

# DATA ABOUT THE MACROLEPIDOPTERA FAUNA OF SIBIU COUNTY (ROMANIA)

**Cristina Stancă-Moise**

\*"Lucian Blaga" University of Sibiu, Faculty of Agricultural Sciences, Food Industry and Environmental Protection, Sibiu, Romania

**ABSTRACT:** This paper is a synthesis of personal research data in the field, published data and also data from the entomological collections preserved at the Natural History Museum in Sibiu, about the Macro Lepidoptera fauna in Sibiu County between 1897-2015. This material (394 species) is analyzed concerning the spread of species in our county, their type of habitat preferred by adults, the structure and dynamics of populations, frequency, altitude scale (between 400-2500 m), trophic base, respective host plants and flight period.

**Keywords:** Macrolepidoptera fauna, Sibiu County, Romania.

## INTRODUCTION:

The first data about Macro Lepidoptera in Sibiu County data also in Transsylvania were published by Dr. D. Czekelius [Czekelius (1897, 1917)] in "*Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt*" (Debates and Communications of the Society of Natural Sciences from Sibiu). This publication appeared regularly in 95 volumes without interruption during the period 1849-1946 and contained not only valuable data about Transylvania but also about other areas of Romania [Rákósy et al. (2003), Székely (2014)].

Besides the publications, I also studied the entomological collections preserved at the Natural History Museum in Sibiu the oldest in our country [Schneider (1996); Pascu & Schneider (1998); Moise (2011d); Antonie (2015); Stancă-Moise (2002, 2015b)].

Documentary and scientific values are quite exceptional because these collections of Lepidoptera illustrate the biogeographic character of Transylvania in general and some of its lands in particular. Rare and endemic species have been reported over the years [Rákósy (2002); Bucșa&Tăușan (2011); Török & Cuzepan (2013)] in different zones of Sibiu County.

The studies in the fields were conducted by myself in the Sibiu County's natural regions that are divided in three main types of relief after their altitude: mountains belonging South Carpathians (25%), plains and hills of the Târnava Plateau (over 50%) and depression (over 20%). All these areas have been extensively researched over the years concerning flora [Schneider-Binder (1971), Drăgulescu (2003)] and fauna since 19 century.

## MATERIALS AND METHODS:

It was very important to consult the published papers and also to study the entomological collections preserved at the Natural History Museum in Sibiu, about Macro Lepidoptera: "Dr. Daniel Czekelius" Lepidoptera Collection from Transylvania [Moise (2011c)], "Dr. Eugen Worell" Entomological Collection [Moise (2011e)], "Dr. Victor Weindel" Transylvanian Lepidoptera Collection [Schneider

(1984); Moise (2011f)], "Henrich Hann von Hanneheim" Entomological Collection, "Prof. Rolf Weyrauch" Entomological Collection, "W. Weber" Lepidoptera Collection [Popescu-Gorj (1970)].

Personal research in the field were conducted in various natural habitats of Sibiu County, both in hilly, mountainous, subalpine and alpine zones, between 2001-2015, in 25 localities and also in 8 Natural Parks and Reservations and protected areas as: Alpine zone: Podragu, Suru, Arpa;u de Jos-Agrig, Cindrel-Jina, Iezere Cindrel-Gura Râului, Bulea Valley-Cârțișoara, Șuvara Sașilor-Tâlmăciu, Zackel Hill-Slimnic, etc.

In order to capture the nocturnal species were used light traps. The diurnal species but also the nocturnal species with diurnal behavior of the families: *Arctiidae*, *Geometridae*, *Noctuidae* were collected using the entomological net. Researches and captures were carried out between the months March to November during the period of 2001-2015 in different types of habitat, from the grasslands around Sibiu, until the hilly and mountainous zones: Csnădie, Gușterița, Csnădioara, Păltiniș, Râu Sadului, Măgura Csnădiei, Ocna Sibiului, Bulea See, Turnu Roșu, Măgura Boiței, Valea Ștezii, Valea Aurie, Șura Mică, Valea Sadului, Dealul Obrejii, Sibiu Vineyard, Sibiul being reported over 83 Lepidoptera species [Stancă-Moise (2014); Stancă-Moise (2015c); Stancă-Moise (2016b)].

In the Forest "Dumbrava Sibiului" were a reported 243 species of Macro Lepidoptera [Ciochia&Stancă-Moise (2002); Stancă-Moise (2003 b,c; 2004; 2005 a,b,c,d,e,f; 2006 a,b; 2007 a,b; 2015 a,b,d; 2016 a,c Moise (2011a,b,g; 2014); Moise&Sand (2012)], some of the data were taken from the collections of other authors in the Mediaș zone [Török (2010)].

They were also investigated the forests from the basins of the main rivers in Sibiu County as: oakery, carpino-beech forests, beech, spruce forests, beech-fir forests, beech-spruce forests and alder trees forests: Cibin, Târnava Mare, Sebeș, Secaș, Sadu, Porumbacul, Lotrioara, Rozdești, Dobra, Olt tributary rivers.

They were studied also the bushes associations and wood sides in Dumbrava and Sibiul (Red Bârca).

Particular attention was paid to knowledge the Macro Lepidoptera in the Natural Protected Areas of

Sibiu County: Făgăraș, Mountains Alpine zone, Podragu and Suru, "Arpașul de Jos-Avrig", Natural Park "Cindrel-Jina", Natural Park "Dumbrava Sibiului", "Iezărele Cindrelului-Gura Râului, Cârțișoara Valley, "Șuvara Sașilor-Tălmăciu", Zackel Hill - Slimnic.

They are mentioned the papers of other authors who studied also the Macro Lepidoptera fauna in Sibiu County as: [Czekelius (1897,1906,1917,1922); Vángel (1905); Rebel (1908); Csiki (1909); Worell (1951); Niculescu (1961); Popescu-Gorj (1964); Schneider (1971,1984,2003); König (1975); Ciochia&Barbu (1980); Burnaz (1993); Rákósy (1995); Stănescu (1995); Székely (2004, 2008); Stancă-Moise (2004,2006,2011a,b); Moise&Sand (2012); Moise (2012); Török (2010), Török&Cuzepan (2013,2014)].

## RESULTS AND DISCUSSIONS:

Butterflies are integrated into different types of ecosystems. Some species, with high ecological valence are spread over the lowlands, hills and at the altitudes of over 2,000 m. They can exist in several types of biocenosis. Other species may exist in many ecosystems but prefer certain habitat characteristic of a particular ecosystem, linked to larval host plants but also to local climatic conditions [Niculescu (1961,1963,1965)]. Even the rocks subalpine-alpine habitats could be favorable places for butterflies in case they can find the plant associations in connection with their larva's food.

Subalpine meadows and alpine-rich flowering plants that correspond to the maximum period of their development of adults are favorite places for species of the genus *Erebia*.

Dense forests, mostly spruce forests are hospitable to butterflies, but meadows, clearings and forest sides, are the preferred habitat for many species of Lepidoptera. Marshes, peat-bogs and vegetation around stagnant waters are the optimal living environments for hydrophilic and mezohydrophilic species. Xeric habitats, especially in rocky limestone areas are favorite habitats for many species xerothermophilous and thermophilic species [Niculescu&König (1970)]. The great diversity of dicotyledonous on grass hill and mountain meadows that characterize the Sibiu County offer favorable conditions, especially food for larva's and adults of Macro Lepidoptera species. An environment with rich species diversity is the main source of food for most diurnal butterfly.

In general, the local occurrence of Macro Lepidoptera species is conditioned not only by larval host plants, but also by the local climate (microclimate), the vegetation structure, especially vegetal groups of plants rich in nectar, as nutrition for adults.

The study of Macro Lepidoptera in Sibiu County was achieved in the natural ecosystems, units distributed on different altitudes in mountains zones and river valleys as following:

### Mesophilic hilly meadows (450-600 m)

They are edified by associations belonging phytocenosis *Festuco-Rubrae-Agrostietum capillaris*,

*Anthoxantho-Agrostietum-capillaris*, *Poa-Trisetum flavescens*.

The grasslands are the most significantly altered by human activities. They repeated tampered by harvesting the above ground vegetative parts (hay) or introducing grazing animals by Csnădie, Csnădioara, Sadu, Rășinari, Poiana, Tilișca, Jina, Rod. The richness of flora grasslands ensures the saturated niches. Grassy carpet of meadows has in its structure perennial hemicriptophytes plants that assure a complex structure. The fauna of this ecosystem is complex invertebrates prevail. The highest number we have insects and their larvae [Rákósy (1996)].

About altitude, mesophilic meadows are distributed between 450-600m. The mesophilic meadows were investigated in the southern of the County, at the contact of the depression and Cibin Mountains and hilly part of the region lying between Bungard, Mohu and Veștem, and Cristian hills. In this type of grassland, secondary installed after deforestation of forest lands (beech, hornbeam-beech forests) were identified 132 Macro Lepidoptera species characteristic of this type of habitat. The species common in the hilly grasslands are mesophilic: *Campptogramma bilineatum*, *Pseudopantehera macularia*, *Siona lineata*, *Ematurga atomnaria*, *Polypogon tentacularia*, *Phytomera viridata*, *Euclidia glyphica*, *Acronicta rumicis*, *Diacrisia sannio*, *Hoplodrina blanda*, *Autographa gamma*, *Erynni tages*, *Pyrgus malvae*, *Melanargia galathea*, *Coenonympha arcania*, *Coenonympha pamphilus*, *Polyommatus icarus*, *Melithaea athalia*, *Leptidea sinapis*, *Pontia daplidice*, *Colias croceus*, *Colias hyale*.

### Mesophilic mountain meadows (600-1800 m)

In the mountain level (600-1800 m) zonal woody vegetation is represented by beech forests, mixed forests and coniferous forests that belong to associations *Symphyto cordato-Fagetum*, *Hieracio transsilvanici-Luzulo-Fagetum*, *Festuco drymeiae-Fagetum*, *Pulmonario rubro-Abieti-Fagetum*, *Chysanthemo rotundifolio-Piceo-Fagetum*, *Hieracio transsilvanicae-Piccetum*, *Oxalo-Piceetum*, mai rar *Sphagno-Piceetum*.

Bushes integrate in associations: *Coryletum avellanae*, *Spireetum ulmifoliae*, *Senescio fuchsii-Sambucetum racemosi*, *Campanulo abietinae-Vaccinietum myrtilli* and *Rubo-Epilobietum*, and the meadows have the associations: *Anthoxantho-Agrostietum tenue* and *Campanulo abietinae-Festucerum rubrae*, *Nardo-Festuceu rubrae*, *Calamagrosietum arudinaceae*.

Hayfields and pastures with their wild flowers offer a real summer colorful performance. Grasslands are rich in various species of plants, many of them missing in Central Europe [Karsholt&Razowski (1996)] carpeted with colorful flowers, just haystacks mowed, humming bees and butterflies: *Scopula immorata*, *idaea biselata*, *Idaea emarginata*, *Scotopteryx chepodata*, *Xanthoroe fluctuate*, *Perizoma minoratum*, *Minoa murinata*, *Hemaris fuciformis*, *Parasemia plantaginis carpathica*, *Dyachrysia chryson*, *Paradrina clavipalpis*, *Photodes captiuncula*, *hada nana*,

*Cerapteryx grammis*, *Neuronia decimalis*, *Lasionycta proxima*, *Aletia conigera*, *Actebia praecox*, *Noctua pronuba*. Floristic variation of mountain meadows causes a great diversity of species of diurnal Lepidoptera. The most common species of diurnal macrolepidoptere, found mainly on flowers *Leucanthemum vulgare*, *Thymus comosus*, *Aster amellus*, *Dianthus carthusianorum*, *Hieracium pilosella*, *Galium verum* are the following species: *Erynnis tages*, *Colias croceus*, *Colias hyale*, *Pieris napi*, *Pieris rapae*, *Boloria dia dia*, *Boloria euphrosyne*, *Boloria selene*, *Melanargia galathea*, *Erebia aethiops aethiops*, *Coenonympha arcania*, *Coenonympha glycerion*, *Argynnis niobe*, *Issoria lathonia*, *Erebia euryale syrmia*, *Polyommatus icarus*.

#### Mesophilic subalpine meadows (1700-2000 m)

These types of subalpine meadows are located in the floor of Cindrel Mountains (1700-2000 m), where they occupy large areas, on table lands and slopping hillsides, of the place of spruce fir forests and junipers. Secondary meadows are enlightened mainly by association *Viola declinatae-Nardetum*. Floristic composition of these grasslands includes species characteristic mesophilic: *Nardus stricta*, *Viola nigrescens*, *Potentilla erecta*, *Hypericum maculatum*, *Arnica montana*, *Agrotis rupestris*, *Anthoxanthum odoratum*, *Deschampsia flexuosa*, *Festuca rubra*. On the North-Eastern slopes, instead cleared junipers were installed subalpine meadows in association *Scorzonero roseae-Festucetum migricantis*. Floristic species of these grasslands are composed of July-August of: *Campanula patula*, *Potentilla chrysocraspeda*, *Ranunculus montanus*, *Phleum alpinum*, *Geum montanum*, *Hieracium sp.* In subalpine meadows of Cindrel Mountains they were identified in total 27 species. In the mesophilic subalpine meadows are characteristic: *Apamea rubrivena*, *Erebia Euryale syrmia*, *Erebia manto trajanus*, *Erebia gorge fredericikoenigi* [Rákósy (1997)], and *Erebia pandrose roberti*, *Erebia epihron transsylvanica*, related to the larval stage of various species of grass. Other species collected in this type of ecosystems surrounding grasslands (alpine shrubs, rocky places and spruce fir edges) are: *Scotopteryx chenopodia*, *Hana nana*, *Leucania comma*, *Noctua fimbriata*, *Xestia speciosa*, *Papestra biren* and *Gnophos obfuscatus*.

#### Subalpine mezo-xerophils meadows (1700-1950 m)

In the subalpine meadows, the associations of *Potentillo chrysocraspedae-Festucetum airoidis* reduced occupies the reduced surfaces on the sunny slopes, less inclined, of Cindrel at the altitudes between of 1700-1950 m. Floristic composition of these meadows is dominated by the presence of species *Potentillo chrysocraspedae-Festucetum airoidis*. Floristic composition of these meadows is dominated by the presence of species *Potentilla aurea*, *Festuca airoides*, *Agrostis rupenstris*. In these meadows have been identified 14 Macro Lepidoptera species. Characteristics are: *Lycaena tityrus subalpina*, *Hyppa rectilinea*, *Leucania comma*, *Papestra biren*, *Altetia impura*, *Mnyotipe adusta*, *Syngrapha interrogationis*.

#### Hilly rocky-mountain

The hills level between 400-600 m alt., lies on high hills and hills of Târnava Plateau (Hârtibaciu Valley), Vurpâr and Birch Peak, Hill Gusterița on the tableland between Hârtibaciu and Târnava Mare and they are covered by oak forests (*Quercus petraea*) and hornbeam (*Carpinus betulus*), and at the higher altitude by beech forests (*Fagus sylvatica*) and hornbeam. These forests alternate with secondary mesophile meadows and xero-mesophilic. Along the Târnava Valleys, Secașe and Porumbacu Valleys, intermountainous, on the shady rocks in the Cindrel Mountains prevails the association: *Asplenio trichomani-Peetum nemoralis veronicetosum bachofenii* [Drăgulescu (2003)]. Besides the main species: *Poa nemoralis*, *Asplenium trichomanes*, *Veronica bachofenii* in this association is also: *Saxifraga cuneifolia*, *Galium kitaibelianum*, *Sedum maximum*, *Digitalis grandiflora*, *Epilobium collinum*, *Silene dubia*, *Melica ciliata*, *Alyssum murale*, *Hieracium pavichii*, *Teucrium chamaedrys*, *Thymus comosus*, *Campanula carpatica*, *Hypericum perforatum*, that are in food relationship with larvae and adults of Macrolepidoptera. In this level have been identified species: *Scopula nigropunctata*, *Scopula marginipunctata*, *Scopula ruginata*, *Chlorissa cloraria*, *Thalera fimbrialis*, *Idaea ochrata*, *Idaea trigeminata*, *Scotopteryx moeniata*, *Anticlea budiata*, *Nebula salicata*, *Nebula tophaceata*, *Euphyia scripturata*, *Perconia strigillaria*, *Hyles lineata livornica*, *Eilema lurideolum*, *Arctia villica*, *Phragmatobia caesarea*, *Dysauxes ancilla*, *Cryphia fraudatricula*, *Hoplodrina superstes*, *Apamea lithoxilea*, *Hadena luteago*.

On the sunny slopes of the hills, on can meet many diurnal Macro Lepidoptera species visiting various flowers of dicotyledonous herbaceous plants, of which the most common are: *Plebeius argygonomon*, *Polyommatus coridon*, *Polyommatus daphnis*, *Scoliantides orion lariana*, *Polyommatus bellargus*, *Poliomatuscarus*, *Melitaea aurelia*, *Melitaea britomartis*, *Melitaea athalia*, *erebia aethiops aethiops*, *Erebia phaeas*, *Argynnis aglaja*, *Issoria lathonia*, *Melanargia galathea*. Rare and low effective population in this habitat is: *Ochropleura musiva*, *Zerynthia polyxena* and *Coscinia cribraria pannonica*.

#### Subalpine rocky

Alpine or subalpine levels with bushes from Bulea See are found between 1800-2000 m (2200 m), consisting of the thickets of zonal phytocenosis area with bilberry-rhododendron (*Rhododendro-Vaccinietum*), juniper with cranberry (*Vaccinio myrtillo-Pinetum mugii*), juniper and blueberry (*Vaccinio-Juniperetum nanae*) or juniper tree with swindle (*Junipero-Brukenthalietum*) blueberry shepherd (*Cetrario-Vaccinietum gaultherioidis*), mountain azalea (*Loiseleurietum procumbentis*) and meadows grass (*Potentillo-Festucetum sudeticae*), the spiky (*Nardetum strictae*). In these habitats have been reported the following species: *Lasiocampa quercus*, *Scopula ternata*, *Idaea ochrata*, *Scotopteryx luridata*, *Xanthorhoe montanata*, *Entephria flavicinctata*,

*Entephria caesiata*, *Eulithis populata*, *Chloroclysta truncata*, *Hydriomena furtata*, *Venusia cambrica*, *Alcis repandata*, *Macroglossum stellatarum*, *Parasemia plataginis carpathica*, *Gonopteryx rhamni*, *Nymphalis polychloros*, *Aglais urticae*, *Polygonia calbum*, *Araschnia levana*, *Argynnis daphne*, *Argynnis lathonia* and *Lycaena phlaeas*.

### Hilly upland deciduous forests

The piedmont units, towards to Făgăraș and Cindrel Mountains are covered with oak forests (*Quercus petraea*) and secondary meadows *Agrotis tenuis*, *Festuca rupicola* and cultures. In an exceptionally way the beech forests could descend also in this level (*Fagus sylvatica*), especially on the northern slopes of the Făgăraș and Cindrel Mountains, where their lower limit reaches 400-500 m in the Tâlmăciu locality.

Beech forests are present in all units in the Sibiu County at the altitudes between 500-1050 m. Throughout the mountain valleys, beech forests are at the altitudes of 1450 to 1500 m. Besides the characteristic species *Symphito cordatum* și *Dentaria glandulosa* [(Drăgulescu (2003))], the floristic composition of the association comprises a series of Carpathian-Balkan species as: *Festuca drymeia*, *Pulmonaria rubra*, *Ranunculus carpathicus* etc. Bushes of the association are: *Corylus avellana*, *Euonymus verrucosa*, *Crataegus monogina*, *Sorbus aucuparia* și *Daphne mesereum*. In this area they have been identified 51 species and the characteristic are the species in connection with: *Fagus sylvatica* and other related species of *Fagaceae*, *Rhamnaceae*, *Acereceae* as: *Aglia tau*, *Epirrita autumnata*, *Operophera brummata*, *Ennomos autumnarius*, *Colotois pennaria*, *Campaea margaritata*, *Phalera bucephala*, *Stauropus fagi*, *Elkeria pudibunda*, *Euproctis chrysochorhoea*, *Pseudoips fagana*, *Colocasia coryli*, *Craniopora ligustri*, *Acrionicta aceris*, *Pyramidocampa pyramidea*, *Litophane ornithopus*, *Mesogona acetosellae*, *Cosmia affinis*, *Cosmia trapezina*, *Xanthia icterita*, *Brachionycha nubeculosa*, *Pontia nebulosa* etc. Frequently are species: *Stauropus fagi*, *Aglia tau*, *Calcasia coryli*, *Eupsilia transversa*, *Epirrita autumnata* and *Litophane ornithopus*.

### Mixed forests (beech-fir and beech-spruce forests)

Beech forests are mixed with resins forests and have a greater extension at altitudes between 900-1050 m. They are the associations of *Pulmonario rubrae-Abieti-Fagetum* and *Leucanthemo waldsteinii-Piceo-Fagetum* [(Drăgulescu (2003))]. The layer of beech-fir trees includes besides the main species: *Abies alba* and *Fagus sylvatica*, also the isolated trees of *Picea abies*, *Acer pseudoplatanus*, *Ulmus glabra*, *Fraxinus excelsior*, *Sorbus aucuparia*.

The shrub layer poorly developed species include species: *Coryllus avellana*, *Lonicera xylosteum*, *Rubus idaeus*, *Sambucus racemosa*, *Sambucus nigra* etc. The herbs layer is composed by species: *Pulmonaria rubra*, *Cardamine glanduligera*, *Symphytum cordatum*, *Oxalis acetosella*, *Galium odoratum*, *Anemone nemorosa*, *Carex sylvatica*, *Salvia glutinosa*, *Epilobium montanum*, *Geranium robertianum*, which are

connected in the larval and adult stage with the Macro Lepidoptera species. In the mixed forest species have been identified 113 Macro Lepidoptera species, most of them are: *Arctornis l-nigrum*, *Biston betularius*, *Calospylos sylvatus*, *Campaea margaritata*, *Phalera bucephala*, *Alsophila aescularia*, *Stauropus fagi*, *Phlogophora sita*, *Brachionycha nubeculosa*, *polypogon tentacularia*, *Abrostola tripartita*, *Amphipyra pyramidea*, *Amphipyra tragopoginis*, *Trachea atriplicis*, *Conistra vaccinii*, *Conistra rubiginea*. Besides these they were collected also characteristic species for fir and spruce-fir trees: *Hylaea fasciaria*, *Alcis jubatus*, *Odontopera bidentata*, *Polia hepatica*, *Eurois occulata*, *Diarsia brunnea*, *Diarsia mendica*, *Cosmotriche lunigera*, *Dendrolimus pini montana*, *Thera variata*, *Panolis flammea*, *Eupithecia abietaria* and *Lymantria monacha*.

### Coniferous forests

Spruce forests have a large extension in Cindrel and Făgăraș Mountains, and all slopes from the superior mountain level, at the altitude between 1200-1750 m. The spruce forests at the limit by contact with junipers at subalpine meadows are characterized by *Brukenthalio-Piceetum*. In the composition of these phytocenosis with multiple eco-protective functions are: *Brukenthalia spiculifolia* și *Picea abies*. In the shrub layer are found the species: *Pinus mugo*, *Juniperus sibirica*, *Vaccinium myrtillus*, *Vaccinium vitis-idaea*, *Betula pendula*. At lower altitudes 1600-1250 m, revealing associations are: *Hieracio rotundali-Piceetum* and *Leucanthemo waldsteinii-Piceetum* [(Drăgulescu (2003))]. In these cenosis besides the dominant species: *Picea abies* and *Hieracium rotundatum* are also some montanous species as: *Leucanthemum waldsteinii*, *Homogyne alpina*, *Campanula abietina*, *Pulmonaria rubra* etc. The shrub level of coenoses include: *Vaccinium myrtillus* and *Sorbus aucuparia*.

In these vegetable formations have been identified 43 Macro Lepidoptera species. In the spruce-fir trees forests are the species: *Cosmotriche lunigera*, *Thera variata*, *Cosmotriche lunigera*, *Thera strangulata*, *Thera obeliscata*, *Semiothisa liturata*, *Semiothisa signaria*, *peribatodes secundaria secundaria*, *Eupithecia abietaria*, *Hylaea fasciaria*, *Puengelera capreolaria*, *Panthea coenobita*, *Lymantria monacha*, *Apamea rubirena*, *Xestia speciosa*, *Apamea monoglypha*, *Diarsia brunnea*, *Diarsia mendica* and *Anaplectoides prasina*.

### Alpine shrubs

Alpine level is spread between 2000-2535 m, in the Făgăraș, Cindrel Mountains, Șteflești Peak, Bulea See and it is covered to a large extent by, grassy area cenosis within the associations: *Primulo-minimae-Caricetum-curveolae*, *Potentillo ternate-Festucetum sudeticae*, *Agrostietum rupestris*. Woody vegetation is represented only by small patches of undergrowth plants: *Salicetum herbaceae*, *Anemone narcissiflorae-Salicetum retusae*, *Salicetum retisae-reticulatae* and groups of rhododendron (*Rhododendro-Vaccinietum*). The phytocenosis of juniper shrubs forms groups

more or less compact in the Cindrel Mountains. The junipers are distinguished by the presence of characteristic species: *Rhododendron myrtifolium* beside some Carpathian-Balkan elements: *Brukenthalia spiculifolia* and *Campanula abietina*. Bushes level of association also includes the species: *Sorbus aucuparia* and *Juniperus sibirica*. By deforestation of junipers on some sides of the mountains, were installed the subalpine phytocenosis of *Rhododendron* at altitudes between 1750-2000 m. In their composition are, beside *Rhododendron* also the blueberry bushes: *Vaccinium gaultheroides*, *Vaccinium myrtillus*. In Some place develops *Juniperus simbrica* and *Anus viridis*. In the subalpine bushes have been identified 26 species of Macro Lepidoptera. These habitats house the butterflies community with some characteristic sub-alpine species: *Thera variata*, *Erebia pandrose roberti*, *Apamea maillardi carpatobrunnea*, *Erebia euryale syrmi*, *Scopula ternata*, *Xestia speciosa*, *Lasiocampa quercus f. alpina*, beside the characteristic species for ecosystem at the limit to subalpine shrubs (mesophilic subalpine meadows, spruce-fir edge, rocky zone): *Hydriomena impluviata*, *Xanthorhoe montanata*, *Rhemaptera hastata*, *Eupithecia tenuiata*, *Aplocera plagiata*, *Cleorodes lichenarius*, *Peribatodes secundaria*, *Puengelaria capreolaria*, *Elopos vittarius mendicarius*, *Parasemia plantaginis carpathica*, *Polia trichoma*, *Diarsia mendica*, *Diarsia brunnea*, *Eurois occultus*, *Hypena proboscidalis*, *Anaplectoides prasina*, *Erebia epiphron transsylvanica*, but also the euribiont species: *Agrotis exclamationis*, *Cuculia umbratica*, *Agrotis ipsilon*, *Inachis io*, *Pieris rapae*, *Pieris napi*, *Aglais urticae*, *Macrogossium stellatarum*. In July and August are very common species: *Erebia euryale syrmi*, *Erebia epiphron transsylvanica*, *Erebia pandrose roberti* whose adults were visiting the cranberry and rhododendron flowers.

## CONCLUSIONS:

The analysis of Macro Lepidoptera for the fidelity to the main types of natural ecosystems was taken into account only the characteristic for the studied habitats [Rákossy (1997)]. It highlights the preferential use of forest edge habitats offered (Dumbrava Sibiu) and the vegetable shrub associations at the edge at the forests or on the sunny slopes and rocky zones. In the ecoton of variable widths of forests and the limitrophe ecosystems areas (meadows and rocky zones) were identified 5% of all species.

7% of species prefer the mesophilic mountain habitats. Mesophilic hilly submountain meadows are preferred habitats for 4% of the identified species

Beech, oak, spruce and mixed forests are typical ecosystems of 2% and 1% of all species. Hill and mountain forests are preferred by 5% and 3% of the total species Macro Lepidoptera. In general sense, the forest is characterized as a grim environment, poor in flowering plants, is less preferred by day butterflies, being attracted by sunlight heat. However, the forest environment, in a large sense constitutes the living environment for many species of Macro Lepidoptera [Karsholt et al. (2011)]. Thus, the clearings of the forests, meadows, provide light and heat for diurnal

species, but also in a source of nectar from flowers of plants.

Many butterflies living in this area that prefer these environments have the particularity to feed on aphid sweet liquid with tree sap, fruits or fermented organic matter from the excrements and dead bodies. Here they have host plants for their larva's as trees, or herbaceous plants monocots and dicots [Koch (1991)]. Some species characteristic for forests, such: *Thecla betulae*, *Satyrrium w-album*, feed with leaves of plants. The larva's of other species *Gonopteryx rhamni rhamni*, *Satyrrium pruni*, are attracted to the woody plants, especially to shrubs and the adults visit the flowers in the clearings, glades meadows and adequate shelters for winter, in various stages of their biological cycle. By addition the personal results with the data published over time by other specialists, on mention the presence of 394 Macro Lepidoptera species into the natural habitats in the Sibiu County. The total of 394 species has been identified in 10 types of ecosystems at different altitude, hilly, mountainous regions, subalpine-alpine of Sibiu County. Beside the common species, ubiquitous, in the mountainous regions and in the plateaus or in the rivers valleys are present some rare species reported for Romanian fauna. Some special interest species *Lycaena dispar*, *Maculinea arion*, *Euphydryas aurita aurita*, were reported in Cindrel Mountains [Worell (1951)].

The Macro Lepidoptera populations are not stable in short periods of time. The populations vary from year to year and these changes are determined by natural factors (climate change, migration of species) and also by anthropogenic factors due to changes caused by human activities in the forestry, agriculture but also by urbanization and pollution.

## REFERENCES:

- Antonie I, The Cursulionidae (Coleoptera) in the Entomological Collections of the Natural History Museum of Sibiu. *Brukenthal Acta Musei*. 10(3): 403-410, 2015.
- Bucşa C, Tăușan I, Istoricul cercetarilor entomologice din împrejurimile Sibiului. Volumul Lucrari al Simpozionului Biodiversitatea și Managementul insectelor din România, 179-200, 2011.
- Burnaz S, Catalogul colecției de lepidoptere a Muzeului Județean Hunedoara, Deva. In: Sargetia. *Acta Musei Devensis Deva*. 14-15:157-302, 1993.
- Ciochia V, Barbu A, Catalogul colecției de lepidoptere „Nicolae Delvig” a Muzeului Județean Brașov. In: *Cumidava*. 12(4): 795, 1980.
- Ciochia V, Stancă-Moise C, Contributions to the knowledge of the Macrolepidoptera from Natural Complex “Dumbrava Sibiului”. Scientific session dedicated to celebrating 75 years since the establishment of Marine Biological Station "Prof. Dr. Ioan Borcea" Agigea-Constanta. 19-20 october 2001. *Analele Științifice ale Universității „Al.I.Cuza” Iași*. s. Biologie Animală, Tom XLVIII: 29-43, 2002.
- Csiki E, Adatok Erdély lepkefaunájához. In: *Rovartani lapok Budapest*. 16 (7-8):112-118, 1909.

- Czekelius D, Kritisches Verzeichnis der Schmetterlinge Siebenbürgens. Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt, 47: 1-78, 1897.
- Czekelius I, Adalék Erdély lepke-faunájához. In: Rovartani lapok Budapest. 12 (4): 84-86, 1906.
- Czekelius D, Beiträge zur Schmetterlingsfauna Siebenbürgens. Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt, 67(1-6): 1-56, 1917.
- Czekelius D, Beiträge zur Schmetterlingsfauna Siebenbürgens. In: Verhandlungen und Mitteilungen des Siebenbürgischen Vereins für Naturwissenschaften zu Hermannstadt 71: 71-77, 1922.
- Drăgulescu C, Cormoflora județului Sibiu. Editura Pelecanus Brașov, 533 pp, 2003.
- Karsholt O, Razowski J, The lepidoptera of Europe - a distributional checklist. Apollo Books, Stenstrup, 380 pp, 1996.
- Karsholt O, Nieukerken, E, Karsholt O, (2011), Lepidoptera, Moths. Fauna Europaea version 2.4, <http://www.faunaeur.org>.
- Koch M, Wir bestimmen Schmetterlinge. Press Neumann Verlag Radebeul, 17: 171-174, 1991.
- König F, Catalogul colecției de lepidoptere a Muzeului Banatului, In: Editura Muzeului Banatului, Timișoara, 1975.
- Moise C, The protected species of Lepidoptera in the oak forest "Dumbrava Sibiului", Romania. Buletin USAMV Agriculture, 68(1): 216-223, 2011a.
- Moise C, Macrolepidoptera (Insecta: Lepidoptera) indicator of climate changes. Buletin USAMV Agriculture, 68(1): 420pp, 2011b.
- Moise C, Lepidoptera (Insecta: Lepidoptera) in the Collection of Daniel Czekelius from Natural History Museum of Sibiu collected from "Dumbrava Sibiului" Forest, Romania. Analele Universitatii din Oradea, Fascicula Biologie, 18(2):104-110, 2011c.
- Moise C, Study on contributions to the knowledge of the fauna siebenbürger saxons of lepidoptera in siebenbürger and around Sibiu, entomology collections of the Museum of Natural History in Sibiu". 18<sup>th</sup> International Economic Conference -Iecs 2011, Sibiu, 179-187, 2011d.
- Moise C, Lepidoptera (Insecta: Lepidoptera) in the Collection of Eugen Worell from Natural History Museum of Sibiu, collected from "Dumbrava Sibiului" forest. Lucrari stiintifice, seria Horticultura, "Ion Ionescu de la Brad". Iași, 54(2): 571-576, 2011e.
- Moise C, Study on the Macrolepidoptera Collected from the Dumbrava Sibiului forest existing within the Collection of Dr. Viktor Weindel. Muzeul Olteniei Craiova, Studii și comunicări, Științele Naturii, 27(2): 96-104, 2011f.
- Moise C, Impact of climate factors and anthropogenic on Macrolepidoptera activity of the Forest Dumbrava Sibiu, Romania. Proceedings of the 7th International Conference. Integrated Systems for Agri-Food Production. SIPA 11, November 10-12, 2011, Nyiregyhaza Hungary, 95-99, 2011g.
- Moise C, Sand, C, Research on Macrolepidoptera species (Insecta:Lepidoptera) collected in Dumbrava Sibiului Forest (Romania) in conditions of the year 2011 and their status line in IUCN 2001 system, Analele Universitatii din Oradea, Fascicula Biologie, 19(1): 55-66, 2012.
- Moise C, The butterflies Red List (Insecta: Lepidoptera) collected from Dumbrava Sibiului forest (Romania) during 2001-2012, Analele Universității din Oradea, Fascicula Biologie, 21(1): 39-44, 2014.
- Niculescu EV, Lepidoptera Family Papilionidae, Fauna RSR, Insecta XI (5). Editura Academiei RSR. Bucharest, 120 pp, 1961.
- Niculescu EV, Lepidoptera Family Pieridae (Fluturi), Fauna RSR, Insecta XI (6). Editura Academiei RSR., Bucharest, 202 pp, 1963.
- Niculescu EV, Lepidoptera Family Nymphalidae, Fauna RSR, Insecta XI (7). Editura Academiei RSR., Bucharest, 361 pp, 1965.
- Niculescu EV, König FR, Lepidoptera (partea generală), Fauna RSR. Insecta XI (10). Editura Academiei R.S.R., Bucharest, 300 pp, 1970.
- Pascu M., Schneider E., 1998, Colecțiile entomologice ale Muzeului de Istorie Naturală din Sibiu, In: Studii și Comunicări, Științe Naturale Muzeul Brukenthal Sibiu 27, Sibiu (1998), p. 201-218
- Popescu-Gorj A, Catalogue de la collection de lépidoptères „Prof. A. Ostrogovich” du Museum d’Histoire Naturelle „Grigore Antipa”, Bucarest. In: Editura Muzeului „Grigore Antipa”, Bucharest, 1964.
- Popescu-Gorj A, Hundert Jahre Schmetterlingsforschungen im Rahmen des Siebenbürgischen Vereins für Naturwissenschaften. Studii și Comunicări. Științele Naturii Muzeul Brukenthal, 15: 91-96, 1970.
- Rákossy L, Wieser C, Stangelmayer G, Székely L, Rezultatele colectărilor realizate în a doua tabără entomologică S.L.R. Munții Făgăraș 23-27(30) iulie, 1994. 1. Lepidoptera. In: Buletin informativ Societatea lepidopterologică română Cluj-Napoca. 5 (3-4): 201-216, 1994/1995.
- Rákossy L, Die Noctuiden Rumaniens (Lepidoptera, Noctuidae). Staphia, 46, Linz: 648 pp, 1996.
- Rákossy L, Die endemischen Lepidopteren Rumäniens. Entomologica Romanica, Cluj-Napoca, 2: 59-81, 1997.
- Rákossy L, Lista rosie pentru fluturii diurni din România. Buletinul Informativ Societatea Lepidopterologica Română. Cluj-Napoca, 13(1-4): 9-26, 2002.
- Rákossy L, Goia M, Kovács Z, Catalogul lepidopterelelor României. Societatea Lepidopterologică Română, Cluj-Napoca, 446 pp, 2003.
- Rebel H, Lepidopterologische Exkursion in die transsylvanischen Alpen. In: Verhandlungen der

- Zoologisch-Botanischen Gesellschaft in Wien 58:74-80, 1908.
- Schneider E, Zur Schmetterlingsforschung in Hermannstadt in der Jahren 1945 bis 1985, Beiträge zur naturwissenschaftlichen Erforschung Siebenbürgens (IV). Lienzer Tagung- Mai 1994, Stapfia 45 pp, 1996.
- Schneider E, Zur Verbreitung von *Argynis laodice* Pall. (Lepidoptera: Nymphalidae) in Roumanien, *Studii și Comunicări, Științele Naturii Muzeul Brukenthal*, 26: 209-214, 1971.
- Schneider-Binder E, Pădurile din Depresiunea Sibiului și dealurile marginale. *Studii și Comunicări, Muzeul Brukenthal, Sibiu*, 18: 71-100, 1973.
- Schneider E, Die Gross-schmetterlinge der Sammlung "Dr. V. Weindel" – Ein Beitrag zur Faunistik der Lepidopteren Südsiebenbürgens und angrenzender Gebiete. *Studii și Comunicări, Științele Naturii, Muzeul Brukenthal Press, Sibiu*, 26: 289-316, 1984.
- Schneider E, Die Schmetterlingssammlung Heinrich von Hanenheim im Naturwissenschaftlichen Museum in Hermanstadt. In: *Studii și Comunicări, Științe Naturale Muzeul Brukenthal Sibiu*. 28: 201-230, 2003.
- Stancă-Moise C, The entomologists from Sibiu their contribution to the knowledge of the Lepidoptero fauna of Sibiu-Surroundings collections. *Lepidoptera. Macrolepidoptera. Analele Științifice ale Universității "Al. I. Cuza" Iasi. Secțiunea I Biologie Animala, TOM XLVIII: 7-12, 2002.*
- Stancă-Moise C, Structura și dinamica Macrolepidopterelor din Complexul Natural Dumbrava Sibiului. In: *Proceedings of 6th National Conference on Environmental Protection in Biological and Biotechnical Methods and Means and the 3rd National Conference Ecosanogenese, (in romanian) 31 of May 2003, Brașov, 293-301pp, 2003a.*
- Stancă-Moise C, Propunere în vederea realizării listei roșii a Macrolepidopterelor din Complexul Natural Dumbrava Sibiului. In: *Proceedings of 6th National Conference on Environmental Protection in Biological and Biotechnical Methods and Means and the 3rd National Conference Ecosanogenese, (in Romanian) 31 of May 2003. Brașov, 301-309pp, 2003b.*
- Stancă-Moise C, The biodiversity of the species of macrolepidoptera from Sibiel zone (Sibiu county) in 2003 summer. *Muzeul Olteniei Craiova. Studii și comunicări. Științele Naturii*. 20(1):214-218, 2003c.
- Stancă-Moise C, Importanța Macrolepidopterelor în cadrul ecosistemului Pădurii de stejar „Dumbrava Sibiului”. *Oltenia. Studii și Comunicări Științele Naturii, Press Sitech Craiova*, 20: 190-222, 2004.
- Stancă-Moise C, Date privind speciile de Macrolepidoptere pereclitate semnalate în Pădurea „Dumbrava Sibiului” și problema ocrotirii acestora. *Proceedings of 7th National Conference on Biotechnology and Environmental Protection by 4-Ecosanogenese National Conference, (in Romanian), 27-28 of May 2005, Brașov, 2: 827-834, 2005a.*
- Stancă-Moise C, The phenology of the Macrolepidoptera (Lepidoptera: Insecta) from the natural Park „Dumbrava Sibiului”. In: *Jubilee Conference with international participation "Science. Processes and Technologies Agro-Food (in romanian) 12-13 May 2005, Sibiu, 565-568pp, 2005b.*
- Stancă-Moise C, Ecological study about the evolution of the species *Papilio machaon machaon* L., 1758 (Lepidoptera, papilionidae) in ecosystem of the oak forest „Dumbrava Sibiului” and the importance of its protection. In: *Jubilee Conference with international participation "Science. Processes and Technologies Agro-Food.(in romanian). 12-13 of May 2005 Sibiu, 569-572pp, 2005c.*
- Stancă-Moise C, A preliminary study on ecological diversity of the Lepidoptero fauna in the Natural Reservation „Dumbrava Sibiului” by means of the specific indexes. *Biotehnologie și Biodiversitate, Agroprint Press, Timișoara, 165-169 pp, 2005d.*
- Stancă-Moise C, Dinamica zborului la Macrolepidoptere (Insecta, Lepidoptera) din pădurea „Dumbrava Sibiului” în perioada 2001-2004, *Fam. Nymphalidae. Muzeul Olteniei. Craiova. Oltenia Studii și Comunicări Științele Naturii*, 21: 87-97, 2005e.
- Stancă-Moise C, Studiu ecologic privind diversitatea lepidopterelor din Pădurea „Dumbrava Sibiului” cu ajutorul indicilor specifici. *Proceedings of 7th National Conference on Biotechnology and Environmental Protection by 4-Ecosanogenese National Conference with international participation. în romanian", 27-28 of May 2005, Brașov, 2: 835-836, 2005f.*
- Stancă-Moise C, Date privind prezenta papilionidelor (Insecta: Lepidoptera: Papilionidae) in fauna Padurii Dumbrava Sibiului in perioada 2001-2005. *Muzeul Olteniei, Craiova, Oltenia Studii și Comunicări Științele Naturii*, 22: 203-206, 2006a.
- Stancă-Moise C, A preliminary study on ecological diversity of the Lepidoptero fauna in the Natural Reservation „Dumbrava Sibiului” by means of the specific indexes, *Biotehnologie și Biodiversitate. Press Agroprint Timișoara, 165-169 pp, 2006b.*
- Stancă-Moise C, Biodiversitatea faunei de Macrolepidoptere (Insecta, Lepidoptera), din ecosistemul Pădurii „Dumbrava Sibiului” în perioada anilor 2001-2006. In: *The works of the 8th National Conference for Biotechnology and Environmental Protection by 5-Ecosanogenese National Conference (in Romanian), 26-27 of May 2007, 64-66 pp, 2007a.*
- Stancă-Moise C., (2007): Noi contribuții la cunoașterea Macrolepidopterelor din complexul forestier „Dumbrava Sibiului”. pp: 59-63. In:

- The works of the 8th National Conference for Biotechnology and Environmental Protection by 5-Ecosanogenese National Conference (in romanian), 26-27 of May 2007b.
- Stancă-Moise C, The specific index in view of ecological diversity analisys of the lepidopterofauna populations in the natural Reservation „Dumbrava Sibiului”. In: Proceeding of the International Conerence „Agricultural anf Food Sciences, Process and Technologies” with theme „Agriculture and food Industry within the Context of European Integration”, April 26-28, 2007, 439-442 pp, 2007.
- Stancă-Moise C, (2012), Macrolepidopterele din Pădurea Dumbrava Sibiului, Editura Universităţii “Lucian Blaga” din Sibiu, 271 p.
- Stancă-Moise C, Method of analysis for population limitation of the Lepidoptera pest in fruiterers (Lepidoptera: Tortricidae) in Sibiul village, Sibiu city in conditions of year 2013. Management economic engineering in agriculture and rural development. 14(1): 333-336, 2014.
- Stancă-Moise, C, Information on the Macrolepidoptera fauna of “Dumbrava Sibiului” oak forest (Sibiu, Romania). Analele Universităţii din Oradea, Fascicula Biologie, 22(1): 33-46, 2015a.
- Stancă-Moise C, Lepidoptera colleted from Dumbrava Sibiu forest, preserved in collections of Museum of Natural History in Sibiu. Analele Universităţii din Oradea, Fascicula Biologie, 22(2): 81-95, 2015b.
- Stancă-Moise C, Observation on the biology of species *Cydia pomonella* (worm apple) in an orchard in the town Sibiul, Sibiu county in 2014. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development. 15(3): 293-296, 2015c.
- Stancă-Moise C, Family Pieride (Lepidoptera, Pieridae) and evolution over time in forest grove Sibiu (Sibiu, Romania) Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 15(1): 307-311, 2015d.
- Stancă-Moise C, Migratory species of butterflies in the surroundings of Sibiu (Romania). Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 16(1): 319-324, 2016a.
- Stancă-Moise C, Behaviour and dynamics of mamestra brassicae species (Lepidoptera: Noctuidae) in an agricultural ecosystem in the town Sibiul, county in regim of the years 2014-2015. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 16(1): 325-329, 2016b.
- Stancă-Moise C, Baseline monitoring of Macrolepidoptera in high grasslands around Sibiul, Romania. Studia Universitatis “Vasile Goldiş”, Seria Ştiinţele Vieţii , 26 (3): 361-374, 2016c.
- Stănescu M, The catalogue of “Ludovic Bereszgászy” lepidopteran collection (Insecta: Lepidoptera). In: Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa” Bucarest. 35: 221-346, 1995.
- Székely L, Noutăţi Lepidopterologice din sud-estul Transilvaniei. In: Buletin Informare Entomologică 14-15, Cluj-Napoca (2003-2004), 41-56 pp, 2004.
- Székely L, (2008), Székely Levente, The Butterflies of Romania – Fluturii de zi din România. In: Brastar Print, Braşov, 262 p.
- Székely L, (2014), Istoria Lepidopterologiei din România. Brastar Print, Braşov, 297 p.
- Török SC, Contributions To The Study Of Heterocera (Lepidoptera) From Mediaş and Surroundings (Sibiu County). Brukenthal Acta Musei. VII. (3): 441-458, 2010.
- Török SC, Cuzepan G, Subspecii de macrolepidoptere endemice în colecţiile Muzeului de Istorie Naturală din Sibiu (România). In: Travaux du Muséum National d’Histoire Naturelle “Grigore Antipa” Bucharest 56(1): 65-80, 2013.
- Török SC, Cuzepan G, Butterfly (Insecta: Lepidoptera) hot spots in Sibiu County (Transylvania, Romania). Brukenthal Acta Musei. IX (3): 469-482, 2014.
- Váγγελ J, Adatok Magyarország rovarfaunájához. In: Rovartani lapok Budapest. 12 (3): 48-52, 1905.
- Worell E, Contribuţii la cunoaşterea faunei coleopterelor şi lepidopterelor din Transilvania, mai ales din împrejurimile oraşului Sibiu. In: Academia Republicii Populare Romane, Buletin Ştiinţific Secţia Ştiinţe Biologice Agronomie Geologie Geografie Bucureşti 3(3): 533-543, 1951.