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**STUDY ON THE CHRYSOMELIDAE FAUNA
(INSECTA, COLEOPTERA, CHRYSOMELIDAE)
IN THE UPPER SECTOR OF THE MURES BASIN**

SUMMARY OF THE PH.D. THESIS

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Keywords: Chrysomelidae, upper basin of Mures, faunistics, zoogeographical units, habitats, ecology, environmental category, the food regime, abundance, frequency.

INTRODUCTION

Chrysomelides by their large number of known species and their specific adaptations can be considered as a family of insects in full evolutionary expansion. They are exclusively phytophagous with a highly advanced variability and a very marked population dynamics. Thus, they can become extremely dangerous pests for agricultural crops as well as for the forest flora. Most are terrestrial species, but one can find semi-aquatic and aquatic forms (*Donacia*, *Haemonia*) as well. Data regarding the total number of species included in the Chrysomelidae family ranges from 25,000 (1962, Z. Kaszab) to 35,000 (the actual number accepted by most specialists), however there are studies mentioning 50,000 species (Le Sage, 1997). In principle, the variation of figures on the number of species in between these limits is accepted, since most descriptions regarding new species represents data from the tropical zone.

Their name derives from the Greek *chrysis* = gold, due to their very luxurious color, often metallic ones. Their popular name (bug-gloss, gold bugs, leaf beetle, *levélbogarak* - Hungarian., Leaf Beetle - English., *Käferblatten* - German) – mirrors perfectly their morphological appearance and their main source of food.

They are widespread throughout the world especially in the tropical zone these groups of beetles (coleopters) present a high variability. Some chrysomelides look so nice (for example *Desmonota variolosa* in Brazil) that are considered real jewels and are worn in necklaces.

The scientific interest expressed for the Chrysomelidae family is manifested in a series of works developed over the years, at the beginning in a broader context that is the Coleoptera order, due to the lack of delimitation and taxonomic identification of the chrysomelidae families of the respective periods.

In reconsidering the systematic position of subfamilies and of the chrysomelidae genera, most changes are due to lifting the inferior taxons to superior taxons (eg. a genus becomes a subfamily), respectively, at the level of subfamilies, to introducing new taxons as tribes sub-tribes, subgenera. Due to all these, the taxonomic categories are also modified, respectively the scientific name of the species or the introduction of new taxonomy units, like the series, the tribes, etc..

This work is a synthesis of our research results on chrysomelidae from the Upper Basin of the Mures River and is structured on five big chapters. The research area is distinguished by the variety of the relief forms, by the special climate features and the biodiversity of the researched habitats, many of them being located in NATURA 2000 sites, respectively the Calimani National Park and the national interest

Landscape Reserve the Upper Mureş Gorge. In most of these areas no fauna assessments have been completed on crhrysomelidaes up to now.

Thus, an important objective of our research was a most comprehensive assessment of the fauna from the area of research, resulting out of the total number of 227 species identified, 204 new species for the Upper Mures river's Basin, in our research area delimited by the Vălenii de Mures Depression, the Toplița – Deda Gorge, the Calimani Mountains, Gurghiului Mountains, the Giurgeu Depression and Mountains, the Hasmas Mountains.

Analyzing the literature out of the 227 species, 184 species are common and 43 species are new to the Eastern Carpathians.

The elaboration of this Ph.d. thesis would not have been possible without the help of some people whom I would like to thank. First, I would like to express my gratitude and appreciation to the coordinator of this PhD thesis, university professor, Dr. Nicolae Tomescu, who guided me with perseverance, understanding, dedication as well as scientific and professional exigence and from whom I have learned a lot in terms of scientific research.

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I dedicate this work to my wife.



CHAPTER I. HISTORY OF RESEARCHES ON CRHRYSOMELIDES ON THE EUROPEAN LEVEL, WITH SPECIAL REGARD TO THE ROMANIAN FAUNA

This chapter includes specialized publications found on taxonomic research, morphology, anatomy, reproduction, life cycle, zoogeography, fauna and environmental aspects of the crhrysomelides of Europe with special reference to Romania. 456 publications were consulted.

CHAPTER II. CHARACTERIZATION of CRHRYSOMELIDES

In this chapter we gave a brief characterization of chrysomelides, group of insects whose study is object of the present doctoral thesis. I described mainly, on basis of bibliographic data, aspects regarding: morphology, anatomy, reproduction and life cycle.

CHAPTER III. CHARACTERIZATION OF THE UPPER MURES BASIN SECTOR AND OF THE RESEARCHED HABITATS

Our researches were made in the upper Mures basin, which comprises diverse geomorphological units: mountains, the sub-Carpathian area and hills. The hydrographic basin of the Upper Mures includes (fig.30) mountains: Călimani mountains, Gurghiului and Giurgeu mountains, the Hasmas Mountains, the intermountain depression of the Giurgeu and Toplita - Deda gorge (UJVÁRI, 1972; Szocs, 2010). We made a detailed description of the units within the studied area, using data from the respective literature. In the upper basin of the Mures river there are protected areas, which I mentioned in the thesis: the Calimani National Park, the Nature Park of the Upper Mures Gorge Toplița- Deda. Within the Mures and Harghita counties there 17 Natura 2000 sites, in the area of which there are many species of plants and animals protected by law.

The research stations where the chrysomelide samples were taken fall into four geographic units (tab.7).

Within these zoogeographic units we have identified 55 areas characteristic for the entire area of the upper basin of the Mures, where we collected samples from x habitat types. Most research areas are located in the Toplița – Deda Gorge (45%) (fig.57).



Fig.30: Map of the researched area (according to the Romanian Geographic Atlas, 2010, modified)

Tabel 7: Geographic units within the researched area of the upper basin of the Mures

	Research areas	Geographic units
A	Sub-mountain depression Valenii de Mures	Mures river valley
		Dosului-Vatava peak
		Gurghiu stream valley
		Gurghiu Mountains
B	Mures valley down the gorge	Gurghiu Mountains
C	Mures Gorge Toplita-Deda	Mures river valley
		Calimani Mountains
		Gurghiu Mountains
D	Gheorgheni Depression	Mures river valley
		Giurgeului Mountains
		Hasmas Mountains
		Gurghiu Mountains
		Harghita Mountains

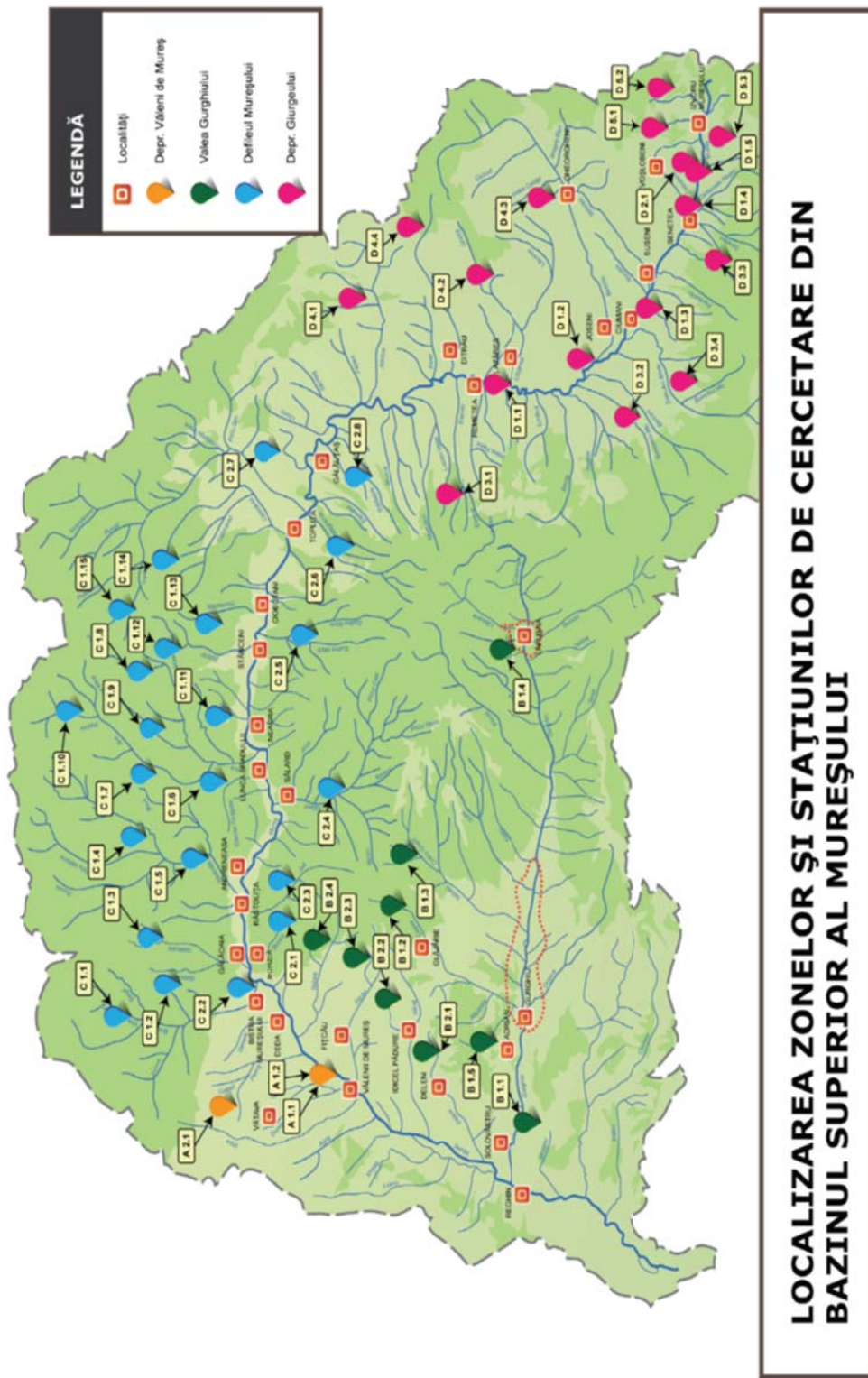


Fig.57.: Research areas located in the upper basin of the Mures

Habitats where samples were taken from are located at altitudes ranging between 365 m and 1290 m. The samples were taken from: spruce forests, mixed spruce and beech forests, beech forests, mixed deciduous forests, water meadows, shrub meadows and swamps, clearings, glades, hydrophil, mesophil and xerophil meadows, as well as ruderal vegetation, vacant lands, abandoned agriculture crops.

CHAPTER IV. RESEARCH METHODS IN TAXONOMY AND CHRYSOMELIDE ECOLOGY

The collecting of samples in the field was done with an entomological net, umbrella net, entomological vacuum. We have collected 1365 samples from the researched habitats. We made quantitative collections (50-mowing per sample) and qualitative collections. The insects from each sample were put into separate tubes, preserved in alcohol, labelled and determined in the laboratory. The collected material was processed statistically by the following indexes: numeric abundance, relative abundance, dominance, frequency and constancy, distribution of species, equitability and similarity.

CHAPTER V. THE CHRYSOMELIDAE FAUNA OF THE UPPER BASIN OF THE MURES RIVER

In the researches carried out during 2005 - 2009 we collected 8097 specimens of chrysomelides, of which we have identified 227 species belonging to 51 genera and 10 subfamilies.

The number of species in the area studied represents 38.75% out of all chrysomelidae species, 62.19% out of the total number of genera, respectively 76.92% out of the total number of chrysomelidae subfamilies reported up to the present date in Romania and reflects a large biodiversity of the researched area. The 204 species, from our research area delimited by the Valenii de Mures Depression, the Toplita – Deda Gorge, the Calimani Mountains, the Gurghiului Mountains, the Giurgeului Depression and Mountains, the Hasmas Mountains, are considered new for the Upper Basin of the Mures river.

In the upper basin of the Mures river we identified 17 species of chrysomelides considered rare and protected and mentioned also in the literature: (MAICAN, 2004, CRISAN, 2010), such as *Zeugophora flavicollis* (Zeugophorinae) *Oulema (Haspidolema) erichsoni* (Criocerinae) *Cryptocephalus (Cryptocephalus) biguttatus* (Cryptocephalinae) *Chrysolina (Hypericia) cuprina*, *Chrysolina (Sphaerochrysolina) rufa*, *Chrysomela (Pachylina) collaris*, *Gonioctena (Gonionema)*

quinquepunctata, *Gonioctena* (*Goniomena*) *interposita*, *Hydrotassa glabra*, *Hydrotassa marginella*, *Oreina* (*Allorina*) *bidentata*, *Oreina* (*Virgulatorina*) *virgulata virgulata*, (*Chrysomelinae*), *Galerucella* (*Neogalerucella*) *tenella* (*Galerucinae*) *Asiorestia femoral*, *Longitarsus* (*Longitarsus*) *languidus*, *Longitarsus* (*Longitarsus*) *rubellus*, *Sphaeroderma rubidum* (*Halticinae*). There have been also identified three endemic species for the Carpathians: *Cryptocephalus* (*Burlinius*) *carpathicus* (*Cryptocephalinae*) *Sclerophaedon carniolicus*, *Sclerophaedon carpathicus* (*Chrysomelinae*) and 10 montanous species: *Chrysolina* (*Ovostoma*) *globipennis*, *Chrysolina* (*Ovostoma*) *olivieri olivieri*, *Gonioctena* (*Goniomena*) *interposita*, *Oreina* (*Intricatorina*) *intricata intricata*, *Oreina* (*Virgulatorina*) *virgulata virgulata*, *Oreina alpestris*, *Sclerophaedon carniolicus*, *Sclerophaedon carpathicus* (*Chrysomelinae*) *Aphthona stussineri*, *Longitarsus* (*Longitarsus*) *monticola* (*Halticinae*).

From the ten subfamilies where the identified species of the researched area belong, the Halticinae subfamily comprises 101 species, representing 44.49% out of the total 227, followed by Chrysomelinae subfamily (54 species, 23.79%), the Cryptocephalinae subfamily (27 species, 11.89%), the Cassidinae subfamily (15 species, 6.61%), the Clytrinae subfamily (12 species, 5.29%), the Galerucinae subfamily (11 species, 4.85%). The least represented are the Criocerinae subfamilies (4 species, 1.76%), the Donaciinae, the Zeugophorinae and the Lamprosomatinae with one species each, which represents 0.44% out of the total. (Fig. 106).

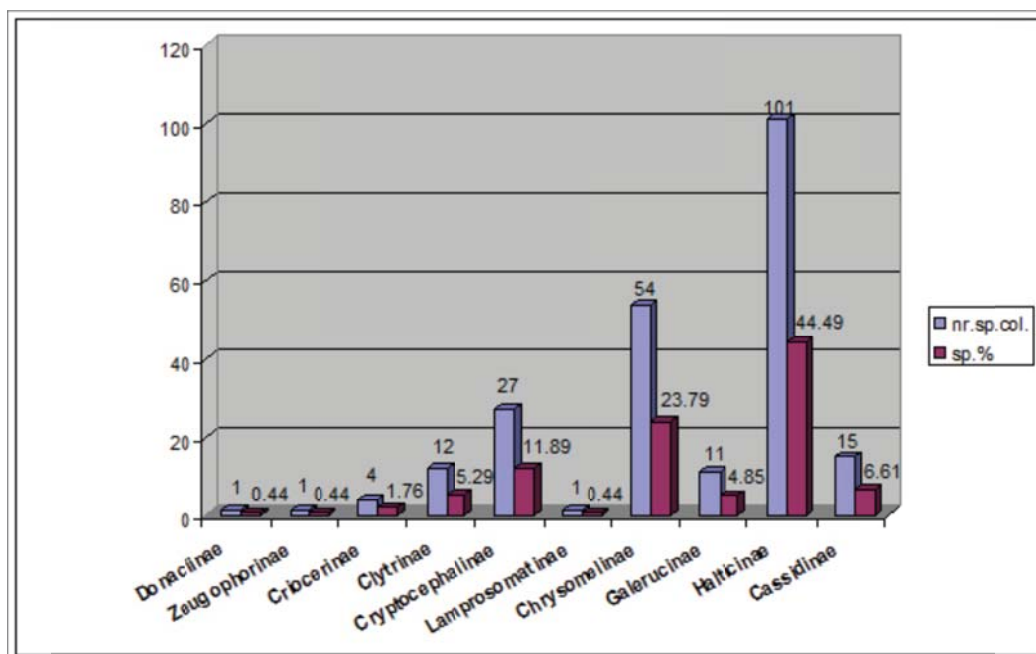


Fig.106: Numeric distribution in percentage of the collected chrysomelidae species on subfamilies within the Upper Basin of the Mures river

From a zoogeographic point of view, out of the 227 species, 121 species have a limited spread in the European complex (Central European, Central-European Mountain area, South-Eastern European mountain area, Eastern sub-mediterranean, Northern - Mediterranean and 106 species with Palearctic spread). (Fig.112).

The research areas identified are set within the altitude limits ranging from 365m to 1290 m in the boreal nemoral zones respectively the highlands.

By analysing the distribution of species (fig.152), results that most Chrysomelidae species are localized at altitude intervals between 501 - 1076 m, with a maximum number at the 501-798 m interval in the Upper Mures Gorge. Other maximum intervals with a larger number of species are to be found at intervals between 799-982m, 983-1076 m. A constant altitudinal distribution is to be remarked with the following species: *Chrysolina polita* (*Erythrochysa*), *Chrysolina* (*Sphaeromela*) *varians*, *Chrysolina* (*Euchrysolina*) *graminis*, *Chrysolina* (*Synergia*) *herbacea*, *Hydrotassa glabra*, *Plagioderia versicolora* (Subfamily Chrysomelinae) *Altica oleracea*, *Chaetocnema* (*Tlanoma*) *concinna*, *Longitarsus* (*Longitarsus*) *brunnaeus*, *Longitarsus* (*Longitarsus*) *melanocephalus*, *Phyllotreta nemorum*, *Phyllotreta undulata* (Subfamily Halticinae). Other species like: *Cryptocephalus* (*Cryptocephalus*) *bipunctatus*, *Cryptocephalus* (*Cryptocephalus*) *decemmaculatus*, *Gonioctena* (*Spartomena*) *fornicata*. The *Linnaeidea* (*Linnaeidea*) *aenea* species appear at altitude ranges from 983 -1076 and 1183-1290 meters.

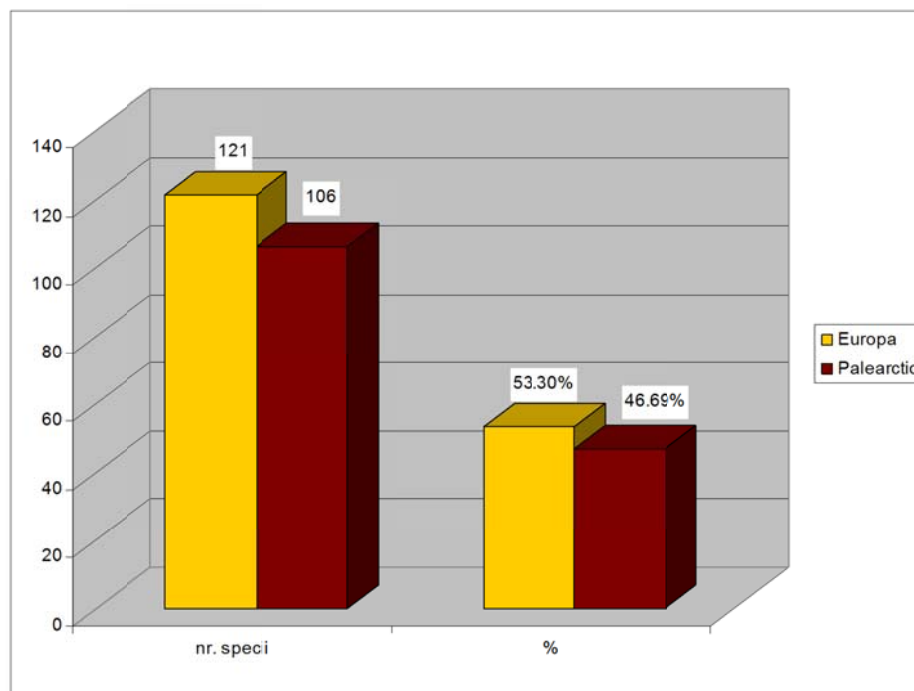


Fig. 112: Numeric distribution in percentage of the collected chrysomelidae species in the European complex and Palearctic spread.

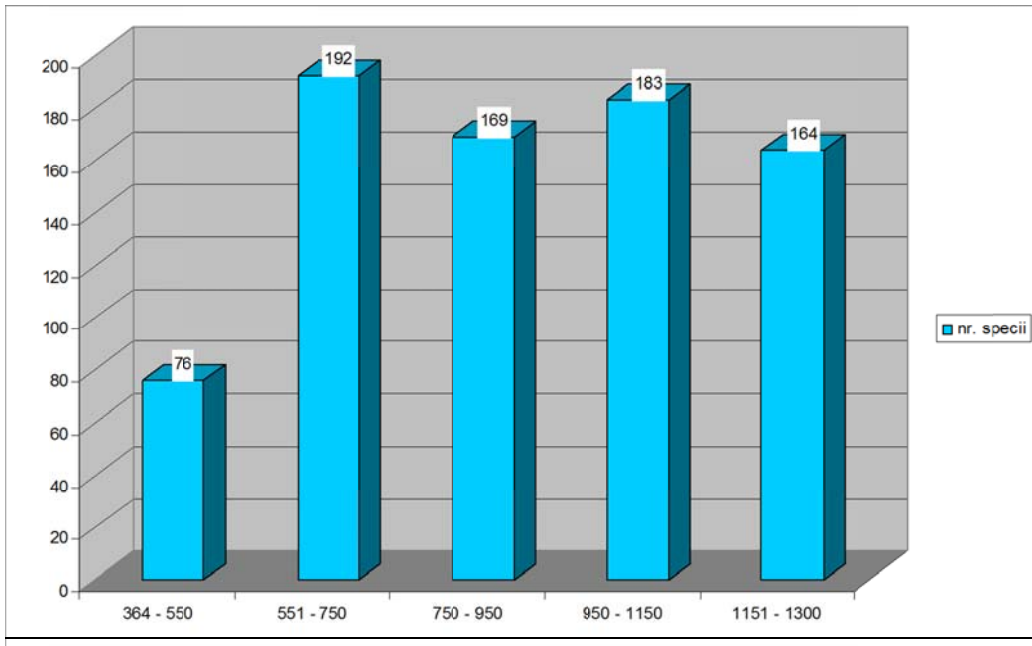


Fig.152: Distribution of the number of Chrysomelidae species within the Upper Mures Basin on altitude ranges

CHAPTER VI. ECOLOGY OF CHRYSOMELIDE SPECIES IN THE RESEARCHED HABITATS

Quantitative sampling in the habitats situated in the upper basin of the river Mures has allowed us to make a quantitative ecologic analysis of the populations forming chrysomelidae communities within these habitats. For the communities of species in each habitat. I have calculated: numeric abundance or absolute abundance (meaning average number of individuals captured for sample), the frequency of species in the habitat expressing constancy, relative abundance or numeric dominance, equitability and specific diversity as well as similarity between habitats, calculated on basis of the common species living in these habitats.

V.1.3. Ecological grouping of species

The ecological grouping of species was made in terms of the populated habitats (Environmental groups), by geographical units where chrysomelidae species are spread, respectively by grouping species according to habitat types. When grouping the species according to these criteria, we relied on data offered by literature.

Chrysomelidae species from the upper basin of the Mures fall into three environmentally representative categories: **Pratico**, living predominantly in meadows, glades, pastures, hay fields; **Forest**, occupying habitats in forests and **Euritope**,

which can take up many habitat types, differentiated as relief, soil, climate, humid conditions.

In general, out of the 227 species of collected chrysomelidae, the majority are Pratico (70%), followed by the Forest and Euritope ones, with 34 species each, representing 15% of the total.

V.1.5. Food spectrum of the chrysomides from the upper basin of the Mures

Analysing, based on literature, the nutritional category of the chrysomelidae species identified in the upper basin of the Mures, we found that species in the research area represent all the three food categories. The oligophagous chrysomelidae species are the most numerous (127 species), followed by the poliphagous chrysomelidae species (78 species), the least numerous being the monophagous ones (22 species). Expressed in percentage oligophagous species represent 56% out of the total, poliphagous ones 34% and monophagous species 10%.

VI.1. Ecology of the chrysomelidae communities in forest habitats

The researched forest habitats were the spruce forests, mixed forests of beech and coniferous, beech forests and mixed deciduous forests. In total there were collected 2048 individuals and were identified 140 species of chrysomelides. Resulting from the comparative analysis of the chrysomelidae populations living in forest habitats, on basis of the number of species, the best represented are the mixed deciduous forests with 59 species (43% out of the total), followed by the mixed beech and coniferous forests with 31 species (22%), beech forests with 27 species (19%), spruce forests with 23 species (16%). (Fig. 153 and fig. 154)

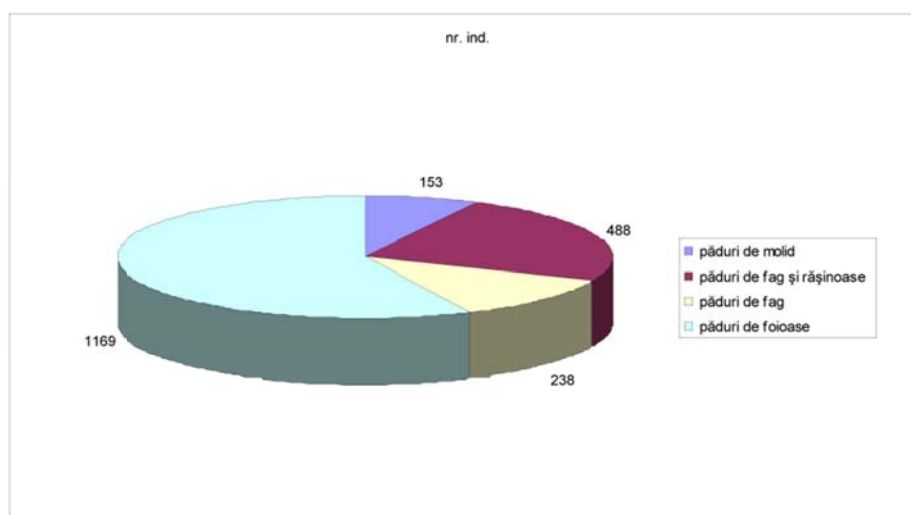


Fig.153: Distribution of chrysomelidae species according to the number individuals in the forest habitats, the Upper Basin of the Mures

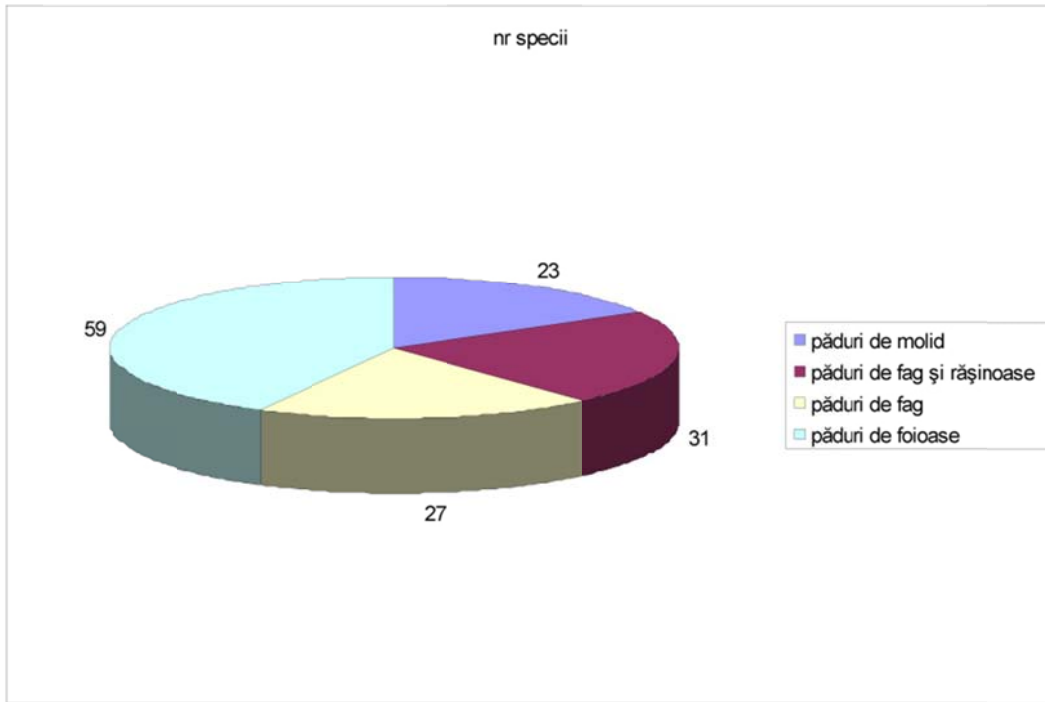


Fig. 154: Distribution of chrysomelidae species according to the number species in the forest habitats, the Upper Basin of the Mures

VI.1.3. The ecology of chrysomelidae communities in deciduous forests

Deciduous forests were investigated in 21 areas ranging from an altitude of 703 m and 1143 m, while samples were taken in 25 forests. 1169 individuals were collected and 59 species of chrysomelides have been identified. It is an area rich in chrysomelidae species, the nutritional conditions, the climate and especially the richness and diversity of the vegetation allowed the development of populations with large diversity.

Regarding the distribution of species in subfamilies, the Halticinae with 510 individuals and 23 species (44%) is in the first place, followed by Chrysomelinae subfamily with 386 individuals, 17 species (33%), the Cryptocephalinae subfamily with 82 individuals, 7 species (10%), the Clythrinae subfamily with 68 individuals, six species (7%) and Criocerinae subfamily with 5 individuals, one species (0.42%). (Fig. 170).

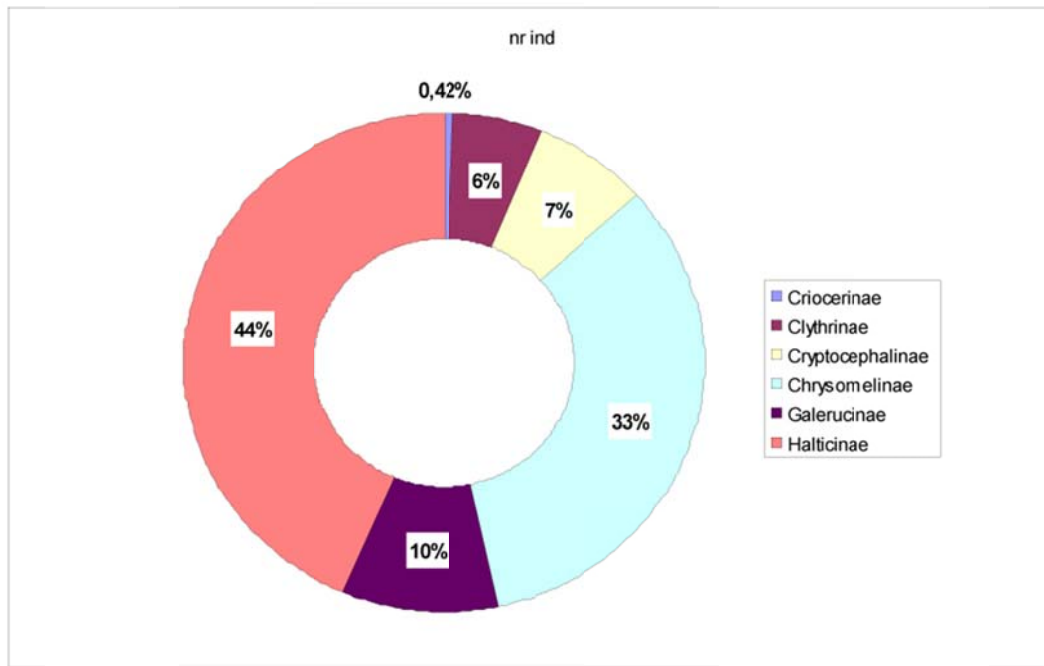


Fig. 170: Distribution in percentage of the number of chrysomelidae individuals on subfamilies in the deciduous forests of the Upper Basin of the Mures

According to the environmental category to which they belong, 36 species are Pratico (61.02%) and 23 species are Forest ones (38.93%). This distribution reflects the similar climates of the habitats in the deciduous forests and the open habitats of the researched areas and the deciduous forest habitats.

According to the food regime 35 species are oligophagous (59.32%), 22 species are poliphagous (37.28%) and two species (3.38%) *Chrysolina olivieri olivieri* (host plant *Salvia glutinosa*) and *Galerucella calmariensis* (host plant *Lythrum salicaria*) are monophagous.

Forest species prefer the trees belonging to the Fagaceae, Betulaceae, Salicaceae families. All species identified in deciduous forests occur in other forest habitats too, respectively in open habitats.

Numerical abundance of chrysomelidae species in deciduous forests

According to the numeric abundance value of species found in deciduous forests, species with large populations are, for instance: *Batophila Rubi*, *Phratora vitellinae*, *Phratora laticollis*, *Crepidodera aurata*, *Plagioderma versicolora*, *Galerucella lineola*. Species with restrained populations are: *Crepidodera aurea*, *Derocrepis rufipes*, *Smaragdina tibialis*, *Lochmea suturalis* etc.

Relative abundance of the chrysomelidae species in deciduous forests

Among the chrysomelide species identified, the **predominant** species is the *Crepidodera aurata* (A% = 10.27%), followed by 5 **dominant** species: *Plagioderma versicolora*, *Phratora (Phratora) laticollis*, *Gareluca (Neogareluca) lineola*, *Batophila Rubi*, *Phratora (Phratora) vitellinae*, 8 **subdominant** species: *Chrysolina graminis*, *Clytra laeviscula*, *Chaetocnema hortensis*, *Chaetocnema tibialis*, *Phyllotreta nemorum*, *Asiolestia ferruginea*, *Chaetocnema concinna*, *Chaetocnema semicoerulea*.

Most species fall into the **recedent** and **subrecedent** categories with 18, respectively 27 species (Fig.174), fact that reflects a dynamic variability of the populations probably due to the migration of species from other neighbouring habitats. It should be noted that within many research areas, in the vicinity of deciduous forests there are agricultural lands and hayfields.

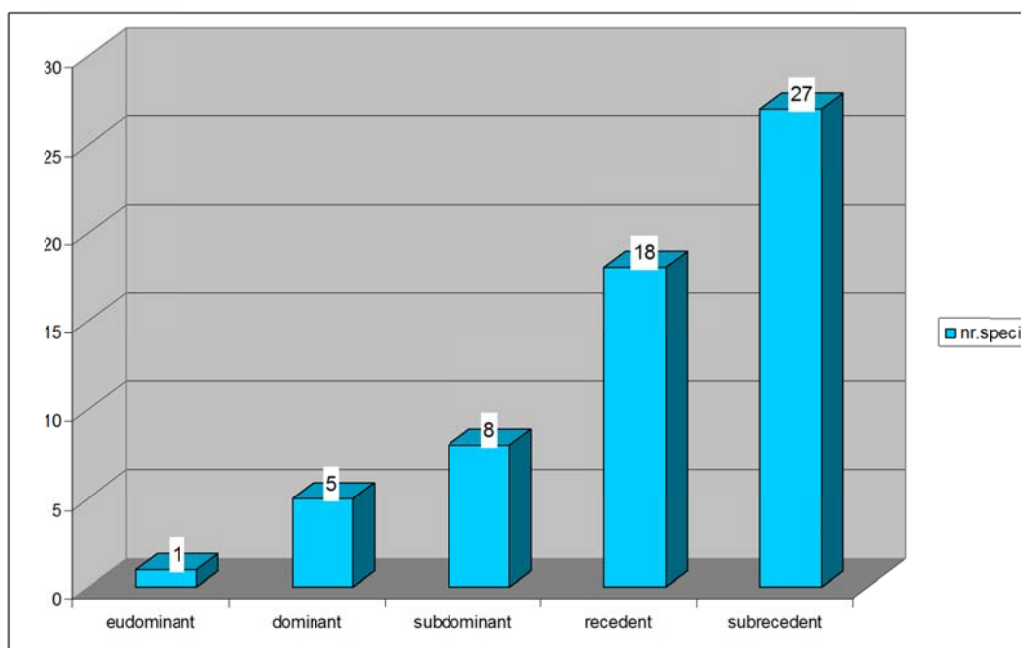


Fig.174.: Number of species belonging to the dominant numeric classes

Frequency of chrysomelidae species in deciduous forests

According to the frequency values, two species: the *Crepidodera aurata* (F% = 82.86) and *Phratora (Phratora) vitellinae* (F% = 77.14) are euconstant, followed by 12 constant species as eg. *Phyllotreta nemorum*, *Batophila rubi*, *Phratora laticollis*, *Chrysolina graminis*, *Clytra laeviscula* etc. All euconstant species are harmful in case of overpopulation, causing great damage to crops of cabbage, wheat and rye. The number of accidental species is the highest (33 species), followed by the accessory and constant species with 12 species each. (Fig.175).

The vegetation in these habitats is very varied with plant species from the Umbellifere, Lamiaceae, Asteraceae, Boraginaceae, Betulaceae, Salicaceae, etc. families but for many chrysomelidae species the host plant density is low, constituting a limiting factor for the chrysomelidae species reproduction.

Compared to other forest habitats one can notice an increase in the number of represented subfamilies, the appearance of the Galerucinae, Criocerinae subfamilies reflecting the increase of biodiversity within the chrysomelidae population, being linked to the increase of variability and dynamics of the biocenosis.

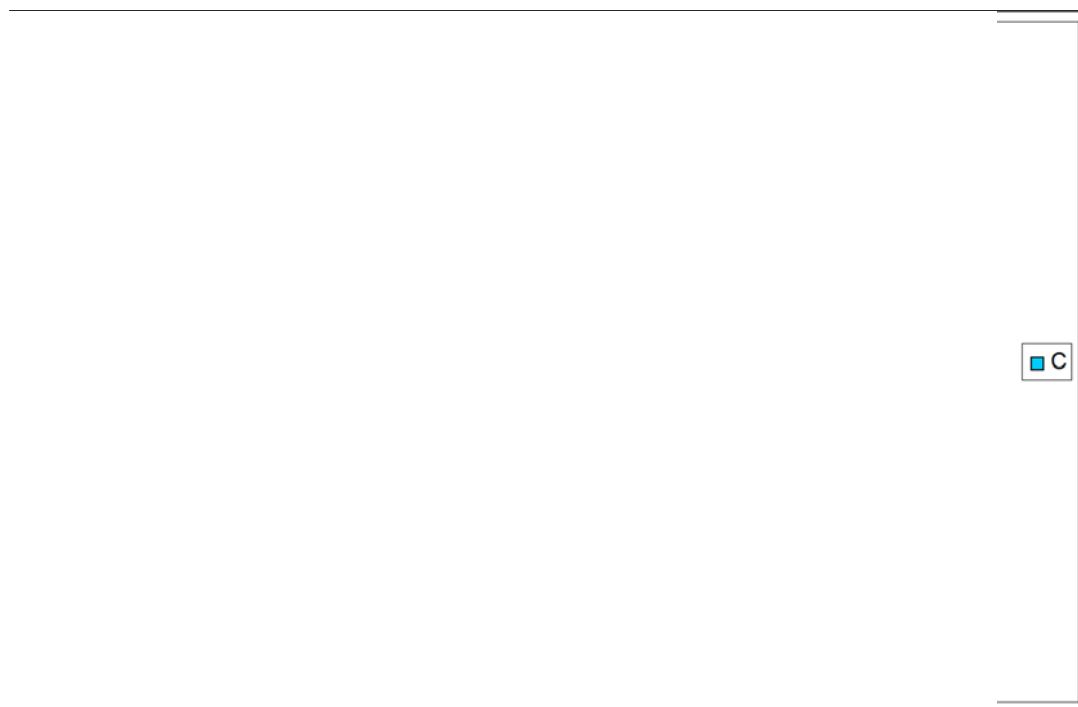


Fig.175.: Number of species belonging to the constancy classes

VI.2. Ecology of open habitats

The category of these habitats comprises mesophilic meadows, pastures, clearings, glades, damp, marshes, ruderal vegetation, shrubs, artificial meadows. Generally, the distribution of chrysomelidae populations by number of individuals, number of species shows a strong variety. According to the number of individuals within the habitats, the mesophilic meadows are the richest in chrysomelides with 1558 individuals, followed by water meadows/damp with 1358 individuals, respectively the forest glades with 525 individuals.

The fewest specimens were collected from artificial meadows, 48 individuals (Fig. 182). On basis of the number of chrysomelidae species collected, results that habitats with mesophilic meadows and damp are the richest in species, followed by habitats with glades and shrubs.

The fewest species were collected from areas with artificial meadows, swamps and ruderal vegetation. (Fig.183).

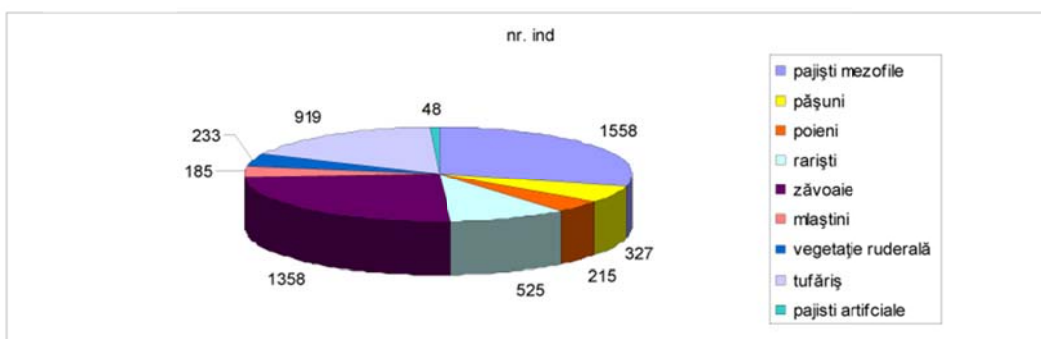


Fig.182: Distribution of chrysomelidae species according to the number of individuals in the open habitats of the Upper Basin of the Mures river

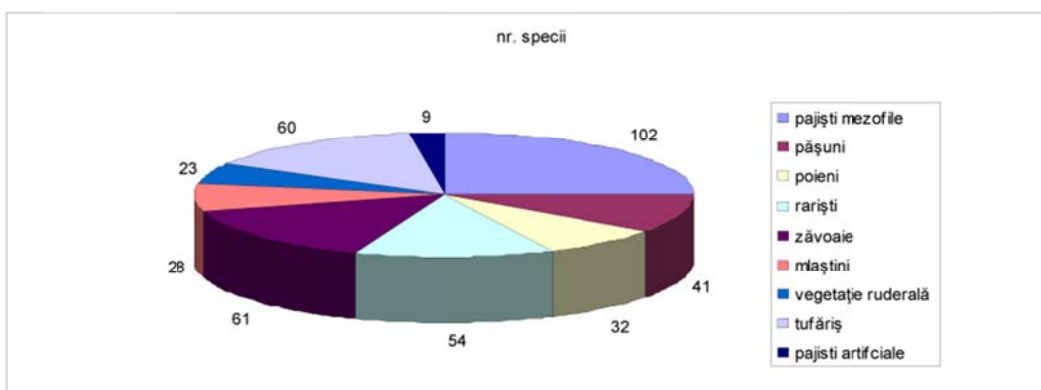


Fig.183: Distribution of chrysomelidae species according to the number of species in the open habitats of the Upper Basin of the Mures river

GENERAL CONCLUSIONS

1. During researches carried out between 2005 - 2009 in 12 habitat types, within 55 areas located in the upper basin of the Mures we collected 8097 individuals belonging to the Chrysomelidae family and we identified 227 species, classified in 51 genera and 10 subfamilies, representing 38.75% of the known species in the Romanian fauna, namely 62.19% of the total number of genera, 76.92% of the total known subfamilies within the Romanian fauna. Our research took place from year 2005 to 2009, in the months May – June, within 55 collecting areas.

2. Out of the total 227 species, 204 species are considered new species for the Upper basin of the Mures river, and 43 species are new species for the Eastern Carpathians.

3. From the taxonomic evaluation of the work collected, results that the 227 species belong to 10 subfamilies: Donaciinae, Zeugophorinae, Criocerinae, Clytrinae, Cryptocephalinae, Lamprosomatinae, Chrysomelinae, Galerucinae, Halticinae and Cassidinae. The number of species belonging to subfamilies differs. In the Halticinae subfamily there are 101 species, followed by the Chrysomelinae subfamily with 54 species, the Cryptocephalinae subfamily with 27 species, the Galerucinae subfamily with 11 species, the Cassidinae subfamily with 15 species, the Clytrinae subfamily with 12 species. Subfamilies with few species are the Criocerinae with 4 species, the Donaciinae with one species as well as the Zeugophorinae and Lamprosomatinae with one species each. As far as it regards the number of genera to which the collected species belong to, the best represented are the Chrysomelinae and Halticinae subfamilies with 17 genera, the Clytrinae with 5 genera, the Galerucinae with 4 genera, and Cryptocephalinae and Criocerinae with 2 genera each, the Donaciinae, the Zeugophorinae and the Lamprosomatinae with one single genera.

4. From this perspective we can see that the most taxonomic diversity on the chrysomelidae individuals collected is in case of the Halticinae subfamily, followed by the Chrysomelinae, Clytrinae, Galerucinae subfamilies while a lower taxonomic variability is to be found with the Cassidinae subfamily where 386 individuals of the 15 species belong to one single genus.

5. Following the analyse of the report in percentage on collected chrysomelidae species, it appears that out of the total 227 species 46,48% belong to the Halticinae subfamily, followed by the Chrysomelidae subfamily with 28.36%, the Cryptocephalinae subfamily with 9.34%, the Galerucinae subfamily with 7.48%, the Clytrinae

subfamily with 3.14% and Donaciinae, Zeugophorinae and Lamprosomatinae subfamilies representing less than 1% of the total.

6. In the upper basin of the Mures we identified 17 chrysomelide species considered rare and protected as defined by the literature, such as *Zeugophora flavicollis* (Zeugophorinae) *Oulema (Haspidolema) erichsoni* (Criocerinae); *Cryptocephalus (Cryptocephalus) biguttatus* (Cryptocephalinae); *Chrysolina (Hypericia) cuprina*, *Chrysolina (Sphaerchrysolina) rufa*, *Chrysomela (Pachylina) collaris*, *Gonioctena (Gonionema) quinquepunctata*, *Gonioctena (Goniomena) interposita*, *Hydrotassa glabra*, *Hydrotassa marginella*, *Oreina (Allorina) bidentata*, *Oreina (Virgulatorina) virgulata virgulata* (Chrysomelinae), *Galerucella (Neogalerucella) tenella* (Galerucinae), *Asiolestia femorata*, *Longitarsus (Longitarsus) languidus*, *Longitarsus (Longitarsus) rubellus*, *Sphaeroderma rubidum* (Halticinae).

7. There have been identified three endemic species for the Carpathians: *Cryptocephalus (Burlinius) carpathicus* (Cryptocephalinae) *Sclerophaedon carniolicus*, *Sclerophaedon carpathicus* (Chrysomelinae) and 10 species of rare and protected mountain species: *Chrysolina (Ovostoma) globipennis*, *Chrysolina (Ovostoma) olivieri olivieri*, *Gonioctena (Goniomena) interposita*, *Oreina (Intricatorina) intricata*, *Oreina (Virgulatorina) virgulata*, *Oreina alpestris*, *Sclerophaedon carniolicus*, *Sclerophaedon carpathicus*, (Chrysomelinae), *Aphthona stussineri*, *Longitarsus (Longitarsus) monticola* (Halticinae).

8. From zoogeographic point of view the species collected fall within the following zoogeographical units: with specific spread across the entire Europe (66 species) in the Central European area (12 species), Central – Southern European (8 species), Northern – Central European (7 species), Central South - Eastern European (6 species), Central - Southern European (4 species), Central – Northwest European and Central South-Western European with 3 species each, South -Eastern European, Central West European, Central-Eastern European and Central South – Eastern with one species each. From this zonal representation of the territories of various chrysomelidae species we conclude that most species studied are common to the research area, with spread throughout the whole Europe (54.54%) and in Central Europe (9.91%), 106 species with specific Palaearctic area, of which 79 Eurasian species, 27 species in the area specifically differentiated by cardinal points, respectively Eurasian geographical areas. Expressed in percentage, 74.52% of the species collected have a specifically Eurasian area, 21.69% belong to Eurosiberian Palaearctic area, 1.88% belong to the Eurosiberian West - Palaearctic area and 0.94% belong to the Euroasian Western Palaearctic area. According to zoogeographical

elements, we found that most of the species belong to the Transpalearctic zone with 31 species (38.27%), followed by species from the mountain areas with 24 species (29.62%), the Holopaelearctic species with 8 species (9.87%), the Eurosiberiens with 7 species (8.64%), Eurasians with 5 species (6.17%).

9. The richness of Chrysomelidae species in the researched areas and geographical units varies according to the diversity of the vegetation cover of the researched habitats. Another important factor is the anthropic, mainly the grazing and massive tree cuttings within the area. Many habitats, even if they are protected by law and are Natura 2000 sites of community interest or natural botanical and bird reserves are exploited by grazing, agricultural crops cultivation, often deserted, roads and unmarked paths used for transporting agricultural products, transport of fertilizers, etc.

10. The anthropic effect is destructive to vegetation and wildlife areas containing many protected, rare and endangered species by mining sites, holiday house constructions, a phenomenon encountered in the Calimani and Gurghiu mountains. The Mures valley in the Giurgeu Depression is strongly clogged with waste in the Ciumani, Joseni, Remete areas that are protected eutrophic wetland reserves.

11. We notice a large altitudinal distribution at species like *Chrysolina (Erythrochysa) polita*, *Chrysolina (Sphaeromela) varians*, *Chrysolina (Euchrysolina) graminis*, *Chrysolina (Synergia) herbacea*, *Hydrotassa glabra*, *Plagioderma versicolora* (Subfamily Chrysomelinae); *Altica oleracea*, *Chaetocnema (Tlanoma) concinna*, *Longitarsus (Longitarsus) brunnaeus*, *Longitarsus (Longitarsus) melanocephalus*, *Phyllotreta nemorum*, *Phyllotreta undulata* (Subfamily Halticinae). There are also species with a limited distribution, eg. *Cryptocephalus (Cryptocephalus) bipunctatus*, *Cryptocephalus (Cryptocephalus) decemmaculatus*, *Gonioctena (Spartomena) fornicata*, *Linaeidea (Linaeidea) aenea*. The *Linaeidea (Linaeidea) aenea* species appears at such altitude ranges as 983-1183 m and 1290 -1076 m.

12. Chrysomelidae species of the upper basin of the Mures fall into three representative ecologic categories: **Pratico**, living predominantly in meadows, glades, pastures, hay fields, **Forest**, occupying habitats in forests and **Euritope** that can occupy several habitat types, differentiated as relief, soil, climate, humid conditions. Overall, out of the 227 chrysomelidae species collected, most are Pratico (70%), followed by the Forest and Euritope ones, each with 34 species, representing 15% of total.

13. According to the populated geographical units most species are characteristic for hill and mountain areas (72 species, 32%), at the same value with plains and hills, followed by species in the mountain area (28 species, 18% of the

total). Most favored to occupy new habitats are the Euritope species in total 34 species, mostly represented by the Halticinae subfamily with 14 species, followed by the Chrysomelinae with 8 species, the Cryptocephalinae with 6 species, the Cassidinae and respectively the Galerucinae with 4 and 2 species each.

14. The Pratico species are the most numerous from the collected Chrysomelidae species. From the 10 subfamilies present in the upper basin of the Mures, 8 subfamilies are represented by a total of 157 species. The best represented subfamily is the Halticinae with 79 species, followed by the Chrysomelinae subfamily with 34 species, the Cryptocephalinae with 17 species, the Cassidinae with 11 species. The Clytrinae, Donaciinae and Criocerinae, the Galerucinae subfamilies are present with a small number of species.

15. The forest type Chrysomelidae species are present with species from 7 subfamilies. Most of the species belong to the Chrysomelidae subfamily (11 species), followed by the Halticinae (9 species) and the Clytrinae (8 species) subfamilies. The Cryptocephalinae, the Lamprosomatinae, the Galerucinae subfamilies are underrepresented in the researched area.

16. The spread to preferred geographical units shows a majority for the species with preferences for the plain and hill areas, opposite to the species in the hill and mountain areas. It is to be noted that the climate effects of the Upper Defile of producing inversions of the forest vegetation, influence, by the composition of the vegetation.

17. The oligophagous Chrysomelidae species are the most representative with a number of 127 species, followed by poliphagous Chrysomelidae species with a number of 78 species, respectively the monophagous species are fewer with 22 species. Expressed in percentage, the oligophagous species represent 56% of the total, the poliphagous species represents 34%, while the monophagous species represent 10%.

18. The distribution of the number of species identified on habitats and the environmental characteristics of the species is as follows: **spruce forests** 23 species of which 3 eudominant, 7 dominant, 3 constant, 13 accidental, 7 accessories; in **beech and coniferous forests** 31 species of which 3 eudominant, 9 subdominant, 1 euconstant, 1 constant, 21 accidental, 6 accessories; beech forest 27 species, of which 3 eudominant, 3 dominant, 8 constant, 16 accidental, 3 accessories; **deciduous forests** 59 species, of which 1 eudominant, 2 dominant, 2 constant, 33 accidental, 12 accessories; **mesophilic meadows** 100 species of which 1 eudominant, 14 dominant, 5 euconstant, 20 constant, 41 accidental, 31 accessories; **mezo – hidrophilic**

meadows 30 species, of which 2 eudominant, 3 dominant, 2 euconstant, 17 constant, 7 accessories, 4 accidental; **pastures** 41 species of which 2 dominant, 2 euconstant, 5 constant, 13 accessories, 22 accidental; **mezoxerofile meadows** 18 species of which 2 eudominant, 6 dominant, 1 euconstant, 4 constant, 7 accessories, 5 accidental; **water meadows** 61 species of which 1 dominant, 3 euconstant, 10 constant, 8 accessories, 40 accidental; **bushes** 60 species of which 5 dominant, 7 euconstant, 7 constant, 26 accidental, 9 accessories; **swamps** 28 species of which 6 dominant, 1 euconstant, 1 constant, 9 accessories, 17 accidental; **glades** 54 species of which 5 dominant, 7 euconstant, 7 constant, 26 accidental, 9 accessories; **ruderal vegetation** 23 species of which 2 dominant, 2 euconstant, 1 constant, 19 accidental, 2 accessories; **clearings** 33 species of which 1 dominant, 1 euconstant, 2 constant, 21 accidental, 8 accessories.



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