

THE COLIAS GENUS IN THE COLLECTIONS OF THE NATURAL HISTORY MUSEUM OF SIBIU, ROMANIA

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Abstract: The main purpose of the writing was to inventory the species of diurnal butterflies of the *Colias* Genus in the six lepidopterological collections within the Museum of Natural History in Sibiu. Following the research and indexing of the collections of *Daniel Czekelius*, *Eugen Worell*, *Viktor Weindel*, *Heinrich Hann von Hannenheim*, *Rolf Weirauch*, and *Eckbert Schneider*, we found that the species collected come from several localities of Romania, especially from Transylvania, Sibiu County but there are also specimens collected from other European countries. This paper makes an important contribution to the knowledge of butterflies in Romania, collected in the period between 1900-1982. Through the data obtained from the inventory of the six collections, we managed to identify a number of seven species belonging to the *Colias* Genus, totaling a number of 545 specimens. Through the information presented related to the collection places we want to actively contribute to the protection of these species with the status of Endangered (EN), Vulnerable (VU), Near threatened (NT), or Last concern (LC) and to send a message in order to protect them, especially by improving the living conditions in some habitats.

Keywords: *Colias erate erate* (Esper, 1805), *Colias croceus* (Fourcroy, 1785), *Colias myrmidone myrmidone* (Esper, 1780), *Colias chrysotheme chrysotheme* (Esper, 1781), *Colias hyale hyale* (Linnaeus, 1758), *Colias alfacariensis* Ribbe, 1905.

INTRODUCTION

This paper brings an important contribution to the knowledge of species distribution: *Colias erate erate* (Esper, 1805); *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias myrmidone myrmidone* (Esper, 1780); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758); *Colias alfacariensis* Ribbe, 1905 = *australis* Verity from *Colias* Genus, existing data in the six Collections: Daniel Czekelius, Eugen Worell, Viktor Weindel, Heinrich Hann von Hannenheim, Rolf Weirauch, Eckbert Schneider, from Natural History Museum of Sibiu, Romania. The aim of this paper is to study, analyze and process existing data from collections and to publish them because many of them are unpublished so far. These processed and centralized data are useful and of interest for the studied genre.

In Romania, the *Colias* Genus has seven species: *Colias palaeno* (Linnaeus, 1761) sin. *Colias palaeno europome* (Esper, 1778), sin. *Colias palaeno europomene* Ochsenheimer, 1816; it has a regional spread, being reported only in Moldova in the period between 1901-1980, it is considered as an extinct species *Colias erate erate* (Esper, 1805), reported between the years 1981-2001 in Transylvania, Maramureș, Muntenia, Moldova, and Dobrogea, and it is considered as a vulnerable species, *Colias croceus* (Fourcroy, 1785) sin. *Colias edusa* Fabricius, 1787, with spread in all the eight historical regions of Romania (Banat, Crișana, Maramureș, Oltenia, Muntenia, Moldova, Dobrogea) in the period between 1981-2001 without any degree of endangerment. *Colias myrmidone myrmidone* (Esper, 1780), reported

between 1901-1980 in (Banat, Crișana, Maramureș, and Oltenia) and between 1981-2001 (Transylvania, Maramureș, Oltenia, and Muntenia) with the status of endangered as a vulnerable species. *Colias chrysotheme chrysotheme* (Esper, 1781), a species with local distribution, being reported between 1901-1980 in Banat and Muntenia, and between 1981-2001 in Transylvania (Székely L., 1996, Rákósy L., Lászlófy, 1997, Rákósy L., 2013) Moldova (Székely L., 1992) and Dobrogea (Rákósy L., Székely L., 1996), being a vulnerable species. *Colias hyale* (Linnaeus, 1758) is a species noted in all eight historical regions of Romania (Banat, Crișana, Maramureș, Oltenia, Muntenia, Moldova, Dobrogea) in the period between 1981-2001, having no endangered status.

Colias alfacariensis Ribbe, 1905 sin. *Colias australis* Verity, 1911, is present in all the historical regions of Romania except Oltenia, and the data shows that the collection period is between 1981-2001, all this information was taken from the reference work *Catalog of Lepidoptera in Romania* (Rákósy L. and collab., 2003a) and *Day butterflies from Romania, Knowledge, protection, conservation* (Rákósy L., 2013).

According to the data identified after the analysis of the six lepidopterological collections, we reported as collection periods of the species listed above, the following time intervals: *Colias croceus*, the year 1904 *D. Czekelius's* collection and the year 1982, *E. Schneider's* collection. The *Colias erate* species was only reported in R. Weyrauch's collection, the oldest copy dating from 1959, while in the reference monograph (Rákósy L. and collab., 2003a) the

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reporting period of the species has been between 1981-2001. *Colias myrmidone myrmidone* the data confirm the period indicated in the reference monograph, the oldest specimen was collected from the surroundings of Sibiu in 1907 and comes from V. Weindel's Collection, and the most recent one is from 1978 and can be found in E. Schneider's collection and it was collected from Dobrogea, The Hagieni Forest. The species *Colias chrysotheme chrysotheme* was reported in only two collections, in that of E. Worell, the specimen was collected in 1922, from Germany and the most recent specimen from Slimnic, near Sibiu, in 1976, which confirms the data offered by the literature (Székely L., 2008).

Colias hyale hyale is a species present in all six collections, the oldest specimen was collected in 1904, and it can be found in Weindel's collection, and the most recent one that was collected, in 1979 and it is present in Schneider's collection, both specimens come from the surroundings of Sibiu. The species *Colias alfariensis* is present only in Weyrauch's collection, the oldest specimen was collected from Slimnic, near Sibiu, in 1961.

MATERIALS AND METHODS

The material that represents the base of the paper consists of the data from the six collections of lepidoptera: Daniel Czekelius, Eugen Worell, Viktor Weindel, Heinrich Hann von Hannenheim, Rolf Weyrauch, and Eckbert Schneider. These collections have been studied over time by many specialists and some of the data have been published in specialized articles (Antonie I., 2017; Czekelius D., 1897, 1898; Moise C., 2011 a,b,c; Niculescu E.V., 1961; Popescu-Gorj A., 1960, 1964; Popescu-Gorj A., Drăhă I., 1964; Székely L., 2003, 2004; Schneider E., 1984, 1996; Stancă-Moise C., 2002, 2017, 2018, 2019, 2020; Székely L., 2006; Török S.C., Cuzepan G., 2014; Worell E., 1951). After studying the six collections of Lepidoptera, we found that some of the specimens do not have the day, month, and year of collection on the label. In this paper, we have rendered the notations according to the labels of each specimen. The paper presents the seven species of the *Colias* Genus existing in the six collections mentioned above.

RESULTS

Below we present the collections from which the data presented in the paper come.

Dr. D. Czekelius's collection

1. *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787)

1♀, July 12, 1904, Borgo Bistritza, leg. D.Czekelius; 1♀, July 21, 1907, Hermanstadt, leg.; 1♀, October 4, 1908, Hermanstadt, leg. Groh; 1♂, August 5, 1909, Nepandorf, leg. D.Czekelius; 1♂, June 22, 1919, Klausburg Hamgarten, leg. A.Muller; 1♀, July 29, 1919, (indecipherable label), leg. A.Muller; 1♀, August 22, 1919, Kolozsvar Klausenburg, leg. A.Muller; 1♂, 1♀, (no data), Hermanstadt, leg. D.Czekelius; 1♂, August 7 (without year), Hermnastadt, leg. D.Czekelius; 1♀, August 10 (without year), Negoe Schuthitter, leg. D.Czekelius; 1♀, (no data), Hodod-Ighyghys, leg. Dr.Kiss; 2♀♀, (no data), Kaisd, leg. Silbernel;

2. *Colias croceus ab. helice* Hübner, 1779

1♀, August 27, 1900, Hamersdorf, leg. Weindel; 1♀, September 20, 1910, Râu Sadului, leg. D.Czekelius; 1♀, September 18, 1919, Kolozsvar Bekas, leg. A.Muller; 1♀, August, Fogorascher Gebthal (?), leg. D.Czekelius;

3. *Colias myrmidone myrmidone* (Esper, 1780)

4♂♂, (without day and moon), 1908, Kronstadt, leg. Deubel; 1♀, June 18, 1908, Kronstadt, leg. D.Czekelius; 1♀, (without day and moon), 1908, leg. Deubel; 1♂, (no data), Michaelsberg, leg. Prall; 1♀, May 26 (without year), Talmatsch Stein, leg. D.Czekelius; 1♀, June 25 (without year), Zvodl, leg. D.Czekelius;

4. *Colias chrysotheme chrysotheme* (Esper, 1781)

1♂, September, 16, 1916, Mezöség Hut-weide bei Gyekl, leg. Groh; 1♀, August 26, 1916, Mezöség Hut-weide bei Gyekl, leg. Groh; 1♂, 1♀, September 26, 1947, Sakelsberg, Stolzenburg, leg. Dr.Worell.

5. *Colias hyale hyale* (Linnaeus, 1758)

1♂, August 1, 1933, Hermanstadt Alternberg, leg. D.Czekelius; 1♂, June 3, 1934, Hermanstadt Alternberg, leg. D.Czekelius; 1♂, August 24 (without year), Hermanstadt, leg. D.Czekelius; 1♂, (no data), Kuisd (?) sau Vuisd (?), leg. Silbernel; 1♂, June 17 (without year), Salzburg, leg. D.Czekelius; 1♂, June 29, Hermanstadt Alternberg, leg. D.Czekelius; 1♀, September 26 (without year), Hermanstadt Alternberg, leg. D.Czekelius;

6. *Colias flava* Riley 1926

2♂♂, July 20, 1920, Fägensdorf, leg. D.Czekelius, 1♀, May 17, 1921, Hermanstadt Alternberg, leg. D.Czekelius.



Fig. 1 Dr. D. Czekelius' collection

Dr. Eugen Worell's collection

1. *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787)

3♂♂, August 9, 1912, Pola-Pirinei, leg. Worell; 1♀, August 8, 1918, Pola Istrien, leg. Worell; 1♀, August 10, 1935, Păltiniș, leg. Worell; 2♀♀, August 28, 1937, Chișinău, leg. Worell; 6♂♂, 3♀♀, September 5, 1937, Chișinău, leg. Worell; 3♂♂, 3♀♀, September 18, 1937, Chișinău, leg. Worell; 4♂♂, 1♀, September 28, 1937, Chișinău, leg. Worell; 1♀, October 6, 1937, Chișinău, leg. Worell; 3♀♀, October 8, 1937, Chișinău, leg. Worell; 1♀, August 20, 1938, Sibiu, leg. Worell; 2♀♀, August 24, 1938, Chișinău, leg. Worell; 1♀, September 28, 1940, Păltiniș, leg. Worell; 4♀♀, (no day) October, 1940, Gușterița, 2♂♂, August 11, 1947, Gușterița, leg. Worell; 1♂, 3♀♀, October 4, 1947, Sibiu, leg. Worell; 1♂, 2♀♀, October 31, 1948, Cîsnădioara, leg. Worell; 1♂, October 1, 1951, Sibiu, leg. Worell; 1♂, 8♀♀, September 18, 1953, Pădurea Dumbrava Sibiului, leg. Worell; 1♀, September 18, 1954 Turnișor Sibiu, leg. Worell; three specimens no data;

2. *Colias myrmidone myrmidone* (Esper, 1780)

1♂, (no day) August 1922, München, leg. Worell; 1♂, June 1, 1938, Cîsnădioara leg. Worell; five specimens not data. 1♀, August 20, 1939, Pădurea Dumbrava Sibiului, leg. Worell; 2♂♂, August 17, 1940, Gușterița, leg. Worell; 1♂, (no day) June, 1943,

Sibiu, leg. Worell; 1♀, (no day) June, 1943, Pădurea Dumbrava Sibiului, leg. Worell; 1♀, September 18, 1953, Pădurea Dumbrava Sibiului, leg. Worell; 1♀, (no data), Gușterița, leg. Worell; two specimens no data.

3. *Colias chrysotheme chrysotheme* (Esper, 1781)

15♂♂, August 22, 1937, Chișinău, leg. Worell; 12♂♂, 2♀♀, August 25, 1937, Chișinău, leg. Worell; 14♂♂, September 4, 1937, Chișinău, leg. Worell; 13♀♀, September 18, 1937, Chișinău, leg. Worell; 3♀♀, 2♀♀, September 20, 1947, Dealul Gușteriței, leg. Worell; 3♀♀, September 26, 1947, Dealul Gușteriței, leg. Worell; 1♀, September 15, 1948, Dealul Gușteriței, leg. Worell; 3♂♂, no data

4. *Colias hyale hyale* (Linnaeus, 1758)

1♂, June 8, 1937, Cîsnădie, leg. Worell; 4♂♂, June 28, 1937, Chișinău, leg. Worell; 3♂♂, 6♀♀, August 24, 1937, Chișinău, leg. Worell; 6♂♂, 1♀, September 5, 1937, Chișinău, leg. Worell; 1♂, September 18, 1937, Chișinău, leg. Worell; 3♂♂, September 28, 1937, Chișinău, leg. Worell; 3♂♂, October 5, 1937, Chișinău, leg. Worell; 5♂♂, 5♀♀, October 8, 1937, Chișinău, leg. Worell; 1♂, September 20, 1940, Ocna Sibiului, leg. Worell; 1♂, July 4, 1946, Sibiu, leg. Worell; 1♂, October 4, 1947, Sibiu, leg. Worell; 1♂, October 3, 1953, Pădurea Dumbrava Sibiului, leg. Worell; 1♂, September 5, 1957, Sighișoara, leg. Worell; 1♂, no data, Păltiniș, leg. Worell.



Fig. 2 Dr. Eugen Worell's collection

Dr. V. Weindel's collection

1. Colias croceus (Fourcroy, 1785)

1♂, August 10, 1903, Gușterița (Sibiu); leg. Weindel; 2♂♂, June 4, 1904, 1♂, September 28, 1919, 1♂, September 26, 1920; 1♂, September 31, 1957; Dealul Gușteriței (Sibiu), leg. Weindel; 1♂, October 5, 1907, Cluj; leg. Weindel; 1♂, October 5, 1919, 5♂♂, September 28, 1919, Cibin (Sibiu); leg. Weindel; 1♂, October 4, 1925, 1♂, October 3, 1926, 1♂, July 1, 1957, Măgura Cîsnădăei (Sibiu); leg. Weindel; 1♂, August 1, 1925, Păltiniș (Sibiu); leg. Weindel; 3♂♂, October 9, 1955, Rășinari (Sibiu); leg. Weindel; 1♂, August 5, 1956, 1♂, August 25, 1956, Râu Vadului; leg. Weindel; 1♂, June 18, 1957, Muntele Suru, leg. Weindel.

2. Colias croceus ab. helice Hübner, 1779

1♂, September 28, 1919, Dealul Gușteriței (Sibiu); leg. Weindel, 1♂, 3♀♀, October 9, 1955, Cioara; October 9, 1955, September 31, 1957, Dealul Gușteriței (Sibiu).

3. Colias myrmidone myrmidone (Esper, 1780)

1♂, August 2, 1907, 2♂♂, August 31, 1907, Cîsnădioara (Sibiu); leg. Weindel; 2♀♀, May 29, 1921, Dumbrava Sibiului (Sibiu), leg. Weindel; 1♀, August 4, 1925, Dealul Gușteriței (Sibiu); leg. Weindel, 1♂, May 15, 1920, Șura Mică (Sibiu).

4. Colias chrysotheme chrysotheme (Esper, 1781)

1♂, September 16, 1957, Dealul Gușteriței (Sibiu), 1♂ (no data).

5. Colias hyale hyale (Linnaeus, 1758)

2♂♂, May 3, 1904, Schottergrube (Sibiu); 1♂, May 12, 1904, Pădurea Dumbrava (Sibiu); leg. Weindel; 1♂, May 14, 1922, one specimen Târnăvioara (Sibiu); leg. Weindel; 1♂, April 30, 1922, Cîsnădie (Sibiu); leg. Weindel; 1♂, May 21, 1922, Râpa Roșie-Sebeș (Alba); leg. Weindel; 1♂, May 18, 1958, Șura Mică (Sibiu); leg. Weindel; 1♂, August 15, 1903, Dumbrava Sibiului (Sibiu); leg. Weindel; 1♂, August 3, 1904, Schottergrube (Sibiu); leg. Weindel; 3♂♂, October 5, 1907, Cluj; leg. Weindel; 2♂♂, October 5, 1919, Schottergrube (Sibiu); leg. Weindel; 1♂, July 28, 1904, 1♂, June 25, 1921, 1♀, June 26, 1921, 5♀♀, August 28, 1921, 6♂♂, September 25, 1921, Gușterița (Sibiu); leg. Weindel; 2♀♀, August 1, 1921, Borsec (Harghita); leg. Weindel; 4♂♂, September 11, 1921, Ocna Sibiului (Sibiu); leg. Weindel; 1♂, September, 1919, 1♂, October, 19, 1920, 2♂♂, September 16, 1954, 1♂, September 31, 1957, Dealul Gușteriței (Sibiu); leg. Weindel; 1♀, September, 15, 1921, Sibiu; 1♂, September 28, 1919, Cibin (Sibiu); leg. Weindel; 1♂, June 24, 1955, Gușterița forest (Sibiu); leg. Weindel; 1♀, October, 11, 1925, Pădurea Branîș (Sibiu); leg. Weindel; 1♂, October, 3, 1926, Măgura Cîsnădăei (Sibiu); leg. Weindel; 1♂, August 7, 1922, Păltiniș (Sibiu), 1♂ (no data).



Fig. 3 Dr. V. Weindel's collection

Heinrich Hann von Hannenheim's collection

1. *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787)

1♂, October 20, 1953, Slimnic, leg. Hannenheim;
1♂, September 2, 1954, Valea Jartelni, leg. Hannenheim;
1♀, September 5, 1954, Cîsnădioara, leg. Hannenheim;
2♂♂, September 12, 1954, Slimnic, leg. Hannenheim;

2♀♀, September 26, 1954, Gușterița, leg. Hannenheim;
1♂, July 24, 1955, Slimnic, leg. Hannenheim;
2♂♂, August 15, 1955, Păltiniș, leg. Hannenheim;
1♂, September 6, 1955, Poplaca, leg. Hannenheim;
1♀, September 12, 1955, Cîsnădioara, leg. Hannenheim;
1♂, September 21, 1955, Slimnic, leg. Hannenheim;
1♂, October 20, 1955, Dealul Gușteriței, leg. Hannenheim;
2♂♂, September 25,

1955, Tălmăciu, leg. Hannenheim; 3♂♂, September 21, 1955, August 12, 1954, September 21, 1955, Slimnic, leg. Hannenheim; 1♀, July 20, 1957, Păltiniș, leg. Hannenheim. 1♂, October 20, 1957, Păltiniș, leg. Hannenheim; 1♂, September 5, 1957, Râul Vadului, leg. Hannenheim; 1♂, October 20, 1957, Gotenberg, leg. Hannenheim; 1♂, October 26, 1961, Podul Olt, leg. Hannenheim.

2. *Colias hyale hyale* (Linnaeus, 1758)

1♂, 1♀, September 12, 1954, Moiken, leg. Hannenheim; 1♂, July 25, 1955, Tălmăciu, leg. Hannenheim; 1♀, September 4, 1955, leg. Hannenheim; 1♀, June 10, 1956, Dealul Gușteriței, leg. Hannenheim; 1♂, May 18, 1958, Dorf (sat), leg. Hannenheim.



Fig.4 Heinrich Hann von Hanneheim's collection

Rolf Weyrauch's collection

1. Colias erate erate (Esper, 1805)

1♂, October 11, 1959, Valea Lupului, leg. Weyrauch; 1♂, July 18, 1973, Pădurea Hagieni, leg. Weyrauch; 2♂♂, July 25, 1973, Valea lui Traian (Dobrogea), leg. Weyrauch; 5♂♂, June 3, 1974, Delta Crișanei (Dobrogea), leg. Weyrauch; 5♂♂, May 15-18, 1975, Canaraua Fetii (Dobrogea), leg. Weyrauch; 1♂, May 20, 1975, Mangalia, leg. H. Peli; 1♂, May 15-18, 1976, Canaraua Fetii (Dobrogea), leg. Weyrauch; 2♂♂, 2♀♀, July 5, 1976, Delta Letea, leg. Weyrauch; 6♂♂, 3♀♀, July 28, 1976, Mangalia (Dobrogea), leg. Weyrauch; 5♂♂, 2♀♀, June 28, 1978, Pădurea Hagieni, leg. Weyrauch;

2. Colias croceus (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787)

1♂, October 15, 1951, Micheloly, leg. Weyrauch; 1♂, September 18, 1954, Băile Herculane, leg. Weyrauch; 2♂♂, October 15, 1954, Cislădioara, leg. Weyrauch; 1♂, 4♀♀, October 16, 1955, Cislădioara, leg. Weyrauch; 1♂, July (no day), 1955, Roșia, Sibiu, leg. Weyrauch; 1♂, August (no day), 1955, Sebeș, leg. Weyrauch; 1♂, September 25, 1955, Băile Herculane, leg. Weyrauch; 1♂, 1♀, October 23, 1955, Cislădioara, leg. Weyrauch; 1♂, June 30, 1956, Domogled, leg. Weyrauch; 1♂, June 12, 1963, Kärnten Ulrichzb (800m), leg. J. Thurner; 1♂, August 15, 1963, Carinthia Ferlach is Ros, leg. Weyrauch; 2♂♂, 1♀, August 9, 1963, Slimnic, leg. Weyrauch; 1♂, July 6, 1967, Băile Herculane, leg. Weyrauch; 1♂, August 11, 1967, Slimnic, leg. Weyrauch; 1♂, June 25, 1969, Mangalia, leg. Weyrauch; 1♂, June 20, 1971, Pădurea Hagieni, leg. Weyrauch; 1♂, October 15, 1971, Cislădioara, leg. Weyrauch; 1♂, 1♀, July 6-9, 1972, Delta Crișanei (Delta Dunării), leg. Weyrauch; 1♀, August 27, 1972, Ghiroda, leg. Weyrauch; 1♂, July 22-25, 1973, Agigea, leg. Weyrauch; 1♂, July 27-31,

1973, Sulina, leg. Weyrauch; 1♂, July 16, 1973, Pădurea Hagieni (Dobrogea), leg. Weyrauch; 1♂, May 15-18, 1975, Canaraua Fetii (Dobrogea), leg. Weyrauch; 2♂♂, July 11, 1977, Pădurea Hagieni, leg. Weyrauch; 1♂, July 18, 1977, Pădurea Hagieni, leg. Weyrauch; 1♂, July 18, 1977, Canaraua Fetii (Dobrogea), leg. Weyrauch; 1♀, April 14-17, 1977, Găiești, Pădurea Gârbova, leg. Weyrauch; 1♀, July 6-7, 1977, Găiești, Pădurea Gârbova, leg. Weyrauch; 1♂, September 30, 1953, Dealul Cioplea, leg. Weyrauch;

3. Colias myrmidone myrmidone (Esper, 1780)

1♂, June (no day), 1950, Gop (?); 1♂, September 20, 1953, Cislădioara, leg. Weyrauch; 6♂♂, October 4, 1953, Cislădioara, leg. Weyrauch; 1♂, 1♀, June 28, 1978, Pădurea Hagieni, leg. Weyrauch; 2♂♂, September 25, (no year), Gop (?)

4. Colias chrysotheme chrysotheme (Esper, 1781)

1♂, May 6, 1961, Slimnic, leg. Weyrauch; 1♂, June 2, 1956, Slimnic, leg. Weyrauch; 2♂♂, June 25, 1963, Slimnic, leg. Weyrauch; 1♂, July 10, 1963, Slimnic, leg. Weyrauch; 1♂, June 11, 1967, Slimnic, leg. Weyrauch;

2♂♂, August 11, 1967, Slimnic, leg. Weyrauch; 4♂♂, June 6, 1968, Slimnic, leg. Weyrauch; 2♂♂, June 20, 1973, Slimnic, leg. Weyrauch; 1♂, July 17, 1975, Slimnic, leg. Weyrauch; 1♂, July 25, 1975, Slimnic, leg. Weyrauch; 3♂♂, May 12, 1976, Slimnic, leg. Weyrauch; one specimen, no data

5. Colias hyale hyale (Linnaeus, 1758)

1♂, (no day) May, 1950, Gop (?); 1♂, May 9, 1951, Slimnic, leg. Weyrauch; 1♀, June 2, 1956, Slimnic, leg. Weyrauch; 1♂, October 17, 1959, Breaza, leg. Weyrauch; 1♀, June 17, 1963, Slimnic, leg. Weyrauch; 1♂, July 15, 1967, Domogled, leg. Weyrauch; 1♂, May 1, 1968, Porumbacu, leg. Weyrauch; 2♂♂, September 8, 1968, Băile Herculane, leg. Weyrauch; 1♂, August 12, 1969, Slimnic, leg.

Weyrauch; 2♀, June 1, 1969, Bungard, Sibiu, leg. Weyrauch; 1♂, June 6, 1970, Domogled, leg. Weyrauch; 1♂, July 12, 1971, Băile Herculane, leg. Weyrauch; 1♂, July 17, 1971, Băile Herculane, leg. Weyrauch; 1♂, July 6, 1971, Băile Herculane, leg. Weyrauch; 1♂, July 8, 1971, Metkulesbad, leg. Weyrauch; 1♂, 1♀, July 18, 1971, Băile Herculane, leg. Weyrauch; 1♀, April 23, 1972, Cisnădie, leg. Weyrauch; 1♂, 1♀, June 6-9, 1972, Delta Crișanei (Dobrogea), leg. Weyrauch; 1♂, July 31, 1972, Lacul Roșu, leg. Weyrauch; 1♂, August 9-11, 1973, Băile

Herculane, leg. Weyrauch; 2♂♂, May 8-13, 1975, Hagieni (Dobrogea), leg. Weyrauch; 1♂, 1♀, July 25, 1975, Slimnic, leg. Weyrauch; 1♂, 1♀, September 6, 1975, Slimnic, leg. Weyrauch; 1♀, July 8, 1976, Pădurea Gârbova, leg. Weyrauch;

6. *Colias alfacariensis* Ribbe, 1905 = *australis* Verity, 1911

1♂, May 6, 1961, Slimnic, leg. Weyrauch; 1♀, May 26, 1963, Slimnic, leg. Weyrauch; 1♂, May 15, 1970, Herhbd, leg. Weyrauch; 1♂, July 17, 1973, Ungaru Zemplengeb, leg. Weyrauch.



Fig. 5 Rolf Weyrauch's collection

Dr. E. Schneider's collection

1. *Colias croceus croceus* (Fourcroy, 1785)

4♂♂, August 2, 1975, Rusciori, leg. Schneider; 2♂♂, September 21, 1975, Tâlmaciu-Dealul cu pini, leg. Schneider; 1♂, August 24, 1972, Dealul Zekel, leg. Schneider; 1♂, October 3, 1969, Veștem, leg. Schneider; 1♂, August 29, 1965, RinBboch, leg. Schneider; 2♂♂, August 15-23, 1970, Costinești (Dobrogea), leg. Schneider; 1♂♂, September 1-10, 1979, C.A.Rosetii (Delta Dunării), leg. Schneider; 1♂, May 30, 1980, C.A.Rosetii (Delta Dunării), leg. Schneider; 1♂, October 11, 1970, Hammerdorf Berg, leg. Schneider; 1♂, August 24, 1975, Valea Cernei (380 m), leg. Schneider; 1♀, September 3, 1975, Dealul Zekel, leg. Schneider; 1♂, August 20, 1969, Costinești (Dobrogea), leg. Schneider; 1♀, June 28, 1979, Șeica Mare, leg. Schneider; 1♀, June 7-9, 1982, Munții Cozia-Stânișoara, leg. Schneider; 1♂, September 16, 1971, Hagieni (Dobrogea), leg. Schneider; 1♀, July 16-26, 1979, Caraorman (Delta Dunării), leg. Schneider; 1♀, July 20, 1973, Șura Mare, leg. Schneider; 1♀, May 18, 1975, Dealul Gușteriței, leg. Schneider; 2♀♀, August 7, 1970, Orlat-Sibiu, leg. Schneider; 1♂, September 11, 1966, Podul Olt-Tâlmaciu, leg. Schneider; 1♂, August 6, 1970, Sibiu, leg. Schneider; 1♂, October 18, 1953, Michelberg, leg. Schneider; 3♂♂(no data).

2. *Colias chrysotheme chrysotheme* (Esper, 1781)

1♂, May 16, 1965, Zekelberg, leg. Schneider; 1♂, May 26, 1976, Axente Sever, leg. Schneider; 3♂♂, May 12, 1976, Dealul Zakel, leg. Schneider; 1♂, July 16, 1976, Cenade, leg. Schneider; 1♀, May 12, 1975, Dealul Zakel, leg. Schneider; 4♂♂, September 3, 1975, leg. Schneider; 4♂♂, August 9, 1977, Boarta, leg. Schneider; June 28, 1979, 7♂♂, Șeica Mare, leg. Schneider; one specimen, May 17, 1975; 2♀♀, October 10, 1971, Zekelberg, leg. Schneider; 1♀, April 29, 1980, Seica Mare, leg. Schneider.

3. *Colias hyale hyale* (Linnaeus, 1758)

1♂, May 4, 1974, Mihaileni, leg. Schneider; 1♂, May 12, 1976, Dealul Zakel, leg. Schneider; 1♂, May 8, 1973, Șura Mare, leg. Schneider; 1♀, May 12, 1975, Șura Mare, leg. Schneider; 1♀, July 12, 1975, Dealul Zakel, leg. Schneider; 4♂♂, September 21, 1975, Tâlmaciu-Dealul cu pini, leg. Schneider; 2♂♂, August 31, 1975, Ruși, Sibiu, leg. Schneider; 1♂, June 29, 1975, Munții Apuseni-Valea Runcului, 1♂, May 14, 1972, Șura Mare, leg. Schneider; 1♂, May, 1963 (no day), Cincu, June 28, 1979, 1♂, Șeica Mare, leg. Schneider; August 12, 1975, Sighișoara, leg. Schneider; 1♂, (without day and moon) 1962, Cincu, leg. Schneider; 1♂, August 31, 1975, Ruși, leg. Schneider; 1♂, September 13, 1970, Veștem, leg. Schneider; 1♂, October 11, 1970, Hammersdorf, leg. Schneider; 1♂, May 16, 1965, Zokelberg, Illinois USA, leg. Schneider.



Fig. 6. Dr. E. Schneider's collection

DISCUSSIONS

After centralizing all the data from the six collections, we were able to identify the existing species in each collection, the number of specimens collected, the collection period, and the collection site according to the historical regions of Romania, according to Table 1.

The endangered status for the studied species described by Székely L., in 2008 in the reference monograph *The Butterflies of Romania* is the following: *Colias erate erate* (Esper, 1805), has the status of Vulnerable (VU) at the regional level and the one of Near threatened (NT) at the national level. *Colias chrysotheme chrysotheme* (Esper, 1781) has the

status of Last Concern (LC) taxon both nationally and regionally. *Colias myrmidone myrmidone* (Esper, 1780) has the status of a Vulnerable (VU) taxon at the national level and Near-threatened (NT) at a regional level. *Colias hyale hyale* (Linnaeus, 1758) has the status of Last Concern (LC) taxon both nationally and regionally. *Colias alfacariensis* Ribbe, 1905 has the status of Near threatened (NT) taxon both nationally and regionally (Rákósy L., 2005, 2011). The *Colias flava* species Riley 1926, the existence in the collection of Daniel Czekelius is not mentioned in the reference work *Catalog of Lepidoptera in Romania* (Rákósy L. and collab., 2003a, Rákósy L., 2003 b).

Table 1.

The collections of Lepidoptera in which the six species belonging to the *Colias* Genus were identified

Crt. No.	Collection	<i>Colias</i> Genus	Existent samples	Period of collection	The area of collection
1	Daniel Czekelius	1. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 2. <i>Colias croceus</i> ab. <i>helice</i> Hübner, 1779 3. <i>Colias myrmidone myrmidone</i> (Esper, 1780) 4. <i>Colias chrysotheme chrysotheme</i> (Esper, 1781) 5. <i>Colias hyale hyale</i> (Linnaeus, 1758) 6. <i>Colias flava</i> Riley 1926	40	1900-1947	Transylvania
2	Eugen Worell	1. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 2. <i>Colias myrmidone myrmidone</i> (Esper, 1780) 3. <i>Colias chrysotheme chrysotheme</i> (Esper, 1781) 4. <i>Colias hyale hyale</i> (Linnaeus, 1758)	189	1912-1957	Transylvania (the surroundings of Sibiu), Republic of Moldova (Chisinau), The Pyrenees Mountains, Germany (Munich)
3	Viktor Weindel	1. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 2. <i>Colias croceus</i> ab. <i>helice</i> Hübner, 1779 3. <i>Colias myrmidone myrmidone</i> (Esper, 1780) 4. <i>Colias chrysotheme chrysotheme</i> (Esper, 1781) 5. <i>Colias hyale hyale</i> (Linnaeus, 1758)	65	1903-1958	Transylvania (the surroundings of Sibiu)

4	Heinrich Hann von Hannenheim	1. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 2. <i>Colias hyale hyale</i> (Linnaeus, 1758)	30	1953-1961	Transylvania (the surroundings of Sibiu)
5	Rolf Weyrauch	1. <i>Colias erate erate</i> (Esper, 1805) 2. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 3. <i>Colias myrmidone myrmidone</i> (Esper, 1780) 4. <i>Colias chrysotheme chrysotheme</i> (Esper, 1781) 5. <i>Colias hyale hyale</i> (Linnaeus, 1758) 6. <i>Colias alfacariensis</i> Ribbe, 1905 = <i>australis</i> Verity, 1911	142	1950-1978	Banat, Dobrogea (The Danube Delta), Transylvania (the surroundings of Sibiu)
6	Eckbert Schneider	1. <i>Colias croceus</i> (Fourcroy, 1785) (= <i>Colias edusa</i> Fabricius, 1787) 2. <i>Colias chrysotheme chrysotheme</i> (Esper, 1781) 3. <i>Colias hyale hyale</i> (Linnaeus, 1758)	79	1953-1982	Dobrogea, Transylvania (Sibiu its surroundings), USA
TOTAL			545	1900-1982	Romania, Moldova, Germany, USA

CONCLUSIONS

After the analysis, processing, and centralization of the existing data within the six lepidopterological collections studied: Daniel Czekelius, Eugen Worell, Viktor Weindel, Heinrich Hann von Hannenheim, Rolf Weyrauch, and Eckbert Schneider but also those from the literature (Czekelius D., 1897, 1898; Moise C., 2011 a,b,c; Niculescu E.V., 1961; Popescu-Gorj A., 1960, 1964; Popescu-Gorj A., Drăhia I., 1964; Stancă-Moise C., 2002, 2012, 2015, 2017, 2018, 2019, 2020; Székely L., 2003, 2004; Török S.C., Cuzepan G., 2014; Worell E., 1951), a number of seven species of the *Colias* Genus have been identified as follows: In the collection of Daniel Czekelius are present the following species belonging to the *Colias* Genus: *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias croceus ab. helice* Hübner, 1779; *Colias myrmidone myrmidone* (Esper, 1780); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758); *Colias flava* Riley 1926, totaling a number of 40 specimens, collected in the period between 1900-1947, most of the species coming from Transylvania, Sibiu and Sibiu county.

In Eugen Worell's collection, a number of four species of *Colias* have been identified: *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias myrmidone myrmidone* (Esper, 1780); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758), totaling a number of 189 specimens collected between 1912-1957 from the outskirts of Sibiu, from the Republic of Moldova, Chişinău, but there are also specimens that come from the Pyrenees Mountains or Munich, Germany.

Following the analysis of Viktor Weindel's collection, 65 specimens from five species were registered: *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias croceus ab. helice* Hübner, 1779; *Colias myrmidone myrmidone* (Esper, 1780); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758), collected between 1903-1958 from Sibiu, the surroundings of Sibiu and other localities from Transylvania.

Within the collection of Heinrich Hann von Hannenheim were reported two species belonging to the *Colias* Genus: *Colias croceus* (Fourcroy, 1785)

(= *Colias edusa* Fabricius, 1787) si *Colias hyale hyale* (Linnaeus, 1758), which totals a number of 30 specimens collected between the years 1953-1961, from the surroundings of Sibiu.

The fifth collection analyzed was Rolf Weyrauch, where we identified a number of six species of the *Colias* Genus: *Colias erate erate* (Esper, 1805); *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias myrmidone myrmidone* (Esper, 1780); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758); *Colias alfacariensis* Ribbe, 1905 = *australis* Verity, 1911, totaling a number of 142 specimens, collected during the years 1950-1978 from Dobrogea, Danube Delta, Banat, Transylvania, Sibiu, and surroundings.

The latest data comes from the collection of Eckbert Schneider which has three species of the *Colias* Genus: *Colias croceus* (Fourcroy, 1785) (= *Colias edusa* Fabricius, 1787); *Colias chrysotheme chrysotheme* (Esper, 1781); *Colias hyale hyale* (Linnaeus, 1758), totaling a number of 79 specimens, collected between 1953-1982 from Dobrogea, Sibiu and the surroundings of Sibiu, but it also has a specimen from the USA.

Following the centralization of all data, we can conclude that the collection period of the existing exemplars in the six collections extends over a period of 82 years in the time interval between the years 1900-1982. Summarizing the number of specimens from the six collections, belonging to seven species of the *Colias* Genus, we identified a number of 545 specimens. The oldest collection data belong to a 1900 specimen from Daniel Czekelius' collection, and the most recent collection data from 1982 have been identified in Eckbert Schneider's collection.

This paper makes an important contribution to the knowledge of the distribution and evolution over time of the *Colias* Genus species in Romania, bringing an informational contribution for future studies. There is currently a lot of unpublished data in museum collections, of interest to specialists that study the evolution in time and space of the different species of insects.

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AUTHORS CONTRIBUTIONS

Conceptualization: C. Stancă-Moise; Methodology: C. Stancă-Moise; Data collection: C. Stancă-Moise; Data validation: C. Stancă-Moise; Data processing: C. Stancă-Moise; —original draft preparation: C. Stancă-Moise; —review and editing: C. Stancă-Moise.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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