

**THE SATURNIIDAE FAMILY (LEPIDOPTERA, SATURNIIDAE)
AS AN IMPORTANT FAUNISTICAL AND BIOGEOGRAPHICAL PATRIMONY
IN THE LEPIDOPTERA COLLECTIONS PRESERVED
BY THE NATURAL HISTORY MUSEUM OF SIBIU, ROMANIA**

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Abstract. The purpose of this paper is to present the collected data on the Lepidoptera species of the Saturniidae family. The studied species are available in the four Lepidoptera collections preserved by the Natural History Museum of Sibiu, Romania: the Lepidoptera collection by Daniel Czekelius, the Palearctic Lepidoptera collection by Daniel Czekelius, the Lepidoptera collection by Eugen Worell and the Lepidoptera collection by Rolf Weyrauch. As a result of my research, it comes out that the collected species proceed from many regions of Romania, mainly from Transylvania, especially from the surroundings of Sibiu, but were also obtained from materials in exchanges with other specialists from abroad. This paper is a contribution to the knowledge concerning the spread of the biggest butterflies in Romanian fauna: *Saturnia pyri* Denis & Schiffermuller, 1775; *S. spini* Denis & Schiffermuller, 1775; *S. pavonia* Linnaeus, 1758; *S. boisduvalia* Eversmann 1846 belonging to the Saturniidae family with samples collected during 1886-1974. After the centralization of the data from the labels and inventory of the four collections, a total number of 56 specimens (22♂♂ and 34♀♀) were identified. Considering the important faunistic and biogeographical information, we should warn about the protection of the endangered and vulnerable species and recommend a rational application of the treatments with chemical substances in agriculture, orchards and in the forestry ecosystems.

Keywords: Saturniidae, collections of Lepidoptera, Museum of Natural History Sibiu, Romania.

Rezumat. Familia Saturniidae (Lepidoptera, Saturniidae) ca un important patrimoniu faunistic și biogeografic în colecțiile de Lepidoptera păstrate de Muzeul de Istorie Naturală din Sibiu, România. Scopul prezentei lucrări este de a publica datele de colectare ale speciilor de fluturi din familia Saturniidae, specii existente în patru colecții de lepidoptere din cadrul Muzeului de Istorie Naturală din Sibiu. În urma cercetării și a indexării colecțiilor: colecția de lepidoptere Daniel Czekelius, colecția de lepidoptere Palearctice a lui Daniel Czekelius, colecția de lepidoptere Eugen Worell și colecția de lepidoptere Rolf Weirauch. Putem concluziona faptul că speciile colectate provin din mai multe regiuni ale României, dar mai ales din Transilvania și îndeosebi din împrejurimile orașului Sibiu, dar și din schimburi de material cu alți colecționari din afara țării. Lucrarea aduce o contribuție importantă la cunoașterea răspândirii celor mai mari fluturi din fauna României. Patru specii: *Saturnia pyri* Denis & Schiffermuller, 1775; *S. spini* Denis & Schiffermuller, 1775; *S. pavonia* Linnaeus, 1758; *S. boisduvalia* Eversmann 1846, aparținând familiei Saturniidae, exemplare colectate în perioada cuprinsă între anii 1886-1974. După centralizarea datelor de pe etichete, au fost identificate în urma inventarierii celor patru colecții, un număr de 56 exemplare (22♂♂, 34♀♀). Prin informațiile prezentate, importante din punct de vedere faunistic și biogeografic, dorim să tragem un semnal de alarmă cu privire la protejarea acestor specii amenințate cu dispariția, și să recomandăm aplicarea rațională a tratamentelor cu substanțe chimice în agricultură, livezile de pomi fructiferi dar și în ecosistemele forestiere.

Cuvinte cheie: Saturniidae, colecții de lepidoptere, Muzeul de Istorie Naturala Sibiu, România.

INTRODUCTION

The butterfly species belonging to the Saturniidae family in the Lepidoptera collections preserved by the Natural History Museum of Sibiu are among the biggest in size collected in the Romanian fauna. The *Saturnia pyri* Denis & Schiffermuller, 1775 (the giant emperor moth); the spreading areal is in the Central and South Europe (Southern Alps, Alsace) Minor Asia (Iran) (DEML & DETTNER, 1993; PARK et. al., 1999), Caucasus, Northern Africa. In accordance with IUCN (***) EUROPEAN UNION, 1992) the species is in danger of disappearance, with Endangered status (RÁKOSY, 2013).

In Romania, at the national and regional level, the status is described in the reference monograph "The Catalogue of the Lepidoptera in Romania", as a vulnerable taxon (VU) at the national and regional level, the species being recorded between the years 1981-2001 in the following regions of our country: Banat, Transylvania, Maramures, Oltenia, Muntenia, Moldova, Dobrudja and between the years 1901-1980 it was also recorded in Crișana (RÁKOSY et. al., 2003).

In accordance with data published in Fauna Europaea, the spreading areal of the species *Saturnia pavonia* Linnaeus 1758 is in Europe, Northern Africa, North and Central Asia (at the North of Himalaia, North and Centrale parts in the Arabic half-isle (<https://www.gbif.org/dataset/90d9e8a6-0ce1-472d-b682-3451095dbc5a>). The *S. pavonia* Linnaeus, 1758 is a vulnerable (VU) species at the national and regional level, the species being recorded between the years 1981-2001 in the following regions of our country: Banat, Transylvania, Maramureș, Muntenia and Dobrudja. During 1901-1980 it was recorded in Crisana, Oltenia and Moldova (RÁKOSY et. al., 2003). The species *Saturnia spini* Denis & Schiffermuller, 1775 has a distribution in the Eastern Europe, from Austria and Poland, Romania, Greece, Turkey, Armenia, Ukraine, and Kazakhstan (http://www.pyrgu.s.de/Saturnia_spini_en.html).

The *S. spini* is considered an extinct species, but it is recorded in all regions of Romania: Banat, Crisana, Transylvania, Maramures, Oltenia, Muntenia, Moldova and less in Dobruđja only between the years 1901-1980 (RÁKOSY et. al., 2003).

The *Saturnia (Caligula) boisduvalia* Eversmann, 1846 is a species spread in North and South Korea, Japan, Northern China, Amur, the Far East of Russia and in deciduous trees forest in the South-East of Siberia (PARK et. al., 1999). The samples in the Palaearctic Lepidoptera Collection of Daniel Czekelius are collected in Udinsk, Russia in the period between the years 1914-1918.

The species of Saturniidae family are monovoltine (they have only one generation per year). The adults fly by twilight and by night, from April till June. The species from four collections were captured between the months April and June. The earliest samples are of the species *S. pavonia* and they proceed from eggs, in January. These samples are in the Rolf Weyrauch's collection. The larvae of *S. pyri* develop between the months May-August, on the fruit trees.

The host plants for larvae of this species are: pear tree (*Pyrus communis*), apple (*Malus* sp.), sweet cherry tree (*Prunus avium*), (*Prunus spinosa*), peach tree (*Prunus persica*), quince tree (*Cydonia* sp.), but also forestry species: ash tree (*Fraxinus excelsior*), elm tree (*Ulmus* sp.), linden tree (*Tilia* sp.), birch tree (*Betula* sp.), poplar (*Populus* sp.), willow tree (*Salix* sp.), alder tree (*Alnus* sp.) chestnut tree (*Aesculus hippocastanum*), maple tree (*Acer tree*), raspberry (*Rubus* sp.), hazelnut tree (*Corylus* sp.), lilac (*Syringa* sp.). The larvae feed on their lives (https://tpittaway.tripod.com/silk/s_pyr.htm).

The caterpillar builds a cocoon in which the pupa develops. The species hibernates in the stage of pupa. The adults of the "giant emperor moth" live about a week and they don't feed in their short life, because do not have a "proboscis" oral apparatus. The species is attracted by sources of light. They often appear in parks, gardens, orchards, but also in clearings and at the skirts of deciduous tree forests (http://salvaeco.org/insecte/page/saturnia_pyri_denis.php).

MATERIALS AND METHODS

In order to draw up a list with collecting data of the species of Saturniidae family: *S. pyri*, *S. spini*, *S. pavonia* and *S. boisduvalia*, I studied seven Lepidoptera collections, but the species belonging to this family are only found in four from these collections: Daniel Czekelius' Lepidoptera collection, Daniel Czekelius' Palaearctic Lepidoptera collection, Eugen Worell's Lepidoptera collection and Rolf Weyrauch's Lepidoptera collection.

These collections are in the patrimony of the Natural History Museum of Sibiu and they were studied in time by many naturalists and some data were published in scientific papers (CZEKELIUS, 1897; 1898; 1917, 1922; MOISE CRISTINA, 2011 a,b,c,d; STANCĂ-MOISE CRISTINA, 2021; POPESCU-GORJ, 1960, 1964; NICULESCU & KÖNIG, 1970; SZÉKELY, 2003, 2004; SCHNEIDER, 1984, 1996; STANCĂ-MOISE CRISTINA 2002, 2012, 2015, 2017, 2018, 2019, 2020; 2021a,b; SZÉKELY 1996, 2003, 2004, 2008; TÖRÖK & CUZEPAN, 2012; WORELL E., 1951).

The purpose of this paper is to study, analyse and process the collecting data of the species from the Saturniidae family, existing in the mentioned collections, and to publish these data that have a great faunistic and biogeographical importance. All these data processed and centralized are useful and of scientific interest for studies about the evolution of species in time, their threatening and desperation because of the intervention of the human factor in the ecosystems, the breaking up of the habitats or climate changes.

In the present paper I gave the information in accordance with data written on the label of every studied sample. It is necessary to mention that some samples collected before the year 1900 have no data on the label (about the day, the month, the year, and the place of collecting).

RESULTS AND DISCUSSIONS

The list below presents the collecting data of the four studied species of Saturniidae family existent in the four above mentioned collections.

I. From Daniel Czekelius' collection (Figs. 1; 2; 3).

1. *Saturnia pyri* Denis & Schiffermüller, 1775.

Examined material: 1♂, May 7, 1887, Sibiu (45°47'45"N 24°9'8"E), leg. Czekelius D. (Cz.), 2♀♀, May 29, 1911, Sibiu (45°47'45"N 24°9'8"E), leg. Czekelius D. (Cz.), June 4, 1886 Sibiu (45°47'45"N 24°9'8"E), leg. Czekelius D. (Cz.)



Figure 1. *Saturnia pyri* in Daniel Czekelius' collection (Photo taken by C. Stancă-Moise).

2. *Saturnia spini* Denis & Schiffermüller, 1775.

Examined material: 1♀ (no data collection), leg. Kiss.



Figure 2. *Saturnia spini* in Daniel Czekelius' collection (Photo taken by C. Stancă-Moise).

3. *Saturnia pavonia* Linnaeus, 1758.

Examined material: 1♂, 1♀, June 2, 1908, Sibiu (45°47'45"N 24°9'8"E), leg. Kzerd.

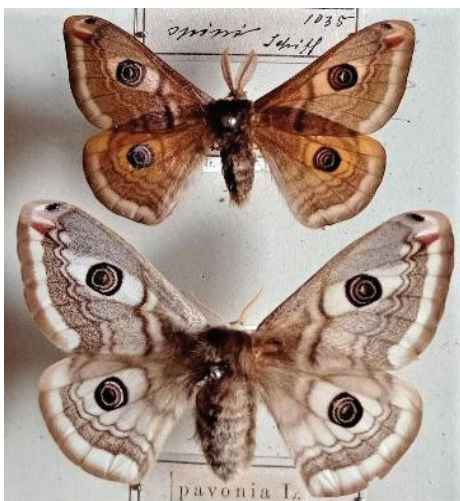


Figure 3. *Saturnia pavonia* in Daniel Czekelius' collection (Photo taken by C. Stancă-Moise).

II. Daniel Czekelius collection Palearctic (Figs. 4; 5; 6; 7).

1. *Saturnia pyri* Denis & Schiffermüller, 1775.

Examined material: 1♂, April 10, 1925, (without the place of collection), leg. Czekelius D. (Cz.); 2♀♀, 1921 (without the day and month of collection), Romania, leg. Galasy



Figure 4. *Saturnia pyri* in Daniel Czekelius' Palearctic (photo taken by C. Stancă-Moise).

2. *Saturnia spini* Denis & Schiffermüller, 1775.

Examined material: 1♂, May 3, 1925, Comuna Vlașca, leg. Dioszeghy; 1♀, April 26, 1925, Borosjeno, leg. Dioszeghy.



Figure 5. *Saturnia spini* in Daniel Czekelius' Palearctic (Photo taken by C. Stancă-Moise).

3. *Saturnia pavonia* Linnaeus, 1758.

Examined material: 1♂, Dumbrava Sibiului, leg. Czekelius D. (Cz.); 1♀, March 21, 1924, Cluj (46°46'0"N 23°35'0"E), leg. Czekelius D. (Cz.).



Figure 6. *Saturnia pavonia* in Daniel Czekelius' Palearctic (Photo taken by C. Stancă-Moise).

4. *Saturnia boisduvalia* Eversmann, 1846.

Examined material: 1♂, July 27, 1914, Ussuriens Ves, leg. Konradt, 2♀♀, July 28, 1914, Ussuriens Ves, leg. Konradt; August (without collection day), 1918, Udinsk, coll Dr. H. Ko.ar.



Figure 7. *Saturnia boisduvalia* in Daniel Czekelius' Palearctic (Photo taken by C. Stancă-Moise).

III. Eugen Worell's collection (Figs. 8; 9).

1. *Saturnia pyri* Denis & Schiffermüller, 1775.

Examined material: 2♂♂, 6♀♀, April 11, 1937, Chişinău (7°01'0"N 28°52'0"E), Republic of Moldova, leg. Worell.



Figure 8. *Saturnia pyri* in Eugen Worell's collection (Photo taken by C. Stancă-Moise).

2. *Saturnia spini* Denis & Schiffermüller, 1775.

Examined material: 4♂♂, 2♀♀, June 2, 1939, Lovirjn Br. Liphay, leg. Worell.

3. *Saturnia pavonia* Linnaeus, 1758.

Examined material: 2♂♂, 3♀♀, April 12, 1945, Sibiu (45°47'45"N 24°9'8"E), leg. Worell.



Figure 9. *Saturnia pavonia* in Eugen Worell's collection (Photo taken by C. Stancă-Moise).

IV. Rolf Weyrauch's collection (Figs. 10; 11).

1. *Saturnia pyri* Denis & Schiffermüller, 1775.

Examined material: 8♂♂, May 8, 1951, Sibiu (45°47'45"N 24°9'8"E), leg. Weyrauch; May 12, 1952, Sibiu (45°47'45"N 24°9'8"E), leg. Weyrauch; May 24, 1957, Gușterița/Hammersdorf (45°48'19"N 24°11'31"E), leg. Weyrauch; May 30, 1950, Apoldul de Sus/Großpold (5°51'2"N 23°49'40"E), leg. Weyrauch; May 6, 1949 (two specimens), Apoldul de Sus/Großpold; May 5, 1956, Gușterița/Hammersdorf, leg. Weyrauch; May 5, 1956, Gușterița/Hammersdorf, leg. Weyrauch; 6♀♀, May 6, 1953, Gușterița/Hammersdorf, leg. Weyrauch; May 17, 1970, Băile Herculane/Herkulesbad (44°52'43"N 22°24'51"E), leg. Weyrauch; June 26, 1952, Gușterița/Hammersdorf, leg. Weyrauch; June 3, 1955, Gușterița/Hammersdorf, leg. Weyrauch; May (without collection day), 1957 (two specimens), Gușterița/Hammersdorf, leg. Weyrauch.



Figure 10. *Saturnia pyri* in Rolf Weyrauch's collection (Photo taken by C. Stancă-Moise)

2. *Saturnia pavonia* Linnaeus, 1758.

Examined material: 2♂♂, April 4, 1974, Sibiu (45°47'45"N 24°9'8"E), leg. Weyrauch; January 25, 1974, Timișoara (45°47'58"N 21°17'38"E), leg. Weyrauch; 5♀♀, May 15, 1951, Sibiu (45°47'45"N 24°9'8"E), leg. Weyrauch; February 27, 1966, Sibiu (45°47'45"N 24°9'8"E), leg. Weyrauch; January 25, 1974, Timișoara (two samples) (45°47'58"N 21°17'38"E), leg. Weyrauch; February 21, 1966, Moravița (45°15'21"N 21°16'12"E) Timișoara, leg. Weyrauch (Fig. 12).



Figure 11. *Saturnia pavonia* in Rolf Weyrauch's collection (Photo taken by C. Stancă-Moise).

Table 1. The collections of Lepidoptera in which the four species belonging to the Saturniidae family were identified.

No.	Collection	Species	Existent specimens	Period of collection	The area of collection
1	Daniel Czekelius	1. <i>Saturnia pyri</i> Denis & Schiffermüller, 1775	1♂, 2♀♀	1886-1911	Sibiu, Transylvania
		2. <i>Saturnia spini</i> Denis & Schiffermüller, 1775	1♀	no data collection	
		3. <i>Saturnia pavonia</i> Linnaeus, 1758	1♂, 1♀	1908	
2	Daniel Czekelius Palearctic	1. <i>Saturnia pyri</i> Denis & Schiffermüller, 1775	1♂, 2♀♀	1921-1925	Romania
		2. <i>Saturnia spini</i> Denis & Schiffermüller, 1775	1♂, 1♀	1925	Cluj, Sibiu, Transylvania
		3. <i>Saturnia pavonia</i> Linnaeus, 1758	1♂, 1♀	1924	
		4. <i>Saturnia boisduvalia</i> Eversmann, 1846	1♂, 2♀♀	1914-1918	
3	Eugen Worell	1. <i>Saturnia pyri</i> Denis & Schiffermüller, 1775	2♂♂, 6♀♀	1937	Chişinău, Republic of Moldova Rusia Sibiu, Transylvania
		2. <i>Saturnia spini</i> Denis & Schiffermüller, 1775	4♂♂, 2♀♀	1939	
		3. <i>Saturnia pavonia</i> Linnaeus, 1758	2♂♂, 3♀♀	1945	
4	Rolf Weyrauch	1. <i>Saturnia pyri</i> Denis & Schiffermüller, 1775	6♂♂, 8♀♀	1949-1970	Sibiu, Transylvania Timișoara, Banat
		2. <i>Saturnia pavonia</i> Linnaeus, 1758	2♂♂, 5♀♀	1951-1974	
Total			22♂♂, 34♀♀	1886-1974	



Figure 12. Map with the spread of the Saturniidae family in Romania, exemplary red dots existing in the studied collections, exemplary blue dots quoted from the collections of other museums (adapted after google map).

CONCLUSIONS

After the analysis of the four studied Lepidoptera collections, the processing of the data and their centralization, it comes out that the Saturniidae family is represented by following species: *S. pyri*, *S. spini*, *S. pavonia* and *S. boisduvalia* (Table 1). 56 samples were identified in the four collections; the most numerous captures are females – 34 specimens, and the males are represented by only 22 specimens. The period of collecting is between the year 1886, the oldest sample proceeding from Daniel Czekelius' collection in Sibiu and the latest is in the Rolf Weyrauch's collection in 1974, also from Sibiu.

Most samples existing in collections proceed from the Transylvania, the Cluj and Sibiu counties and also from other regions of Romania, the Timisoara county, Banat, Teleorman county, Muntenia. There are also samples collected from Chisinau in the Republic of Moldova or obtained in exchange with other collectors.

Daniel Czekelius collection includes three species: *S. pyri*, *S. spini* and *S. pavonia* with a total of 6 specimens collected between the years 1886-1911, from surroundings of Sibiu, but they are also samples without data on the labels about the year, month, day, place and collector. I could mention that this collection includes the oldest sample that is dated 134 years ago.

Daniel Czekelius' Palaearctic Lepidoptera collection includes four species of the Saturniidae family: *S. pyri*, *S. spini*, *S. pavonia* and *S. boisduvalia*, with a total number of 10 specimens collected between the years 1914-1925 in Romania. The most numerous specimens are collected in Transylvania, in the surroundings of Sibiu.

Three species were identified in Eugen Worell's collection: *S. pyri*, *S. spini* and *S. pavonia*, with a total of 19 specimens collected between the years 1937-1945 in the surroundings of Sibiu, Transylvania but also in Chisinau, the Republic of Moldova.

The fourth analysed collection is Rolf Weyrauch's, where two species were identified: *S. pyri* and *S. pavonia*, with a total of 21 specimens, collected in the period between the years 1949-1974 in Timisoara, the Banat Region, but the most numerous proceed from Transylvania and Sibiu surroundings.

After the centralization of the data, it comes out that the period of collecting of the specimens in the four studied collection is of 88 years during 1886-1974. The total number of specimens in the four collections is 56 specimens. The oldest collecting data are in the year 1886 in Daniel Czekelius' collection and the latest collecting data are in the year 1974, that were identified in Rolf Weyrauch's collection.

In order to do a map with the collecting zones (Fig. 12) other collecting data had to be added about the species preserved in the Lepidoptera collections in other Natural History Museums in Romania that are presented further on. (BURNAZ, 1993; CARADJA, 1931; CAPUȘE & KOVÁCS, 1987; MARCU & RÁKOSY, 2002).

The Catalogue of the "N. Delvig" Collection of Lepidoptera from the Brașov county Museum mentions 9 specimens (5♂♂ and 4♀♀) collected in the surroundings of Brasov but also obtained from eggs: *S. pyri*: 3♂♂, June 12, 1975, Hagieni

Forest, Braşov, April 14, 1959 (1♂, 1♀; ex ovo). *S. pavonia*: 2♂♂, May 5, 1960, Sighisoara leg. Weber; 3♀♀, May 6, 1960 (2 specimens, leg. Weber) one specimen from "Grigore Antipa" Museum (CIOCHIA & BARBU, 1980).

The "M. Peiu" collection of Lepidoptera preserved by the Museum Complex in Craiova includes 2 specimens of the species *S. pyri*, collected in May 20, 1964 and one specimen of the species *S. pavonia* collected in April 16, 1954 (CHIMIŞLIU, 1989).

The "Ioan Lazarescu" Collection of Lepidoptera, curated by the "Grigore Antipa" National Museum of Natural History from Bucharest, preserves 33 specimens, six species and 3 genera, collected between the years 1964-1978 in the Banat zone, Timisoara, but are also samples obtained "ex ovo" or "ex larvae" (STĂNESCU, 2005).

The "Ioan Stanoiu" Catalogue of Macrolepidoptera preserved in the patrimony of the Natural Sciences section of the Oltenia Museum in Craiova includes two species of the Saturniidae family: *S. pyri* with 2 specimens collected in Craiova, Dolj county, Oltenia region, on June 28, 1968, and one specimen of *S. pavonia* collected also in Craiova on June 28, 1964 (CHIMIŞLIU, 2005).

The "Ion Firu" entomological collection in the patrimony of the Oltenia Museum of Craiova includes the species *S. pyri* with 6 specimens collected in Banat region at Baile Herculane on June 20, 1965; 2 specimens collected in Brabova on May 10, 1976, and four specimens in Craiova collected on May 8, 1963; May 20, 1965; May 10, 1967 (CHIMIŞLIU, 2006).

In the year 2021, Cosmin Mancî found out one specimen of *S. pyri* in the North Dobruja Plateau (<https://apnd.ro/saturnia-pyri-cel-mai-mare-fluture-din-romania>).

After the centralization of the data and the analysis of the nowadays situation of the species in the Saturniidae family, we could learn the conclusion that these species are in danger of disappearance. The main reasons for the decline of these species are due to the degradation of the habitats due to the intensification of agriculture (fertilizers and pesticides), the disappearance of the host plants that constitute the trophic base, the destruction of the habitats from sheep by the excessive pasturage, mechanical haymaking and the destruction of vegetation by trampling of the herbs, the invasion of the abandoned pastured grasslands through shrubs, afforestation, constructions of roads and residential zones (WEIDEMANN & KÖHLER, 1996).

The increase with more than 25% of the quantity of CO₂ results in the growth of the plants in the spontaneous flora, the impact of the climate changes with extreme temperatures that affect the evolution of the species of plants, having a direct effect on the evolution of the species of butterflies (BRERETON et al., 2011). As a final recommendation, I consider that the collection of the butterflies from this family shall be done only in the scientific circumstantial interest.

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