, Strada Tóth Sándor, deposit of the Mureş River at its right bank, leg. Domokos, 02.10.2005., DOT/1; ► Zarándului Mts., Cladova, north of the settlement, leaf litter in an oak (*Quercus*) forest, leg. Domokos, 10.06.2006., DOT/1; ► Codru-Moma Mts., Vidra, north of the settlement, stony bank of the stream Tăcăşele, leg. Domokos, 03.07.2006., DOT/6; ► Codru-Moma Mts., Moneasa (5 km NW), Vf. Izoi (peak), leaf litter of beech (*Fagus*), 1098 m asl, leg. Domokos, 24.09.2006., DOT/1; ► Codru-Moma Mts., Moneasa, Liliecilor Cave, red Jurassic limestone, leaf litter (*Tilia*, *Fagus*, *Acer*), leg. Domokos, 24.09.2006., DOT/4; ► Codru-Moma Mts., Botfei, near Cantonul Botfei, bank of the Botfei stream, leg. Domokos, 04.09.2004., MMMB 00827/9; ► Codru-Moma Mts., Groşeni, near Groşeni stream, leaf litter, leg. Domokos, Lennert, 05.09.2004., MMMB 00826/2; ► Codru-Moma Mts., Hăşmaş, near Hăşmaş stream, leaf litter, leg. Domokos, Lennert, 05.09.2004., MMMB 00829/18; ► Codru-Moma Mts., Urvişu de Beliu, bank of the Urviş stream, leg. Domokos, 05.09.2004., MMMB 00828/8; ► Codru-Moma Mts., Prunişor, Valea Nouă, 5.5 km from settlement, leg. Domokos, 05.09.2004., MMMB 00825/4; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, ruins of the castle chapel, rock vegetation, leg. Domokos, 10.06.2006., DOT/22; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, rock vegetation exposed to northeast, leg. Domokos, 30.09.2006., DOT/17; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, rock vegetation in the castle ruin (chapel), leg. Domokos, 06.09.2008., DOT/5; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, shady, west side, leg. Domokos, 08.10.2010., DOT/1; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, rock vegetation of the castle ruins, leg. Domokos, 07.04.2012., DOT/8; ► Zarándului Mts., Lipova-Şoimoş, Cetatea Şoimoş, ruins of the castle, north part of the moat, granite rocks with cool microclimate, leg. Domokos, Kovács T.J., 01.07.2013., DOT/24; ► Zarándului Mts., Lipova-Şoimoş, Cetate Şoimoş, south part of the castle wall, rock vegetation, leg. Domokos, 16.03.2007.,

DOT/6; ► Zarándului Mts., Obârşia, near county border, beech forest, leg. Domokos, 07.03.2007., DOT/1; ► above Obârşia (1.9 km W of Arad-Hunedoara board), forest clearing (*Corylus*), 700 m asl, leg. Deli, Domokos, 07.03.2007., MMMB 90864/1; ► Zarándului Mts., 0.5 km S Păiuşeni, near the stream, *Sambucus-Phyllitis* vegetation, leg. Deli, Domokos, Lennert, 22.04.2007., MMMB 91008/1; ► Zarándului Mts., Păiuşeni, 3 km south of the settlement, beech (*Fagus*) forest, leg. Domokos, 02.04.2007., DOT/8; ► Zarándului Mts., Păiuşeni, 2 km S of the settlement, side valley and hillside, leg. Domokos, 02.04.2007., DOT/1; ► Zarándului Mts., between Chisinda and Păiuşeni (3 km from Chisinda), alder (*Alnus*) vegetation along the Chisinda stream, leg. Domokos, 02.04.2007., DOT/2; ► Zarándului Mts., Păiuşeni, north of the settlement, shrubby side of the unpaved road, leg. Domokos, 02.04.2007., DOT/1; ► Zarándului Mts., Joia Mare, 2 km W of the settlement, hill slope covered by hornbeam (*Corylus*) leaf litter, leg. Domokos, 10.05.2007., DOT/1; ► Pecica, Lunca Mureşului Natural Parc, north-east of Bezdin Monastery, flood area, gallery forest, leg. Vánca, 20–26.07.2000., MMMB 00853/1; ► Same area, MMMB 00859/1; ► Same area, MMMB 00844/1; ► Pecica, Pădurea Popinilor, west side of the Valea Sălca (Nr.8), leg. Domokos, 30.06.2004., MMMB 00822/1; ► Zădăreni, Lunca Mureşului Natural Parc, forest-part (oak) Nr. 33, near mortlake, leg. Domokos, 29.06.2004., MMMB 00820/29; ► 1 km W of Zam, flotsam deposit of the Almaş stream, leg. Deli, Páll-Gergely, 19.04.2010., MMMB 91670/3; ► 2 km E of Pojoga, leg. Deli, 21.04.2009., MMMB 92325/11; ► between Pojoga and Căprioara (7 km SE Săvârşin), in gorge-forest, 120 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 15.04.2007., MMMB 91043/3; ► Same area, leg. Deli, 12.06.2007., MMMB 90813/7; ► between Pojoga and Căprioara (7 km SE Săvârşin), in rocky-forest (*Tilia-Fraxinus*), 120 m asl, leg. Deli, 12.06.2007., MMMB 92400/2; ► Bodrogu Vechi, Ciala forest, oak forest, leg. Domokos, 30.06.2004., MMMB 00821/7; ► Căprioara (SE Săvârşin), near Duţu cave, 120 m, leg. Deli, Domokos, Páll-Gergely, Subai, 15.04.2007., MMMB 91042/4; ► Pădurea Craiului Mts., Şuncuiuş, Valea Mişidului, leg. Vánca, 26.05.2002., MMMB 00815/4; ► Zarándului Mts., 2.5 km S Păiuşeni, beech (*Fagus*) forest, leg. Deli, Domokos, Lennert, 22.04.2007., MMMB 91028/6; ► Zarándului Mts., 7 km S Buteni, old beech (*Fagus*) forest, leg. Deli, Domokos, Lennert, 22.04.2007., MMMB 91001/2;

►Zarandului Mts., Groșii Noi, Groșu stream, beech (*Fagus*) forest, leg. Domokos, 26.05.2005., MMB 00835/4; ►Zarandului Mts., Groșii Noi, Natural Reserve, Bârzava, leaf litter (beech, locust), leg. Domokos, 26.05.2002., MMB 00814/2; ►Zarandului Mts., Săvârșin, alder habitat in the side of Troaș book in the vicinity of castle, leg. Domokos, 06.06.2002., MMB 00816/2; ►Zarandului Mts., Troaș, left bank of the Cătălini stream, leg. Domokos, 27.05.2005., MMB 00837/1; ►Zarandului Mts., Troaș, left side of the Cătălini stream, leg. Domokos, 07.06.2002., MMB 00813/1; ►Zarandului Mts., Troaș, mossy cliff in the Tisa valley, near of the sign 35 km, leg. Domokos, 07.06.2002., MMB 00809/2; ►Zarandului Mts., Troaș, Tisa valley, near km stone 35, leg. Domokos, 07.06.2002., MMB 00811/2; ►Zarandului Mts., Troaș, Valea Pietroasa, floating deposit near the bridge of the Galsa stream, leg. Domokos, 27.05.2005., MMB 00836/10; ►Zarandului Mts., Troaș, valley of the Troaș stream, leg. Domokos, 25.05.2005., MMB 00834/2; ►Zarandului Mts., Troaș, *Alnus* forest near the km stone 20 on both sides of Tisa river, leg. Domokos, 07.06.2002., MMB 00812/3; ►Zarandului Mts., Troaș, deposit of the Pietroasa stream before it confluence with the Cătălinii stream, leg. Domokos, 07.06.2002., MMB 00810/2; ►Sânpetru German, Bezdin, flood plain, leg. Domokos, 30.06.2004., MMB 00823/5; ►Sânpetru German, Bezdin, pits within embankment, leg. Domokos, 01.07.2004., MMB 00824/4; ►Cenad, Lunca Mureșului, *Salix* gallery forest, 46°7'47.56"N, 20°37'29.79" E, leg. Gheoca, 15.06.2015, GHV/6; ►Zarandului Mts., Valea Troaș, *Fagus* forest, 46°6'58.42"N, 22°18'9.78" E, leg. Gheoca, 16.06.2015, GHV/6.

**Argeș county:** ►Făgăraș Mts., Curtea de Argeș 30 km N, Valea Lui Stan, 855 m asl, leg. Danyik, Deli, Páll-Gergely, 12.07.2013., MMB 00334/1; ►Făgăraș Mts., Curtea de Argeș, mixed forest near Vidraru Lake Gheoca, 16.06.2014, GHV/1; ►Făgăraș Mts., Cheile Dâmbovicioarei, forest with *Acer pseudoplatanus* leg. Gheoca, 16.06.2016, GHV/1.

**Bihar county:** ►Codru-Moma Mts., Briheni (1 km E of the settlement), bridge near the junction with the road, leg. Domokos, 03.06.2006., DOT/1; ►Codru-Moma Mts., base of the rock wall above the karstic spring, leg. Domokos, 24.09.2006., DOT/2; ►Codru-Moma Mts., Borz, base of the rock wall above the karstic spring, leg. Domokos,

17.08.1990., MMB 00804/15; ►Codru-Moma Mts., near Borz, limestone cliffs, leg. Deli, Domokos, Lennert, 25.03.2009., MMB 90948/3, DOT/3; ►Plopișului Mts., Aleșd, close to the road No.1H (9.6 km from Aleșd), side valley, leg. Domokos, 28.05.2007., DOT/4; ►Bihorulului Mts., Pietroasa, Stațiunea Boga, near Peștera Dracului, humid leaf litter, leg. Domokos, 01.12.2009., DOT/5; ►Bihorulului Mts., Pietroasa, Valea Bulzului, Pietra Bulzului, south-facing cliff, shady biotope with humid leaf litter, leg. Domokos, 01.12.2009., DOT/2; ►Bihorulului Mts., Pietroasa, Bulz stream, shrubby streamside, leg. Domokos, 10.06.2007., DOT/1; ►Bihorulului Mts., Pietroasa, Valea Boghii, leg. Domokos, Megyesi, 21.09.1997., MMB 00808/2; ►Bihorulului Mts., Pietroasa, Stațiunea Boga, close by Cascada Oșelu, leg. Sarkadi, August 2008., DOT/6; ►Apuseni Mts., near Boga (E of Beius), Bulz-cliff, limestone rocks, leg. Deli, Domokos, 30.11.2009, MMB 92042/1; ►Bihar, Mts Galbena Gorge (Cheile Galbenes) S of Boga, 700 m. alt, leg. T. Pócs, 10.09.2006, VA; ►Bihorulului Mts., Cheile Someșului Cald, Cetățile Rădesei, leg. Domokos, 12.06.2007., DOT/35; ►Cheile Someșului Cald, Cetățile Rădesei, rock vegetation, leg. Csák, August 1994, MMB 00805/1; ►Bihorulului Mts., Cheile Someșului Cald, leg. Domokos T., 11.09.2004., MMB 00830/4; ►Bihorulului Mts., Zona Padiș, gorge east from Cabana Cetățile Ponorului, leaf litter, leg. Domokos, 12.06.2007., DOT/2; ►Bihorulului Mts., Cetățile Ponorului, rock vegetation, beech and pine trees, leg. Domokos, May 1985, MMB 00799/43; ►Bihorulului Mts., Cetățile Ponorului, rock vegetation, leg. Domokos, 22.09.1987., MMB 00807/2; ►Bihorulului Mts., Zona Padiș, Cetățile Ponorului, rock vegetation, leg. Domokosné, 18.05.1984., MMB 00792/2; ►Bihorulului Mts., Zona Padiș, Valea Brădețanului, leaf litter in beech forest, leg. Domokos, 12.06.2007., DOT/7; ►Bihorulului Mts., Zona Padiș, Izbuc Ponor, hill-side looking north-east, leg. Domokos, 13.06.2007., DOT/3; ►Bihorulului Mts., Zona Padiș, Valea Brădețanului (0.5 km N of the Izbuc Ponor), left side of the stream, leg. Domokos, 13.06.2007., DOT/4; ►Bihorulului Mts., Sighiștel, Cheile Sighiștelului, close to the first cave, rock vegetation, leg. Domokos, 29.09.2007., DOT/7; ►Bihar, V. Sighiștel (Kisszegyesdi-völgy), leg. T. Pócs, 24.06.2004, VA; ►Bihorulului Mts., Pasul Vârtoș, 1140 m asl, dell to Groapa Ruginoasa, leg. Domokos, 29.09.2007., DOT/1; ►Pădurea Craiului Mts., Stâna de Vale, left side of the Valea

Iadului, leg. Domokos, 24.02.2008., DOT/1; ►Bihorului Mts., Stâna de Vale, in the environment of the Cascada Iadului (water fall), leg. Domokos, 07.06.1986., MMB 00801/3; ►Stâna de Vale, Valea Iada, left bank of the Iada stream between Cascada Iadolina and the quarry, leg. Domokos, 19.05.1984., MMB 00793/30; ►Bihorului Mts., Stâna de Vale, Cascada Iadului, leg. Domokos T., 07.06.1986., MMB 70813/2; ►Bihorului Mts., Stâna de Vale, Valea Iadului, leg. Domokos, 29.05.2005., MMB 00838/8; ►Plopişului Mts., Cuişd, 500 m SE from Cuişd, 5.2 km from the junction Țigăneştii de Criş, in direction of Lugaşu de Sus, deposit and shells collected from the right side of the stream, leg. Domokos, 08.07.2008., DOT/4; ►Plopişului Mts., Cetea, south of the settlement, near the bridge, green corridor of the Cetea stream, leg. Lennert, 13.07.2008., LJ/2; ►Plopişului Mts., Aleşd, base of the rock wall (cavernous limestone) under the ruins of the Cetatea Şinteului, leg. Domokos, 13.07.2008., DOT/2; ►Plopişului Mts., Aleşd, near Cetatea Şinteului, both sides of the Secătura stream, 13.07.2008., DOT/3; ►Codru Moma Mts., between Uileacu de Beiuş and Şuncuiş, base of mountain near the Crişul Negru, cavernous limestone, leg. Domokos, 25.03.2009., DOT/2; ►Codru-Moma Mts., left side of Crişul Negru, between Şuncuiş and Finiş, limestone cliffs in the beech (*Fagus*) forest, leg. Deli, Domokos, Lennert, 25.03.2009., MMB 90919/8; ►Bihorului Mts., Chişcău, rock-glacier near ramp of the Peştră Urşilor, leg. Domokos, 09.04.2009., DOT/5; ►Pădurea Craiului Mts., Meziad, Valea Peşterii, rock wall at the end of the gorge (ca. 100 m northwards and southwards from the bridge) leg. Domokos, 04.05.2009., DOT/1; ►Pădurea Craiului Mts., Meziad, Valea Peşterii, Peştera Meziad, 297 m asl, leaf litter, leg. Domokos, 04.05.2009., DOT/1; ►Pădurea Craiului Mts., Meziad (3 km E from Meziad), near to the left side of the Meziad stream, leg. Domokos, 04.05.2009., DOT/1; ►Pădurea Craiului Mts., Meziad, in front of the Cave Meziad, leg. Domokos, 05.05.1984, MMB 00791/2; ►Pădurea Craiului Mts., Meziad, near to Cave Meziad, leg. Domokos, October 1983, MMB 00790/2; ►Pădurea Craiului Mts., Meziad, Valea Iadului, 2 km north of Cascada Iadolina (waterfall) close by the bridge, leg. Domokos, 09.07.2009., DOT/1; ►Pădurea Craiului Mts., Sohodol (3 km from the church of the settlement) green corridor of the Sohodol stream, stream deposit, leg. Domokos, 05.05.2009., DOT/6; ►Pădurea Craiului Mts., Culmea Beiuşele, between Căbeşti and Sohodol,

rocks on the left side of the Sohodol stream, leg. Domokos, 05.05.2009., DOT/1; ►Remetea, left side of the Roşia stream near the football field, 5 m wide green corridor, leg. Domokos, 05.05.2009., DOT/2; ►Pădurea Craiului Mts., Roşia (300 m far south from the water mill), green corridor (5–3 m wide Alnetum gallery forest), leg. Domokos, 06.05.2009., DOT/2; ►Pădurea Craiului Mts., Luncasprie, Peştera Topliţa, rocks close to the karst spring, leg. Domokos, 06.05.2009., DOT/8; ►Pădurea Craiului Mts., Luncasprie, Cheile Vida in the vicinity of the Lake Vida, leg. Domokos, Domokosné, Márkus, 22.05.1983., MMB 00788/16; ►Pădurea Craiului Mts., Luncasprie, Cheile Vida, near to Sifoanelor cave, leg. Domokos, Domokosné, Márkus, 22.05.1983., MMB 00787/4; ►Pădurea Craiului Mts., Luncasprie, Cheile Vida, rocks on left side of the Vida stream., leg. Lennert, 27.09.2009., LJ/4; ►Pădurea Craiului Mts., Luncasprie, Cheile Vida, rock vegetation and deposit close to Peştera Sifoanelor, 260 m asl, leg. Domokos, 27.09.2009., DOT/3; ►Pădurea Craiului Mts., Leşu, Valea Iadului (Leşu recreation area), cliffs near to the blue triangle tourist mark, on the left side of the Iad stream opposite to Valea Guga, leg. Domokos, 09.07.2009., DOT/4; ►Pădurea Craiului Mts., Remeţi-Poiană, Valea Leşului, Peştera cu apa, rock glacier, leg. Domokos, 09.07.2009., DOT/3; ►Pădurea Craiului Mts., Remeţi, Valea Boţii (500 m from the paved road DJ 108 J), limestone quarry with rock vegetation, leg. Domokos, 09.07.2009., DOT/1; ►Pădurea Craiului Mts., Munteni, of the Iad stream, shady green corridor, leg. Domokos, 10.07.2009., DOT/2; ►Pădurea Craiului Mts., Lorău, Valea Boiului (100 m northwest from the Cascada Boiului), stream deposit, Domokos, 10.07.2009., DOT/6; ►Pădurea Craiului Mts., Lorău, Valea Boiului, rocks and beech leaf litter at the base of the rock wall (500 m northwest from the Cascada Boiului), leg. Domokos, 10.07.2009., DOT/6; ►Pădurea Craiului Mts., Bratca, Valea Arsura (4.3 km north from settlement), travertine, leaf litter (beech, walnut) on the right side of the Arsura stream, leg. Domokos, 10.07.2009., DOT/1; ►Pădurea Craiului Mts., Bratca, Izbuţ Brăţcanilor, leaf litter, leg. Domokos, 11.07.2009., DOT/2; ►Pădurea Craiului Mts., Birtin, south from the settlement, leg. Domokos, 11.07.2009., DOT/7; ►Pădurea Craiului Mts., Roşia (Țarina), north from Peştera Ciur Izbuţ, rock outcrop next to the unpaved road towards Poniţa, leg. Domokos, 11.07.2009., DOT/1; ►Pădurea Craiului Mts., Cornet (3.7 km from the settlement), near to a

sharp curve of the road DJ 764, leaf litter of beech forest, leg. Domokos, 12.07.2009., DOT/2; ►Pădurea Craiului Mts., Vârciorog, rocks on the right side of the Topa stream at the sharp curve of the stream situated south from the settlement, leg. Domokos, 12.07.2009., DOT/1; ►Pădurea Craiului Mts., Vârciorog, Valea Topa, cliffs facing to the Peștera Mică de sub Stan, 290 m asl, leg. Domokos, 26.09.2009., DOT/3; ►Pădurea Craiului Mts., Vârciorog (2.7 km south from Șermas, parting of the ways, Alnetum gallery forest on the left side of the Vârciorogul stream, leg. Domokos, 26.09.2009., DOT/1; ►Pădurea Craiului Mts., Zece Hotare, Prislop (750 m southeast from Chicera Buglei) 784 m asl, beech (*Fagus*) forest along the road DJ 764, leg. Domokos, 26.09.2009., DOT/1; ►Pădurea Craiului Mts., Cotiglet, Valea Satului, at the bridge of the road no. DC 197, 200 m asl, sandy and shady slope on the right side of the stream, leg. Domokos, 27.09.2009., DOT/3; ►Pădurea Craiului Mts., Șuncuiuș, Peștera Napișteleu, base of the rock wall, leg. Domokos, 28.10.2010., DOT/1; ►Pădurea Craiului Mts., Șuncuiuș, cliffs over the karst spring (Izvor Izbândiș), leaf litter of beech (*Fagus*), leg. Domokos, 11.07.2009., DOT/4; ►Pădurea Craiului Mts., Șuncuiuș, gorge near Peștera Ungurului, leg. Deli, Domokos, 07.07.2005., MMB 00839/13; ►Pădurea Craiului Mts., Șuncuiuș, near Crișul Repede, rocks with *Pinus sylvestris* vegetation, leg. Bata, Danyik, Deli, 11.04.2011., MMB 92638/3; ►Pădurea Craiului Mts., Șuncuiuș, valley of the Crișul Repede, under shrubs, leg. Deli, Domokos, 08.07.2005., MMB 00841/2; ►Pădurea Craiului Mts., Șuncuiuș, valley of the Mișid stream, near stream, Alnetum gallery forest, leg. Deli, Domokos, 08.07.2005., MMB 00842/1; ►Pădurea Craiului Mts., Șuncuiuș, rocks close to the path between Peștera Ungurului and Bălnaca, leg. Domokos, 13.05.2011., DOT/1; ►Codru-Moma Mts., Șuncuiuș, Mare Valley (2 km south from the settlement), stream deposit, leg. Domokos, 04.06.2006., DOT/1; ►Pădurea Craiului Mts., between Șuncuiuș and Bălnaca, 3 m high bank on the right side of the Crișul Repede, leg. Domokos, 08.11.2014., DOT/2; ►Pădurea Craiului Mts., between Vadu Crișului and Șuncuiuș, at the second railway tunnel, shady rocks, leg. Domokos, 13.05.2011., DOT/2; ►Pădurea Craiului Mts., Vadu Crișului, Defileul Crișului Repede, in gorge close to the first tunnel, leg. Domokos, 23.07.1982., MMB 00789/2; ►Same area, leg. Deli, Domokos, 07.07.2005., MMB 00840/8; ►Bihorului Mts., Giulești,

Valea Seacă at inflow of the Țiganul stream, base of the rock wall with beech (*Fagus*) leaf litter, leg. Domokos, 06.11.2010., DOT/1; ►Bihorului Mts., Giulești, Valea Luncoșoara, vegetation along the Galbena river, leg. Domokos, 06.11.2010., DOT/10; ►Pădurea Craiului Mts., Vadu Crișului, Defileul Crișului Repede, in gorge, leg. Kovács, 1975, MMB 00786/1; ►Pădurea Craiului Mts., flood plain (Salicetum, Alnetum) of the Crișul Repede near the junction of the road and the railway, leg. Domokos, 08.11.2014., DOT/1; ►Bihorului Mts., Gârda de Sus, Cheile Ordâncușei, rocks, leg. Domokos, May 1985, MMB 00800/1; ►Bihorului Mts., Valea Ordâncușa, streamside, leg. Deli, Fehér, 22.07.2005., MMB 00843/1; ►Bihorului Mts., Zona Padiș, Cheile Galbenei, leg. Domokos, 12.09.2004., MMB 00831/6; ►Romania, Piatra Galbenei, Bihar-hg., leg. Domokos MÁFI R.5707/1; ►Codru-Moma Mts., Șoimi, along the Șoimi stream, leaf litter, leg. Domokos, 04.09.2004., MMB 00832/5; ►Codru-Moma Mts., Șoimi, Alnetum on the left side of the Șoimi stream, leg. Deli, Domokos, 04.09.2004., MMB 00833/6; ►Pădurea Craiului Mts., Bălnaca-Groși, rocks in front of the Peștera Moanei, leg. Domokos, 18.04.2004., MMB 00818/2; ►Pădurea Craiului Mts., Bălnaca-Groși, rock wall outside of the Peștera Moanei, leaf litter, leg. Domokos, 18.04.2004., MMB 00819/1; ►Râpa, stony part of Pusta stream, steam deposit, leg. Csák, Domokos, 18.08.1990., MMB 00803/2; ►Uileacu de Beius, Valea of Imam stream, near the quarry, leaf litter, leg. Csák, Domokos, 17.08.1990., MMB 00802/30; ►Oradea, Băile 1 Mai, vashíd ("iron bridge"), leg. Perjési, 23.05.1984., HNHM 19793/1; ►Oradea, Băile 1 Mai, leg. Drimmer, 23.04.1984., coll. Perjési, MGY 68086/1; ►Criștioru de Jos, around the Izvorul lui Valer, leg. Kovács, Gy., 07.10.1984., HNHM 69960/2; ►Defileul Crișului Repede, 46°52'55"N, 22°31'6" E, leg. Gheoca, 17.07.2015, GHV/20; ►The nature reserve Pârâul Peștea, near the lake and along the river, 47°0'38"N, 21°58'38"E, leg. Gheoca, Popescu, 22.09.2015, GHV/5; ►Bihorului Mts., Peștera Porțile Bihorului, near the cave, beech forest, 46°30'4.86"N, 22°37'27.84" E, leg. Sîrbu, 23.09.2005, GHV/1; ►Bihorului Mts., Cheile Someșului Cald, *Fagus* forest with pine trees, 46°37'59.27"N, 22°42'47.92" E, leg. Gheoca, 29.07.2009, GHV/3; ►Bihorului Mts., Cetățile Rădesei, *Fagus* forest, 46°37'45.47"N, 22°42'32.73" E, leg. Gheoca, 28.07.2009, GHV/3; ►Betfia, Sânmartin, 46°57'54.51"N, 22°2'5.503"

E, leg. Gheoca, 22.09.2015, GHV/1; ►Tășad, near the cave, 46°55'33.53"N, 22° 8'22.92"E, leg. Gheoca, 23.09.2015, GHV/1; ► Jud. Bihor, Királyhágó (Bucea), stream bank, 580 m a.s.l., leg. Eröss, 18.06.1986; ► Jud. Bihor, 1 km W of Bucea: beech forest, leg. Eröss, 11.08.2002.

**Brașov county:** ►Cheile Râșnoavei, between Râșnov and Pârâul Rece, 760 m asl, leg. Danyik, Deli, Páll-Gergely, 14.07.2013., MMB 00266/1; ►Perșani Mts., Valea Bogata, roadside (43 km), Alnetum, leg. Deli, Domokos, Kóra, 22.06.2006., MMB 90174/1; ►Perșani Mts., Valea Bogata, roadside (46 km), limestone rocks in the forest, leg. Deli, Domokos, Kóra, 22.06.2006., MMB 90175/1; ►Perșani Mts., *Alnus* gallery forest along a stream, leg. Danyik, Deli, Páll-Gergely, 15.07.2013., MMB 00228/1; ►Victoria, *Fagus* forest, roadside between Viștișoara and Victoria, 643 m, 45°42'6.2"N, 24°43'54.2"E, leg. Gheoca, 23.09.2001., GHV/2; ►Viștișoara, *Fagus* forest, 689 m, 45°41'33.2"N, 24°45'26.1"E, leg. Gheoca, 23.09.2001., GHV/1; ►Sâmbăta de Sus Complex, *Fagus* forest, near Sâmbăta Monastery, 717 m, 45°41'14.1"N, 24°47'45.07"E, leg. Gheoca, 22.09.2001., GHV/2; ►Sâmbăta de Sus, *Alnus* gallery forest along Sâmbăta River, leg. Gheoca, 11.06.1999., GHV/3; ►Breaza, *Alnus* gallery forest along Breaza River, 717 m, 45°41'14.1"N, 24°47'45.07"E, leg. Gheoca, 22.09.2001., GHV/1; ►Recea, *Alnus* gallery forest, 562 m, 45°43'26.1"N, 24°56'27.3"E, leg. Gheoca, 21.09.2001., GHV/2; ►Sebeș, *Salix* gallery forest, 593 m, 45°43'38.6"N, 25°2'18.7"E, leg. Gheoca, 8.05.2001., GHV/2; ►Măliniș, *Alnus* gallery forest, 686 m, 45°40'39.7"N, 25°3'31.1"E, leg. Gheoca, 22.09.2001., GHV/2; ►Ileni, *Salix* gallery forest, 480 m, 45°46'29"N, 24°59'59.3"E, leg. Gheoca, 12.09.2001., GHV/1; ►Ucea de Jos, *Salix* gallery forest along Ucea River near the confluence with the River Olt, leg. Gheoca, 5.06.2000., GHV/2; ►Perșani Mts., Bogata Forest, leg. Gheoca, 5.10.1998., GHV/2; ►Ciucaș Mts., Babarunca, *Fagus* forest, 45°30'39.41"N, 25°51'30.7"E, leg. Gheoca, 16.09.2010., GHV/2; ►Ciucaș Mts., Dălghiu, *Fagus* forest, 45°33'28.99"N, 25°55'7.09"E, leg. Gheoca, 17.09.2010., GHV/4; ►Făgăraș Mts., Prăpăștiile Zărneștilor, 45°31'22.57"N, 25°15'20.96"E, leg. Gheoca, 17.06.2016, GHV/1; ► Jud. Brașov, Săcele, valley of the Garcin stram, leg: Eröss & Hunyadi, 24.08.2001.

**Caraș-Severin county:** ►Valea Cernei, 4 km Băile Herculane road - Cerna Sat, beech (*Fagus*) forest, 390 m asl, leg. Deli, Domokos, Lennert, Szekeres, 14.08.2006, MMB 90197/1; ►Valea

Cernei, 6 km Băile Herculane road - Cerna Sat, beech (*Fagus*) forest, 400 m asl, leg. Deli, Domokos, Lennert, Szekeres, 14.08.2006, MMB 90193/1; ►Cerna-sat, Cheile Corcovei, leg. A. Varga, 20.07.1971, MMGY 74595/1 juvenile; ►Mehedinți Mts., 20 km N Băile Herculane, right side of Cerna valley, limestone cliffs, 350 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 19.04.2007., MMB 01057/1; ►Cheile Carașului (S Carașova), 0.5 km east from the bridge, right side of the Caraș river, limestone cliffs, 200 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 20.04.2007., MMB 01212/1; ►Mehadica village, valley of Mehadica River, collector and date are not indicated, ZMMU Lc-23615/1; ►Semenic Mts., Trei Ape, mixed foerst, leg. Gheoca, 19.08.2011, GHV/1; ►Cheile Carașului 3 km upstream Carașova, limestone rocks, 45°46'29"N, 24°59'59.3"E, leg. Gheoca, 13.06.2015., GHV/3; ►Cheile Carașului near the bridge, limestone rocks, 45°46'29"N, 24°59'59.3"E, leg. Gheoca, 14.06.2015., GHV/4; ►Valea Cernei, 10 km Băile Herculane road - Cerna Sat, *Fagus* forest, leg. Gheoca, 27.07.2012, GHV/2; ►Sadova Veche, scrubs with *Robinia pseudoacacia*, leg. Gheoca, 20.08.2011, GHV/1.

**Cluj county:** ►Vlădeasa Mts., Răchițele, cliff 200 m E of the Cascada Răchițele, rock vegetation, leg. Domokos, 11.10.2014., DOT/1; ►Cluj-Napoca, Colonia Făget, beech forest behind Făget Camping, leg. Barti, 15.06.2002., MMB 00817/4; ►Körösfehértó (Negreni), leg. B. Nagy, 12.07.1998, MMGY 74597/2; ►Trascău Mts., Cheia, Cheile Turzii, Cetate Mică (cave) near the fourth bridge of the brook Heșdate, leaf litter, leg. Domokos, 16.06.2009., DOT/2; ►Tordai hasadék (Cheile Turzii), leg. Z. Mészáros, 08.07.1998, MMGY 74596/2; ►Ciucea, rocks under the Goga villa, leg. Kovács, Gy., 20.11.1977., HNHM 69968/1; ►Trascău Mts., Cheia, Cheile Turzii, limestone cliffs, 46°33'53.03"N, 23°40'32.12"E, leg. Gheoca, 19.05.2015, GHV/2; ►Gilău, Valea Someșului Rece, mixed forest, 46°41'44.35"N, 23°19'2.71"E, leg. Gheoca, 24.07.2009., GHV/2; ► Cluj Napoca, Bükk (Făget), along the road DJ107R, approx. 500 m north of the cross with road no. 81, 46.692434°N, 23.551724°E, leg. Kolcsár & Páll-Gergely, 15.04.2018, coll. PGB; ►Cluj Napoca, Bükk (Făget), along the road DJ107R towards Sălicea, not far from the last, houses, 46.711259°N, 23.566605°E, leg. Kolcsár & Páll-Gergely, 15.04.2018, coll. PGB; ► Cluj Napoca, Bükk (Făget), along the road DJ107R, sharp road curve, Drumul Sfântul Ioan,

46.721691°N, 23.559878°E, leg. Kolcsár & Páll-Gergely, 15.04.2018, coll. PGB.

**Gorj county:** ►Vâlcan Mts., N Tismana, southwest from the Monastery Tismana, travertine and limestone cliff, leg. Deli, Domokos, Páll-Gergely, Subai, 18.04.2007., MMMB 92055/3; ►Vâlcan Mts., Piscuri-valley, 1.4 km north of Vâlcele (NE Tismana), gorge and limestone, leg. Deli, Domokos, Páll-Gergely, Subai, 17.04.2007., MMMB 01120/1; ►Vâlcan Mts., Piscuri-valley, 1.4 km north of Vâlcele (NE Tismana), flotsam deposit, leg. Deli, Domokos, Páll-Gergely, Subai, 17.04.2007., MMMB 01138/9; ►Vâlcan Mts., north of Tismana, near Monastery Tismana, travertine cliff in the forest, leg. Deli, Domokos, Páll-Gergely, Subai, 18.04.2007., MMMB 01157/7; ►Vâlcan Mts., north of Tismana, near the Tismana Monastery, bank of Tismana stream, flotsam deposit, leg. Deli, Domokos, Páll-Gergely, Subai, 18.04.2007., MMMB 01158/12; ►Vâlcan Mts., N Tismana, near Monastery Tismana, travertine cliff in the forest, leg. Deli, Páll-Gergely, 17.04.2010., MMMB 92293/5; ►Vâlcan Mts., Cheile Sohodolului, 45°8'21.707"N, 23°8'11.38" E, leg. Gheoca, 07.06.2016, GHV/1.

**Hunedoara county:** ►Metaliferi Mts., Căzânești (4–5 km in the unpaved road from the county border), rocks, leg. Domokos, 07.03.2007., DOT/5; ►above Obârșia (3.8 km east of the Arad-Hunedoara county border), *Carpinus* forest with *Robinia* and *Sambucus* trees, leg. Deli, Domokos, 07.03.2007., MMMB 90899/1 ►Retezat Mts., Râul Mare, 13 km north of Brazi (SW of Hațeg), right riverside, Alnetum gallery forest, leg. Deli, Páll-Gergely, 19.04.2010., MMMB 92424/2; ►Retezat Mts., Râul Mare, 22 km north of Brazi (SW of Hațeg), *Petasites* and *Carex* vegetation, leg. Deli, Páll-Gergely, 19.04.2010., MMMB 92117/1; ►Same site, MMMB 92294/3; ►Șureanu Mts., Streiul valley, 1 km north of Valea Șipotului, leg. Deli, Domokos, Páll-Gergely, Subai, 16.04.2007., MMMB 00879/5; ►Șureanu Mts., Cheile Taia (north of Petrila), right-bank, limestone, 700 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 16.04.2007., MMMB 00918/1; ►Șureanu Mts., Valea Roșie (NW Petrila), gorge, limestone, 780 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 16.04.2007., MMMB 00966/2; ►Șureanu Mts., Valea Șipotului (N Baru), left side of Streiul valley, limestone, leg. Deli, Páll-Gergely, 19.04.2010., MMMB 92298/2; ►SW Căzânești (4.2 km east of the Arad-Hunedoara county

border), near the stream, vegetation with *Salix* and *Urtica*, leg. Deli, Domokos, 07.03.2007., MMMB 90993/2; ►Retezat Mts., Jiu de Vest valley Câmpu lui Neag, Cheile Scocului, 910 m asl, leg. Deli, Domokos, Lennert, Szekeres, 16.08.2006., MMMB 90195/2; ►Retezat Mts., Jiu de Vest valley Câmpu lui Neag, Alnetum, 840 m asl, leg. Deli, Domokos, Lennert, Szekeres, 16.08.2006., MMMB 90191/2; ►Șureanu Mts., left side of Cheile Taia, N of Petrila, 730 m asl, leg. Deli, Domokos, Lennert, Szekeres, 16.08.2006., MMMB 90196/1; ►Metaliferi Mts., Cheile Mada, limestone cliffs, 45°46'29"N, 24°59'59.3"E, leg. Gheoca, 11.06.2015., GHV/4; ►Șureanu Mts., Grădiștea Muncelului – Cioclovina, 3 km upstream Grădiștea de Munte, leg. Șonea, 18.07.2012., GHV/4; ►Șureanu Mts., Grădiștea Muncelului – Cioclovina, Grădiște River Valley, leg. Olosutean, 11.06.2015., GHV/1; ►Parâng Mts. cota 1678, leg. Sîrbu, 2.06.2007; ►Retezat Mts., Gura Zlata, leg. Sîrbu, 5.09.2000., GHV/1; ►Retezat Mts., Cheile Buții, 45°18'08.56" N, 22°58'18.65" E, leg. Gheoca, 20.07.2000., GHV/1. ►Retezat Mts., Câmpușel, 45°23'07.98" N, 22°45'59.67" E, leg. Sîrbu, 5.09.2000., GHV/1; ►Podul Natural Grohot, Bulzești, 46°15'27.37"N, 22°44'0.56"E, leg. Gheoca, 12.06.2015., GHV/1.

**Maramureș county:** ►Masivul Gutâi, Baia Sprie, Cabana Mogoșa, forest dominated by hornbeam trees, near to parking place, leg. Domokos, 19.05.2012., DOT/1; ►Masivul Lăpușului, Baia Sprie, Cabana Mogoșa, cliff above *Alnus* gallery forest, leg. Domokos, 05.04.1985., MMMB 00798/2; ►Masivul Lăpușului, Baia Sprie, Cabana Mogoșa, *Alnus* gallery forest, in the environs of Lac Bodi, leg. Domokos, 05.04.1985., MMMB 00797/6; ►Maramureșului Mts., Vișeu de Sus, Vaser River and its gallery beneath Șuligu, ca. 650 m, 47°48.205'N, 24°40.242'E, leg. Csuzdi, Kotschán, Murányi, Pop, 22.05.2008., HNHM 96973; ►Baia Sprie, Cabana Mogoșa, *Alnus* forest, leg. Domokos, T., 05.04.1985., HNHM 69963/1; ►Maramureșului Mts., Poienile de Sub Munte 47°51'15.86"N, 22°31'55.56" E, leg. Gheoca, 7.08.2009, GHV/2; ►Maramureșului Mts., Valea Vișeuului, near the Ukrainian border 47°54'58.34"N, 24°9'49.72" E, leg. Gheoca, 6.08.2009, GHV/6; ►Maramureșului Mts., Bistra, Fagus forest 47°52'31.42"N, 24°12'18.28" E, leg. Gheoca, 13.08.2007, GHV/1; ►Maramureșului Mts., Bistra, leg. Sîrbu, 6.07.2005, GHV/1; ►Maramureșului Mts., Valea Repedea, leg. Gheoca, 12.08.2007, GHV/1; ►Maramureșului

Mts., Valea Vaserului, Făina, 47°47'17.801"N, 24°41'47.43"E leg. Gheoca, 12.08.2007, GHV/1; ►Maramureşului Mts., Bărdău, leg. Sîrbu, 8.07.2005, GHV/1; ►Maramureşului Mts., Rona de Sus, leg. Sîrbu, 7.07.2005, GHV/1.

**Mehedinţi county:** ►Mehedinţi Mts., Valea Cernei, 28 km north of Băile Herculane, small gorge, limestone rocks, leg. Deli, Domokos, Kóra, 19.06.2006., MMB 90099/1; ►Mehedinţi Mts., Valea Cernei, 18 km north of Baile Herculane, roadside bush, leg. Deli, Domokos, Kóra, 19.06.2006., MMB 92316/2; ►Mehedinţi Mts., Valea Cernei, Cheile Râmnuţei, 3.9 km upstream of the junction with the Cerna Sat, 420 m asl, leg. Deli, Domokos, Páll-Gergely, Subai, 19.04.2007., MMB 01035/5; ►Mehedinţi Mts., Cerna valley, 0.5 km north of Cerna-Sat, beech (*Fagus*) forest, 513 m asl, leg. Boldog, Deli, Kóra, 05.07.2007., MMB 01236/3; ►Mehedinţi Mts., Cerna valley, Cheile Râmnuţei, 3.9 km upstream of the Cerna Sat junction, 420 m asl, leg. Boldog, Deli, Kóra, 05.07.2007., MMB 01238/1; ►Mehedinţi Mts., 22 km N Băile Herculane, right side of Valea Cernei, near a stream, leg. Deli, Páll-Gergely, 18.04.2010., MMB 92309/2; ►Mehedinţi Mts., Valea Cernei, Cheile Râmnuţei, 3.9 km upstream of the Cerna Sat junction, 420 m asl, leg. Deli, Páll-Gergely, 18.04.2010., MMB 92321/1; ►Mehedinţi Mts., Valea Cernei, 20 km Băile Herculane road, *Fagus* forest, leg. Gheoca, 27.07.2012, GHV/2.

**Prahova county:** ►Masivul Ciucaş, between Pritvale and Valea Stâniei, *Fagus* forest, leg. Gheoca, 14.09.2010, GHV/1; ►Gîrbova, Buştenii, völgy (valley), leg. A. Varga, 31.07.1971, MMGY 4402/1.

**Sibiu county:** ►Sibiu, Dumbrava, 7.2 km south of the city, *Alnaetum* and *Quercus-Fraxinetum*, leg. Deli, Domokos, Kóra, 22.06.2006., MMB 90180/2; ►Făgăraş Mts., path from the Cabana Arpaşu along the red triangle, 970 m, 45°39'14.9"N, 24°40'23.3"E, leg. Páll-Gergely, 02.07.2006., PGB/1; ►Făgăraş Mts., Valea Arpaşului, on the "red triangle" tourist mark, 810 m, 45°39'30.0" N, 24°40'10.5" E, leg. Páll-Gergely, 24.07.2007., PGB/1; ►Fogarasi havasok, V. Arpaşului, leg- A. Varga, 01.07.1968, MMGY 4265/1; ►Făgăraş Mts., Valea Arpaşului, leg. Varga, July 1968, MMGY4265/1; Arpaşel, *Quercus* forest, 1000-1400m, 30.07.1976, collected by E. Schneider (ident. by Ileana Corocleanu), NHMS/1; ►Arpaşu de Sus, left side of Arpaşel River, *Alnus* gallery forest, 477 m, 45°43'51.77"N, 24°37'37.5"E, leg. Gheoca,

29.09.2001., GHV/2; ►Gura Râului, right side of Cibin River, 504 m, 45°44'21.1"N, 23°58'59.8"E, leg. Gheoca, 23.05.1999., GHV/3; ►Upstream Gura Râului, right side of Cibin River, leg. Gheoca, 2.10.1999., GHV/3; ►Cindrel Mts., Cibin Gorges, mixed forest, 29.04.2011., GHV/4; ►Tocile River Valley, at the limit between a *Quercus* forest and an apple orchard, 409 m, 45°42'56.8"N, 24°12'12.7"E, leg. Gheoca, 15.08.2000., GHV/4; Sibiel, 506 m, 45°45'30.21"N, 23°56'44.73"E, leg. Gheoca, 5.06.2001., GHV/1; ►Sibiu, Dumbrava Sibiuului, 499 m, 45°44'14.6"N, 24°06'08.3"E, leg. Gheoca, 14.07.2000., GHV/2; ►Seviş River Valley between Sibiu and Cisnădie, *Salix* gallery forest 454 m, 45°44'33.3"N, 24°08'33.9"E, leg. Gheoca, 14.05.1999., GHV/2; ►Cisnădioara, Catrinei Forest, *Quercus petraea* *Carpinetum*, 583 m, 45°42'45.8"N, 24°06'19.7"E, leg. Gheoca, 20.05.2001., GHV/2; ►Sadu, left side of the Sadu River, *Salicetum albae*, 474 m, 45°39'41.9"N, 24°10'10.6"E, leg. Gheoca, 22.06.2009., GHV/2; ►Pădurea Bradului, *Quercus* forest, 438 m, 45°42'14.8"N, 24°17'18.26"E, leg. Gheoca, 24.09.2001., GHV/2; ►Făgăraş Mts., Transfăgăraşan, mixed forest, 648 m, 45°40'13.9"N, 24°34'40.08"E, leg. Gheoca, 5.06.2000., GHV/2; ►Lotrului Mts., Lotrioara, left side of the Lotrioara River, *Alnus* gallery forest, 521 m, 45°34'40.3"N, 24°12'26.4"E, leg. Gheoca, 13.05.2011., GHV/3; ►Lotrului Mts., Lotrioara Valley, left side of the river, 12 km upstream, mixed forest, leg. Gheoca, 5.09.2000., GHV/2; ►Lotrului Mts., Căprăreţ Valley, right side of the river, 45°32'56.83"N, 24°12'0.22"E, leg. Gheoca, 14.05.2011, GHV/4; ►Cisnădioara, Valea Argintului, 4 km upstream locality *Fagus* forest, leg. Gheoca, 10.07.2012., GHV/4; ►Cisnădie, 408 m, 45°44'47.84"N, 24°11'24.9"E, leg. Gheoca, 27.04.2013., GHV/5; ►Poieniţa, 465 m, 45°48'35.60"N, 24°33'52.18"E, leg. Gheoca, 21.05.2017., GHV/2.

**Sălaj county:** ►Gorge between Țicău and Benesat (Țicău Pass), on the left bank of the Someş river, leaf litter, leg. Domokos, 27.05.2007., DOT/1; ►County border between Țicău and Benesat, a steep hillside covered by *Allium*, leg. 27.05.2007., DOT/3; ►Someş Guruslău, right side of the Someş river, approx. 100 m south from the bridge, *Salicetum* gallery forest, leg. 27.05.2007., DOT/2; ►Ciocmani, between the truck road and the railway bridge, flood plain on left side of the Someş River, leg. Domokos, 21.10.2007., DOT/2; ►Baica, Valea Printre (2 km west from Sânpetru Almaşului, near

the bridge), bank of the Printre Văi stream, leg. Domokos, 22.10.2007., DOT/1; ► Between Creaca and Lupoia, green corridor near the bridge of the Agrij stream, leg. Domokos, 22.10.2007., DOT/1; ► Meseșului Mts., between Moigrad-Porolissum and Ortelec, left bank of the Ortelec stream, leg. Domokos, 22.10.2007., DOT/2; ► Plopișului Mts., Preoteasa, Cheile Barcăului, south end of the settlement, 727 m asl, leg. Domokos, 09.07.2008., DOT/2; ► Boghiș, at the vehicular bridge of the Iaz stream, leg. Domokos, 09.07.2008., DOT/2; ► Between Buciumi and Răstoil, green corridor of the Agrij Stream, leg. Domokos, 11.07.2008, DOT/1; ► Fabrica, deposit of the Brâglez stream at the bridge, leg. Domokos, 11.07.2008., DOT/2; ► Bozolnic, left side of the Almaș stream, leg. Domokos, 12.07.2008., DOT/1.

**Vâlcea county:** ► Valea Rudăreasa, 4 km north of Ciunget, limestone rocks in the forests, leg. Deli, Domokos, Kóra, 20.06.2006., MMMB 90127/1; ► Masivul Cozia *Fagus* forest, leg. Zaharia 20.05. 2016, GHV/1; ► Căpățâni Mts., Cheile Bistriței, leaf litter, leg. Gheoca 25.09. 1999, GHV/1; ► Căpățâni Mts., Cheile Oltețului, *Fagus* forest, leg. Gheoca 28.07. 2013, GHV/3; ► Băile Olănești, Valea Cheii, mixed forest, leg. Gheoca 30.05. 2015, GHV/1.

**Unknown:** ► Transsylvania, leg. Bielz, MMGY 61634/1.

## HUNGARY

**Békés county** ► Gyula, Dénesmajor, Fekete-Körös foreshore, botoló-füzes (*Salicetum*), leg. Bába, 01.06.1996., MMGY 49611/14; ► Dénesmajor, Csigás-erdő, *Salicetum*, leg. Domokos, 01.06.1996., MMGY 50844/2; ► Gyulavári, Dénesmajori-csigás erdő, uszadék, leg. Domokos, 26.07. 1997, MMM00722/44; ► Gyulavári, Sitka, kiszáradt meder avarja (bodza), leg. Domokos, 19.06.1995, MMM00723/90; ► Gyulavári, Sitka (129. kiírtott erdőtag) avar, leg. Domokos, 1993, MMM00724/186; ► Gyulavári, Sitka-erdő (129), bodzás (holtág), leg. Domokos, 16.04.1994, MMM00725/72; ► Gyulavári, Sitkai-erdő (129), bodzás, leg. Domokos 16.04.1994, MMM00726/61; ► Gyulavári, Fekete-K. hullámtere a 18 tkm-nél, uszadék a füzesben, leg. Domokos, 21.01.1996, MMM00727/41; ► Gyula, Sitka, 129-es kivágott tag (tölgyes) 57x28 lépésről, felszíni, leg. Domokos, 09.04.1993, MMM00728/68; ► Gyula-Városerdő, riverside of dried out oxbow, orchard and kitchen-garden, soil

surface, leg. Domokos, 1980, MMM, F02604/12; ► Gyulavári, Dénesmajor, Csigás-erdő, *salicetum*, uszadék, leg. Domokos, 02.10.1996., MMM00729/38; ► Gyulavári, Dénesmajori Csigás-erdő, uszadék, avar, leg. Domokos, 02.10.1996, MMM00730/8; ► Dénesmajor, Csigás-erdő, *salicetum*, leg. Domokos, 01.06.1996, MMM00731/35; ► Gyulavári, Sitka holtág, leg. Domokos, 23.09.1993, MMM00732/37; ► Gyulavári, Sitka, holtág, bodzás, avar, leg. Domokos, 23.09.1993, MMM00733/22; ► Gyula, Sitka, 129-es erdőtag, avarból egyeléssel, leg. Domokos, 09.04.1993, MMM00734/30; ► Gyula, Sitka, 129/A fiatal tölgy-kőris-a.dió, leg. Domokos 08.10.2001, MMM00735/5; ► Gyulavári, Sitkai-erdő, 129/A, holtág (bodzás, szil, avar), leg. Domokos, 28.05.2004, MMM00736/22; ► Gyulavári, Sitka (129) leg. Domokos, 09.04.1993, MMM00737/22; ► Gyulavári, Sitkai-erdő (128/A és 129/A) holtág, leg. Domokos, 18.04.1991, MMM00738/1; ► Gyulavári, Sitka, kiszáradt holtág (127/F), leg. Domokos, 22.09.1994, MMM00739/5; ► Gyulavári, Sitka (129), holtág, parti tuskókról, leg. Domokos, 09.04.1993, MMM00740/5; ► Gyulavári, Sitkai-erdő, gyöngyvirágos, leg. Domokos, 18.04.1991, MMM00741/1; ► Gyulavári, Sitka 129/A a holtág D-i oldalán, bodzás avar, leg. Domokos, 16.11.2000., MMM00742/3; ► Gyula, Sitka, 127/A, tölgy, leg. Domokos, 08.10.2001, MMM00743/1; ► Gyulavári, Sitkai erdő (128/A és 129/A) lágyszárú növény, leg. Domokos, 18.04.1990, MMM00744/2; ► Gyulavári, Sitkai erdő 127/F, holtág, leg. Domokos, 22.06.1998, MMM00745/1; ► Gyula-Gyulavári, Málvád, 72/A, nyár, akác, csalános avar, leg. Domokos, 04.08.2002, MMM00746/1; ► Gyulavári, Dénesmajori-Csigás-erdő, leg. Domokos, 26.07.1997, MMM00747/1; ► Gyula, Sitkai-erdő, tölgyes avar és tuskók, leg. Domokos, 18.04.1991, MMM00748/7; ► Gyulavári, a 6.5 tkm-nél fekvő hullámtéri füzes, leg. Domokos, Lennert, Répásiné, 08.10.1999, MMM00749/2; ► Gyulavári, Dénesmajori-Csigás-erdő, avar, leg. Domokos, Lennert, Répásiné, 08.10.1999, MMM00750/35; ► Gyulavári, Sitkai-erdő, 128/B, mederből, leg. Domokos, 28.05.2004, MMM00751/4; ► Gyulavári, Sitka (128) tölgy, avar, leg. Domokos, 09.04.1993, MMM00752/2; ► Gyula, Sitka, 128/F kőris-tölgy, leg. Domokos, 30.06.2001, MMM00753/16; ► Gyulavári, Sitkai-erdő, tölgyes, tuskók, leg. Domokos, 18.04.1991, MMM00754/5; ► Gyulavári, Gabonás, 18 tkm hullámtér, füzes avar, leg. Domokos, 23.10.1994,



MMM00755/36; ► Geszt, Kastélypark, fás-bokros, avar, leg. Domokos, 11.12.2003, MMM00773/30; ► Geszt, Kastélypark, vöröstölgy alatt, leg. Béres, 19.11.2003, MMM00774/1; ► Geszt, Kastélypark D-i oldalán lévő kerítés lábuzatán lévő növényi törmelék, leg. Domokos, 11.12.2003, MMM00775/2; ► Geszt, Templom mögött, holtág partja, leg. Danyik, Deli, 12.04.2013, MMMB00510/52; ► Doboz, Marói-erdő, domb (14) 86-os kitelepítés, leg. Domokos, 16.04.1987, MMM00776/1; ► Doboz, Marói-erdő, domb 86.-os kitelepítés, leg. Domokos, 15.05.1986, MMM00777/1; ► Doboz, Marói-erdő, gödrös (14), leg. Domokos, 30.10.1986, MMM00778/3; ► Doboz, Takácszug leg. Domokos, 19.08.1986, MMM00779/1; ► Békés, Kettős-K. hullámtere a 107 tkm közelében avar, uszadék, leg. Domokos, 24.11.2000, MMM00783/3; ► Between Doboz and Sarkad along the river Tisza, 46°42'11.72"N, 21°18'31.34"E, observed: T. Deli, 07.06.2014; ► Between Doboz and Sarkad along the river Tisza, 46°42'16.50"N, 21°20'22.07"E, observed: T. Deli, 07.06.2014; ► Southeast of Sarkad, close to the border, 46°41'42.81"N, 21°25'30.96"E, observed: T. Deli, 09.06.2014; ► Southeast of Sarkad, along to the border, 46°40'37.03"N, 21°25'48.53"E, observed: T. Deli, 09.06.2014; ► Southeast of Sarkad, along to the border, 46°40'29.10"N, 21°25'52.46"E, observed: T. Deli, 09.06.2014.

**Csongrád county** ► Kiszombor, Zugoly, bank of the Maros River, leg. T. Kovács, T. Kovács, 10.06.1996., MMGY 46630/1; ► Makó, floodplain of the Maros River, leg. Drimmer, 23.10.1990., MMGY 73810/4; ► Makó, Landor, ártéri erdő, avar, leg. Domokos, 20.07.1990, MMM00764/94; ► Makó, Landor, ártéri erdő, leg. Domokos, 18.05.1991, MMM00765/40; ► Makó, Landor, fehér nyáras, leg. Domokos, 21.09.1991, MMM00766/58; ► Makó, Landor, ártéri erdő, leg. Domokos, 23.07.1991, MMM00767/10; ► Makó, Landor, ártéri erdő, leg. Domokos, 12.05.1990, MMM00768/18; ► Makó, Landor, ártéri erdő, leg. Domokos, 06.09.1990, MMM00769/34; ► Makó, Landor, tölgyes, avar, leg. Domokos, 26.09.1987, MMM00770/34; ► Makó, Strand mögötti erdő, avar, leg. Domokos, Domokosné, 12.10.1986, MMM00771/44; ► Makó, Marosnál lévő strand mögötti tölgyes széle, bokros, leg. Domokos, 12.10.1986, MMM00772/16; ► Szeged, Boszorkányszigeti fűzes ártér, tutajok közti törmelékben, leg. Czögler, 10.06.1922, MMM00780/1; ► Szeged, Köves Tisza part, lemnás hordalék a Juhász Gy.térnél, leg.

Domokos, 06.12.1986, MMM00781/1; ► Szeged, Juhász Gy.tér, Tisza hordalék, leg. Domokos, 01.09.1992, MMM00782/1; ► Makó, Landor, tölgyes, avar 100 m-re a Maros, leg. Domokos, 26.09.1987, MMM00784/5; ► Makó, Landor, tölgyes, avar (3), leg. Domokos, 26.09.1987, MMM00785/2; ► Makó, Landor, fehérnyaras, leg. Domokos, 21.09.1991, MMM70812/1; ► South of Nagylak, next to the border, 46°09'42.59"N, 20°42'12.83"E, observed by T. Deli, 18.06.2014; ► Southwest of Nagylak, next to the border, 46°09'35.55"N, 20°41'31.59"E, observed by T. Deli, 18.06.2014; ► Southwest of Nagylak, next to the border, 46°08'55.64"N, 20°41'21.15"E, observed by T. Deli, 18.06.2014; ► Southeast of Magyarcsanád, 46°07'41.55"N, 20°38'26.08"E, observed by T. Deli, 18.06.2014; ► East-southeast of Maroslele, edge of gallery forest, 46°14'15.99"N, 20°16'06.86"E, observed by T. Deli, 19.06.2014; ► Makói Maros-híd, 46°12'13.59"N, 20°27'13.19"E, observed by T. Deli, 19.06.2014.

#### Szabolcs-Szatmár-Bereg

#### county

► Vásárosnamény, Bagiszeg, leg. Bába, July 1972, MMGY 1947/5; ► Vásárosnamény, Bagszegi-erdő, leg. Bába, Varga, 18.07.1987., MMGY 11423/14; ► Vásárosnamény, Bagi-szeg, leg. Szilágyi, 22.04.1993., MMGY 36493/2; ► Vásárosnamény, Bagi-szeg, leg. Deli, Kiss, 15.10.1993., MMGY 36500/2; ► Tiszabecs, Szabó-fűzes (*Salicetum*), leg. Deli, 16.10.1993., MMGY 38858/3; ► Vásárosnamény, Bagiszeg, leg. Bába, 13.07.1978., MMGY 48681/2; ► Vásárosnamény, Bagiszeg, leg. Bába, Varga, 18.07.1978., MMGY 48687/5; ► Vásárosnamény, Bagiszeg, leg. Bába, Varga, 18.07.1978., MMGY 48691/9; ► Vásárosnamény, Bagiszeg, leg. Bába, Varga, 19.07.1978., MMGY 48694/2; ► Vásárosnamény, Bagiszeg, leg. Bába, Varga, 19.07.1978., MMGY 48695/13; ► Vásárosnamény, Bagiszeg, leg. Bába, Varga, 12.07.1987., MMGY 50427/3; ► Vásárosnamény, Sárkánykert, *Salix alba* gallery forest, leg. Bába, Varga, 19.07.1978., MMGY 50459/4; ► Vásárosnamény, Bagiszeg, gallery forest, leg. Kovács, 30.09.1980., MMGY 55390/3; ► Tiszabecs: mouth of the Batár stream, leg. Kovács, 04.05.2000., MMGY 59807/2; ► Tiszabecs: mouth of the Batár stream, leg. Kovács, 28.04.2011., MMGY 71790/1; ► Vásárosnamény, Bagiszeg, leg. Drimmer, 20.04.1985., MMGY 73811/1; ► Vásárosnamény, Bagszegi-erdő, tölgyes, leg. Domokos, 06.04.1984, MMM00756/47; ► Vásárosnamény, Bagiszeg, leg. Domokos, 23.06.1979,

MMM00757/2; ► Vásárosnamény, Bagiszeg, tölgyes, leg. Domokos, 06.04.1984, MMM00758/17; ► Vásárosnamény, Bagiszeg, leg. Domokos, 18.06.1984, MMM00759/27; ► Vásárosnamény, Bagiszeg, leg. Domokos, Megyesi, 20.04.1985, MMM00760/30; ► Vásárosnamény, Bagiszeg erdészház környéke, csalános, leg. Domokos, 18.06.1984, MMM00761/21; ► Vásárosnamény, Bagiszeg, tölgyes, avar, leg. Domokos, 10.04.1983, MMM00762/13; ► Vásárosnamény, Bagiszeg, erdő, leg. Domokos, 10.04.1983, MMM00763/28; ► Cégénydányád, Szamos hullámtér, puhafás ligeterdő, leg. Deli, Domokos, 14.09.2006, MMM91855/6; ► Milota, Keleti-kanyarulat, 48°07'16.40"N, 22°47'59.36"E, observed by T. Deli & T. Danyik, 14.05.2016; ► Milota, Nyugati-kanyarulat, 48°07'10.00"N, 22°46'19.91", observed by T. Deli & T. Danyik, 14.05.2016; ► Tiszacsécse, Keleti-kanyarulat, 48°07'08.67"N, 22°45'21.69"E, observed by T. Deli & T. Danyik, 15.05.2016; ► Tiszacsécse, Nyugati-kanyarulat, 48°07'03.20"N, 22°44'20.31"E, observed by T. Deli & T. Danyik, 15.05.2016; ► Tizsakóród, 48°06'35.83"N, 22°42'36.81"E, observed by T. Deli & T. Danyik, 15.05.2016; ► Szatmárcseke, 48°05'17.26"N, 22°34'50.82"E, observed by T. Deli & T. Danyik, 15.05.2016; ► East of Tarpa, 48°05'47.51"N, 22°34'33.32"E, observed by T. Deli & T. Danyik, 15.05.2016; ► East of Kisvarsány, 48°08'52.68"N, 22°19'49.02"E, observed by T. Deli & T. Danyik, 07.05.2016; ► East of Kisvarsány, 48°08'36.95"N, 22°18'58.60"E, observed by T. Deli & T. Danyik, 07.05.2016.

## UKRAINE

► Transcarpathian region, Rakhiv district, Kuziy, valley of Kuziy Stream in Kuziy massif of Carpathian biosphere reserve (4 km west from Dilove village), beech forest near basement of large calcareous cliff, ca. 400–800 m, 47°56'38"N 24°7'7", leg. Baidashnikov, 11.06.1986., IZAN GT B490/1; ► Same area, forest of maple sycamore and ash along stream and among beach forests, leg. Baidashnikov, 11.06.1986., IZAN GT B491/10 dry shells, 2 alc; ► Same area, hornbeam-maple forest, *Sambucus* in undergrowth, leg. Baidashnikov, 12–14.06.1986., IZAN GT B492/42; ► Same area, underbrush of *Andromeda* (some alive snails of *Drobacia* on leaflets of this shrub) near forest of black alder on margin of forest of Durmast oak (*Quercus petraea*), leg. Baidashnikov, 14.06.1986., IZAN

GT B494/8; ► Same area, underbrush of *Andromeda* and *Petasites* near large calcareous rocks, among beach forest, leg. Baidashnikov, 15.06.1986., IZAN GT B495/2; ► Same area, hornbeam-maple forest, leg. Baidashnikov, 23.08.1990., IZAN GT B1119/30; ► Same area, leg. Gural-Sverlova, 22.07.1995., SNHM 606/7 [in collection of terrestrial molluscs]; ► Same area, leg. Gural-Sverlova, 01.07.2003., SNHM 2859/2 [in collection of terrestrial molluscs]; ► Same area, leg. Kanarskyi Yu, June 2009, SNHM 3126/1; ► Same area, leg. Gural-Sverlova, 01.07.2003., IZAN 410/1 [this is with individual number in arranged part of terrestrial molluscs' collection]; ► Transcarpathian region, Rakhiv district, Malyi Rossosh, valley of Malyi Rossosh stream in Marmaroskyi massif of Carpathian biosphere reserve. 3 km east from Dilove village, ca. 500–600 m, approximate GPS data: 47°55'18"N 24°12'39"E, leg. Baidashnikov, 28.05.1986., IZAN GT B470/1 dry shell, and its body in ethanol; ► Transcarpathian region, Rakhiv district, Stogovets River Valley, 12.5 km southeast from Lugy village, riparian spruce forest, ca. 1000 m, approximate GPS data: 47°58'30.00"N 24°32'22"E, leg. Baidashnikov, 10.08.1982., ZIN, 105/4dry, 5 in ethanol; ► Transcarpathian region, Rakhiv district, Baltsatul River Valley, near its outflow to Bila Tysa River, 7 km southeast from Lugy village, riparian spruce forest with ferns and *Petasites*, ca. 800 m, approximate GPS data: 48°1'45"N 24°31'4"E, leg. Baidashnikov, 05.08.1982., ZIN 100/1; ► Transcarpathian region, Rakhiv district, valley of Bila Tysa River, few km southeast from Lugy village, spruce forest with ferns and *Petasites*, ca. 700 m, 48°3'20"N 24°28'55"E, leg. Baidashnikov, 07.08.1982., ZIN 101/3 dry, 2 in alcohol; ► Same area, spruce forest with ferns, leg. Baidashnikov, 08.08.1982., ZIN 102/4 dry, 1 in alcohol; ► Same area, riparian grass, leg. Baidashnikov, 21.08.1982., ZIN 128/1 dry; ► Same area, forest of grey alder, leg. Baidashnikov, 21.08.1982., ZIN 129/3; ► Same area, grass near spruce forest, leg. Baidashnikov, 26.08.1982., ZIN 139/1 in alcohol; ► Same area, spruce-fir forest, leg. Baidashnikov, 28.08.1982., ZIN 142/9 dry, 1 in alcohol; ► Same area, forest of grey alder, leg. Baidashnikov, 28.08.1982., ZIN 143/1; ► Transcarpathian region, Khust district, Hutynski Mountains, 4 km southwest from Khust city, forest of beech and sycamore maple, ca. 500–600 m, approximate GPS data: 48°7'42"N 23°16'28"E, leg. Baidashnikov, 13.09.1983., ZIN 305/17 dry, 4 in alcohol; ► Same area, leg.

Baidashnikov, 13.09.1983., ZMMU Lc-68633/2, ZMMU Lc-19700 and Lc-21648/4 in alcohol;  
 ► Transcarpathian region, Khust district, castle ruins of Khust city, 330 m, 48°10'1"N 23°17'59"E, leg. Goltseva, 08.10.1980., ZIN 2/1;  
 ► Same area, leg. Kuznetsov, 17–18.06.1994., ZMMU Lc-24087/2 in alcohol.

## HISTORICAL MUSEUM COLLECTIONS

**Senckenberg Forschungsinstitut und Naturmuseum:** Banat, coll. Parreys ex coll. Rossmässler, SMF 155816/1; Siebenbürgen, Banat, coll. Rossmässler, SMF 190658/5; Banat, coll. Rossmässler, SMF 190659/5; no locality, SMF 190660/18; Banat, coll. Möllendorff 30.06.1913., SMF 190661/1; Siebenbürgen, coll. Knobbe, S., SMF 190662/2; Banat, coll. A. Gysser, SMF 190663/1; Siebenbürgen, Eishöhle b. Topán falva, SMF 190664/2; Transsylvanien, Götzenberg, coll. Hashagen, SMF 190665/2; Banat, coll. K. Hashagen, SMF 190666/1; Banat, SMF 190667/2; Siebenbürgen, Mühlbach, Coll. Möllendorff, SMF 190668/5; Siebenbürgen, Klausenburg, coll. Bielz, SMF 190669/4; Michelstein b. Herrmannstadt, SMF 190670/1; Rumänien, Azuga, 21.10.1930., coll. H. Roos, ex coll. Helbig, S., 1910, SMF 190671/5; Siebenbürgen, Mühlbach, 1544, SMF/1; Gölzenberg bei Herrmannstadt, collected on 19.04.1940., SMF 9346/2; Klausenburg, coll. C. Dosch, SMF 190674/5; Banat, SMF 81154/1; Bihar, Solymosköer Wald bei Élesd, coll. Hazay, 1885, SMF 81160/1; Klausenburg, SMF 81155/2; Klausenburg, Bükkwald, coll. Bielz 1928, SMF 82256/3; Umgebung von Mehadia im Banat, leg. Golopenza, 1928, SMF 81157/3; Ober-Tömösch bei Kronstadt in der Nähe der großen Tunnels, leg. Deubel, SMF 81168/1; Banat, SMF 81169/1; Hinterbackthal von Götzenberg, Cibinsgebirge, SMF 81161/3; Kleiner Stadtwald, Arezol, SMF 81164/1; Alpene Onczáza bei der Höhle an der Strenze Siebenbürgens, coll. Hazay, SMF 81165/1; Siebenbürgen, Mühlbach, coll. C. Boettger, 1907, SMF 81171/1; Banat, Mehadia, C. Boettger, 1907, SMF 81173/1; Siebenbürgen, Bükkwald bei Klausenburg, coll. C. Boettger, 1912, SMF 81172/5; Rumänien, Azuga, SMF 81170/7; Nord-Rumänien, Valea Jeppi, bei Busteny, 1928, SMF 81167/2; Transsylvanien, Bühl (?) bei Klausenburg, 1928, SMF 81168/2; Siebenbürgen, Klausenburg, coll. Kimakowicz jr., 1934, SMF 81169/3; SO Ungarn, Hegyes Drócsa Gebirge [Zarandului Mts.], Komitat Arad, coll. C. Boettger, 1912, SMF 81174/2; N-Kleine Walachei, Vaideeni-Horezu, leg. Buse, coll. Zilch

ex coll. Grossu, 12.06.1964, SMF 180775/2; Götzenberg nächst Heltau im Cibinsgebirge, leg. Kimakowicz, SMF 81163/3; Rumänien, Carpathen, Azuga, Thal von Prahova, coll. Montandon, SMF 81166/2; Klausenburg, Bükkwald, 1928, SMF/2; Rumänien, Sinaia, leg. Grossu, July 1956, coll. Zilch, SMF 155740/2; Kolozsvár (Klausenburg), coll. Jaeckel, SMF 216261/1; Rumänien, Apuseni-geb., Stina de Vale, coll. Lupu, coll. Zilch, 18.08.1964, SMF 180776/2.

**Natural History Museum, Sibiu:** Cisnădie (Sibiu County), NHMSB 25198 – 25200/3; Cisnădioara (Sibiu County), NHMSB, 25201 /1; Muntele Dungu (Ciucaș Mountains), NHMSB, 25231 /1; Pasul Timiș (Predeal Pass), NHMSB, 25232 – 25234/3; *Alnus glutinosa* forest near Petrești (Alba County), NHMSB 25235-25239 /5; Bucoșoiu (Bucegi Mountains), NHMSB, 25280-25281/2; Timișu de Sus (Brașov, County), NHMSB 25282-25284/3; Valea Sebeș (Bistra, Alba county), NHMSB 25285-25288 /4; Viștea de Sus (Brașov County), NHMSB 25332/1; Colțu Chiliilor (Zărnești, Piatra Craiului), NHMSB 25333/1; Zlatna (Alba County), NHMSB 25334 - 25336/3; Valea Lamba (Timiș Valley), NHMSB 25367-25368 /2; Râul Sadului (Sibiu County) 1869, NHMSB 25369-25371 /3; Ghețarul Scărișoara (Apuseni Mountains), NHMSB 25372 – 25374 /3; Bradu (Sibiu County), NHMSB 25400 – 25403/4; Feleacu (Cluj County), 25404-25408, NHMSB/5; Cristian (Sibiu County), 25438, NHMSB/1; Cibin Mts., 25439, NHMSB/1; Cibin Mts. near Gura Râului, (Sibiu County), 25440, NHMSB/1; Grădiștea (Hunedoara county), 25441, NHMSB/2; Fagus forest near Cluj (Făget), 25442-25447, NHMSB/6; Sebeș (Alba County), 30064-30079, NHMSB/16; Fagus forest near Cluj, 1890, 94742-94774, NHMSB/33; Piatra Arsă (Bucegi Mountains), 128697, NHMSB/1; Dâmbovicioara (Piatra Craiului Mountains), 128698, NHMSB/1; Oradea (Bihar County), leg. C. Riess, 128699 – 129700, NHMSB/2; Muntele Mic (Caraș-Severin County) 128704-128705, NHMSB/2; Rodnei Mts., 128702-128703 NHMSB/2; *Alnus glutinosa* forest near Petrești (Alba County), 128706-128711 NHMSB/6; Feleacu (Cluj County), 128712-128716, NHMSB/5; Fagus forest near Cluj (Făget), 128717-128724, NHMSB/7; Băile Herculane (Cerna Valley), 128725 – 128731, NHMSB/7; Măgura Cisnădiei (Sibiu County), 3.05.1892., 177003, NHMSB/1; Rășinari (Sibiu county), 177136, NHMSB/1; Chirpăr (Sibiu County), 203948-203951, NHMSB/4. Oradea (Bihar county), 1879, NHMSK, 5532/1; Arad

(Arad, county), 1889, NHMSK 5533/1; Cluj-Napoca, 1897, NHMSK 5534/1; Scărişoara cave, 1884, NHMSK 5535/1; Cluj-Napoca, forest, NHMSK 5536/3; Cluj-Napoca, NHMSK 5537/4; Detunata (Apuseni Mountains), 1888, NHMSK 5538/1; Cluj-Napoca, 1884, leg. A. Bielz, NHMSK 5539/2; Zlatna (Alba county), 1866, leg. Barth, NHMSK 5540/2; Piatra Şipotului, 1883, NHMSK 5541/1; Piatra Şipotului, 1883, citrine gelb NHMSK 5542/1; Ohaba-Ponor (Hunedoara county), 1883, NHMSK 5543/3; Duş, Cibin Mountains, 1880, leg. Kimak., NHMSK 5544/1; Orlat (Sibiu, county), 1907, leg. Kimak. NHMSK 5545/1; Cristian (Sibiu, county), 1895, NHMSK 5546/2; Şanta, Păltiniş, Sibiu county, 1884, NHMSK 5547/4; Măgura Cisnădiei (Sibiu county), 1889, NHMSK 5548/2; Măgura Cisnădiei 1900, leg. Kimak. NHMSK 5549/2; Cisnădioara (Sibiu, county), 1889, NHMSK 5550/1; Măgura Cisnădiei, 1881, NHMSK 5551/4; Prejba (Cibin Mountains), 1884, leg. Bielz, NHMSK 5552/1; Răşinari (Sibiu, county), 1884, leg. Bielz, NHMSK 5553/1; Râu Sadului (Cibin Mountains), 1880, NHMSK 5554/2; Sadu (Sibiu, county), 1879, leg. Riess, NHMSK 5555/1; Piatra Corbului (Tâlmăciu, Sibiu county), 1885, NHMSK 5556/1; Turnu Roşu, Valea Lotrioara, (Sibiu, county), 1883, leg. Kimak. NHMSK 5557/1; Valea Lotrioara, Turnu Roşu (Sibiu, county), 1883, leg. Kimak. NHMSK 5558/2; Râul Vadului (Vâlcea county), 1891, NHMSK 5559/3; Plaiul Foii (Piatra Craiului), 1887, NHMSK 5560/1; Cheile Dâmbovicioarei, 1879, leg. Riess, NHMSK 5561/1; Valea Dobleni, 29.07.1900, NHMSK 5562/1; Valea Dobleni (Ciucaş Mountains), 1100 m, 1927, leg. R.v. Kimak., NHMSK 5563/1; Muntele Dungu (Ciucaş Mountains), 1927, leg. R.v. Kimak., NHMSK 5565/1; Măgura (Dungu Mountains), 1927, leg. R.v. Kimak., NHMSK 5566/1; Piatra Mare, 1400 m 1936, leg. Rimmer, NHMSK 5566/1; Transilvania, NHMSK 5567/2.

**Mining and Geological Survey of Hungary (MÁFI/MGSH):** Bihar vm., Nagybáród (Borod), leg. Dr. T. Roth K., 1914 vii, MÁFI R.5459/1; Bihar vm., Nagyvárad (Fácános), MÁFI R.5460/2; Bihar vm., Püspökfürdő, det. Soós, MÁFI R.5461/2 juvenile shells; Bihar vm., Félix-fürdő, 1910, MÁFI R.5462/11; Bihar vm., Belényes (Beiuş), leg. Dr. Pálffy, Kormos coll., MÁFI R.5463/1; Brassó vm., Brassó, 1910, MÁFI R.5469/1; Bihar vm., Rézbánya (Băiţa), MÁFI R.5464/1; Bihar vm., Drágcséke, leg. Dr. Szontágh, 1892, MÁFI R.5465/2; Kolozs vm., Gyalui-havasok, 1400 m. a.s.l., leg. Dr. Pálffy,

MÁFI R.5468/1; Kolozs vm., Kolozsvár, Klausenburg, Bükkwald, coll. E.A. Bielz, MÁFI R.5467/2; Kolozsvár, coll. ifj. Entz, MÁFI R.5466/1; Alsó-Fehér vm., Sohodol (Topánfalva mellett), coll. Kormos, MÁFI R.5475/1; Szeben vm., Szászsebes, Kisdisznód, leg. ifj. Entz, Kormos coll., MÁFI R.5474/1; Arad vm., Aranyág, MÁFI R.5471/1; Mühlback gegen Peterdorf (?), Brassó, E.A. Bielz coll., MÁFI R.5473/2; Arad vm., Pajsán, Kormos coll., MÁFI R.5472/2; Arad vm., Monyásza, leg. Brancsik, Kormos coll., MÁFI R.5470/1; Erdély, Zichi-bg., MÁFI R.5477/3; Krassó-Szörény vm., Herkulesfürdő, Mehádia, MÁFI R.5476/1; Kolozs vm., Brassó, leg. Endrey, MÁFI R.5479/1; Bihar vm., Serges, 25.08.1892, MÁFI R.5561/1.

#### *Fossil localities*

### 1. Pleistocene

#### HUNGARY

**Borsod-Abaúj-Zemplén county:** ► Bükk Mountains, Varbó, Lambrecht Kálmán-cave, layer V/a, leg. Jánossy, 1960, published in Krolopp (1964), MÁFI, Q.9142/8; ► Sajó River Valley, Serényfalva (Serényfalva is situated in the IV. terrace levels (195–210 m SLB) of the Sajó River (according to biochronological Pleistocene classification it belongs to the Lower Biharium/Günz-Mindel period [Hír 1989, Füköh *et al.* 1995]), Hubocska hill, gravel pit, slope loess, 1985/1986., leg. Hír, PÁM, (broken fragments); ► Serényfalva, exposure 1 of the brick-works, between –300 and –320 m SLB, leg. Hír, 1983, PÁM (broken fragments); ► Serényfalva, Hubocska hill, exposure 1 of the gravel pit, clayey slope loess between –60 and –100 cm, leg. Hír, 1985/1986, PÁM (fragments); ► Serényfalva, Hubocska hill, exposure 1 of the gravel-pit, clayey slope loess between –240 and –280 cm, leg. Hír, 1985/1986, PÁM (fragments); ► Serényfalva, Hubocska hill, exposure 2 of the gravel-pit, clayey loess slope, sampling 84/1 (~ –200 cm) leg. Hír, 1985/1986, PÁM (broken fragments), published in Hír (1988, 1989).

**Csongrád county:** ► Tisza River Valley, Mindszent, check-wells (MÁFI) of Mindszent, between –508.25 and –510.05 meters SLB, leg. Krolopp, date unrecorded, Q4103 (2), published in Krolopp (1970).

**Győr-Moson-Sopron county:** Duna River Valley, ► Győrújfalva, gravel-pit, between 25 and 27 meters, leg. Pongrácz, date unrecorded, MÁFI Q.12583 (3 cm wide fragment).

**Heves county:** ► Bükk Mountains, Monosbél, travertine, leg. Kerekes (?), date unrecorded, MÁFI Q.8725/8; ► Eger, 6, Bárány Street, leg. Krolopp, date unrecorded, MÁFI Q.9996 (one apex and fragments); 8, Bárány Street, leg. Krolopp, date unrecorded, MÁFI Q.10037 (one apex and fragments); 16, Bárány Street, leg. Krolopp, date unrecorded, MÁFI Q.10097 (fragments); 20, Bárány Street, leg. Krolopp, date unrecorded, MÁFI Q.10134 (fragments); 32, Bárány Street, leg. Krolopp, date unrecorded, MÁFI Q.10183 (two apexes and fragments); 4, Pető Street, leg. Krolopp, date unrecorded, MÁFI Q.10394 (fragments); 14, Pető Street, lower layer, leg. Krolopp, date unrecorded, MÁFI Q.10 497 (one apex).

**Komárom-Esztergom county:** ► Gerecse Mountains, Szomód, Kender-hegy, leg. Krolopp, date unrecorded, MÁFI Q.12932 (aperture fragment);

**Pest county:** ► Buda Mountains, Budapest, Castle Hill in Buda, NW from Castle, Szent-György square, road making leg. Krolopp, date unrecorded, MÁFI Q.13277 (5 apices and 5 broken shells), published in Füköh *et al.* (1995).

## ROMANIA

**Alba county:** Mureş River Valley, ► Miriszló/Mirâslău, flood formation of the Mureş River, sand or loess (?), leg. Pávay Vajna, 1907/8, MÁFI Q. 586 (3), published in Kormos (1909).

**Bihar county:** Királyerdő/Pădurea Craiului Mountains, ► Esküllő/Aştileu, „La Cruce” conglomerate rock with *D. banatica* fossils, cavity filled with hard aragonite travertine, leg. Szontágh, 1896, Q.2661 (Fig. 2), Q.2672, published in Kormos (1909); ► Bratca, meeting-place of Valea Arsula and Valea Mare, loose travertine on the right side of the Arsula brook, leg. Domokos, 2009, DOT/12.

**Braşov county:** ► Masivul Postăvaru, Brassó/Braşov, Fortyogóhegy/Dealul Şprenghei, lime pit, leg. Éhik & Podek, Q.3195 (1), Q.3196 (2), published in Soós (1916, 1918, 1926).

## Harghita county:

Romania, Harghita County, Súgó-barlang/Peştera Şugău (= cave) Cave near Gheorgheni, 46°40.927'N, 25°40.413'E, cave wall in the so-called Zene-terem, leg. Crişan, H-F., 2010, TMM STN-235/R (see Figs 3–4).

**Hunedoara county:** Mureş River Valley, ► Nagyrapolt/Rapoltu Mare, travertine, upper layer, collector and date unrecorded, MÁFI Q.780/6.

## GERMANY

Thüringen, Burgtonna, collector and date unrecorded, MÁFI Q. 4103/2.

## 2. Holocene

## ROMANIA

**Bihar county:** Királyerdő/Pădurea Craiului Mountains, ► Vércsorog/Vărciorog, Köves brook, leg. Szontágh, 1892, MÁFI Q.6112/2.

## HUNGARY

**Békés county:** ► Bélmegyer, Csömök hillock, archeological locality (Avar graves), loessy soil disturbed on top, leg. Domokos, 1985, MMM, F02606 (1), 1986, MMM, F02607 (fragments), published in Domokos *et al.* (1989); ► Békéscsaba, István Széchenyi Gardens, mole-hills, leg. Domokos, 1986, MMM, F 02603 (fragments); ► Doboz, hilly part of the Marói Forest, leg. Domokos, 1986, MMM, F02598 (2), F02608(2), 1987, MMM, FF02599 (1); ► Doboz, Marói Forest, mole hills, leg. Domokos, 1987, MMM, F02596 (fragments), F02598 (fragments), leg. Domokos & Lennert, 1987, MMM, F02600 (fragments); ► Doboz, Óvártó, small hillock on the channel-side covered by loess-like deposit, leg. Domokos, 1987, MMM, F02592 (5); ► Doboz, Pósteleki szőlők hillock, plough-land, leg. Domokos, 1987, MMM, F02593 (2); ► Doboz, Szanazug, Demeter, plough-land, leg. Domokos, 1987, MMM, F02594 (1); ► Doboz, Veresgyűrűs hillock, plough-land, leg. Domokos, MMM, F02595 (fragments); ► Doboz, hillock near wooden-bridge above Szuszóka-zug, opposite to Óvártó on the other side of oxbow, leg. Domokos, 1986, MMM, F02602 (19) (Geographical maps of the sampling sites found in Domokos 1989); ► Szarvas, archaeological site of Szarvas 23, N from Arboretum, Late Neolithic, garbage heap, leg. Gyurkovics, 1998, GYH/1.

## Discussion

### *Fossil shell from the Súgó/Şugău Cave*

One of the authors (H. Flaviu-Crişan) found a single fossil shell (Figure 3) in the Súgó/Şugău Cave, near Gheorgheni, Harghita County, Romania (TMM STN-235/R). More precisely, the shell was found in approximately 3 meters depth

in a small cavity in the cave wall in the so-called Zene-terem ("music room"), which is indicated on speleological maps as "Ödön-terem". The exact age of this fossil is unknown. However, Topál (1988) examined mammal (mostly bat) bones from sediments of the Sűgő/Șugău Cave, and according to him, the fossils are from the Early Pleistocene. Therefore, we identify date *Drobacia banatica* fossil also from the Early Pleistocene. Together with a fossil record from the Cheile Vargasului (Negrea 1994), this record indicates that the species was present in the Eastern Carpathians during the Pleistocene.

#### Ecology

The densest populations are known to inhabit *Alnus*-dominated gallery along mountain streams forests and the *Salix-Populus*-dominated gallery forest along lowland rivers, especially the ones with limestone rocks. In the latter case most populations are found approximately 30–50 meters from the river, in most cases under decaying plant debris material (often flotsam wood). It is also lives along the streams in the beech, spruce and other mountain forests. This species is particularly rarely found (i.e. population density is low) in the higher mountainous regions, such as in the Făgăraș Mountains.

#### Distribution

Currently *Drobacia banatica* is distributed in four countries (Figure 5). The centre of the distribution is in Romania, where many populations are known. In this country, *D. banatica* lives in the southern Carpathians until the Ciucaș and the Perșani Mountains in the east, inhabits the whole Apuseni Mountains and occurs in the Maramureș region. The southern limit is the Cerna Valley, Mehedinți Mountains. No living populations are known from the eastern chain of the Carpathians. In Ukraine it lives along the Romanian border, on the inner side of the Carpathian Mountains. In Hungary *D. banatica* lives along the river Tisza between Szeged and the Romanian border, around Gyula in the floodplain of the Fekete- and Fehér Körös Rivers, and in north-eastern Hungary near the Ukrainian border, near the Tisza River. *Drobacia banatica* has also been introduced to Germany, Quedlinburg (Clauss 1979). A single shell was collected in the Croatian Voćarica by Tamás Szontágh in October 1904 (record published by Kormos 1910, shell deposited in the MÁFI: R5478). Soós (1943) mentioned that this locality lies that far from the main distribution of the species that it is very much questionable. We

agree with the statement of Soós, and since *Drobacia banatica* has not been found in Croatia in the last century (Štamol 2010), we don't include this site on our map, and interpret the Croatian locality as erroneous. Šteffek (2007) found a shell with remains of the snail's body in Slovakia, in the flood area of the river Tisa. There is no evidence yet, however, that *D. banatica* could establish a population in that country.

The fossil data from Germany, Austria, Czech Republic, Slovakia, Hungary, southern Poland, Ukraine and the Romania show that the species had a far larger distributional area than now during the Quaternary and the Upper Miocene (Figure 6). The current distribution exceeds the fossil area only in the south (Banat region), although extensive research might reveal fossils in the Banat region as well. This indicates that the species did not move from its past area, its distribution only become narrower.

The comparison of the historical locality data (i.e. older than 50 years) and the modern sampling information is difficult because of two reasons. First, the sampling activity was focussed on different geographic areas. At the end of the 19th and beginning of the 20th century most *D. banatica* specimens were collected in the Southern Carpathians whereas in the past couple of decades most populations were found in the Apuseni Mountains. Second, the historical samples are often not provided with exact locality data, therefore many of them could not be located on the map. In most "classic" localities the species can be also found now, and we cannot observe clear disappearance of the species from previously inhabited areas.

As a summary, we can state that *Drobacia banatica* is a relict species which was much more widespread during the Quaternary and the Upper Miocene. In the last 100–150 years we have no evidence to state that the number of populations declines, although some populations surely became extinct along with the human spreading.

#### Conservation status

In Ukraine, where only the 7 locations are known, it is assessed as Endangered B1ab(i-iii)+2ab(i-iii) on the national level (Balashov, 2016). Following threats are considered to be most concerning in Ukraine: direct destruction of the habitats, forestry activity in existing forests (including protected ones), recreation and maybe collecting of alive snails (Balashov, 2016). Since most of the populations are known to live along the mountain

streams, another important threat for *D. banatica* is regulation of the mountain streams and rivers and building of the small hydroelectric power stations on the streams and rivers, which is especially concerning for Ukrainian Carpathians, where such activities become very intense in the last several years (Balashov, 2016). In Hungary the number of known populations is more than five, and some of them inhabit protected areas. Therefore, it is assessed as Least Concern on Hungarian level. If any loss in the number of subpopulations is experienced in the future, this could be changed to Near Threatened. Since this species occurs only locally, it is protected in Hungary by the law. In Romania the species is protected under the Habitats Directive transposed into Romanian legislation, and many of its populations inhabit protected areas, such as national parks.

As a summary, according to IUCN criteria *Drobacia banatica* must be assessed as Least Concern in the European Union and on global scale as well, because it inhabits a relatively wide geographical range and many, stable populations are known, and many populations inhabit protected areas. At the moment, we have no direct evidence that the number of populations is

continuously declining across its whole range. However, as a large, conspicuous, "pretty" snail species, which is a relict in the Carpathian Mountains, indicates natural habitats of high quality and belongs to a monotypic genus, should be protected by the law in all countries where it occurs, in order to avoid future reductions of the number of living populations.

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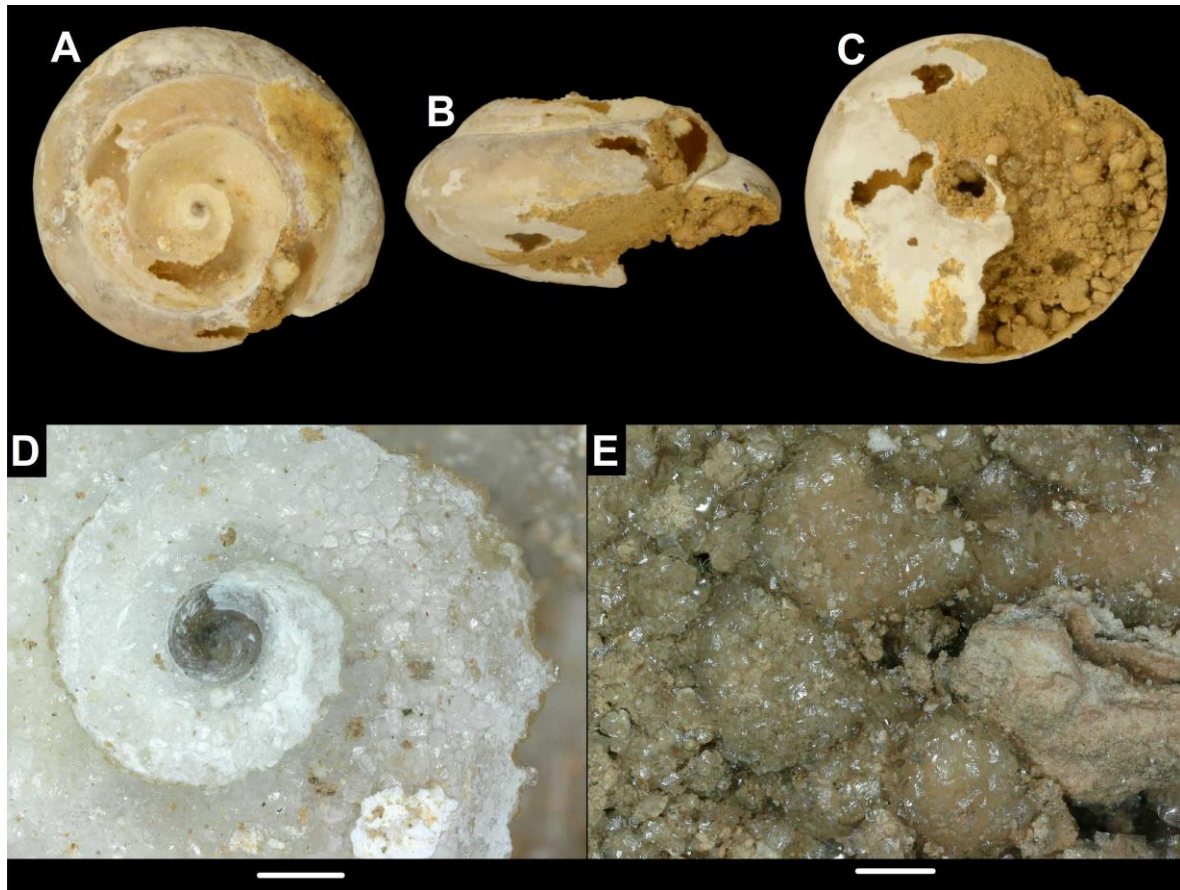
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**Fig. 1** Living individual of *Drobacia banatica*. Photo: T. Deli.



**Fig. 2** Shell breccia of *Drobacia banatica* from collection of the HGGI. Photo: Bálint Szappanos.



**Fig. 3** Fossil *Drobacia banatica* from the Súgó Cave, Harghita County, Romania (TMM STN-235/R). A–C: different views of the shell; D: crystals on the dorsal side; E: crystal side of the ventral side of the shell. Photos: B. Páll-Gergely. Diameter: 27.4 mm. Scales represent 1 mm.



**Fig. 4** Locality of the fossil *Drobacia* shell in the Súgó Cave, Harghita County, Romania. Photo: H. Flaviu-Crişan.

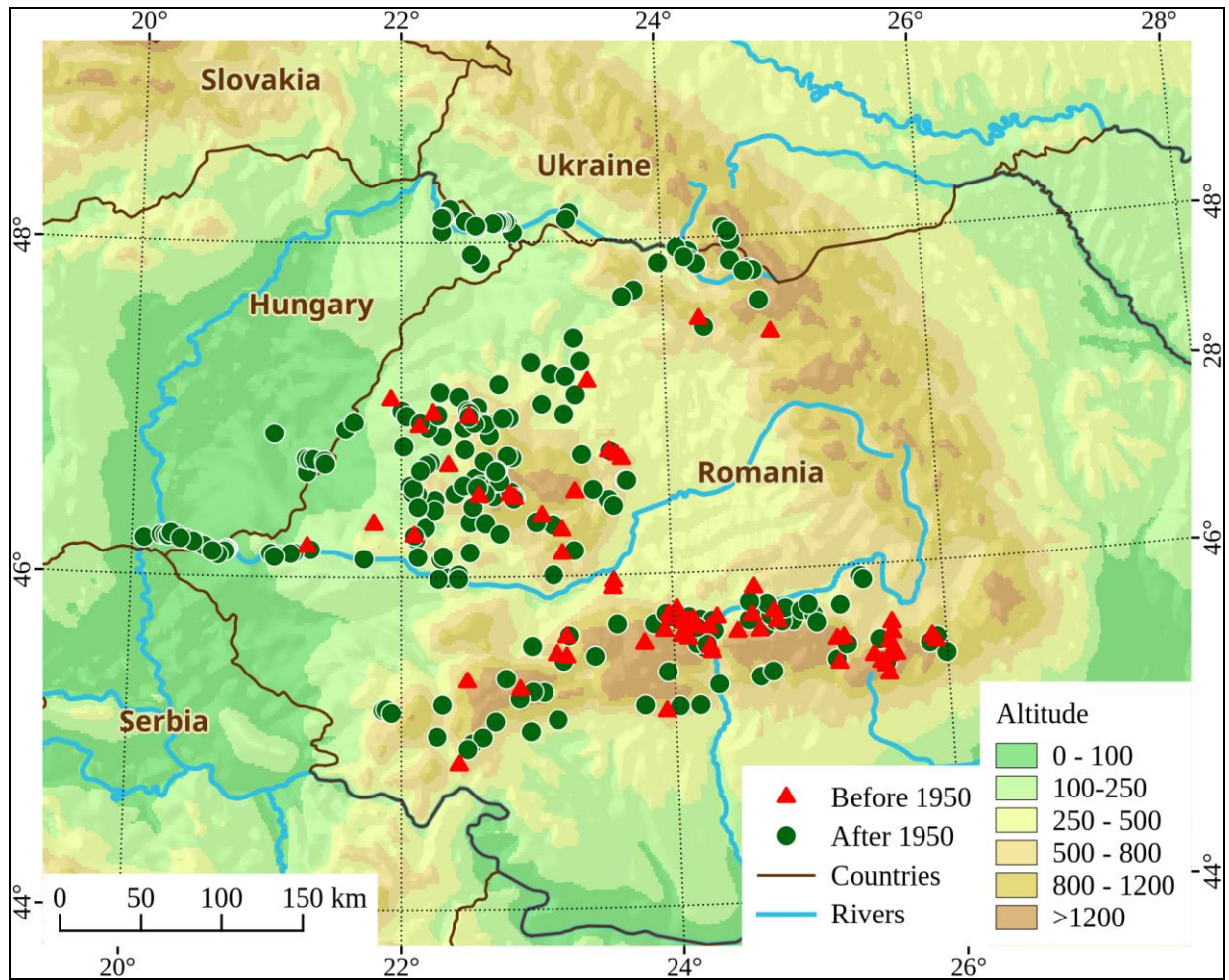


Fig. 5 Recent distribution of *Drobacia banatica*

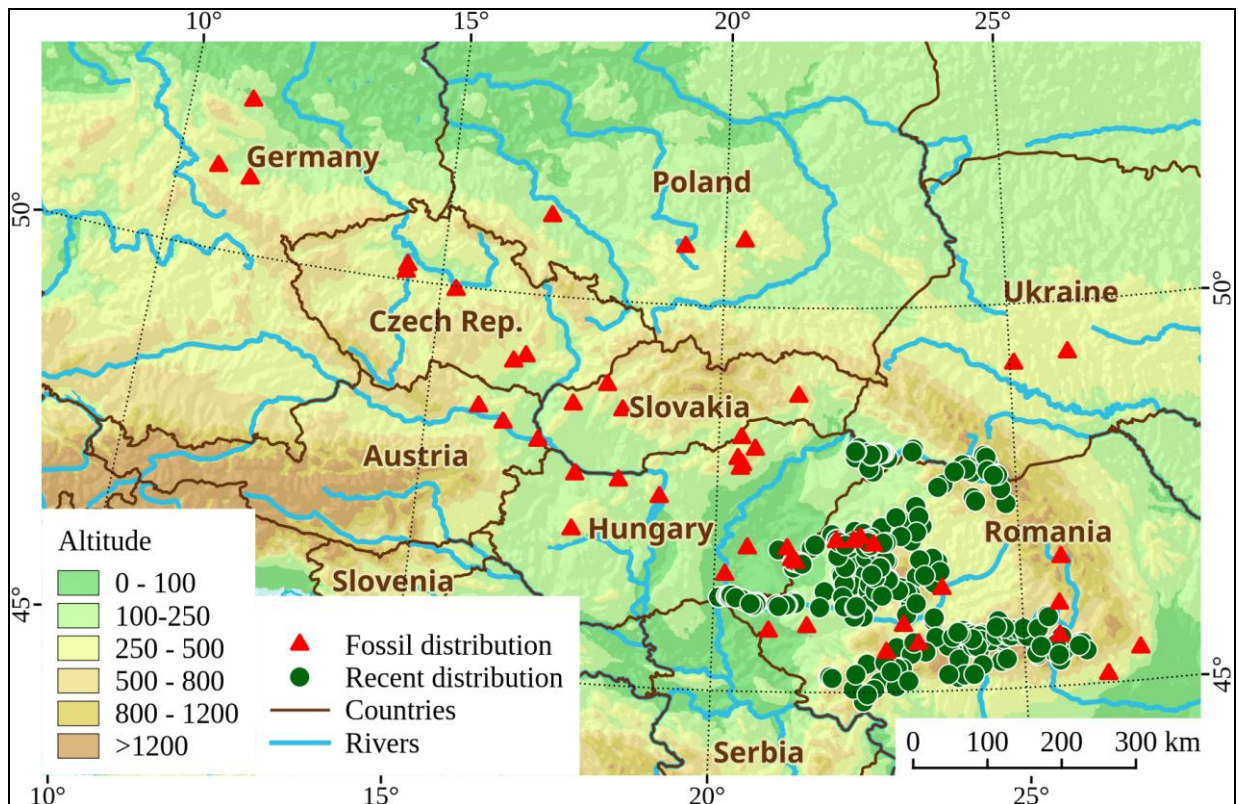


Fig. 6 Fossil and recent distribution of *Drobacia banatica*

# THE CATALOGUE OF SMALL MAMMALS COLLECTIONS (MAMMALIA: ERINACEOMORPHA, SORICOMORPHA AND RODENTIA) FROM THE NATURAL HISTORY MUSEUM AND AUGUST VON SPIESS HUNTING MUSEUM IN SIBIU

Aurelian BORDEI \*

**Abstract.** *This catalogue presents small mammals in the collection of Transylvanian Society of Natural Science from Sibiu and those from the August von Spiess collection. We identified 202 specimens belonging to 32 species and 27 genera. The majority of the specimens were collected from Transylvania, especially from the vicinity of Sibiu, by the members of the Society, museum's personnel and by August von Spiess himself.*

**Key words:** *small mammals, collections, catalogue, Transylvanian Society of Natural Science from Sibiu August von Spiess.*

**Rezumat.** *Acest catalog prezintă mamiferele de talie mică din cadrul colecției de mamifere a Societății Ardelene de Științele Naturii din Sibiu precum și din colecția August von Spiess. Au fost identificate 202 de specimene ce aparțin la 32 de specii și 27 de genuri. Majoritatea indivizilor au fost colectați de pe teritoriul Transilvaniei în special din împrejurimile Sibiului, de către membrii Societății, personalul muzeului și respectiv August von Spiess.*

**Cuvinte cheie:** *mamifere mici, colecții, catalog, Societatea Ardeleană de Științele Naturii din Sibiu, August von Spiess.*

## Introduction

The mammal collection was created just one year after the establishment of the Transylvanian Natural Science Society in Sibiu (*Siebenbürgischer Verein für Naturwissenschaften zu Hermannstadt*) in 1849 (Pop, 1970; Schneider, Stamp, 1970). In 1850, the botanist Johann Ferdinand Schur donates a water rat (*Arvicola terrestris*) and shortly after this donation the collection started to develop significantly. After 46 years, in 1896, the collection included the majority of mammals that could be found in Transylvania (\*\*\*) 1956).

Later on the collection was enriched with new donations and field collections, trophies, osteological pieces and skins.

Daniel Czekelius had an important role in the development of the collection. He donated antelope trophies, African buffalos, but also different small mammals from his own collection (*Glis glis* and *Spermophilus citellus*).

In 1956 the museum's mammal collection was not large in terms of numbers of individuals but it

comprised different species. Among these: chamois, deer, wild boars, wild cats, lynxes, wolves, bears, badgers, minks, squirrels, hamsters, rabbits, bats, moles and hedgehogs (Idem).

Throughout the 20<sup>th</sup> century the personnel of the museum brought numerous contributions to the development of this collection (especially small mammals) through collections from the area of Sibiu.

Colonel August Roland von Spiess was an Austro-Hungarian hunter, collector and naturalist and held the important title of the Keeper of the Royal Hunting grounds under King Ferdinand (Ciobanu, Sandu, 2010; Alaci, 2014).

The creation of this collection is the result of his inclination towards the study and exploration of nature. The specimens that held an important hunting role were hunted starting with the last decade of the 19<sup>th</sup> century up until the start of the Second World War, the most important ones being those collected in the interwar period.

Among these Spiess collected also small mammals (*Ondatra zibethicus* and *Mesocricetus newtoni*). This collection is superior thanks to the exotic trophies collected in the hunting

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expeditions in Africa in 1936 and 1938 (Spiess, 1942).

### Material and methods

The specimens in the two collections were identified based on the keys in the works published by Pukek (1981), Murariu (2000), Murariu and Popescu, (2001).

The systematics and nomenclature are in accordance with the Integrated Taxonomic Information System (<https://www.itis.gov/>).

The identification of the collecting sites that have Saxon names was made with the help of the dictionary of Transylvanian localities (Szabo, Szabo, 1992).

The majority of tags were handwritten, and in some cases information such as the collector or the collecting site are either missing or are indecipherable. (Fig. 1).

For each recorded species, information is provided concerning the number of specimens, the original species name on the original specimen's label (where they were identified), preservation method, the collecting place and date (presented in chronological order), the name of the collector or donor, and the inventory number written in brackets. The specimens are preserved in formaldehydes (formalin), rounded skin, study skins and skulls. The collection specimens that belonged to the Sibiu Association of Natural Sciences in Transylvania have in front the inventory number the letter "M", and those of the Spiess collection have the letters "Vt".

Some specimens are albinos, a phenomenon which was noted after the preservation method. The specimens that lack information were noted at the end.

Abbreviations: alb.- albino; don.- donor; Dr.- doctor, frst.- forest; ill.- illegible; lbl.- label; leg.- legit; Mtn.(s)- mountain/mountains; pa.- park; pk.- peak; spec. (s)- specimen/specimens

### Results

Based on the examined material, the small mammals collections of the Natural History Museum and August von Spiess Hunting Museum, include 202 specimens, belonging to 32 species of 27 genera (Tab. 1), presented below

Class MAMMALIA Linnaeus, 1758

Order Erinaceomorpha Gregory, 1910

Family Erinaceidae G. Fischer, 1814

Genus *Erinaceus* Linnaeus, 1758

*Erinaceus roumanicus* Barrett-Hamilton, 1900

(Northern White-Breasted Hedgehog)

Material: 1 spec., rounded skin, Sibiu, 8.02.1878 (M 692); 1 spec., skull, 1902 (M 631); 1 spec., lbl. *Erinaceus europaeus* L., preserved in formaldehyde, Sibiu, 29.03.1961, leg. H. Hannenheim (M 45); 1 spec., taxidermy mount, without any data (M 41/84); 1 spec., lbl.

*Erinaceus europaeus* L., taxidermy mount, without any data (M 42/85); 1 spec., preserved in formaldehyde, without any data (M 46); 1 spec., taxidermy mount, without any data (M 86).

Order Soricomorpha Gregory, 1910

Family Soricidae G. Fischer, 1814

Genus *Crocidura* Wagler, 1832

*Crocidura leucodon* Hermann, 1780 (Bicolored White Thooted-Shrew)

Material: 1 spec., preserved in formaldehyde, Sibiu, 1898, leg. Kremer (M 601/3665); 1 spec., lbl. *Crocidura aranea* Schreb., preserved in formaldehyde, Avrig, Sibiu, leg. Eduard Albert Bielz (M 32/3666); 1 spec., lbl. *Sorex araneus* L., taxidermy mount (M 39/90).

*Crocidura suaveolens* (Pallas, 1811) (Lesser White Thooted-Shrew)

Material: 1 spec., lbl. *Crocidura araneus* Schreb., skull, Sibiu, 7.10.1901 (M 40/2463); 1 spec., preserved in formaldehyde, without any data.

Genus *Neomys* Kaup, 1829

*Neomys anomalus* Cabrera, 1907 (Miller's Water Shrew)

Material: 1 spec., lbl. *Crossopus fodiens* Pall., taxidermy mount, Sadu, Sibiu, 25.07.1923, leg. Carl Orendi (M 35/88); 1 spec., rounded skin, without any data.

*Neomys fodiens* (Pennant, 1771) (Water Shrew)

Material: 1 spec., lbl. *Crossopus fodiens* Pall., preserved in formaldehyde, Măgura Cisnădiei, Sibiu, 20.06.1889 (M 38/4066); 1 spec., rounded skin, Sibiu, 26.12.1900 (M 34/87); 1 spec., lbl.

*Crossopus fodiens* Pall., skull, Sadu, Sibiu, 1902 (M 36/2169); 1 spec., lbl. *Sorex fodiens*, preserved in formaldehyde, Sadu, Sibiu, 18.06.1926 (M 37/3664).

Genus *Sorex* Linnaeus, 1758

*Sorex araneus* Linnaeus 1758 (Common Shrew)

Material: 1 spec., lbl. *Sorex araneus* L., preserved in formaldehyde, 1916; 1 spec., lbl. *Sorex vulgaris*

L., skull, Sibiu (M 31/2465); 1 spec., taxidermy mount, ill. lbl. (M 30/89).

*Sorex minutus* Linnaeus 1766 (Pygmy Shrew)

Material: 1 spec., lbl. *Sorex pygmaeus* Pall., preserved in formaldehyde, Alba Iulia, 1903, leg. Dr. Carl Petri (M 33/3663).

Family Talpidae G. Fischer, 1814

Genus *Talpa* Linnaeus 1758

*Talpa europaea* Linnaeus, 1758 (European Mole)

Material: 1 spec., lbl. *Talpa europaea* L., taxidermy mount, alb., Slimnic, Sibiu, 1922, don. Hannenheimer (M 24/97); 1 spec., lbl. *Talpa europaea* L., skull, Sibiu, 1922 (M 27/2451); 1 spec., lbl. *Talpa europaea* L., skull, 1923, ill. leg. (M 29/2454); 1 spec., lbl. *Talpa europaea* L., taxidermy mount, alb., Sibiu, 23.05.1925, ill. don. (M 23/96); 1 spec., lbl. *Talpa europaea romana* Barrett-Hamilton, 1902, taxidermy mount, Dobrogea, 1930, leg. August von Spiess (M 19/91); 1 spec., lbl. *Talpa europaea* L., taxidermy mount, Apoldu de Sus, Sibiu, 15.08.1938, leg. Gustav Henrich (M 20/92); 1 spec., lbl. *Talpa europaea* L., taxidermy mount, 22.11.1940, leg. A. Kamner (M 25/95); 1 spec., lbl. *Talpa europaea* L., study skin, Sibiu, 10.04.1960, don. Ecaterina Müller (M 629); 1 spec., lbl. *Talpa europaea* L., skull, Sibiu, 09.1963, don. Trigarsky W. (M 679); 1 spec., rounded skin, Tâlmăciu, Sibiu, 4.06.1978, leg. C. Popescu (M 693); 1 spec., lbl. *Talpa europaea* L., skull, Sibiu (M 28/2452); 1 spec., rounded skin, without any data (M 21/93); 1 spec., taxidermy mount, without any data (M 22/94); 1 spec., lbl. *Talpa europaea* L., skull, without any data (M 26/2450); 2 specs., preserved in formaldehyde, without any data (3650); 1 spec., rounded skin, without any data; 1 spec., preserved in formaldehyde, without any data.

Order Rodentia Bowdich, 1821

Family Caviidae Fischer de Waldheim, 1817

Genus *Cavia* Pallas, 1766

*Cavia porcellus* (Linnaeus, 1758) (Guinea Pig)

Material: 1 spec., lbl. *Cavia porcellus*, rounded skin, Sibiu, 26.10.1970, leg. Zsivanovits; 1 spec., lbl. *Cavia porcellus* L., rounded skin, Sibiu, 28.10.1970, leg. Zsivanovits; 1 spec., lbl. *Cavia porcellus* L., rounded skin, Sibiu, 28.10.1970; 1 spec., lbl. *Cavia porcellus*, rounded skin, alb., 18.09.1973; 3 specs., lbl. *Cavia porcellus* L., rounded skin, 18.09.1973; 2 specs., lbl. *Cavia cobaya*, taxidermy mount, ill. leg. (M 175/3212);

1 spec., rounded skin, alb., without any data; 1 spec., rounded skin, without any data.

Family Hystricidae Fischer de Waldheim, 1817

Genus *Hystrix* Linnaeus, 1758

*Hystrix cristata* Linnaeus, 1758 (Crested Porcupine)

Material: 1 spec., lbl. *Hystrix cristata*, taxidermy mount, Africa de Nord, ill. leg. (M 174/3161).

Family Myocastoridae Ameghino, 1902

Genus *Myocastor* Kerr, 1792

*Myocastor coypus* (Molina, 1782) (Coypu)

Material: 1 spec., lbl. *Myocastor coypus*, rounded skin, Sibiu, 07.1986, leg. C. Popescu; 1 spec., skull, Sibiu, 1987 (M 173/2549); 1 spec., rounded skin, 12.12.1936 (M 172/78); 1 spec., lbl. *Myocastor coypus*, taxidermy mount, Sibiu, 6.09.1937, leg. Carl Orendi (M 171/77).

Family Cricetidae Fischer, 1817

Genus *Arvicola* Lacépède, 1799

*Arvicola scherman* (Schaw, 1801) (Montane Water Vole)

Material: 1 spec., lbl. *Paludicola amphibius*, preserved in formaldehyde, Sibiu, 1899 (M 145/3660); 1 spec., lbl. *Paludicola terrestris*, taxidermy mount, Sibiu, 03.1914, ill. leg. (M 143/80).

Genus *Lemmus* Link, 1795

*Lemmus lemmus* Linnaeus, 1758 (Norway Lemming)

Material: 2 specs., taxidermy mount, Bergen, Norway, 1911, don. Alfred Müller (M 147/72).

Genus *Microtus* Schrank, 1789

*Microtus arvalis* (Pallas 1779) (Common Vole)

Material: 1 spec., lbl. *Mus agrarius* Pall., skull, Cîsnădie, Sibiu, 1910, ill. leg. (M 141/2494); 1 spec., skull, Sibiu, 1921 (M 158/2492); 1 spec., preserved in formaldehyde, without any data (3650).

Genus *Myodes* Pallas, 1811

*Myodes glareolus* (Schreber, 1780) (Bank Vole)

Material: 1 spec., preserved in formaldehyde, Păltiniș, Sibiu, 1890 (M 620); 1 spec., lbl. *Clethrionomys glareolus isticus* Miller, 1909, preserved in formaldehyde, Măgura Cîsnădiei, Sibiu, 06.1914 (M 610/3753); 1 spec., lbl. *Clethrionomys glareolus isticus* Miller, 1909, preserved in formaldehyde, Negoiu pk., Făgăraș Mtns., 08.1924, leg. Karl Wolf (M 599/3656); 1 spec., preserved in formaldehyde, Măgura

Cisnădiei, Sibiu, 22.08.1932 (M 140); 1 spec., taxidermy mount, Dumbrava frst., Sibiu, 24.07.1961 (M 656); 1 spec., lbl. *Microtus arvalis* Pallas, study skin and skull, Dumbrava frst., Sibiu, 8.12.1964, leg. Zsivanovits Peter; 1 spec., taxidermy mount, without any data (67); 1 spec., preserved in formaldehyde, without any data (3650).

Genus *Ondatra* Link, 1795

*Ondatra zibethicus* (Linnaeus, 1766) (Muskrat)  
Material: 1 spec., study skin, Timișoara, 08.1956 (M 146/4580); 1 spec., lbl. *Sciurus vulgaris*, skull, Dumbrava frst., Sibiu, 10.10.1968, leg. Zsivanovits Peter (M 686); 1 spec., skull, leg. August von Spiess (Vt 622); 1 spec., skull, leg. August von Spiess (Vt 623); 1 spec., skull, leg. August von Spiess (Vt 624); 1 spec., study skin, without any data (M 690); 1 spec., taxidermy mount, without any data.

Genus *Cricetus* Leske, 1779

*Cricetus cricetus* (Linnaeus, 1758) (Common Hamster)  
Material: 1 spec., skull, Sibiu, 1911, leg. Theil (M 138/2487); 1 spec., skull, Sibiu, 1911 (M 137/2486); 1 spec., lbl. *Cricetus frumentarius* L., taxidermy mount, Turnișor, Sibiu, 16.06.1934, leg. Rolf Wepriél (M 135/60); 1 spec., lbl. *Cricetus frumentarius*, taxidermy mount, 25.04.1940, ill. leg. (M 136/62); 1 spec., lbl. *Cricetus cricetus* L., taxidermy mount, Tâlmăciu, Sibiu, 4.09.1958, leg. Horst Schneider (M 139/4605); 1 spec., rounded skin, Turnișor, Sibiu, 9.06.1965 (M 684).

Genus *Mesocricetus* Nehring, 1898

*Mesocricetus newtoni* (Nehring, 1898) (Romanian Hamster)  
Material: 1 spec., lbl. *Mesocricetus nurtoni*, taxidermy mount, Tulcea, 20.11.1930, leg. August von Spiess (Vt 628).

Family Muridae Illiger, 1811

Genus *Apodemus* Kaup, 1829

*Apodemus flavicollis* (Melchior, 1834) (Yellow Necked Field Mouse)  
Material: 1 spec., lbl. *Mus musculus* L., preserved in formaldehyde, Sibiu, 11.1919 (M 151/3654); 1 spec., lbl. *Mus sylvaticus* L., skull, Sibiu, 04.1921, ill. leg. (M 157/2491); 1 spec, lbl. *Mus sylvaticus* L., taxidermy mount, Sibiu, 28.02.1922, leg. Hans Hermann (M 155/64); 1 spec, lbl. *Mus sylvaticus* L., taxidermy mount, Sibiu, 15.03.1922, leg. Hans Hermann (M 156/65); 4 specs., preserved in formaldehyde, without any data.

*Apodemus sylvaticus* (Linnaeus, 1758) (Wood Mouse)

Material: 1 spec, lbl. *Mus sylvaticus* L., preserved in formaldehyde, Prejba, Lotru mts., 6.07.1889; 2 specs., preserved in formaldehyde, Gușterița, Sibiu, 1914, leg. Michael Fuss (M 619/3661); 7 specs., lbl. *Apodemus sylvaticus* L., preserved in formaldehyde, Lotrioara, Sibiu, 26.05.2001, leg. K. Philippi (M 703); 1 spec., taxidermy mount, without any data (M 154/63).

Genus *Hydromys* É. Geoffroy, 1804

*Hydromys chrysogaster* (É. Geoffroy Saint-Hilaire, 1804) (Common Water Rat)

Material: 1 spec., lbl. *Hydromys chrysogaster* Geoff., taxidermy mount, Sydney, Australia, 1941, don. Carl Melisca (M 168/3314).

Genus *Mus* Linnaeus, 1758

*Mus musculus* Linnaeus, 1758 (House Mouse)

Material: 6 specs., lbl. *Mus musculus*, preserved in formaldehyde, 12.1914 (M 149/3642); 1 spec., lbl. *Arvicola arvalis*, skull, Sibiu, 1915 (M 142/2495); 1 spec., preserved in formaldehyde, 1916 (M 150/3644); 5 specs., lbl. *Mus musculus* L., preserved in formaldehyde, Sibiu, 09.1920 (M 152/3657); 1 spec., lbl. *Mus musculus*, taxidermy mount, alb., Timișoara, 07.1956 (M 153/4212); 1 spec., lbl. *Mus musculus* L., study skin, Sibiu, 29.5.1959, leg. Katharina Müller (4935); 1 spec., lbl. *Mus musculus* L., preserved in formaldehyde, Sibiu, 10.07.1961, leg. Silvia Stein (M 653); 1 spec., lbl. *Mus musculus albius*, study skin and skull, alb., Timișoara (M 167/4211); 2 specs., lbl. *Mus musculus*, taxidermy mount, without any data (M 148/66).

Genus *Rattus* Fischer, 1803

*Rattus norvegicus* (Berkenhout, 1769) (Brown Rat)

Material: 1 spec., skull, Sibiu, 1915 (M 163/2498); 1 spec., lbl. *Mus decumanus*, preserved in formaldehyde, Sibiu, 3.07.1927 (M 166/3652); 1 spec., taxidermy mount, alb., Timișoara, 07.1956; 1 spec., lbl. *Rattus norvegicus* Berkenhout, study skin, Sibiu, 7.02.1959, don. Katharina Müller (M 666/4879); 1 spec., lbl. *Rattus norvegicus*, study skin, Sibiu, 10.1961, leg. Stamp Hans Martin (M 658); 1 spec., lbl. *Rattus norvegicus*, skull, Sibiu, 10.1961, leg. Stamp Hans Martin (M 659); 1 spec., lbl. *Rattus norvegicus*, skull, Sibiu, 9.03.1962, don. Hannenheim (M 680); 1 spec., skull, Sibiu (M 164/2500); 2 specs., lbl. *Mus decumanus*, preserved in formaldehyde, without any data (M 165/3640); 1 spec., taxidermy mount, without any

data (M 161/73); 1 spec., taxidermy mount, without any data (M 162/74); 2 specs., rounded skin, alb., without any data.

*Rattus rattus* (Linnaeus, 1758) (Black Rat)

Material: 1 spec., lbl. *Epimys rattus* L., taxidermy mount, Breuberg, Germany, 28.03.1933, leg. Dr. N. Vasvary (M 160/76).

Family Spalacidae Gray, 1821

Genus *Nannospalax* Palmer, 1903

*Nannospalax leucodon* (Nordmann, 1840) (Lesser Blind Mole Rat)

Material: 1 spec., skull, Târgu Mureş, 1912 (M 170/2541); 1 spec., lbl. *Spalax hungaricus* Nhrgr., taxidermy mount, Aiud, Alba, 1915, don. Dr. G. Müller (M 169/79).

Family Gliridae Muirhead, 1819

Genus *Glis* Brisson, 1762

*Glis glis* (Linnaeus, 1766) (Edible Dormouse)

Material: 1 spec., lbl. *Myoxus glis* L., taxidermy mount, Saschiz, Mureş, 25.09.1901, don. Dr. Daniel Czekelius (M 123/51); 1 spec., lbl. *Myoxus glis* L., taxidermy mount, Saschiz, Mureş, 1922, ill. leg. (M 125/53); 1 spec., rounded skin, 1922, Sibiu, (M 124/52); 1 spec., lbl. *Glis glis*, taxidermy mount, Medias, 09.1980, leg. P. Weber (M 126/54); 2 specs., rounded skin, without any data.

Genus *Dryomys* Thomas, 1906

*Dryomys nitedula* (Pallas, 1778) (Forest Dormouse)

Material: 1 spec., lbl. *Myoxus dryas* Schreb., preserved in formaldehyde, Păltiniş, Sibiu, 15.08.1899, leg. Dr. Daniel Czekelius (M 133/3671); 1 spec., lbl. *Eliomys quercinus* L., taxidermy mount, Guşteriţa, Sibiu, 1912, ill. leg. (M 129/58); 1 spec., lbl. *Myoxus dryas*, preserved in formaldehyde, Guşteriţa, Sibiu, 1914, leg. Karl Fuss (M 134/3809); 1 spec., taxidermy mount, Păltiniş, Sibiu, 1915, leg. Dr. Daniel Czekelius (M 132/55); 1 spec., lbl. *Eliomys quercinus*, taxidermy mount, Sibiu, 4.03.1941, leg. Dr. Hartmut Walter Palmhert (M 128/57); 1 spec., lbl. *Eliomys quercinus* L., taxidermy mount, Ocna Sibiului, Sibiu, 4.05.1958, don. Varga Jozsef (M 130/4590); 1 spec., lbl. *Eliomys quercinus* L., study skin, Catrina frst., Sibiu, 8.05.1958, leg. Dan Droc (4588); 1 spec., lbl. *Eliomys quercinus* L., study skin and skull, Catrina frst., Sibiu, 8.05.1958, leg. Dan Droc (4589); 1 spec., lbl. *Eliomys quercinus* L., taxidermy mount, Catrina frst., Sibiu, 07.1958 (M 131/4907); 1 spec., taxidermy mount, Ocna Sibiului, Sibiu,

21.04.1964 (M 673); 1 spec., lbl. *Myoxus dryas*, preserved in formaldehyde, Sibiu, ill. leg.; 1 spec., taxidermy mount, without any data (M 127/56).

Genus *Muscardinus* Kaup, 1829

*Muscardinus avellanarius* (Linnaeus, 1758) (Hazel Dormouse)

Material: 5 specs., lbl. *Muscardinus avellanarius*, preserved in formaldehyde, 08.1878, ill. leg. (M 120/3646); 1 spec., rounded skin, 30.08.1878, leg. Wilhelm Hausmann (M 118/80); 1 spec., lbl. *Muscardinus avellanarius* L., taxidermy mount, Viile Sibiului, Sibiu, 1899, don. L. Klein (M 116/69); 1 spec., lbl. *Paludicola amphibius* L., taxidermy mount, Sighişoara, 1900, leg. Krauss (M 144/81); 1 spec., lbl. *Muscardinus avellanarius*, taxidermy mount, Sibiu, 10.1929, don. A. Kamner (M 117/70); 1 spec., lbl. *Mus minutus* Pall., taxidermy mount., Sibiu, 06.1933, ill. leg. (M 159); 1 spec., taxidermy mount, Catrina frst., Sibiu, 8.05.1958 (M 122/4591); 1 spec., lbl. *Muscardinus avellanarius* L., study skin and skull, Catrina frst., Sibiu, 9.05.1959, don. Silvia Stein (4932); 1 spec., lbl. *Muscardinus avellanarius* L., study skin and skull, Catrina frst., Sibiu, 8.06.1961, don. Muţiu Ioan (M 655); 1 spec., preserved in formaldehyde, Cindrel mts., Sibiu, 08.1987, leg. M. Rotman (M 702); 1 spec., lbl. *Muscardinus avellanarius* L., skull, Viile Sibiului, Sibiu (M 119/2497); 1 spec., lbl. *Muscardinus avellanarius*, preserved in formaldehyde, Sub Arini pa., Sibiu (M 121/3658); 1 spec., preserved in formaldehyde, without any data (M 600/3659).

Family Sciuridae Fischer de Waldheim, 1817

Genus *Funambulus* Lesson, 1835

*Funambulus palmarum* (Linnaeus, 1766) (Common Palm Squirrel)

Material: 1 spec., rounded skin, India, 2001 (M 705); 1 spec., rounded skin, India, 2001 (M 706).

Genus *Sciurus* Linnaeus, 1758

*Sciurus vulgaris* Linnaeus, 1758 (Eurasian Red Squirrel)

Material: 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Sibiu, 9.10.1902, don. Friedrich Bömches von Boor (M 102/43); 1 spec., lbl. *Sciurus vulgaris* L., skull, Cisdădie, Sibiu, 19.09.1920, ill. leg. (M 107/2502); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Şanta, Păltiniş, Sibiu, 10.1920, don. J. Kessler (M 103/45); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Sibiu, 27.02.1935, leg. Dr. G. Wermescher (M 105/47); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Sibiu, 18.07.1837, leg. Dr. Hartmut Walter Palmhert (M

104/46); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Sibiu, 18.10.1944, ill. leg. (M 108/3069); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Sub Arini pa., Sibiu, 5.01.1959, don. Diether Ungar (M 100/4877); 1 spec., lbl. *Sciurus vulgaris* L., rounded skin, Dumbrava, frst., Sibiu, 1.02.1959, don. Diether Ungar (4878 a); 1 spec., lbl. *Sciurus vulgaris* L., skull, Dumbrava, frst., Sibiu, 1.02.1959, don. Diether Ungar (4878 b); 1 spec., lbl. *Sciurus vulgaris* L., taxidermy mount, Dumbrava, frst., Sibiu, 18.04.1959, leg. Diether Ungar (M 109/4916); 1 spec., lbl. *Sciurus vulgaris* L., preserved in formaldehyde, Sibiu, 15.08.1959, don. Diether Ungar (M 110); 1 spec., lbl. *Sciurus vulgaris* L., skull, 26.05.1962, Sub Arini pa., Sibiu, don. Spiridonescu M. (M 676); 1 spec., rounded skin, Sibiu, 23.12.1962 (M 665); 1 spec., lbl. *Sciurus vulgaris* L., 1758, skull, Dumbrava frst., Sibiu, 7.05.1964, don. The Police Department of Sibiu (M 677); 1 spec., lbl. *Sciurus vulgaris*, 1758, skull, Sebeş de Jos, Alba, 10.10.1966, leg. Peter Zsivanovits; 1 spec., lbl. *Sciurus vulgaris*, study skin and skull, Dumbrava frst., Sibiu, 5.06.1968, leg. Schoger G. (M 688); 1 spec., lbl. *Sciurus vulgaris* L., skull, Dumbrava frst., Sibiu, 24.01.1969, don. Popa V. (M 687); 1 spec., lbl. *Sciurus vulgaris*, taxidermy mount, ill. leg. (M 101/42); 1 spec., skull, without any data (M 106/2501); 1 spec., rounded skin, without any data (M 685).

Genus *Marmota* Blumenback, 1779

*Marmota marmota* Linnaeus, 1758 (Alpine Marmot)

Material: 1 spec., rounded skin, leg. Buda Adam (M 115/4220).

Genus *Spermophilus* F. Cuvier, 1825

*Spermophilus citellus* (Linnaeus, 1766) (European Ground Squirrel)

Material: 1 spec., lbl. *Spermophilus citellus* L., taxidermy mount, Ungarisch Weiss Kirchen, Serbia, 1903, don. Dr. Daniel Czekelius (M 111/48); 1 spec., skull, Ungarisch Weiss Kirchen, Serbia, 1903 (M 114/2488); 1 spec., rounded skin, Constanța, 1925 (M 112/49); 1 spec., lbl. *Spermophilus citellus* L., taxidermy mount, Timișoara, 1928, leg. R. Albrecht (M 113/50).

## Conclusions

The small mammal collection belonging to the Transylvanian Natural Science Society in Sibiu

was created through donations and filed collections made by its researchers. In some cases it is debatable if the donors were also the collectors of the specimens. We identified 198 specimens belonging to 31 species and 26 genera, most of them being collected from Transylvania, especially from the vicinity of Sibiu. Most of the species found in the collections are typical forest species (squirrels, dormice, yellow-necked field mouse, wood mouse, etc.) while common open habitat species are either absent from the collections (the striped field mouse *Apodemus agrarius* Pallas, 1771, pygmy field mouse *A. uralensis* Pallas, 1811, or harvest mouse *Micromys minutus* Pallas, 1771) or poorly represented (the common vole or the white-teethed shrews).

In this collection we identified seven non native species. Among them four are exotic (*Hydromys chrysogaster*, *Hystrix cristata*, *Lemmus lemmus* and *Funambulus palmarum*) and were collected from their native ranges, two are kept as pets, lab or farm animals (*Cavia porcellus* and *Mycastor coypus*) and one is invasive (*Ondatra zibethicus*) being collected from its new range, in Romania. For species (*Cavia porcellus*, *Mus musculus*, *Rattus norvegicus* and *Talpa europaea*) were represented by albino specimens (Fig. 2 and Fig. 3). In case of the first three species the albino individuals came from captivity, from artificially selected genetic lineages.

In the August von Spiess collection we identified 4 specimens collected from the field belonging to 2 species and 2 genera. We were able to identify the place and date of collection only for Romanian hamster (*Mesocricetus newtoni*), an endemic and endangered species in the Balkans (Murariu, Stanciu 2009; Murariu et. al, 2010), which was collected from the vicinity of Tulcea in 1930 (Fig. 4).

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### LIST OF ILLUSTRATIONS

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### LISTA ILUSTRĂȚILOR

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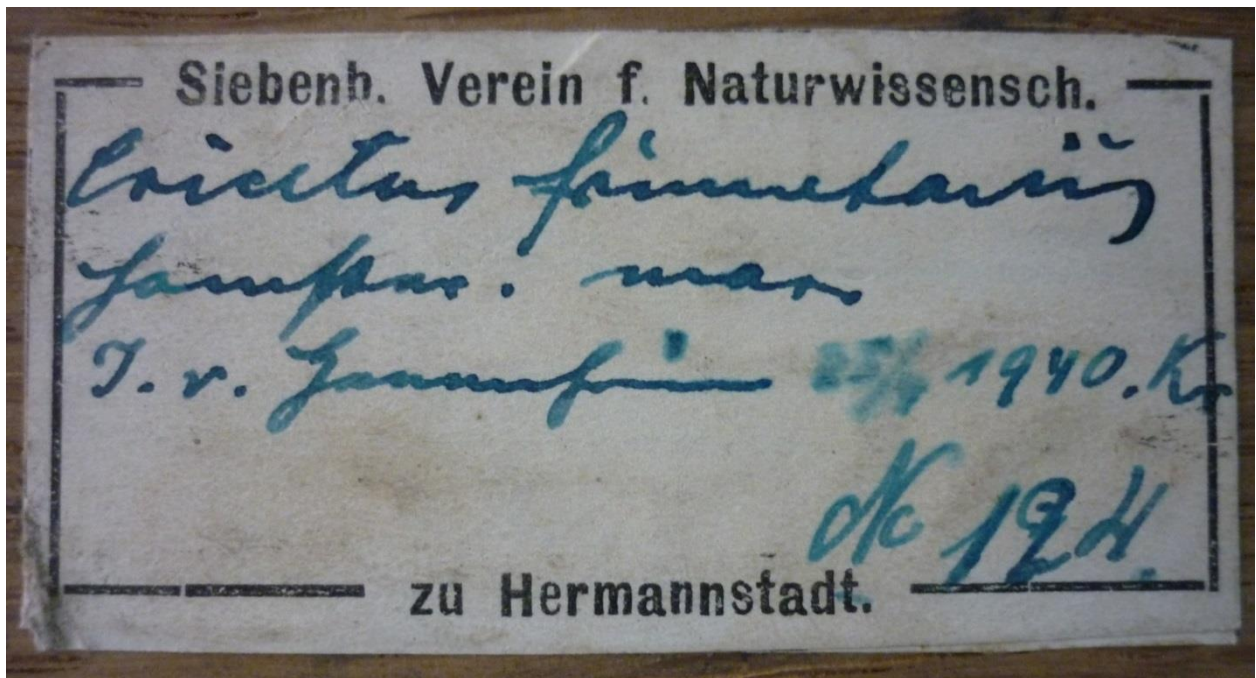


Fig. 1. Handwritten label in which the collector's name is indecipherable.



Fig. 2. Albino *Mus musculus* (Linnaeus, 1758) specimen.





Fig. 3. Albino *Rattus norvegicus* (Berkenhout, 1769) specimen.



Fig. 4. Taxidermic mount of *Mesocricetus newtoni* (Nehring, 1898).

Tab. 1. List of the orders, families, genres and species from the present catalogue

Order	Family	Genus	Species
Erinaceomorpha Gregory, 1910	Erinaceidae G. Fischer, 1814	<i>Erinaceus</i> Linnaeus, 1758	<i>Erinaceus roumanicus</i> Barrett-Hamilton, 1900
Soricomorpha Gregory, 1910	Soricidae G. Fischer, 1814	<i>Crocidura</i> Wagler, 1832	<i>Crocidura leucodon</i> Hermann, 1780
			<i>Crocidura suaveolens</i> (Pallas, 1811)
		<i>Neomys</i> Kaup, 1829	<i>Neomys anomalus</i> Cabrera, 1907
	<i>Sorex</i> Linnaeus, 1758	<i>Neomys fodiens</i> (Pennant, 1771)	
		<i>Sorex araneus</i> Linnaeus 1758	
		<i>Sorex minutus</i> Linnaeus 1766	
	Talpidae G. Fischer, 1814	<i>Talpa</i> Linnaeus 1758	<i>Talpa europaea</i> Linnaeus, 1758
Rodentia Bowdich, 1821	Cavidae Fischer de Waldheim, 1817	<i>Cavia</i> Pallas, 1766	<i>Cavia porcellus</i> (Linnaeus, 1758)
	Hystricidae Fischer de Waldheim, 1817	<i>Hystrix</i> Linnaeus, 1758	<i>Hystrix cristata</i> Linnaeus, 1758
	Myocastoridae Amenghino, 1902	<i>Myocastor</i> Kerr, 1792	<i>Myocastor coypus</i> (Molina, 1782)
	Cricetidae Fischer, 1817	<i>Arvicola</i> Lacépède, 1799	<i>Arvicola scherman</i> (Schaw, 1801)
		<i>Lemmus</i> Link, 1795	<i>Lemmus lemmus</i> Linnaeus, 1758
		<i>Microtus</i> Schrank, 1789	<i>Microtus arvalis</i> (Pallas 1779)
		<i>Myodes</i> Pallas, 1811	<i>Myodes glareolus</i> (Schreber, 1780)
		<i>Ondatra</i> Link, 1795	<i>Ondatra zibethicus</i> (Linnaeus, 1766)
		<i>Cricetus</i> Leske, 1779	<i>Cricetus cricetus</i> (Linnaeus, 1758)
		<i>Mesocricetus</i> Nehring, 1898	<i>Mesocricetus newtoni</i> (Nehring, 1898)

Muridae Illiger, 1811	<i>Apodemus</i> Kaup, 1829	<i>Apodemus flavicollis</i> (Melchior, 1834)
		<i>Apodemus sylvaticus</i> (Linnaeus, 1758)
	<i>Hydromys</i> É. Geoffroy, 1804	<i>Hydromys chrysogaster</i> (É. Geoffroy Saint-Hilaire, 1804)
	<i>Mus</i> Linnaeus, 1758	<i>Mus musculus</i> Linnaeus, 1758
	<i>Rattus</i> Fischer, 1803	<i>Rattus norvegicus</i> (Berkenhout, 1769)
		<i>Rattus rattus</i> (Linnaeus, 1758)
Spalacidae Gray, 1821	<i>Nannospalax</i> Palmer, 1903	<i>Nannospalax leucodon</i> (Nordmann, 1840)
Gliridae Muirhead, 1819	<i>Glis</i> Brisson, 1762	<i>Glis glis</i> (Linnaeus, 1766)
	<i>Dryomys</i> Thomas, 1906	<i>Dryomys nitedula</i> (Pallas, 1778)
	<i>Muscardinus</i> Kaup, 1829	<i>Muscardinus avellanarius</i> (Linnaeus, 1758)
Sciuridae Fischer de Waldheim, 1817	<i>Funambulus</i> Lesson, 1835	<i>Funambulus palmarum</i> (Linnaeus, 1766)
	<i>Sciurus</i> Linnaeus, 1758	<i>Sciurus vulgaris</i> Linnaeus, 1758
	<i>Marmota</i> Blumenback, 1779	<i>Marmota marmota</i> Linnaeus, 1758
	<i>Spermophilus</i> F. Cuvier, 1825	<i>Spermophilus citellus</i> (Linnaeus, 1766)

# CRITICAL OVERVIEW ON THE ODONTOLOGICAL RESEARCHES OF THE MESOZOIC AND CENOZOIC FISH FROM ROMANIA

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**Abstract:** *This work aims to make a critical review of the last 168 years of research regarding the fossil fish teeth from the Cenozoic and the Mesozoic deposits of Romania and to analyze not only the progress made by the authors, but also the challenges they encountered with their work and the progresses they achieved.*

**Keywords:** *vertebrate paleontology, fish teeth, research, history of science.*

**Rezumat:** *Lucrarea de față realizează o privire critică de ansamblu asupra cercetărilor ultimilor 168 de ani cu privire la dinții de pești fosili găsiți în depozitele mezozoice și cenozoice din România, analizând provocările întâmpinate de autori, dar și progresele realizate de aceștia.*

**Cuvinte cheie:** *paleontologia vertebratelor, dinți de pești, cercetări, istoria științei*

## Introduction

Comparing the Romanian paleontological references with the ones from Western Europe, United States, but also from Eastern Europe (especially from Russia), it is obvious that the analysis of the fossil fish record had a rather faint contribution to the progress of paleontology in our country. Even the basic works of historic geology, the synthetic studies on the paleoenvironment reconstructions or the analyses on the biostratigraphy of the sedimentary basins frequently fail to mention fossil fishes. As a small exception, there are the works referring to the fish skeletons from the Carpathian Oligocene (Grădianu, 2018). In addition to all these facts, a lack of collection culture frequently contributed to the loss of described specimens that can no longer find, reexamined and reevaluated by nowadays researchers. The access to recent or fossil comparative materials is extremely limited, often creating controversial results, especially regarding systematics. Besides all this, an acute shortage of specialty literature mostly during the years of communism led to a slow progress in the research of fossil fish in Romania. The effects of this context are still visible in the museums or in the university libraries from our country, even three decades after the major political changes.

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## Methodology

In the description of the Romanian Mesozoic and Cenozoic fish teeth occurrences we used the original nomenclature concerning the ages and lithostratigraphic units, as well as the original spelling of the names of the genera and species used by their authors. The ages whose denominations have become obsolete internationally, are reproduced between quotes. The names of the localities where the fossils originate from are those commonly used today, but the Hungarian or the German names are also mentioned in brackets in those cases where they were used in the original text.

Taxonomy-related comments have not been intended to be redeterminations, but rather a discussion point to highlight issues relating to the description, illustration or sometimes the obvious erroneous determination of the specimens. Only the research on fish teeth has been considered in this study. Works describing skeletons are not the subject of this work. As an exception to this rule, we will also mention the works that treat the shark gill rakers. These ones, although not dental pieces, still feature hard elements of the buccal apparatus, as they are made up of keratin (Paig-Tran & Summers, 2014) and are used for filter feeding by the sharks from the Cetorhinidae family.

A number of 124 bibliographic sources have been consulted. These sources include systematic works, monographs of geological units, various articles and doctoral thesis. Holocene remains

from natural sites or from archaeological excavations are herein omitted. The abbreviations of the collections used in the text refer to: the Museum of Paleontology and Stratigraphy of the Babeş-Bolyai University of Cluj Napoca (hereinafter, abbreviated BBUPSM), the Natural History Museum of Sibiu (NHMS) and the Hungarian Museum of Natural History in Budapest (HMNH).

## Discussions

*The history of Mesozoic fish research in Romania*  
As can be seen in the bibliographic sources, the geologists and the paleontologists haven't given much attention to the Mesozoic teeth and that might be because of the occurrences of fish teeth that seem to be quite rare in the Mesozoic formations of Romania. In most situations, Mesozoic teeth are isolated and with the exception of the Bihor Triassic we are unable to reconstruct a faunistic assemblage.

From the Middle Triassic (Anisian) of the Bihor Unit (Internal Dacides; Săndulescu, 1984) there are known fish teeth from the northern side of the Apuseni Mountains, more exactly from the southern border of the Plopiş Mountains (=Rez Mountains). A series of works from 1975 to 2015 describe the macrofauna and microfauna from Lugaşu de Sus and Peştiş localities (Bihor County), due to the work of specialists from the Țării Crişurilor Museum in Oradea. Along with Triassic reptiles there are also mentioned teeth of *Hybodus reticulatus* Agassiz 1837 (Jurcsák, 1976), *Hybodus* sp., *Acrodus* sp. and *Birgeria* sp. (Jurcsák, 1977), *Hybodus* cf. *multiconus* Jaekel 1889, *Palaeobates angustissimus* Agassiz 1838, *Birgeria* sp., *Serrolepis* cf. *suevicus* Dames 1888, *Gyrolepis quenstedti* Dames 1888, *Saurichtys* sp. (Jurcsák, 1978). More recently, *Palaeobates* sp. and *Lissodus* sp. have been added to this fauna (Posmoşanu, 2015). These species are the only Triassic fish representatives from Romania described on the basis of their dentition. Unfortunately, most of the outcrops are no longer accessible.

As far as the Jurassic is concerned, fish teeth are just as rare. From the Early Jurassic (Pliensbachian) of the Getic Nappe (Median Dacides, Reşiţa-Moldova Nouă sedimentation area; Săndulescu, 1984) there are described and illustrated some teeth of *Hybodus* sp. from the Ponor quarry nearby Anina (Caraş Severin County, Dica & Codrea, 2006). From the Median Dacides there are also reports of isolated teeth of

*Sphenodus longidens* Agassiz 1843 belonging to the Middle Jurassic of the Ialomiţa Valley, at the mouth of the Horoaba Valley (Patrulus, 1969, p.57).

From the Upper Jurassic of the Sănduleşti quarry (the Transylvanids of the Apuseni Mountains, Bedeleu Nappe *sensu* Balintoni, 1997, Trascău Mountains) there have been reported teeth belonging to *Sphaerodus maximus* Wagner, 1863 (Hauer & Stache, 1863, Koch, 1889, 1900, Săsăran, 2006; Bucur & Săsăran, 2012) and *Asteracanthus ornatissimus*, Agassiz, 1837 (Niţulescu, 1936). From the Middle Jurassic of the Median Dacides in the Strunga Pass of the Bucegi Mountains several isolated teeth of *Asteracanthus* sp., *Orthacodus* sp. and *Lepidotus* sp. have been reported (Lazăr et al., 2002, Lazăr, 2006).

Teeth of *Sphaerodus gigas* Agassiz, 1833, *Sphaerodus* (sic!) *tithonius* Gemmellaro 1836, *Hybodus striatulus*, Agassiz 1837, *Lepidotus* sp. and *Paraisurus* sp. have been reported by Dragastan (1975) in the Late Jurassic (Kimmeridgian) of the Mesozoic syncline Tulgheş-Hăşmaş-Ciuc (Transylvanids of the Oriental Carpathians, Hăşmaş Nappe; Grasu et al., 2012) from the "acanthicum formation" of the Bicaz Gorges, in the Ghilcoş Mountain, without being described.

From the same area of the Ghilcoş Mountain, Băncilă (1945) reported the presence of *Sphaerodus gigas* from the Tithonian Stramberg limestones, the same species being mentioned in the area by Grasu (1971). *Sphaerodus* is also mentioned from the Braşov area by Hauer & Stache (1863) under the name of *Sphaerodus neocomiensis* Agassiz 1843.

From Cretaceous, there are reported teeth belonging to the pycnodont *Coelodus* sp. (Simionescu, 1906) from the Lower Cretaceous deposits of Cochirleni (Valanginian, Cernavodă Formation; Dragastan et al., 1998), in the South Dobrogea sector of the Moesian Platform (Săndulescu 1984). This specimen has recently been reassessed as *Gyrodus* sp. (Dragastan et al., 2014, p. 235). Unfortunately, the authors of the redetermination do not specify the characters that led them to the re-evaluation of its taxonomic classification as *Gyrodus* sp.

A pharyngeal tooth of the teleost *Eotrigonodon* sp. is also described. It was found in the Lower Cretaceous (Barremian-Aptian) deposits of the Reşiţa-Moldova Nouă area, the Valea Minişului Formation (Dica et al., 1998). Selachian teeth

belonging to *Oxyrhina mantelli* Agassiz 1843 are reported from the "Senonian" limestone located at the confluence of Lotru and Olt rivers (Redlich, 1899). The same genus, *Oxyrhina* sp., is encountered in the Dobrogea Upper Cretaceous rocks at Bașchioii (today, Nicolae Bălcescu locality; Simionescu, 1909). Another shark species, *Ptychodus* cf. *mammillaris* Agassiz, 1839 is described and illustrated from the Upper Turonian - Lower Conacian deposits of the Village Ormeniș (Peșani Mountains) by Șuraru (1984). Recently the specimen described by Șuraru (1984) has been brought into attention once again and has been redetermined as *Ptychodus rugosus* together with a new material from the Cretaceous of Dobrogea, material determined as *Ptychodus* sp. (Trif & Codrea, 2017b). Also, from Central Peșani Mountains, Pauliuc (1968) mentioned in the Turonian-Coniacian marls with inocerams from Cărbunelui Valley (Racoșul de Sus) the species *Oxyrhina* cf. *macrorhiza* Pictet & Campiche, 1858. From the Late Cretaceous of the Eastern Carpathians, NV of Cărlibaba locality, Szajnocha (1890, p. 92) described a tooth that belonged at that time to the collections of the University of Krakow, tooth he assigned to *Ptychodus polygirus* Agassiz, 1839 (according to Athanasiu, 1898, p. 23 the tooth has been collected by a certain "Alois v. Alth" since 1852).

Several mentions of selachian teeth, however undetermined, are made by Bărbulescu (1960, 1973), Avram (1988) and Basarab (1990). These teeth have been collected from the Topalu, Cuza Voda and Peștera localities, all Cretaceous, in Dobrogea.

Mesozoic continental formations also bear teeth and fish scales, originating from the fluvial sequences of the uppermost Cretaceous (Maastrichtian) of the Hațeg Basin and from the sedimentation area of the Metaliferi Mountains (Codrea & Dica, 2005). Among these remains are *Lepisosteus* sp., represented by teeth and isolated scales from Fântânele-Vălioara (Grigorescu et al., 1999), Budurone-Vălioara (Csiki et al., 2008) and from Oarda de Jos, Alba County (Codrea & Jipa, 2011). Another species of Lepisosteidae, belonging to the *Atractosteus* genus, is represented in the Hațeg Basin (Csiki, 2005; Weishampel et al., 2010), but it is possible that also a part of the material from Oarda de Jos could be allocated to this genus too (Codrea & Jipa, 2011). Another type of lepisosteidae from Oarda de Jos is allocated on the basis of the teeth morphology to ?*Lepidotes* (Codrea & Jipa, 2011).

In the continental formations teeth of Characiformes indet. can also be encountered in Pui locality (Grigorescu et al., 1985). Two other Characiformes morphotypes are present at Oarda de Jos (Codrea & Jipa, 2011).

In the Hațeg basin there are also reported remains of Acipenseriformes indet. (Grigorescu et al., 1985). It should be noted, however, that the material of Acipenseriformes is considered to be lost and a verification of the validity of the determination can no longer be carried out (Grigorescu et al., 2010, p. 144).

#### *The history of Cenozoic fish research in Romania*

In the history of the research of the Cenozoic fish in Romania the interest of the paleontologists for some special areas with rich fauna has been noted since the 19<sup>th</sup> century. This category of areas includes the north-western region of the Transylvanian Depression, especially the area of Cluj, where both the Paleogene and the Neogene are cropping out extensively and contain an interesting fauna. It is worth indicating within the same category the south of the mentioned depression, especially the locality of Turnu Roșu (Porcești), where the Paleogene is preserved in the form of an erosional patch on a restricted surface, but with a rich fish fauna. Beside these two regions there are areas with fossil fish finding potential such as the Borzești-Cetea area from the western Transylvania, where the marine Badenian (the Gârbova Formation) crops out on large areas.

The first references to the teeth of fossil fish in the Cenozoic of Romania refer to Paleogene, more precisely to the Eocene. From the Eocene formations of Turnu Roșu (=Porcești) not less than 65 shark species are described and illustrated by Ludwig Johan Neugeboren (1850; 1851) in his work *Die vorweltlichen Squaliden-Zähne aus dem Grobkalke bei Portsesd am Altflusse unweit Talmatsch*.

It is important to dwell on this mid-nineteenth century work. The author is considered to be one of the pioneers of the study of fossil fish in Transylvania, province which was a part of the Austro-Hungarian Empire at the time. Neugeboren's work comes a few years after the publication of the monumental text of the Swiss paleontologist Louis Agassiz, *Recherches sur les poissons fossiles* (Agassiz, 1833-1843), and his monograph printed in Sibiu can be considered to be written to the highest scientific standards of the time.

The Transylvanian author describes in detail the 65 species of which 28 are new to science and he even sketches the drawings for the five plates that illustrate his work. The long lasting disappearance of his holotypes at an unknown date as well as the limited circulation of his work in the scientific circles outside the Austro-Hungarian Empire led to a rather modest knowledge of this publication.

It is important however to know, as the author points out in the introduction to his paper, that the fossil material arrived largely in his possession through purchase and not by direct collection. The local people from Porcești were accustomed to gathering fossil teeth as curiosities that they then offered for sale to interested travelers under the popular name of "snake tongues." This habit is still current, the local term used being the same. The examination of some photographs taken in the early decades of the nineteenth century and kept in the Turnu Rosu museum reveals that the outcrops were much more extensive that day as compared to nowadays. We take into account that the erosion processes was of course much more intense, allowing easier access and, implicitly, allowing more numerous specimens to be collected.

The 65 species described by Neugeboren in the two parts of his work are: **1850** - *Notidanus primigenius*, Agassiz; *Notidanus microdon*, Agassiz, 1843; *Galeocerdo latidens* 1843, Agassiz; *G. minor* Agassiz 1843; *Sphyrna prisca*, Agassiz; *Carcharodon productus*, Agassiz 1843; *C. sulcidens*, Agassiz, 1843; *C. angustidens*, Agassiz, 1843; *C. turgidus*, Agassiz, 1843; *C. semiserratus*, Agassiz, 1843; *C. lanceolatus*, Agassiz, 1843; *C. toliapicus*, Agassiz, 1843, *C. sulcatus*, Neugeboren; *C. elegans*, Neugeboren; *C. gracilis*, Neugeboren; *C. latidens*, Neugeboren; *C. heterodon*, Agassiz, 1843; *C. leptodon*, Agassiz, 1843; *C. haidingerii*, Neugeboren; *C. hauerii*, Neugeboren; *C. cavidens*, Neugeboren; *C. bielzii*, Neugeboren; *C. crassus*, Neugeboren; *C. inaequeserratus*, Neugeboren; **1851** - *Otodus obliquus*, (Agassiz, 1843); *O. plicatilis*, Neugeboren; *O. appendiculatus*, Agassiz, 1843; *O. ambiguus*, Neugeboren; *O. arcuato-decrescens*, Neugeboren; *Oxyrhina hastalis*, Agassiz, 1843; *O. xyphodon*, Agassiz, 1843; *O. quadrans*, Agassiz, 1843; *O. leptodon*, Agassiz, 1843; *O. desorii*, Agassiz, 1843; *O. subinflata*, Agassiz, 1843; *O. zippei*, Agassiz, 1843; *O. heckeliana*, Neugeboren; *O. haueri*, Neugeboren; *O. lata*, Neugeboren; *Lamna elegans*, Agassiz; *L. depressa*, Neugeboren; *L. cuspidata*, Agassiz; *L. speciosa*, Neugeboren; *L.*

*carinata*, Neugeboren; *L. compressa*, Agassiz; *L. denticulata* Agassiz, 1843; *L. acuminata*, Agassiz, 1843; *L. crassidens*, Agassiz, 1843; *L. (Odontaspis) hopei*, Agassiz, 1843; *L. (O.) verticalis*, Agassiz, 1843; *L. (O.) acutissima*, Agassiz, 1843; *L. (O.) contortidens*, Agassiz, 1843; *L. (O.) dubia*, Agassiz, 1843; *L. (O.) plicatella*, Reuss, 1845; *L. (O.) raphiodon*, Agassiz, 1843; *L. (O.) alveata*, Neugeboren; *L. (O.) elongata*, Neugeboren; *L. xyphodon*, Neugeboren; *L. cavidens*, Neugeboren; *L. ackneri*, Neugeboren; *L. haueri*, Neugeboren; *L. (Odontaspis) ferox fossilis*, Neugeboren; *L. serrata*, Neugeboren; *L. minuta*, Neugeboren; *L. minima*, Neugeboren.

Recently, a part of Neugeboren's collection was re-discovered at the Hungarian Museum of Natural History in Budapest (Magyar Természettudományi Múzeum). The retrieved material is considered to be part of the types and syntypes of the species described by him (Palfy et al., 2008, Palfy, 2009). No less than 18 species are found in this material, 7 species of which are represented by holotypes and 11 by syntypes (Palfy et al., 2008). Still, only one of the species described by Neugeboren is considered as potentially valid. *Striatolamia elongata*, Neugeboren 1851 (synonym of *Lamna (Odontaspis) elongata*) is mentioned by Schultz (2013) on the basis of material considered by him as the holotype of this species. The material in question is hosted by the Hungarian Natural History Museum in Budapest and registered under the number V 2008.35.1. This species is quoted by Schultz as having a *stratum typicum* in the Priabonian of the Valea Nișului Formation and a *locus typicus* at Grohotișul, Turnu Roșu, "Porcesd" (Porcești) (Schultz 2013, p.53). Unfortunately, while consulting the collections of the Budapest Museum, we could not find this specimen anymore.

Three other species, *Lamna (Odontaspis) ferox fossilis*, *Lamna minima* and *L. serrata* have been evaluated by Cappetta & Nolf (2005) on the basis of Neugeboren's illustrations, being considered by these authors as uncertain species which should be rejected.

Together with his syntypes of fossil sharks, as in the case of foraminiferers (Ciobanu, 1996g), Neugeboren seems to have sent duplicates of his fish teeth collections in Budapest and Vienna. Schultz (2006) is the one that refers to the existence of some *Phyllodus* sp. teeth from Porcești at the Museum of Natural History in

Vienna, found under inventory number 1869, as a donation from Neugeboren.

A smaller part of Neugeboren's collection was found this year at the Museum of Natural History in Sibiu. By comparing the specimens from the historical collections of the Transylvanian Society for Natural Sciences in Sibiu with the illustrations from his work (Neugeboren, 1850, I & II, 1851, III-V), we were able to identify a number of 20 teeth belonging to the Neugeboren Collection.

In their monumental work on the geology of Transylvania, Hauer & Stache (1863) mention the work of Neugeboren several times and in the list of species at the end of the book they enumerate all the 65 taxons that he described.

The list published by Neugeboren is subsequently used by many other authors, including Koch (1894, p.285; 1900b), which reminds us that the Transylvanian author determined a number of 63 (*sic!*) species without specifying them.

After 1900 some of Neugeboren's determinations are used again by Ilie (1955), which lists 63 of the 65 species described, unfortunately also introducing a series of errors in the spelling of the species' names. However, it is interesting to note that Ilie makes some considerations, trying to reconstruct the paleoclimate and the living environment of the Paleogene sharks. The author also presents two illustrations of fish teeth from Porcești, but in the Figure 8 (p. 285) entitled "Selacian teeth" there are actually figured two pycnodontiform teeth.

Immediately after the 1990s, the Eocene formations of Turnu Roșu came in a new stage of research that continues until today. Rodica Ciobanu from the Museum of Natural History in Sibiu begins to publish her first results of this research (Ciobanu, 1994), shortly before the finalization of her doctoral thesis titled "*Paleogene Selacians from Romania*" (Ciobanu, 1995a). The thesis is mainly focused on the study of the museum's collection from Sibiu, especially on the valuable Brekner collection (Ciobanu, 1998b), and on several pieces from the Paleogene of Cluj. It is probably the first work that deals with the study of shark teeth in Romania using a large bibliography and an active correspondence with many European specialists. The species described, discussed and represented in this work are: *Abdounia beaugei* (Arambourg, 1935), *Aetobatis* sp., *Aetobatis irregularis* Agassiz, 1843, *Carcharinus* sp., *Carcharinus priscus* (Agassiz, 1843), *Carcharias acutissima* (Agassiz, 1844), *C.*

*cuspidata* (Agassiz, 1844), *Carcharocles angustidens* (Agassiz, 1843), *C. auriculatus* (Blainville 1818), *Cretolamna* aff. *aschersoni* (Stromer, 1905), *C. lerichei* (Casier, 1946), *C. twiggsensis* (Case, 1981), *Dasyatis jaekely* (Leriche, 1905), *Dasyatis* ssp., *Galeocerdo latidens* Agassiz 1843, *Galeorhinus* aff. *lefervrei* (Daimeries, 1891), *G. ypresiensis* Casier, 1946, *G. galeus*, *Ginglymostoma angolense* Dartevelle & Casier, 1837, *Ginglymostoma* sp., *Hemipristis curvatus* Dames, 1883, *Hexanchus* sp., *Isurolamna* aff. *inflata* (Leriche, 1905), *Isurus praecursor* (Leriche, 1904), "*Lamna*" *rupeliensis* Le Hon, 1871, *Leydibatis jugosus* Leidy, 1877, *Myliobatis* aff. *pentonis* Woodward, 1893, *M. dixonii* Agassiz, 1843, *Myliobatis* ssp., *Nebrius thielensis* (Winkler, 1873), *Negaprion eurybathrodon* (Blake, 1862), *Negaprion* sp., *Notorhynchus kempii* Ward 1979, *Notorhynchus* sp., *Otodus obliquus*, *Physogaleus latus* (Storms, 1894), *P. secundus* Winkler, 1876, *Rhinobatus bruxelliensis* (Jaekel, 1894), *Rhinoptera* aff. *studerii* Agassiz, 1838, *Rhinoptera* sp., *Rhynchobatus* aff. *vincenti* Jaekel, 1894, *Rhizoprionodon* aff. *ganntourensis* (Arambourg, 1952), *Striatolamia macrotia* Agassiz, 1843 and *Xiphodolamia eocaena* Woodward 1889.

A series of articles which appeared in various publications from Romania (Ciobanu, 1995b, c, d, 1996a, b, c, d, e, f, 1997b, 1998a, b; 2006) and abroad (Ciobanu, 1997a; 2000), but also in a book (Ciobanu, 2002) deepens this research. After 2006, the author completes the research in the field with the study of bone fish teeth, focusing on completing the teeth determination from the Brekner collection of the Sibiu Museum. There are described and figured pharyngeal and oral teeth of *Eotriconodon* cf. *serratus* and *Eotriconodon* sp. (Ciobanu, 2011a, b). Later, in a series of works, other groups of fish from the collections of the same museum are described: Diodontidae (Ciobanu & Trif, 2012), Labridae (Ciobanu, 2013), an unusual pycnodont for Eocene, *Phacodus punctatus* Dixon, 1850 (Ciobanu & Trif, 2013) and a fragment of *Cylindracanthus* sp. rostrum (Ciobanu & Trif, 2016).

The Paleogene fauna from Northwest of Transylvania has also been researched by a number of authors, but for a long time the studies were only sporadic and lacking a general overview.

Hauer & Stache (1863), although mentioning many fish teeth occurrences in the Northwest



Transylvania, limit themselves to using the generic name of "fish teeth", except for a short mention in the Eocene of Cluj of some small teeth belonging to the taxa *Spaherodus* sp. and *Capitodus* sp.

In his lists of fossil fauna, Koch (1894) also mentions shark teeth in a number of localities from Cluj and Sălaj Counties. From the ostreid horizon ("Fauna des Ostreentegel-Horizontes", the current Mortănușa formation, Bartonian-Priabonian; Mészáros & Moisescu, 1991) he lists: *Lamna cuspidata*, *Oxyrrhina* sp. and *Otodus ambiguus* from Băile Leghia, *Lamna contortidens* and *Oxyrrhina heckeliana* from Tăuți and *Oxyrrhina* sp. from Florești.

Only seven decades later the first studies dedicated to the fossil fish teeth that were found in the Eocene deposits from the Cluj area are published. Fuchs (1963, 1966) describes several Myliobatidae teeth from the Hoia and Baci Gorges quarries or from the outcrops of Someșul Mic (Mănăștur) and the Pleșca Valley. The rather fragmented material and the very poor bibliography he had access to did not allow the author to do more than the generic allocation under the name of *Myliobatis* sp.

It was only in the '80s that the next articles on fish teeth from the Eocene of the Cluj area were published. Teeth belonging to both the cartilaginous fish (Chondrichthyes) and the bony fish (Osteichthyes) have been described and figured.

The identified material belongs to *Progymnodus* cf. *hilgendorfi* (Dames 1883), *Numopalatus* cf. *multidens* (Münster 1846), *Scaroides gatunensis* (Toula, 1908) (Șuraru et al., 1980, ) and *Ginglymostoma* cf. *thielensi*, *Procarcharodon latidens*, *Aprionodon* cf. *frequens* Dames, 1883, *Odontaspis* (*Synodontaspis*) *hopei*, *Pristis lathami* Galeotti, 1837, *Myliobatis owenii* Agassiz, 1843 (Șuraru & Șuraru, 1987).

The list of the Eocene species of the Cluj region has been supplemented in the last decade of the 20th century by new studies (Dica et al., 1996; Codrea et al., 1997). The described and figured material includes fish species from the Priabonian of Cluj: *Rhynchobatus* sp. *Rhinobatus* cf. *bruxelliensis*, *Dasyatis jaekeli* and *Dasyatis* sp., *Nebrius thielensis*, *Carcharias cuspidata*, *Carcharias acutissima*, *Carcharocles* cf. *auriculatus*, *Physogaleus secundus*, *Aprionodon* cf. *frequens*, *Negaprion* sp., *Myliobatis* cf. *toliapicus*, *Pristis* sp., *Pycnodus* sp. (?), *Albula* sp.

(?), *Lepidopus* sp. (?), *Phyllodus* cf. *toliapicus* Agassiz, 1844, *Cybium* sp., *Numopalatus* cf. *multidens*, *Scaroides gatunensis*, *Progymnodus* cf. *hilgendorfi* and *Eotrigonodon* sp. Unfortunately, most species are neither described, nor illustrated, being included only as lists.

Research on the Paleocene of the Jibou Formation, namely the Rona Member (Codrea & Săsăran, 2002), led to the discovery of a rich fauna and flora in this formation (Gheerbrant et al., 1999, Petrescu & Codrea, 2003, 2004). Of the fish fossils, Gaudant et al. (2005) describe fragments of dentition belonging to *Cyclurus* sp.

Dica (2002) describes and illustrates the teeth of *Chylomicterus hilgendorfi* and *Lachnolaimus multidens* collected from the Cluj Limestone Formation (Priabonian, the outcrops from Cluj-Napoca and Turbuța) and the Nișului Valley Formation (Priabonian, Turnu Roșu, Porcești), respectively.

An important progress in the fish research in Romania is made by Dica (2006), who defends a doctoral thesis entitled "*Studii paleoambientale în formațiunile paleogene din NV-ul Depresiunii Transilvaniei pe baza asociațiilor ichtiologice*" [*Paleoambiental studies in the Paleogene formations from the north-west of the Transylvanian Depression based on the ichtiological associations*]. There are described, widely discussed and illustrated many Paleocene, Eocene and Oligocene taxa of Gilău sedimentary area: *Cyclurus* sp. (Rona Member, Thanetian-?Sparnacian); *Jaekelotodus* sp., *Striatolamia macrota*, *Myliobatis* sp., *Aetobatus irregularis* and indetermined forms of Pycnodontidae (Căpuș Formation, Late Lutetian - Bartonian); indetermined remains of Odontaspidae (Mortănușa Formation, Bartonian-Early Priabonian); *Dasyatis* aff. *jaekeli* and *Myliobatis* cf. *dixoni* and bony fish (Balistidae indet. and *Eotrigonodon serratus*) (Racoți Sandstone, Early Priabonian); Lepisosteidae (Turbuța Formation, Early Priabonian); *Lachnolaimus* cf. *multidens*, *Trigonodon* sp. and Labridae indet., *Chilomycterus hilgendorfi*, *Pseudoegertonia* sp., *Sphyræna* sp., *Trichiuridae* indet., *Hexanchus* sp., *Heptranchias howellii* Reed 1946, *Squalus minor* Daimeries 1888, *Nebrius thielensi*, *Carcharias acutissima*, *Physogaleus secundus*, *Carcharhinus frequens*, *Rhizoprionodon ganntourensis*, *Galeorhinus ypresiensis* (Casier, 1946), *Carcharocles angustidens*, *Dasyatis* aff. *jaekeli*, *Myliobatis* cf. *dixoni*, *Myliobatis* sp., *Rhinobatos bruxelliensis*, *Pristis lathami* (Cluj Limestone,

Late Priabonian); *Carcharocles angustidens* and *Chilomycterus hilgendorfi* (Brebi Formation: Late Priabonian-Early Rupelian); Odontaspidae indet. (Hoia Limestone, Early Rupelian); ?*Myliobatis* sp., *Carcharhinus* sp., (Mera Formation, Early Rupelian); *Myliobatis* sp. (Ciocmani Formation, Early Rupelian); Sparidae indet., *Dasyatis* sp., *Squalus* cf. *alsaticus*, *Myliobatis* sp. (Dâncu Formation, Rupelian); *Carcharocles angustidens*, *Physolgaleus latus* (Ileanda Formation, Rupelian).

From the Eocene limestones of Albești (Argeș County; Carpathian Foredeep), a number of authors mentioned different species of selacians at the end of the 19<sup>th</sup> century or in earliest 20<sup>th</sup>. Popovici-Hatzeg (1896, 1898) lists several species he found at Albești (*Lamna macrotus*, *Carcharodon auriculatus*, *Lamna* (?) *obliqua*, *Carcharodon* sp., *Odontaspis elegans*, *Myliobatis toliapicus*, *Oxyrhina hastalis*) and Bughea de Sus (*Odontaspis cuspidata*, *Odontaspis contortidens*, *Odontaspis* (?) *crassides*, *Notidanus primigenius* Agassiz 1843). It is noteworthy that Popovici-Hatzeg quotes the newly published at that time bibliographic reference of Woodward (1889), the "Catalogue of Fossil Fishes in the British Museum" that he used in the study of these teeth and the two volumes published by Neugeboren (1850, 1851) concerning the selachians from Turnu Roșu, which he used for comparisons.

After 1908, the fish teeth reports from this locality are very sporadic. Murgeanu et al. (1968) mentions from the Albești Limestone the species *Carcharodon angustidens*, *Lamna elegans* and *Myliobatis* sp. The same short list is given by Ilie (1969), but without specifying a bibliographic source.

From the southwest of the Transylvanian Depression in the uppermost Eocene from Alba Iulia (Priabonian, Bilag Hill; Ighiu Formation, in Codrea & Dica, 2005) teeth of *Lamna* sp. (Băluță, 1987) are reported, without descriptions or illustrations.

From the **Oligocene**, the reports of fish teeth are restricted to just a few works.

The earliest one, in which fish teeth are described and illustrated, belongs to Böhm (1941). It's a work which is otherwise very rarely quoted - practically forgotten - by the authors who subsequently approached the subject. The fish teeth in question come from the Covasna and Commandău areas, more exactly from the "both sides of the Covasna Stream, about 150 meters below the Nagy Janos Dam", and from "the

middle section of the Miskey Valley" and "north of the Commandău on Baska brook" (p. 182). The rocks from where they were collected are menilic shales. The taxa documented by teeth are: *Odontaspis* sp. (Taf. I, Fig 1) and *Lepidopus hungaricus* (Taf. II, Figs. 8a, b, Taf. III, 1a, b), the latter being considered a new species. The list of documented species based on fragmented or complete skeletons is considerably longer. It is noteworthy that the author we refer to also had other works related to the fish in the Carpathians (Böhm, 1927/1928, 1929), but those remained either in the manuscript or in a relatively small publication, which he recalls in the bibliography.

Paucă (1931) also describes from the Oligocene formations in Suslănești a tooth of *Odontaspis cuspidata*. *Cetorhinus* gill-rakers and *Odontaspis* teeth are later mentioned by Jonet (1947, 1949) from the Homorâciu disodyle shale. Much later, Ciobanu (1977) describes and illustrates from the Oligocene of Piatra Neamț several teeth of *Odontaspis cuspidata*, *O. acutissima*, *Lamna rupeliensis*, *L. contortidens*, and a few gill-rakers of *Cetorhinus parvus* (Leriche, 1908). A similar but less diverse fauna is mentioned by Baciu et al., (2016) from the Oligocene of Vrancea Nappe: *Carcharias acutissima* and *Keasius parvus*.

From the Oligocene of Valea Rea (Gâlgău), Sălaj County, a tooth of *Hypoprion* cf. *singularis* (Șuraru, 1969) is mentioned without being illustrated or described.

From the **Early Miocene** (Eggenburgian, Coruș Formation), there are known a few fish teeth reports from the Cluj area. Nițulescu (1937) mentions teeth of *Lamna* sp. from the outcrop of the Coasta Mare. From the same location, Fuchs (1962) lists the species *Trygon* aff. *rugosa*, *Myliobatis* sp., *Galeocerdo* aff. *latidens*, *Galeus* sp., *Sphyrna* sp., *Lamna* aff. *duplex*, *Lamna denticulata* and *Aurata* (*Chrysophrys*) sp. From Coasta Mare but also from Coruș, in the same formation, Șuraru (1978), in an ample work dedicated to the Lower Miocene fish, describes and illustrates an assemblage composed of: *Hexanchus primigenius* (Agassiz 1843), *Odontaspis* (*Synodontaspis*) *acutissima*, *Odontaspis* (*Synodontaspis*) *cuspidata*, *Isurus desori* Agassiz 1843, *Carcharhinus priscus*, *Hypoprion acanthodon* Leriche 1926, *Eugaleus* aff. *minor*, *Squatina subserrata* Münster, 1846, *Dasyatis cavernosus* (Probst, 1877), *Aetobatis arcuatus*, *Myliobatis* sp., *Rhinoptera studeri* (Agassiz, 1843) and *Chrysophrys aurata* (Linnaeus 1758).

From the **Middle Miocene**, Koch (1890, 1900) lists several shark teeth from the Leitha limestone (Badenian) in the Turda surroundings. From "Szind" locality (Sândulești) he lists *Carcharias* sp. and several other shark teeth "... und andere Haifischzähne" ["...and other shark teeth"]; from "Várfalva" (Moldovenești) – a tooth of *Picnodus* sp. (*sic!*). A few years later, in his monograph on the Alba County, Herepey (1896) puts together a list of fossil shark taxa originating in the Leitha limestone from the Cetea and Gârbova localities, in Aiud area. The species *Lamna raphiodon*, *Carcharodon megalodon* and *Lamna elegans* are listed by him. From the same area of western Transylvania, Noszky (1925) puts together a list of species such as: *Lamna subulata*, *L. gracilis*, *L. cuspidata*, *Oxyrhina hastalis*, *O. xyphodon*, *Carcharodon megalodon* and *Sparoides robustus*. Fortunately, Noszky's specimens have been preserved at the Museum of Natural History in Budapest and have been recently redefined as *Araloselachus cuspidatus*, *Carcharias* sp., *C. acutissima*, *Carcharoides* cf. *catticus*, *Cosmopolitus hastalis*, *Isurus desori*, *Isurus* sp. and *Otodus megalodon* (Szabo & Kocsis, 2016). From the sedimentary basin border between Trascău and Metaliferi mountains (Cetatea-Țelna-Ampoița region), Ilie (1950) offers another fauna list for the "Tortonian". He compiles the list by using older references, but he also includes his own data. However, it is not clear which species have been added by himself. His list includes *Lamna raphiodon*, *L. cuvieri*, *Lamna* sp., *Carcharodon megalodon* and *C. oxyrhina*. Considering that at least some of the authors cited by him are not in the bibliographic list or that the spelling of their names (transcription) is incorrect, we will trust his list cautiously. Mészáros et al., (1992) report a tooth of *Procarcharodon megalodon megalodon* (*sic!*) from Borzești without entering into details about its morphology or taxonomy.

A newer series of works proceed to bring into discussion original material and reevaluate old specimens from museum collections. These articles describe and illustrate the following species from the Badenian: *Otodus* (*Carcharocles*) *megalodon*, *Hemipristis serra* Agassiz 1835, *Carcharodon hastalis* Agassiz 1838, *Diplodus jomnitanus* and Sparidae indet. from Lăpugiu de Sus, Borzești, Lopadea Veche, Rachiș, Gârbova de Sus and Cetea (Trif et al., 2016b; Trif & Codrea, 2017a, Trif et al., 2017).

From the Neogene Bahna-Orșova Basin, from Bahna locality, there are reported several teeth of *Chrysophis* and *Lamna* (Marinescu & Marinescu, 1962) originating from a marl level belonging to the "Upper Tortonian". Mentions of some fish teeth from the same location, on a similar level, are also made by Murgeanu (1954, p. 233), without being assigned to a species or genus. From the Miocene of Bahna there has also been reported a tooth of *Oxyrhina incerta* (Ștefănescu, 1888), a species found subsequently by Macovei (1909).

A very interesting report is the one of a Cyprinide fauna from the "Tortonian" of the Mehădia Basin (Grosu & Voicu, 1971). The teeth of the *Aspius*, *Alburnus*, *Leuciscus*, *Scardinius* and *Rutilus* genera are described and represented from a landmark horizon that is found in numerous drillings of the Bolvașnița area. The authors emphasize the large number (though not clearly mentioned) and the very good preservation of these teeth.

From the Badenian of Dezmir ("Desmir"), Brzobohatý & Schultz (1978) report the presence of *Gadus* sp., likely documented on the basis of the teeth. The Miocene undoubtedly contains a much richer fauna than the one reported in the literature, because often the authors limit themselves to the use of the collocation "fish teeth". There are numerous fish teeth reports in the Miocene between Siret and Prut (e.g. Paghida-Trelea, 1969, pp. 47, 50, 59, 82, 83, 84, 85, 108, 113, 114, 121), but the few listed fish species are determined on the basis of the otoliths rather than on teeth.

A work describing a fauna of Middle and **Upper Neogene** is that of Rado & Pană (1969), which report fish teeth from both the marine environment (the "Tortonian" fauna from Buituri) and the fresh and brackish waters of Sarmatian in the Basin of Crișul Repede and from the Pliocene region between the valleys of Râmnic and Buzău rivers. Numerous specimens with varied morphologies are illustrated, demonstrating a wide diversity of species. Unfortunately, the geographic origin and the imprecise stratigraphy of the described specimens considerably reduce the value of this work. The authors determine the teeth of the genus *Tinca*, *Esox*, *Leuciscus*, *Scardinius*, *Cyprinus* and a representative of the family Carcharinidae.

Pană (1982a) reports a gobiid tooth from the Pannonian of the Beiuș Basin (from the level with

*ornithopsis* of Sohodol), which she also illustrates (Pl. I, Fig. 19). From the basal level of Frăgești and Miheleu that overlies the Badenian or Sarmatian, Pană reports other fish remains belonging to *Pomatoschistus tenuis* (Weil.). From Miheleu and Răbăgani she reports "*Gobius*" *intimus* Prochazka, 1893 and from Drăgești, "*G.*" *pretiosus*.

The same author reports from the *partschi* level Gobidae and Gadidae teeth from the localities Dobrești, Prisaca, Răbăgani. It seems that the melanopsidae bio-facies of the basin is dominated by Gobiidae and the Gadiidae are present only in subsidiary. The *Psilunio* bio-facies hosts teeth of Gobiidae, while the lithofacies of the "white marls" abound in teeth of Gadiidae and some other carnivorous fish.

The author emphasizes the decrease of the importance of the marine species abundant in the Badenian or the Sarmatian. She states that they are substituted by Pannonian-specific forms. Some representatives of the Gadidae, Triglidae and Trachinidae families are interpreted as examples of endemic evolution that could lead to new species. It is highlighted the increase of the occurrence of carnivorous fish teeth in the area of the permo-triassic island of Răbăgani, where they occur in micro-lenticular concentrations. The rarity or even the absence of Gobiids is associated with the resurgence of the thermalized waters which is still active.

The same author (Pană, 1982b) illustrates a series of teeth from the outcrops or drillings that crossed the Dacian deposits (Getian, Parscovian) from Oltenia. The documented taxa are: Gobiidae (Late Dacian, Corabia, Prunișoru), a "herbivorous fish" (Late Dacian, Băilești), *Tinca* sp., *Leuciscus* (?), a "carnivorous fish", *Gobius* sp. (Early Dacian, Prunișoru), *Gobius* sp. (Romanian, Isalnița), *Gobius* sp., *Tinca* sp., and *Leuciscus* sp. (Late Dacian, Mihăiță).

From the Dacian of Mălușteni, Simionescu (1930) describes and illustrates teeth and vertebrae of *Lamna* sp., teeth of *Sargus* sp., *Chrysophrys* sp., as well as spines of *Myliobatis* sp. Based on the author's drawings, we can specify that the determinations are obviously incorrect. The vertebra most likely belonged to *Silurus* sp., and the "*Lamna*" teeth obviously belong to the *Esox* genus. The teeth of *Sargus* and *Chrysophrys* do not belong to these Sparidae but to Cyprinidae. Also, the *Myliobatis* spines of Simionescu belong to some Siluridae and one of them is obviously a left dentary, possibly of Esocidae.

More recently, Trif et al., (2016a) described a freshwater fauna from the Dacian Basin, at Podari. The fish, of Romanian age, are represented by *Esox* sp., *Tinca* sp., *Scardinius* sp., and *Silurus* sp.

From Pleistocene, without being illustrated or described, there are reported teeth of *Carassius*, *Tinca*, *Rutilus*, *Squalius*, *Scardinius*, *Esox* and *Silurus* (Vasile et al., 2013).

Along with these bibliographical sources, we have to mention two lists of fossil fish from two synthetic works on fossil vertebrates. The oldest one is from the Austro-Hungarian Empire and it is an extensive fossil vertebrate list made by Koch (1900b). It incorporates some of the data provided by himself in his preceding work (Koch, 1890, 1894, 1900) and by Neugeboren (1850, 1851), but it also brings new data, as to the number of the recorded occurrences. There are 170 species of fossil fish from all the geological ages, most of which are represented by teeth. The species on today's territory of Romania are: *Notidanus primigenius*, from Turnu Roșu, Sibiu County (Porcsesd); *N. microdon*, Turnu Roșu; *Acrodus minimus*, Baia Mare (Nagybányai völgy); *Hemipristis serra*, Șimleu Silvaniei (Szilágy-Somlyó); *Galeocерdo latidens*, and *G. minor*, Turnu Roșu; *Sphenodus tithonicus* Ghilcoș, Lacul Roșu (Gyilkoskő); *Oxyrhina desorii*, Gaura, Sălaj (Gaura, Szolnok-Doboka) and Turnu Roșu; *O. hastalis* and *O. haueri*, Turnu Roșu; *O. quadrans*, Horlacea (Jakotelke), Baciú (Kardosfalva) and Gârbău (Magyar-Gorbó); *O. subinflata*, *O. xiphodon*, and *O. zippei*, Turnu Roșu, Băile Leghia (Jegenyefürdő), Florești (Szász-Fenes) and Viștea (Vista); *Odontaspis contortidens*, Băile Leghia, Mera (Méra), Rachiș, (Oláh-Rákos) and Turnu Roșu; *O. akneri*, *O. acutissima*, *O. alveata*, *O. cavidens*, *O. dubia*, *O. elongata*, *O. ferox fossilis*, *O. hopei*, *O. haueri*, *O. minima*, *O. minuta*, *O. plicatella*, *O. raphiodon*, *O. serrata*, *O. verticalis* and *O. xiphodon*, Turnu Roșu (Porcsesd); *Lamna acuminata*, Baciú, Valea Băștăraú (Bácsi torok), Turnu Roșu; *L. carinata*, *L. compressa* and *L. crassidens*, Turnu Roșu; *L. cuspidata*, Aghireșu (Egeres), Leghia (Jegenye), Turnu Roșu, Florești (Tótfalu Kolos); *L. denticulata* and *L. depressa*, Turnu Roșu; *L. elegans*, Aghireș (Egeres), Gârbova de Sus, Alba County, (F. Orbó, A.-Fehér), Lopadea Veche, Alba County (Oláh-Lapád, A.-Fehér), Turnu Roșu, Săliște, Hunedoara County (Szelistye, Hunyad), Viștea (Vista); *L. odontaspis*, Huedin, (Bánffy-Hunyad), Cluj (Kolozsvár); *L. speciosa*, Turnu Roșu; *Lamna* sp., Minișu de Sus, Arad County (Felménes, Arad), Mănăștur (Kolosmonostor),

Minișel, Arad County (Kresztaménes, Arad), Gârbău, Lopadea Nouă, Alba County (Magy Lapád, A.-Fehér), Steierdorf-Anina, Caraș-Severin County, (Stájerlak, Krassó-Ször); *Otodus ambiguus*, Leghia, Mănăștur Cluj County; *O. arcuato decrescens* and *O. appendiculatus*, Turnu Roșu; *O. obliquus*, Baci, Valea Băștărau, Mănăștur, Turnu Roșu; *O. plicatilis*, Turnu Roșu, *Otodus* sp., Mănăștur; *Carcharodon angustidens*, Turnu Roșu; *C. auriculatus*, Mănăștur; *C. bielzii*, *C. Cavidens*, *C. crassus*, *C. elegans*, *C. gracilis*, *C. haidingeri*, *C. haueri*, *C. heterodon*, *C. inaequeserratus*, *C. lanceolatus*, *C. latidens*, *C. leptodon*, *C. productus*, *C. semiserratus*, *C. sulcatus*, *C. sulcidens*, *C. toliapicus* and *C. turgidens*, all from Turnu Roșu; *Carcharodon* sp., Sândulești (Szind); *Pycnodus* sp., Cluj, Tăietura Turcului (Törökvgás), Gârbova de Sus, Alba County (F. Orbó, A.-Fehér), Borod, Bihor County (Nagy-Báród, Bihar), Turnu Roșu, Brusturi, Bihor (Tataros, Bihar), Moldovenești, Alba (Várfalva, Torda-Arany); *Sphaerodus gigas*, Lacul Roșu (Gyilkoskö), Vf. Ecem, Hăghimaș (Öcsémteteje), Cheile Turului (Túri hasadék, Torda-Arany); *Sphaerodus* sp., Lacul Roșu (Gyilkoskö); *Phyllodus* sp., Șimleu Silvaniei; *Nummopalatus* sp., Turnu Roșu; *Capitodus* sp., Brusturi, Bihor; *Gymnodus* sp., Turnu Roșu.

The list ends with undetermined fish teeth coming from almost all the locations already mentioned above.

At the beginning of the 20th century another work of synthesis, "Paleontology of Romania" (Simionescu & Barbu, 1909), appeared with a series of original contributions. The list of fish presented is more limited including: *Lamna elegans*, Porcești, (Sibiu) and Albești, (Muscel); *Odontaspis cuspidata*, Suslanesti (Muscel); *Carcharodon* (sic!) *Auriculatus*, Albești, Muscel; *Oxyrhina quadrans*, Cluj; *Orthacodus* (*Sphenodus*) *longidens*, Valea Lupului; *Strophodus* sp., Valea Lupului; *Myliobatis Albis*, Albesti, Porcești; *Girodus* sp. (sic!), Cernavoda; *Coelodus* sp., Cernavoda and *Sphaerodus gigas*, Turda. At the end the authors added a number of fish species represented by skeletons.

## Conclusions

The analysis of the cited references indicates the existence of important gaps in the knowledge of the odontology of fossil fish in Romania, both for the groups of cartilaginous fish and for the bony

fishes. Because of this, we are still in the stage of completing information on taxonomic diversity and we are still far from the zonal evolutions of the fossil faunas.

Most of the material quoted and published before 1980 is considered to be definitively lost or, in any case, not available for study. The described specimens are rarely inventoried by authors and registered in public collections.

We note, with few exceptions, that small fish are missing from the collected fauna. They may have been totally ignored by the authors who did not have the logistics needed to locate them or who focused on other fossils such as foraminifera or molluscs found in the same dimensional fraction of the sediments. Another less favorable aspect that we have noted in the references is the very low quality of the illustrations for the vast majority of works before 1990 and not only, which obviously created difficulties in their subsequent use.

Specimens collected by some of the above-mentioned authors are rarely kept, but when they are, they generally have a historical value only. Some of the teeth donated by Neugeboren, Popovici-Hazteg, Voitești, Koch, Herepey, Șuraru and Mészáros-Nicorici are found in museum collections (**Figures 1a-h and 2a-h**; BBUPSM, NHMS and HMNH collections). Most of these specimens cannot unfortunately be linked to those in the articles, as the old publications are rarely illustrated.

All these aspects strongly motivate us to continue the research on fossil fish dentition in the Chondrichthyes and Actinopterygii classes in Romania and the inclusion of the data obtained in the regional context of evolution of the ichthyological fauna.

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Figure 1. Specimens from the BBUPSM collections that were donated by well known geologists



**Figure 2.** Specimens from the BBUPSM, NHMS and HMNH collections that were donated by well known geologists

## REASSESSMENT OF THE SAWFISH ROSTRA TAXONOMY FROM THE NATURAL HISTORY MUSEUM IN SIBIU

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**Abstract:** A total of 7 sawfish (*Pristidae*) rostral specimens from the Natural History Museum, Sibiu and from the Hunting Museum, Sibiu that were previously identified as *Pristis pectinatus* Latham 1794, *Pristis* sp. or *Pristis antiquorum* Latham 1794 (*nomen dubium*), are reevaluated using available literature, identification keys and statistical analysis using PAST software. Following the reassessment, all the specimens were classified as either *Pristis zijsron* Bleeker 1851 or *Anoxypristis cuspidata* Latham 1794.

**Keywords:** *Pristidae*, *Anoxypristis*, *Pristis*, rostra, statistical analysis, PAST, Brukenthal Museum.

**Rezumat.** Un total de 7 rostruri de pește fierăstrău (*Pristidae*) de la Muzeul de Istorie Naturală din Sibiu și de la Muzeul de Vânătoare din Sibiu anterior identificate drept *Pristis pectinatus* Latham 1794, *Pristis* sp. sau *Pristis antiquorum* Latham 1794 (*nomen dubium*), sunt reevaluate folosind literatura de specialitate, cheile de identificare și analiza statistică bazată pe programul PAST. În urma reevaluării, speciunile au fost atribuite speciilor *Pristis zijsron* Bleeker 1851 și *Anoxypristis cuspidata* Latham 1794.

**Cuvinte cheie:** *Pristidae*, *Anoxypristis*, *Pristis*, rostru, analiză statistică, PAST, Muzeul Brukenthal

### Introduction

The need for the reevaluation of the sawfish specimens from the Natural History Museum in Sibiu arose from another research subject that involved a comparison between fossil material of the family *Pristidae* and recent material of the same family. Soon after starting this project it became clear that the recent material is not correctly identified and taxonomical reevaluation was needed.

Six of the evaluated specimens belong to the historic collection of the Transylvanian Society for Natural History in Sibiu (Der Siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt) and were all donated prior to 1900's. Now these specimens are part of the Natural History Museum in Sibiu.

The rostra usually have two or even three catalog numbers due to the renumbering performed several times in the last 117 years or more since they were donated to the Transylvanian Society.

The first catalog of fishes, written by Moritz von Kimakowicz between 1897 and probably 1909, records the *Pristidae* material.

This catalog contains the records of 20 rostra including 4 small, presumably juvenile-sized, rostra. These rostra donations consisted of two of *Pristis antiquorum* (*nomen dubium*) from the Red Sea of Ethiopia ("M. rub. Abessynien") donated by C. F. Czeckelius in 1895 and 1899 (catalog numbers 171 and 172), three rostra of *Pristis antiquorum* from the Aden Gulf of the Red Sea ("M. rub. ins Aden erworben") by M. Schuleri in 1889 (catalog numbers 173-175), and four juvenile-sized rostra from Singapore South China Sea (catalog numbers 176-179). Another eleven rostra were recorded in 1898 under the name *Pristis* sp., donated again by M. Schuleri, with catalog numbers 180-190. Unfortunately, much of the material is now lost and only a few rostra could be located in collections. The latest catalog lists 7 rostra, all under *Pristis pectinata*, with no mention of the old catalog numbers. Fortunately, some of the specimens preserve, inscribed with black ink, the old numbers (see Table 1).

Another rostrum is preserved in the Museum of Hunting in Sibiu but it might not have come from any of the donations discussed above since no label or associated data could be located for it.

No information regarding these specimens was published until 2003 when a list of taxa in the fish collection was compiled (Bănăduc, 2003).

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Unfortunately, only one specimen is listed, under the name *Pristis pristis* Linnaeus 1758, but no catalog number is associated with it.

### Material and Methods

A combined morphological, morphometrical and statistical approach was taken. The seven rostra were measured and photographed. The length was recorded with a measuring tape while the width of the rostra, the inter-dental distance and the dimensions of the rostral spines were measured with digital calipers. The images were taken with a Nikon D700 camera and 14–24 mm lens.

We use the term ‘rostral spines’ vs. ‘rostral teeth’ as established by paleontologists that acknowledge that these odontological formations have a different evolutive origin than the oral teeth, most likely originating from modified dermal denticles (Welten *et al.*, 2015).

The measurements were done following Whitty *et al.*, (2013) and Seitz & Hoover (2017) and consist of: total specimen length (TSL), the distance measured between the tip of the rostrum to the place where the rostrum was cut; total rostrum length (TRL), the distance measured from the tip of the rostrum to the place where the rostrum begins to flare; standard rostrum length (SRL), the distance from the tip of the rostrum to the midpoint of the line that unites the posterior edge of the most proximal rostral spine from the left and the right sides; proximal rostrum width (PRW), the width of the rostrum between the left most proximal rostral spine base to the opposite edge of rostrum; distal rostrum width (DRW), the width of the rostrum between the left most distal rostral spine base to the opposite edge of rostrum; distal inter-spine distance (DSD), the distance between the bases of the two most distal right rostral spines (DSD has the RD as equivalent in Whitty *et al.*, 2013 and DTG in Seitz & Hoover, 2017); and proximal inter-spine distance (PSD), the distance between the bases of the two most proximal rostral spines) (see Fig. 1).

The abbreviations used for the name of collections are NHMS, for the Natural History Museum in Sibiu; and HMS, for the Hunting Museum in Sibiu. Since HMS belongs from the administrative point of view to the NHMS in the title we refer only to NHMS.

For the statistical analysis (Hammer *et al.*, 2011) we used the PAST software v.3.11. The approach used in analysis is different from the method of Seitz & Hoover (2017), who included additional

data correction, but is based on their method. We used a univariate statistical test with basic descriptive statistics (as gave by the PAST package) for one or more samples of univariate data. The descriptive statistics are: N (number of individuals [48]), minimum and maximum values, the mean, standard error, variance, standard deviation, median, the 25th percentile, the 75th percentile and the geometric mean. The univariate statistics give us the skewness distribution (zero for a normal distribution, positive for a tail to the right) and kurtosis: (zero for a normal distribution). Coefficient of variation (CV), expressed as a percentage, allows for an evaluation for the normality test together with the skewness distribution and kurtosis. In the table of univariate statistic test it can be seen that PRW, DSG or DRW/ TRL\*100 have an abnormal distribution, have a high CV value and the average is not one of the representative indicators. For this reason, it was necessary to test for the normal distribution for all characters using the PAST software package.

We analyzed eight rostra preserved as dried specimens, with current catalog numbers: P569, P21, P22, P570, P568, P567, P566, VT738 (see Figure 2 and Table 1).

### Discussions

Recent Pristidae include two genera, *Anoxypristis* and *Pristis*. There is currently a single species within the genus *Anoxypristis*, *A. cuspidata*. The genus *Pristis* currently includes four species: *Pristis pristis* that until recently had been represented by three species (*P. pristis*, *P. perotteti* Müller & Henle 1841 [*nomen dubium*], and *P. microdon* Latham 1794 [*nomen dubium*]); and three closely related species having clear genetic and morphological differences; *P. pectinata*, *P. zijssron* and *P. clavata* Garman 1906, (Faria *et al.*, 2012).

In order to evaluate the taxonomy of the species form NHMS and HMS we firstly took into account the differences among genera, and then various indicators that distinguish between species: number of rostral spines per side of rostrum, the presence or absence of grooves on the rostral spines, cutting edges of the spines, inter-spine distance ratios, distribution of spines along the rostrum etc. It is important to note that there is some variation in the number of rostral spines per side within a given species based on biogeographic region from where the specimens originate (see Table 3).

The rostra were separated in two morphological categories according to the shape of the rostral spines, disposition of the spines on the rostrum and general shape.

*Morphological type A*: referred specimens P569 and P570 (see Figure 2 a, b).

The rostral spines are short with a rounded end in dorsal view and both anterior and posterior with sharp margins. Both the length and the thinness of the spines increase from the distal part of the rostrum towards the middle and decrease again towards the proximal part. The density of the spines in the most proximal quarter of the rostrum is obviously lower than in the remaining length. Morphology and morphometry indicates that these rostra belong to *Anoxypristis cuspidata*.

*Morphological type B*: referred specimens P21, P568, P567, P566 and VT738 (see Figures 2 c, d, e, f, g.)

The spines are slender and pointed, most of them presenting a posterior groove bordered by two edges. The most proximal four or five rostral spines present either a much shallower groove, or a flat posterior surface. The thickness of the rostral spines decreases constantly, starting from the most distal part of the rostrum towards the proximal part. Morphology and morphometry indicates that these rostra belong to *Pristis zijnsron*.

We conducted statistical analysis in addition to comparing morphology and morphometry. This analysis intended to confirm the allocation to the species level with the help of a larger data sample analyzed by Seitz & Hoover (2017).

Species analyzed: *Anoxypristis cuspidata*; *Pristis pectinata*; *P. pristis* and *P. zijnsron*.

Characters analyzed: TSL, TRL, SRL, PRW, DRW, PRW/DRW, Rostral spines (left), Rostral spines (right), PSD, DSD, SRL/TRL\*100, PRW/TRL\*100, DRW/TRL\*100, PSD/TRL\*100, DSD/TRL\*100.

Three statistical tests were conducted for normal distribution of one or several samples of univariate data, given in one or more separate columns or with a single data column and a group column. The data in Table 5 were generated by the normal and uniform random number generators in PAST ("Evaluate expression" module). For all three tests, the null hypothesis is  $H_0$ : The sample was taken from a population with normal distribution. If the given  $p$  (normal) is less than 0.05, normal distribution can be rejected.

Shapiro and Wilk's  $W$ -statistic is a well-known goodness of fit test for the normal distribution.

The Shapiro-Wilk test (PAST Package) returns a test statistic  $W$ , which is small for non-normal samples, and a  $p$  value. For example, our sample shows that PRW, rostral spines left, DSD, SRL/TRL\*100, PRW/TRL\*100, DRW/TRL\*100, and DSD/TRL\*100 each have a  $p$  value  $< 0.05$  (accepted threshold). For this reason, these morphological variables were log-transformed using a base-10 logarithm. The resultant values were then compared to a log-normal distribution.

The next step in our interpretation of data was to correlate the morphological characters. The PAST package investigates the dependence between multiple variables at the same time with the correlate test. The correlation was computed by Pearson's  $r$ , which is the most commonly used parametric correlation coefficient. It can be seen that few variables (TSL, TRL, rostral spines left) have high values ( $>0.95$ ) for the accepted threshold of  $p = 0.05$ .

The following analyses were conducted without the variables TSL, TRL and no. of rostral spines left because there is a strong relationship between two variables. This means that changes in one variable are strongly correlated with changes in the second variable. In our example, Pearson's  $r$  is 0.994 between overall length and TRL, this number is very close to 1. For this reason, we can conclude that there is a strong relationship between these variables. The same situation is between overall length and SRL and between TRL and SRL. Finally, we concluded that best results utilize TRL and rostral spines (right side) from the following analysis.

The data were further computed with principal component analysis (PCA), which finds variables (components) that account for as much as possible of the variance of multivariate data (Hammer, 2017). PCA may be used for reduction of the effective dimensional of a multivariate data set by producing linear combinations of the original components that summarize the predominant patterns in the data.

In order to provide meaningful interpretations for principal components, it is important to determine which variables are associated with particular components, in our case it seems that SRL characters is very important to separate the data in groups (see the fig. loading plot). The eigenvalue has a very large variance (99.84 %) for PC1

(Table 7) with confidence intervals from 99.769 to 99.906 bootstrapped (computed with PAST).

The coefficient value from loading plot of PCA (almost 1.0) gives the PC coefficients and correlation plot gives the correlation between the best variable (SRL, PTG and DRW) and the PC scores.

The PCA analysis based on matrix of variance-covariance (Fig. 4) shows very little overlap between *P. pristis* and *P. zijsron*, however, *A. cuspidata* and *P. pectinata* have considerable overlap for these two components. From this reason, additional ordinal statistical tests were conducted using the multivariate data.

Linear discriminant analysis (LDA) is a generalization of Fisher's linear discriminant, a classification method where two or more groups are known *a priori* and one or more new observations are classified into one of the known groups based on the measured characteristics (Fig. 5).

A scatter plot of specimens was computed using the PAST package along the first two canonical axes produces maximal and second to maximal separation between all groups. The linear combinations of the original variables in the first axis of PCA shows that SRL variable is the best morphological character for differences between groups, explained by the 23.808 (along axis 1) and 58.082 (along axis 2) coefficient of variation (Table 8).

The data were classified with the classifier command (PAST package), assigning each point to the group that gives minimal Mahalanobis distance to the group mean. The Mahalanobis distance is calculated from the pooled within-group co-variance matrix, giving a linear discriminant classifier. The given and estimated group assignments are listed for each point (Table 9).

The group assignment were 97.92 % correct classified in the predicted groups (on columns) (see the table of classifier). It seems that one individual of *Pristis zijsron* was incorrectly classified according to the LDA analysis.

### Conclusions

The taxonomic analysis of the rostra in the NHMS and HMS collections confirmed that they were misidentified. Of the seven rostra analyzed, two were reassigned to *Anoxypristis cuspidata* (specimens P570 and P569) and the remaining five specimens were reassigned to *Pristis zijsron* (specimens: P21, P568, P567, P566, and VT738). PCA over imposed on a larger sample (see Seitz & Hoover, 2017), confirmed the morphologic and morphometric observations. The new taxonomic assignment significantly increases the scientific value of these specimens. It opens the opportunity of integration into an international database (e.g., 'Sawfish Conservation Society' or the 'International Sawfish Encounter Database (ISED)' at the Florida Museum of Natural History) in order to allow other researchers the use of data for research projects. One example would be a study of the historic dynamic of the distribution of sawfishes in the Indian Ocean or around the world.

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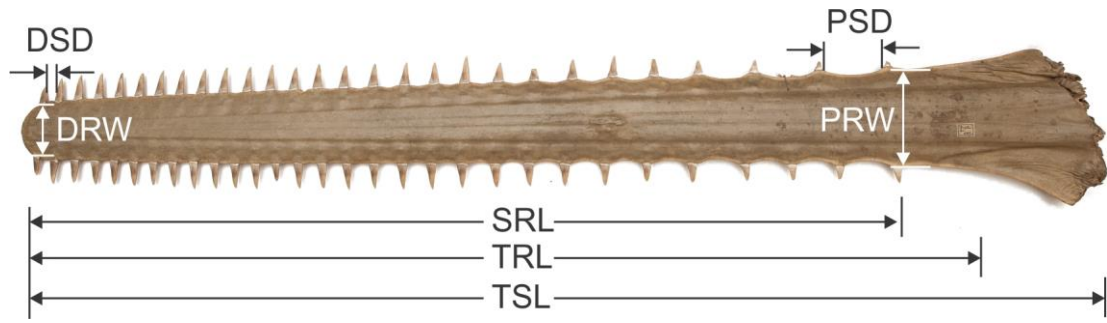
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**Fig. 2.** The rostra analyzed: a. P570; b. P569; c. P21; d. P568; e. P567; f. P. 566; g. VT 738;

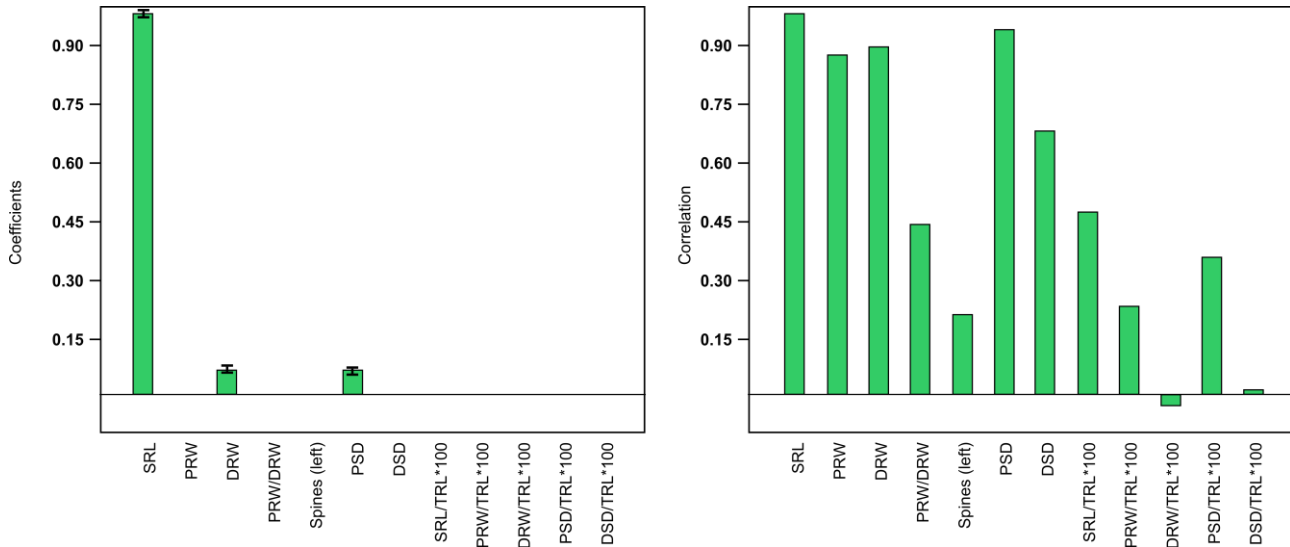


Fig. 3. Loadings plot of PCA with the best morphological character along PC1

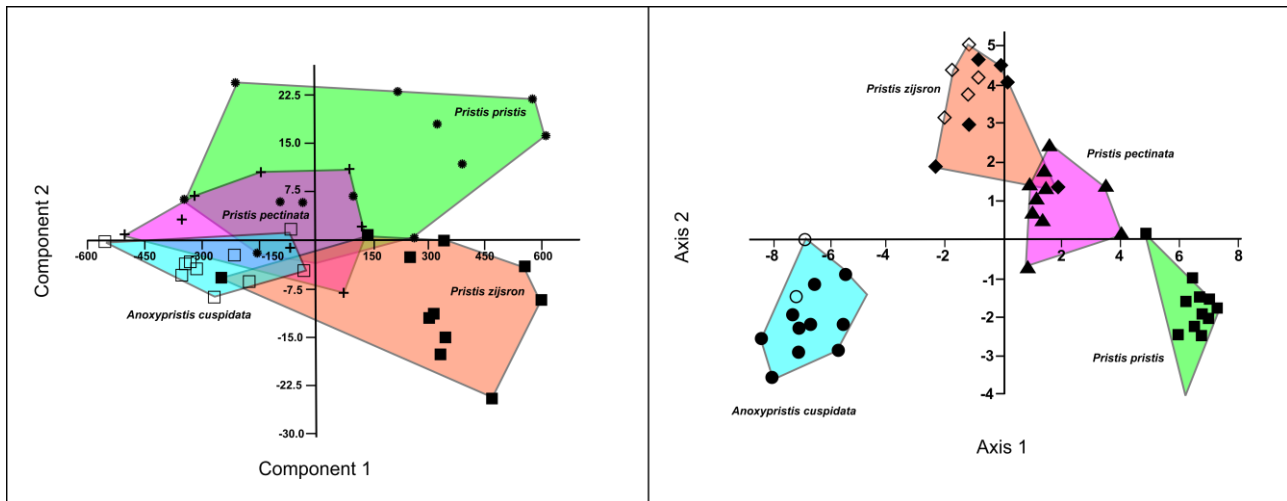


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Tab. 1. Correspondence of the old and current catalog numbers for rostral specimens

Old catalog number	Recorded as	Current catalog number	Recorded as	Other number present on specimen	Origin
NHMS					
174	<i>P. antiquorum</i>	P21	<i>P. pectinatus</i>	2530	Red Sea, Aden
179	<i>P. antiquorum</i>	P22	<i>P. pectinatus</i>	4063	Singapore
180	<i>Pristis</i> sp.	P570	<i>P. pectinatus</i>	4061	Singapore
181	<i>Pristis</i> sp.	P569	<i>P. pectinatus</i>	4960	Singapore
Not found	-	P568	<i>P. pectinatus</i>	4062	Unknown
Not found	-	P567	<i>P. pectinatus</i>	4059	Unknown
Not found	-	P566	<i>P. pectinatus</i>	-	Unknown
HMS					
Not found		VT738	-	-	Unknown



**Tab. 2:** Morphometry of the rostra. For the abbreviations used in this table see material and methods section.

Specimen (current catalog numbers)	No. of rostral spines (left and right)	TSL (mm)	TRL (mm)	SRL (mm)	PRW (mm)	DRW (mm)	DSD (mm)	PSD (mm)	DSD/PSD ratio
P570	L29/R30	824	676	602	54	40	6	27	0.22
P569	L30/R27	866	743	637	58	36	6	30	0.2
P21	L31/R28	1189	1062	920	109	60	10	65	0.15
P568	L31/R31	1076	1076	1014	108	51	9	61	0.14
P567	L28/R29	1080	1054	971	108	53	11	66	0.16
P566	L29/R32	1273	1273	1134	117	52	12	83	0.14
VT738	L29/R30	1370	1270	1220	135	73	14	65	0.21

**Tab. 3.** The reported range in the number of rostral spines per side by species of sawfish

Source:	Biogeographic region	<i>Anoxypristis cuspidata</i>	<i>Pristis pristis</i>	<i>Pristis zijsron</i>	<i>Pristis clavata</i>	<i>Pristis pectinata</i>
Faria <i>et al.</i> 2012	Indian Ocean	22-29	16-21	27-34		
	West Pacific	17-30	14-23	24-32		
	West Atlantic		14-23			20-30
	East Atlantic		14-19			20-27
	East Pacific		15-23			
Morgan <i>et al.</i> 2009	Western Australia		17-24		18-24	
Whitty <i>et al.</i> 2013	within and outside of Australia	16-33	14-24	23-37	18-27	

**Tab. 4:** Univariate statistics test table using 48 specimens. Lengths and measurements are in mm.

	Overall length	TRL	SRL	PRW	DRW	PRW/DRW	No. of rostral spines (left)	No. of rostral spines (right)	PSD	DSD	SRL/TRL *100	PRW/TRL *100	DRW/TRL *100	FTG/TRL *100	DTG/TRL *100
<b>Min.</b>	174	163	114	15	10	1.33	14	14	7	2	69.94	7.11	4.07	3.22	0.79
<b>Max.</b>	1497	1470	1272	268	102	3	37	35	89	54	97.89	20.72	11.63	9.13	4.86
<b>Sum</b>	36913	35381	32096	4723	2163	100.17	1101	1109	2001	746	4295.95	629.71	298.8	263.33	101.09
<b>Mean</b>	769	737	668	98	45	2.09	22.94	23.1	41.69	15.54	89.5	13.12	6.23	5.49	2.11
<b>SE</b>	50.16	48.17	46.25	8.71	3.26	0.06	0.75	0.73	3.23	1.87	1.17	0.65	0.23	0.18	0.18
<b>Variance</b>	120759.6	111392.5	102669.8	3640.33	510.1	0.16	27.34	25.46	500.18	167.57	65.37	20.39	2.59	1.52	1.6
<b>SD</b>	347.5	333.76	320.42	60.34	22.59	0.4	5.23	5.05	22.36	12.94	8.08	4.52	1.61	1.23	1.27
<b>Median</b>	733.5	685.5	619.5	101.5	45	2.05	23	22.5	41	11.5	93.18	12.23	6.07	5.41	1.51
<b>25 percentile</b>	489.75	477	407	52.5	27.25	1.8	18.25	18.25	22.25	7	86.1	9.07	4.88	4.57	1.11
<b>75 percentile</b>	1053.25	1042	958.25	119.5	56.5	2.27	27	27	61	21.25	95.45	17.84	7.42	6.38	3.49
<b>Skewness</b>	0.23	0.24	0.22	<b>0.99</b>	0.63	0.37	0.34	0.2	0.29	<b>1.49</b>	<b>-1.15</b>	0.34	<b>0.86</b>	0.63	<b>0.86</b>
<b>Kurtosis</b>	-0.78	-0.67	<b>-0.9</b>	<b>0.86</b>	-0.01	-0.2	-0.57	-0.84	<b>-0.96</b>	<b>1.34</b>	0.06	<b>-1.4</b>	<b>1.12</b>	0.75	-0.78
<b>Geom. Mean</b>	680.64	651.17	580.28	80.54	39.29	2.05	22.36	22.56	34.87	11.63	89.11	12.37	6.03	5.35	1.79
<b>Coeff. Var.</b>	45.19	45.28	47.92	61.32	50.12	19.12	22.79	21.84	53.65	83.29	9.03	34.42	25.86	22.45	60.15
<b>Min.</b>	174	163	114	15	10	1.33	14	14	7	2	69.94	7.11	4.07	3.22	0.79

Tab. 5: Normal distribution test.

	TSL	TRL	SRL	PRW	DRW	PRW/ DRW	No. of rostral spines (left)	No. of rostral spines (right)
Shapiro- Wilk <i>W</i>	0.973	0.975	0.964	0.912	0.956	0.976	0.950	0.966
<i>p</i> (normal)	0.322	0.393	0.141	<b>0.002</b>	0.070	0.435	<b>0.040</b>	0.170
	PSD	DSD	SRL/ TRL*100	PRW/ TRL*100	DRW/ TRL*100	PSD/ TRL*100	DSD/ TRL*100	
Shapiro- Wilk <i>W</i>	0.957	0.799	0.827	0.898	0.938	0.970	0.831	
<i>p</i> (normal)	0.077	<b>0</b>	<b>0</b>	<b>0.001</b>	<b>0.014</b>	0.261	<b>0</b>	

**Table 6:** Pearson's *r* correlation coefficient and linear regression statistics

	TSL	TRL	SRL	PRW	DRW	PRW/DRW	No. of rostral spines (left)	No. of rostral spines (right)	PSD	DSG	SRL/TRL*100	PRW/TRL*100	DRW/TRL*100	PSD/TRL*100	DSD/TRL*100
TSL		0	0	0	0	0.01	0.11	0.05	0	0	0.02	0.45	0.39	0.05	0.6
TRL	<b>0.99</b>		0	0	0	0	0.12	0.05	0	0	0.01	0.41	0.35	0.03	0.64
SRL	<b>0.98</b>	<b>0.99</b>		0	0	0.02	0.15	0.07	0	0	0.01	0.13	0.83	0.01	0.97
PRW	0.82	0.89	0.88		0	0	0.62	0.82	0	0	0	0	0.05	0.01	0.01
DRW	0.86	0.86	0.89	0.92		0	0.56	0.79	0	0	0	0	0.02	0.02	0.01
PRW/DRW	0.36	0.39	0.44	0.7	0.49		0.01	0.02	0	0	0	0	0.1	0	0
No. of rostral spines (left)	0.23	0.23	0.21	-0.07	-0.08	-0.35		0	0.337	0.01	0.43	0.01	0.01	0.41	0
No. of rostral spines (right)	0.28	0.28	0.26	-0.03	-0.05	-0.34	<b>0.96</b>		0.209	0.01	0.3	0.01	0.01	0.41	0
PSD	0.92	0.93	0.94	0.84	0.83	0.52	0.14	0.18		0	0.01	0.08	0.69	0	0.66
DSG	0.62	0.63	0.68	0.91	0.84	0.76	-0.42	-0.38	0.682		0	0	0.01	0.01	0
SRL/TRL*100	0.34	0.35	0.47	0.67	0.56	0.51	0.11	0.15	0.425	0.6		0	0	0.01	0.01
PRW/TRL*100	0.11	0.12	0.22	0.6	0.52	0.72	-0.46	-0.45	0.252	0.74	0.74		0	0.01	0
DRW/TRL*100	-0.19	-0.14	-0.03	0.29	0.34	0.24	-0.4	-0.4	-0.058	0.46	0.62	0.84		0.31	0
PSD/TRL*100	0.28	0.31	0.35	0.48	0.34	0.58	-0.12	-0.12	0.61	0.48	0.45	0.43	0.15		0.02
DSD/TRL*100	-0.07	-0.07	0.006	0.39	0.34	0.62	-0.75	-0.74	0.065	0.7	0.46	0.88	0.78	0.33	

**Table 7:** Summary of components used in principal component analysis (PCA)

PC	Eigenvalue	% variance
1	103523	99.847
2	99.0649	0.095547
3	59.5471	0.057432
4	0.351806	0.000339
5	0.112209	0.000108
6	0.012047	1.16E-05
7	0.008358	8.06E-06
8	0.006254	6.03E-06
9	0.001055	1.02E-06
10	0.000108	1.04E-07
11	3.88E-05	3.75E-08
12	2.98E-21	2.88E-24

**Table 8.** Discriminant analysis loadings of first three axis

Parameters	Axis 1	Axis 2	Axis 3
SRL	23.808	58.082	-136.04
PRW	0.041205	0.02668	-0.08667
DRW	2.6921	1.7302	-7.8178
PRW/DRW	0.06124	-0.01006	-0.05303
No. of rostral spines (left)	-0.00757	0.03141	0.013283
PSD	1.8225	4.3106	-10.075
DSG	0.05293	-0.01306	-0.10349
SRL/TRL*100	0.00624	0.006279	0.005389
PRW/TRL*100	0.02856	-0.00665	0.015777
DRW/TRL*100	0.01579	-0.00666	0.024413
PSD/TRL*100	0.12155	0.16126	-0.27145
DSD/TRL*100	0.04029	-0.04639	-0.00104

**Table 9.** Classifier table with Mahalanobis distance to the group mean.

	<i>Anoxypristis cuspidata</i>	<i>Pristis pectinata</i>	<i>Pristis pristis</i>	<i>Pristis zijsron</i>	Total
<i>Anoxypristis cuspidata</i>	14	0	0	0	14
<i>Pristis pectinata</i>	0	10	0	0	10
<i>Pristis pristis</i>	0	0	13	0	13
<i>Pristis zijsron</i>	0	1	0	10	11
Total	14	11	13	10	48

# THE LEGACY OF DOCTOR VIKTOR WEINDEL (1887 – 1966) TO THE BRUKENTHAL NATIONAL MUSEUM IN SIBIU

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Gabriela CUZEPAN-BEBEȘELEA\*\*

**Abstract:** *The Brukenthal National Museum is the custodian of Dr. Viktor Weindel Collections. The collections are included in the cultural heritage of the Natural History Museum in Sibiu and the History of Pharmacy Museum, both departments of the renowned national museum from Sibiu. This paper brings new data regarding the life and scientific legacy of Dr. Viktor Weindel. The paper summarized for the first time the Dr. V. Weindel History of Medicine Collection.*

**Key words:** *Weindel, Lepidoptera Collection, Microscope Slide Collection, History of Medicine Collection.*

**Rezumat:** *Muzeul Național Brukenthal este custodele colecțiilor Dr. Viktor Weindel. Colecțiile sunt incluse în patrimoniul Muzeului de Istorie Naturală și al Muzeului de Istorie a Farmaciei, ambele instituții fiind departamente ale renumitului muzeu național din Sibiu. Această lucrare aduce noi date cu privire la viața și moștenirea științifică a Dr. Viktor Weindel. Pentru prima dată este prezentată succinct Colecția de Istoria Medicinii Dr. V. Weindel.*

**Cuvinte cheie:** *Weindel, Colecția de Lepidoptere, Colecția de Lame Microscopice, Colecția de Istoria Medicinii.*

## Introduction

Viktor Weindel (Fig.1) was born in Sibiu, on November 3<sup>rd</sup> 1887. He attended the oldest German-language school in Romania, the *Evangelic Gymnasium* in Sibiu (today “Samuel von Brukenthal” National College). Even at a young age, he was preoccupied and attracted by natural sciences (Schneider 1984, 289; Schneider 1996, 367). His main interest focused on insects, and especially on butterflies.

Since 1847, in Sibiu, the *Society for the scientific research of Transylvania (Verein für Siebenbürgische Landeskunde)* held regular lectures on natural sciences. On Mai 4<sup>th</sup>, 1849 the *Transylvanian Society for Natural Sciences in Sibiu – Siebenbürgischen vereins für naturwissenschaften zu Hermannstadt* was inaugurated officially

Dr. Daniel Czekelius (1857 – 1938) (Fig. 2), the *protomedicus* of Sibiu, cofounded on December 16<sup>th</sup> 1887, the same year that Weindel was born, the Medical Section of this Society. In his free time Dr. Czekelius was an entomologist. Members

of the Society Medical Section were doctors but also zoologists, botanists or geologists. Their scientific research, coordinated by Dr. Czekelius, led to personal natural history collections and they were appointed curators to the *Transylvanian Society* collections. We can affirm that Dr. Daniel Czekelius was a mentor for young Viktor Weindel. He influenced him to study the Lepidoptera group. Dr. Daniel Czekelius was the curator of the Society’s lepidopteran collection during the years 1901-1906, 1925-1938 (*Verhandlungen* 1901, 1902, 1903, 1904, 1905, 1926/1927, 1928, 1929/1930, 1933/1934, 1935/1936, 1937/1938). Dr. Daniel Czekelius guided Weindel in creating his first collection of butterflies (Schneider 1984, 289; Antonie, Ciobanu 2004, 29). Later on in his life, Weindel payed tribute to Dr. Czekelius in various occasions, he also wrote his obituary (Weindel 1935a, 1 – 11; Weindel 1937/1938, 2 – 5).

At only 16 years, Viktor Weindel is mentioned by Dr. Czekelius in the Society scientific journal *Verhandlungen und Mitteilungen des Siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt* for his faunistical observation and collected entomological materials. On 26 March 1904 he collected from Dumbrava Sibiului (Jungerwald)

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the species *Taeniocampa opima* Hli. (Verhandlungen 1908, 155).

At 19 years old, in 1906, he signed up at the University of Munich (today "Ludwig Maximilian" University of Munich), Faculty of Medicine. Probably during university breaks he pursued his natural science passions as in 1908, he collected species belonging to the genus *Biston* Leach, 1815 from Sibiu, genus *Lycaena* Fabricius, 1807, from Braşov and Sibiu (Verhandlungen, 1908, 155, 157, 158, 159) and genus *Pieris* Schrank, 1801 from Sibiu (Czekelius 1917, 8).

After four years at the University of Munich, in 1910 he finished his studies here and obtained his doctor title from the Budapest University in 1911.

Dr. Weindel worked for one year as internist in Munich and another year in Berlin (Von Killyen 2017, 286).

On February 13, 1912 Dr. Weindel signed up as a member of the *Transylvanian Society for Natural Sciences in Sibiu* (Verhandlungen 1912, 138).

He was appointed, in 1913, Secretary (*Schreffürer*) to the Medical Section of the Society (*Medizinische Sektion*) (Verhandlungen 1913, 54).

In 1914 he returned in Sibiu from Berlin as internist and specialist pulmonologist at the *Polyklinischen Ambulatorium die Abteilung für Lungenkranke*. He was later appointed by the town council as secondary doctor (*Sekundararzt*) at the Franz-Joseph-Bürgerspital today the Public Hospital of Sibiu (Schneider 1996, 366).

He also owned and worked at his private medical office for internal diseases (Fig. 3; Fig. 4 a, b).

During the First World War, he served as a military doctor in Sibiu – *Lazarettarzt im Hermannstädter Garnisonsspital* (1916 – 1918) (Von Killyen 2017, 286).

After the war he returned as physician to *Franz – Joseph Bürgerspital* in Sibiu.

The Society Medical Section meetings were also resumed. Dr. Weindel presented on February 12, 1919 a scientific communication related to the exanthematic typhus epidemic from 1916 – 1918 in Romania, the biggest epidemic in Romania's history, counting approximately 300.000 victims. The communication was related to *Typhus exanthematicus*, its ethology, symptomatology, therapy, prophylaxis, transmission and skin hygiene behaviors (Verhandlungen 1920, 44 – 45).

In March 1919 Dr. Weindel was appointed *Leiter des mikroskopischen Laboratorium – Head of the Microscopy Laboratory at the Natural History Museum*, after Dr. Müller who was in charge before him left Sibiu for Bucharest (Verhandlungen 1919, 120 – 121).

Beside his regular research activities in the laboratory he held classes to the *Evangelic Gymnasium* students and during summers to university students (Antonie, Ciobanu 2004, 29 – 30).

Dr. Weindel brought a new perspective to the general exhibition of the museum, following the example of the Salzburg Museum "Das Haus der Natur" (Muzeul de Istorie Naturală din Sibiu, *Istoricul și colecțiile lui*, 1956, 18).

Dr. Weindel married the violinist Hedwig Schuster, the granddaughter of the Transylvanian Saxon poet and ethologist Friedrich Wilhelm Schuster (1824 – 1912). On June 20, 1924 was born the only child of the couple Hedwig Ulrike, called by relatives and friends "Uli" (Klein 2009).

On 16 September 1919, Dr. Weindel attended the Society Council meeting during which it was announced that the request to the *Sächsische Nationsuniversität (The Transylvanian Saxon University)* to write off the museum's building patents had been decisively granted (Verhandlungen 1919, 35).

*The Natural History Museum in Sibiu Microscope Slides Collection* was officially initiated and curated by Dr. Weindel in 1920 (Fig. 5 a, b). The original name of the collection was *Sammlung menschlicher und tierischer parasite* (Verhandlungen, 1920, 41). His interest was, especially, in malaria. The Microscope Slide Collection from the museum includes various malaria related slides (inventory number 331/3 *spleen affected by malaria*). The doctor published in the Transylvanian Society Journal – *Verhandlungen* scientific papers dedicated to parasitology (Weindel 1924a, 260 – 264; Weindel 1924b, 265 – 269). In Romania since 1961 indigenous transmission of malaria was interrupted and in 1963 the maintenance phase of malaria eradication was initiated (Lipan *et al.* 2011, 25; Pițigoii 2014).

As a physician he enrolled as ordinary member in the German Society for Internal Medicine – *Deutschen Gesellschaft für Inner Medizin* since 1928 (Géronne 1928, XL). Between 18 and 21 April 1933, Dr. Weindel attended the Forty-fifth

Congress of the Society members held in Wiesbaden (Germany).

He is present at the general assembly, listed as Head of the *Evangelic Nursing School in Sibiu – Anstaltsleiter der Evangelische Krankenpflegeanstalt Hermannstadt – Sibiu (Siebenbürgen, Rumänien)* (Géronne, 1933, XLV).

The "Martin Luther Krankenhaus" today one of the Pediatric Hospitals in Sibiu, was opened in 1934. Weindel contributed as head physician to its foundation (Weindel 1935, Ulrich 2013).

Between 9 and 12 April 1934 he participated at the Forty – sixth Congress organized by the German Society, but this year he is registered as Head physician of the *Martin Luther Hospital in Sibiu (Leitender Arzt des Martin-Luther – Krankenhauses Hermannstadt – Sibiu)* (Géronne. 1934, XL).

Dr. Weindel cofounded in 1939 the *Union of German Doctors in Romania (Bund deutscher Ärzte in Rumänien)*; he was Chair of the union. In 1941, May 10<sup>th</sup>, a new and larger society was initiated entitled *German Doctors in Romania (Deutsche Ärzteschaft in Rumänien)*. Dr. Weindel dissolved the Union founded by him on the same day. In the last meeting of the Society held in Timișoara (Romania) he motivated the decision: "*the way we have governed ourselves until now, with characteristics like choice and elections, has these days become outdated, not fit for purpose or our times – when a tough authoritarian leadership has proven itself necessary in all other areas*" (Weindel 1941b, 85). Weindel joined the *Deutsche Ärzteschaft in Rumänien* as Second Chair after Franz Wilhelm Wokalek who was elected Primary Chair. Turda (2015, 559) considers the *Deutsche Ärzteschaft in Rumänien* an East – Central European eugenics society because of the statements of its members especially Dr. Wokalek (1942, 1). Georgescu (2016, 269) deems Weindel as eugenicist, mentioning his paper written in collaboration entitled "*Deutsche Arzte!*" (Hager, Weindel 1940, 283). He published in the 1941/1942 *Verhandlungen* number the paper *Die Eingliederung des Siebenbürgischen Vereines für Naturwissenschaften in das Forschungsinstitut der Deutschen Volksgruppe in Rumänien (The incorporation of the Transylvanian Society of Natural Sciences into the Research Institute of the German National Group in Romania)*.

In the interval 1942 and 1944, Dr. Weindel was the chairman of the *Medical Section of the*

*Transylvanian Society* (Schneider, 1996, 367), the last to have held this position, as in 1944 the Section was closed down (Von Killyen, 1998, 323).

The *Nationalization Law* from June 1948 turned the Society museum and all of its collections into state property. That same year the *Transylvanian Society* stopped its activity after 99 years.

During his career as a physician and lepidopterist, Dr. Weindel wrote scientific papers almost exclusively medical topics or Transylvanian Society updates (Weindel, 1940, 2 – 5; Weindel, 1941, 1 – 3; Weindel, 1942, 5 – 9). Schneider (1996, 367) counts 42 such works.

In 1953, his daughter, Ulrike marries the Romanian physician Dan Rușdea, originally from Oradea (the son of a renowned Romanian doctor from that region), without the family approval (Klein, 2009).

Three years later, in 1956, the couple welcomed their first daughter Evelyn and in 1959 Sabine Rușdea.

Diagnosed in 1961 with senile dementia, Dr. Weindel is helped by Ulrike, who together with her husband and daughters moved to the family home located on Hegel Street, number 18 in Sibiu.

On December 1957, Dr. Berwerth, his former Society colleague, wrote in the *Siebenbürgische Zeitung*, an article dedicated to Dr. Weindel with the occasion of his 70<sup>th</sup> birthday (<https://www.siebenbuenger.de>).

Dr. Viktor Weindel passed away on May 27<sup>th</sup> 1966 in Sibiu at the age of 79 years.

## Material

### 1. *The Lepidoptera Collection* (Fig. 6 a,b,c).

Viktor Weindel collected butterflies over a long period of time, comprising 60 years (1900-1959) (Schneider 1984). Among his collection are preserved the first specimens he collected starting with 1900 (Schneider 1984, 289; Schneider 1996, 367). As a member of the *Transylvania Society for Natural Science*, he contributed along with other members, at the development of the Society's collections through donations and personal collections (*Verhandlungen* 1921, 96; Cuzepan et. al. 2015, 378).

His collection, counting 4322 specimens of macro and micro Lepidoptera, was acquired by the Natural History Museum from Sibiu in 1964 (report 71/28.02.1964, accounting note



91/18.04.1964; Schneider 1984, 289). The collection was purchased because of its value reflected in a rich varied material, in rare and representative species for some biogeographical areas from where the specimens were collected (Schneider 1984, 289; Pascu, Schneider 1998, 208; Moise 2017, 97-98). Dr. Weindel himself proposed that his collection should be acquired by the museum, in order to contribute in enriching the entomological collection. He mentioned in his acquisition proposal that the collection was seen and evaluated in 1963 by the most authorized lepidopterist in Romania and well known abroad Dr. doc. Aurelian Popescu-Gorj. Weindel evaluated and proposed his collection to be bought with 9000 lei, but the museum acquired it at the 4500 lei in 1964 (report 71/28.02.1964). Besides being a physician, an active collector of butterflies, and because of a serious illness, he didn't succeed to scientifically review his collection material in order to be published (Schneider 1984, 290; Schneider 1996, 367).

After his collection entered the Natural History Museum, the material was processed and rearranged into macro and microlepidoptera group by the entomologist and museum curator dr. Eckbert Schneider starting with spring 1981 (Schneider 1984). A comprehensive list containing data from his collection was first published in 1984 by dr. Eckbert Schneider (Schneider 1984, 294-315). Several other authors studied his Lepidoptera material and published data regarding valuable species from his collection (e.g. Popescu-Gorj 1961, 207; Popescu-Gorj 1963, 241; Török, Cuzepan 2012, 463; Török, Cuzepan 2013, 68, 72; Cuzepan *et.al.* 2015, 391-396; Stancă-Moise 2011, 181-182; Stancă-Moise 2015, 36, 38; Stancă-Moise 2017, 98-99 and others).

In his collection are preserved valuable endemic species – *Parnassius apollo transsylvanicus* Schweitzer, 1912; *Parnassius mnemosyne distincta* Bryk & Eisner, 1930; *Pieris bryoniae carpathensis* Moucha, 1956; *Erebia medusa psodea* (Hübner, 1804); *Erebia gorge fredericikoenigi* Varga, 1999; *Erebia pandrose cibinica* Dannehl, 1927; *Boloria pales carpathomeridionalis* Crosson & Popescu-Gorj, 1963; *Glacies coracina dioszeghyi* Schmidt, 1930; *Elophos dilucidaria carphatica* (Soffner, 1932) (Török, Cuzepan 2012, Török, Cuzepan 2013); and Natura 2000 species – *Heteropterus morpheus* (Pallas, 1771); *Colias chrysotheme* (Esper, 1781); *Parnassius apollo jaraensis* Kertész, 1922; *Parnassius apollo transsylvanicus* Schweitzer,

1912; *Parnassius mnemosyne distincta* Bryk & Eisner, 1930; *Zerynthia polyxena* (Denis & Schiffermüller, 1775); *Zerynthia (Allancastria) cerisy ferdinandi* Stichel, 1907; *Lycaena dispar rutila* (Werneburg, 1864); *Cupido osiris* (Meigen, 1829); *Maculinea arion* (Linnaeus, 1758); *Maculinea teleius* (Bergsträsser, 1779); *Argynnis laodice* (Pallas, 1771); *Nymphalis vaualbum* (Denis & Schiffermüller, 1775); *Neptis sappho* (Linnaeus, 1758); *Lopinga achine* (Scopoli, 1763); *Erebia sudetica radnaensis* (Rebel, 1915); *Erebia gorge fredericikoenigi* Varga, 1999; *Proserpinus proserpina* (Pallas, 1772); *Eriogaster catax* (Linnaeus, 1758); *Euplagia quadripunctaria* (Poda 1761) (Schneider 1984, 294-315; Török & Cuzepan 2013, 68, 72; Cuzepan *et al.* 2015, 391-396).

In the article published in 1984 by dr. Eckbert Schneider, are presented 568 species belonging to 3113 macrolepidoptera specimens of Weindel's Lepidoptera collection preserved in the museum. An overview of the sampling areas was made. The main area from which Weindel collected butterflies was Transylvania region, especially near Sibiu and Southern Carpathians. Here he undertook numerous excursions for sampling material. One of his regular sampling location was also his home garden located on Gușterița Hill (Dealul Gușteriței, Hammersdorf) (Schneider 1984, 298). Apart from this, he also undertook sampling excursions in the south part of Romania and in the Eastern Carpathians – in search of the typically mountain butterfly species *Parnassius apollo* (Linnaeus, 1758) (Schneider 1984, 289), now a vulnerable species due to his habitat reduction. In dr.V.Weindel collection can be found specimens which are collected since his highschool years (Schneider 1984, 289). Schneider mentions in his article from 1996, 367 a handwritten note of dr. Viktor Weindel where he underlines the sampling locations of the butterflies collected („Die Herkunft meiner Schmetterlinge”) referring to: Sibiu, Gușterița Hill, Viile Sibiului, Cîsnădioara, Sadu, Cîsnădie, Păltiniș, Măllseifen (or Mehlseifen is the hill that rises behind the citadel of the Cîsnădioara church) and Măgura Cîsnădiei. His collection also preserves a small number of butterflies specimens collected and brought by Weindel himself from München and from Serbia, and a material from Vrșac which was collected by Dr. D. Czekelius (Schneider 1984, 293).

Among the 42 papers published by Weindel (Schneider 1996, 367), data referring to Lepidoptera appears in the appreciation of the

80th birth anniversary of physician Daniel Czekelius (Weindel 1935a, 1-11), in the obituary of D. Czekelius, MD (Weindel 1937/1938, 2-5).

In 2000 an edited article of Weindel was published (Weindel 2000 edited by László Rákósy). The article published formed a part of Weindel written work presented in 1957 with the occasion of D.Czekelius, MD 100th anniversary of birth, in a small circle of friends. His manuscript was not intended to be published (Weindel 2000, edited by L. Rákósy, 5). In 1997 Rákósy received the unpublished manuscript from Weindel's granddaughter Dr. Ing. Evelyn Rușdea. The manuscript comprised data regarding *Parnassius apollo* distribution patterns in Romania and a part addressed to D.Czekelius MD, Weindel's mentor (Weindel 2000, edited by L. Rákósy, 5-10). The part referring to *Parnassius* has additional information added by the lepidopterist L. Rákósy (Weindel 2000, edited by L. Rákósy, 6-10).

## 2. *The Microscope Slides Collection.*

Comprises 2245 inventory numbers (Natural History Museum in Sibiu General Inventory Book, 623 – 716). The Weindel medical and biological microscopy slides collection has various medical applications for researchers today like diagnoses, studies and documentation in terms of comparison. Some slides have lost their quality due to ageing or have darkened by oxidation – dehydration processes of the media but the general aspects are relevant. The collection is not arranged according with general standards for this type of museum objects (Cilliers 1981; Decker *et al.* 2018). The first inventory numbers included in the museum slide collection, today counted at 328/1, is *skin from a patient with Addison's disease*. In general, the collection slides can be grouped as follows: human histological slides (pathological and comparative), animal histological slides (pathological and comparative), animal and human parasitology slides and general animal anatomy comparative slides.

*Sammlung menschlicher und tierischer parasite* (Verhandlungen, 1920, 41) collection initiated and included in the museum cultural heritage in 1920 is part of today's general *Microscope slide collection*.

The human pathological slides are in large number. Slide labels are written in German language, and are incomplete regarding the dating of the museum object. The oldest slides according to their labels are from 1880, inventory numbers

305/1116, 306/1117, 307/1118 and 308/1119 consisting of *human liver tissue*.

## 3. *Dr. Viktor Weindel History of Medicine Collection from Sibiu.*

The Pharmacy Museum in Sibiu (section of the Brukenthal National Museum) shelters *Dr. Viktor Weindel History of Medicine Collection*. The collection was donated by Dr. Weindel's daughter on December 20, 1986 (Fig. 7). At that time Dr. Hedwig Ulrike Rușdea (1924 – 2009) was an internationally renowned ethnographer (Klein, 2009). The collection was officially registered as inventory objects on 24 February 1987 and 29 January 1988. Considering the foreign travel limitations imposed by the Communist party during that period and especially the status of minorities in Communist Romania of the 1980s, H.U. Rușdea donated the objects to the Natural History Museum in Sibiu, homage to her father who contributed at the development of this institution as doctor, entomologist, microbiologist and naturalist. Immediately after the act of donation, in 1987, she emigrated to Germany, where she continued her researches in ethnography.

The collection comprises especially glass laboratory equipment (Tabel 1) for various medical tests. Grate interest for medical historians are the medical kits like the *Hemocytometer* (F 3682, Fig. 8c, blood testing medical instrument in case, on the outside of case are the words: *Blutkörperzahlapparat. Nach Thom. Ernst Leitz Wetzlar*, produced around 1920).

The personal items of doctor Weindel, like his personal signature stamp, hand written notebooks, patient evidence record are sought after bought by entomologists and medical historians.

As Arnold (1999, 167) points out museums have the dominant role in preserving and illuminating the historical significance of material culture of medicine.

## Conclusions

Many natural history collections, held today in museum's around Europe, were initiated by apothecaries and physicians who studied and gathered for personal or professional interest natural and artificial curiosities from home or exotic countries (Arnold 1999, 146). In the nineteenth century several European medical societies sustained teaching collections of various natures. The Medical section of the Transylvanian

*Society for Natural Sciences in Sibiu - Siebenbürgischen vereins für naturwissenschaften zu Hermannstadt* has supported the development of the Natural History Museum in Sibiu and of its collections. As a member of the Society and as a passionate naturalist doctor Viktor Weindel is part of the museum history.

In Europe there are museums dedicated entirely to medical personalities. The Brukenthal National Museum in Sibiu, through its two sections of natural history and history of pharmacy, facilitates the study and display of doctor Weindel Collections by different means: access to researchers, temporary or permanent exhibitions and catalogs.

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Fig. 1 Dr. Viktor Weindel (1887-1966)

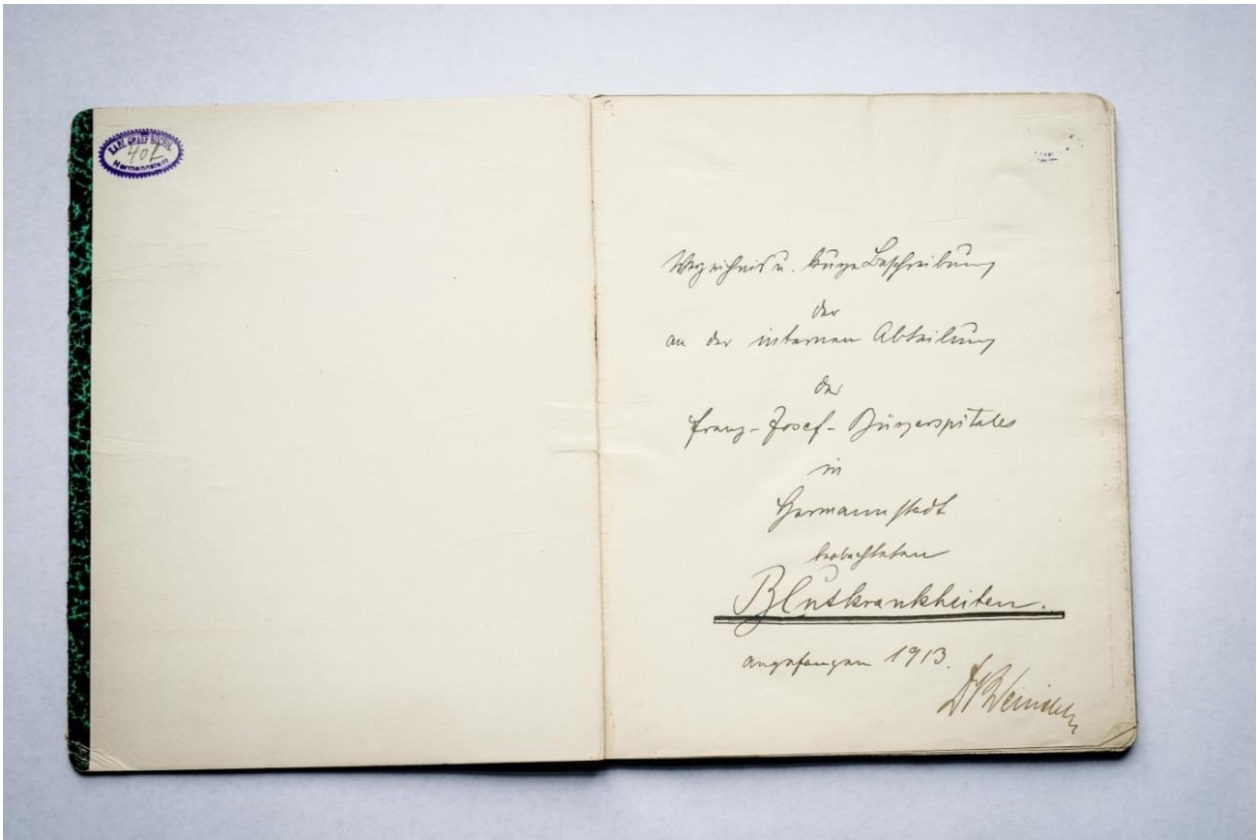


Fig. 2. Daniel Czekelius (1857 – 1938) (Harris (2016))

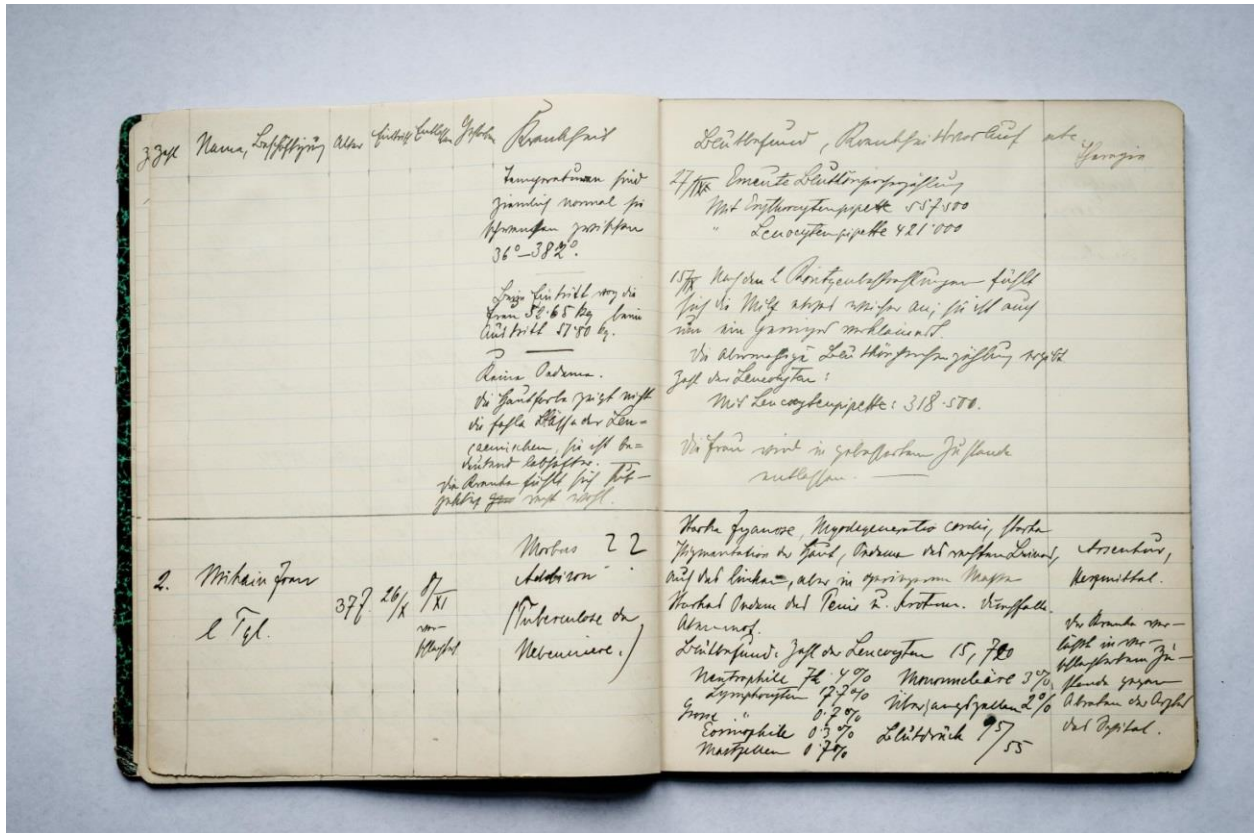


Fig. 3 Dr. Viktor Weindel private medical office plate





a.



b.

Fig. 4 Doctor's registry book dated 1913 and signed by him



**a.** **b.**  
**Fig. 5** Objects from the *Natural History Museum in Sibiu Microscope slides Collection* that belonged to Dr. Weindel.



**a.**

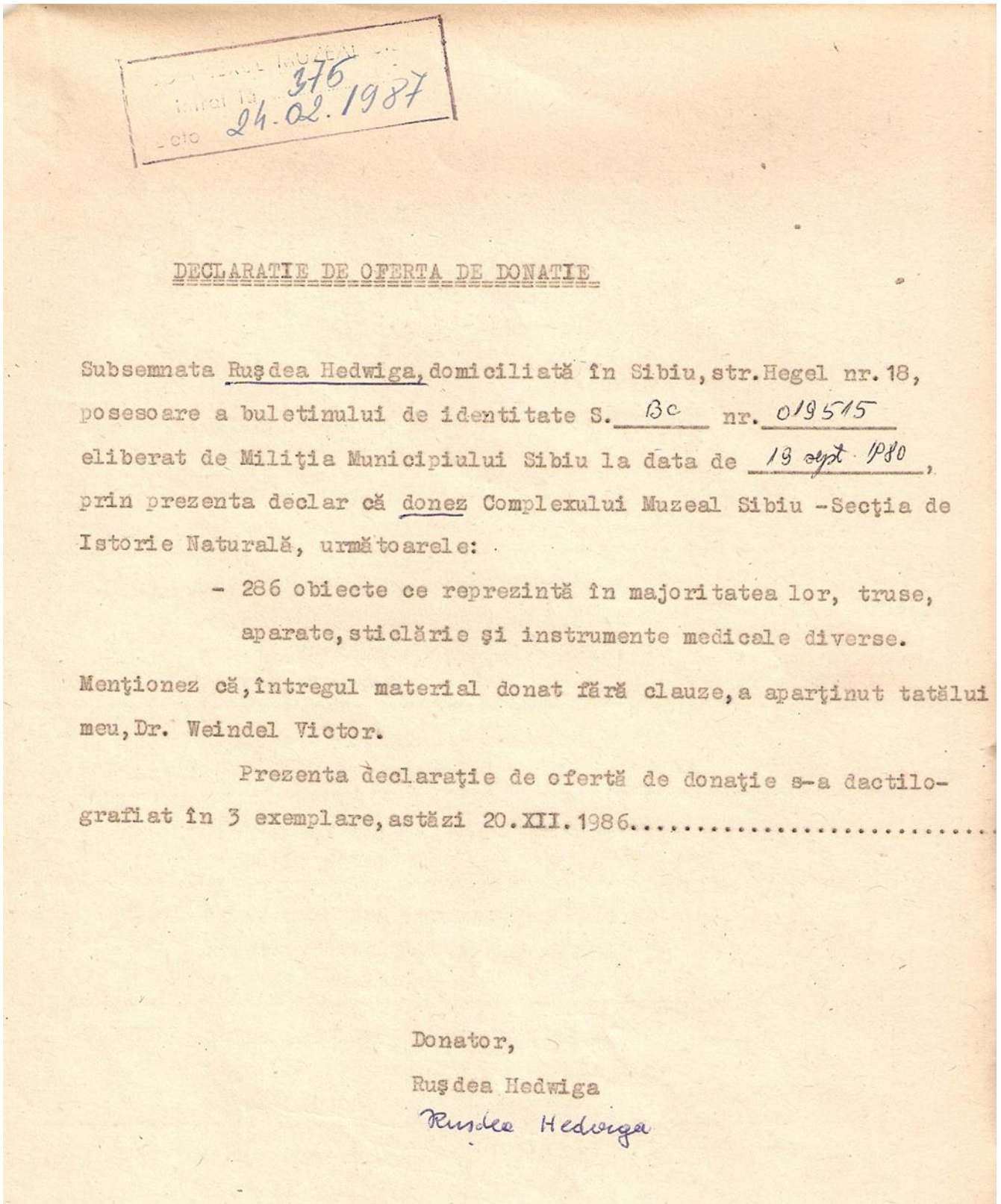


b.



c.

**Fig. 6** Dr. Viktor Weindel Lepidoptera Collection Natural History Museum in Sibiu: a. *Papilionidae* and *Pieridae*; b. *Pieridae*; c. *Pieridae* and *Nymphalidae* (photo: Nicolae Trif).

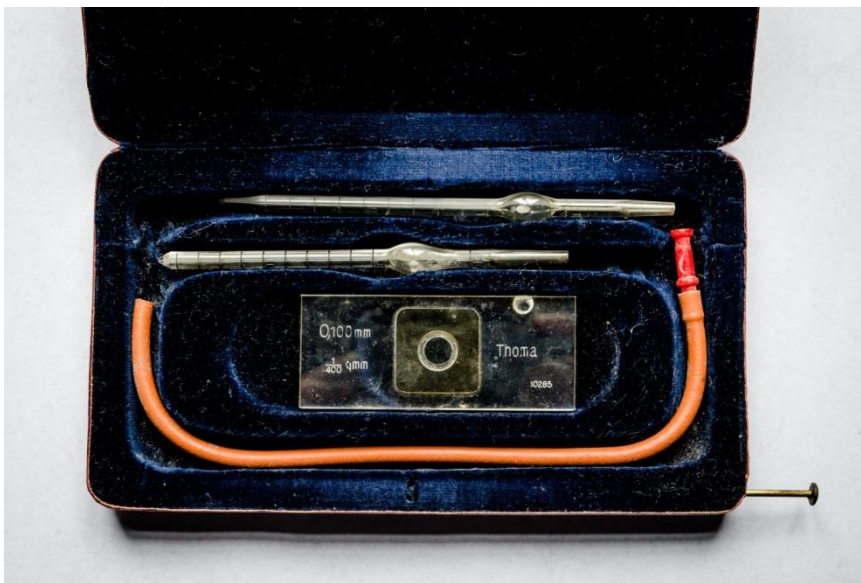


**Fig. 7** The donation act (number 375/24.02.1987) signed by Dr. Hedwig Ulrike Rușdea (1924 – 2009) on December 20, 1986 (Source: the archive of the History of Pharmacy Museum in Sibiu, section of the Brukenthal National Museum)



a.

b.



c.

**Fig. 8** Dr. Weindel's medical equipment: a. Stethoscopes (F 3672, F 3673, F 3674); b. Manual test tube centrifuge (F 3686); c. Hemocytometer blood testing medical instrument in case, on the outside of case are the words: *Blutkörperzahlapparat. Nach Thoma. E. Leitz Wetzlar* (F 3682). (History of Pharmacy Museum Collection, photo Gabriela Cuzepan – Bebeșelea).

**Tab. 1.** List of inventory numbers and objects included in to *Dr. Viktor Weindel History of Medicine Collection from Sibiu.*

Inventory number	Object
F 3639	Apparatus in wood case for diabetic analysis C. Reichert, Wien (Austria)
F 3640	Leather hand bag for medical instruments, possibly used for house calls
F 3641, F 3643, F 3644, F 3645, F 3646, F 3652, F 3659, F 3684	Metal medical instruments
F 3642, F 3655, F 3656, F 3778, F 3793 – F 3803, F 3809, F 3810	Syringes and Hypodermic needle
F 3647, F 3648, F 3664, F 3665, F 3666, F 3667, F 3668, F 3669	Otorhinolaryngology equipment
F 3649, F 3660	Scalpels
F 3650, F 3651, F 3675	Surgical catgut and thread
F 3653, F 3654, F 3700, F 3701	Glass medical instruments
F 3657, F 3658,	Pneumothorax needles, other types of needles
F 3661, F 3662, F 3663,	Porcelain medical instruments
F 3670, F 3671, F 3672, F 3673, F 3674, F 3811	Wooden stethoscope
F 3676, F 3681, F 3682,	Medical apparatus for blood analysis
F 3677, F 3678, F 3680	Apparatus for urine analysis
F 3679	Device for pulmonary drainage
F 3683	Colorimeter for diabetes analysis
F 3685	Electric centrifuge D.R.P.
F 3686	Manual centrifuge D.R.G.M.
F 3687, F 3688, F 3689, F 3691, F 3692, F 3693, F 3694, F 3695, F 3702, F 3703, F 3704 – F 3777	Medical glass laboratory equipment
F 3696, F 3697	Wood pharmaceutical jars
F 3698, F 3699	Albuminimetry equipment
F 3779	Dr. Viktor Weindel seal

F 3780	Dr. Viktor Weindel private medical office advertisement
F 3781	Dr. Viktor Weindel hand written book with incompatible substances
F 3782	Dr. Viktor Weindel hand written patient evidence record
F 3783	Photograph in frame "Deutscher Arzt" 1610
F 3784	Photograph in frame "Deutscher Arzt" 1682
F 3785	Photograph in frame "Deutscher Arzt" 1485
F 3786	Photograph in frame "Deutscher Arzt" 1517
F 3787	Photograph in frame "Deutscher Arzt" 1250
F 3788	Photograph in frame "Deutscher Arzt des 14 Jahr"
F 3789	Photograph in frame "Deutscher Arzt" 1578
F 3790	Photograph in frame "The Chemistry Laboratory"
F 3791	Dr. Viktor Weindel's office desk
F 3792	Apparatus for measuring blood pressure in a metallic box, inscribed SPHYGMOMANOMETER NACH DR.H.VON RECKLINGHAUSEN"

## BRUKENTHAL NATIONAL MUSEUM IN 2017: 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 2017.*

**Keywords:** *Brukenthal National Museum, natural history, 2017.*

**Rezumat:** *Articolul de față constituie o prezentare sintetică a ofertei culturale a Muzeului Național Brukenthal în domeniul istoriei naturale, pe parcursul anului 2017.*

**Cuvinte cheie:** *Muzeul Național Brukenthal, istorie naturală, 2017.*

In 2017, Brukenthal Museum celebrated 200 years of public activity.

The Bicentennial provided a moment in time to acknowledge the importance of the Museum as the first to be established in Romania. The goal assumed was to coordinate a year-long celebration comprising museum projects and activities along additional events staged by local and national partners.

2017 was dedicated to the long mission in promoting the heritage that the museum carried on up to our days but, it addressed to people, to the general public.

In organizing 2017 Bicentennial Year, the Museum emphasized on the special experience binding museum employees, cultural partners and visitors to the Brukenthal identity

### 1. Temporary exhibitions<sup>1</sup>

#### a. Exhibitions at the museum locations:

37 temporary exhibitions were organized at the Museum's premises during 2017, of which 23 exhibitions presented cultural heritage through collections or photo-documentary presentation; 9 exhibitions featured contemporary art, 1 exhibition was the result of educational projects; 4 exhibitions consisted of media and marketing projects. Also, of the 37 exhibitions, 16 were exclusive projects of Brukenthal National Museum, 18 were projects developed in collaboration with local and national partners and 3 projects were carried out in collaboration with international partners.

Out of the total of 37 temporary exhibitions, 7 displayed selections of exhibits in various fields of natural history. To be noted in the 2017 exhibition agenda is the diversity and the interdisciplinary approach shown by the exhibition projects coordinated by the Museum of Natural History:

*Mineralia – Spring Crystals* (Casa Albastră/Blue House, Multimedia Hall, 23 – 26.02): organized in partnership with Mineralia Association, the spring edition of Mineralia exhibition presented to the public in Sibiu a special selection adjoining rough stones – collective crystals and minerals, fossils and meteorites; cut and polished stones (gems); original jewelry made of natural stones only and ornaments made of polished stone.

*Mineralogical tours in Transylvania. Samuel von Brukenthal's collection of minerals* (Museum of Natural History, 5.04 – 31.12): Samuel von Brukenthal's activity in collecting paintings, coins, medals, and decorative art is well known. Less known, though, is the Baron's interest in gathering valuable samples of minerals. The exhibition presented the outcome of his passion for mineralogy – von Brukenthal collection of minerals of which 153 samples are to be found on displayed. The Brukenthal mineralogical collection also stands as eloquent proof for the Baron's complex intellectual profile, in addition to his aesthetic and spiritual affinities also devoting a special attention to mineralogy. Originally in the same structure with the other collections in Brukenthal

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<sup>1</sup> The short descriptions of temporary exhibitions are selected from the texts given by the curators for public information.



Museum, the Brukenthal minerals collection was handed over in the year 1923 by the administration of the Brukenthal Museum – while maintaining property rights – to the “Transylvanian Society of Natural Sciences in Sibiu”. In 1957, when the Museum of Natural History became part of Brukenthal Museum, the collection returned to the mother-institution. As governor and shareholder in mining industry, von Brukenthal was able to come into possession of valuable mineralogical samples. Thus his collection represents, considering the place of collection, variety and diversity, a “mineralogical journey” in Transylvania. Extended after the death of its founder, the Baron’s collection of minerals has now scientific, historical and museum importance. It is a tangible proof of the concerns and knowledge about nature, of the generosity of this precursor of the systematic learning and understanding of the environment as a premise for its protection. If, at the end of the 18<sup>th</sup> century, Sibiu becomes the scientific center of the Transylvanian movement for nature, gaining an international notoriety as a center of culture and science, this was possible, first of all, due to Samuel von Brukenthal’s endeavors as a Maecenas in arts and sciences.

*\_Gușterița through the eyes of the paleontologist* (Museum of Natural History, 25.04 – 31.12): Gușterița Hill in Sibiu, as it is known in specialty literature, is scientifically important from several points of view. The geological importance – for the reconstitution of the evolution of the southern area of the Transylvanian Basin, for stratigraphic correlations at Pontian and Pleistocene levels, for the study on several taxa from various fossil groups (plants, mollusks, vertebrates, etc.). The outcrop “Gușterița Hill” became known due to the studies and collections made by the priest, paleontologist and historian Johann Michael Ackner (1782-1862). The Pontiac of Gușterița Hill is renowned not only for the collected fossils, particularly among mollusks, fish and vertebrates, but also for the economic potential of the Pontic clays in this area, exploited for the manufacturing of bricks and tiles. The collections at the Natural History Museum in Sibiu, as well as recent collections, are proofs of the importance and richness of the area while the specialty studies in which the fossil area it is mentioned, have expanded the field of knowledge among paleontologists and beyond. The exhibition presented fossils collected from the Gușterița Hill from the J.M.Ackner paleontological collection.

*\_From mineral to homeopathic remedy: Hahnemann in Sibiu – 240 years (1777 – 1779)*

(Museum of Pharmacy, 26.05 – 31.12): Coordinated together with Conf. Dr. Pharmacist Ladislau Rosenberg from the Romanian Society for the History of Pharmacy, Sibiu section, the exhibition emphasized that 2017 is significant for celebrating 200 years since the public inauguration of the Brukenthal Museum as well as 240 years since Christian Friedrich Samuel Hahnemann (1755 – 1843), the founder of the Homeopathy, visited Sibiu. Between 1777 and 1779, Hahnemann was Samuel von Brukenthal's protégé and official librarian to the baronial library. The exhibition opened at the Pharmacy Museum pays a tribute to both personalities, presenting natural history specimens from the Baron von Brukenthal’s Mineral Collection and homeopathic remedies of mineral origin from the Museum of Pharmacy Homeopathic Collection.

The exhibition is part of the scientific symposium: “Samuel von Brukenthal – supporter of research in the field of natural sciences”, organized by the Museum of Natural History (22-26.05.2017), an event included in the 2017 Brukenthal Bicentennial Cultural Agenda.

*\_Secret Garden: the Oriental Wallpaper from Brukenthal Palace* (Museum of Natural History, Multimedia Room, 16.08 - 31.12): the exhibition aimed at detailing the graphic elements depicted on the wallpaper from the oriental rooms in Brukenthal Palace, in terms of species of exotic plants, birds and insects. Starting with their artistic and biological description, the exhibition includes the corresponding items from the collections of the Museum of Natural History. Also, the fantastic atmosphere illustrated by the wallpaper has been supported the exhibition’s narrative by identifying the oriental myths that refer to the represented species.

*\_Mineralia – Winter Edition, Agate, Crystals and Jewelry* (Blue House, Multimedia Hall, 23-26.11): among the stones used in jewelry or ornaments, the agate occupies a special place. It is a fascinating stone through its infinity of patterns, textures and colors. Since 2007, the Mineralia Exhibition invites the public to a trip into the world of fine and precious stones, wonders of nature, presented in all forms, from raw stone to jewelry: rough stones - crystals and collection minerals; fossils, meteorites, cut and ground stones, original jewelry, natural stones only, polished stone ornaments.

*\_Live reptiles* (Blue House, basement, 1.01 – 31.12): organized together with Gabonica, the exhibition presented a large variety of reptiles.

**b. Online exhibitions:**

2M2O - 2 Muzeu 2 Obiecte [2M2O – 2Museums 2 Objects] <http://brukenthalnaturale.wordpress.com>

**2. Events**

Give nature of your energy in Brukenthal National Museum (24.03)

In 2017, on the occasion of the Earth Hour event, Brukenthal National Museum celebrated a double bicentennial. 1817 it is both the year of the public opening of the first museum in Romania by testamentary dispositions of Baron Samuel von Brukenthal (1721-1803) and the official year for the invention of the bicycle by Baron Karl Drais (1785-1851). On March 24, at the premises of the Museum of History and the Museum of Natural History took place a series of educational activities on the importance of non-polluting means of transportation and the history of the bicycle.

**3. Scientific symposiums**

Samuel von Brukenthal – promoter of research in the field of natural sciences (25 – 26.05)

The personal library in the field of natural sciences, the collection of minerals, the attention granted to botanic and agriculture are aspects through the means of which Samuel von Brukenthal contributed to the development of natural sciences in Transylvania.

The works hosted by the symposium addressed to these subjects but also to transversal aspects occasioned by an event on natural history scientific research, the program comprising activities hosted by the Museum of Natural History, the Museum of Pharmacy and Brukenthal Palace.

The “Api-History” Symposium (7.10)

In October 2017, Sibiu hosted the 10<sup>th</sup> edition of the National Congress of Apitherapy. On this occasion, within the project “Sibiu Pharmaceutical Traditions”, a satellite symposium entitled “Api – History” was organized at the Museum of Natural History.

**4. 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.

**5. Publications**

Liviu Răzvan Pripon, Gabriela Cuzepan-Bebeșelea, Palatul Brukenthal: grădina secretă din tapetul oriental (Sibiu, Editura Muzeului Național Brukenthal, 2017), 66 pagini, ISBN 978-606-8815-12-1

Exhibition catalogue

**6. Worth mentioning**

Brukenthal Museum – the first in Romanian to receive EMAS registration!

Brukenthal National Museum is the first museum in Romania to receive EMAS registration, Environment Management Audit System. The EMAS certifying procedure also comprised the obtaining of ISO 14001:2004 certificate – Environment Management System.

The system implementation involves direct participation of all museum employees in order to achieve the key performance indicators aimed at: reduced consumption of electricity, natural gas and water, lower waste and higher degree of information and awareness. EMAS certification was part of the “Green Cap” project initiated by the Evangelical Parish CA in Sibiu together with Brukenthal National Museum and APM Sibiu being financed by DBU Germany and the Ministry of Environment, Water and Forestry.

In 2017, the certification was renewed for the duration of the year and 2018.

**7. Distinctions**

The Order of “Cultural Merit” in the rank of Commander, Category E “National Cultural Heritage”, conferred to Brukenthal National Museum by His Excellency, Mister Klaus Werner Iohannis the President of Romania.

Anniversary plaque granted to Brukenthal National Museum by the Sibiu County Council.

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\_Dana Roxana Hrib, *Brukenthal 2017 Agenda*

<http://www.brukenthalmuseum.ro/virtuale/evenimente/>

\_online source on events:

<http://www.brukenthalmuseum.ro/index2.php/en/news/>

\_online source on exhibitions:

<http://www.brukenthalmuseum.ro/index2.php/en/expo>

\_ online exhibitions:

[http://www.brukenthalmuseum.ro/index2.php/virtuale/index\\_en](http://www.brukenthalmuseum.ro/index2.php/virtuale/index_en)

MUZEUL NAȚIONAL BRUKENTHAL

PUBLICAȚIILE PERIODICE APĂRUTE DE-A LUNGUL TIMPULUI  
(INCLUSIV PRECURSORII)

CRONOLOGIE	ISTORIE, ARHEOLOGIE	ARTA PLASTICĂ	ȘTIINȚELE NATURII	RESTAURARE	ETNOGRAFIE
<b>Ante 1950</b>		Mitteilungen aus dem Baron von Brukentalischen Museum 1931-1937 - Neue Folge I-VII 1941 - Neue Folge I-VIII 1944 - Neue Folge IX-X 1946-1947 - Neue Folge XI-XII	Verhandlungen und Mitteilungen der siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt  1849-1945 95 de numere		
<b>1959-1989</b>	Studii și comunicări Muzeul Brukenthal, Sibiu  1956, nr. 1 1965, nr. 12 1967, nr. 13 Volum omagial, Anuarul Muzeului Brukenthal, 1817-1967 1969, nr. 14 1973, nr. 18 1975, nr. 19 1977, nr. 20 1981, nr. 21	Studii și comunicări Muzeul Brukenthal, Sibiu  1956, nr. 4, 5 1956, nr. 7 Istoria culturii 1978, nr. 1 1979, nr. 2	Studii și comunicări Muzeul Brukenthal, Sibiu  1958, nr. 10, 11 1970, nr. 15 1971, nr. 16 1972, nr. 17 1973, nr. 18 1975, nr. 19 1976, nr. 20 1977, nr. 21 1978, nr. 22 1979, nr. 23 1980, nr. 24 + Supliment 1983, nr. 25 + Supliment 1984, nr. 26 1998, nr. 27 2003, nr. 28 2004, nr 29 + Supliment		Studii și comunicări Muzeul Brukenthal, Sibiu  1956, nr. 2, 3, 6 1958, nr. 8, 9  Cibinium, Studii și materiale privind Muzeul tehnicii populare din Dumbrava Sibiului, Sibiu  1966, vol I 1967/68, vol II 1969/73, vol III 1974/78, vol IV 1979/83, vol V
<b>După 1989</b>	2006, I, 1 2007, II, 1 2008, III, 1 2009, IV, 1 2010, V, 1 2011, VI, 1 2012, VII, 1 2013, VIII, 1 2014, IX, 1 2015, X, 1 2016, XI, 1 2017, XII, 1	2006, I, 2 2007, II, 2 2008, III, 2 2009, IV, 2 2010, V, 2 2011, VI, 2 2012, VII, 2 2013, VIII, 2 2014, IX, 2 2015, X, 2 2016, XI, 2 2017, XII, 2	2006, I, 3 2007, II, 3 2008, III, 3 2009, IV, 3 2010, V, 3 2011, VI, 3 2012, VII, 3 2013, VIII, 3 2014, IX, 3 2015, X, 3 2016, XI, 3 2017, XII, 3	2010, V, 4 2011, VI, 4 2012, VII, 4 2013, VIII, 4 2014, IX, 4 2015, X, 4 2016, XI, 4 2017, XII, 4	