Muzeul Județean Mureş

MARISIA

Studii şi materiale

XXXII

Ştiințele Naturii

2012

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Științele Naturii

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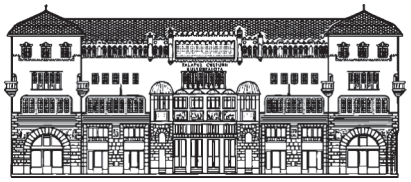

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Marisia XXX, 2012 (Etnografie și Artă Populară)
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CONTENT

BOTANY

ZOOLOGY

PALEONTOLOGY AND MINERALOGY

BOTANY

CATEGORIES OF ENDANGERED PLANTS IN THE CAMPANULACEAE FAMILY, INCLUDING RED LIST OF ARGEȘ COUNTY

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Abstract: This article aims to present categories of endangered plants in the family Campanulaceae in Arges county flora. From studies so far have been identified 9 species, belonging to three sozologic categories. Investigations have been made in the project "Chorology study of the sozological categories of Arges county flora to restore endangered by conventional methods of breeding and biotechnology".

Keywords: sozological, endangered, vulnerable, lower risk, UICN, Red List, Campanulaceae

Introduction

The **IUCN Red List of Threatened Species** (also known as the **IUCN Red List** or **Red Data List**), founded in 1948, is the world's most comprehensive inventory of the global conservation status of plant and animal species.

Species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation.

- Extinct (EX) – Plant species extinct, extinguished.
- Extinct in the Wild (EW) – Species missing spontaneous, but kept in culture.
- Critically Endangered (CR) – Species with extremely high risk of extinction in the near future state spontaneous.
- Endangered (EN) – Species with very high risk of extinction in the near future spontaneous state.
- Vulnerable (VU) – Species with high risk of extinction in the near future state spontaneous.
- Lower Risk (LR) – Low risk of extinction.
- Data Deficient (DD) – Deficient information on species.
- Not Evaluated (NE) – Has not yet been evaluated against the criteria.
- Not Threatened (NT) – Rare species, less threatened, but may enter in one of the categories above in future

Materials and methods

The establishment of the protected plants was made on the basis: *Red List of extinct endangered, vulnerable and rare higher plants of Romania flora* (Boșcaiu N., Coldea Gh., Horeanu

Cl., 1994), *Rare vulnerable and endemic plants of Romania flora – The Red List* (Dihoru Gh., Dihoru Alexandrina, 1994), *The Red List of higher plants of Romania flora* (Oltean M., Negrean G., Popescu A., Roman N., Dihoru G., Sanda V., Mihăilescu S., 1994), *Critical list of vascular plants in Romania*, (Oprea A., 2005), *Argeș county cormoflora* (Alexiu V., 2008), *Red book of vascular plants in Romania* (Dihoru G., Negrean G., 2009).

Abbreviations: Al – Albania, Au – Austria, Be – Belgium, Bu – Bulgaria, Cz – Czech Republic, E.C. – Central-Europe, Ga – France, Ge – Germany, Gr – Greece, He – Switzerland, Ho – Netherlands, Hs – Spain, Hu – Hungary, It – Italy, Ju – Jugoslavia, Po – Poland, Rm – Romania, Rs (W) – Western Russia, Tu – Turkey.

For each species are presented: Synonymies, common name, areal, frequency in Romania, IUCN Category, Location in Argeș county.

Results

In Argeș county have been identified 9 species belonging to different sozological categories: 1 species Vulnerable (VU), 6 species Not Threatened (NT) 2 species Lower Risk (LR)

***Campanula carpatica* Jacq.**

European area: Cz Po Rm Rs (W)

Frequency in Romania: Frequently

IUCN Category: NT, Carpathians endemic

Located in Arges: Râiosu-Buda Mountains, Buda Valley (STANCU Ileana Daniela, 2005), Piatra Craiului Massif: Dâmbovicioara (HARALAMB AT., 1946; GRECESCU D., 1898; DRĂGHICI Bibica, 1994; SÂRBU Anca (coord.), et al., 2007; SĂVULESCU TR. (coord. pp.), 1952–1976; ALEXuiIU; 2008), Great Valley in Grind (DRĂGHICI BIBICA, 1994), Brusturetului Gorges, Marele Grohotiș (POP O., 2006; SÂRBU Anca (coord.), et al., 2007), Ghimbav Mountains: Crovului Gorges, Ghimbav Gorges, Dâmbovița's Large Gorges, Cheia Gorges, Cheița Gorges (ALEXIU V., 1998; DIACONESCU Florița, 1971; NEBLEA Monica, 2007; UDUDEC R.V., POP O., 2006), Iezer-Păpușa Mountains: Dâmbovița's Small Gorges (ALEXIU V., 1998), Leoata Mountains: Bădenilor Valley (NEBLEA Monica, 2007; ALEXIU, 2008), Făgăraș Mountains: Negoiu peak (SĂVULESCU TR. (coord. pp.), 1952–1976).

***Campanula patula* L.** subsp. ***abietina* (Griseb.) Simonk.** (*Campanula abietina* Griseb.)

European area: E. & S. Carpathians, and mountains of Transylvania and N. part of Balkan peninsula

Frequency in Romania: Frequently

IUCN Category: LR. Subendemic

Located in Arges: Piatra Craiului Massif: Dâmbovicioara Gorges, Brusturetului Gorges (POP O., 2006; SÂRBU Anca (coord.), et al., 2007), Dâmbovița Valley (DANCIU M., POP O., INDREIA A., 2006), Râiosu-Buda Mountains, toward Buda Lake (STANCU Ileana Daniela, 2005), Ghimbav Mountains: Rudăriței Gorges, Cheia Gorges, Secări (NEBLEA Monica, 2007), Dâmbovița's Large Gorges (POP O., 2006; SÂRBU Anca (coord.), et al., 2007), Mateiaș Mountain (SĂVULESCU TR. (coord. pp.), 1952–1976), Iezer-Păpușa Mountains: Păpușa, Bahna Rusului, Bătrâna

Valley, Grădișteanu, Cottage Voina, Meadow Sântilii, Iezerului Valley, Colților Valley, Colții lui Andrei Mari (GRECESCU D., 1898; ALEXIU V., 1998; ALEXIU, 2008), Leoata Mountains: Românescu Mountain, Tâncava Mountain, Marginea Domnească, Bădenilor Valley, Leaota Ridge (NEBLEA Monica, 2007; ALEXIU, 2008), Vâlsanului Valley (SANDA V., BARABAȘ N., ȘTEFĂNUȚ S., 2004), Făgăraș Mountains: Zârna, Paltina (SĂVULESCU TR. (coord. pp.), 1952–1976).

***Campanula transsilvanica* Schur**
European area: Bu Rm
Frequency in Romania: Occasionally
IUCN Category: VU
Located in Arges: Râiosu Mountain, Râiosului Ledge, Capra Budei (BUIA AL., TODOR I., 1948; Buia Al., colab., 1946–1947; STANCU Ileana Daniela, 2005), Făgăraș Mountains: Negoiu Peak (Săvulescu Tr. (coord. pp.), 1952–1976).

***Campanula crassipes* Heuffel**
European area: Rm Sb
Frequency in Romania: Rare
IUCN Category: NT
Located in Arges: Ghimbav Mountains: Zacotelor ledge (Diaconescu Florița, 1972).

Campanula serrata* (Kit.) Hendrych (Campanula pseudolanceolata* Pant.; *Campanula napuligera* Schur)
European area: Cz Po Rm Rs (W)
Frequency in Romania: Frequently
IUCN Category: LR
Located in Arges: Piatra Craiului Massif: Dâmbovicioara (ALEXIU V., 1998; POP O., 2006), Brusturetului Gorges (POP O., 2006; SÂRBU Anca (coord.), et al., 2007), Iezer-Păpușa Mountains: Tămașu Mountain, Jupâneasa Mountain, Roșu Mountain, Iezeru Mic Mountain, Iezerului Valley, Piatra Nămăeștilor, Groapele, Mogoș Valley, Comisu Mountain (ALEXIU V., 1998; Săvulescu Tr. (coord. pp.), 1952–1976; ALEXIU, 2008), Ghimbav Mountains: Dâmbovița's Large Gorges (POP O., 2006; SÂRBU Anca (coord.), et al., 2007), Leoata Mountains: Leaota Ridge, Românescu Mountain, Tâncava Mountain (DIACONESCU Florița, 1971; DIACONESCU Florița, 1972; NEBLEA Monica, 2007), Bândea Mountain, Ghițu Mountain, Făgăraș Mountains: Negoiu Peak (SĂVULESCU Tr. (coord. pp.), 1952–1976).

***Campanula kladniana* (Schur) Witasek** (*Campanula rotundifola* L. subsp. *kladniana* (Schur)Tacik)
European area: Rm
Frequency in Romania: Occasionally
IUCN Category: NT
Located in Arges: Râiosu-Buda Mountains (BUIA AL., TODOR I., 1948; STANCU Ileana Daniela, 2005), Ghimbav Mountains: Crovului Gorges

(DIACONESCU Florița, 1971), Piatra Craiului Massif: Dâmbovicioara Valley (SĂVULESCU Tr. (coord. pp.), 1952–1976); Iezer-Păpușa Mountains (Alexiu V., 1998).

***Symphyandra wanneri* (Rochel) Heuffel**
European area: Bu Ju Rm
Frequency in Romania: Occasionally
IUCN Category: NT
Located in Arges: Râiosu-Buda Mountains: Buda Lake (STANCU Ileana Daniela, 2005; Săvulescu Tr. (coord. pp.), 1952–1976), Piscu Negru (ALEXIU, 2008); Vidraru Lake (STANCU Ileana Daniela, 2003).

***Phyteuma tetramerum* Schur**
European area: Rm Rs (W)
Frequency in Romania: Occasionally
IUCN Category: NT, Carpathians endemic
Located in Arges: Râiosu-Buda Mountains (BUIA AL., TODOR I., 1948; STANCU Ileana Daniela, 2005), Piatra Craiului Massif: Dâmbovicioara (DIACONESCU Florița, 1971; POP O., 2006; SÂRBU Anca (coord.), et al., 2007; Săvulescu Tr. (coord. pp.), 1952–1976; MIHĂILESCU Simona, 2003); Podul Dâmboviței (BORZA Al., 1946), Ghimbav Mountains: Colții lui Dumitru (DIACONESCU Florița, 1970); Crovului Gorges (ALEXIU V., 1998).

***Phyteuma confusum* A. Kerner** (*Phyteuma hemisphaericum* L. subsp. *confusum* (A.Kern.) Nyman; *Phyteuma nanum* Schur, nom. nud.)
European area: Al Au Bu Ju Rm
Frequency in Romania: Occasionally
IUCN Category: NT
Located in Arges: Iezer-Păpușa Mountains: Bătrâna Mountain, Iezeru Mic Mountain, Iezerului Valley, Colții lui Andrei Mari, (STANCU R., ALEXIU V., BOȘCAIU N., 1993; ALEXIU V., 1998), Păpușa, Oticu (GRECESCU D., 1898), Râiosu-Buda Mountains (BUIA AL., TODOR I., 1948; STANCU Ileana Daniela, 2005; SĂVULESCU Tr. (coord. pp.), 1952–1976); Leoata Mountains: Românescu Mountain, Tâncava (BUIA Al., colab., 1946–1947; POP O., 2006; ALEXIU, 2008), Făgăraș Mountains: Bândea Peak, Zârna Peak, Podeanu Mountain, Negoiu Peak, Capra Budei (SĂVULESCU Tr. (coord. pp.), 1952–1976); Piatra Craiului Massif (MIHĂILESCU Simona, 2003).

Conclusions

– The 12 species are classified in three sozological categories:

LR	VU	NT
2	1	6

– Vulnerable species is *Campanula transsilvanica* Schur;

– Species with low risk of vulnerability are: *Campanula serrata* (Kit.) Hendrych and *Campanula patula* L. subsp. *abietina* (Griseb.) Simonk.

– The coenotaxonomical classification of the endangered plants in the family Campanulaceae:

I. ASPLENIETEA TRICHOMANIS (Br.-Bl. in Meier *et* Br.-Bl. 1934) Oberdorfer 1977

TORTULO-CYMBALARIETALIA Segal 1969

Cymbalario-Asplenion Segal 1969 em. Mucina 1993

– *Asplenietum trichomano-rutae-murariae* Kuhn 1937, Tx. 1937
  - *Campanula carpatica* Jacq.

Cystopteridion Richard 1972

– *Asplenio-Cystopteridetum fragilis* Oberd. (1936) 1949
  - *Campanula carpatica* Jacq.

– *Asplenio quadrivalenti – Poëtum nemoralis* Soó ex Gergely *et al*. 1966
  - *Campanula carpatica* Jacq.

– *Asplenio – Poëtum nemoralis* Boșcaiu 1971 *veronicetosum bachofenii* (Borza 1959) Boșcaiu 1971
  - *Symphyandra wanneri* (Rochel) Heuffel

– *Thymo pulcherrimi – Poëtum rehmanii* Coldea (1986) 1990
  - *Campanula kladniana* (Schur) Witasek

ANDROSACETALIA VANDELII Br.-Bl. in meier *et* Br.-Bl. 1934

Asplenion septentrionalis Oberdorfer 1938

– *Asplenio – Poëtum nemoralis* Boșcaiu 1971 *veronicetosum bachofenii* (Borza 1959) Boșcaiu 1971
  - *Symphyandra wanneri* (Rochel) Heuffel

Silenion lerchenfeldianae

– *Senecio glaberrimi – Silenetum lerchenfeldianae* Boșcaiu, Täuber, Coldea 1977
  - *Campanula kladniana* (Schur) Witasek

– *Sileno lerchenfeldianae – Potentilletum haynaldianae* (Horvat, Pawl. *et* Walas 1937) Simon 1958
  - *Symphyandra wanneri* (Rochel) Heuffel

ARTEMISIETALIA PETROSAE Sanda*et al.* 2001

Gypsophilion petraeae Borhidi *et* Pócs 1957

– *Saxifrago luteoviridis – Silenetum zawadzkii* Pawl. *et* Walas 1949
  - *Campanula carpatica* Jacq.
  - *Campanula kladniana* (Schur) Witasek

– *Artemisio petrosae – Gypsophiletum petraeae* Pușcaru *et al*. 1956
  - *Campanula carpatica* Jacq.
  - *Campanula kladniana* (Schur) Witasek

– *Saxifrago moschatae – Drabetum kotschyi* Puşcaru *et al.* 1956
  • *Campanula carpatica* Jacq.
– *Saxifrago rochelianae – Gypsophiletum petraeae* Boşcaiu, Täuber, Coldea 1977
  • *Campanula kladniana* (Schur) Witasek
– *Saxifrago demissae – Gypsophiletum petraeae* Boşcaiu *et* Täuber 1977
  • *Campanula kladniana* (Schur) Witasek

Micromerion pulegii Boşcaiu (1971) 1979
– *Campanuletum crassipedis* Borza ex Schneider-Binder *et al.* 1970
  • *Campanula crassipes* Heuffel

II. THLASPIETEA ROTUNDIFOLII Br.-Bl. 1926

THLASPIETALIA ROTUNDIFOLII Br.-Bl. 1926
Achnatherion calamagrostis Br.-Bl. 1918
– *Thymo comosi – Galietum albi* Sanda, Popescu 1999
  • *Campanula carpatica* Jacq.

III. JUNCETEA TRIFIDI Klika et Hadač

CARICETALIA CURVULAE Br.-Bl. in Br.-Bl. *et* Jenny 1926
Caricion curvulae Br.-Bl. in Br.-Bl. *et* Jenny 1926
– *Primulo minimae-Caricetum curvulae* Br.-Bl. 1926 em. Oberdorfer 1957
  • *Phyteuma confusum* A. Kerner
– *Potentillo chrysocraspedae-Festucetum airoidis* Boşcaiu 1971
  • *Campanula serrata* (Kit.) Hendrych
  • *Phyteuma confusum* A. Kerner
– *Oreochloo – Juncetum trifidi* Szafer *et al.* 1927
  • *Phyteuma confusum* A. Kerner

Loiseleurio-Vaccinion Br.-Bl. 1926
– *Cetrario – Loiseleurietum procumbentis* Br.-Bl. *et al.*1939
  • *Phyteuma confusum* A. Kerner
– *Empetro-Vaccinietum gaultherioidis* Br.-Bl. in Br.-Bl. *et* Jenny 1926 corr. Graebherr in Graebherr *et* Mucina 1993
  • *Phyteuma confusum* A. Kerner

IV. NARDO-CALLUNETEA Preising 1949

NARDETALIA Oberdorfer 1949
Potentillo-Nardion Simon 1959
– *Scorzonero roseae – Festucetum nigricantis* (Puşcaru *et al.* 1956) Coldea 1978
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych
– *Violo declinatae – Nardetum* Simon 1966
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych
– *Poëtum mediae* Csürös *et al.* 1956
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

Genistion pillosae Duvigneaud Büker 1942
– *Vaccinio – Callunetum vulgaris* Bük. 1942
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych

V. SESLERIETEA ALBICANTIS Br.-Bl. 1948 em.Oberdorfer 1978

SESLERIETALIA ALBICANTIS Br.-Bl. in Br.-Bl. *et* Jeny 1926

Seslerion rigidae Zólyomi 1939

– *Seslerietum filifoliae* Zólyomi 1939

• *Campanula crassipes* Heuffel

VI. MULGEDIO-ACONITETEA Hadač et Klika in Klika 1948

ADENOSTYLETALIA ALLIARIAE Br.-Bl. 1931

Adenostylion alliariae Br.-Bl. 1925

– *Cirsio waldsteinii – Heracleetum transsilvanici* Pawl. *et* Walas 1949

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

– *Adenostylo-Doronicetum austriaci* Horvat 1956

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

– *Salici – Alnetum viridis* Colic *et al.* 1962

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

Calamagrostion villosae Pawlowski *et al.* 1928

– *Triseto fusci – Salicetum hastatae* Coldea (1986) 1990

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

VII. QUERCO-FAGETEA Br.-Bl. et Vlieger in Vlieger 1937 em. Borhidi 1996

QUERCETALIA ROBORIS R. Tüxen 1931

Pino-Quercion Medweka-Kornás *et* Pawlowski 1959, Ružička 1964 em. Soó 1971

– *Leucobryo – Pinetum* Matusz 1962

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

VIII. ERIKO-PINETEA I. Horvat 1959

ERIKO-PINETALIA I. Horvat 1959

Seslerio rigidae-Pinion Coldea 1991

– *Juniperetum sabinae* Csürös 1958

• *Campanula serrata* (Kit.) Hendrych

– *Carici humilis-Pinetum banatici* Popescu *et* Sanda 1999

• *Campanula kladniana* (Schur) Witasek

IX. VACCINIO-PICEETEA Br.-Bl. in Br.-Bl. *et al.* 1939

PICEETALIA EXCELSAE Pawlowski in Pawlowski *et al.* 1928

Piceion excelsae Pawlowski in Pawlowski *et al.* 1928

Soldanello majori-Picenion Coldea 1991

– *Hieracio transsilvanici-Piceetum* Pawlowski *et* Br.-Bl. 1939

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

– *Doronico columnae-Piceetum* Coldea 2002

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

ATHYRIO-PICEETALIA Hadač 1962

Chrysanthemo rotundifolii-Piceion (Krajina 1933) Březina *et* Hadač in Hadač 1962

– *Leucanthemo waldstenii-Piceetum* Krajina 1933

• *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

Rhododendro – Vaccinion Br.-Bl. ex G. Br.-Bl. *et* Br.-Bl. 1931

– *Rhododendro myrtifolii-Vaccinietum* (Borza 1959) Boșcaiu 1971
  • *Campanula kladniana* (Schur) Witasek
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych

JUNIPERO – PINETALIA Boșcaiu 1971

Pinion mugi Pawlowski 1928

– *Rhododendro myrtifolii–Piceetum* Coldea *et* Pânzaru 1986
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
– *Rhododendro myrtifolii-Pinetum mugi* Borza 1959 em. Coldea 1985
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
– *Bruckenthalio-Piceetum* Borhidi 1969
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
– *Saxifrago cuneifoliae-Laricetum* (Beldie 1969) Coldea 1991
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai

Junipero – Bruckenthalion Horvat 1936

– *Junipero – Bruckenthalietum* Horv. 1936 *daphnetosum blagayanae* Onete 2002
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
– *Campanulo abietinae-Juniperetum* Simon 1966
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych
– *Campanulo abietinae – Vaccinietum* (Buia *et al*. 1962) Boșcaiu 1971
  • *Campanula patula* L. subsp. *abietina* (Griseb.) Simonkai
  • *Campanula serrata* (Kit.) Hendrych

REFERENCES

1. Alexiu, V., 2008, *Cormoflora județului Argeș*, Ed. Ceres, București, 332 pp.
2. Alexiu, V., 2008, Fitotaxoni amenințați la nivel global, european și național, identificați în județul Argeș, *Ecos*, Pitești, **20**.
3. Alexiu, V., 2011, C*ategorii sozologice din cormoflora județului Argeș*, Ed. „Paralela 45", Pitești.
4. Alexiu, V., Stancu, D., Chirițoiu, M., 2011, *Arii protejate din județul Argeș*, Ed. Universității din Pitești.
5. Alexiu, V., Stancu, D. I., 2003, Considerații privind vegetația județului Argeș. *Argesis. Studii și comunicări***,** Pitești, **XI**: 63–84.
6. Boșcaiu, N., Coldea, Gh., Horeanu, C., 1994, Lista rosie a plantelor vasculare dispărute, periclitate, vulnerabile și rare din flora României, *Ocrotirea Naturii și a Mediului înconjurător*, București, **38** (1): 45–56.
7. Chirițoiu, M., 2005, Particularități ecologice ale megaforbietelor din județul Argeș, *Acta Universitatis Cibiniensis, Seria Științe Agricole*, vol.**1**, nr. 1(5), Ed. Univ. „Lucian Blaga", Sibiu: 77–86.
8. Ciocârlan, V., 2009, *Flora ilustrată a României*. *Pteridophyta* et *Cormophyta*, Ed. Ceres, București.
9. Dihoru, Gh., Pârvu, C., 1987, *Plante endemice în flora României*, Ed. Ceres, București, 183 pp.
10. Mihăilescu, S., 2003, Protected plant species and fragile habitats of Piatra Craiului Massif Flora, *Research in Piatra Craiului National Park*, Ed. Phoenix, Brașov: 119–129.
11. Mihăilescu, S., 2001, *Flora și vegetația Masivului Piatra Craiului,* Ed. Vergiliu, București, 400 pp.
12. Neblea, M., 2007, *Flora și vegetația Munților Leaota și al sectorului vestic al Munților Bucegi*, Teză de doctorat, București.
13. Oltean, M., Neagrean, G., Popescu, A., Roman, N., Dihoru, G., Sanda, V., Mihăilescu, S., 1994, Lista Roșie a plantelor superioare din România, *Inst. de biologie, Studii, sinteze, documentații de ecologie*, București, **1**: 1–52.
14. Oprea, A., 2005, *Lista critică a plantelor vasculare din România*. Ed. Univ. „Al. I. Cuza", Iași, 668 pp.
15. Pop, O., 2006, *Identification of important plant areas (IPAs) within Piatra Craiului National Park*, Research in Piatra Craiului National Park, Ed. Universității Transilvania, Brașov, **II**: 108–133.
16. Sanda, V., colab., 1998, Conspectul cormofitelor spontane din România. *Acta Horti Bot*, București: 3–336.
17. Sanda, V., Vicol, I., Ștefănuț, S., 2008, *Biodiversitatea ceno-structurală a învelișului vegetal din România*, Ed. Ars Docendi, București.

18. Săvulescu, Tr. (coord.), 1952–1976, *Flora R.P.R.-R.S.R.*, **I–XIII**, Ed. Academiei Române.
19. Sârbu, A. (coord.), et al., 2007, *Arii speciale pentru protecția și conservarea plantelor în România*, Ed. "Victor B Victor", București.
20. Stancu, D. I., 2005, *Flora și vegetația Munților Râiosu și Buda, Masivul Făgăraș*, Ed. Universității din Pitești, 226 pp.
21. Stancu, D. I., Alexiu, V., 1995, Conspectul sistematic al florei din Munții Râiosu și Budei (Masivul Făgăraș), *Naturalia, St. Cerc.*, Muz. Jud. Argeș, Pitești, **1**: 63–75.
22. Witkowski, Z.J., Król, W., Solarz, W. (eds.), 2003, *Carpathian List of Endangered Species. WWF and Institute of Nature Conservation*, Polish Academy of Sciences. Viena, Krakow. Europress Krakow.
23. * * * MONITORUL OFICIAL AL ROMÂNIEI nr. 625 din 4 decembrie 2000. Guvernul României. Regimul ariilor naturale protejate în România. Ordonanța de Urgență nr. 236 din 24 noiembrie 2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și faunei sălbatice.
24. http://mybiosis.info/nature/portal.php?pagename=firstpage&status=justlogged

CATEGORII DE PLANTE PERICLITATE DIN FAMILIA CAMPANULACEAE, INCLUSE ÎN LISTA ROȘIE A JUDEȚULUI ARGEȘ
(Rezumat)

Lucrarea își propune să prezinte speciile de plante din familia Campanulaceae, din Lista Roșie a județului Argeș, aflate în diferite grade de vulnerabilitate. Cele 9 specii identificate sunt încadrate în trei categorii sozologice: vulnerabile (VU), cu risc scăzut de dispariție (LR) și neevaluate (NT). Investigațiile au fost efectuate în cadrul Proiectului „Studiu corologic al categoriilor sozologice din flora județului Argeș pentru refacerea fitopopulațiilor periclitate prin metode convenționale și biotehnologice de înmulțire".

Fig. 1: *Campanula carpatica* Jacq.

Fig. 2: ***Campanula serrata*** **(Kit.) Hendrych**

Fig. 3: ***Phyteuma confusum*** **A. Kerner**

THE MEDICINAL FLORA OF MUREȘ COUNTY REFLECTED IN MUREȘ COUNTY MUSEUM, NATURAL SCIENCE DEPARTMENT COLLECTIONS

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Abstract: The patrimony of Mureș County Museum, Natural Science Department contain numerous collections whose documentary and scientific value is undisputed. Botanical collection of the museum comprises approximately 20000 pieces from field researches, donations and purchases. Among these species, medicinal plants have a remarkable share.

The objective of this study is to present the medicinal plants of museum's collection, collected from Mureș County, in order to complete the floristic inventory of this area and thus have a clearer picture of the floristic diversity of the vegetation cover and its evolution.

The inventory of medicinal flora present in the collections of Mureș County Museum, Natural Science Department has led to the identification of 302 taxa containing certain therapeutic chemical compounds. The taxa were enrolled in 69 families. The best represented families are Lamiaceae (31 species), Asteraceae (27 species), Rosaceae (23 species), Apiaceae and Scrophulariaceae (18 species each) and Fabaceae (17 species).

Medicinal plants were grouped by dominant active principles they are used in traditional medicine, namely phytotherapy. Thus, we see that the largest plants contain alkaloids (16.89%), essential oils (13.25%), tannins (11.59%), flavonoids (11.26%), saponins (7.62%), mucilage (6.95%), and coumarin (4.97%).

Keywords: medicinal plants, active principles, Mureș County Museum collections

Introduction

The objective of this study is to present the species of medicinal plants from the museum's collection, collected from Mureș County, in order to complete the floristic inventory of the area and thus have a clearer picture of the floristic diversity of the vegetation cover and its evolution.

Aromatic and medicinal plants are an inexhaustible source of raw materials for food industry, pharmaceutical industry, etc. Mankind has used natural resources since its early history.

Romania's resources in this area are very diverse. 3700 species vegetate in the wild flora, of which 800 species have defined phytotherapeutical properties, and 370 species have well-known attributes with pharmacodynamic effects.

Medicinal plants are an important natural wealth of Mureș County. Establishment of plant gene pool of therapeutic interest can be achieved by plant inventory by location, as it plays the correct territorial spread of medicinal plants, in conjunction with various phytocenosis to which they belong and with ecological factors.

Studies on medicinal spontaneous flora in Mureș county led to the identification of 304 species of medicinal plants [11].

The patrimony of the Division of Natural Sciences at the Mureș County Museum includes many collections, whose scientific and documentary value is undisputed. Botanical collection of the museum comprises approximately 20,000 pieces from field research, donations and purchases. Among these pieces, medicinal species have a remarkable share.

Mureș County is located in north-central Romania, with an area of 6696 km^2. It has a varied landscape, with differentiated climate on altitude, from the abundance of rainfall in the mountains to the arid steppe of the Transylvanian Plain.

The mountainous area is represented by Călimani and Gurghiului Mountains. Călimanilor mountainous cones are composed of andesite, and volcanic plateaus, formed of agglomerates, are covered with mountain pastures with small marshy areas. In the Gurghiului Mountains, volcanic cones seem intertwined, plateaus are wider and smooth. The narrow Mureș Gorge, with very close slopes, is the largest section through the volcanic chain in Eastern Transylvanian Basin.

The transition from the mountains to Transylvania Plateau is through hilly and lowland regions.

Târnavelor Plateau is a hilly plateau, slightly curled, with cuesta landforms and asymmetrical slopes, affected by landslides, characterized by the presence of gas domes.

Transylvanian Plain, north of Mureș, appears as a geographical region with original features which confers it a touch of distinction. The landscape is characterized by a series of hills at an average altitude of 400 m, with depressions which reach over 200 m from the local base, valleys carved in clay, marl and Sarmatian sands, rare volcanic tuffs with eroded flanks and muddy flows, landslides that sometimes cross rivers, forming lakes that today are arranged in large ponds. Coastal slopes have usually western or southern orientation.

From a climate perspective, Mureș county lies in the temperate continental climate, of interference between the hills and the mountains. Annual average temperatures have values of 8 and 9 ° C in the west and between 2–4 º C in the east. Term average precipitation ranges from 550 mm / year and 1000 to 1200 mm / year. Prevailing winds are from the west and north-west, with medium intensity and frequency.

From the highest peaks of the mountains and down to the low plains of the rivers, we meet a wide range of regional, intrazonal and azonal soils.

Mountain brown, yellowish brown podzolic or brown acid alpine meadows, acid brown forest and podzolic feriiluvial soils are specific to the mountainous areas and young soils of scree and also skeletal soils are specific to the slopes.

In hilly and plateau area, most common are dark brown forest soils, sometimes clay-illuviated, podzolic clay-illuviated pseudogleizated, brown chernozem forest soils, erosion and colluvial soils at the slopes base.

In the Transylvanian Plain region, forest brown soils predominate, especially chernozems leachates, wet meadow black soils, yellowish coastal and eroded soils, chernozem levigated wet freatic and groundwater leachate and humic gley [15].

Material and methods

Inventory was done according to the dominant active principles in the species analyzed.

1555 herbarium sheets of plants belonging to 69 families were processed.

Within families, the plants were inventoried in alphabetical order of genres, and within genres, in the alphabetical order of the species.

Plant nomenclature was revised in accordance with Flora Europaea [17,18] and Ciocârlan V. [2].

The specified data are mentioned for each species: date and place of collection, the name of whom collected it and of whom determined the plant. In brackets are also mentioned the inventory numbers of the herbarium sheets included in inventory registries Superior Plants (I, II and III) of the Department of Natural Sciences.

Results and discussions

Botanical collection of the museum comprises about 20,000 pieces from field research, donations and purchases.

Inventory of medicinal flora of Mureș County present in the collections of the Division of Natural Sciences has led to the identification of 302 taxa containing certain therapeutic chemical compounds, grouped in 69 families. The best represented families are: Lamiaceae (31 species), Asteraceae (27 species), Rosaceae (23 species), Apiaceae and Scrophulariaceae (18 species each) and Fabaceae (17 species).

Medicinal plants were grouped according to the dominant active ingredients for which they are used in traditional medicine or in phytotherapy (Table 1). Thus, we see that the numerous plants contain: alkaloids (16.89%), essential oils (13.25%), tannins (11.59%), flavonoids (11.26%), saponins (7.62%), mucilage (6.95%), and coumarin (4.97%). Today's special interest worldwide for herbal medicine, in which phytotherapy occupies a privileged place, can sometimes have negative repercussions for the conservation of plant species of wild flora, species that are included in national or European red lists.

In the museum's collections are found a number of medicine taxa, in various degrees of endangerment, such as: *Aconitum moldavicum, Adonis vernalis, Alcea pallida, Angelica archangelica, Dictamnus albus, Galanthus nivalis, Leucojum vernum, Lycopodium clavatum, Orchis morio, Prunus tenella* etc.

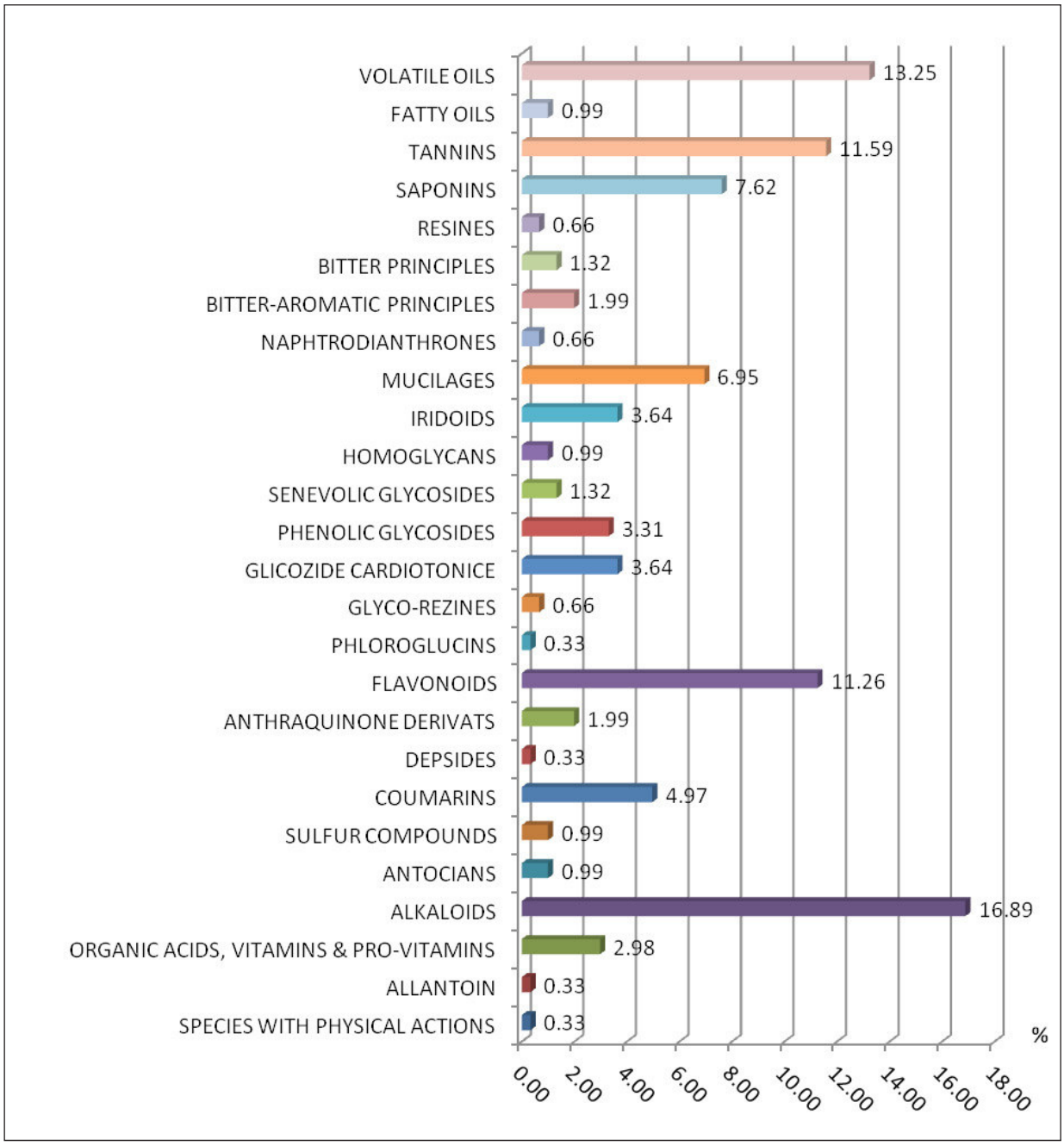

Fig. 1: The analysis of studied taxa by dominant active ingredients

Table 1: The dominant active principles of Mureș county spontaneous medicinal plants identified in museum's collections

THE DOMINANT ACTIVE PRINCIPLES	FAMILY	TAXA	COLLECTING DATA
SPECIES WITH PHYSICAL ACTIONS	LYCOPODIACEAE	*Lycopodium clavatum* L.	Săcădat, 14.04.1936, Nagy Ödön (7996)
HOMOGLYCANS	ASTERACEAE	*Arctium lappa* L.	Târgu-Mureș, at the border of Sântana de Mureș, 12.08.1939, Nagy Ödön (2689) Sântana de Mureș, 12.08.1939, Nagy Ödön (2690)
	CUCURBITACEAE	*Bryonia alba* L.	Târgu-Mureș, 07.07.1947, Nagy Ödön (2740) Târgu-Mureș, 14.06.1944, Nagy Ödön (2741)
	POACEAE	*Elymus repens* (L.) Gould (*Agropyron repens* (L.) Beauv.)	Târgu-Mureș, Mureșeni Forest, 02.06.1943, Nagy Ödön (1808) Târgu-Mureș, Beșa, 19.06.1942, Nagy Ödön (1809) Târgu-Mureș, 14.06.1942, Nagy Ödön (1810) Târgu-Mureș, 15.06.1946, Nagy Ödön (1811) Târgu-Mureș, 22.06.1938, Nagy Ödön (1812) Târgu-Mureș, Kali spring, 1939, Nagy Ödön (1813) Sângeorgiu de Mureș, 21.06.1943, Nagy Ödön (1814) Târgu-Mureș, toward Platoul Cornești, 18.06.1944, Nagy Ödön (1815) Târgu-Mureș, Platoul Cornești, 10.06.1948, Nagy Ödön (1816) Târgu-Mureș, 12.06.1942, Nagy Ödön (1817) Târgu-Mureș, toward Platoul Cornești, 10.06.1948, Nagy Ödön (1818) Târgu-Mureș, 17.07.1937, Nagy Ödön (1819)
MUCILAGES	MALVACEAE	*Alcea pallida* (Willd.) W. et K. (syn. *Althaea pallida* Willd.)	Târgu-Mureș, airport, 29.08.1941, Nagy Ödön (697, 698, 699)
	MALVACEAE	*Althaea officinalis* L.	Târgu-Mureș, Pocloș stream bank, 01.09.1953, Nagy Ödön (700) Târgu-Mureș, "Dâmbul cu Comoară", 350 m altit., 27.09.1938, Nagy Ödön (701) Târgu-Mureș, toward Sângeorgiu de Mureș, 07.09.1951, Nagy Ödön (702) Târgu-Mureș, on the border of Mureșeni, 308 m altit., 13.09.1937, Nagy Ödön (703) Târgu-Mureș, "Râtul cu scoici", 309 m altit., 21.07.1940, Nagy Ödön (704) Târgu-Mureș, Mureș river shore, 06.07.1950, Nagy Ödön (705) Târgu-Mureș, Pocloș stream bank, 24.07.1939, Nagy Ödön (706) Târgu-Mureș, Corunca park, 340 m altit., 03.06.1939 (707) Târgu-Mureș, Mureș river shore, 01.10.1958, Nagy Ödön (4590) Vidrasău, Mureș river shore, 19.06.1992, Silvia Oroian (7847)

	BORAGINACEAE	*Anchusa officinalis* L.	Târgu-Mureș, 21.06.1942, Nagy Ödön (359) Târgu-Mureș, Mureș river shore, 311m altit., 03..06.1938, Nagy Ödön (360) Târgu-Mureș, Platoul Cornești, 480 m altit., 03.05.1935, Nagy Ödön (361) Târgu-Mureș, near Beșa forest, 03.06.1951, Nagy Ödön (362) Târgu-Mureș, Mureș dam, 310 m altit, 24.05.1939, Nagy Ödön (363) Târgu-Mureș, 11.06.1942, Nagy Ödön (364) Băgaciu, 1872 (5442) Reghin, 02.05.2000, Mihaela Sămărghițan (11208)
	ASTERACEAE	*Antennaria dioica* (L.) Gaertner	Târgu-Mureș, 1939, Nagy Ödön (2678, 2687) Băgaciu, 1872 (5421)
	BORAGINACEAE	*Borago officinalis* L.	Sângeorgiu de Mureș, 06.07.1955, Nagy Ödön (367)
	MALVACEAE	*Hibiscus trionum* L.	Târgu-Mureș, Platoul Cornești, 380 m altit., 05.08.1947, Nagy Ödön (693) Târgu-Mureș, Platoul Cornești, 450 m altit., 27.09.1937, Nagy Ödön (694) Târgu-Mureș, Platoul Cornești, 380 m altit., 24.09.1948, Nagy Ödön (695)
	MALVACEAE	*Lavatera thuringiaca* L.	Târgu-Mureș, Budiu Hill, 350 m altit., 01.09.1937, Nagy Ödön (688) Porumbeni, 20.08.1947, Nagy Ödön (689, 690) Târgu-Mureș, Mureș river shore, 26.09.1951, Nagy Ödön (691) Târgu-Mureș, 24.06.1950, Nagy Ödön (692) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5793, 5806) Zau de Câmpie, the hill near reserve, 12.07.1991, Silvia Oroian (7849) Reghin, 11.07.2000, Mihaela Sămărghițan (11251)
	LINACEAE	*Linum catharticum* L.	Târgu-Mureș, 1 Mai Hill, 16.06.1936, Nagy Ödön (1626) Băgaciu, 1872 (5441) Săbed, Corhan Hill, northern slope, 29.05.1981, Silvia Oroian (7863) Sântana de Mureș, orchard, 05.06.1990, Silvia Oroian (7864)
	LINACEAE	*Linum flavum* L.	Târgu-Mureș, Platoul Cornești, 10.05.1937, Nagy Ödön (1628) Târgu-Mureș, Platoul Cornești, 12.06.1936, Nagy Ödön (1629) Târgu-Mureș, Platoul Cornești, 17.06.1944, Nagy Ödön (1630) Târgu-Mureș, the base of Halmok Hill, 10.06.1939, Nagy Ödön (1631) Zau de Câmpie, 12.07.1991, Silvia Oroian (7860)
	LINACEAE	*Linum hirsutum* L.	Târgu-Mureș, the base of Halmok Hill, 27.09.1938, Nagy Ödön (1627) Lechința de Mureș, landslides, 02.07.1985, leg. Sarkany Andrei, det. Silvia Oroian (7862)
	LINACEAE	*Linum usiatissimum* L.	Porumbeni, 26.07.1948, Nagy Ödön (1632, 1633) Porumbeni, 25.08.1947, Nagy Ödön (1634)

	MALVACEAE	*Malva sylvestris* L.	Târgu-Mureș, Budiu Hill, 450 m altit., 26.05.1936, Nagy Ödön (686) Târgu-Mureș, plough land, 300 m altit., 28.08.1936, Nagy Ödön (687) Târgu-Mureș, the base of Mare Hill, 12.06.1956, Nagy Ödön (4573) Băgaciu, 1872 (5431) Vidrasău, Mureș river shore, 19.06.1992, Silvia Oroian (7848)
	ORCHIDACEAE	*Orchis morio* L.	Târgu-Mureș, 350 m altit., 18.05.1938, Nagy Ödön (493) Târgu-Mureș, Platoul Cornești 450 m altit, 14.05.1939, Nagy Ödön (494) Târgu-Mureș, 350 m altit., 11.05.1937, Nagy Ödön (495) Băgaciu, 1886 (5499) Zau de Câmpie, 06.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5678) Deda Bistra, Scaunul Domnului, 15.06.1960, leg. Konya Istvan, det. Silvia Oroian (55752) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7520) Gurghiu, the hill near Poiana Narciselor, 06.06.1991, Silvia Oroian (7690) Gurghiu, pasture, 04.05.1991, Silvia Oroian (7700) Răstolița, Podirei, 18.05.1995, leg. Silvia Oroian, det. Mihaela Sămărghițan (11134) Răstolița, Podirei, 02.06.1995, leg. Silvia Oroian, det. Mihaela Sămărghițan (11135)
	PLANTAGINACEAE	*Plantago arenaria* W. et K. (syn. *Plantago psyllium* L.)	Târgu-Mureș, Medicinal Plants Garden of UMF, 10.07.1952
	PLANTAGINACEAE	*Plantago lanceolata* L.	Sângeorgiu de Mureș, 03.07.1950, Nagy Ödön (556) Târgu-Mureș, Platoul Cornești, 16.06.1948, Nagy Ödön (557) Târgu-Mureș, Mare Hill, 03.07.1948, Nagy Ödön (558) Târgu-Mureș, "Râtul cu scoici", 316 m altit., 23.07.1947, Nagy Ödön (559) Târgu-Mureș, "Râtul cu scoici", 316 m altit., 23.06.1947, Nagy Ödön (560) Porumbeni, 21.07.1946, Nagy Ödön (561) Sângeorgiu de Mureș, 21.06.1943, Nagy Ödön (562) Sângeorgiu de Mureș, salty baths, 21.07.1956, Nagy Ödön (563) Fărăgău Lake, 03.06.1976, Sarkany A. (5851) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7676) Răstolița, Podirei, 20.06.1993, Silvia Oroian (11153) Răstolița, 26.09.1993, Silvia Oroian (11154) Răstolița, 01.08.1993, Silvia Oroian (11155) Stânceni, Leu Mountain, 1995, Silvia Oroian (11156) Răstolița, 01.08.1993, Silvia Oroian (11157)
	PLANTAGINACEAE	*Plantago major* L.	Bedeni, 30.05.1939, Nagy Ödön (564) Târgu-Mureș, airport, 28.08.1941, Nagy Ödön (565)

	PLANTAGINACEAE	*Plantago media* L.	Târgu-Mureș, 15.05.1937, Nagy Ödön (566) Târgu-Mureș, plough land, 300 m altit., 12.05.1936, Nagy Ödön (567) Sânpaul, 27.05.1939, Nagy Ödön (568) Târgu-Mureș, Platoul Cornești, 05.06.1943, Nagy Ödön (569) Târgu-Mureș, Mare Hill, 380 m altit., 03.07.1948, Nagy Ödön (570) Târgu-Mureș, 250 m altit., 23.05.1939, Nagy Ödön (571) Porumbeni, 22.08.1946, Nagy Ödön (575) Zau de Câmpie, 06.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5699) Sângeorgiu de Mureș, 07.1959, Konya Istvan (5881) Răstolița, podirei, 26.09.1993, Silvia Oroian (11158) Bistra Mureșului, 30.05.1993, Silvia Oroian (11159) Stânceni-Meștera, Leu Mountain, 09.06.1996, Silvia Oroian (11160) Meștera, Gurghiu Mountains, 04.06.1995, leg. Florentina Togănel, det. Silvia Oroian (11161) Stânceni, Ciobotani, 18.05.1995, Silvia Oroian (11162)
	BRASSICACEAE	*Sinapis alba* L.	Târgu-Mureș, Botanical Garden of UMF, 16.06.1952, Nagy Ödön (2516)
	ASTERACEAE	*Tussilago farfara* L.	Târgu-Mureș, Mureș river shore, 1936, Nagy Ödön (2412) Târgu-Mureș, 26.02.1937, Nagy Ödön (2413) Târgu-Mureș, Stejăriș forest, 08.03.1936, Nagy Ödön (2414) Târgu-Mureș, the base of Dealului Halmok, 18.04.1939, Nagy Ödön (2415) Târgu-Mureș, plough land, 08.03.1936, Nagy Ödön (2416) Corunca, 09.05.1939, Nagy Ödön (2417) Târgu-Mureș, Mureș river shore, 16.04.1939, Nagy Ödön (2418) Târgu-Mureș, 1938, Nagy Ödön (2419) Băgaciu, 1872 (5365, 5458)
	SCROPHULARIACEAE	*Verbascum phlomoides* L.	Porumbeni, 03.08.1948, Nagy Ödön (2051) Târgu-Mureș, 28.08.1941, Nagy Ödön (2052)
	SCROPHULARIACEAE	*Verbascum phoeniceum* L.	Târgu-Mureș, Corunca, 03.06.1939, Nagy Ödön (2050)

SENEVOLIC GLYCOSIDES	BRASSICACEAE	*Brassica nigra* (L.) Koch	Târgu-Mureș, Medicinal Plants Garden of UMF, 20.06.1952, Nagy Ödön (3162)
	BRASSICACEAE	*Raphanus raphanistrum* L.	Târgu-Mureș, the citadel's wall, 05.06.1942, Nagy Ödön (2446) Târgu-Mureș, near Trebely, 03.07.1943, Nagy Ödön (2447) Târgu-Mureș, 03.06.1942, Nagy Ödön (2451)
	BRASSICACEAE	*Raphanus sativus* L.	Târgu-Mureș, vineyard of Mare Hill, 03.07.1948, Nagy Ödön (2448) Târgu-Mureș, garden, 05.07.1938, Nagy Ödön (2449) Târgu-Mureș, Mureș river dead branch, 10.06.1936, Nagy Ödön (2450)

	BRASSICACEAE	*Sisymbrium officinale* (L.) Scop.	Târgu-Mureș, Beșa, 19.06.1942, Nagy Ödön (2474) Târgu-Mureș, 06.07.1940, Nagy Ödön (2475) Târgu-Mureș, plough land, 08.06.1936, Nagy Ödön (2476, 2477) Târgu-Mureș, toward Budiu, 26.05.1936, Nagy Ödön (2478) Târgu-Mureș, plough land, 30.05.1937, Nagy Ödön (2479)

PHENOLIC GLYCOSIDES	ROSACEAE	*Filipendula ulmaria* (L.) Maxim.	Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7603) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7610)
	SALICACEAE	*Populus nigra* L.	Târgu-Mureș, Mureș river shore, 11.05.1937, Nagy Ödön (2313) Târgu-Mureș, hippodrome, 07.1959, leg. Konya Istvan, det. Silvia Oroian (5997) Gurghiu, school, 10.06.1967, Ion Patachi (7139)
	SALICACEA	*Populus tremula* L.	Sângeorgiu de Mureș, 19.10.1938, Nagy Ödön (986) Târgu-Mureș, 25.10.1938, Nagy Ödön (988) Târgu-Mureș, Platoul Cornești, 05.10.1937, Nagy Ödön (994) Târgu-Mureș, 28.04.1941, Nagy Ödön (2315) Târgu-Mureș, Cocoșd forest, 26.03.1935, Nagy Ödön (2316) Târgu-Mureș, Platoul Cornești, 04.04.1938, Nagy Ödön (2317) Târgu-Mureș, Stejăriș forest, 23.05.1938, Nagy Ödön (2318) Târgu-Mureș, Stejăriș forest, 11.05.1936, Nagy Ödön (2319) Târgu-Mureș, Beșa forest, 05.1953, leg. Konya Istvan, det. Silvia Oroian (5995)
	ROSACEAE	*Pyrus pyraster* Burgsd.	Târgu-Mureș, Platoul Cornești, 13.05.1939, Nagy Ödön (1909) Târgu-Mureș, Platoul Cornești, 28.04.1939, Nagy Ödön (1912) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7605)
	SALICACEAE	*Salix alba* L.	Târgu-Mureș, toward Budiu, 17.05.1937, Nagy Ödön (2289) Târgu-Mureș, Mureș river shore, 26.04.1936, Nagy Ödön (2292) Târgu-Mureș, 1 Mai Hill, leg. Babos Bertalan, det. Silvia Oroian (7146) Răstolița, Listeș, 12.04.1991, Silvia Oroian (7149) Vidrasău, Mureș river shore, 19.06.1991, Silvia Oroian (7504, 7505, 7506) Gurghiu, arboretum, 04.06.1956, I. Gergely (8753)
	SALICACEAE	*Salix caprea* L.	Târgu-Mureș, Cocoșd Forest fringe, 24.03.1937, Nagy Ödön (2293) Târgu-Mureș, Budiu Forest fringe, 24.03.1937, Nagy Ödön (2294) Târgu-Mureș, Platoul Cornești, 1938, Nagy Ödön (2295) Târgu-Mureș, Mureșeni Forest, 20.04.1939, Nagy Ödön (2296) Târgu-Mureș, the base of Halmok Hill, 28.04.1939, Nagy Ödön (2297) Târgu-Mureș, Stejăriș forest, 23.05.1938, Nagy Ödön (2298) Târgu-Mureș, Platoul Cornești, 04.05.1939, Nagy Ödön (2299)

	SALICACEAE	*Salix cinerea* L.	Târgu-Mureș, the base of Halmok Hill, 02.09.1948, Nagy Ödön (2288) Fărăgău Lake, 20.05.1976, Konya Istvan (5860) Gurghiu, 04.05.1991, Silvia Oroian (7147) Gurghiu, Poiana Narciselor, 04.05.1991, Silvia Oroian (7148) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7503)
	SALICACEAE	*Salix fragilis* L.	Târgu-Mureș, Mureș river shore, 08.05.1938, Nagy Ödön (2300) Târgu-Mureș, Pocloș stream, 08.05.1938, Nagy Ödön (2301) Porumbeni, 16.04.1947, Nagy Ödön (2303) Sântana de Mureș, 13.04.1937, Nagy Ödön (2304) Târgu-Mureș, Mureș river shore, 17.04.1937, Nagy Ödön (2305) Târgu-Mureș, Mureș river shore, 17.04.1937, Nagy Ödön (2306) Târgu-Mureș, Mureș river shore, 06.04.1937, Nagy Ödön (2307)
	SALICACEAE	*Salix purpurea* L.	Târgu-Mureș, 21.04.1959, Nagy Ödön (4579)
	CAPRIFOLIACEAE	*Viburnum opulus* L.	Târgu-Mureș, Stejăriș forest, 480 m altit., 30.09.1937, Nagy Ödön (484) Târgu-Mureș, Budiu Hill, 450 m altit., 17.05.1937, Nagy Ödön (485) Târgu-Mureș, Mureș river shore, 350 m altit., 12.05.1936, Nagy Ödön (486) Târgu-Mureș, Platoul Cornești, 04.06.1944, Nagy Ödön (487) Târgu-Mureș, Stejăriș forest, 380 m altit., 23.05.1938, Nagy Ödön (488) Târgu-Mureș, Cocoșd forest, 350 altit., 09.05.1936, Nagy Ödön (489) Târgu-Mureș, Mureș river shore, 300 m altit., 12.05.1937 (490) Târgu-Mureș, cultivated, 320 m altit., Nagy Ödön (491) Târgu-Mureș, Stejăriș forest, 460 m altit., Nagy Ödön (997) Orșova, 29.07.2000, Mihaela Sămărghițan (11298) Piatra Orșova, 26.07.2000, Mihaela Sămărghițan (11375) Răstolița, Mureș river shore, 30.05.1993, Silvia Oroian (11376) Răstolița, 12.07.1996, Silvia Oroian (11377) Răstolița, 24.05.1996, Silvia Oroian (11378) Răstolița, Mureș river shore, 01.08.1993, Silvia Oroian (11383)

ANTHRAQUINONE DERIVATS	RHAMNACEAE	*Frangula alnus* Mill.	Târgu-Mureș, Platoul Cornești, 480 m altit., 05.10.1937, Nagy Ödön (993) Târgu-Mureș, Stejăriș forest, 17.06.1953, leg. Konya Istvan, det. Silvia Oroian (6039)
	POLYGONACEAE	*Rumex acetosa* L.	Târgu-Mureș, 18.05.1938, Nagy Ödön (624) Târgu-Mureș, island on Mureș river, 25.05.1948, Nagy Ödön (625) Sânpaul, 27.05.1939, Nagy Ödön (1939) Târgu-Mureș, 29.05.1939, Nagy Ödön (639) Orșova, Seci hamlet, 05.1979, Sarkany Andrei, (7168)

	POLYGONACEAE	*Rumex acetosa* L.	Sântana de Mureș, Beșa hill, 05.06.1990, Silvia Oroian (7176) Gurghiu, Poiana Narciselor, 04.05.1991, Silvia Oroian (7177) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7636) Deleni, 06.1992, Silvia Oroian (8020) Jabenița, 19.08.1994, Silvia Oroian (8023)
	POLYGONACEAE	*Rumex acetosella* L.	Târgu-Mureș, Platoul Cornești, 380 m altit., 13.08.1947, Nagy Ödön (619, 620, 621) Târgu-Mureș, Stejăriș forest, 360 m altit., 06.05.1938, Nagy Ödön (622) Târgu-Mureș, near church, 380 m altit., Nagy Ödön (623) Hetiur, Sighișoara, 29.05.1984, Silvia Oroian (7164) Răstolița, 07.08.1986, Silvia Oroian (7165) Răstolița, Bistra Mureșului, 16.05.1988, Silvia Oroian (7166) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7635) (f. *multifidus*) Jabenița, 1994, Silvia Oroian (8028) Jabenița, 01.07.1993, Silvia Oroian (8029) Deleni, 06.1992, Silvia Oroian (8030)
	POLYGONACEAE	*Rumex conglomeratus* Murray	Târgu-Mureș, 03.06.1942, Nagy Ödön (635) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (8032)
	POLYGONACEAE	*Rumex crispus* L.	Târgu-Mureș, "Râtul cu scoici", 316 m altit., 23.06.1947, Nagy Ödön (608) Târgu-Mureș, citadel's church, 350 m altit., 14.06.1941, Nagy Ödön (609) Târgu-Mureș, Mare Hill, 360 m altit., 27.07.1947, Nagy Ödön (610) Târgu-Mureș, Platoul Cornești, 350 m altit., 05.08.1947, Nagy Ödön (611) Târgu-Mureș, garden, 23.06.1947, Nagy Ödön (612) Târgu-Mureș, "Râtul cu scoici", 23.06.1947, Nagy Ödön (613) Târgu-Mureș, Budiu Forest, 350 m altit., 22.05.1939, Nagy Ödön (614) Târgu-Mureș, 29.05.1942, Nagy Ödön (616) Târgu-Mureș, str. 7 Noiembrie, 25.05.1948, Nagy Ödön (617) Târgu-Mureș, Mare Hill vineyard, 380 m altit., 17.05.1948, Nagy Ödön (618) Daneș, 11.06.1984, Silvia Oroian (7169) Hetiur, 29.05.1984, Silvia Oroian (7170) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7633) Sântana de Mureș, 05.06.1990, Silvia Oroian (8033) Sângeorgiu de Mureș, 30.06.1993, Silvia Oroian (8036)
	FABACEAE	*Sophora japonica* L.	Târgu-Mureș, 16.08.1946, Nagy Ödön (1051)

NAPHTRODIANTHRONES	HYPERICACEAE	*Hypericum maculatum* Cr.	Răstolița, 03.07.1995, Silvia Oroian, Mihaela Sămărghițan (11367)
	HYPERICACEAE	*Hypericum perforatum* L.	Târgu-Mureș, Cocoșd forest, 29.06.1946, Nagy Ödön (1393) Târgu-Mureș, Bența, 19.06.1942, Nagy Ödön (1394) Târgu-Mureș, Stejăriș forest, 14.08.1950, Nagy Ödön (1395) Târgu-Mureș, Mureșeni, 02.06.1947, Nagy Ödön (1396) Târgu-Mureș, Platoul Cornești, 05.10.1937, Nagy Ödön (1397) Săbed, Corhan Hill, 01.07.1981, Silvia Oroian (5790) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5968) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7611) Gălăoaia, 30.07.1993, Silvia Oroian (11372)
CARDIOTONIC GLYCOSIDES	RANUNCULACEAE	*Adonis vernalis* L.	Band, 14.04.1937, Nagy Ödön (2245) Porumbeni, 09.04.1947, Nagy Ödön (2246) Târgu-Mureș, Cocoșd Forest fringe, 20.04.1940, Nagy Ödön (2247) Târgu-Mureș, the base of Halmok Hill, 10.05.1941, Nagy Ödön (2248) Zau de Câmpie, 26.04.1967, leg. Konya Istvan, det. Silvia Oroian (5730) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5973) Crăiești toward Herepea, 28.05.1985, Silvia Oroian (7308) Gheja-Luduș, 03.05.1988, Silvia Oroian (7309) Băla-Lefaia, 15.05.1983, Silvia Oroian (7310) Săbed, reserve, 06.04.1989, Silvia Oroian (7311) Zau de Câmpie, reserve, 30.04.1991, Silvia Oroian (7340) Târgu-Mureș, 24.03.1908, Bitai Arpard (8073) Târgu-Mureș, Cocoșd forest, 25.04.1936, Nagy Ödön (8074) Zau de Câmpie, 04.1994, Mihaela Sămărghițan (8075) Hărțău, 12.04.1995, Ion Patachi (8076) Porumbeni, church yard, 07.05.1995, leg. Ana Berbecar, det. Mihaela Sămărghițan (8210)
	ASPARAGACEAE	*Asparagus officinalis* L.	Sângeorgiu de Mureș, 21.06.1943, Nagy Ödön (1571) Târgu-Mureș, 07.06.1943, Nagy Ödön (1572) Târgu-Mureș, 17.06.1959, Ion Patachi (7574)
	ASPARAGACEAE	*Convallaria majalis* L.	Târgu-Mureș, Căpâlnița, 02.05.1939, Nagy Ödön (1577) Târgu-Mureș, cultivated, 1939, Nagy Ödön (1578) Târgu-Mureș, Rotundă Forest, 08.05.1908, Bitai Arpard (7562) Târgu-Mureș, garden, 21.04.1936, Nagy Ödön (7568) Glodeni, 06.05.1959, Ion Patachi (7576)

	SCROPHULARIACEAE	*Digitalis grandiflora* Mill.	Târgu-Mureș, the base of Halmok Hill, 1938, Nagy Ödön (2011) Zau de Câmpie, 05607.1981, leg. Eftenie Ioan, det. Silvia Oroian (5668) Târgu-Mureș, Botanical Garden of UMF, 14.06.1980, Silvia Oroian (5767) Târgu-Mureș, Botanical Garden of UMF, 14.06.1980, Konia Istvan (5774) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7658)
	SCROPHULARIACEAE	*Digitalis lanata* Ehrh.	Târgu-Mureș, Botanical Garden of UMF, 16.06.1952, Nagy Ödön (2012, 2013)
	SCROPHULARIACEAE	*Digitalis purpurea* L.	Târgu-Mureș, Botanical Garden of UMF, 16.06.1952, Nagy Ödön (2014, 2015) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5977)
	BRASSICACEAE	*Erysimum odoratum* Ehrh.	Târgu-Mureș, Corunca, 03.06.1939, Nagy Ödön (3197) Târgu-Mureș, 1 Mai Hill, 21.07.1948, Nagy Ödön (3198) Târgu-Mureș, 1939, Nagy Ödön (3199) Târgu-Mureș, Beța, 19.06.1942, Nagy Ödön (3200) Târgu-Mureș, the citadel's wall, 05.06.1942, Nagy Ödön (3201) Târgu-Mureș, Bețа Valley, 19.06.1942, Nagy Ödön (3202) Târgu-Mureș, Platoul Cornești, 01.08.1947, Nagy Ödön (3203) Porumbeni, 26.07.1948, Nagy Ödön (3204) Târgu-Mureș, the citadel's wall, 13.06.1941, Nagy Ödön (3205) Târgu-Mureș, the citadel's wall, 21.06.1947, Nagy Ödön (3206) Târgu-Mureș, Mare Hill, 23.06.1943, Nagy Ödön (3207) Zau de Câmpie, 17.07.1937, leg. Konya Istvan, det. Silvia Oroian (7732) Săbed, reserve, 12.08.1989, Silvia Oroian (7733)
	CELASTRACEAE	*Euonymus europaea* L.	Târgu-Mureș, Stejăriș forest, 18.05.1938, Nagy Ödön (3022) Târgu-Mureș, Trebely, 18.05.1938, Nagy Ödön (3023) Târgu-Mureș, 24.04.1936, Nagy Ödön (3026) Târgu-Mureș, Platoul Cornești, 07.05.1936, Nagy Ödön (3027)
	CELASTRACEAE	*Euonymus verrucosa* Scop.	Târgu-Mureș, Platoul Cornești, 11.05.1946, Nagy Ödön (3025) Târgu-Mureș, Cocoșd forest, 12.05.1936, Nagy Ödön (3029)
	RANUNCULACEAE	*Helleborus purpurascens* W. et K.	Târgu-Mureș, Platoul Cornești, 05.04.1939, Nagy Ödön (2197) Târgu-Mureș, Mare forest, 1941, Nagy Ödön (2198) Târgu-Mureș, the base of Halmok Hill, 29.04.1939, Nagy Ödön (2199) Târgu-Mureș, near Uriaș Hill, 09.04.1937, Nagy Ödön (2200) Băgaciu, 1886 (5463) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (7345, 7807) Crăiești toward Herepea, 06.08.1985, Silvia Oroian (7346) Săbed, reserve, 23.03.1989, Silvia Oroian (7347, 7805) Săbed, reserve, 06.04.1989, Silvia Oroian (7348, 7804) Hetiur-Sighișoara, 29.05.1985, Silvia Oroian (7349)

	RANUNCULACEAE	*Helleborus purpurascens* W. et K.	Zau de Câmpie, 06.07.1981, Eftenie, Ioan (7350) Gurghiu, Poiana Narciselor, 04.05.1991, Silvia Oroian (7393, 7808) Zau de Câmpie, 06.05.1981, Eftenie, Ioan (7802) Hetiur, 29.05.1984, Silvia Oroian (7803) Adămuș, Herepea village, 08.06.1985, Konya Istvan, Szombath Zoltán, Silvia Oroian (7806) Târgu-Mureș, Cocoșd forest, 14.03.1936, Nagy Ödön (7947) Deda, 16.04.1995, Silvia Oroian (8104) Sângeorgiu de Mureș, 10.05.1959, Ion Patachi (8105) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (8221)
	LAMIACEAE	*Leonurus cardiaca* L.	Târgu-Mureș, Budiu Hill, 350 m altit., 26.05.1936, Nagy Ödön (156) Târgu-Mureș, "Cartierul Funcționarilor", 300 m altit., 04.06.1937 (157) Târgu-Mureș, Platoul Cornești, 01.08.1947, Nagy Ödön (158) Târgu-Mureș, airport, 305 m altit., 06.07.1940, Nagy Ödön (159) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5974)

SAPONINS	HIPPOCASTANACEAE	*Aesculus hippocastanum* L.	Târgu-Mureș, cultivated, 13.05.1939, Nagy Ödön (1401) Târgu-Mureș, Platoul Cornești, 28.04.1940, Nagy Ödön (1402) Târgu-Mureș, 09.05.1939, Nagy Ödön (1403) Târgu-Mureș, Fire Department yard, 19.05.1980, Silvia Oroian (5822)
	CARYOPHYLLACEAE	*Agrostemma githago* L.	Târgu-Mureș, 06.06.1939, Nagy Ödön (2924) Târgu-Mureș, Mureș river dead branch, 08.06.1939, Nagy Ödön (2925)
	PRIMULACEAE	*Anagallis arvensis* L.	Târgu-Mureș, 05.08.1947, Nagy Ödön (2258) Târgu-Mureș, Budiu Forest, 03.10.1938, Nagy Ödön (2259) Târgu-Mureș, Platoul Cornești, 16.06.1936, Nagy Ödön (2260) Târgu-Mureș, near Stejăriș, 05.08.1947, Nagy Ödön (2261) Târgu-Mureș, 05.08.1947, Nagy Ödön (2262)
	PRIMULACEAE	*Anagallis foemina* Miller (syn. *Anagallis arvensis* L. *ssp.caerulea* Hartman)	Târgu-Mureș, Budiu, 31.05.1946, Nagy Ödön (2252) Târgu-Mureș, the base of Halmok Hill, 07.09.1940, Nagy Ödön (2253, 2254) Porumbeni, 18.08.1947, Nagy Ödön (2255) Porumbeni, 26.07.1948, Nagy Ödön (2256) Târgu-Mureș, 09.1937, Nagy Ödön (2257)
	ASTERACEAE	*Bellis perennis* L.	Târgu-Mureș, cultivated, 25.03.1938, Nagy Ödön (2719) Târgu-Mureș, 19.05.1939, Nagy Ödön (2720) Băgaciu, 1872 (5406) Băgaciu, 1886 (5472) Târgu-Mureș, 10.1981, Silvia Oroian (5650) Târgu-Mureș, Platoul Cornești, 12.04.1970, Konya Istvan (5821)

	APIACEAE	*Bupleurum falcatum* L.	Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7592)
	ASTERACEAE	*Calendula officinalis* L.	Târgu-Mureș, garden, 21.06.1951, Nagy Ödön (2723) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5976)
	EQUISETACEAE	*Equisetum arvense* L.	Târgu-Mureș, 315 m altit., 1937, Nagy Ödön (192) Târgu-Mureș, 340 m altit., 09.05.1939, Nagy Ödön (193) Târgu-Mureș, near Budiu Forest, 22.05.1939, Nagy Ödön (194) Sântana de Mureș, 320 m altit., 09.06.1939, Nagy Ödön (195) Târgu-Mureș, Mureș river shore, 308 m altit., 18.05.1939, Nagy Ödön (196) Sânpaul, Mureș river shore, 02.05–27.05.1939, Nagy Ödön (197) Târgu-Mureș, Reformed cementery, 01.07.1958, Nagy Ödön (198) Zau de Câmpie, 08.06.1981, leg. Eftenie Ioan, det. Silvia Oroian (5677) Săbed, Corhan Hill, 19.08.1980, Silvia Oroian (5794) Sântana de Mureș, 23.06.1989, Konya Istvan (7054) Orșova, Seci hamlet, 23.06.1989, Silvia Oroian (7054) Orșova, Seci hamlet, 05.1979, Sarkany Andrei (7055) Sântana de Mureș, 05.06.1990, Silvia Oroian (7132) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7497)
	APIACEAE	*Eryngium campestre* L.	Târgu-Mureș, Platoul Cornești, 30.10.1955, Nagy Ödön (1329) Porumbeni, 22.07.1946, Nagy Ödön (1331) Târgu-Mureș, Platoul Cornești, 24.07.1947, Nagy Ödön (2563, 2564)
	APIACEAE	*Eryngium planum* L.	Târgu-Mureș, 1 Mai Hill, 16.06.1936, Nagy Ödön (1327) Târgu-Mureș, Platoul Cornești, 31.08.1937, Nagy Ödön (1330) Târgu-Mureș, Platoul Cornești, 24.07.1947, Nagy Ödön (2565)
	CARYOPHYLLACEAE	*Gypsophila paniculata* L.	Târgu-Mureș, 29.06.1946, Nagy Ödön (2968) Târgu-Mureș, Botanical Garden of UMF, 16.06.1952, Nagy Ödön (2969)
	ARALIACEAE	*Hedera helix* L.	Zau de Câmpie, 1982, leg. Eftenie Ioan, det. Silvia Oroian (5708)
	EUPHORBIACEAE	*Mercurialis perennis* L.	Târgu-Mureș, Căpâlnița, 30.03.1936, Nagy Ödön Răstolița, The Iod Valley, 13.04.1991, Silvia Oroian (7293) Pădurea Săbed, 14.04.2000, Mihaela Sămărghițan (11292) Răstolița, 05.04.1984, Silvia Oroian, Mihaela Sămărghițan (11391)
	FABACEAE	*Ononis arvensis* L. (*Ononis hircina* Jacq.)	Târgu-Mureș, 1939, Nagy Ödön (1028) Târgu-Mureș, Cocoșd forest, 07.10.1938, Nagy Ödön (1030) Târgu-Mureș, Stejăriș forest, fringe, Nagy Ödön (1031) Târgu-Mureș, „Dâmbul cu Comoară”, 27.09.1938, Nagy Ödön (1032) Târgu-Mureș, „1 Mai”, 21.07.1948, Nagy Ödön (1033) Târgu-Mureș, „Dâmbul cu Comoară”, 11.08.1948, Nagy Ödön (1034) Porumbeni, 22.07.1946, Nagy Ödön (1035)

	FABACEAE	*Ononis arvensis* L. (*Ononis hircina* Jacq.)	Sântana de Mureș, 27.08.1941, Nagy Ödön (1036) Sântana de Mureș, 09.06.1939, Nagy Ödön (1037) Târgu-Mureș, near Kali spring, 18.06.1947, Nagy Ödön (1038) Sângeorgiu de Mureș, 11.08.1950, Nagy Ödön (1039) Târgu-Mureș, hippodrome, 08.07.1960, leg. Konya Istvan, det. Silvia Oroian (6017) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7649) (f. *inermis* (Ldb.)
	POLYGALACEAE	*Polygala comosa* Schkuhr	Târgu-Mureș, Stejăriș forest, 01.05.1936, Nagy Ödön (577, 578) Târgu-Mureș, Mureșeni Forest, 02.06.1943, Nagy Ödön (579) Târgu-Mureș, Platoul Cornești, 17.06.1944, Nagy Ödön (580) Târgu-Mureș, Platoul Cornești, 08.05.1939, Nagy Ödön (581) Târgu-Mureș, Budiu, 28.05.1946, Nagy Ödön (582) Târgu-Mureș, Platoul Cornești, 400 m altit., 15.05.1938, Nagy Ödön (583) Târgu-Mureș, bricks factory, 350 m altit., 18.05.1938, Nagy Ödön (584) Târgu-Mureș, Beșa forest, 360 m altit., 23.05.1938, Nagy Ödön (585) Târgu-Mureș, 312 m altit., 06.05.1938, Nagy Ödön (586)
	POLYGALACEAE	*Polygala major* Jacq.	Târgu-Mureș, "Dâmbul cu Comoară", 350 m altit., 27.09.1938, Nagy Ödön (587) Târgu-Mureș, Corunca park, 19.06.1944, Nagy Ödön (588) Târgu-Mureș, Corunca park, 340 m altit., 03.06.1939, Nagy Ödön (589) Târgu-Mureș, near church, 350 m altit., 10.06.1937, Nagy Ödön (590) Târgu-Mureș, 1 Mai Hill, 08.06.1946, Nagy Ödön (2330) Băgaciu, 1872 (5391, 5446) Zau de Câmpie, 09.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5665) Fărăgău Lake, 20.05.1976, Vasarhely Zoltan (5852) Moreşti, 24.06.1953, Konya Istvan (5883)
	POLYGALACEAE	*Polygala vulgaris* L	Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7647) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7648)
	PRIMULACEAE	*Primula veris* L.em.Huds (syn. *Primula officinalis* (L.) Hill)	Târgu-Mureș, "Dâmbul cu Comoară", 09.05.1939, Nagy Ödön (2280) Târgu-Mureș, the base of Halmok Hill, 19.04.1939, Nagy Ödön (2281) Târgu-Mureș, Platoul Cornești, 10.05.1937, Nagy Ödön (2282) Târgu-Mureș, Trebely, 17.05.1938, Nagy Ödön (2283) Târgu-Mureș, Platoul Cornești, 21.04.1936, Nagy Ödön (2284) Târgu-Mureș, Mureș river shore, 02.05.1939, Madar Lajos, Nagy Ödön (2285) Târgu-Mureș, Căpâlnița, 09.05.1939, Nagy Ödön (2286) Băgaciu, 1886 (5478) Târgu-Mureș, Platoul Cornești, 06.1953, leg. Konya Istvan, det. Silvia Oroian (5751) Băgaciu, 29.04.1972 (6057)

	RANUNCULACEAE	*Ranunculus ficaria* L. (syn. *Ficaria verna* Huds.)	Luduș, 12.04.1939, Nagy Ödön (2162) Târgu-Mureș, Platoul Cornești, 16.04.1937, Nagy Ödön (2163) Zau de Câmpie, 04.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5671) Săbed, Lechința forest, 23.04.1981, leg. Szombath Zoltán, det. Silvia Oroian (5907) Săbed, 08.05.1980, leg. Szombath Zoltán, det. Silvia Oroian (5808) Sântana de Mureș, 06.04.1989, Silvia Oroian (7361, 7789) Gheja-Luduș, 29.04.1988, Silvia Oroian (7362, 7788) Papiu Ilarian, Șandru forest, 04.05.1988, Silvia Oroian (7363, 7787) Săbed, reserve, 06.04.1989, Silvia Oroian (7364) Mureșeni, Mureș river shore, 03.04.1968, Szombath Zoltán (7365, 7786) Zau de Câmpie, 30.04.1991, Silvia Oroian (7392) Mureșeni, Mureș river shore, 03.04.1968, leg. Szombath Zoltán, det. Silvia Oroian (7785) Zau de Câmpie, reserve, 30.04.1991, Silvia Oroian (7795) Târgu-Mureș, Rotundă Forest, 18.03.1908, Bitai Arpard, (8128) Târgu-Mureș, Mureș river shore, 20.04.1936, Nagy Ödön (8129) Deda, 16.04.1995, Silvia Oroian (8130) Gurghiu, 05.05.1992, Silvia Oroian (8224)
	CARYOPHYLLACEAE	*Saponaria officinalis* L.	Târgu-Mureș, Mureș river shore, 06.1952, Nagy Ödön (2991) Târgu-Mureș, Mureș river shore, 25.09.1951, Nagy Ödön (2992) Târgu-Mureș, island on Mureș river, 16.08.1960, Konya Istvan (7219) Târgu-Mureș, 15.06.1959, Ion Patachi (8052) Târgu-Mureș, 10.09.1960, Ion Patachi (8053)
	ASTERACEAE	*Solidago virgaurea* L.	Târgu-Mureș, Platoul Cornești, 05.10.1937, Nagy Ödön (2397) Târgu-Mureș, Platoul Cornești 16.10.1956, Nagy Ödön (2398) Târgu-Mureș, 19.10.1956, Nagy Ödön (2399)
	VIOLACEAE	*Viola arvensis* Murray	Târgu-Mureș, Trebely Hill, 350 m altit., 17.05.1938, Nagy Ödön (876) Târgu-Mureș, 360 m altit., 21.06.1946, Nagy Ödön (877) Târgu-Mureș, Beșa, 31.05.1944, Nagy Ödön (878) Târgu-Mureș, Near church, 400 m altit., 10.05.1937, Nagy Ödön (879) Târgu-Mureș, Mare forest, 400 m altit., 10.06.1946, Nagy Ödön (880) Târgu-Mureș, 10.06.1946, Nagy Ödön (881) Târgu-Mureș, Mureșeni Forest, 350 m altit., 28.07.1939, Nagy Ödön (882) Târgu-Mureș, Platoul Cornești, 480 m altit., 16.06.1936, Nagy Ödön (883) Târgu-Mureș, Mare hill, 360 m altit., 17.04.1948, Nagy Ödön (884) Târgu-Mureș, the edge of Beșa forest, 350 m altit., 31.05.1949, Nagy Ödön (885) Târgu-Mureș, Beșa, 03.06.1951, Nagy Ödön (886) Gornești, railroad side, 21.06.1942, Nagy Ödön (887)

	VIOLACEAE	*Viola odorata* L.	Sânpaul, 16.04.1939, Nagy Ödön (860) Târgu-Mureș, Platoul Cornești, 480 m altit., 24.03.1936, Nagy Ödön (861) Băgaciu, 1886 (5485) Zau de Câmpie, 06.06.1981, leg. Eftenie Ioan, det. Silvia Oroian (5723)

FLAVONOIDS	APIACEAE	*Anthriscus cerefolium* (L.) Hoffm.	Băgaciu, 1872 (5411)
	APIACEAE	*Anthriscus sylvestris* (L.) Hoffm.	Păuloaia, 06.07.2000, Mihaela Sămărghițan (11295)
	BETULACEAE	*Betula pendula* Roth (*Betula verrucosa* Ehrh.)	Târgu-Mureș, Stejăriș forest, 400 m altit., 20.05.1920, Nagy Ödön (331) Târgu-Mureș, Platoul Cornești, 480 m altit, 20.04.1936, Nagy Ödön, (332) Târgu-Mureș, Platoul Cornești, 380 m altit., 09.06.1942, Nagy Ödön (333) Târgu-Mureș, Platoul Cornești, 480 m altit, 01.04.1936, Nagy Ödön (334) Târgu-Mureș, 01.09.1934, Nagy Ödön, (335) Târgu-Mureș, 05.1937, Nagy Ödön, (336) Târgu-Mureș, 22.04.1943, Nagy Ödön (337) Târgu-Mureș, Platoul Cornești, 21.04.1936, Nagy Ödön (338) Târgu-Mureș, 24.04.1952, Nagy Ödön (339) Sânpaul, park, 01.04.1939, Nagy Ödön (339) Zau de Câmpie, 1982, leg. Eftenie Ioan, det. Silvia Oroian (5712) Târgu-Mureș, Platoul Cornești, 20.06.1984, leg. Sarkany Andrei, det. Silvia Oroian (7099) Târgu-Mureș, 06.04.1908, Bitai Arpard (8025)
	BRASSICACEAE	*Capsella bursa-pastoris* (L.) Medicus	Târgu-Mureș, 26.02.1948, Nagy Ödön (3171) Târgu-Mureș, Mureș river shore, 27.07.1956, Nagy Ödön (3172) Târgu-Mureș, 25.05.1941, Nagy Ödön (3173) Târgu-Mureș, plough land, 05.04.1939, Nagy Ödön (3174) Târgu-Mureș, plough land, 19.04.1938, Nagy Ödön (3175) Băgaciu, 1872 (5371) Gurghiu, Poiana Narciselor, 05.05.1991, Silvia Oroian (7509) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7614) Târgu-Mureș, 1 Mai Hill, 15.05.1940, leg. Babos Bertalan, det. Silvia Oroian (7744)
	ROSACEAE	*Crataegus monogyna* Jacq.	Târgu-Mureș, 04.06.1958, Nagy Ödön (1881), f. *decussata (Wallr.)* Târgu-Mureș, garden, 20.05.1939, Nagy Ödön (1871) Târgu-Mureș 1 Mai Hill, 03.05.1936, Nagy Ödön (1872) Târgu-Mureș, near citadel's church, 10.05.1937, Nagy Ödön (1873) Târgu-Mureș, 19.02.1938, Nagy Ödön (1874) Târgu-Mureș, near Căpâlnița, 30.05.1944, Nagy Ödön (1875)

	ROSACEAE	*Crataegus monogyna* Jacq.	Târgu-Mureș, Stejăriș forest, northern side, 23.05.1938, Nagy Ödön (1876) Târgu-Mureș, Stejăriș forest, 12.08.1950 (1877) Târgu-Mureș, Platoul Cornești, 10.05.1939, Nagy Ödön (1878) Târgu-Mureș, 20.04.1939, Nagy Ödön (1879) Târgu-Mureș, Stejăriș forest, northern side, 10.1937, Nagy Ödön (1880) Târgu-Mureș, Beșa forest, 05.1953, leg. Konya Istvan, det. Silvia Oroian (6033) Gurghiu, near Poiana Narciselor, 06.06.1991, Silvia Oroian (7597) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7600)
	RUTACEAE	*Dictamnus albus* L.	Crăiești, toward Herepea, 04.06.1984, Silvia Oroian (5517) Zau de Câmpie, 09.05.1973, Konya Istvan (5776) Toldal, 26.05.1985, Sarkany A. (5982)
	ASTERACEAE	*Eupatorium cannabinum* L.	Târgu-Mureș, Mureș river dead branch, near Sântana de Mureș, 30.09.1958, Nagy Ödön (2566) Târgu-Mureș, Stejăriș forest, 14.08.1950, Nagy Ödön (2567)
	MORACEAE	*Ficus carica* L.	Sânpaul, cultivated, 27.05.1939, Nagy Ödön (681)
	GINKGOACEAE	*Ginkgo biloba* L.	Târgu-Mureș, 19.07.1958, Nagy Ödön (4582) Târgu-Mureș, 01.11.1958, Nagy Ödön (4583)
	ASTERACEAE	*Hieracium pilosella* L.	Porumbeni, 03.08.1948, Nagy Ödön (2865) Târgu-Mureș, Mare hill, 01.08.1947, Nagy Ödön (2866) Târgu-Mureș, 06.06.1943, Nagy Ödön (2867) Sânpaul, 20.05.1939, Nagy Ödön (2868)
	SCROPHULARIACEAE	*Linaria vulgaris* Mill.	Târgu-Mureș, Platoul Cornești, 380 m altit, 01.08.1947, Nagy Ödön (154) Târgu-Mureș, 18.06.1947, Nagy Ödön (155) Târgu-Mureș, 30.09.1936, Nagy Ödön (2021) Târgu-Mureș, 23.06.1956, Nagy Ödön (2022) Târgu-Mureș, 24.09.1937, Nagy Ödön (2023) Zau de Câmpie, 05.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5660) Cuieșd, 29.08.1960, Konya Istvan (5942) Pietroasa Valley, 28.07.2000, Mihaela Sămărghițan (11299)
	MORACEAE	*Morus nigra* L.	Acățari, 322 m altit., 17.05.1937, Nagy Ödön (677, 678)
	APIACEAE	*Petroselinum hortense* Hoffm.	Târgu-Mureș, 16.06.1939
	POLYGONACEAE	*Polygonum persicaria* L.	Târgu-Mureș, plough land, 350 m altit., 14.10.1937, Nagy Ödön (605) Târgu-Mureș, airport, 29.08.1941, Nagy Ödön (606)
	ROSACEAE	*Prunus avium* L. (*Cerasus avium* (L.) Moench)	Târgu-Mureș, 10.05.1937, Nagy Ödön (1976) Sânpaul, 16.04.1939, Nagy Ödön (1977) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7604)

	FABACEAE	*Robinia pseudacacia* L.	Târgu-Mureș, 01.06.1938, Nagy Ödön (1048) Târgu-Mureș, 05.06.1938, Nagy Ödön (1049) Târgu-Mureș, 23.05.1939, Nagy Ödön (1050) Săbed, Lechința forest, 09.06.1986, leg. Szombath Zoltán, det. Silvia Oroian (5809)
	CAPRIFOLIACEAE	*Sambucus nigra* L.	Băgaciu, 1872 (5443) Răstolița, 12.07.1996, Silvia Oroian (11379) Răstolița, Mureș river shore, 30.05.1993, Silvia Oroian (11385)
	CAPRIFOLIACEAE	*Sambucus racemosa* L.	Răstolița, 24.06.1995, Silvia Oroian (11381)
	FABACEAE	*Trifolium medium* L.	Târgu-Mureș, Platoul Cornești, 30.06.1941, Nagy Ödön (1066)
	FABACEAE	*Trifolium montanum* L.	Târgu-Mureș, Stejăriș forest, 12.05.1936, Nagy Ödön (1067) Târgu-Mureș, Stejăriș forest fringe, 23.05.1938, Nagy Ödön (1068) Zau de Câmpie, 06.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5696)
	FABACEAE	*Trifolium pratense* L.	Târgu-Mureș, Mureș river shore, 08.06.1936, Nagy Ödön (1070) Târgu-Mureș, Mare forest, 13.07.1946, Nagy Ödön (1071) Târgu-Mureș, 08.05.1936, Nagy Ödön (1072) Sânpaul, 28.05.1939, Nagy Ödön (1073) Târgu-Mureș, Budiu Forest fringe, 22.05.1939, Nagy Ödön (1074) Băgaciu, 1872 (5402) Zau de Câmpie, 1982, leg. Eftenie Ioan, det. Silvia Oroian (5713) Fărăgău Lake, 03.06.1976, Sarkany A. (5844) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7593)
	FABACEAE	*Trifolium repens* L.	Târgu-Mureș, Mureșeni Forest, 12.05.1936, Nagy Ödön (1075) Târgu-Mureș, 23.05.1940, Nagy Ödön (1076) Târgu-Mureș, near Căpâlnița, 30.05.1944, Nagy Ödön (1077) Sângeorgiu de Mureș, 12.07.1956, Nagy Ödön (1078) Fărăgău Lake, 03.06.1976, Sarkany A. (5846) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7650)
	SCROPHULARIACEAE	*Veronica anagallis-aquatica* L.	Bedeni, 30.05.1948, Nagy Ödön (2064)
	SCROPHULARIACEAE	*Veronica arvensis* L.	Târgu-Mureș, 24.05.1943, Nagy Ödön (2065, 2066) Târgu-Mureș, Platoul Cornești, 14.05.1951, Nagy Ödön (2067) Târgu-Mureș, 29.05.1941, Nagy Ödön (2068) Târgu-Mureș, Platoul Cornești, 02.06.1941, Nagy Ödön (2069) Târgu-Mureș, 07.1959, Konya Istvan (5867)
	SCROPHULARIACEAE	*Veronica beccabunga* L.	Târgu-Mureș, “Fântâna puturoasă” spring, 23.05.1938, Nagy Ödön (2070) Târgu-Mureș, “Dâmbul cu Comoară”, Nagy Ödön (2071) Deda – Bistra Mureșului, 15.06.1960, Konya Istvan (5931)

	SCROPHULARIACEAE	*Veronica chamaedrys* L.	Târgu-Mureș, Platoul Cornești, 24.04.1936, Nagy Ödön (2077) Târgu-Mureș, Trebely, 17.05.1938, Nagy Ödön (2078) Târgu-Mureș, 06.06.1943, Nagy Ödön (2079) Târgu-Mureș, near citadel's church, Nagy Ödön (2080) Băgaciu, 1872 (5390) Zau de Câmpie, 08.06.1981, leg. Eftenie Ioan, det. Silvia Oroian (5676) Deda Bistra, 15.06.1960, Konya Istvan (5864) Târgu-Mureș, 05.1953, Konya Istvan (5865) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7652) Gurghiu, Poiana Narciselor, 05.05.0992, Silvia Oroian (7659)
	SCROPHULARIACEAE	*Veronica officinalis* L.	Târgu-Mureș, Stejăriș forest, 12.06.1938, Nagy Ödön (2095) Târgu-Mureș, top of 1 Mai Hill, 08.06.1946, Nagy Ödön (2096) Târgu-Mureș, the base of Halmok Hill, 30.04.1939, Nagy Ödön (2097) Târgu-Mureș, 1939, Nagy Ödön (2098) Târgu-Mureș, Platoul Cornești, 17.06.1953, Konya Istvan (5870)
	SCROPHULARIACEAE	*Veronica persica* Poiret	Târgu-Mureș, Mureș river dead branch, 26.04.1936, Nagy Ödön (2072) Târgu-Mureș, Platoul Cornești, 22.03.1936, Nagy Ödön (2073) Târgu-Mureș, 20.10.1939, Nagy Ödön (2074) Târgu-Mureș, 12.10.1937, Nagy Ödön (2075) Târgu-Mureș, 1941, Nagy Ödön (2076) Băgaciu, 1872 (5449)
	SCROPHULARIACEAE	*Veronica spicata* L. ssp. *orchidea* Crantz (*Pseudolysimachion orchideum* (Cr.) T.Wrab. *Veronica orchidea* Crantz)	Târgu-Mureș, Mare Hill, 26.07.1950, Nagy Ödön (2099) Târgu-Mureș, Platoul Cornești, 13.07.1947, Nagy Ödön (2100) Târgu-Mureș, Mare Hill, 03.07.1948, Nagy Ödön (2101) Târgu-Mureș, Platoul Cornești, 18.06.1936, Nagy Ödön (2102) Porumbeni, 18.08.1947, Nagy Ödön (2103) Târgu-Mureș, 07.1947, Nagy Ödön (2104) Târgu-Mureș toward Livezeni, 18.09.1938, Nagy Ödön (2105) Sântana de Mureș, 28.08.1941, Nagy Ödön (2106) Porumbeni, 18.08.1947, Nagy Ödön (2107) Târgu-Mureș, Mare Hill, 14.07.1948, Nagy Ödön (2112) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5575) Săbed, Corhan Hill, 24.06.1972, Konya Istvan (5576, 5577, 5579) Săbed, Corhan Hill, 01.07.1981, Szombath Zoltan (5578) Cuieșd, 29.08.1960, Konya Istvan (5874) Morești, 24.06.1960, Konya Istvan (5875)

	SCROPHULARIACEAE	*Veronica spicata* L. ssp. *spicata*	Târgu-Mureș, Platoul Cornești, 18.06.1936, Nagy Ödön (2119) Porumbeni, 22.07.1946, Nagy Ödön (2120) Târgu-Mureș, Valea Rece, 21.07.1948, Nagy Ödön (2121) Târgu-Mureș, Stejăriș forest, 21.07.1948, Nagy Ödön (2122) Târgu-Mureș, "Dâmbul cu Comoară", 11.08.1947, Nagy Ödön (2123) Târgu-Mureș, Cocoșd forest, 29.06.1946, Nagy Ödön (2124) Târgu-Mureș, Vulpii stream, 17.07.1940, Nagy Ödön (2125) Târgu-Mureș, Cornești, 07.07.1946, Nagy Ödön (2126) Târgu-Mureș, Platoul Cornești, 16.10.1960, Konya Istvan (5869)
	SCROPHULARIACEAE	*Veronica teucrium* L.	Târgu-Mureș, Mureșeni Forest, 12.05.1936, Nagy Ödön (2084) Băgaciu, 1872 (5397, 5438) Sângeorgiu de Mureș, 06.1953, Konya Istvan (5872)
	APOCYNACEAE	*Vincetoxicum hirundinaria (Cynanchum vincetoxicum* (L.) Pers.*)*	Târgu-Mureș, Stejăriș forest, 28.08.1958, Nagy Ödön (321) Târgu-Mureș, Platoul Cornești, 480 m altit., 18.05.1937, Nagy Ödön (322) Târgu-Mureș, Mureșeni Forest, 13.06.1951, Nagy Ödön (323, 324) Târgu-Mureș, Platoul Cornești, 380 m altit., 26.06.1948, Nagy Ödön (325) Zau de Câmpie, 06.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5689) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7638) Orșova Pădure, 03.06.1994, leg. So, det. Mihaela Sămărghițan (11189) Bistra Mureșului, 30.05.1993, Silvia Oroian (11192) Lunca Bradului, 14.06.1994, Silvia Oroian (11193) Stânceni, Leu Mountain, 18.05.1994, Silvia Oroian (11194) Răstolița, 24.05.1996, Silvia Oroian, Mihaela Sămărghițan (11195) Lunca Bradului, 25.07.1996, Silvia Oroian (11196)
	VIOLACEAE	*Viola tricolor* L.	Băgaciu, 1872 (5394)

ANTOCIANS	ASTERACEAE	*Centaurea cyanus* L.	Târgu-Mureș, Stejăriș forest, 06.06.1939, Nagy Ödön (9) Șardu Nitajului, 02.06.1947, Nagy Ödön (10) Târgu-Mureș, Mare forest, 13.07.1946, Nagy Ödön (11) Sînpaul, 1939, Nagy Ödön, (12) Târgu-Mureș, Corunca, 22.05.1939, Nagy Ödön (13) Târgu-Mureș, Dealul cu Comoară, 345 m altit., Nagy Ödön (14) Zau de Câmpie, 09.05.1973, Konya Istvan (5775, 5780) Beica de Sus, 31.05.1999, Mihaela Sămărghițan (11275)
	RANUNCULACEAE	*Consolida regalis* S.F.Gray	Târgu-Mureș, 11.08.1947, Nagy Ödön (2201) Târgu-Mureș, "Dâmbul cu Comoară", 05.09.1946, Nagy Ödön (2202) Târgu-Mureș, 01.06.1938, Nagy Ödön (2203)

	RANUNCULACEAE	*Consolida regalis* S.F.Gray	Târgu-Mureș, "Dâmbul cu Comoară", 22.09.1938, Nagy Ödön (2204) Târgu-Mureș, satul Stejăriș, 15.09.1935, Nagy Ödön (2205) Băgaciu, 1872 (5428) Moreşti, 24.06.1953, Konya Istvan (5917) Crăieşti, toward Herepea, 06.08.1985, Silvia Oroian (7330) Sântana de Mureș, 23.06.1989, Silvia Oroian (7331) Sântana de Mureș, 08.06.1989, Silvia Oroian (7332) Săbed, reserve, 20.06.1989, Silvia Oroian (7333) Cerghid, 19.06.1974, Konya Istvan (7334) Târgu-Mureș, 1 Mai Hill, 15.05.1940, Babos Bertalan (7335, 8331) Vidrasău, semănături, 11.07.1991, Silvia Oroian (7942) Târgu-Mureș, 17.04.1935, Nagy Ödön (8332) Târgu-Mureș, 02.06.1908, Bitai Arpard (8333) Târgu-Mureș, 10.06.1959, Ion Patachi (8103) Jabeniţa, 1994, Silvia Oroian (8220)
	PAPAVERACEAE	*Papaver rhoeas* L.	Târgu-Mureș, plough land, 01.05.1939, Nagy Ödön (534) Băgaciu, 1872 (5417) Vidrasău, 28.05.1989, Silvia Oroian (7128) Târgu-Mureș, 15.06.1960, Ion Patachi (8156) Răstoliţa, 28.07.1995, Silvia Oroian (11095)

COUMARINS	RUBIACEAE	*Cruciata laevipes* Opiz	Băgaciu, 1872 (5384) Fărăgău Lake, 20.05.1976, Konya Istvan (5856) Târgu-Mureș, Platoul Cornești, 06.1953, leg. Konya Istvan, det. Silvia Oroian (5989)
	OLEACEAE	*Fraxinus excelsior* L.	Târgu-Mureș, Mare forest, 01.06.1938, Nagy Ödön (656) Târgu-Mureș, reformed cemetery, 03.05.1942, Nagy Ödön (657) Târgu-Mureș, reformed cemetery, 340 m altit., 09.06.1942, Nagy Ödön (658)
		Galium aparine L.	Fărăgău Lake, 13.06.1976, Konya Istvan (5858)
	RUBIACEAE	*Galium mollugo* L.	Fărăgău Lake, 03.06.1976, Sarkany A. (5859) Târgu-Mureș, island, 16.08.1960, leg. Konya Istvan, det. Silvia Oroian (5986) Târgu-Mureș, hippodrome, 07.1959, leg. Konya Istvan, det. Silvia Oroian (5987) Sângeorgiu de Mureș, 07.1959, leg. Konya Istvan, det. Silvia Oroian (5988) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7679) Reghin, 02.05.2000, Mihaela Sămărghiţan (11225)
	RUBIACEAE	*Galium odoratum* (L.) Scop. (*Asperula odorata* L.)	Târgu-Mureș, Platoul Cornești, 06.1936, leg. Konya Istvan, det. Silvia Oroian (5990) Deda-Bistra, Scaunul Domnului, 15.06.1953, leg. Konya Istvan, det. Silvia Oroian (5992) Moreşti, 24.06.1953, leg. Konya Istvan, det. Silvia Oroian (5993)

	RUBIACEAE	*Galium verum* L.	Zau de Câmpie, 07.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5669) Târgu-Mureș, hippodrome, 08.07.1960, Konya Istvan (5898) Târgu-Mureș, Bența forest, 05.1953, Konya Istvan (5899)
	APIACEAE	*Heracleum sphondylium* L.	Târgu-Mureș, 16.07.1946, Nagy Ödön (1823) Târgu-Mureș, 08.07.1946, Nagy Ödön (1824)
	FABACEAE	*Medicago falcata* L.	Târgu-Mureș, 312 m altit., 14.10.1937, Nagy Ödön (998) Budiu near Târgu-Mureș, 23.06.1935, Nagy Ödön (999) Târgu-Mureș, Platoul Cornești, 480 m altit., 16.03.1936, Nagy Ödön (1000) Târgu-Mureș, "1 Mai", 340 m altit., 30.09.1935, Nagy Ödön(1001) Târgu-Mureș, Platoul Cornești, 480 m altit., 02.09.1936, Nagy Ödön (1003) Fărăgău Lake, 03.06.1976, Sarkany A. (5840)
	FABACEAE	*Medicago lupulina* L.	Târgu-Mureș, Mureșeni Forest, 08.05.1936, Nagy Ödön (1002) Sângeorgiu de Mureș, 12.07.1956, Nagy Ödön (1004) Târgu-Mureș, Mureș river shore, 02.05.1939, Nagy Ödön (1006, 1007) Târgu-Mureș, Trebely Hill, 350 m altit., 17.05.1938, no (1008) Târgu-Mureș, island, 16.08.1960, leg. Konya Istvan, det. Silvia Oroian (6013) Târgu-Mureș, Bența forest, 05.1953, leg. Konya Istvan, det. Silvia Oroian (6014, 6015)
	FABACEAE	*Medicago sativa* L.	Porumbeni, 20.09.1947, Nagy Ödön (1009) Târgu-Mureș, at the border of Sântana de Mureș, 12.08.1939, Nagy Ödön (1010) Gornești, Mureș river shore, 21.06.1942, Nagy Ödön (1011) Târgu-Mureș, 312 m altit., 27.09.1937, Nagy Ödön (1012) Sânpaul, 28.05.1938, Nagy Ödön (1013)
	FABACEAE	*Melilotus officinalis* (L.) Pall.	Târgu-Mureș, citadel's wall, 24.06.1941, Nagy Ödön (1014) Porumbeni, 01.08.1948, Nagy Ödön (1015, 1016) Târgu-Mureș, Platoul Cornești, 480 m altit., 27.09.1937, Nagy Ödön (1017)
	APIACEAE	*Pastinaca sativa* L.	Târgu-Mureș, Mureș river shore, 27.07.1956, Nagy Ödön (1827) Târgu-Mureș, 24.07.1948, Nagy Ödön (1828) Târgu-Mureș, garden, 26.07.1948, Nagy Ödön (1829) Târgu-Mureș, garden, 26.07.1948, Nagy Ödön (1830) Târgu-Mureș, Stejăriș forest fringe, 28.07.1958, Nagy Ödön (1831) Târgu-Mureș, Pocloș stream, 28.08.1958, Nagy Ödön (1832) Târgu-Mureș, plough land, 23.08.1950, Nagy Ödön (1833)
	APIACEAE	*Pimpinella anisum* L.	Târgu-Mureș, garden, 18.09.1952, Nagy Ödön (1844)
	APIACEAE	*Pimpinella major* (L) Huds. (syn. *Pimpinella saxifraga* L. var. m*ajor* L)	Târgu-Mureș, Platoul Cornești, 05.10.1937, Nagy Ödön (1845) Târgu-Mureș, "Dâmbul cu Comoară", 11.08.1947, Nagy Ödön (1846)

		Pimpinella saxifraga L.	Târgu-Mureș, 28.08.1936, Nagy Ödön (1847) Târgu-Mureș, "Dâmbul cu Comoară", 11.08.1947, Nagy Ödön (1848) Târgu-Mureș, Platoul Cornești, 11.09.1938, Nagy Ödön (1849) Târgu-Mureș, the base of Halmok Hill, 02.09.1948, Nagy Ödön (1850) Târgu-Mureș, Mureșeni Forest, 28.08.1940, Nagy Ödön (1851)

TANNINS	ROSACEAE	*Agrimonia eupatoria* L.	Târgu-Mureș, 23.06.1936, Nagy Ödön (1868) Târgu-Mureș, "Fântâna puturoasă", 29.06.1946, Nagy Ödön (1869) Porumbeni, 21.07.1946, Nagy Ödön (1870) Săbed, Corhan Hill, 01.07.1981, Silvia Oroian (5637) Herghelia, Ceuașul de Câmpie commune, 12.07.1972, Konya Istvan (5657) Târgu-Mureș, Căpâlnița, 10.08.1982, Silvia Oroian (5658) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5797) Vidrasău, 11.07.1991, Silvia Oroian (7713) Sântana de Mureș, Bocșa Hill, 05.06.1990, Silvia Oroian (7714)
	BETULACEAE	*Alnus glutinosa* (L.) Gaertn	Târgu-Mureș, Remetea, 16.05.1936, Nagy Ödön (340) Târgu-Mureș, 1938, Nagy Ödön (341) Târgu-Mureș, Podeni, 16.05.1936, Nagy Ödön (342) Zau de Câmpie, 1982, leg. Eftenie Ioan, det. Silvia Oroian (5711) Târgu-Mureș, 18.03.1908, Bitai Arpard (8022)
	FABACEAE	*Anthyllis vulneraria* L.	Săbed, Corhan Hill, 29.05.1981, Silvia Oroian (5785) Jabenița, salty soil, 1994, Silvia Oroian (11049) Jabenița, Lacul Sărat, 26.06.1992, I. Eftenie (11050) Stânceni, Meștera, 09.06.1996, leg. Florentina Togănel, det. Silvia Oroian (11051) Răstolița, 10.06.1995, Silvia Oroian (11052) Stânceni, Leu Mountain, 18.05.1994, Silvia Oroian (11053) Stânceni, Mureș river shore, 17.09.1993, Silvia Oroian (11055) Răstolița, The Iod Valley, 07.08.1986, Silvia Oroian (11054) Deleni, 06.1992, Silvia Oroian (11056) Târgu-Mureș, Stejăriș forest, 10.07.1959, Ion Patachi (11057) Crăiești toward Herepea, 28.05.1985, leg. Konya Istvan, det.Silvia Oroian (11060) Hetiur-Sighișoara, 29.05.1984, Silvia Oroian (110629 Crăiești-Herepea, Fânațe Hill, 04.06.1984, Silvia Oroian (11062) Zau de Câmpie, Bota Mare, 28.05.1980, Silvia Oroian (11063)
	FAGACEAE	*Castanea sativa* Miller (subspont.)	Târgu-Mureș, "1 Mai", 27.08.1933, Nagy Ödön (1344) Săbed, pădure, 20.06.1959, Ion Patachi (8034)

	BETULACEAE	*Corylus avellana* L.	Sânpaul, 01.04.1939, Nagy Ödön (347) Târgu-Mureș, Platoul Cornești, 480 m altit., 10.03.1937, Nagy Ödön (348, 349) Târgu-Mureș, Mică Forest, 25.03.1935, Nagy Ödön (350) Târgu-Mureș, Mureșeni Forest, 05.04.1940, Nagy Ödön (351) Târgu-Mureș, Mare forest, 18.03.1938, Nagy Ödön (352) Târgu-Mureș, Parcul UMF, 14.08.1957, Nagy Ödön (353) Târgu-Mureș, 05.06.1950, Nagy Ödön (354) Adămuș, Herepea commune, 05.1979, Silvia Oroian (7095) Adămuș, Herepea commune, 1986, Silvia Oroian (7096) Târgu-Mureș, Platoul Cornești 20.04.1940, leg. Babos Bertalan, det. Silvia Oroian (7097) Orșova, Seci hamlet, 05.1979, leg. Sarkany Andrei, det. Silvia Oroian (7098)
	ONAGRACEAE	*Epilobium angustifolium* L.	Târgu-Mureș, 24.06.1950, Nagy Ödön (676) Răstolița, 10.07.1995, Silvia Oroian (11110) Răstolița, Mureș river shore, 25.07.1996, Silvia Oroian (11111)
	ONAGRACEAE	*Epilobium hirsutum* L.	Târgu-Mureș, dealul cu comoară, 370 m altit., 02.09.1948, Nagy Ödön (671) Târgu-Mureș, the base of Halmok Hill, 01.09.1948, Nagy Ödön (672) Târgu-Mureș, Mureș river shore, 310 m altit., 17.09.1936, Nagy Ödön (673) Târgu-Mureș, Mureș river shore, 311 m altit., 10.09.1938, Nagy Ödön (674) Târgu-Mureș, toward Sângeorgiu de Mureș, 11.08.1950, Nagy Ödön (675) Reghin, 11.07.2000, Mihaela Sămărghițan (11250) Răstolița, 25.07.1996, Silvia Oroian (11128)
	ONAGRACEAE	*Epilobium parviflorum* Schreb.	Târgu-Mureș, Pocloș stream, 300 m sltit., 11.10.1937, Nagy Ödön (664) Târgu-Mureș, 26.09.1951, Nagy Ödön (665)
	ASTERACEAE	*Erigeron acris* L.	Târgu-Mureș, Mare Hill vineyard, 20.06.1957, Nagy Ödön (2558) Târgu-Mureș, Corunca, 03.06.1939, Nagy Ödön (2559) Târgu-Mureș, island on Mureș, "Râtul cu scoici", 25.05.1948, Nagy Ödön (2560)
	GERANIACEAE	*Erodium cicutarium* (L.) L'Héritier	Târgu-Mureș, Mureș river shore, 23.06.1947, Nagy Ödön (1352) Porumbeni, 06.04.1947, Nagy Ödön (1353) Târgu-Mureș, 15.10.1942, Nagy Ödön (1354)
	ROSACEAE	*Fragaria vesca* L.	Târgu-Mureș, Stejăriș forest fringe, 13.05.1940, Nagy Ödön (1895) Târgu-Mureș, Stejăriș forest, 12.04.1939, Nagy Ödön (1896) Sânpaul, 28.05.1939, Nagy Ödön (1897) Târgu-Mureș, the base of dealului 1 Mai, 18.04.1939, Nagy Ödön (1898) Târgu-Mureș, Stejăriș forest, 18.05.1938, Nagy Ödön (1899) Băgaciu, 1872 (5386) Băgaciu, 1886 (5476) Târgu-Mureș, Platoul Cornești 19.05.1982, leg. Konya Istvan, det. Silvia Oroian (5648)

	ROSACEAE	*Fragaria vesca* L.	Deda-Bistra, Scaunul Domnului, 15.06.1960, leg. Konya Istvan, det. Silvia Oroian (6036) Târgu-Mureș, Platoul Cornești, 06.1953, leg. Konya Istvan, det. Silvia Oroian (6037) Orșova, Seci hamlet, 05.1979, leg. Sarkany Andrei, det. Silvia Oroian (7722) Sântana de Mureș, pasture, 22.05.1989, Silvia Oroian (7725) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7726) Răstolița, The Iod Valley, meadow, 17.04.1991, Silvia Oroian (7728)
	ROSACEAE	*Fragaria viridis* Duch.	Zau de Câmpie, 07.07.1981, leg. Eftenie Ioan, det. Silvia Oroian (5670) Sânpaul, 12.05.1987, Silvia Oroian (7723) Valea Izvoarelor, Măgheruș Hill, 13.05.1987, Silvia Oroian (7724) Zau de Câmpie, reserve, 30.04.1990, Silvia Oroian (7227)
	GERANIACEAE	*Geranium robertianum* L.	Târgu-Mureș, Platoul Cornești, 26.06.1948, Nagy Ödön (1384) Târgu-Mureș, "1 Mai", 21.07.1948, Nagy Ödön (1385) Târgu-Mureș, Mureșeni Forest, 14.05.1937, Nagy Ödön (1386) Târgu-Mureș, 21.05.1936, Nagy Ödön (1387) Târgu-Mureș, the base of Halmok Hill, 01.05.1939, Nagy Ödön (1388) Târgu-Mureș, Stejăriș forest, 17.06.1953, Konya Istvan (5958)
	ROSACEAE	*Geum urbanum* L.	Târgu-Mureș, the base of Halmok Hill, 01.05.1939, Nagy Ödön (1900) Târgu-Mureș, Platoul Cornești, 31.05.1942, Nagy Ödön (1901) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7598)
	JUGLANDACEAE	*Juglans regia* L. (subspont.)	Târgu-Mureș, 08.05.1939, Nagy Ödön (1413) Târgu-Mureș, 01.04.1939, Nagy Ödön (1414) Târgu-Mureș, 12.05.1937, Nagy Ödön (1415) Târgu-Mureș, 14.05.1937, Nagy Ödön (1416) Târgu-Mureș, 02.05.1936, Nagy Ödön (1417) Târgu-Mureș, 08.05.1936, Nagy Ödön (1418) Târgu-Mureș, 13.05.1939, Nagy Ödön (1419) Târgu-Mureș, Mică Forest, 17.04.1939, Nagy Ödön (1420)
	PLUMBAGINACEAE	*Limonium gmelini* (Willd.) O. Kuntze (*Statice gmelinii* Willd.)	Sânpaul, 1938, Nagy Ödön (549)
	PRIMULACEAE	*Lysimachia nummularia* L.	Târgu-Mureș, 14.06.1944, Nagy Ödön (2271) Târgu-Mureș, top of 1 Mai Hill, 16.06.1936, Nagy Ödön (2272) Târgu-Mureș, Trebely, 19.05.1942, Nagy Ödön (2273) Târgu-Mureș, "Râtul cu scoici", 21.07.1940, Nagy Ödön (2274) Băgaciu, 1886 (5507) Târgu-Mureș, hippodrome, 07.1959, Konya Istvan (5962) Târgu-Mureș, Stejăriș forest, 17.06.1953, Konya Istvan (5963) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7653)

	PRIMULACEAE	*Lysimachia punctata* L.	Târgu-Mureș, Mureșeni Forest, 13.06.1951, Nagy Ödön (2263) Târgu-Mureș, Stejăriș forest, 06.06.1939, Nagy Ödön (2264) Târgu-Mureș, Platoul Cornești, 10.04.1948, Nagy Ödön (2275) Târgu-Mureș, top of 1 Mai Hill, 08.06.1946, Nagy Ödön (2276) Târgu-Mureș, Stejăriș forest, 14.08.1950, Nagy Ödön (2277) Târgu-Mureș, Platoul Cornești, 26.06.1948, Nagy Ödön (2278) Târgu-Mureș, Platoul Cornești, 03.06.1941, Nagy Ödön (2279) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5971)
	PRIMULACEAE	*Lysimachia vulgaris* L.	Târgu-Mureș, Mureș river shore, 12.08.1956, Nagy Ödön (2265)
	LYTHRACEAE	*Lythrum salicaria* L.	Târgu-Mureș, Stejăriș forest, 31.08.1936, Nagy Ödön (1545) Târgu-Mureș, "Râtul cu scoici", 21.07.1940, Nagy Ödön (1546) Târgu-Mureș, Mureș river shore, 20.05.1939, Nagy Ödön (1547) Sânpaul, 28.05.1939, Nagy Ödön (1548) Porumbeni, 20.08.1947, Nagy Ödön (1549) Târgu-Mureș, island, 16.08.1953, leg. Konya Istvan, det. Silvia Oroian (6047)
	POLYGONACEAE	*Polygonum aviculare* L.	Târgu-Mureș, plough land, 300 m altit., 28.08.1936, Nagy Ödön (598) Târgu-Mureș, Budiu Forest, 350 m altit., 03.10.1938, Nagy Ödön (599) Târgu-Mureș, 10.07.1960, Ion Patachi (8010) Sângeorgiu de Mureș, 30.06.1993, Silvia Oroian (8011)
	POLYGONACEAE	*Polygonum bistorta* L.	Târgu-Mureș, plough land, 315 m altit., 01.05.1936, Nagy Ödön (604) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7637)
	ROSACEAE	*Potentilla anserina* L.	Târgu-Mureș, Mureș river shore, "Râtul cu scoici", 03.06.1938, Nagy Ödön (1925) Târgu-Mureș, Beșa, 31.05.1944, Nagy Ödön (1926) Băgaciu, 1872 (5407) Reghin, 02.05.2000, Mihaela Sămărghițan (11210)
	ROSACEAE	*Potentilla arenaria* *(syn. P.cinerea* Chaix ex Vill.*)*	Târgu-Mureș, Platoul Cornești, 05.04.1939, Nagy Ödön (1921) Porumbeni, 07.04.1947, Nagy Ödön (1922) Târgu-Mureș, the base of Halmok Hill, 30.03.1939, Nagy Ödön (1923) Târgu-Mureș, "Dealul Uriaș", 09.04.1937, Nagy Ödön (1924) Băgaciu, 1872 (5387, 5456)
	ROSACEAE	*Potentilla argentea* L.	Târgu-Mureș, Platoul Cornești, 13.07.1947, Nagy Ödön (1913, 1914) Târgu-Mureș, Mureșeni Forest, 12.05.1936, Nagy Ödön (1915) Târgu-Mureș, Mureșeni Forest, 24.09.1938, Nagy Ödön (1916) Târgu-Mureș, Platoul Cornești, 13.07.1947, Nagy Ödön (1917) Târgu-Mureș, Beșa, 19.06.1942, Nagy Ödön (1918) Târgu-Mureș, Mureș river shore, 03.06.1938, Nagy Ödön (1919) Târgu-Mureș, Stejăriș forest, 08.06.1946, Nagy Ödön (1920) Băgaciu, 1872 (5423)

	ROSACEAE	*Potentilla erecta* (L.) Rauschel	Târgu-Mureș, Cocoșd forest, 20.05.1941, Nagy Ödön (1929) Târgu-Mureș, 1 Mai Hill, 21.07.1948, Nagy Ödön (1930) Târgu-Mureș, Platoul Cornești, 29.05.1941, Nagy Ödön (1931) Târgu-Mureș, Budiu Forest, 03.10.1938, Nagy Ödön (1932) Târgu-Mureș, "Dealul Uriaș", 14.1939, Nagy Ödön (1933) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7599) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7606)
	ROSACEAE	*Potentilla recta* L.	Târgu-Mureș, the base of Mare Hill, 20.06.1957 (1946) Târgu-Mureș, Platoul Cornești, 01.07.1956, Nagy Ödön (1947) Târgu-Mureș, the fringe of Platoul Cornești, toward Livezeni, 18.09.1948, Nagy Ödön (1948) Târgu-Mureș, Stejăriș forest, 30.09.1937, Nagy Ödön (1949) Târgu-Mureș, Platoul Cornești, 19.10.1936, Nagy Ödön (1950) Târgu-Mureș, Platoul Cornești, 26.06.1948, Nagy Ödön (1951) Târgu-Mureș, Platoul Cornești, 13.07.1947, Nagy Ödön (1952, 1953) Târgu-Mureș, toward Platoul Cornești, 16.06.1948, Nagy Ödön (1954) Sântana de Mureș, Bocșa Hill, 05.06.1990, Silvia Oroian (7729)
	ROSACEAE	*Potentilla reptans* L.	Târgu-Mureș, 05.06.1950, Nagy Ödön (1938) Târgu-Mureș, Platoul Cornești, 05.06.1943, Nagy Ödön (1939) Băgaciu, 1872 (5434)
	ROSACEAE	*Prunus spinosa* L.	Târgu-Mureș, Platoul Cornești, 16.04.1937, Nagy Ödön (1965) Târgu-Mureș, Platoul Cornești, 06.1953, leg. Konya Istvan, det. Silvia Oroian (6031)
	ROSACEAE	*Prunus tenella* Batsch	Târgu-Mureș, Platoul Cornești, 18.04.1939, Nagy Ödön (1968) Săbed, Corhan Hill, 23.04.1981, Szombath Zoltán, Silvia Oroian (5639) Săbed, Corhan Hill, 08.05.1980, Silvia Oroian (5792)
	FAGACEAE	*Quercus petraea* (Matt.) Liebl.	Săbed, reserve, 12.08.1989, Silvia Oroian (7104) Târgu-Mureș, 27.04.1908, Bitai Arpard (8035)
	FAGACEAE	*Quercus pubescens* Willd.	Orșova, Seci hamlet, 05.1979, Sarkany Andrei (7112)
	FAGACEAE	*Quercus robur* L.	Târgu-Mureș, Near church, 380 m altit., 10.05.1937, Nagy Ödön (990) Târgu-Mureș, 28.09.1928, Nagy Ödön (991) Târgu-Mureș, Platoul Cornești, 01.05.1939 (1336) Târgu-Mureș, 01.05.1943, Nagy Ödön (1337) Târgu-Mureș, 24.04.1936, Nagy Ödön (1338) Târgu-Mureș, 10.05.1936, Nagy Ödön (1339) Târgu-Mureș, Platoul Cornești, 29.06.1939, Nagy Ödön (1340) Târgu-Mureș, 16.05.1936, Nagy Ödön (1341) Târgu-Mureș, Platoul Cornești, 10.1948, Nagy Ödön (1342)

	FAGACEAE	*Quercus robur* L.	Săbed, reserve, 16.09.1989, Silvia Oroian (7105) Săbed, reserve, 12.08.1989, Silvia Oroian (7106) Săbed, reserve, 20.06.1989, Silvia Oroian (7107) Adămuș, Herepea commune, 29.05.1984, Silvia Oroian (7108) Petelea, 05.06.1967, Konya Istvan (7109) Gurghiu, Poiana Narciselor, forest, 06.06.1991, Silvia Oroian (7500) Păuloaia Valley, 06.07.2000, Mihaela Sămărghițan (11297) Viilor Hill Gurghiu, 27.07.2000, Mihaela Sămărghițan (11300)
	ROSACEAE	*Sanguisorba officinalis* L.	Târgu-Mureș, Platoul Cornești, 18.10.1936, Nagy Ödön (1994) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7601)

DEPSIDES	ASTERACEAE	*Cichorium intybus* L.	Târgu-Mureș, 16.08.1957, Nagy Ödön (2526) Târgu-Mureș, plough land, 16.09.1941, Nagy Ödön (2527) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5636) Târgu-Mureș, museum's yard, 10.07.1980, Silvia Oroian (5652)

FATTY OILS	CUCURBITACEAE	*Cucurbita pepo* L.	Târgu-Mureș, the base of Dealului Halmok, 01.09.1948, Nagy Ödön (2746) Târgu-Mureș, garden, 29.05.1939, Nagy Ödön (2747)
	ASTERACEAE	*Helianthus annuus* L.	Târgu-Mureș, plough land, 16.09.1941, Nagy Ödön (2577)
	ONAGRACEAE	*Oenothera biennis* L.	Târgu-Mureș, Mureș dam, 07.09.1948, Nagy Ödön (660) Târgu-Mureș, Mureș river shore, 26.06.1942, Nagy Ödön (661) Lunca Bradului, 25.07.1996, Silvia Oroian (11109) Lunca Bradului, 25.07.1996, leg. Silvia Oroian, det. Mihaela Sămărghițan (11112) Reghin, 17.06.2000, Mihaela Sămărghițan (11289)

VOLATILE OILS	ASTERACEAE	*Achillea millefolium* L.	Târgu-Mureș, Mureș river shore, 20.05.1939, Nagy Ödön (2675) Târgu-Mureș, 320 m altit., 30.09.1937, Nagy Ödön (2676) Târgu-Mureș, the citadel's wall, 24.06.1941, Nagy Ödön (2677) Zau de Câmpie, 21.06.1981, leg. Eftenie Ioan, det. Silvia Oroian (5692) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5970)
	ASTERACEAE	*Achillea ptarmica* L.	Lăpușna, 14.08.1997, Mihaela Sămărghițan (11256) Valea Bătrâna, 12.08.1998, Mihaela Sămărghițan (11260) Dubiște, 06.08.1997, Mihaela Sămărghițan (11279, 11282)
	APIACEAE	*Anethum graveolens* L.	Târgu-Mureș, 19.06.1939, Nagy Ödön (1262) Târgu-Mureș, 26.06.1939, Nagy Ödön (1263)
	APIACEAE	*Angelica archangelica* L.	Târgu-Mureș, 16.06.1952, Nagy Ödön (1264)
	ASTERACEAE	*Anthemis tinctoria* L.	Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7518) Beica de Sus, 16.06.1999, Mihaela Sămărghițan (11272)

	ARISTOLOCHIACEAE	*Asarum europaeum* L.	Sânpaul, 27.05.1939, Nagy Ödön (316) Târgu-Mureș, Platoul Cornești, 480 m altit., 04.04.1937, Nagy Ödön (317) Târgu-Mureș, 18.04.1939, Nagy Ödön (318) Târgu-Mureș, Platoul Cornești, 480 m altit, 1938, Nagy Ödön (319) Târgu-Mureș, Platoul Cornești, 22.04.1939, Nagy Ödön (320) Băgaciu, 1872 (5369) Băgaciu, 1886 (5468) Săbed, reserve, 12.08.1989, Silvia Oroian (7114) Săbed, reserve, 06.04.1989, Silvia Oroian (7115) Papiu Ilarian, Șandru forest, 04.05.1988, Silvia Oroian (7116) Orșova, Seci hamlet, 05.1979, Sarkany Andrei, (7117) Răstolița, The Iod Valley, 07.08.1986, Silvia Oroian (7118) Târgu-Mureș, Mare forest, Ion Patachi (8162) Livezeni, 25.04.1936, Nagy Ödön (8163) Răstolița, Podirei, 09.05.1993, Silvia Oroian (8169) Răstolița, Podirei, 26.09.1993, Silvia Oroian (8170) Răstolița, Podirei, 20.06.1993, Silvia Oroian (8171) Răstolița, pădure, 26.07.1985, Silvia Oroian (8172) Răstolița, 04.05.1997, Silvia Oroian (11386)
	APIACEAE	*Carum carvi* L.	Târgu-Mureș, Botanical Garden of UMF, 10.06.1980, Silvia Oroian (5770) Târgu-Mureș, Beșa forest, 05.1953, Konya Istvan (5886) Bedeni, 25.05.1948, Nagy Ödön (1307) Târgu-Mureș, str. Libertății, 30.05.1948, Nagy Ödön (1308) Târgu-Mureș, Mureșeni Forest, 24.09.1938, Nagy Ödön (1309) Târgu-Mureș, toward Platoul Cornești, 04.06.1944, Nagy Ödön (1310) Târgu-Mureș, Mureșeni Forest, 05.1937, Nagy Ödön (1311) Târgu-Mureș, 09.05.1936, Nagy Ödön (1312) Târgu-Mureș, 01.05.1936, Nagy Ödön (1313
	APIACEAE	*Coriandrum sativum* L.	Târgu-Mureș, Medicinal Plants Garden of a UMF, 10.07.1952, Nagy Ödön (1304) Târgu-Mureș, Medicinal Plants Garden of a UMF, 16.06.1952, Nagy Ödön (1305)
	IRIDACEAE	*Iris pseudacorus* L.	Fărăgău Lake, 26.05.1976, Vasarhelyi Zoltan (5828) Fărăgău Lake, 13.06.1976, Konya Istvan (5829) Răstolița, 1959, Ion Patachi (7524) Târgu-Mureș, Mureș river dead branch, 31.05.1936 (7526) Reghin, toward Beica, 31.05.1999, Mihaela Sămărghițan (11331)
	IRIDACEAE	*Iris sibirica* L.	Gurghiu, Poiana Narciselor, 1992, Silvia Oroian (7519) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7695, 7703) Gurghiu, Poiana Narciselor, 22.05.1998, Mihaela Sămărghițan (11327)

	CUPRESSACEAE	*Juniperus communis* L.	Târgu-Mureș, 310 m altit., 06.03.1939, Nagy Ödön (211) Târgu-Mureș, Platoul Cornești, 480 m altit., Nagy Ödön (212) Târgu-Mureș, 330 m altit., 12.04.1937, Nagy Ödön (213) Târgu-Mureș, catholic cemetery, 31.04.1941, Nagy Ödön (214)
	ASTERACEAE	*Matricaria recutita* (syn. *Matricaria chamomilla* L)	Sângeorgiu de Mureș, 05.06.1941, Nagy Ödön (2333) Târgu-Mureș, 21.05.1938, Nagy Ödön (2334)
	LAMIACEAE	*Melissa officinalis* L.	Târgu-Mureș, cultivated, 02.07.1950, Nagy Ödön (148) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5966)
	LAMIACEAE	*Mentha aquatica* L.	Târgu-Mureș, Beșa, 19.06.1942, Nagy Ödön (134) Târgu-Mureș, Mureș dam, 07.09.1948, Nagy Ödön (135, 136) Târgu-Mureș, Mureș river shore, 310 m altit., Nagy Ödön (137)
	LAMIACEAE	*Mentha arvensis* L.	Târgu-Mureș, 07.09.1940, Nagy Ödön (138), var. *angustissima* Târgu-Mureș, Mureșeni Forest, 07.09.1940, Nagy Ödön (139) Târgu-Mureș, Stejăriș forest, 470 m altit., 04.09.1938 (140) Sînpaul, 28.05.1939, Nagy Ödön (141) Târgu-Mureș, 06.09.1940, Nagy Ödön (142) Târgu-Mureș, Mureșeni Forest, 340 m altit., 29.08.1940 (143) Târgu-Mureș, Platoul Cornești, 480 m altit., Nagy Ödön (144)
	LAMIACEAE	*Mentha longifolia* (L.) Huds.	Târgu-Mureș, airport, 28.08.1941, Nagy Ödön (131) Târgu-Mureș, 1 Mai Hill, 21.07.1948, Nagy Ödön (132) Târgu-Mureș, "Dealul cu Comoară", 112 m altit., 25.09.1939, Nagy Ödön (132)
	LAMIACEAE	*Mentha pulegium* L.	Târgu-Mureș, 29.07.1953, Nagy Ödön (4564)
	LAMIACEAE	*Mentha rotundifolia* L.	Târgu-Mureș, Botanical Garden of UMF, 20.10.1980, leg. Konya Istvan, det. Silvia Oroian (5652)
	LAMIACEAE	*Mentha verticillata* (L.) Hudson	Târgu-Mureș, 12.08.1957, Nagy Ödön (4566) Târgu-Mureș, garden, 13.08.1951, Nagy Ödön (4567) Târgu-Mureș, garden, 12.08.1957, Nagy Ödön (4571)
	LAMIACEAE	*Mentha x piperita* L. (*M. aquatica* x *spicata)*	Târgu-Mureș, cultivated, 13.08.1951, Nagy Ödön (129) Acățari, cultivated, 13.09.1935, Nagy Ödön (130)
	LAMIACEAE	*Nepeta nuda* L. ssp. *nuda* (*Nepeta pannonica* L.)	Târgu-Mureș, the base of Mare Hill, 300 m altit., 14.07.1948, Nagy Ödön (126) Târgu-Mureș, Budiu Hill, 400 m altit., 26.06.1936, Nagy Ödön (127) Zau de Câmpie, 09.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5684) Lechința de Mureș, 02.07.1985, col. Sarkany Andrei, det, Silvia Oroian (7898)
	LAMIACEAE	*Origanum vulgare* L.	Târgu-Mureș, 07.09.1940, Nagy Ödön (124) Târgu-Mureș, "Dâmbul cu Comoară", 11.08.1947, Nagy Ödön (125) Târgu-Mureș, Botanical Garden of UMF, 20.10.1980, leg. Konya Istvan, det. Silvia Oroian (5645) Zau de Câmpie, 19.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5687)

	ASTERACEAE	*Petasites hybridus* (L.) P.Gaertner, B.Meyer et Schreb.	Târgu-Mureș, Mureș river shore, 15.04.1938, Nagy Ödön (2340, 2341) Târgu-Mureș, Mureș river shore, 12.05.1937, Nagy Ödön (2342) Orșova, 12.05.1997, Mihaela Sămărghițan (11281)
	APIACEAE	*Peucedanum oreoselinum* (L.) Moench	Porumbeni, 20.07.1948, Nagy Ödön (1835) Porumbeni, 01.08.1948, Nagy Ödön (1836, 1838) Târgu-Mureș, the base of Halmok Hill, 02.09.1948, Nagy Ödön (1837)
	PINACEAE	*Pinus nigra* Arnold	Târgu-Mureș, Budiu Forest, 350 m altit., Nagy Ödön (226) Săbed, reserve, 23.03.1989, Silvia Oroian (7081)
	PINACEAE	*Pinus sylvestris* L.	Târgu-Mureș, Platoul Cornești, 350 m altit., 15.05.1937, Nagy Ödön (228) Târgu-Mureș, Platoul Cornești, 06.06.1937, Nagy Ödön (229) Târgu-Mureș, 1937, Nagy Ödön (230) Acățari, 320 m altit., 17.05.1937, Nagy Ödön (231) Târgu-Mureș, Platoul Cornești, 500 m altit., 04.1938, Nagy Ödön (232) Târgu-Mureș, 29.05.1942, Nagy Ödön, (233) Săbed, reserve, 12.08.1989, Silvia Oroian (7082, 7085) Târgu-Mureș, Platoul Cornești, 12.05.1940, leg. Babos Bertalan, det. Nagy Ödön (7083) Târgu-Mureș, Platoul Cornești, 26.04.1940, leg. Babos Bertalan, det. Nagy Ödön (7084)
	LAMIACEAE	*Salvia officinalis* L.	Târgu-Mureș, Platoul Cornești, 22.05.1936, Nagy Ödön (3117) Târgu-Mureș, Mare Hill vineyard, 17.06.1949, Nagy Ödön (3118) Târgu-Mureș, Botanical Garden of UMF, 16.06.1952, Nagy Ödön (3119)
	LAMIACEAE	*Salvia sclarea* L.	Târgu-Mureș, Botanical Garden of UMF, 10.07.1952, Nagy Ödön(3110, 3111)
	LAMIACEAE	*Thymus glabrescens* Willd.	Târgu-Mureș, Căpâlnița, 01.06.1938, Nagy Ödön (3043) Băgaciu, 1872 (5404) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7672)
	LAMIACEAE	*Thymus pannonicus* All.	Târgu-Mureș, Căpâlnița, 19.05.1937, Nagy Ödön (3019) Târgu-Mureș, 06.06.1943, Nagy Ödön (3033) Târgu-Mureș, Mureșeni Forest, 06.06.1943, Nagy Ödön (3034) Târgu-Mureș, Platoul Cornești, 05.06.1943, Nagy Ödön (3038) Târgu-Mureș, 27.05.1943, Nagy Ödön (3042) Târgu-Mureș, 18.06.1947, Nagy Ödön (3048) Târgu-Mureș, "Râtul cu scoici", 25.06.1947, Nagy Ödön (3049) Târgu-Mureș, 18.06.1947, Nagy Ödön (3050) Târgu-Mureș, "Râtul cu scoici", 23.06.1947, Nagy Ödön (3051) Fărăgău Lake, 26.05.1976, Vasarhely Zoltan
	LAMIACEAE	*Thymus pulegioides* L.	Târgu-Mureș, Stejăriș forest fringe, 12.05.1946, Nagy Ödön (3040) (ssp. chamaedrys) Târgu-Mureș, Stejăriș forest fringe, 09.05.1947, Nagy Ödön (3040) (ssp. chamaedrys) Târgu-Mureș, Platoul Cornești, 11.05.1946, Nagy Ödön (3045) (ssp. chamaedrys)

	LAMIACEAE	*Thymus pulegioides* L.	Târgu-Mureș, the base of pădurii Stejăriș, 11.05.1937, Nagy Ödön (3046) (ssp. chamaedrys) Târgu-Mureș, 21.05.1946, Nagy Ödön (3047) (ssp. chamaedrys) Deda-Bistra Mureșului, 15.06.1960, Konya Istvan (5939)
	LAMIACEAE	*Thymus serpyllum* L.	Târgu-Mureș, 21.06.1936, Nagy Ödön (3052) Târgu-Mureș, Platoul Cornești, 06.1953, Konya Istvan (5937)
	LAMIACEAE	*Thymus x dacicus* Borb. (*T.pannonicus* x *T.pulegioides*)	Târgu-Mureș, Mureșeni Forest, 03.06.1943, Nagy Ödön (3035) Târgu-Mureș, 06.06.1943, Nagy Ödön (3036) Târgu-Mureș, Mureșeni Forest, 02.06.1943, Nagy Ödön (3037) Târgu-Mureș, 05.06.1943, Nagy Ödön (3039) Târgu-Mureș, 06.06.1943, Nagy Ödön (3044)
	TILIACEAE	*Tilia cordata* Mill.	Sânpaul, garden, 27.05.1939, Nagy Ödön (926) Târgu-Mureș, 29.05.1938, Nagy Ödön (927) Târgu-Mureș, 05.07.1957, Nagy Ödön (928) Târgu-Mureș, Budiu Hill, 380 m altit., 17.05.1937, Nagy Ödön (929) Târgu-Mureș, hippodrome, 08.07.1960, leg. Konya Istvan, det. Silvia Oroian (6045) Răstolița, 01.08.1993, Silvia Oroian (11168) Răstolița, 24.05.1996, Silvia Oroian (11170) Gălăoaia, 30.07.1996, Silvia Oroian (11171)
	TILIACEAE	*Tilia plathyphyllos* Scop.	Târgu-Mureș, 05.07.1957, Nagy Ödön (925) Răstolița, 24.05.1996, Silvia Oroian (11166) Lunca Bradului, 15.10.1993, Silvia Oroian (11167) Lunca Bradului, 19.10.1993, Silvia Oroian (11169)
	TILIACEAE	*Tilia tomentosa* Moench	Târgu-Mureș, Mare Hill, 15.06.1950, Nagy Ödön (924) (cultivated)
	VALERIANACEAE	*Valeriana officinalis* L.	Târgu-Mureș, Platoul Cornești 30.05.1944, Nagy Ödön (901) Târgu-Mureș, 31.05.1947, Nagy Ödön (902) Târgu-Mureș, Mureș river shore, 17.09.1956, Nagy Ödön (903, 904) Zau de Câmpie, 08.06.1981, leg. Eftenie Ioan, det. Silvia Oroian (5675) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7682) (var.tenuifolia Vohl.) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7682) (var.tenuifolia Vohl.) Răstolița, 10.07.1995, Silvia Oroian (11175) Stânceni, Leu Mountain, 18.05.1994, Silvia Oroian (11176) Răstolița, Podirei, 22.04.1994, Silvia Oroian (11177) Ciobotani-Toplița, 18.05.1994, Silvia Oroian (11178) Răstolița, Vișa Valley, 29.05.1995, Silvia Oroian (11179)
	ASTERACEAE	*Xanthium spinosum* L.	Târgu-Mureș, 20.07.1951, Nagy Ödön (2420) Porumbeni, 18.08.1947, Nagy Ödön (2421)

	ASTERACEAE	*Xanthium strumarium* L.	Târgu-Mureș, 17.08.1951, Nagy Ödön (2422) Târgu-Mureș, Mureș river shore, 17.09.1956, Nagy Ödön (2423) Sântana de Mureș, 16.10.1937, Nagy Ödön (2424)
ALLANTOIN	BORAGINACEAE	*Symphytum officinale* L.	Porumbeni, 20.08.1947, Nagy Ödön, (419) Târgu-Mureș, plough land, 300 m altit., 13.05.1936, Nagy Ödön (420) Băgaciu, 1872 (5399)
RESINES	CANNABACEAE	*Cannabis sativa* L.	Porumbeni, 03.08.1948, Nagy Ödön (682) Botanical Garden of UMF, Silvia Oroian (7152)
	CANNABACEAE	*Humulus lupulus* L.	Târgu-Mureș, Mureș river dead branch, 310 m altit., 18.09.1936, Nagy Ödön (679) Târgu-Mureș, 309 m altit., 20.09.1941, Nagy Ödön (680) Reghin, 02.05.2000, Mihaela Sămărghițan (11291)
GLYCO-REZINES	CONVOLVULACEAE	*Calystegia sepium* (L.) R.Br.	Târgu-Mureș, malul pârâului Kali, 19.09.1938, Nagy Ödön (2643) Târgu-Mureș, near Platoul Cornești, plough land, 05.08.1947, Nagy Ödön (2644) Voiniceni, 27.07.1948, Nagy Ödön (2645)
	CONVOLVULACEAE	*Convolvulus arvensis* L.	Târgu-Mureș, plough land, 06.1937, Nagy Ödön (2646) Târgu-Mureș, at the base of Platoul Cornești (2647) Băgaciu, 1872 (5427) Târgu-Mureș, museum's yard, 02.07.1960, Konya Istvan (5919) Târgu-Mureș, hippodrome, 07.1959, Konya Istvan (5920) Săbed, Corhan Hill, 01.07.1981, Silvia Oroian (7906) Crăiești toward Herepea, 28.05.1985, leg. Konya Istvan, det. Silvia Oroian (7907) Zau de Câmpie, reserve, 12.07.1991, Silvia Oroian (7908) Vidrasău, Mureș river shore, 19.06.1991, Silvia Oroian (7909) Târgu-Mureș, museum's yard, 27.05.1985, Silvia Oroian (7910) Sântana de Mureș, 05.06.1990, Silvia Oroian (7911)
SULFUR COMPOUNDS	BRASSICACEAE	*Alliaria petiolata* (Bieb.) Cavara&Grande (syn. *Alliaria officinalis* Andry. et Bieb.)	Târgu-Mureș, Platoul Cornești, 04.04.1937, Nagy Ödön (3128) Târgu-Mureș, the base of Dealului Halmok, 28.04.1939, Nagy Ödön (3135) Băgaciu, 1886 (5488) Târgu-Mureș, Platoul Cornești, 06.0953, Konya Istvan (5935) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7620) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7621) Târgu-Mureș, hippodrome, 28.04.1980, Silvia Oroian (7747)
	ALLIACEAE	*Allium ursinum* L.	Băgaciu, 1872 (5416) Gurghiu, school, 26.04.1960, Ion Patachi (7554) Valea Orșova, Obârsii Hill, 15.05.1997, Mihaela Sămărghițan (11332)

	ALLIACEAE	*Allium ursinum* L.	Valea Orșova, Obârsii Hill, 12.05.1997, Mihaela Sămărghițan (11333) Gurghiu, 23.05.1995, leg. So, det. Mihaela Sămărghițan (11338) Orșova Pădure, 03.06.1994, Silvia Oroian, Mihaela Sămărghițan (11352)
	BRASSICACEAE	*Armoracia rusticana* P. Gaertner	Târgu-Mureș, garden, 18.05.1940, Nagy Ödön (3138) Târgu-Mureș, garden, 27.05.1939, Nagy Ödön (3139) Târgu-Mureș, garden, 20.04.1939, Nagy Ödön (3139)
IRIDOIDS	LAMIACEAE	*Ajuga genevensis* L.	Târgu-Mureș, Budiu, 07.07.1942, Nagy Ödön, (59) Târgu-Mureș, near Stejăriș forest, 03.06.1969, Nagy Ödön (60) Târgu-Mureș, Stejăriș forest, 08.06.1946, Nagy Ödön, (61) Târgu-Mureș, Mureșeni Forest, 350 m altit., 12.05.1936 (67) Târgu-Mureș, Near church, 440 m altit., 16.05.1936, Nagy Ödön (68) Târgu-Mureș, Near church, 440 m altit., 10.05.1937, Nagy Ödön (69) Târgu-Mureș, Platoul Cornești, 27.05.1951, Nagy Ödön, (70) Târgu-Mureș, Beșa forest, 380 m altit., 14.05.1939, Nagy Ödön (71) Băgaciu, 1872 (5373) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7655) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7667) Gurghiu, Poiana Narciselor, 05.05.1992, Silvia Oroian (7668)
	LAMIACEAE	*Ajuga reptans* L.	Târgu-Mureș, Platoul Cornești, 13.05.1937, Nagy Ödön, (64) Târgu-Mureș, Near church, 440 m altit., 10.05.1967, Nagy Ödön (65) Târgu-Mureș, 28.04.1939, Nagy Ödön, (66) Târgu-Mureș, 03.05.1936, Nagy Ödön (72) Băgaciu, 1886 (5491, 5492) Deda Bistra, „Scaunul Domnului”, 15.06.1960, Konya Istvan (5594) Deda – Bistra Mureșului, 15.06.1960, Konya Istvan (5941) Gurghiu, Poiana Narciselor, 09.05.1991, Silvia Oroian (7669) Glodeni, 10.05.1959, Ion Patachi (7892)
	SCROPHULARIACEAE	*Euphrasia stricta* D.Wolf	Porumbeni, 09.08.1948, Nagy Ödön (2024) Porumbeni, 25.08.1947, Nagy Ödön (2025) Târgu-Mureș, Mureșeni Forest, 03.06.1951, Nagy Ödön (2026)
	LAMIACEAE	*Lamium album* L.	Târgu-Mureș, Mureș river shore, 02.05.1939, Nagy Ödön (112) Târgu-Mureș, 1939, Nagy Ödön (113) Băgaciu, 1886 (5480, 5481) Sângeorgiu de Mureș, 07.1959, Konya Istvan (5605) Fărăgău Lake, 13.06.1976, Konya Istvan (5847) Gurghiu, Poiana Narciselor, 02.06.1992, Silvia Oroian (7665)
	CAPRIFOLIACEAE	*Sambucus ebulus* L.	Târgu-Mureș, “Râtul cu scoici”, 309 m altit., 21.07.1940, Nagy Ödön (477)

	SCROPHULARIACEAE	*Scrophularia nodosa* L.	Târgu-Mureș, Mureșeni Forest, 12.05.1936, Nagy Ödön (2049)
	SCROPHULARIACEAE	*Scrophularia scopolii* Hoppe	Reghin, 02.05.2000, Mihaela Sămărghițan (11209)
	LAMIACEAE	*Stachys germanica* L.	Târgu-Mureș, Corbul, 30.05.1948, Nagy Ödön (3085) Târgu-Mureș, 1 Mai Hill, 08.06.1946, Nagy Ödön (3086) Târgu-Mureș, 1 Mai Hill, 16.06.1946, Nagy Ödön (3087) Curteni 27.08.1941, Nagy Ödön (3088) Târgu-Mureș, 21.06.1935, Nagy Ödön (3089) Târgu-Mureș, Stejăriș forest, 12.06.1938, Nagy Ödön (3090) Târgu-Mureș, 11.06.1959, Nagy Ödön (4569) Băgaciu, 1872 (5426)
	LAMIACEAE	*Stachys officinalis* L. (syn. *Betonica officinalis* L.)	Târgu-Mureș, 08.09.1936, Nagy Ödön (3078) Târgu-Mureș, Platoul Cornești, 01.07.1946, Nagy Ödön (3071) Târgu-Mureș, Platoul Cornești, 26.06.1918, Nagy Ödön (3080) Târgu-Mureș, Cocoșd forest, 29.06.1946, Nagy Ödön (3081) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7656)
	LAMIACEAE	*Stachys recta* L.	Târgu-Mureș, Corunca, 03.06.1939, Nagy Ödön (3069) Târgu-Mureș, Beșa, 16.05.1936, Nagy Ödön (3070) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5574) Zau de Câmpie, 09.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5725) Lechința de Mureș, 02.07.1985, col. Sarkany Andrei, det, Silvia Oroian (7901)
	VERBENACEAE	*Verbena officinalis* L.	Târgu-Mureș, Platoul Cornești 19.06.1942, Nagy Ödön (889) Târgu-Mureș, Beșa, 13.05.1939, Nagy Ödön (889) Târgu-Mureș, "Dâmbul cu Comoară", 350 m altit., 11.08.1947, Nagy Ödön (890, 891) Târgu-Mureș, Mureș river dead branch, 310 m altit., 15.06.1936, Nagy Ödön (892)

ALKALOIDS	PINACEAE	*Abies alba* Miller	Târgu-Mureș, cultivated, 320 m altit., 07.02.1939, Nagy Ödön (208) Târgu-Mureș, cultivated, 330 m altit., 1938, Nagy Ödön (209) Săbed, reserve, 06.04.1989, Silvia Oroian (7077)
	ACERACEAE	*Acer campestre* L.	Târgu-Mureș, Near church, 400 m altit., 10.05.1937, Nagy Ödön (262)
	ACERACEAE	*Acer negundo* L.	Târgu-Mureș, 25.04.1939, Nagy Ödön (253) Târgu-Mureș, Platoul Cornești, 29.03.1939, Nagy Ödön (254) Târgu-Mureș, 17.04.1937, Nagy Ödön (255) Târgu-Mureș, Mureș river shore, 09.04.1935, Nagy Ödön (256) Târgu-Mureș, 02.04.1937, Nagy Ödön (257) Târgu-Mureș, sub the citadel's wall, 10.06.1947, Nagy Ödön (258) Târgu-Mureș, 10.05.1939, Nagy Ödön (259) Cristești, 315 m altit., 28.05.1939, Nagy Ödön (260) Târgu-Mureș, Platoul Cornești, 450 m altit., 05.05.1937, Nagy Ödön (261)

	ACERACEAE	*Acer platanoides* L.	Târgu-Mureș, Platoul Cornești, 380 m altit., 24.04.1936, Nagy Ödön (248) Târgu-Mureș, Platoul Cornești, 450 m altit., 29.04.1938, Nagy Ödön (249) Târgu-Mureș, cimitirul reformat, 350 m altit., 12.06.1942, Nagy Ödön (250) Târgu-Mureș, Platoul Cornești, 400 m altit., 18.04.1938, Nagy Ödön (251) Târgu-Mureș, cultivated, 10.05.1939, Nagy Ödön (252) Târgu-Mureș, Platoul Cornești, 25.10.1938, Nagy Ödön (982)
	ACERACEAE	*Acer pseudoplatanus* L.	Târgu-Mureș, Platoul Cornești, 1937, 1938, Nagy Ödön (263) Târgu-Mureș, Platoul Cornești, 380 m altit., 27.04.1939, Nagy Ödön (264) Târgu-Mureș, UMF, 340 m altit., 16.04.1930, Nagy Ödön (265) Deda-Bistra, Scaunul Domnului, 15.06.1960, leg. Konya Istvan, det. Silvia Oroian (6055)
	RANUNCULACEAE	*Aconitum moldavicum* (L.) Hacq.	Târgu-Mureș, the base of Halmok Hill, Gheorghe Doja, 17.05.1937, Nagy Ödön (2251) Săbed, Lechința forest, 09.06.1980, Silvia Oroian (7300) Lunca Bradului, Neagra, 14.06.1994, Silvia Oroian (8070)
	RANUNCULACEAE	*Aconitum napellus* L.	Târgu-Mureș, Botanical Garden of UMF, 14.06.1980, Silvia Oroian (7301)
	ARISTOLOCHIACEAE	*Aristolochia clematitis* L.	Târgu-Mureș, 05.06.1941, Nagy Ödön (313, 314, 315) Vidrasău, Mureș river shore, 19.06.1991, Silvia Oroian (7397)
	SOLANACEAE	*Atropa bella-donna* L.	Târgu-Mureș, Medicinal Plants Garden of UMF, 10.07.1952, Nagy Ödön (975) Târgu-Mureș, Botanical Garden of UMF, 10.06.1980, Silvia Oroian (5980)
	BERBERIDACEAE	*Berberis vulgaris* L.	Târgu-Mureș, Botanical Garden of UMF, 1988, Silvia Oroian (7119) Târgu-Mureș, garden, 1908, Bitai Arpard (8165)
	SOLANACEAE	*Capsicum annuum* L.	Târgu-Mureș, cultivated, 29.05.1939, Nagy Ödön (974)
	FABACEAE	*Chamaespartium sagittale* (L.) P.Gibbs (syn. *Genista sagittalis* L.)	Gurghiu, Poiana Narciselor, 02.06.0992, Silvia Oroian (7646) (f. *latifolia*)
	PAPAVERACEAE	*Chelidonium majus* L.	Târgu-Mureș, Mare Hill, 03.05.1939, Nagy Ödön (520) Târgu-Mureș, Beșa forest, 30.05.1939, Nagy Ödön (521) Târgu-Mureș, Mare Hill, 01.05.1939, Nagy Ödön (523) Băgaciu, 1872 (5414) Târgu-Mureș, museum's yard, 1984, Silvia Oroian (5981) Târgu-Mureș, 16.06.1959, Ion Patachi (8151) Neagra, Mureș river shore, 19.10.1993, Silvia Oroian (11093)
	RANUNCULACEAE	*Clematis recta* L.	Târgu-Mureș, forest fringe, 20.06.1957, Nagy Ödön (2213) Târgu-Mureș, 07.06.1953, Nagy Ödön (2214) Târgu-Mureș, 21.09.1956, Nagy Ödön (2215) Târgu-Mureș, 20.05.1939, Nagy Ödön (2216) Târgu-Mureș, Platoul Cornești, 04.05.1938, Nagy Ödön (2217) Târgu-Mureș, top of 1 Mai Hill, 18.06.1946, Nagy Ödön (2218)

	RANUNCULACEAE	*Clematis recta* L.	Târgu-Mureș, 06.06.1952, Nagy Ödön (2219) Târgu-Mureș, "Dâmbul cu Comoară", 27.09.1937, Nagy Ödön (2220) Târgu-Mureș, 12.06.1952, Nagy Ödön (2221) Târgu-Mureș, Mare Hill, 12.06.1935, Nagy Ödön (2222) Herepea, 1986, Silvia Oroian (7328)
	RANUNCULACEAE	*Clematis vitalba* L.	Târgu-Mureș, 09.09.1952, Nagy Ödön (2209) Târgu-Mureș, 17.10.1951, Nagy Ödön (2210) Târgu-Mureș, Mureș river shore, 17.10.1951, Nagy Ödön (2211) Târgu-Mureș, 1954, Nagy Ödön (2212) Zau de Câmpie, 1981, leg. Eftenie Ioan, det. Silvia Oroian (5674) Săbed, reserve, 12.08.1989, Silvia Oroian (7329) Sântana de Mureș, orchard, 05.06.1990, Silvia Oroian (7336) Săbed, reserve, 12.08.1989, Silvia Oroian (7940) Răstolița, Mureș river shore, 20.06.1993, Silvia Oroian (8101) (f. *integrata* D.C.)
	COLCHICACEAE	*Colchicum autumnale* L.	Târgu-Mureș, near Kali spring, 19.10.1938, Nagy Ödön (1574, 1575) Zau de Câmpie, 24.09.1981, leg. Eftenie Ioan, det. Silvia Oroian (5679) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7691, 7699) Borzia, 13.06.1996, Silvia Oroian (11316) Meștera, 19.10.1993, Silvia Oroian (11319) Orșova, Seci hamlet, 05.1979, leg. Sarkany Andrei, det. Mihaela Sămărghițan (11339)
	APIACEAE	*Conium maculatum* L.	Târgu-Mureș, 14.08.1950, Nagy Ödön (1306)
	FUMARIACEAE	*Corydalis cava* (L.) Schweigger et Koerte (*Corydalis bulbosa* (L.) Pers.)	Târgu-Mureș, Platoul Cornești, 11.04.1953, Konya Istvan (7120) Gurghiu Mountains, Fâncel, 17.04.1960, Ion Patachi (8152) Târgu-Mureș, Rotundă Forest, 28.03.1908, Bitai Arpard (8154) Răstolița, Podirei, 05.04.1994, Silvia Oroian (11093, 11097, 11103, 11104) Răstolița, Podirei, 08.04.1995, Silvia Oroian (11096) Răstolița, 09.05.1993, Silvia Oroian (11102) Rstolița, Podirei, 09.04.1995, Silvia Oroian (11105) Răstolița, Podirei, 08.04.1995, leg. Silvia Oroian, det. Mihaela Sămărghițan (11106) Pădurea Săbed, 14.04.2000, Mihaela Sămărghițan (11293)
	FUMARIACEAE	*Corydalis solida* (L.) Sw.	Băgaciu, 1872 (5366) Băgaciu, 1886 (5460, 5462) Târgu-Mureș, Platoul Cornești, 23.03.1986, Silvia Oroian (7121) Răstolița, The Iod Valley, 13.04.1991, Silvia Oroian (7122) Răstolița, Listeș, 22.04.1991, Silvia Oroian (7123) Sântana de Mureș, 15.03.1989, Silvia Oroian (8124) Săbed, reserve, 06.04.1989, Silvia Oroian (7125)

	FUMARIACEAE	*Corydalis solida* (L.) Sw.	Răstolița, Podirei, 05.04.1994, Silvia Oroian (11092, 11101) Răstolița, 09.05.1993, Silvia Oroian (11098, 11102) Răstolița, The Iod Valley, 13.04.1991, Silvia Oroian (11099) Răstolița, 09.05.1993, Silvia Oroian (11100)
	BORAGINACEAE	*Cynoglossum officinale* L.	Târgu-Mureș, 19.06.1948, Nagy Ödön (365) Târgu-Mureș, Mureșeni Forest, 350 m altit., 12.05.1936, Nagy Ödön (366)
	SOLANACEAE	*Datura stramonium* L.	Târgu-Mureș, 20.07.1951, Nagy Ödön (973)
	BORAGINACEAE	*Echium vulgare* L.	Târgu-Mureș, 02.10.1938, Nagy Ödön (376) Porumbeni, 22.08.1946, Nagy Ödön (377) Târgu-Mureș, 300 m altit., 10.06.1935, Nagy Ödön (378) Târgu-Mureș, "Cartierul Funcționarilor", 02.06.1936, Nagy Ödön (379) Băgaciu, 1872 (5451) Târgu-Mureș, 07.1959, Konya Istvan (5606, 5614) Morești, 24.06.1953, Konya Istvan (5607) Târgu-Mureș, hippodrome, 08.07.1960, Konya Istvan (5608) Deda Bistra „Scaunul Domnului", 15.06.1960, Konya Istvan (5610, 5616) Târgu-Mureș, museum's yard, 02.07.1960, Konya Istvan (5615) Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5782, 5796) Săbed, Corhan Hill, 24.06.1972, Konya Istvan (5795) Deda-Bistra, Scaunul Domnului, 15.06.1960, leg. Konya Istvan, det. Silvia Oroian (6049) Sângeorgiu de Mureș, 06.1953, leg. Konya Istvan,det. Silvia Oroian (6053)
	FUMARIACEAE	*Fumaria officinalis* L.	Târgu-Mureș, 02.05.1908, Bitai Arpard (8150)
	FUMARIACEAE	*Fumaria vaillantii* Loisel.	Târgu-Mureș, garden, 30.05.1951, Nagy Ödön (536) Târgu-Mureș, 27.05.1948, Nagy Ödön (537) Livezeni, miriște, 15.05.1939, Nagy Ödön (538) Târgu-Mureș, Stejăriș forest, 10.05.1939, Nagy Ödön (539) Târgu-Mureș, 350 m altit., 26.04.1939, Nagy Ödön (540) Târgu-Mureș, Mureș dam, 27.05.1939, Nagy Ödön (541) Târgu-Mureș, Nagy Ödön (542) Târgu-Mureș, the base of Halmok Hill, 01.05.1939, Nagy Ödön (543)
	AMARYLLIDACEAE	*Galanthus nivalis* L.	Corunca, 28.01.1948, Nagy Ödön (298) Târgu-Mureș, Mureșeni Forest, 340 m altit., 09.04.1940, Nagy Ödön (299) Târgu-Mureș, 350 m altit., 29.03.1942, Nagy Ödön (300) Târgu-Mureș, Platoul Cornești, 380 m altit., 02.04.1939, Nagy Ödön (301) Târgu-Mureș, 380 m altit., 05.03.1938, Nagy Ödön, (302) Băgaciu, 1872 (5359) Săbed, pădurea Lechinței, 23.04.1981, Szombath Zoltán, Silvia Oroian (5640

	AMARYLLIDACEAE	*Galanthus nivalis* L.	)Târgu-Mureș, Platoul Cornești 16.03.1938, Varodi Miklos (7539) Târgu-Mureș, Cocoșd forest, 01.03.1936, Nagy Ödön (7540) Săbed, 15.03.1959, Ion Patachi (7541) Andreneasa, 19.03.1995, Mihaela Sămărghițan (11303)
	FABACEAE	*Galega officinalis* L.	Târgu-Mureș, 24.06.1950, Nagy Ödön (750, 751) Târgu-Mureș, airport, 07.1940, Nagy Ödön (752) Târgu-Mureș, 26.08.1939, Nagy Ödön (753) Târgu-Mureș, Budiu Hill, 26.09.1937, Nagy Ödön (754) Sânpaul, 28.05.1939, Nagy Ödön (755) Târgu-Mureș, Mureș river shore, 300 m altit., 16.09.1936, Nagy Ödön (756)
	FABACEAE	*Genista tinctoria* L. (syn. *Genista elatior* Koch.)	Târgu-Mureș, 350 m altit., 19.06.1936, Nagy Ödön (757) Târgu-Mureș, Cocoșd forest, 29.06.1946, Nagy Ödön (758) Târgu-Mureș, Stejăriș forest, 16.08.1950, Nagy Ödön (759) Porumbeni, 01.08.1948, Nagy Ödön (760) Stejăriș village, near Târgu-Mureș, 15.09.1935, Nagy Ödön (761)
	FABACEAE	*Genista tinctoria* L. ssp. *elata* (Mnch.) A. et G.	Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7651)
	SOLANACEAE	*Hyosciamus niger* L.	Porumbeni, 22.08.1947, Nagy Ödön (968) Târgu-Mureș, Mureș river shore, 27.07.1956, Nagy Ödön (969) Târgu-Mureș, 11.06.1942, Nagy Ödön (970) Târgu-Mureș, plough land, 30.05.1929, Nagy Ödön (971) Târgu-Mureș, Medicinal Plants Garden of UMF, 30.05.1952, Nagy Ödön (972)
	LAMIACEAE	*Hyssopus officinalis* L.	Târgu-Mureș, Medicinal Plants Garden of a UMF, 16.06.1952, Nagy Ödön (97) Târgu-Mureș, the citadel's wall, 330 m altit., 06.09.1941, Nagy Ödön (98, 99) Târgu-Mureș, the citadel's wall, 25.08.1951, Nagy Ödön (100) Târgu-Mureș, cetate, Nagy Ödön (4568) Târgu-Mureș, Botanical Garden of UMF, 1984, Silvia Oroian (5978)
	FABACEAE	*Laburnum anagyroides* Medicus	Târgu-Mureș, cultivated, 380 m altit., 03.06.1939, Nagy Ödön (766)
	PINACEAE	*Larix decidua* Mill.	Târgu-Mureș, Platoul Cornești, 480 m altit., 01.05.1939, Nagy Ödön (240) Târgu-Mureș, Platoul Cornești, 24.04.1937, Nagy Ödön (241) Târgu-Mureș, Platoul Cornești, 480 m altit., 01.04.1938, Nagy Ödön (242) Târgu-Mureș, "Cartierul Funcționarilor", 02.06.1939, Nagy Ödön (243) Târgu-Mureș, 27.05.1908, Bitai Arpard (7966)
	AMARYLLIDACEAE	*Leucojum vernum* L.	Sângeorgiu de Mureș-Tofalău, 14.03.1936, Nagy Ödön (7542) Târgu-Mureș, 03.05.1908, Bitai Arpard (7543) Gurghiu, 10.04.1960, Ion Patachi (7546)

	AMARYLLIDACEAE	*Leucojum vernum* L.	Fâncel river meadow, 03.04.1998, Mihaela Sămărghițan (11184) Dubișteț, Hodac commune, 05.04.1997, leg. Elena Boer, det. Mihaela Sămărghițan (11186, 11306) Brădețel, Gurghiu Valley, 03.04.1998, Silvia Oroian, Mihaela Sămărghițan (11344, 11348) Gurghiu Valley, Gura Fâncel, 03.04.1998, Mihaela Sămărghițan (11346) Orșova Pădure, 03.04.1998, Silvia Oroian, Mihaela Sămărghițan (11347)
	LAMIACEAE	*Majorana hortensis* Mnch.	Târgu-Mureș, cultivated, 29.07.1948, Nagy Ödön (150) Târgu-Mureș, cultivated, 05.10.1948, Nagy Ödön (151)
	SOLANACEAE	*Nicotiana tabacum* L.	Porumbeni, 20.08.1947, Nagy Ödön (961, 962) Porumbeni, 18.08.1947, Nagy Ödön (963)
	NYMPHAEACEAE	*Nuphar lutea* (L.) Sibth. et Sm.	Târgu-Mureș, near Mureș dam, 20.05.1927, Nagy Ödön (685)
	NYMPHAEACEAE	*Nymphaea alba* L.	Târgu-Mureș, near Mureș dam, 11.06.1932, Nagy Ödön (684) Târgu-Mureș, Mureș river dead branch, 31.05.1936, Nagy Ödön (7496)
	PAPAVERACEAE	*Papaver somniferum* L.	Târgu-Mureș, cultivated, 330 m altit., 13.05.1939, Nagy Ödön (533) Târgu-Mureș, Botanical Garden of UMF, 14.06.1980, Silvia Oroian (7129)
	LAMIACEAE	*Prunella vulgaris* L.	Târgu-Mureș, Platoul Cornești, altit. 490 m, 14.09.1936 (121) (var.alba) Târgu-Mureș, "Cartierul Funcționarilor", 350 m altit., 23.06.1936 (122) Târgu-Mureș, UMF park, 14.08.1957 (123) Târgu-Mureș, Stejăriș forest, 17.06.1953, Konya Istvan (5592) Târgu-Mureș, 08.07.1960, Konya Istvan (5593) Târgu-Mureș, island, 16.08.1960, Konya Istvan (5602) Târgu-Mureș, Ștejăriș village, 17.06.1953, Konya Istvan (5943) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7673)
	SOLANACEAE	*Scopolia carniolica* Jacq.	Răstolița, 24.04.1995, Silvia Oroian (11145) Between Răstolița and Borzia, 08.06.1996, leg. Silvia Oroian, det. Mihaela Sămărghițan (11146) Răstolița, Costeasa Valley, 08.06.1996, Silvia Oroian (11147) Răstolița, Podirei, 15.06.1994, Silvia Oroian (11150, 11151) Reghin, 02.05.2000, Mihaela Sămărghițan (11235)
	ASTERACEAE	*Senecio jacobaea* L.	Târgu-Mureș, Platoul Cornești, 19.07.1948, Nagy Ödön (2362) Târgu-Mureș, Valea Rece, 21.07.1948, Nagy Ödön (2363) Târgu-Mureș, Stejăriș forest, 14.08.1950, Nagy Ödön (2364) Târgu-Mureș, Stejăriș forest, 21.07.1948, Nagy Ödön (2365) Zau de Câmpie, 19.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5694)

	ASTERACEAE	*Senecio vulgaris* L.	Târgu-Mureș, 11.05.1937, Nagy Ödön (2368) Târgu-Mureș, 18.05.1946, Nagy Ödön (2369) Târgu-Mureș, 27.09.1947, Nagy Ödön (2370) Târgu-Mureș, 19.05.1937, Nagy Ödön (2371) Târgu-Mureș, 12.06.1942, Nagy Ödön (2372) Târgu-Mureș, 01.06.1950, Nagy Ödön (2373)
	SOLANACEAE	*Solanum dulcamara* L.	Târgu-Mureș, "Râtul cu scoici", 23.06.1947, Nagy Ödön (948) Târgu-Mureș, Corunca, 340 m altit., 03.06.1939, Nagy Ödön (953) Gurghiu, Poiana Narciselor, 02.07.1992, Silvia Oroian (7666) Valea Gălăoaia, 02.06.1996, Silvia Oroian (11148) Răstolița-Gălăoaia, 02.06.1996, Silvia Oroian (11149)
	SOLANACEAE	*Solanum tuberosum* L.	Sânpaul, 27.05.1939, Nagy Ödön (941) Târgu-Mureș, garden, 13.06.1939, Nagy Ödön (942) Târgu-Mureș, garden, 19.06.1936, Nagy Ödön (943)
	TAXACEAE	*Taxus baccata* L.	Târgu-Mureș, park near stadium, 14.04.1937, Nagy Ödön (244) Târgu-Mureș, 28.05.1938, Nagy Ödön (245) Târgu-Mureș, 29.04.1938, Nagy Ödön (246, 247) Târgu-Mureș, 09.01.1959, Nagy Ödön(4584) Târgu-Mureș, 18.04.1908, Bitai Arpard (7961)
	RANUNCULACEAE	*Thalictrum aquilegifolium* L.	Târgu-Mureș, Budiu, 03.06.1946, Nagy Ödön (2135) Târgu-Mureș, Stejăriș forest, lizieră, 03.06.1942, Nagy Ödön (2136) Băgaciu, 1886 (5467, 5490) Fărăgău Lake, 03.06.1967, Sarkany A. (5838) Zau de Câmpie, Valea Botei Mari, 28.05.1980, Silvia Oroian (7379, 7776) Gurghiu, 08.05.1967, Konya Istvan (7380) Orșova, Seci hamlet, 05.1979, Sarkany Andrei (7381) Orșova, Seci hamlet, 05.1979, leg. Sarkany Andrei, det. Silvia Oroian (7773) Gurghiu, 08.05.1967, leg. Konya Istvan, det. Silvia Oroian (7774) Lunca Bradului, 19.07.1959, Ion Patachi (8140) Orșova Pădure, 03.06.1994, Silvia Oroian (8227) Gurghiu, near Poiana Narciselor, 12.07.1993, Silvia Oroian (8228)
	RANUNCULACEAE	*Thalictrum minus* L.	Târgu-Mureș, 13.07.1953, Nagy Ödön (2132) Orșova, Seci hamlet, 05.1979, Sarkany Andrei (7381) Săbed, Corhan Hill, 01.07.1981, Silvia Oroian (7383, 7771) Săbed, reserve, 12.08.1989, Silvia Oroian (7384, 7770) Valea Izvoarelor, Măgheruș Hill, 13.05.1987, Silvia Oroian (7385, 7769) Saschiz, Cloașterf, 12.06.1984, Silvia Oroian (7386, 7768)

	RANUNCULACEAE	*Thalictrum minus* L.	Herepea, 1986, Silvia Oroian (7387) Orșova, Seci hamlet, 05.1979, leg. Sarkany Andrei, det. Silvia Oroian (7772) Zau de Câmpie, reserve, 12.07.1991, Silvia Oroian (7943) Andreneasa, 18.05.1944, Silvia Oroian (8141)
	MELANTHIACEAE	*Veratrum album* L.	Deda Bistra, Scaunul Domnului, 15.06.1960, Konya Istvan (5589) Gurghiu, Poiana Narciselor, 06.06.1991, Silvia Oroian (7692, 7704) Gurghiu, pasture, 04.05.1991, Silvia Oroian (7698, 7767)
	APOCYNACEAE	*Vinca herbacea* W.et K.	Târgu-Mureș, Stejăriș forest, 500 m altit., 27.04.1936, Nagy Ödön (306) Târgu-Mureș, 29.04.1939, Nagy Ödön (307) Porumbeni, 07–09.04.1947, Nagy Ödön, (308) Valea Izvoarelor, Măgheruș Hill, 17.04.1991, Silvia Oroian (7850) Zau de Câmpie, reserve, 30.04.1991, Silvia Oroian (7851)
	APOCYNACEAE	*Vinca minor* L.	Târgu-Mureș, 27.04.1939, Nagy Ödön (309) Târgu-Mureș, Platoul Cornești, 480 m altit., 07.02.1938, Nagy Ödön (310) Târgu-Mureș, Stejăriș forest, 400 m altit., 27.04.1936, Nagy Ödön (311) Târgu-Mureș, Stejăriș forest, 500 m altit., 21.04.1937, Nagy Ödön (312) Băgaciu, 1872 (5374) Băgaciu, 1886 (5470) Săbed, Corhan Hill, 08.05.1980, Silvia Oroian (5635) Zau de Câmpie, 09.07.1982, leg. Eftenie Ioan, det. Silvia Oroian (5702)
	LORANTHACEAE	*Viscum album* L.	Târgu-Mureș, Mare forest, 03.1952, Nagy Ödön (1637)

BITTER PRINCIPLES	LAMIACEAE	*Ballota nigra* L.	Târgu-Mureș, church yard din cetate, 21.05.1947, Nagy Ödön (73) Târgu-Mureș, Platoul Cornești, 480 m altit., 02.09.1936 (74) Târgu-Mureș, Vulpii stream, 17.07.1940, Nagy Ödön (75) Târgu-Mureș, Curteni, 310 m altit., 28.08.1940, Nagy Ödön (76) Târgu-Mureș, Sásvári stream, 26.07.1958, Nagy Ödön (4559) Târgu-Mureș, Platoul Cornești, 05.1953, Konya Istvan (5944)
	GENTIANACEAE	*Centaurium erythraea* Rafn	Târgu-Mureș, Mare forest, 01.08.1947, Nagy Ödön (1348) Porumbeni, 03.08.1948, Nagy Ödön (1349) Târgu-Mureș, Cocoșd forest, Nagy Ödön (1350)
	LAMIACEAE	*Glechoma hederacea* L.	Târgu-Mureș, Platoul Cornești, 480 m altit., 21.04.1936, Nagy Ödön (92) Târgu-Mureș, Mureș dam, 24.04.1948, Nagy Ödön (93, 94) Târgu-Mureș, 18.04.1939, Nagy Ödön (95) Târgu-Mureș, 08.07.1960, Konya Istvan (5595) Târgu-Mureș, Platoul Cornești, 19.05.1982, Silvia Oroian (5649)

	ASTERACEAE	*Taraxacum officinale* Webber	Târgu-Mureș, Platoul Cornești, 16.04.1939, Nagy Ödön (2409) Târgu-Mureș, Mureș river shore, 02.05.1939, Nagy Ödön (2410) Târgu-Mureș, the base of Mare Hill, 01.05.1939, Nagy Ödön (2411)

BITTER-AROMATIC PRINCIPLES	ASTERACEAE	*Artemisia annua* L.	Târgu-Mureș, 23.09.1937, Nagy Ödön (2696) Târgu-Mureș, 22.09.1937, Nagy Ödön (2697)
	ASTERACEAE	*Artemisia campestris* L.	Târgu-Mureș, "Dâmbul cu Comoară", 11.08.1947, Nagy Ödön (2694, 2695)
	ASTERACEAE	*Artemisia vulgaris* L.	Porumbeni, 05.09.1946, Nagy Ödön (2691) Târgu-Mureș, Platoul Cornești, 09.09.1937, Nagy Ödön (2692)
	ASTERACEAE	*Tanacetum vulgare* L.	Târgu-Mureș, 29.07.1946, Nagy Ödön (2521) Târgu-Mureș, plough land, 02.09.1936, Nagy Ödön (2522) Târgu-Mureș, Stejăriș forest, 12.08.1950, Nagy Ödön (2523) Târgu-Mureș, museum's yard, Konya Istvan (5625)
	LAMIACEAE	*Teucrium chamaedrys* L.	Porumbeni, 28.07.1948, Nagy Ödön (3062) Târgu-Mureș, Corunca, 19.06.1944, Nagy Ödön (3063) Târgu-Mureș, Budiu, Nagy Ödön (3064) Târgu-Mureș, liziera Pădurii Mari, 14.07.1948, Nagy Ödön (3065) Săbed, Corhan Hill, 01.07.1981, Szombath Zoltán (5585) Săbed, Corhan Hill, 01.07.1981, Silvia Oroian (5791) Reghin, 17.06.1953, Konya Istvan (5945)
	LAMIACEAE	*Teucrium montanum* L.	Săbed, Corhan Hill, 18.08.1980, Silvia Oroian (5782)

PHLOROGLUCINS	DRYOPTERIDACEAE	*Dryopteris filix-mas* (L.) Schott	Târgu-Mureș, Platoul Cornești, 450 m altit., Nagy Ödön (188) Târgu-Mureș, Pocloș stream, 10.03.1948, Nagy Ödön (189) Târgu-Mureș, 06.1935, Nagy Ödön (190) Orșova, Seci hamlet,, 05.1979, Sarkany Andrei (7066) Răstolița, 16.05.1988, Silvia Oroian (7067) Valea Izvoarelor, 12.05.1988, Silvia Oroian (7068) Târgu-Mureș, 20.04.1936, Nagy Ödön (8003) Târgu-Mureș, 08.05.1908, Bitai Arpard, (8005) Răstolița, Podirei, 26.09.1993, Silvia Oroian (8200) Andreneasa, rocks, 19.10.1993, Silvia Oroian (8201) Neagra, Mureș river shore, 19.10.1993, Silvia Oroian (8202) Ciobotani, pasture, 19.10.1993, Silvia Oroian (8203) Răstolița, Mureș river shore, 01.08.1993, Silvia Oroian (8204) Stânceni, Leu Mountain, 18.05.1994, Silvia Oroian (8205) Răstolița, 10.07.1995, Silvia Oroian (8206)

ORGANIC ACIDS, VITAMINS AND PRO-VITAMINS	ROSACEAE	*Cydonia oblonga* Mill.	Târgu-Mureș, Trebély, 18.05.1938, Nagy Ödön (1886) Târgu-Mureș, garden, 07.05.1939, Nagy Ödön (1887)
	APIACEAE	*Daucus carota* L.	Târgu-Mureș, Halmok Hill, 07.09.1940, Nagy Ödön (1323) Sânpaul, Nagy Ödön (1324) Târgu-Mureș, 28.08.1936, Nagy Ödön (1326) Târgu-Mureș, island, 16.08.1960, Konya Istvan (5888)
	SOLANACEAE	*Physalis alkekengi* L.	Târgu-Mureș, 21.06.1953, Nagy Ödön (950) Târgu-Mureș, 19.06.1953, Nagy Ödön (951) Târgu-Mureș, Platoul Cornești, 480 m altit., 10.05.1936, Nagy Ödön (952) Târgu-Mureș, Budiu, 350 m altit., 21.05.1946, Nagy Ödön (954) Târgu-Mureș, 20.10.1951, Nagy Ödön (955) Târgu-Mureș, Sântana Hill, 350 m altit., Nagy Ödön (956) Târgu-Mureș, Platoul Cornești, 06.06.1943, Nagy Ödön (957)
	ROSACEAE	*Rosa canina* L.	Târgu-Mureș, toward Budiu, 26.05.1936, Nagy Ödön (1987) Târgu-Mureș, 04.06.1944, Nagy Ödön (1988) Târgu-Mureș, 04.06.1942, Nagy Ödön (1990) Gurghiu, near Poiana Narciselor, 06.06.1991, Silvia Oroian (7607)
	ROSACEAE	*Rubus caesius* L.	Târgu-Mureș, 31.05.1951, Nagy Ödön (1978) Târgu-Mureș, Mureșeni Forest, 13.06.1951, Nagy Ödön (1979) Târgu-Mureș, toward Budiu, 26.05.1936, Nagy Ödön (1980) Târgu-Mureș, the citadel's wall, 24.06.1941, Nagy Ödön (1981) Târgu-Mureș, at the border with Sântana de Mureș, 12.08.1939, Nagy Ödön (1982) Reghin, 02.05.2000, Mihaela Sămărghițan (11217)
	ROSACEAE	*Rubus idaeus* L.	Târgu-Mureș, garden, 18.05.1939, Nagy Ödön (1983) Târgu-Mureș, 28.05.1939, Nagy Ödön (1984) Târgu-Mureș, 20.05.1939, Nagy Ödön (1985)
	ROSACEAE	*Sorbus aucuparia* L.	Târgu-Mureș, 19.05.1938, Nagy Ödön (1995) Between Bistra Mureșului and Răstolița, 16.05.1988, Silvia Oroian (7716)
	URTICACEAE	*Urtica dioica* L.	Târgu-Mureș, Platoul Cornești, 480 m altit., 29.04.1939, Nagy Ödön (906) Târgu-Mureș, Platoul Cornești, 13.05.1939, Nagy Ödön (907)
	VITACEAE	*Vitis vinifera* L.	Târgu-Mureș, 13.06.1947, Nagy Ödön (827) Bedeni, 04.10.1947, Nagy Ödön (828) Târgu-Mureș, 07.06.1942, Nagy Ödön (847) Târgu-Mureș, 29.05.1939, Nagy Ödön (848, 849) Târgu-Mureș, 330 m altit., 06.06.1939, Nagy Ödön (850)

Conclusions

In this paper 1555 herbarium sheets with medicinal plants were processed.

Following the research of the botanical collection of the Department of Natural Sciences, a total of 302 taxa belonging to 69 families have been identified.

Families with the most numerous representatives are: Lamiaceae (31 species), Asteraceae (27 species), Rosaceae (23 species), Apiaceae, Scrophulariaceae (18 species each) and Fabaceae (17 species).

Medicinal species of the collections come both from the wild flora, from many towns in the county, as well as from crops especially from the Botanical Garden of the University of Medicine and Pharmacy Targu-Mureș.

The earliest samples come from "Herbarium of Băgaciu", sheets dating from 1872–1886. A remarkable number of sheets belong to "Nagy Ödön" collection, a biology professor at Bolyai Farkas High School in Târgu-Mureș, which has the merit of having studied the flora in the town surroundings, from 1920 to 1950.

Depending on the dominant active principles for which they are used in traditional medicine and phytotherapy, it was found that the largest plants contain: alkaloids (16.89%), essential oils (13.25%), tannins (11.59%), flavonoids (11.26%), saponins (7.62%), mucilage (6.95%), and coumarin (4.97%.)

Among the 302 taxa analyzed there are also 11 species in various degrees of endangerment, included in national and European red lists.

Abreviations:

Leg. = Legit
Det. = determined by
UMF = University of Medicine and Farmacy Târgu-Mureș
Altit.= altitude

REFERENCES

1. Boșcaiu, N., Coldea, Gh., Horeanu C., 1994, Lista roșie a plantelor vasculare dispărute, periclitate, vulnerabile și rare din flora României, *Ocrotirea Naturii și a Mediului înconjurător*, București, **38 (1)**: 45–56.
2. Ciocârlan, V., 2009, *Flora ilustrată a României. Pteridophyta et Cormophyta*. Edit. Ceres, București.
3. Ciulei, I., Grigorescu, E., Stănescu, U., 1993, *Plante medicinale, Fitochimie și fitoterapie*, vol. **1–2**, Edit. Medicală București.
4. Csedö, C. (red.), 1980, *Plantele medicinale și condimentare din județul Harghita*, UCCOOP, Miercurea Ciuc.
5. Dihoru, G. & Negrean, G., 2009, *Cartea roșie a plantelor vasculare din România*, Edit. Acad. Române, București: 630 pp.
6. Dihoru, Gh., Dihoru, A., 1993 – 1994, Plante rare, periclitate și endemice în flora României – Lista Roșie, *Acta Botanica Horti Bucurestiensis*, București: 173–179.
7. Istudor, V., 1998, 2001, *Farmacognozie, Fitochimie, Fitoterapie*, vol. **1–2**, Edit. Medicală București.
8. Oroian, S., 2000, Conspectul plantelor medicinale spontane din zona de câmpie a județului Mureș, *Marisia* **XXVI**, Târgu-Mureș: 15–25.
9. Oroian, S., 2001, Plantele medicinale spontane din Valea Târnavei Mici, *Note Botanice* **XXVII**, U.M.F. Târgu-Mureș: 59–69.
10. Oroian, S., 2006, The spontaneous medicinal plants registering from Târnave Plateau, *Proceedings from the Third Conference on Medicinal and Aromatic Plants of Southeast European Countries*, Belgrad, Sebia: 62–69.
11. Oroian, S., 2007, Plante medicinale din flora spontană a județului Mureș, *Revista de Medicină și Farmacie, Universitatea de Medicină și Farmacie Târgu-Mureș,* **53**: 97–128.
12. Oroian, S., Giurgiu, M., 2003, Plantele medicinale spontane din Valea Nirajului, *Revista Medico-Chirurgicală a Societății de Medici și Naturaliști*, Iași, (2), supl. **1**: 124–130.

13. Oroian, S., Oroian, F., 2003, The medicinal plants of spontaneous flora in Săbed village (Mureș county), *Analele Universității Ovidius, seria Științe Medicale-Farmacie*, Constanța, **1 (2)**: 78–83.
14. Rácz, G., Laza, A., Coiciu, A., 1970, *Plante medicinale și aromatice*, Edit. Ceres, București.
15. Roșu, Al., *Geografia fizică a României*, 1980, Edit. Didactică și Pedagogică, București.
16. Sămărghițan, M., Oroian, S., 1999, Inventarierea plantelor medicinale din Valea Gurghiului, *Note Botanice* **XXV**, U.M.F. Târgu-Mureș: 43–60.
17. Tutin, T. G., Burges, N. A., Chater, A. O., Edmonson, J. R., Heywood, V. H., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (eds) 1993, *Flora Europaea*, **1** *(Psilotaceae to Platanaceae)*, 2nd ed., Cambridge: Cambridge University Press, 581 pp.
18. Tutin, T. G., Heywood, V. H., Burges, N. A., Moore, D. M., Valentine, D. H., Walters, S. M. & Webb, D. A. (eds) 1964–1980, *Flora Europaea*, **1–5**, 1st Ed., Cambridge: Cambridge University Press, 464, 455, 370, 523, 467 pp.

FLORA MEDICINALĂ A JUDEȚULUI MUREȘ OGLINDITĂ ÎN COLECȚIA SECȚIEI DE ȘTIINȚELE NATURII A MUZEULUI JUDEȚEAN MUREȘ

Obiectivul acestui studiu este prezentarea speciilor de plante medicinale din colecția muzeului, colectate din județul Mureș, pentru a completa inventarul floristic al acestei zone și astfel, a avea o imagine mai clară asupra diversității floristice a covorului vegetal precum și a evoluției acestuia.

Patrimoniul Secției de Științele Naturii din cadrul Muzeului Județean Mureș cuprinde numeroase colecții, a căror valoare științifică și documentară este incontestabilă. Colecția botanică a muzeului cuprinde aproximativ 20 000 piese, provenite din cercetări pe teren, donații și achiziții. Dintre aceste piese o pondere remarcabilă o au și speciile medicinale.

Inventarierea florei medicinale a județului Mureș prezente în colecțiile Secției de Științele Naturii a dus la identificarea a 302 taxoni cu conținut cert în compuși chimici terapeutici, încadrați în 69 de familii. Cele mai bine reprezentate familii sunt: Lamiaceae (31 specii), Asteraceae (27 specii), Rosaceae (23 specii), Apiaceae și Scrophulariaceae (câte 18 specii) și Fabaceae (17 specii).

În funcție de principiile active dominante pentru care ele sunt utilizate în medicina tradițională și fitoterapie, s-a constatat că cele mai numeroase plante conțin: alcaloizi (16,89%), uleiuri volatile (13,25%), taninuri (11,59%), flavonoide (11,26%), saponine (7,62%), mucilagii (6,95%), și cumarine (4,97%.)

CONSIDERATIONS CONCERNING THE CONSERVATION STATUS OF THE NATURAL HABITATS FROM CEAHLĂU NATIONAL PARK

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Abstract: In this paper a characterization of the conservation status of natural habitats from Ceahlău National Park was made. There were analyzed three types of habitats, according to NATURA 2000 classification, as follows: 8210 Calcareous rocky slopes with chasmophytic vegetation; 6170 Alpine and subalpine calcareous grasslands and 4060 Alpine and Boreal heaths.

Keywords: natural habitats, conservation, Ceahlău National Park.

Introduction

The Ceahlău Massif belongs to the central group of the Oriental Carpathians, being bounded on the north, east and south by river valleys: Bistricioara, Bistrița (Izvorul Muntelui–Bicaz Lake) and Bicaz. The western limit corresponds with the Pintic and Jidan Valleys, that flows into the Bicaz river. The Ceahlău Massif has a surface of 290 km^2, and the Ceahlău National Park occupies 26,7% of this (7 742,5 ha).

From geological point of view, the characteristic formations from Ceahlău Massif are: Ceahlău Canvas (sandstones, marls, clays, conglomerates known as „Ceahlău conglomerates") and Teleajen Canvas (black shales, gray-green shales, gray micaceous sandstones, limestone sandstones, marls and green, red clays.

In terms of climate, Ceahlău Mountains have a moderate-temperate continental climate, with an annual average temperature of 0,7° C on Toaca Peak and 7,2° C on inferior mountain level. The annual average precipitation is over 700 mm. The most frequent winds are from the west, with an average speed of 6–8 m/s in summer and 12–14 m/s in winter.

The Ceahlău National Park was designated as Site of Community Importance (SCI) in accordance with MO M.M.D.D no. 1246/2007 for a total of 13 natural habitats, 5 species of mammals, 3 species of amphibians and reptiles and 4 species of plants.

Material and methods

The identification and characterization of the natural habitats from Ceahlău National Park was undertaken in 2011–2012 as part of the project *MANAGEMENT DEVELOPMENT FOR CEAHLĂU NATIONAL PARK*. In this respect, there have been mad phytosociological surveys in the field, in accordance with the method of Central-European School from Zürich-Montpellier [5]. The codes of the habitats correspond to the NATURA 2000 and Romanian

system of classification [6, 8]. The conservation status of the habitats was assessed by the indicators considered useful in this assessment: size of the area; presence of alien species; specific composition; structure and dynamic elements of the phytocoenoses.

The assessment of the conservation status of habitats (according to Article 17 of the Habitats Directive 92/43/EEC) was made by their classification into one of four categories: „good" (green), „unfavorable, inadequate" (orange), „very unfavorable" (red) and „unknown" (gray), depending on the attributes declared for each of them, threats of destruction and hazards that may cause destruction or disappearance [4].

Results and discussions

8210 Calcareous rocky slopes with chasmophytic vegetation

(R 6206 South-East Carpathian Communities of the limestone, rock walls cracks with *Cystopteris fragilis, Campanula carpatica, Saxifraga cuneifolia* and *Valeriana sambucifolia*; **R6202** South-East Carpathian Communities of limestone rocks with *Artemisia eriantha* and *Gypsophila petraea*)

These coenoses were identified at Ocolașu Mare, Toaca Peak, Bistra Mică well and Masa dacilor, at 1008–1900 m altitude, on surfaces of 10–15 m^2. Phytocoenoses with *Asplenium viride* and *Cystopteris fragilis* are poorer in species than those with *Artemisia eriantha* and *Gypsophila petraea.* In the latter, we found many characteristic species to the sesleriets, plant grouping whom they come in contact.

Characteristic species: *Asplenium viride, Artemisia eriantha, Silene zawadski*.

Edifying species: *Asplenium viride*, *Cystopteris fragilis, Artemisia eriantha, Gypsophila petraea*.

Frequent species in composition: *Saxifraga paniculata, S. corymbosa, Polypodium vulgare, Valeriana montana, Cortusa matthioli, Campanula carpatica, Daphne mezereum, Veronica urticifolia, Mycelis muralis, Senecio ovatus, Asplenium trichomanes, Helianthemum oelandicum* ssp. *alpestre, Primula veris* ssp. *columnae, Crepis jacquinii, Carex sempervirens, Oxytropis halleri, Thymus pulcherrimus*.

From the structural point of view, the vegetation has a height of 5–20 cm and a covering of 40–60%. The bryophytes layer is more developed for *Asplenio – Cystopteridetum fragilis* Oberd. (1939) 1949 association.

Habitat maintains its characteristic structure, although in some areas, biotopes with *Artemisia eriantha* and *Gypsophila petraea* can develop into sesleriets, because of the expansion of the heliophilous and transgressive mesotherms species from *Seslerietea albicantis* class (*Thymus pulcherrimus, Primula veris* ssp. *columnae, Helianthemum oelandicum* ssp. *alpestre, Crepis jacquinii, Anthyllis vulneraria* ssp. *alpestris)*. These grouping have a large expansion on the limestone rocks from Ceahlău, it is well defined, with a good state of preservation on the route to Masa Dacilor, under Ocolașu Mare. These coenoses occupy lower surfaces on the Toaca Peak, being identified near the touristic routes, a potential threat to the integrity of the habitat.

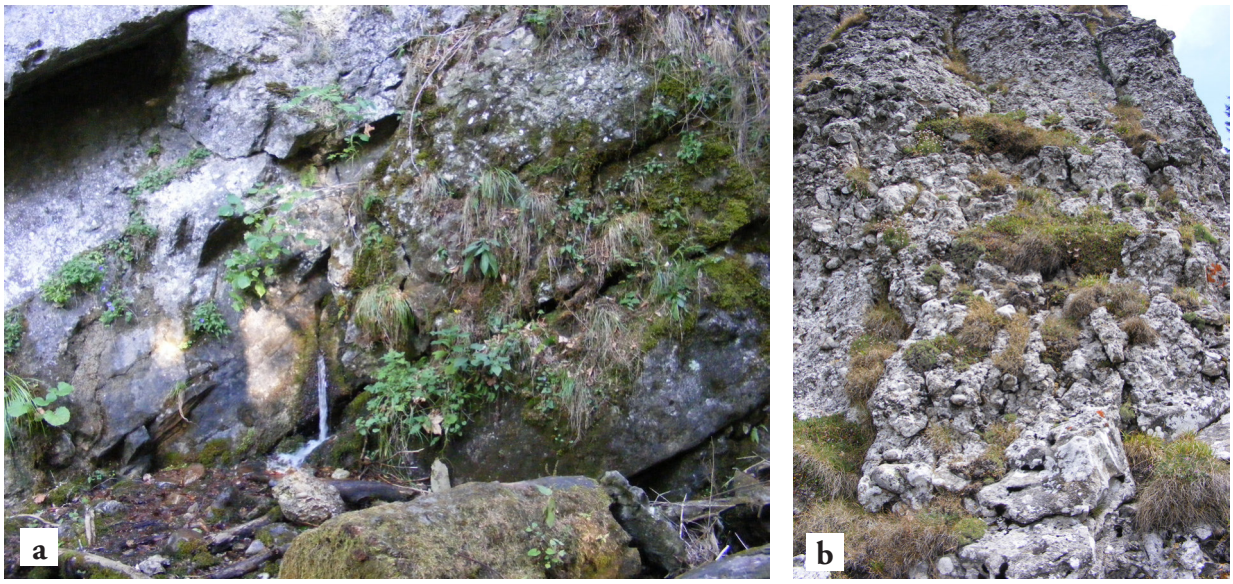

Photo 1, a: Coenoses with *Asplenium viride* and *Cystopteris fragilis* at Bistra well;
Photo 1, b: Coenoses with *Artemisia eriantha* and *Gypsophila petraea* at Masa Dacilor

The grouping with *Asplenium viride* and *Cystopteris fragilis* are fragmented, being identified on the limestone rocks, along the Bistra Mică creek. The stationary conditions (steep slopes, cracks, increased humidity) are favorable for maintaining these groups. As part of these coenoses, we observed juvenile specimens of *Abies alba, Fagus sylvatica, Picea abies*, given their presence in the beech forests of 91V0 habitat.

It is a habitat of high conservative value, which houses endemic species mentioned in Red List of vascular plant from Romania [7]: *Crepis jacquinii, Silene zawadskii, Thymus pulcherrimus, Trisetum alpestre*, *Campanula carpatica*.

6170 Alpine and subalpine calcareous grasslands

(**R 3612** South-East Carpathian grasslands of *Carex sempervirens* and *Sesleria bielzii*, **R3605** South-East Carpathian grasslands of *Festuca versicolor* and *Sesleria rigida* ssp. *haynaldiana*

These coenoses are installed on the cornices with Jurassic limestone from subalpine and alpine zone, being identified at Ocolașu Mare, Gardul Stănilelor, Toaca Peak. There are developed at 1500–1910 m altitude, on surfaces of 100 m^2.

The grazing ban has led to a regeneration of vegetal layer and to increased of the specific diversity. As part of this habitat were identified more than 55 species.

Characteristic and edifying species: *Festuca versicolor, Sesleria bielzii*.

Frequent species in composition: *Alyssum repens, Bupleurum diversifolium, Campanula cochlearifolia, Dianthus tenuifolius, Galium anisophyllon, Gypsophila petraea, Helianthemum oelandicum* ssp. *alpestre, Minuartia verna, Oxytropis halleri, Polygonum viviparum, Saxifraga corymbosa, S. paniculata, Scabiosa lucida* ssp. *barbata, Anthyllis vulneraria* ssp. *alpestris, Biscutella laevigata, Campanula glomerata, Carlina acaulis, Centaurea pinnatifida, Cruciata laevipes, C. glabra, Dryas octopetala, Euphrasia salisburgensis, Gymnadenia conopsea, Hieracium villosum, Leontopodium alpinum, Linum perenne* ssp. *extraaxilare, Myosotis alpestris, Onobrychis montana, Parnassia palustris, Phyteuma orbiculare, Pedicularis verticillata, Silene zawadski, Ranunculus oreophilus, Primula elatior, Thymus pulcherrimus, Festuca amethystina, Potentilla thuringiaca, Acinos alpinus, Allium senescens* ssp. *montanum, Alchemilla xanthochlora, Cirsium erisithales, Avenula pubescens*.

Alien species: *Picea abies, Juniperus sibirica, Pinus mugo*.

The vegetation stratification exists only in areas invaded by *Picea abies, Pinus mugo, Juniperus sibirica*, where distinguished a layer of grasses and shrubs. The vegetation has a height of 10–40 cm and a covering of 50–100%.

Photo 2: Coenoses with *Carex sempervirens* and *Sesleria bielzii* at Ocolașu Mare

The conservation status is good and it can be maintained by practicing a controlled tourism, requiring the tourists to travel only on marked routes in Toaca Peak. Otherwise, over time, the herbaceous layer is destroyed, soil will be degraded, erosion will increase and, not least, many specimens of rare plants will disappear. The juvenile specimens of *Picea abies, Pinus mugo* and *Juniperus sibirica* vegetate in the coenotic environment of limestone meadows, which can be evolved in bushes edified by *Vaccinium myrtillus, V. vitis-idaea, Juniperus sibirica* and *Pinus mugo.*

The habitat develops on steep slopes, with inclination of 70^0 and at the based on gentle slopes ($30–45^0$) at the Masa Dacilor. We observed a covering of 100 % in these areas. But, in this case, the presence and development of *Picea abies* or *Juniperus sibirica* seedlings emphasize the assimilation of these coenoses by the spruce forest or subapine bushes.

The route to the Masa Dacilor is less frequented by tourists, because of it is inaccessibility, in some areas, and the populations of edelweiss (*Leontopodium alpinum*) are well developed in terms of individuals vigorously and their density.

This habitat has a high conservative value, expressed by the presence of endemic species: *Thymus pulcherrimus, Dianthus tenuifolius, Linum perenne* ssp. *extraaxilare, Onobrychis montana, Silene nutans* ssp. *dubia, S. zawadski, Centaurea pinnatifida*. Taxa such as *Leontopodium alpinum, Thymus pulcherrimus, Dianthus tenuifolius, Centaurea pinnatifida, Silene zawadski, S. nutans* ssp. *dubia, Oxytropis halleri* are sozological categories in the Red List of vascular plant from Romania [7].

4060 Alpine and Boreal heaths

(**R 3617** Bushes with *Dryas octopetala*; **R3108** South-East Carpathian bushes with *Juniperus sibirica*; **R3111** South-East Carpathian bushes with *Vaccinium myrtillus*; **R3109** South-East Carpathian bushes with *Empetrum nigrum* ssp. *hermaphroditum* and *Vaccinium gaultherioides*

Characteristic coenoses of this habitat were identified at 1700–1900 m altitude, as follows: Bâtca lui Ghedeon; Lespezi, over the Dochia chalet, to Ocolașu Mare; Toaca Peak; Ocolașu Mare; Masa Dacilor; under the Ocolașu Mare, near to Gardul Stănilelor; La Pălărie; Piciorul Șchiop; under the Gardul Stănilelor; Piatra Lăcrimată.

This habitat occupies minimal variable surfaces in the subalpine level from 50 m^2 to 0,6 ha. The subshrub layer has a coverage between 60–80%, while the layer grass only 20–30%.

Characteristic species: *Dryas octopetala*, *Campanula patula* ssp. *abietina, Vaccinium myrtillus, V. vitis-idaea, V. uliginosum* ssp. *microphyllum, Cetraria islandica, Thamnolia vermicularis*.

Edifying species: *Dryas octopetala*, *Juniperus sibirica, Vaccinium myrtillus, V. vitis-idaea, V. uliginosum* ssp. *microphyllum*.

Frequent species in composition: *Antennaria dioica, Anthyllis vulneraria* ssp. *alpestris, Botrychium lunaria, Campanula alpina, C. glomerata, Carex sempervirens, Cruciata laevipes, C. glabra, Festuca amethystina, F. airoides, Galium anisophyllon, Gymnadenia conopsea, Helianthemum oelandicum* ssp. *alpestre, Minuartia verna, Oxytropis halleri, Parnassia palustris, Pedicularis verticillata, Phyteuma orbiculare, Pinguicula vulgaris, Polygonum viviparum, Primula elatior, Ranunculus oreophilus, Saxifraga paniculata, S. aizoides, S. oppositifolia, Scabiosa lucida* ssp. *barbata, Sesleria bielzii, Selaginella selaginoides, Silene zawadski, Thesium alpinum, Thymus pulcherrimus, Luzula luzuloides, Lotus corniculatus, Alchemilla xanthochlora, Artemisia eriantha, Anthoxanthum odoratum, Gentianella austriaca, Cotoneaster integerrimus, Picea abies, Polygonum bistorta, Calamagrostis arundinacea, C. villosa, Homogyne alpina, Solidago virgaurea, Gentiana asclepiadea, Huperzia selago, Senecio ovatus, Veratrum album, Poa alpina, Agrostis rupestris*.

There is a stratification of vegetation: the upper layer dominated by *Juniperus sibirica*, the subshrubs edified by *Vaccinium myrtillus, V. vitis-idaea, V. uliginosum* ssp. *microphyllum* and herbs and the lower layer of mosses and lichens. These are stable habitats, in some areas, *Vaccinium myrtillus* and *Juniperus sibirica* compete for dominance.

There is not a clear demarcation of characteristic groups of this habitat. At the Masa Dacilor, under the Ocolașu Mare asserted *Vaccinium myrtillus*, making the transition to vacciniets. At the route Piciorul Șchiop-Piatra Lăcrimată-Cabana Dochia, the habitat has two codominant species, *Vaccinium myrtillus* and *Juniperus sibirica*. Beside of these, participates with an important coverage *Picea abies*. In some areas, we found that the bushes with *Pinus mugo* alternate with vacciniets. The trend is the assimilation of the latter, forming the lower layer of *Pinus mugo* habitats.

Even if in the area of Ceahlău National Park area, the tourism is a very intense phenomenon, the development, especially of the specimens of *Juniperus sibirica* leads the tourists to use only the routes marked for this purpose.

We have not seen the *Empetrum nigrum* ssp. *hermaphroditum* in the composition of phytocoenoses dominated by *Vaccinium uliginosum* ssp. *microphyllum*. These grouping are fragmented, interspersed between the *Juniperus* bushes, which due to the dynamic development tend to invade them.

Photo 3: Coenoses with *Dryas octopetala* at Pălărie

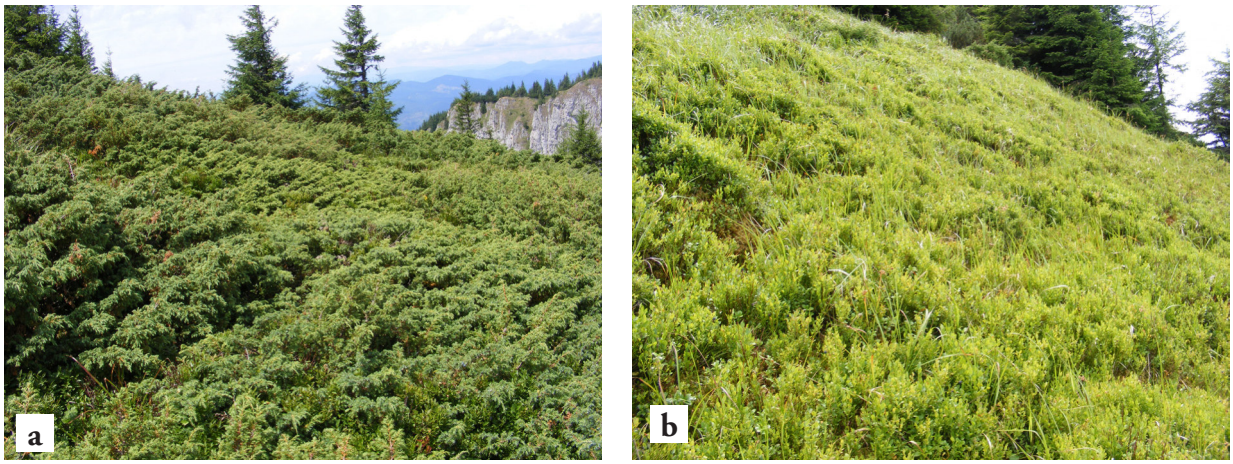

Photo 4, a: Coenoses with *Juniperus sibirica* at Pălărie
Photo 4, b: Coenoses with *Vaccinium myrtillus* near the Gardul Stănilelor

While the coenoses with *Vaccinium myrtillus* and *Campanula patula* ssp. *abietina*, that extending primary or secundary, other subtypes have a high conservative value, including endemic species from Red List of vascular plant from Romania [7], such as: *Dianthus tenuifolius, Campanula serrata, Thymus pulcherrimus, Th. comosus, Silene zawadski, Traunsteinera globosa, Gymnadenia conopsea, Oxytropis halleri, Crepis jacquinii, Festuca amethystina*. *Campanula serrata* is a community interest species which vegetates in all plant associations of this habitat, being mentioned in Annex IIb of Habitats Directive and OUG no. 57/2007, Annex 3b.

Conclusions

Phytosociological analysis allowed the identification of three natural habitats in the National Park Ceahlău, according to Natura 2000 classification: 8210 Calcareous rocky slopes with chasmophytic vegetation; 6170 Alpine and subalpine calcareous grasslands and 4060 Alpine and Boreal heaths. The conservation status of all analyzed habitats is good and we can provide the green code according to European classification.

REFERENCES

1. Chifu, T., Mânzu, C., Zamfirescu, O., 2006, *Flora și vegetația Moldovei (România), II. Vegetația,* Ed. Univ. Al. I. Cuza, Iași.
2. Ciocârlan, V., 2009, *Flora ilustrată a României, Pteridophyta et Spermatophyta*, Ed. Ceres, București.
3. Coldea, Gh., 1991, *Prodrome des associations vegetales des Carpates du sud-est (Carpates Roumaines). Documents phytosociologiques*, **1**, Camerino: 317–539.
4. Combroux, I., Schwoerer, Ch., 2007, *Evaluarea statutului de conservare a habitatelor și speciilor de interes comunitar din România-Ghid metodologic*, Ed. Balcanic, Timișoara.
5. Cristea, V., Gafta, D., Pedrotti, F., 2004, *Fitosociologie*, Ed. Presa Universitară Clujeană, Cluj-Napoca.
6. Doniță, N., Popescu, A., Comănescu Paucă, M., Mihăilescu, S., Biriș, I.A., 2005, *Habitatele din România*, Ed. Tehnică Silvică, București.
7. Oltean, M., Negrean, G., Popescu, A., Roman, N., Dihoru, G., Sanda, P., Mihăilescu, S., 1994, *Lista roșie a plantelor superioare din România,* Institutul de Biologie al Academie Române, București.
8. *** http://www.coastal-biodiv.ro/docs/manual_de_interpretare_a_habitatelor.pdf.
9. *** 2007, Ordonanța de Urgență nr. 57 din 20 iunie 2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și a faunei sălbatice, Anexa 3b. MO nr. 442/29 iunie.
10. *** http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm.
11. *** http://www.ceahlaupark.ro/index.html.

CONSIDERAȚII PRIVIND STAREA DE CONSERVARE A HABITATELOR NATURALE DIN PARCUL NAȚIONAL CEAHLĂU
(Rezumat)

În lucrarea de față este realizată o caracterizare a stării de conservare a trei tipuri de habitate naturale din Parcul Național Ceahlău, parte integrantă a unui studiu mai amplu în cadrul contractului POS Mediu-*Dezvoltarea managementului pentru Parcul Național Ceahlău*, după cum urmează: 8210 Versanți stâncoși calcaroși cu vegetație casmofitică, 6170 Pajiști calcifile alpine și subalpine, 4060 Tufărișuri alpine și boreale. Evaluarea statutului de conservare a habitatelor s-a realizat prin aprecierea stării de conservare la nivelul UE, și anume, prin încadrarea lor în una din cele patru categorii: „favorabile", „nefavorabil inadecvate", „foarte nefavorabile" și „necunoscut", în funcție de atributele anunțate pentru fiecare, de amenințările de distrugere și de pericolele ce pot provoca distrugerea sau dispariția lor.

RESEARCHES ON BRYOPHYTES COMMUNITIES FROM THE VÂLSAN RIVER BASIN

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Abstract: Were studied assemblages of bryophytes tericolous, saxicolous, epiphytic and saprolignicolous from on Vâlsan Valley Natural Reserve, Argeș County (Romania). For saxicolous bryophytes diversity analysis, we took into account the number of species and phytogeographical element, shape and growth "life strategy" of each species. Mosses epiphytic associations have a unitary character and more or less homogeneous, being represented by a small number of species. On saprolignicolous associations observed heterogeneous nature in terms of composition and structure in relation to successional stages determined by the maceration of the substrate as a result of microbiological processes. Some of the species is by abundance and frequency mosses remarkable population, especially in certain biotopes in determining ecological factors to ensure development.

Most studies focus on species diversity of their wealth, which is just one of the many facets of diversity.

Keywords: bryophytes, Vâlsan Valley Natural Reserve, bryophyte diversity variables

Introduction

The Vâlsan River Basin lies in the Făgăraș Mountain of Argeș County, Romania and contains Vâlsan Valley Natural Reserve and the Vâlsan Valley Protected Natural Area of Community Interest. Vâlsan Valley protected area is part of natural reservations appropriate IUCN category IV, aimed at protecting and conserving natural habitats and important species from flora, fauna, forestry, geology and paleontology.

Previous researches concerning Bryoflora of Făgăraș Mountains were made, in the west part of Massive, since 1846, but bryological exploration of Southern part of Făgăraș Mountain has not yet been sufficiently studied.

Plants do not grow almost never solitary in nature, but in different combinations, from some simple to most complex. Mosses are associated in the formations dominated for phanerogams or in own societies subordinated, often together with lichens. [2] The mosses associations from different substrates and habitats characteristic of various vegetation formations are classified into five groups: 1. aquatic; 2. terrestrial (tericolous); 3. rocks (saxicolous); 4. epiphytes (cortical, tree); 5. saprolignicolous (including epixylic bryophytes) with stages of succession according to their physical and biochemical processes of gradual disorganization of organic substrate. [9]

Several studies have shown that specific diversity of these groups of bryophytes depends, among other factors, latitude [1], exposure to sunlight habitat [3], microhabitat heterogeneity [6, 7] or successional age of the substrate [8, 4].

Material and methods

The bryophytes were collected from the Vâlsan River's Basin, between 2002–2009, from June to September.

Mosses were collected from the soil, trees, rotten wood, rocks and boulders, along the river and were stored in paper envelopes. Identification was done using relevant bryological literature. Nomenclature was actualized according to Hill et al. [5]. The bryophyte flora and its environmental correlated were studied.

Numerous photographs original was made that were intended to ease of identifying species, to complete descriptions and to highlight features of bryological communities.

Results and discussions

The environmental factors analysis from bryophytes species can prove the close connection that exists between physical and geographical conditions and their development planning and assemblage. For the analysis of bryophyte diversity, we used total species numbers, but we also classified the species into distribution-range types, growth forms and life-strategy types.

On the lower floor of the valley Vâlsan, in forests dominated by beech, the bryophyte vegetation is poorly developed and consists mostly of *Atrichum undulatum* and *Polytrichastrum formosum* while forests of holm oak or the beech and hornbeam mixed with are common, large areas, tericolous populations with: *Polytrichastrum formosum, Polytrichum juniperinum, Plagiomnium undulatum, Rhythidiadelphus squarrosus, Brachythecium rivulare*. In spruce and fir forests the bryophyte vegetation is richer and characterized by species as *Pleurozium schreberi, Rhytidiadelphus triquetrus, Plagiothecium undulatum.* Of forest species have identified characteristic species upper Vâlsan Valley: *Polytrichastrum formosum, Plagiomnium undulatum, Rhytidiadelphus triquetrus, Thuidium tamariscinum, Hylocomium splendens, Sanionia uncinata, Ptilium crista-castrensis, Marchantia polymorpha, Conocephalum conicum, Plagiochila asplenioides* and wetland habitats from the forest edge: *Plagiothecium undulatum, Sphagnum quinquefarium, Cratoneuron commutatum, Bryum pseudotriquetrum.*

Saxicolous and terricolous bryophytes present a group of organisms with specific physiological and ecological adaptations, which make them thrive in various terrestrial habitats.

Common species of Bryophytes on rocks and boulders are *Syntrichia ruralis, Schistidium apocarpum, Grimmia pulvinata, Bryum argenteum, Bartramia halleriana, Dicranum scoparium.*

Among growth forms, low acrocarpous bryophytes were positively related to base-rich cliffs (Photo 1), tall acrocarpous bryophytes were more frequent on small, shaded and acidic cliffs (Photo 2), and pleurocarpous mats were more frequent on larger cliffs (Photo 3). Generally, small acrocarpous bryophytes positively related sites are well lit, while tall acrocarpous bryophytes are linked to sites in shaded areas.

Photo 1: Saxicolous mosses communities installed rock fissures with small acrocarpous bryophytes (Photo Codruța Dobrescu)

Photo 2: Saxicolous mosses communities with tall acrocarpous bryophytes (Photo Codruța Dobrescu)

Photo 3: Saxicolous mosses communities with pleurocarpous bryophytes (Photo Codruța Dobrescu)

Epiphytic mosses associations have a unitary character and more or less homogeneous, being represented by a small number of species: *Dicranum montanum*, *Isothecium alopecuroides, Hypnum cupressiforme*, *Diplophyllum albicans*.

Characteristic bryophytes species on rotten wood are *Lophocolea heterophylla*, *Scapania nemorea* and *Lophozia incisa*; the succession is followed on older, decayed wood with *Dicranodontium denudatum*, *Plagiothecium cavifolium, Dicranum scoparium, Lepidozia reptans* and *Hypnum cupressiforme* (Photo 4, 5, 6).

Photo 4: Mosses communities on a tree just fell (Photo Codruța Dobrescu)

Photo 5: Mosses communities located on a tree in a state of decomposition environment (Photo Codruța Dobrescu)

Photo 6: Mosses communities on a tree in an advanced stage of decomposition (Photo Codruța Dobrescu)

Saprolignicolous mosses are common among species that are at the same time saxicolous or silicicolous. It also can develop as tericolous species under heavy rains, water brings soil particles on plant debris resulting from logging.

Conclusions

Relationships between bryophyte diversity variables and environmental variables were analyzed and a bigger diversity in the superior tank of Vâlsan River which has a rich precipitation condition and a lower anthropic influence.

Some of the species forms by abundance and frequency, remarkable population, especially in certain biotopes in determining ecological factors to ensure development.

REFERENCES

1. Cox, J.E., Larson, D.W., 1993, Environmental relations of the bryophytic and vascular components of a talus slope plant community, *Journal of Vegetation Science*, **4**: 553–560.
2. Goffinet, B., Shaw, A.J., 2009, *Bryophyte Biology, Second Edition*, Cambridge University Press, 565 pp.
3. Hedderson, T.A., Brassard, G.R., 1990, Microhabitat relationship of five co-occurring saxicolous mosses on cliffs and scree slopes in eastern Newfoundland, *Holarctic Ecology*, **13**:134–142.
4. Hedderson, T.A., Letts, J.B., Payne, K., 2003, Bryophyte diversity and community structure on thatched roofs of the Holnicote Estate, Somerset, *U.K. Journal of Bryology*, **25**:49–60.
5. Hill, M.O., Bell, N., Bruggeman-Nannenga, M.A., Brugués, M., Cano, M.J., Enroth, J., Flatberg, K.I., Frahm, J.-P., Gallego, M.T., Garilleti, R., Guerra, J., Hedenäs, L., Holyoak, D.T., Hyvönen, J., Ignatov, M.S., Lara, F., Mazimpaka, V., Muñoy, J., Söderström, L., 2006, Bryological Monograph. An annotated checklist of the mosses of Europe and Macaronesia, *Journal of Bryology*, **28:**198 – 267.
6. Kimmerer, R.W., Driscoll, M.J.L., 2000, Bryophyte species richness on insular boulder habitats: the effect of area, isolation, and microsite diversity*, Bryologist*, **103**:748–756.
7. Kubesova, S., Chytry, M., 2005, Diversity of bryophytes on treeless cliffs and talus slopes in a forested central European landscape*, Journal of Bryology*, **27**: 35–46.
8. Pharo, E.J., Vitt, D.H., 2000, Local variation in bryophyte and macrolichen cover and diversity in montane forests of western Canada*, Bryologist*, **103**: 455–466.
9. Ștefureac, T.I., 1980, Reflecții și propuneri privind delimitarea și încadrarea ecologică a asociațiilor muscinale dependente în briocenotaxonomie, *Studii și cercetări de Biologie, Seria Biologie Vegetală*, Editura Academiei RSR, **32**(2): 105–113.

CERCETĂRI PRIVIND CENOZELE BRIOFITICE DIN ARIA PROTEJATĂ VALEA VÂLSANULUI (Rezumat)

Plantele nu cresc aproape niciodată singuratice în natură, ci în cele mai diverse combinații, de la unele simple, până la cele mai complexe. Mușchii sunt asociați în cadrul formațiunilor dominate de fanerogame sau în asocieri proprii subordonate (sinuzii), adesea împreună cu lichenii.

Au fost studiate cenozele briofitice tericole, saxicole, corticole și saprolignicole din Rezervația Naturală Valea Vălsanului.

Pentru analiza diversității briofitelor saxicole, am ținut cont de numărul de specii, dar și de elementul fitogeografic, forma de creștere și „strategia de viață" a fiecărei specii.

Asociațiile muscinale epifite au un caracter unitar și mai mult sau mai puțin omogen, fiind reprezentate de un număr mic de specii.

La briocenozele saprolignicole s-a observat un caracter heterogen în ceea ce privește componența și structura, în raport cu stadiile succesionale determinate de gradul de macerare a substratului ca urmare a proceselor microbiologice.

Unele dintre specii constituie, prin abundența și frecvența lor, populații muscinale remarcabile, mai ales în anumite biotopuri în care factorii ecologici determinanți le asigură dezvoltarea.

Cele mai multe studii de diversitatea speciilor se concentrează pe bogăția acestora, care este doar una din multiplele fațete ale diversității.

MACROMYCETES FROM THE AGARICALES ORDER AMONG THE "GHEORGHE SĂLĂGEANU" COLLECTION OF TÂRGU-MUREȘ NATURAL SCIENCE MUSEUM (II)

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Abstract: This work presents a part of the „Gheorghe Sălăgeanu" collection which belongs to the Herbarium of Natural Science Museum from Târgu-Mureș. The 133 taxa of macromycetes from the Agaricales order, belong to 12 families: Clavariaceae, Fistulinaceae, Lyophyllaceae, Marasmiaceae, Mycenaceae, Physalacriaceae, Pleurotaceae, Pluteaceae, Schizophyllaceae, Tricholomataceae, Typhulaceae, Incertae sedis.

For each taxa there was indicated the scientific name, as well as the collecting location, date, phenophase, biological form, edibility or toxicity level (through conventional signs), number of patrimony belongings registred in the inventory „Plante inferioare", of Natural Science Museum from Târgu-Mureș and last but not least, the number of specimens.

First of all, the collection has an important value because it emphasizes a part of the patrimony from our museum, secondly, due to the fact that it completes the knowledge concerning the ecology and chorology of some macromycetes from Romania and finally because of the antiquity of some species (for more than half a century) and the collector's notoriousness.

Keywords: mycetoendocormophyta, mycetoendomycophyta, mycetoepixilophyta, mycetoepibryophyta, mycetoendoxilophyta, mycetogeophyta mycorrhiza, mycetogeophyta parasitica, mycetogeophyta saprophytica.

Introduction

In 2005, the Herbarium of the Natural Science Museum from Târgu-Mureș has enriched with a new collection, bought from the Professor Gheorghe Sălăgeanu. It contains 650 species of macromycetes. These represent almost half of the species which were ever found in Romania [5].

The macromycetes are represented by fruit-bodies in different forms and colours, preserved by drying. The species were mentioned in *„Determinator pentru recunoașterea ciupercilor comestibile, necomestibile și otrăvitoare din România",* which was issued in 1985*,* at the Ceres Publishing House, winning a Romanian Academy prize as the best contribution regarding this field.

The biologist Gheorghe Sălăgeanu, worked with „Ovidius" University of Constanța, Faculty of Natural Science. He was the dean of the Superior Educational Institute of Constanța, between 1976–1984. He was the author of numerous botanical works, one of them beeing „*Rezervații, monumente și frumuseți ale naturii din județul Constanța*", edited by the The Natural Science Complex, Constanța, in 1978 and more than 60 other articles which were concerning the same scientifical field. He was member of the European Society of Mapping Macromycetes, in the Romanian Biological Sciences Society and in the Romanian Commission of the Nature Monuments from Constanța.

This work completes the knowledge regarding the ecology and chorology of some macromycetes from Romania.

Material and methods

This work represents a part of the collection, more precisely 133 taxa of macromycetes, belonging to 12 families from the Agaricales order: Clavariaceae, Fistulinaceae, Lyophyllaceae, Marasmiaceae, Mycenaceae, Physalacriaceae, Pleurotaceae, Pluteaceae, Schizophyllaceae, Tricholomataceae, Typhulaceae, Incertae sedis.

The 692 patrimony belongings, were collected and assigned by Gheorghe Sălăgeanu.

The current name of the taxa and the systematic rules were achieved according to the *Index fungorum* (www.indexfungorum.org) and to the *Cybernome, the Nomenclator for Fungi and their Associated Organisms* [8, 9].

The phenophases, the biological forms, the edibility and toxicity level, as well as the conventional signs were established according to Sălăgeanu & Sălăgeanu (1985).

For each taxa there was indicated the scientific name, collecting location, date, phenophase, biological form, edibility or the toxicity level, number of patrimony belongings registred in the inventory „Plante inferioare", of Natural Science Museum from Târgu-Mureș and last but not least, the number of specimens.

Results and discussions

The taxonomical diversity of the macromycetes from „Gheorghe Sălăgeanu" collection vas finalised through the identification among the Agaricales order, during the second stage, of 133 taxa (132 species and one infraspecifical taxa – varieties), belonging to 12 families: Clavariaceae, Fistulinaceae, Lyophyllaceae, Marasmiaceae, Mycenaceae, Physalacriaceae, Pleurotaceae, Pluteaceae, Schizophyllaceae, Tricholomataceae, Typhulaceae, Incertae sedis (Table no. 1, no. 2).

All of the above were colleted from the following districts from Romania: Alba, Bihor, Bistrița-Năsăud, Cluj, Constanța, Maramureș, Satu-Mare and Sălaj, collected between 1954–1965, 1967, 1968 and 1970.

According to Sălăgeanu & Sălăgeanu (1985), the taxa are part of these biological forms:
– mycetoendocormophyta (E) = 2 taxa;
– mycetoendomycophyta = 3 taxa;
– mycetoepixilophyta(EPx) = 17 taxa;
– mycetoepibryophyta (EPbr) = 1 taxon;
– mycetoendoxilophyta(Ex) = 2 taxa;
– mycetogeophyta mycorrhiza (Gm) = 13 taxa;
– mycetogeophyta parasitica (Gp) = 3 taxa;
– mycetogeophyta saprophytica(Gs) = 70 taxa.

At those mentioned above, there can be supplemented some intermediar forms:
– EPx-Ex = 2 taxa;
– EPx-Gs = 1 taxon;
– Ex-EPx = 13 taxa;
– Gp-EPx = 1 taxon;
– Gs-EPx = 5 taxa.

In the first scientifical work regarding this subject, we idenified 92 taxa of macromycetes from the Agaricales order, which belong to 6 families: Agaricaceae, Amanitaceae, Bolbitiaceae, Coprinaceae, Entolomataceae, Hygrophoraceae [2].

These two taxonomical identifications combined result in a number of 225 taxa and 18 families: Agaricaceae (19 taxa), Amanitaceae (16 taxa), Bolbitiaceae (12 taxa), Clavariaceae (4 taxa), Coprinaceae (11 taxa), Entolomataceae (12 taxa), Fistulinaceae (1 taxon), Hygrophoraceae (22 taxa), Lyophyllaceae (11 taxa), Marasmiaceae (28 taxa), Mycenaceae (19 taxa), Physalacriaceae (8 taxa), Pleurotaceae (3 taxa), Pluteaceae (6 taxa), Schizophyllaceae (2 taxa), Tricholomataceae (48 taxa), Typhulaceae (2 taxa), Incertae sedis (1 taxon) (Fig. 1).

The Agaricales order represents more than 30% from the total number of taxa which can be found in this collection.

List of collecting sites

AB: Apuseni Mountains: Belioara-Scărișoara, Detunata.
BH: Vadul Crișului, Oradea.
BN: Rodnei Mountains: Vinului Valley, Corongiș Peak.
CS: Semenicului Mountains: Trei Ape.
CJ: Apuseni Mountains: Călățele; Cluj-Napoca: Babeș Park, Craiului Hill (Mănăștur), Galicer Hill, Hoia Forest, Hoia Hill, Lomb Forest, Mănăștur Forest, Someș, Someșul Mic (Babeș Park); Corus-Baciu; Dumbrava Hill; Făgetul Clujului (Coasta Mare, PlecicaValley); Gilăului Mountains: Băișoara, Buscat Peak;
Mount Vlădeasa: Răcadului Valley.
CT: Agigea.
MM: Lăpușului Mountains: Toria Stream – Băiuț village, Băiuț Valley.
SM: Săuca village.
SJ: Năpradea (Jibou).

Table 1: The taxonomical conspect of macromycetes from the above mentioned families, with the confining of the biological forms and phenophases.

PHYLLUM Class Order	Family	Taxa	Bioform	Phenophase
BASIDIOMYCOTA Basidiomycetes Agaricales	Clavariaceae	*Clavaria fragilis*	Gs	IX–X
		Clavaria fumosa		
		Clavulinopsis corniculata	Gs	VIII–X
		Clavulinopsis helvola	Gs	VIII–X
	Fistulinaceae	*Fistulina hepatica*	Ex – EPx	VIII–X
	Lyophyllaceae	*Asterophora lycoperdoides*	Em	IX–XI
		Asterophora parasitica	Em	X–XI
		Calocybe gambosa	Gs	IV–VI
		Lyophyllum connatum	Gs	VIII–X
		Lyophyllum decastes	Gs	IX–XI
		Ossicaulis lignatilis	EPx	VII–IX
		Rugosomyces carneus	Gs	X–XI
		Rugosomyces chrysenteron	Gs	VIII–X
		Rugosomyces ionides	Gs	VII–IX
		Tephrocybe atrata	Gs	IX–X

		Tephrocybe rancida	Gs	IX–XI
	Marasmiaceae	*Clitocybula lacerata*	EPx	VIII–X
		Crinipellis scabella	E	VI–XI
		Gymnopus androsaceus	Gs	V–XI
		Gymnopus brassicolens	Gs	VI–VIII
		Gymnopus confluens	Gs	VII–XI
		Gymnopus dryophilus	Gs	V–XI
		Gymnopus erythropus	Ex-EPx	VI–X
		Gymnopus foetidus	EPx	VI–VIII
		Gymnopus fuscopurpureus	Gs	IX–X
		Gymnopus fusipes	EPx-Ex	VI–XI
		Gymnopus hariolorum	Gs	V–IX
		Gymnopus impudicus	Gs	VIII–XI
		Gymnopus perforans	Gs	I–XII
		Gymnopus peronatus	Gs	VII–XI
		Marasmius epiphyllus	Gs	X–XI
		Marasmius graminum	E	VII–IX
		Marasmius oreades	Gp	V–XI
		Marasmius rotula	EPx-Gs	V–X
		Marasmius wynneae	Gs	IX–X
		Marasmiellus ramealis	EPx	VI–X
		Megacollybia platyphylla	EPx	VI–X
		Mycetinis alliaceus	Gs	VIII–X
		Mycetinis scorodonius	Gp	VI–XI
		Omphalotus olearius	Ex-EPx	VIII–IX
		Pleurocybella porrigens	EPx	VII–X
		Rhodocollybia butyracea	Gs	VII–XI
		Rhodocollybia maculata	Gs	IX–X
		Rhodocollybia prolixa var. distorta	Gs	VIII–IX
	Mycenaceae	*Mycena aetites*	Gs-EPx	VII–XI
		Mycena alcalina	EPx	VII–X
		Mycena atromarginata	EPx	IX–XII
		Mycena crocata	Gs	IX–XI
		Mycena epipterygia	Gp, EPx	IX–XI
		Mycena flavoalba	Gs	VIII–XI
		Mycena galericulata	Ex-EPx	IV–XII
		Mycena inclinata	Ex-EPx	IX–XII
		Mycena pelianthina	Gs	IV–X
		Mycena polygramma	Gs-EPx	VIII–XI
		Mycena pura	Gs	VII–XI
		Mycena rosella	Gs	VIII–XI
		Mycena sanguinolenta	Gs	VI–XI
		Mycena stylobates	Gs	IX–X
		Mycena vitrea	Gs	VI–IX
		Mycena vulgaris	Gs	IX–XI
		Panellus mitis	Ex-EPx	X–III
		Panellus stipticus	EPx-Ex	I–XII
		Xeromphalina campanella	EPx	VII–X
	Physalacriaceae	*Armillaria mellea*	Ex-EPx	VIII–XII
		Armillaria tabescens	Ex-EPx	VIII–X
		Flammulina velutipes	Ex-EPx	X–IV
		Oudemansiella mucida	Ex	VIII–XI
		Strobilurus esculentus	Gs	III–V
		Strobilurus tenacellus	Gs	III–V

		Xerula pudens	Ex-EPx	VIII–X
		Xerula radicata	Gp	VI–X
	Pleurotaceae	*Hohenbuehelia petaloides*	Gs, EPx	VIII–XI
		Pleurotus dryinus	Ex	VI–XI
		Pleurotus ostreatus	Ex-EPx	IX–XII
	Pluteaceae	*Pluteus atromarginatus*	EPx	V–X
		Pluteus cervinus	EPx	V–XI
		Pluteus nanus	EPx	VIII–IX
		Volvariella bombycina	Ex-EPx	VI–X
		Volvariella gloiocephala	Gs	V–VII
		Volvariella surrecta	Em	VIII–XI
	Schizophyllaceae	*Schizophyllum amplum*	EPx	I–XII
		Schizophyllum commune	Ex-EPx	I–XII
	Tricholomataceae	*Arrhenia epichysium*	EPx	VII–X
		Arrhenia griseopallida	Gs	VI–X
		Arrhenia onisca	EPbr	VI–IX
		Cantharellula umbonata	Gs	VIII–XI
		Clitocybe candicans	Gs	IX–XI
		Clitocybe dealbata	Gs	IX–XI
		Clitocybe infundibuliformis	Gs	VI–IX
		Clitocybe inornata	Gs	IX–X
		Clitocybe nebularis	Gs	IX–XI
		Clitocybe odora	Gs	VIII–XI
		Clitocybe phyllophila	Gs	IX–XI
		Clitocybe radicellata	Gs	III–IV
		Clitocybe suaveolens	Gs	VII–XI
		Clitocybe vermicularis	Gs	III–IV
		Collybia cirrhata	Gs	VIII–XI
		Collybia tuberosa	Gs	VIII–XI
		Delicatula integrella	Gs-EPx	VI–IX
		Infundibulicybe geotropa	Gs	VIII–XI
		Laccaria amethystina	Gs	V–XI
		Laccaria laccata	Gs	V–XI
		Laccaria tortilis	Gs	VI–IX
		Lepista flaccida	Gs	VIII–X
		Lepista nuda	Gs	IX–XI
		Lepista personata	Gs	X–XI
		Lepista sordida	Gs	VII–IX
		Leucopaxillus amarus	Gs	VIII–X
		Leucopaxillus lepistoides		
		Melanoleuca brevipes	Gs	IV–XI
		Melanoleuca evenosa	Gs	IV–VIII
		Melanoleuca grammopodia	Gs	IV–VIII
		Melanoleuca melaleuca	Gs	IV–X
		Myxomphalia maura	Gs	IX–X
		Omphalina pyxidata	Gs	IX–XI
		Pseudoclitocybe cyathiformis	Gs-EPx	X–XI
		Tricholoma acerbum	Gm	VIII–X
		Tricholoma album	Gm	VIII–X
		Tricholoma lascivum	Gm	IX–X
		Tricholoma populinum	Gm	X–XI
		Tricholoma resplendens	Gm	IX–XI
		Tricholoma saponaceum	Gm	IX–XI
		Tricholoma scalpturatum	Gm	VII–XI

		Tricholoma sejunctum	Gm	IX–X
		Tricholoma sulphureum	Gm	VII–X
		Tricholoma terreum	Gm	VIII–XI
		Tricholoma ustale	Gm	VIII–XI
		Tricholoma vaccinum	Gm	VII–X
		Tricholoma virgatum	Gm	IX–X
		Tricholomopsis rutilans	EPx	VII–XI
	Typhulaceae	*Macrotyphula juncea*	Gs	X–XI
		Typhula phacorrhiza	Gs	IX–XI
	Not assigned	*Plicaturopsis crispa*	EPx	IX–XII

Table 2: ***The numerological report of the studied taxonomical cathegories.***

Agaricales	Number of families	Number of genres	Number of taxa
	12	50	133

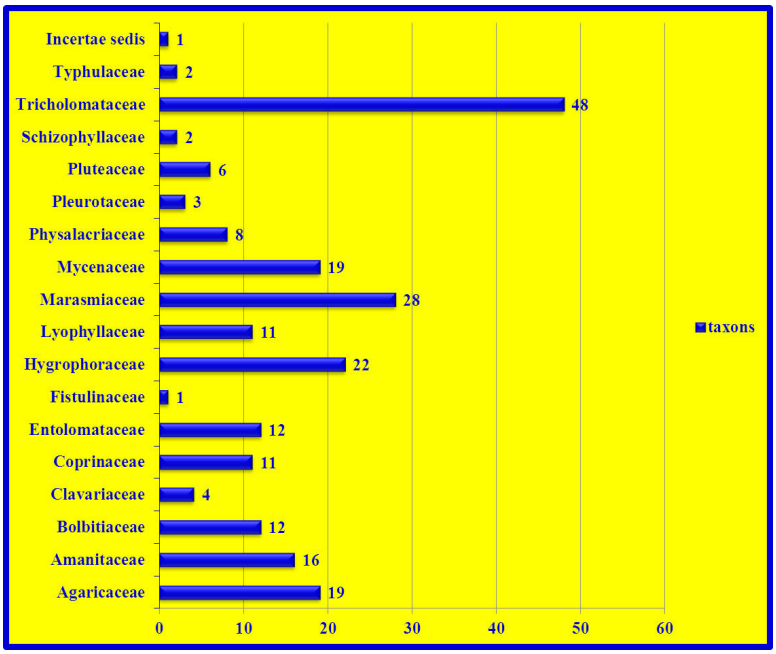

Fig. 1: The distribution into families of macromycetes.

The taxa list (the species and the families have been listed alphabetically):

Clavariaceae Family

Clavaria fragilis Holmsk. (1790)

CJ: on the wet lands, in the meadows, on Galicer Hill from Cluj-Napoca; 24 VIII 1968; IX–X; **Gs**; HMŞ 510 under *C. vermicularis* Sw.; 5 ex.

***Clavaria fumosa* Fr.**

BN: in clusters, in sunny and grassy places, at Vinului Valley from Rodnei Mountains; 29 X 1962; HMŞ 511; 4 ex.

Clavulinopsis corniculata (Schaeff.) Corner (1950)

CJ: in the meadows with moss, on Galicer Hill, at Cluj-Napoca; 15 X 1956; VIII–X; **Gs**; HMŞ 512 under *C. corniculata* (Schff. ex Fr.) Corner; 4 ex.

Clavulinopsis helvola (Pers.) Corner

CJ: in the meadows with moss, at the edge of Hoia Forest from Cluj-Napoca; 23 X 1965; VIII−X; **Gs**; HMș 513 under *C. Helvola* (Pers. ex Fr.) Corner; 2 ex.

Fistulinaceae Family
Fistulina hepatica (Schaeff.) With.(1792)
CJ: at the base of Quercus trunks, in Hoia Forest and on Galicer Hill, at Cluj-Napoca; 17 X 1955; VIII−X; **Ex- EPx**; 🍽; HMș 557 under *F. hepatica* (Schff. ex Fr.) With.; 1 ex.

Lyophyllaceae Family
Asterophora lycoperdoides (Bull.) Ditmar (1809)
CJ: on the decaying/decayed fruit-bodies (Russula nigricans), on Dumbrava Hill, nearby Cluj-Napoca 14 VIII 1957; IX−XI; **Em**; HMș 768 under *Nyctalis asterophora* Fr.; 2 ex.
Asterophora parasitica (Bull.) Singer (1951)
BN: on the pileusof Russula nigricans, at Vinului Valley from Rodnei Mountains; 17 IX 1961; X−XI; **Em**; HMș 769 under *Nyctalis parasitica* (Bull. ex Fr.) Fr.; 2 ex.
***Calocybe gambosa* (Fr.) Donk** (1962)
Without location: on the soil, on shrubberyes, on grassy places, on sunny places, in gardensand at the edges of the forests; 23 IV 1959; IV−VI; **Gs**; 🍽;🍽;🍽; HMș 764; 8 ex.
Lyophyllum connatum (Schumach.) Singer (1939)
CJ: in the wet deciduous forests, especially on the clayey soils, in connates clusters, at Făgetul Clujului, under Coasta Mare; 25 X 1963; VIII−X; **Gs**; 🍽; HMș 762 under *L. connatum* (Schum. ex Fr.) Sing.; 6 ex.
Lyophyllum decastes (Fr.) Singer (1951)
CJ: on the soil, in clusters, shrubberyes and in deciduous forests, at Făget, nearby Cluj-Napoca; 2 X 1957; IX−XI; **Gs**; 🍽; HMș 763 under *L. decastes* (Fr.) Sing.; 8 ex.
Ossicaulis lignatilis (Pers.) Redhead & Ginns (1985)
BN: on the deciduous and coniferous tree, at Vinului Valley from Rodnei Mountains; 28 IX 1962; VII−IX; **EPx**; HMș 671 under *Pleurocybella lignatilis* (Pers.) Singer; 2 ex.
Rugosomyces carneus (Bull.) Bon (1991)
CJ: on the wet soil, through willows, on the Someș riverside, at Cluj-Napoca; 24 VIII 1958; X−XI;**Gs**; 🍽; HMș 766 under *Calocybe carnea* (Bull. ex Fr.) Donk; 4 ex.
Rugosomyces chrysenteron (Bull.) Bon (1991)
CJ: on the fallen leafneedles of Picea, in the coniferous forest, at Băișoara, in Gilăului Mountains, under Buscat Hill; 29 VIII 1962; VIII−X; **Gs**; HMș 765 under *Calocybe chrysenteron* (Bull. ex Fr.) Sing.; 4 ex.
***Rugosomyces ionides* (**Bull.) Bon (1991)
CJ: on the soil of the coniferous forests, in Gilăului Mountains, at Băișoara, under Buscat Hill; 29 VIII 1962; VII−IX; **Gs**; 🍽; HMș 767 under *Calocybe ionides* (Bull. ex Fr.) Donk; 1 ex.
Tephrocybe atrata (Fr.) Donk (1962)
CJ: on the spot of fireplaces, at Făget, at Plecica Valley, nearby Cluj-Napoca; 25 IX 1960; IX−X; **Gs**; HMȘ 761; 10 ex.
Tephrocybe rancida (Fr.) Donk (1962)
BH:on the soil of the deciduous and coniferous forests, at Vadul Crișului; 27 X 1964; IX−XI; **Gs**; HMș 760; 3 ex.

Marasmiaceae Family
Clitocybula lacerata (Scop.) Métrod (1952)

BN: on the decaying tree of Picea, in the coniferous forests, at Vinului Valley from Rodnei Mountains, under Corongiș Peak; 28 IX 1962; VIII−X; **EPx**; HMș 752 under *C. Lacerata* (Scop. ex Lasch) Métr.; 8 ex.

Crinipellis scabella (Alb. & Schwein.) Murrill (1915)

SM: on grassy roots and stems,especially Bromus, at Săuca village; 17 XI;VI−XI; **E**;HMș 675under *Crinipellis stipitaria* (Fr.) Pat.; 3 ex.

Gymnopus androsaceus (L.) J.L. Mata & R.H. Petersen (2004)

CJ: on decaying leafneedles, under Picea, in the coniferous forests, on Mount Vlădeasa; 4 IX 1959; V−XI; **Gs**; HMș 679 under *Marasmius androsaceus* (L. ex Fr.) Fr.; 4 ex.

Gymnopus brassicolens (Romagn.) Antonín & Noordel.var. brassicolens(1997)

MM: on the soil with plant residues in putrefaction, in the spruce fir and beech forests from Lăpușului Mountains, on Toria stream, nearby Băiuț; 26 VII 1965; VI−VIII; **Gs**; HMș 687 under *Micromphale brassicolens* (Romagn.) Orton; 4 ex.

Gymnopus confluens (Pers.) Antonín, Halling & Noordel. (1997)

MM: in connates clusters, in the deciduous and coniferous forests from Lăpușului Mountains, at Băiuț Valley; 26 VIII 1962; VII−XI; **Gs**; HMș 750 under *Collybia confluens* (Pers. ex Fr.) Kumm.; 15 ex.

Gymnopus dryophilus(Bull.) Murrill (1916)

CJ: on the soil of Quercus forests, on Galicer Hill, at Cluj-Napoca; 31 VIII 1958; V−XI; **Gs**; 🍽; HMș 744 under *Collybia dryophila* (Bull. ex Fr.) Kumm.; 6 ex.

Gymnopus erythropus (Pers.) Antonín, Halling & Noordel. (1997)

CJ: on the decaying tree, in the deciduous forests, at Făgetul Clujului; 30 IX 1959; VI−X; **Ex-EPx**; HMȘ 743 under *Collybia bresadolae* (Kühn. & Romagn.) Sing.; 10 ex.

Gymnopus foetidus (Sowerby) J.L. Mata & R.H. Petersen (2004)

BH: in the deciduous forest, on the decaying tree, at Vadul Crișului, Oradea; 27 X 1964; VI−VIII; **EPx**; HMș 686 under *Micromphale foetidum* (Sow. ex Fr.) Sing.; 5 ex.

Gymnopus fuscopurpureus (Pers.) Antonín, Halling & Noordel. (1997)

CJ: in the Fagus forests, in the places with decaying leafs, at Făget, nearby Cluj-Napoca;19 VIII 1964; IX−X; **Gs**; HMȘ 745 under *Collybia fuscopurpurea* (Pers. ex Fr.) Kumm.; 6 ex.

Gymnopus fusipes (Bull.) Gray (1821)

CJ: in connates clusters, on decaying tree, at Cluj-Napoca, in Hoia Forest; 29 VIII 1957; VI−XI;**EPx-Ex**; HMș 740 under *Collybia fusipes* (Bull. ex Fr.) Quél.; 5 ex.

Gymnopus hariolorum (Bull.) Antonín, Halling & Noordel. (1997)

AB: on decaying leafs, in deciduous forests, under Fagus, at Belioara-Scărișoara from Apuseni Mountains; 1 VII 1962; V−IX; **Gs**; HMȘ 751 under *Collybia hariolorum* (DC. ex Fr.) Quél.; 4 ex.

Gymnopus impudicus (Fr.) Antonín, Halling & Noordel. (1997)

CJ: on the soil, under Picea, on Craiului Hill, nearby Mănăștur, Cluj-Napoca; 26 VII 1959; VIII−XI; **Gs**; HMș 749 under *Collybia impudica* (Fr.) Sing.; 8 ex.

Gymnopus perforans (Hoffm.) Antonín & Noordel (2008)

CJ: in the coniferous forests, on Picea and Abies decaying leaves, in Gilăului Mountains, at Băișoara; 6 VIII 1961; I−XII; **Gs**; HMș 685 under *Micromphale perforans*(Hoffm. ex Fr.) Sing.; 10 ex.

Gymnopus peronatus (Bolton) Antonín, Halling & Noordel. (1997)

BN: on decaying leaves and leafneedles in Rodnei Mountains, in the decoduous and coniferous forests, under Corongiș Peak; 17 IX 1963; VII−XI; **Gs**; HMș 748 under *Collybia peronata* (Bolt. ex Fr.) Sing.; 5 ex.

Marasmius epiphyllus (Pers.) Fr. (1838)
CJ: on decaying leafs, in the deciduous forests, at Făgetul Clujului from Cluj-Napoca; 12 X 1957; X–XI; **Gs**; HMȘ 678 under *M. epiphyllus*(Pers. ex Fr.) Fr.; 6 ex.
Marasmius graminum (Lib.) Berk. (1860)
CJ: on grassy stems and leafs, on Craiului Hill from Cluj-Napoca 16 VI 1959; VII–IX; **E**; HMș 677 under *M. graminum* (Libert) Berk.; 5 ex.
Marasmius oreades (Bolton) Fr. (1836)
CJ: on sandy soil, in the meadows, at Fânațele Clujului, Cluj-Napoca; 24 VII 1954; V–XI; **Gp**; ; HMș 682 under *M. oreades* (Bolt. ex Fr.) Fr.; 6 ex.
Marasmius rotula (Scop.) Fr. (1838)
CJ: on the decaying tree, in the deciduous forests, on Galicer Hill, at Cluj-Napoca; 17 VIII 1962; V–X; **EPx-Gs**; HMș 676 under *M. rotula* (Scop. ex Fr.) Fr.; 8 ex.
Marasmius wynneae Berk. & Broome (1859)
BN: on decaying leaves and leafneedles, at Vinului Valley from Rodnei Mountains; 13 IX 1965; IX–X; **Gs**; HMș 683 under *M. globularis* Quél.; 8 ex.
Marasmiellus ramealis (Bull.) Singer (1946)
CJ: on decaying deciduous tree, in Hoia Forest, at Cluj-Napoca; 30 VII 1956; VI–X; **EPx**; HMș 684 under *Marasmius ramealis* (Bull. ex Fr.) Sing.; 40 ex.
Megacollybia platyphylla(Pers.) Kotl. & Pouzar (1972)
BN: on decaying tree, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 19 IX 1963; VI–X; **EPx**; ; HMș 753 under *M. platyphylla* (Pers. ex Fr.) Kotl. et Pouz.; 2 ex.
Mycetinis alliaceus (Jacq.) Earle ex A.W. Wilson & Desjardin (2005)
BN: on fallen and decaying leafs and pieces of wood, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains;19 IX 1960; VIII–X; **Gs**; HMș 681 under *Marasmius alliaceus* (Fr.) Fr.; 3 ex.
Mycetinis scorodonius (Fr.) A.W. Wilson & Desjardin (2005)
BN: on decaying stumps and small branches, on roots and on graminosis plants, at Vinului Valley from Rodnei Mountains;13 VIII 1958; VI–XI; **Gp**; ; HMș 680 under *Marasmius scorodonius* (Fr.) Fr.; 6 ex.
Omphalotus olearius (DC.) Singer (1946)
Sălaj district: on stumps and roots, in connates clusters, in the deciduous forests, especially in the oak forests, at Năpradea, nearby Jibou; 17 VII 1957; VIII–IX; **Ex-EPx**; **+++**; HMș 736 under *O. Olearius*(DC. ex Fr.) Sing.; 3 ex.
Pleurocybella porrigens (Pers.) Singer (1946)
BN: in clusters, on coniferous tree, in Rodnei Mountains, under Corongiș Peak, in the forests from Vinului Valley; 28 IX 1962;VII–X; **EPx**; HMȘ 670 under *Phyllotus porrigens* (Pers. ex Fr.) P. Karst.; 2 ex.
Rhodocollybia butyracea (Bull.) Lennox (1979)
BN: on the soil of the coniferous and deciduous forests, at Vinului Valley from Rodnei Mountains; 17 IX 1963; VII–XI; **Gs**; ; HMș 739 under *Collybia butyracea* (Bull. ex Fr.) Quél.; 8 ex.
Rhodocollybia maculata (Alb. & Schwein.) Singer (1939)
CJ: on the soil, under Picea, in spruce fir forests, at Băișoara, in Gilăului Mountains, under Buscat Peak; 5 IX 1962; IX–X; **Gs**; HMȘ 741 under *Collybia maculata* (A. et S. ex Fr.)Quél.; 2 ex.
Rhodocollybia prolixavar. distorta (Fr.) Antonín, Halling & Noordel. (1997)
AB: on the soil of the conoferous forests, in Apuseni Mountains, at Detunata; 29 IX 1967; VIII–IX; **Gs**; HMș 742 under *Collybia distorta* (Fr.) Quél.; 2 ex.

Mycenaceae Family

Mycena aetites (Fr.) Quél.(1872)

CJ: in the meadows, at Plecica Valley from Făgetul Clujului; 21 IX 1960; VII–XI; **Gs-EPx**; HMŞ 703; 10 ex.

Mycena alcalina (Fr.) P. Kumm. (1871)

BN: in big clusters, on the decaying tree, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 31 X 1964; VII–X; **EPx**; HMş 701 under *M. alcalina* (Fr.) Kumm.; 10 ex.

Mycena atromarginata (Lasch) P. Kumm. (1871)

BN: on the decaying tree, in the coniferous and deciduous forests, at Vinului Valley from Rodnei Mountains; 15 VII 1962; IX–XII; **EPx**; HMş 697 under *M. atromarginata* (Lasch) Kumm.; 1 ex.

Mycena crocata (Schrad.) P. Kumm. (1871)

BN: on the soil of the deciduous forests, at Vinului Valley from Rodnei Mountains; 29 VIII 1964; IX–XI; **Gs**; HMş 689; 8 ex.

Mycena epipterygia (Scop.) Gray (1821)

CJ: on Picea roots, in Gilăului Mountains, at Băişoara, under Buscat Peak; 23 IX 1957; IX–XI; **Gp**; HMş 692 under *M. viscosa* Secr. ex Maire; 10 ex.

CJ: in clusters, on the decaying tree, in the beech and spruce fir forests, at Răcadului Valley from Mount Vlădeasa; 20 X 1962; IX–XI; **EPx**; HMş 693; 8 ex.

Mycena flavoalba (Fr.) Quél. (1872)

CJ: on grassy soils, in Craiului Forest, at Cluj-Napoca; 21 X 1958; VIII–XI;**Gs**; HMş 698; 6 ex.

Mycena galericulata (Scop.) Gray (1821)

CJ: in big and connates clusters, on stumps and trunks, in Hoia Forest, at Cluj-Napoca; 28 X 1956; IV–XII; **Ex-EPx**; HMŞ 706 under *M. galericulata* (Scop. ex Fr.) S. F. Gray; 5 ex.

Mycena inclinata (Fr.) Quél. (1872)

CJ: on the deciduous tree, in connates clusters, in Hoia Forest, at Cluj-Napoca;12 X 1957; IX–XII; **Ex-EPx**; HMŞ 705; 6 ex.

Mycena pelianthina (Fr.) Quél.(1872)

CJ: on the grassy soil, at Făget, from Cluj-Napoca; 21 X 1960; IV–X; **Gs**; HMş 699; 1 ex.

Mycena polygramma (Bull.) Gray (1821)

CJ: on the decaying tree, in the oak forest, in Lomb Forest from Cluj-Napoca; 3 XI 1955; VIII–XI; **Gs-EPx**; HMş 702 under *M. polygramma* (Bull. ex Fr.) S. F. Gray; 1 ex.

Mycena pura (Pers.) P. Kumm.(1871)

CJ: in the deciduous forests, among decaying leafs, on Hoia Hill, at Cluj-Napoca; 28 X 1956; VII–XI; **Gs**; HMş 700 under *M. pura* (Pers. ex Fr.) Kumm.; 8 ex.

Mycena rosella (Fr.) P. Kumm.(1871)

CJ: on Picea leafs, in the coniferous forests, at Răcadului Valley from Mount Vlădeasa; 21 X 1962; VIII–XI; **Gs**; HMş 696 under *M. rosella* (Fr.) Kumm.; 6 ex.

Mycena sanguinolenta (Alb. & Schwein.) P. Kumm. (1871)

BN: among moss, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 28 VIII 1964; VI–XI; **Gs**; HMş 690 under *M. sanguinolenta* (Alb. et Schw. ex Fr.) Kumm.; 10 ex.

Mycena stylobates (Pers.) P. Kumm. (1871)

SM: on Quecus fallen leafs, in the deciduous forest from Săuca village; 22 VII 1957; IX–X; **Gs**; HMŞ 695 under *M. stylobates* (Pers. ex Fr.) Kumm.; 2 ex.

Mycena vitrea (Fr.) Quél.(1872)

CJ: pe on the soil of the coniferous forests, on Mount Vlădeasa, nearby hut Vlădeasa; 18 X 1957; VI–IX; **Gs**; HMș 704; 6 ex.
Mycena vulgaris (Pers.) P. Kumm. (1871)
CJ: on Picea fallen leafs, in the coniferous forests, in Gilăului Mountains, at Băișoara; 5 X 1962; IX–XI; **Gs**; HMș 694 under *M. vulgaris* (Pers. ex Fr.) Quél.; 6 ex.
Panellus mitis (Pers.) Singer (1936)
BN: on the coniferous tree, in the forests from Vinului Valley, in Rodnei Mountains; 1 X 1964; X–III;**Ex-EPx**; HMl 673 under *P. mitis* (Pers. ex Fr.) Sing.; 1 ex.
Panellus stipticus (Bull.) P. Karst. (1879)
CJ: on deciduous stumps and trunks, at Făget and at Hoia, Cluj-Napoca; 5 X 1957; I–XII; **EPx-Ex**; HMș 672 under *P. stipticus* (Bull. ex Fr.) Karst.; 10 ex.
Xeromphalina campanella (Batsch) Maire (1934)
BN: on decaying coniferous tree, in the forests from Vinului Valley, at Rodnei Mountains; 29 VIII 1964; VII–X; **EPx**; HMș 674 under *X. Campanella* (Batsch ex Fr.) Mre.; 6 ex.

Physalacriaceae Family
Armillaria mellea (Vahl) P. Kumm. (1871)
BN: in clusters, on trunks and roots, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 28 IX 1962; VIII–XII; **Ex-EPx**; ; HMș 737 under *Armillariella mellea* (Vahl ex Fr.) Karst.; 2 ex.
Armillaria tabescens (Scop.) Emel (1921)
SJ: in clusters, on Quercus roots and trunks, at Năpradea, nearby Jibou; 18 IX 1965; VIII–X; **Ex-EPx**; ; HMș 738 under *Armillariella tabescens* (Scop. ex Fr.) Sing.; 6 ex.
Flammulina velutipes (Curtis) Singer (1951)
CJ: in big clusters, on deciduous stumps and roots, on Galicer Hill, nearby Cluj-Napoca; 18 XII 1955; X–IV; **Ex-EPx**; ; HMȘ 754 under *F. velutipes* (Curt. ex Fr.) Sing.; 10 ex.
Oudemansiella mucida (Schrad.) Höhn. (1910)
CJ: on trunks and branches, especially on Fagus, at Făget, nearby Cluj-Napoca; 20 VIII 1956; VIII–XI; **Ex**; HMș 756 under *O. mucida* (Schrad. ex Fr.) v. Hoehn.; 8 ex.
Strobilurus esculentus (Wulfen) Singer (1962)
CJ: on Picea excelsa buried cons, at Băișoara, in Gilăului Mountains, in the coniferius forests; 26 V 1956; III–V; **Gs**; ; HMș 758 under *S. esculentus* (Wulf. ex Fr.) Sing.; 10 ex.
Strobilurus tenacellus (Pers.) Singer (1962)
CJ: Pinus silvestris buried cons, on Craiului Hill, at Cluj-Napoca; 22 IV 1959; III–V; **Gs**; HMș 759 under *S. tenacellus* (Pers. ex Fr.) Sing.; 3 ex.
Xerula pudens (Pers.) Singer (1951)
BN: on the roots of the deciduous and coniferous tree, at Vinului Valley from Rodnei Mountains; 28 VIII 1962; VIII–X; **Ex-EPx**; ; HMș 755 under *X. longipes* (Bull. ex St.- Am.) Mre.; 9 ex.
Xerula radicata (Relhan) Dörfelt (1975)
CJ: on the roots of the deciduous tree, at Făget, nearby Cluj-Napoca; 2 IX 1955; VI–X; **Gp**; ; HMș 757 under *Mucidula radicata*(Relh. ex Fr.) Bours.; 4 ex.

Pleurotaceae Family
Hohenbuehelia petaloides (Bull.) Schulzer (1866)
CJ: on the wet soil, in Hoia Forest from Cluj-Napoca; 12VIII 1962; VIII–XI; **Gs**; ; HMș 666 under *Acanthocystis geogenius* (DC. ex Fr.) Gill.; 1 ex.

CJ: on the deciduous tree, frequently in the oak forests, at Făgetul Clujului; 6 X 1956; VIII–XI; **EPx**; ; HMş 667 under *Acanthocystis petaloides* (Bull. ex Fr.) Kühn.; 2 ex.
Pleurotus dryinus (Pers.) P. Kumm. (1871)
BN: on Aces pseudoplatanus trunks, at Vinului Valley from Rodnei Mountains, under Corongiş Peak; 28 IX 1962; VI–XI; **Ex**; HMş 641 under *P. dryinus* (Pers. ex Fr.) Kumm.; 2 ex.
Pleurotus ostreatus (Jacq.) P. Kumm. (1871)
BN: on Fagus silvatica trunks, at Vinului Valley from Rodnei Mountains, under Corongiş Peak; 31 X 1954; IX–XII; **Ex-Epx**; ;; HMş 642 under *P. ostreatus* (Jacq. ex Fr.) Kumm.; 4 ex.

P**luteaceae Family**
Pluteus atromarginatus(Konrad) Kühner (1935)
CJon Picea stumps, in the coniferous forests, in Gilăului Mountains, at Băişoara, under Buscat Peak; 14 VIII 1960; V–X; **EPx**; ; HMş 819; 1 ex.
Pluteus cervinus (Schaeff.) P. Kumm. (1871)
BN: on decaying tree, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 28 IX 1962; V–XI; **EPx**; ; HMş 820 under *P. cervinus* (Schff. ex Fr.) Kumm.; 1 ex.
Pluteus nanus (Pers.) P. Kumm. (1871)
CJ: on decaying tree, in the deciduous forests, at Făgetul Clujului; 29 VIII 1959; VIII–IX; **EPx**; HMş 818 under *P. nanus* (Pers. ex Fr.) Kumm.; 1 ex.
Volvariella bombycina (Schaeff.) Singer (1951)
CJ: on a decaying trunk, on the Someşul Mic riverside, nearby Parcul Babeş, at Cluj-Napoca; 8 VII 1960; VI–X; **Ex-EPx**; ; ; HMş 817 under *V. bombycina* (Pers. ex Fr.) Sing.; 1 ex.
Volvariella gloiocephala(DC.) Boekhout & Enderle (1986)
CT: on the sand dunes from Agigea reservation; 20 V 1970; V–VII; **Gs**; ; HMş 815 sub *V. speciosa*(Fr.) Sing.; 1 ex.
Volvariella surrecta (Knapp) Singer (1951)
BH: on the Clitocybe nebularis fruit-bodies, in the beech and hornbeam forests, at Vadul Crişului; 27 X 1964; VIII–XI; **Em**; HMş 816 under *Volvariella surrecta* (Knapp) Sing.; 1ex.

Schizophyllaceae Family
Schizophyllum amplum (Lév.) Nakasone (1996)
CJ: on decaying Populus tree, in Someşului Micriver meadow, at Cluj-Napoca; 18 X 1964; I–XII; **EPx**; HMş 550 under *Auriculariopsis ampla* (Lév.) Mre.; 40 ex.
Schizophyllum commune Fr. (1815)
CJ: especially on the deciduous treee, among shrubberyes, at Cluj-Napoca; 21 IX 1954; I–XII; **Ex-EPx**; HMş 636; 10 ex.

Tricholomataceae Family
Arrhenia epichysium (Pers.) Redhead, Lutzoni, Moncalvo & Vilgalys (2002)
BN: on Picea excelsa decaying tree, in the coniferous forests, at Vinului Valley from Rodnei Mountains; 28 IX 1962; VII–X; **EPx**; HMş 714 under *Omphalina epichysium* (Pers. ex Fr.) Quél.; 2 ex.
Arrhenia griseopallida (Desm.) Watling (1989)
CJ: in the meadows with moss, on Someşului Mic riverside, at Cluj-Napoca; 17 XI 1960; VI–X; **Gs**; HMş 712 under *Omphalia griseopallida* (Desm.) Quél.; 4 ex.
Arrhenia onisca (Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys (2002)

CJ: in the peat bogs, on the peat moss, at Călățele, in Apuseni Mountains; 3 XI 1962; VI–IX; **EPbr**; HMș 715 under *Omphalina oniscu* (Pers. ex Fr.) Quél.; 2 ex.

Cantharellula umbonata (J.F. Gmel.) Singer (1936)

CJ: among moss, in the coniferous forests, in Gilăului Mountains, at Băișoara, under Buscat Peak; 5 X 1962; VIII–XI; **Gs**; 🍽; HMș 735 under *Cantharellula umbonata* (Gmel. ex Fr.) Sing.; 3 ex.

Clitocybe candicans (Pers.) P. Kumm. (1871)

CJ: in grassy places, at the edges of the forests, on Craiului Hill, at Cluj-Napoca; 11 IX 1963; IX–XI; **Gs**; HMș 724 under *C. gallinacea* (Scop. ex Fr.) Lge.; 10 ex.

Clitocybe dealbata (Sowerby) P. Kumm. (1871)

AB: in the meadows, at the edges of the forests, in Apuseni Mountains, at Detunata; 20 IX 1968; IX–XI; **Gs**; +++; HMș 725under *C. dealbata* (Sow. ex Fr.) Kumm.; 5 ex.

Clitocybe infundibuliformis Quél. (1872)

BN: on the soil, in clusters, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 29 VIII 1964;VI–IX; **Gs**; 🍽; HMș 733 under *C. infundibuliformis* (Schff. ex Fr.) Quél.; 5 ex.

Clitocybe inornata (Sowerby) Gillet (1874)

BN: on the limestone soils, in the coniferous and deciduous forests, at Vinului Valley from Rodnei Mountains, under Corongiș Peak; 15 IX 1965; IX–X; **Gs**; HMș under 729 sub *C. inornata* (Sow. ex Fr.) Gill.; 2 ex.

Clitocybe nebularis (Batsch) P. Kumm. (1871)

CJ: on the soil of the deciduous forests, in shrubberyes, in Hoia Forest, at Cluj-Napoca; 2 X 1960; IX–XI; **Gs**; **+**; HMș 727 under *C. nebularis* (Batsch ex Fr.) Kumm.; 2 ex.

Clitocybe odora (Bull.) P. Kumm. (1871)

BN: on the soil, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains, under Crăciunel Peak; 18 IX 1963; VIII–XI; **Gs**; 🍽; HMș 726 under *C. odora* (Bull. ex Fr.) Kumm.; 3 ex.

Clitocybe phyllophila (Pers.) P. Kumm. (1871)

CJ: on decaying leafneedles, in Craiului Forest, at Cluj-Napoca; 8 X 1960; IX–XI; **Gs**; **+++**; HMș 723 under *Clitocybe pithyophila* (Secr.) Gill.; 6 ex.

Clitocybe radicellata Godey (1884)

CJ: on the sandy soil, in the oak and hornbeam forests, at Corus-Baciu, nearby Cluj-Napoca; 7 V 1965; VIII–XI; **Gs**; HMș 731 under *C. radicellata* Gill.; 6 ex.

Clitocybe suaveolens (Schumach.) P. Kumm. (1871)

BN: on the soil, in the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains, under Corongiș Peak; without collecting data; VII–XI;**Gs**; HMș 721 sub *C. suaveolens* (Schum. ex Fr.) Kumm.; 8 ex.

Clitocybe vermicularis (Fr.) Quél. (1872)

CJ: on the soil of the coniferous forests, under Picea, at Băișoara, in Gilăului Mountains, under Buscat Peak; 30 V 1960; III–IV; **Gs**; 🍽🍽; HMș 732; 1 ex.

Collybia cirrhata (Schumach.) Quél. (1872)

CJ: on the decaying rests of fruit-bodies, at Făgetul Clujului; 18 X 1964;VIII–XI**; Gs**; HMș 746 under *C. cirrhata* (Schum. ex Fr.) Kumm.; 4 ex.

Collybia tuberosa (Bull.) P. Kumm. (1871)

CJ: on the soil, at Craiului Hill, at Cluj-Napoca; 21 X 1958; VIII–XI; **Gs**; HMș 747 under *C. tuberosa* (Bull. ex Fr.) Quél.; 6 ex.

Delicatula integrella (Pers.) Fayod (1889)

CJ: on the tree and on the decaying leafs,in Mănăştur Forest, at Cluj-Napoca; 18 VII 1957;VI−IX; **Gs-EPx**; HMş 707 under *Delicatula integrella* (Pers. ex Fr.) Fay.; 5 ex.

Infundibulicybe geotropa (Bull.) Harmaja (2003)

CJ: in the forests with clearings, in the shrubberyesand in the meadows, in circles, at Cluj-Napoca, at Făget; 13 X 1960; VIII−XI; **Gs**; ; HMŞ 730 *Clitocybe geotropa* (Bull.) Quél.; 4 ex.

Laccaria amethystina Cooke (1884)Gs; ;

BN: on the soil of the deciduous and coniferous forests, at Vinului Valley from Rodnei Mountains; 19 IX 1963; V−XI; **Gs**; ; HMŞ 718 under *L. amethystina* (Bolt. ex Hoker) Murr.; 4 ex.

Laccaria laccata (Scop.) Cooke (1884)

CJ: on the sandy soils, at Făgetul Clujului; 28 VIII 1959; V−XI; **Gs**; ; HMŞ 720 under *L. laccata* (Scop. ex Fr.) Berk. et Br.; 6 ex.

Laccaria tortilis (Bolton) Cooke (1884)

CJ: on the wet soil, without letter box, at Făget-Cluj; 12 VIII 1960; VI−IX; **Gs**; HMş 719 under *L. tortilis* (Bolt. ex S. F. Gray) Cke.; 6 ex.

Lepista flaccida (Sowerby) Pat. (1887)

BN: on the soil, in the deciduous and coniferous forests, at Vinului Valley, in Rodnei Mountains, under Ineuţ Peak; 18 IX 1963; VIII−X; **Gs**; HMş 722 under *Clitocybe inversa* (Scop. ex Fr.) Quél.; 6 ex.

***Lepista nuda* (Bull.) Cooke** (1871)

BN: on the soil of the coniferous and deciduous forests, at Vinului Valley, in Rodnei Mountains, under Corongiş Peak; 28 VIII 1964; IX−XI; **Gs**; ; HMş 791 sub *L. nuda* (Bull. ex Fr.) Cook.; 2 ex.

***Lepista personata* (Fr.) Cooke (1871)**

CJ: in the meadows, shrubberyes or in the deciduous forests, at Hoia from Cluj-Napoca; 25 XI 1964; X−XI; **Gs**; ; ; HMş 790 under *L. personata* (Fr. ex Fr.) Cook.; 4 ex.

***Lepista sordida* (Schumach.) Singer (1951)**

CJ: in species united through the stipe of fungi, at the edge of the forest, at Făget, nearby Cluj-Napoca; 30 X 1960; VII−IX; Gs; ; HMş 792 under *L. sordida* (Fr.) Sing.; 2 ex.

Leucopaxillus amarus (Alb. & Schwein.) Kühner (1828)

CS: on the soil of the coniferous forests, in Semenicului Mountains, at Trei Ape; 3 IX 1960; VIII−X; **Gs**; HMş 789 under *L. amarus* (Alb. et Schw. ex Fr.) Kühn.; 2 ex.

Leucopaxillus lepistoides (Maire) Singer (1939)

CJ: in grassy places, in the gardens and orchades, at Cluj-Napoca; 14 V 1956; HMş 788 under *L. lepistoides* (Mre.) Sing.; 1 ex.

Melanoleuca brevipes (Bull.) Pat. (1900)

CJ: in the parks, gardens and shrubberyes, at Cluj-Napoca;12 VIII 1964;IV−XI; **Gs**; ; HMŞ 786 under *M. brevipes* (Bull. ex Fr.) Pat.; 1 ex.

Melanoleuca evenosa (Sacc.) Konrad (1927)

CJ: in the meadows, in Gilăului Mountains, at Băişoara; 1 VIII 1962; IV−VIII; **Gs**; ; HMş 784 under *Melanoleuca evenosa* (Sacc.) Konr.; 1 ex.

Melanoleuca grammopodia (Bull.) Murrill (1914)

CJ: in the shrubberyes,at the edge of the forest, on Craiului Hill, at Cluj-Napoca; 16 VI 1959; IV−VIII; **Gs**; ; HMş 785 under *M. grammopodia* (Bull. ex Fr.) Pat.; 2 ex.

Melanoleuca melaleuca (Pers.) Murrill (1911)

CJ: in grassy places, at the edge of the forests, on Plecica Valley, nearby Cluj-Napoca; 11 VIII 1962; IV−X;

Gs; 🍽🍽; HMș 787 sub *M. melaleuca* (Pers. ex Fr.) Mre.; 2 ex.

Myxomphalia maura (Fr.) Hora (1960)

BN: on extinguished fireplaces, in association with Funaria hygrometrica, at Vinului Valley, in Rodnei Mountains; 2 XI 1964;IX–X; **Gs**; HMș 717 under *Fayodia maura* (Fr.) Sing.; 5 ex.

Omphalina pyxidata(Bull.) Quél. (1886)

CJ: through grassy and ruderal places, with moss and sandy soil, in Babeș Park from Cluj-Napoca; 15 X 1967; IX–XI; **Gs**; HMș 713 under *O. pyxidata* (Bull. ex Fr.) Quél.; 4 ex.

Pseudoclitocybe cyathiformis (Bull.) Singer (1956)

BN: on the soil and on the decaying tree, in the meadows with moss and in the coniferous and deciduous forests, at Vinului Valley from Rodnei Mountains; 28 IX 1962; X–XI; **Gs-EPx**; 🍽🍽; HMș 734 under *P. cyathiformis* (Bull. ex Fr.) Sing.; 4 ex.

Tricholoma acerbum (Bull.) Vent. (1872)

CJ: on the soil of the deciduous forests, at Făget, aproape de Cluj-Napoca; 24 VIII 1968; VIII–X; **Gm**; HMș 770 under *T. Acerbum* (Bull. ex Fr.) Quél.; 2 ex.

Tricholoma album (Schaeff.) P. Kumm. (1871)

CJ: on the soil of grassy places, especially under Betula, on Plecica Valley, at Cluj-Napoca; 27 XI 1960; VIII–X; **Gm**; HMș 780 under *T. Album* (Schff. ex Fr.) Quél.; 4 ex.

Tricholoma lascivum (Fr.) Gillet (1874)

CJ: on the soil, in the deciduous forests, on Hoia Hill from Cluj-Napoca; 22 XI 1960; IX–X; **Gm**; HMș 781 under *T. lascivum* (Fr.) Gill.; 6 ex.

Tricholoma populinum J.E. Lange (1933)

CJ: on the soil, under Populus, in Babeș Park from Cluj-Napoca; 1 XI 1967; X–XI; **Gm**; 🍽; HMș 771 under *T. populinum* Lge., 2 ex.

Tricholoma resplendens (Fr.) P. Karst. (1876)

CJ: on the soil, in the deciduous forests, among decaying leafs, in Hoia Forest, at Cluj-Napoca; 6 X 1957;IX–XI; **Gm**; HMș 777 under *T. resplendens* (Fr.) Quél.; 2 ex.

Tricholoma saponaceum (Fr.) P. Kumm. (1871)

CJ: on the soil of the deciduous and coniferous forests, at Băișoara from Gilăului Mountains; 30 VIII 1959; IX–XI; **Gm**; HMș 782 under *T. saponaceum* (Fr.) Kumm.; 10 ex.

Tricholoma scalpturatum (Fr.) Quél. (1872)

CJ: on the soil of the deciduous forests, in the oak and hornbeam forests, in grassy places, in Hoia Forest, at Cluj-Napoca; 12 IX 1958;VII–XI; Gm; 🍽🍽; HMș 775; 2 ex.

Tricholoma sejunctum (Sowerby) Quél. (1872)

BN: on the soil of the deciduous and coniferous forests, in Rodnei Mountains, at Vinului Valley, under Corongiș Peak; 28 IX 1969;IX–X; **Gm**; HMș 778 under *T. sejunctum* (Sow. ex Fr) Quél.; 4 ex.

Tricholoma sulphureum (Bull.) P. Kumm. (1871)

BN: on the soil of the deciduous and coniferous forests, in Rodnei Mountains, at Vinului Valley; 19 IX 1963; VII–X; **Gm**; HMș 779 sub *T. sulphureum* (Bull. ex Fr.) Kumm.; 4 ex.

Tricholoma terreum (Schaeff.) P. Kumm. (1871)

BN: on the soil of the deciduous and coniferous forests, among moss, in Rodnei Mountains, at Vinului Valley; 1 XI 1964; VIII–XI;**Gm**; 🍽🍽; HMș 776 under *T. terreum* (Schff. ex Fr.) Kumm.; 5 ex.

Tricholoma ustale (Fr.) P. Kumm. (1871)

CJ: on the soil of the deciduous forests, at Făget, nearby Cluj-Napoca; 22 VIII 1968; VIII–XI; **Gm**; HMș 772 under *T. ustale* (Fr. ex Fr.) Kumm.; 2 ex.

Tricholoma vaccinum(Schaeff.) P. Kumm. (1871)

CJ: on the soil of the coniferous forests, on Mount Vlădeasa, at Răcadului Valley; 20 X 1962; VII−X; **Gm**; HMş 773 under *T. vaccinum* (Pers. ex Fr.) Kumm.; 4 ex.
Tricholoma virgatum (Fr.) P. Kumm. (1871)
CJ: on the soil of the coniferous forests, in Gilăului Mountains, under Buscat Peak, at Băişoara; 30 VIII 1959;IX−X; **Gm**; **+**; HMş 774 under *T. virgatum* (Fr.) Kumm.; 5 ex.
Tricholomopsis rutilans (Schaeff.) Singer (1939)
CJ: 30 VIII 1959;VII−XI; **EPx**; HMş 783 under *T. rutilans* (Schff. ex Fr.) Sing.; 4 ex.

Typhulaceae Family
Macrotyphula juncea (Alb. & Schwein.) Berthier (1974)
CJ: on the decaying leafs, in the deciduous forests, on Hoia Hill, at Cluj-Napoca; 17 X 1957; X−XI; **Gs**; HMş 506 under *Clavariadelphus junceus* (A. et S. ex Fr.) Corner; 2 ex.
Typhula phacorrhiza (Reichardt) Fr. (1818)
CJ: on the limestone soils, among fallen and decaying leafs, in Rodnei Mountains, under Corongiş Peak; 5 X 1962; IX−XI; **Gs**; HMş 504 under *T. phacorrhiza* Fr.; 2 ex.

Not assigned
Plicaturopsis crispa (Pers.) D.A. Reid (1964)
BN: in the decaying beech tree, among moss, in the beech and spruce fir forests, in Rodnei Mountains, at Vinului Valley; 1 XI 1964; IX−XII; **EPx**; HMş 552 under *P. crispa* (Pers. ex Fr.) Reid; 5 ex.

Conclusions

The collection has an important value, first of all, because it emphasizes a part of the patrimony of our museum, secondly, due to the fact that it completes the knowledge concerning the ecology and chorology of some macromycetes from Romania and finally, because of the antiquity of some species (for more than half a century) and the collector's notoriousness.

REFERENCES

1. Bontea, V., 1985, *Ciuperci parazite şi saprofite din România,* vol.I−II, Editura Academiei R.S.R., Bucureşti.
2. Botoş, D.R., 2011, Macromycetes from the Agaricales order among the „Gheorghe Sălăgeanu"collection of Târgu-Mureş, Natural Science Museum (I), *Marisia,* Studii şi materiale, **XXX**I, Ştiinţele Naturii, Editura Mega, Cluj-Napoca: 35–47.
3. Eliade, E., 1965, Conspectul macromicetelor din România*, Lucrările Grădinii Botanice,* Bucureşti: 185–324.
4. Kirk, P.M., Cannon, P.F., Minter, D.W., Stalpers, J.A., 2008, *Dictionary of the Fungi,* Tenth edition, CABI Europe UK.
5. Sălăgeanu, Gh., Sălăgeanu, A., 1995, *Determinator pentru recunoaşterea ciupercilor comestibile, necomestibile şi otrăvitoare din România,* Editura Ceres, Bucureşti.
6. Sârbu, A. (coord.), Coldea, Gh., Sârbu, I., Cristea, V., Negrean, G., Oprea, A., Cristurean, I., Popescu, Gh., 2003**,** *Ghid pentru identificarea importantelor arii de protecţie şi conservare a plantelor din România*, Editura alo, Bucureşti!, Bucureşti.
7. Pop, A., Tănase, C., 2003, *Mapping of Macromycetes-Pilot Series-in Romania:* http://www.wsl.ch/eccf/newsletter13.pdf
8. *** *Cybernome, the Nomenclator for Fungi and their Associated Organisms*: http:/www.cybertruffle.org.uk/cybernome/eng
9. *** *Index Fungorum*: http://www.indexfungorum.org
10. http://healing-mushrooms.net
11. http://www.ncbi.nlm.nih.gov
12. http://www.suzuka-u.ac.jp

13. http://www.superbetaglucan.com
14. http://www.bitterrootrestoration.com
15. http://www.mushroomnutrition.com
16. http://www.activehealthsupplements.com
17. http://www.dl.begellhouse.com
18. http://agris.fao.org
19. http://www.medicalmushrooms.net
20. http://www.dl.begellhouse.com
21. http://informatii-agrorurale.ro
22. http://www.torna.do
23. http://www.unboundmedicine.com
24. http://im.unboundmedicine.com
25. http://en.cnki.com.cn

Abbreviations
ex. – number of specimens
HMș – the Herbarium of the Natural ScienceMuseum from Târgu-Mureș
E – mycetoendocormophyta
Em – mycetoendomycophyta
EPx – mycetoepixilophyta
Epbr – mycetoepibryophyta
Ex – mycetoendoxilophyta
Gm – mycetogeophyta mycorrhiza
Gp – mycetogeophyta parasitica
Gs – mycetogeophyta saprophytica

Conventional signs
🍽= species edible at a minimum value
🍽🍽 = species edible at a high food value
🍽🍽🍽 = species edible at a very high food value
+ = species toxic (causes gastric and intestinal poisoning)
+++ = species very toxic (causes deadly intoxications)
Without mark = species cannot be eaten

MACROMICETE DIN ORDINUL AGARICALES ÎN COLECȚIA „GHEORGHE SĂLĂGEANU" A MUZEULUI DE ȘTIINȚELE NATURII DIN TÂRGU-MUREȘ (II)
(Rezumat)

Lucrarea de față prezintă o parte din colecția de macromicete „Gheorghe Sălăgeanu", din herbarul Muzeului de Științele Naturii din Târgu-Mureș, adică 133 de taxoni de macromicete, aparținând la 12 familii din ordinul Agaricales: Clavariaceae, Fistulinaceae, Lyophyllaceae, Marasmiaceae, Mycenaceae, Physalacriaceae, Pleurotaceae, Pluteaceae, Schizophyllaceae, Tricholomataceae, Typhulaceae, Incertae sedis.

Pentru fiecare specie, s-a indicat denumirea științifică, locul colectării, data colectării, fenofaza, forma biologică, gradul de comestibilitate sau de toxicitate (prin semne convenționale), numărul sub care se regăsește în registrul de inventar „Plante inferioare" al Muzeului de Științele Naturii din Târgu-Mureș și numărul de exemplare.

Colecția este valoroasă, pe de o parte, datorită faptului că pune în valoare o parte din patrimoniul muzeului mureșean, pe de altă parte, datorită faptului că ea completează cunoștințele asupra ecologiei și corologiei unor specii de macromicete din România și nu în ultimul rând, datorită vechimii unora dintre piesele sale (peste 50 de ani), precum și a renumelui colecționarului.

ZOOLOGY

SOME SOIL INVERTEBRATES (COLLEMBOLA, INSECTA) OF THE REPUBLIC OF MOLDOVA AS ELEMENTS OF ECOSYSTEMS BIODIVERSITY

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Abstract. This paper includes the analysis of species diversity of some soil invertebrates: Collembola, Coleoptera and Aphidoidea from Moldova. At the present time in the country a total of invertebrate species: 223 Collembola, 2400 beetles and 39 soil inhabiting aphids are revealed. All Collembola and some beetles species are pedobionts and very important for the processes of organic matter decomposition and maintenance of soil fertility. Between studied insects 8 species of aphids and several genera of beetles are harmful – phytophagous. The role of invertebrates in ecosystems is varied, but all of them are important for the biodiversity and are the links of food chains.

Keywords: biodiversity, Collembola, Coleoptera, Homoptera, invertebrates, importance, Republic of Moldova.

Introduction

The future of humanity depends on our ability to skillfully combine scientific knowledge and modern technology with the "wisdom of the wild nature". We must cooperate with it and learn from it, and not to conquer, the nature, to preserve its resources.

This is particularly important for the forest, where the biodiversity is high, and biocenotic regulation is significant. However, in textbooks and monographs on forest entomology and forest protection the mass tree pests and their entomophagous are generally considered. Fauna of insects and other invertebrates, including those living on shrubs and herbaceous plants (terrestrial and soil), is not taken into account. But it is an important component of biocenotic regulation and therefore – stabilization. The ecologization of agriculture and forestry is needed [25].
The soil is the habitat of a wide variety of invertebrates, which have an important role – not only as pests but also in soil formation. They take part in the transformation of organic matter, in its humification and mineralization, in biological cycle of substances, in formation of the soil profile, in the creation of structure and porosity of the soil [11]. In nature, there are no "necessary" and "unnecessary" organisms, each of the group occupy its ecological niche and are important component of the food chains.

After all, any natural habitat, including forests, will function properly only if all trophic levels, from primary producers to decomposers, perform their separate but related roles. Forest

should be the territory where natural biodiversity, therefore the stability, are preserving and developing. Currently in Moldova the forests consist of 800 plots, ranging in size from 5 to 1500 ha [8] and together with the network of shelter belts [10], they contribute to the biological enrichment of the cultural landscape and its multi-functionality.

At the present time, unfortunately, the agrobiocenoses, and, to a lesser extent, the forests are increasingly losing the capacity for self-regulation. We have to mention that during a year in the forest huge quantities of leaf litter is forming, which annually is processed by various soil invertebrates. Between them Collembola are the second important group after mites.

Before this research in Moldova, the study were carried out only on such invertebrate groups as pest – beetles (Karpov and Neculiseanu) and nematodes (Nesterov), as well as earthworms (Cherevatov) in biocenotic oases and crops [10].

Material and methods

The studies of invertebrates (Collembola, Coleoptera, Homoptera) inhabiting the soil of Moldova permanently or temporarily, were carried out over many years, in all the natural areas. The collection of faunistic material was performed by classical methods: Collembola with metal frames 5 × 5 and 10 × 10 cm^2, the beetles using Barber traps and aphids by hand. The species of small invertebrates were identified by microscopic preparations, using the modified method of their preparation. The coleopterans were determined by morphological characteristics with binoculars.

The main identifying keys specific to each of the studied groups were used, as well as some recent work on the taxonomy, for the diagnosis of aphids the keys and also original polytomik tables were used.

Results and discussions

Springtails (Collembola) – are primarily wingless arthropods that live in all types of soil. Despite their small size (0.5–9 mm, depending on the species), they are important components of natural ecosystems, take an active part in the cycle of matter and the decomposition of plant remains. All species of springtails are saprophagous, living in soil and feed on algae, bacteria, protozoa, nematodes, decomposing plant residues etc. In Moldova are known 223 species [6].

The Collembola are classified according to morphological difference in groups depending on their vertical distribution in soil horizons and ecology [19]:

1. Atmobionts – group of species, including the largest representatives of the class, they are brightly colored, with well-developed eyes, 8 on each side of the head, that can rise on herbaceous plants, shrubs and trees – up to 2 meters high and more. They are often found in berries and inflorescence of trees and shrubs, are actively moving through jumps (species from the genus *Entomobrya*, having the size of 1 mm, has the ability to jump to a height of 16 cm) and move for a distance up to 300 meters per day [20]. This group includes species of the genera *Orchesella*, *Entomobrya*, *Willowsia*, *Sminthurus*, *Bourletiella* etc.
2. Hiperedaphic species can be found in the upper layers of the litter, they inhabit in abundance on decaying algae on the rivers banks and other water basins, on accumulations of organic matter or compost. This group includes mid-sized species, the antennae, legs and fork are well developed, and they also have eyes and pigment. Among hiperedaphics must be mentioned the species from genera *Hypogastruridae*, *Pseudachorutes*, *Brachystomella*, *Isotoma*, *Desoria*, *Sminthurinus* etc.

3. Hemiedaphic species inhabit lower-litter and litter-soil layers. The color of these species is much less bright, the number of eyes varies from 7+7 to 1+1, furcula, legs and antennae are short, adapted to the movement among litter and other plant remains. This group includes species of the genera *Neanura*, *Deutonura*, *Endonura*, *Lathriopyga*, *Anurida*, *Micranurida*, *Folsomia*, *Folsomides*, *Arrhopalites* etc.
4. Euedaphics or deep-soil species – the most small, colorless and blind species which are most often elongated (families Tullbergiidae and Onychiuridae) or spherical (family Neelidae) body shape, and are among the most important in soil formation, because they participate in humus formation.
5. Highly specialized forms including myrmecophilous species occurring with social insects ants and termites (family Cyphoderidae), and troglomorph species, or inhabitants of caves, belonging to the genera *Pseudosinella*, *Oncopodura*, *Arropalites* etc.

In addition to their primary function – processing of litter and other organic residues, Collembolans are important link in other food chains. They serve as food for a large number of invertebrates, including – beetles, centipedes, spiders, mites, pseudoscorpions, ants, birds, fish etc. For some of them Collembolans are a common source of nutrients in their daily diet, for others only a temporary source of energy or substitute in the absence of main trophic groups.

Beetles (Coleoptera) are one of the most important components of forest and agricultural ecosystems, including those living in the soil, litter and herbaceous plants in the woods, with a particular preference for certain biotic and abiotic factors.

According their trophic preference the soil-beetles (in imago stage) are divided into the following groups: saprophagous (xylophagous, detritophagous, necrophagous – feeding on carrion, coprophagous) mycetophagous, phytophagous and zoophagous [11].

Saprophagous species. This type of feeding is particular for soil-beetle larvae, but also occurs in adults.

1. Xylophagous are the beetles feeding on dead decaying wood. Among them are the species of the genera *Dorcus, Lucanus, Platycerus, Cerambyx, Carabus, Elater* etc.
2. Detritophagous are the species feeding on decomposing organic remains and having an important role in humus formation. Larvae of species from subfamily Cetoninae are detritophagous and the adults are antophagous or herbivores. Some species of the family Staphylinidae are detritophagous, including: *Tachyporus hypnorum* (Fab.)*, T. nitidulus* (Fab.), *T. solutus* Erich.*, Tachinus corticinus* Grav., *Anthobium atrocephalum* (Gyll.)*, Ontholestes haroldi* (Eppe.)*, Anotylus rugifrons* (Hoch.), *A. sculpturatus* (Grav.)*, Drusila canaliculata* (Fab.)*, Oxypoda opaca* (Grav.), *Omalium caesum* Grav., *Ocalea badia* Erich., *Parocyusa rubicunda* Erich., *Philonthus carbonarius* (Grav.), *Othius punctulatus* (Goeze.), *Quedius ochropterus* Erich., *Q. nitipennis* (Steph.), *Heterothops niger* Kraatz, *Carpelimus corticinus* (Grav.), *C. exiguus* (Erich.), *Stenus boops* Ljungh, *Sepedophilus testaceus* (Fab.) etc.
3. Necrophagous are beetles that feed on dead animals, and they are a necessary element in the biological cycle of substances. These are the species of genera *Nicrophorus, Silpha, Trox*, some staphylinid beetles and others.
4. Coprophagous are beetles that feed on animal excrements. Subfamily Scarabaeinae includes coprophagous species, also coprophagous are some species of family Staphylinidae – *Philonthus corruscus* (Grav.), *Anotylus rugifrons, A. sculpturatus, Aleochara bipustulata* (L.), *A. curtula* (Goeze), *A. lata* Grav., *Ontholestes tesselatus* (Geoff.), *Philonthus tenuicornis* (Mulsant & Rey), *P. succicola* Th., gen. *Sphaeridium* of fam. Hydrophilidae etc.

5. Phytophagous are species adapted to feed on living tissues of higher plants, the majority of phytophagous are associated with flowering plants [11]. The species of families Curculionidae, Chrysomelidae, Tenebrionidae, Elateridae, genera *Amara*, *Ophonus* and *Harpalus* of family Carabidae etc. are also phytophagous.
6. Zoophagous are carnivorous organisms that feed on other animals or on their own species. These are representatives of fam. Carabidae, Coccinellidae, and some species of the family Staphylinidae, larvae of some species of fam. Elateridae etc.
7. Mycetophagous are species feeding on mushrooms and include some representatives of fam. Staphylinidae (*Anthobium fusculum* (Erich.), *Mycetoporus nigricollis* Steph., *Lordithon trinotatus* (Erich.), *L. lunulatus* (L.), Micetophagidae, Tenebrionidae etc.

The beetles feed in accordance with the environment, and in some species a part of the life cycle occurs in the soil. Among them the phytophagous species damaging the crops were studied more intense, including the soil fauna. Their positive role was less considered, particularly in limiting the number of pests and maintaining the relative balance in natural ecosystems.

In the Republic of Moldova the representatives of soil beetles from fam. Carabidae, Scarabaeidae, Silphidae, Staphylinidae, Meloidae, Tenebrionidae and Elateridae were studied more profound [18].

Among fam. Carabidae are known 510 species [17], Scarabidae – 122 [7], Silphidae – 21 [2]. Within fam. Staphylinidae are known about 300 species [1, 3, 4, 9, 13, 15, 16], in fam. Meloidae – 26 [5], Tenebrionidae – 34 species [1].

In some special studies there are also reported the soil-beetles species from other groups [21, 13, 14, 18 etc.]. At present, in the fauna of the Republic of Moldova there are about 2400 species of beetles, of which only a several species (some representatives of fam. Cerambycidae and Ipidae) depend only on decaying wood or agricultural products (Tenebrionidae and Curculionidae).

In general, the role of soil-beetles is huge; they are involved in different processes: loosening and aerating of the soil, the decomposition of detritus, manure and dead organisms in food chains. However, the most important thing is that they reduce the number of many pests, thus maintaining the balance of ecosystems without contamination.

Aphids (Aphidoidea) are known to quickly respond to unbalanced transformation of ecosystems and climate, particularly by changing their spreading ranges. For example, such representative is the Mediterranean region species *Pterochloroides persicae* Cholodk., recently was recorded in Moldova too. For aphids the ecological polymorphism is also particular. In total in Moldova are registered about 350 species of aphids, and in the world around 4700.

We have to mention that the disturbance occurring in agricultural landscapes, cause changes not only in the spreading range, but also in the population structure of aphids, and this process is rather quick, due to their parthenogenesis. Thus, there is a simplification of the life cycle of holocyclic aphid populations, as result of loss of sexual generation and transition anholocyclic lifestyle. This leads to acceleration of variability, to selection of aggressive clones of aphids and this fact is reflected in the dynamics of their number, process which also occurs in Moldova [27].

Aphids are one of the components of soil inhabiting invertebrates, and in general, their role in the ecosystem is multifunctional. Although they are known as pests [27, 25, 12 etc.], in the deciduous forests of Moldova, however, all species of aphids are links of food chains, which contribute to biocenotic regulation of entomofauna, especially due to the emission of "honeydew" [22]. Many aphid species inhabit only on spontaneous plants, and only few on cultural

ones. Some of the "agrarian" aphids still belong to major pests [27, 12, 23 etc.], in Moldova they constitute about 9% of aphid fauna.

As for the soil inhabiting aphids in Moldova the following species were identified:

Fam. Phylloxeridae – *Viteus vitifoliae* (Fitch); Fam. Pemphigidae – *Eriosoma lanigerum* (Hausm.), *E. lanuginosum* (Hart.), *Forda marginata* Koch, *Paracletus cimiciformis* Heyd., *Patchiella reaumuri* (Kalt.), *Pemphigus borealis* Tullgr., *P. bursarius* L., *P. fuscicornis* (Koch), *P. phenax* Börn et Blunck., *Smynthurodes betae* Westw., *Tetraneura ulmi* (L.); Fam. Lachnidae – *Maculolachnus submacula* (Walk.), *Protrama flavescens* (Koch), *P. radicis* (Kalt.), *Trama rara* Mordv., *T. troglodytes* Heyd.; Fam. Aphididae – *Anuraphis farfarae* (Koch), *A. subterranea* (Walk.), *Aphis frangulae beccabungae* Koch, *A. gossypii* Glov., *A. lambersi* (Börn.), *A. sambuci* L., *A. seseli* Bozh., *Brachycaudus ballotae* (Pass.), *B. lamii* (Koch), *B. lychnidis* (L.), *B. mordvilkoi* H. R. L., *B. persicae* (Pass.), *B. rinariatus* Andr., *B. virgatus* Shap., *Dysaphis brancoi* (Börn.), *D. crataegi* (Kalt.) s.l., *D. lappae* (Koch), *D. ranunculi* (Kalt.), *Protaphis anuraphoides* Nevs., *P. elongata* Nevs., *Toxopterina vandergooti* (Börn.), *Zinia veronicae* Shap. In addition to the above mentioned species of aphids, in Moldova were recorded, but so far only on the main host plants, some species which weren't found here in the soil (the intermediate host).

Soil inhabiting (root) aphids from Moldova mostly belong to the following groups [21]:

1. Dioecious aphids species in the period of their population inhabiting on intermediate plants – hosts. These are, for example, the species *Eriosoma lanuginosum*, *Dysaphis brancoi* and *Tetraneura ulmi*.
2. Constantly inhabiting the soil anholocyclic species, which completely lost their main host plants (aphids of gen. *Protrama* Bak., *Trama* Heyd.), or, just over a significant part of their range, including Moldova (*Forda marginata*, *Paracletus cimiciformis*).
3. Holocyclic species, which colonies are constantly living on roots and (or) the basal parts of plants (*Brachycaudus ballotae*, *B. rinariatus*, *Protaphis elongata*).
4. Anholocyclic or holocyclic species, large colonies of which develop on the upper parts of the plant only in the period of abundant vegetation of these parts (*Brachycaudus persicae*, *B. virgatus*).

In Moldova certain aphid species inhabiting the soil were registered as crop pests, namely – *Viteus vitifoliae* – pest of grapes, *Eriosoma lanigerum* – pest of Apple trees, *Pemphigus fuscicornis* – pest of beet [12], *Tetraneura ulmi* – pest of corn, *Dysaphis crataegi* – pest of carrots.

In the following ant species were found connections with root aphids in Moldova: *Formica cinerea* Mayr., *F. gagates* Latr., *F. pratensis* Retz., *Lasius affinis* Schenck., *L. alienus* Först., *L. brunneus* Latr., *L. emarginatus* Oliv., *L. flavus* F., *L. niger* L., *Myrmecina graminicola* Latr. and *Tetramorium caespitum* L. (out of 31 species of all registered in Moldova aphodophilous ants).

Ants are known to protect many plants against phytophagous insects, but they also "take care" of aphids feeding on plants, even transfer them from one root to another. The trophobiosis with ants allow to some aphid species to live in the soil on the roots of plants, where they can find favorable and stable living conditions [24]. The aphid "honeydew" is used in carbohydrate diet of many ant species. It was emphasized that "honeydew" stimulate soil microflora and accelerates the course of soil formation processes, involving various microorganisms

Conclusion

Only a small part of the invertebrates inhabiting the soil in the Republic of Moldova has been studied. A huge number of groups, including soil inhabiting mites, spiders, pseudoscorpions, myriapods, terrestrial crabs and others remain unexplored.

The invertebrates, including springtails, beetles and aphids are components of soil fauna. Collembola are primarily wingless arthropods, they inhabit all types of soils, both natural and anthropogenic modified. A total of 223 springtails species are known in Moldova and all of them inhabit the soil. Their importance in the processes of organic matter decomposition and maintenance of soil fertility is huge. In Moldova fauna are recorded about 2400 species of beetles. The role of soil inhabiting beetles is huge and versatile, particularly in reducing the number of pests. In Moldova 39 soil inhabiting aphid species were identified. Their value in ecosystems is also varied, among them 5 species of harmful aphids in varying degrees. The rest of the species are only links of food chains, elements of biodiversity, including their trophobiosis with ants, in Moldova – with 11 of ant species.

For biodiversity optimization in general, it is important the knowledge of its individual components and their role in ecosystems, as shown on the example of soil inhabiting Collembola and Insecta (Coleoptera, Aphidoidea) from Moldova.

REFERENCES

1. Bacal, S., 2008, *Diversitatea și ecologia coleopterelor epigee (Insecta: Coleoptera) din rezervația peisagistică „Codrii Tigheci”*. Autoref. al tezei de doctor în biologie. Chișinău, 24 pp.
2. Bacal, S., 2010, Contributions to the knowledge of Meloide fauna (Coleoptera: Meloidae) in the Republic of Moldova*, Muzeul Olteniei Craiova. Oltenia. Studii și comunicări. Științele Naturii*, No. **XXVI (1)**: 124–126.
3. Bacal, S., Derunkov, A., 2009, Rove beetles (Coleoptera: Staphylinidae) from the dead wood in the forests of Lower Dniester, Republic of Moldova*, Muzeul Olteniei Craiova. Oltenia. Studii și comunicări. Științele Naturii*, No. **XXV**: 111–113.
4. Bacal, S., Derunkov, A., 2010, Contributions to the knowledge of rove beetles (Coleoptera, Staphylinidae) from state nature reserve “Plaiul Fagului” Republic of Moldova, *Travaux du Museum National d’Histoare Naturelle «Grigore Antipa»*, No. **53**. București: 217–221.
5. Bacal, S., Gidei, P., 2008, Contributions a la connaissance des silphides (Coleoptera: Silphidae) de la Republique Moldova*, Muzeul Olteniei Craiova. Oltenia. Studii și comunicări. Științele Naturii*, No. **XXIV**: 127–129.
6. Bușmachiu, G., 2010, Checklist of springtails (Collembola) from the Republic of Moldova*, Travaux du Museum National d’Histoare Naturelle «Grigore Antipa»*, No. **53**: 149–160.
7. Cilipic, G., 1998, Fauna, biologia și ecologia scarabeidelor din R. Moldova. Autoref. al tezei de doctor în biologie. Chișinău, 24 pp.
8. Cocîrță, P., 2012, Prezent environment end sustainable development, *Forest ecosystems in Republic of Moldova: evolution, problems end solutions,* No. **6(1)**, Iași: 59–73.
9. Derunkov, A., Bacal, S., 2011, Contributions to the knowledge of staphilinid fauna (Coleoptera: Staphylinidae) from the right side of the Dniester river, *Muzeul Olteniei Craiova. Oltenia. Studii și comunicări. Științele Naturii*, No. **XXVII (1)**: 105–108.
10. *Fauna of biocenotic oases and their practical importance*, 1990, «Știința», Chișinău, 235 pp.
11. Ghiliarov, M. S., 1949, *The particularity of soil as a habitat and its importance in the evolution of insects*, Moscow — Leningrad, 279 pp.
12. Gorbatiuc, N. M., 1969, *Sugar beet root aphid (Pemphigus fuscicornis Koch) from Moldova*. Autoreferatul tezei de doctor în biologie, Chișinău, 20 pp.
13. Karpova, V. E., 1986, *Fauna and ecology of Coleoptera (Carabidae) from agricultural fields in the South of Moldova*. Autoreferatul tezei de doctor în biologie, Moscow, 16 pp.
14. Medvedev, S. I., Shapiro, Д. S., 1957, To the knowledge of Coleoptera from Moldova SSR and adjacent Ukrainian regions, *Proceedings of the Institute of Biology. and biol. factors*, No. **30**: 173–206.
15. Mihailov, I., Derjanschi, V., Agro Buletin AGIR, *Staphilinide (Coleoptera, Staphylinidae) micetobionte din Republica Moldova,* http://www.agir-agrobuletin.com/reviste/revista5/.

16. Neculiseanu, Z., 1984, *Fauna and biology of Staphylininae and Paederinae (Coleoptera, Staphylinidae) from agricultural fields in Moldova*. Autoreferatul tezei de doctor în biologie, Chișinău, 18 pp.
17. Neculiseanu, Z., 2003, *Carabidele (Coleoptera, Carabidae) din zona de interferență biogeografică (taxonomie, diversitate, zoogeografie, biologie) și importanța lor practică*. Autoref. al tezei de doctor hab. în biologie. Chișinău, 42 pp.
18. Ostaficiuc, V. G., 1968, *Fauna of beetles – chuck in Moldova and their economic significance*. Autoreferatul tezei de doctor în biologie, Chișinău, 20 pp.
19. Stebaeva, S. K., 1970, *Life forms of springtails*, Zoological Journal, No. **XLIX (10):** 1437–1455.
20. Thibaud, J.-M., d'Haese, C., 2010, Le petit Collembole illustré, Arvernsis, No. **51–52**: 56.
21. Vereschiaghin, B. V., Andreev, A. V., 1987, The problems of soil zoology. *Soil inhabiting aphids from Moldova,* Tbilisi: 59–60.
22. Vereșceaghin, B., Bacal, S., Bușmachiu, G., 2011, Entomofauna as component of forest ecosystems in the Republic of Moldova*, Marisia,* No. XXIX–XXX, Târgu-Mureș: 65–69.
23. Vereșceaghin, B., Bușmachiu, G., Bacal, S., 2010, Agricultura Moldovei, *Diversitatea entomofaunei silvice, căile ei de conservare și de diminuare a dăunătorilor,* No. **11–12**: 30–31.
24. Vereschiaghin, B. V., Lihovidov V. E., Andreev, A. V., 1983, Buletimul Academiei de Științe a Moldovei, Seria științe biologice și chimice, *Myrmecophilous aphids from Moldova,* No. **3**: 49–52.
25. Vereschiaghin, B., Plugari, S. G., 1962, Buletinul Academiei de Științe, *Impact of avia chemical treatments against Thaumetoppoea processionea on the oak forest entomofauna,* No. **3**: 31–41.
26. Vereschiaghin, B., Vereschiaghinan, A., Bacal, S., Bușmachiu, G., 2012, Mediul Ambiant, *The diversity of entomofauna in the Republic of Moldova due to ecologization of agriculture and forestry and the suppression of pests,* No. **2 (62)**: 33–38.
27. Vereschiaghina, A. B., 2008, Modern problems of plant immunity to pests, II Russian conference, Sankt – Petersburg, *Ecological mechanisms of phenotypic and genotypic variability of populations of aphids*: 197–200.

UNELE NEVERTEBRATE EDAFICE (COLLEMBOLA, INSECTA) DIN REPUBLICA MOLDOVA, CA PARTE COMPONENTĂ A BIODIVERSITĂȚII ECOSISTEMELOR
(Rezumat)

Lucrarea include analiza diversității speciilor de nevertebrate Collembola, Coleoptera și Aphidoidea din Republica Moldova. În urma cercetărilor efectuate și analizei datelor din literatură au fost evidențiate 223 specii de colembole, 2400 specii de coleoptere și 39 specii de afide. Colembolele și unele specii de coleoptere sunt pedobionte și participă activ în procesul de descompunere a materiei organice și menținerea fertilității solului. Între insectele studiate, afidele și unele genuri de coleoptere sunt dăunători-fitofagi. Rolul nevertebratelor în ecosisteme este variat, dar toate grupele sunt importante pentru biodiversitate fiind parte componentă a lanțurilor trofice.

CONTRIBUTION TO THE KNOWLEDGE OF COPROPHAGOUS BEETLES (COLEOPTERA, *SCARABAEINAE*) FROM MEADOWS AND PASTURES IN THE REPUBLIC OF MOLDOVA

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Abstract: An updated study of the *Scarabaeinae* beetle fauna of meadows and pastures from the Republic of Moldova, their biodiversity, ecological peculiarities and distributions was provided. Altogether, 21 species of coprophagous beetles from *Scarabaeinae* subfamily have been revealed for meadow and pasture ecosystems in the Republic of Moldova. The largest genus proved to be *Onthophagus*, which includes 18 species, and by one single species for each genus *Caccobius* and *Pallipes*. The most abundant species in meadows and pastures were *Onthophagus ruficapillus*, followed by *O. vacca* and *O. taurus*. The lowest number of individuals was recorded for species *O. furciceps, O. furcatus*, *O. lemur*, *O. illyricus*, *O. nuchicornis, O. ponticus,* and *O. semicornis*. Also, as a result of our research conducted in meadows and pastures of the Republic of Moldova the presence of 21 *Scarabaeinae* beetle species on the investigated territory has been reconfirmed.

Keywords: *Scarabaeinae,* coprophagous beetles

Introduction

Coprophagous beetles are a highly specialized trophic group adapted to consumption of herbivore dung [12]. They play an important role in nutrient cycling in pastures and meadows; promote soil aeration and fertilization, thus maintaining the ecological balance of ecosystem [10; 3; 2]. Meadows and pastures cover 14,5 % of the agricultural area in the Republic of Moldova. Meadows and pastures are important also as the main components of the characteristic mosaic landscape over large parts of the republic. A large part of these meadows and pastures were used intensively during last time and also reversion for some period of pastures and meadows in arable fields was quite common. Despite their obvious importance, meadows and pastures, in the Republic of Moldova are still poorly studied ecosystems in terms of their biodiversity. From this point of view *Scarabaeinae* beetles in grasslands and pastures have been poorly studied. Information concerning studies on coprophagous *Scarabaeinae* beetles in these areas is fragmentary. Thus, some information concerning identified beetles on the researched region have been recorded by Miller and Zubowski, 1917 [15], Medvedev and Sapiro, 1957 [22] later by Cilipic, 1998, [6] but not all ecological data are available for cited species, and specimens are not deposited in the entomological collections of the republic.

The aim of the present study was to provide an updated data of the *Scarabaeinae* beetle fauna of meadows and pastures from the Republic of Moldova, their biodiversity, ecological peculiarities and distributions.

Material and methods

The main material was collected from following sites: Bacioi (46° 54' 44" North, 28° 53' 2" East), Braila (46° 54' 56" North, 28° 50' 33" East), Cociulia (46° 21' 28" North, 28° 24' 53" East), Colonita (47° 2' 16" North, 28° 57' 30" East), Durlesti (47° 1' 4" North, 28° 45' 45" East), Gratiesti (47° 5' 57" North, 28° 49' 0" East), Hancesti (46° 49' 33" North, 28° 35' 37" East), Leuntea (46° 39' 46" North, 29° 35' 16" East), Salcuta (46° 35' 42" North, 29° 14' 40" East), Tigheci (46° 23' 10" North, 28° 22' 35" East), Tomai (46° 34' 24" North, 28° 19' 29" East), Troita Noua (46° 47' 25" North, 29° 15' 54" East), in central and southern part of the Republic of Moldova between 2004 and 2011 years. Insects were collected using pitfall traps and direct survey of animal dung during each year seasonal activity. The contents of the traps were collected every 10 days at each site. For each species collected, the collection sites, number of specimens and collection dates (day.month.year) are given (Table 1). The identification of species was based on morphological characters, and employed the following keys: Panin, 1955 [16]; Crijanovschii, 1965 [21]; Kabakov, 2006 [20]. All specimens are deposited in the collection of the Entomological Museum, Institute of Zoology of the Academy of Science of Moldova.

Results and discussions

In total 21 species of coprophagous beetles from *Scarabaeinae* subfamily have been revealed for meadow and pasture ecosystems in the Republic of Moldova (Table 1). The largest genus proved to be *Onthophagus*, which includes 18 species, and by one single species for each genus *Caccobius*, *Copris* and *Pallipes*. Over the entire sampling period a total of 431 specimens of adult *Scarabaeinae* dung beetles were collected. The most abundant species were *Onthophagus ruficapillus* with 96 samples, followed by *O. vacca* with 77 colected samples and *O. taurus* with 43 exemplars. The lowest number of individuals was recorded for species *O. furciceps* and *O. furcatus* by one species, *O. lemur* with 2 exemplars and *O. illyricus*, *O. nuchicornis, O. ponticus, O. semicornis* by 3 exemplars for each species.

Therefore, historically up to date, 29 species from *Scarabaeinae* subfamily were documented in the Republic of Moldova. As a result of our research conducted in meadows and pastures of the Republic of Moldova the presence of only 21 species on the investigated territory has been reconfirmed. Among them, species *O. ponticus* and *O. nuchicornis* were not found by the Cilipic (1998), and *Oniticellus palipes*, were not recorded in our survey, being a rare species. Concerning following species *Sacarbaeus sacer*, *Gymnopleurus geoffroyi*, *G. mopsus*, *Sisyphuus schaefferi*, *Onthophagus gibbulus*, *O. lucidus*, *Chironitis hungaricus* and *Onitis damoetas,* were not found on the territory of the Republic of Moldova by Cilipic (1998), and neither in our research. This can be explained by the fact that those species have restricted their area of distribution, or were collected in southern part of Moldova, territories that actually are part of neighboring country Ukraine, or were incorrectly identified. Species *Sacarbaeus sacer*, is distributed in southern parts of the Ukrainian steppe zone, the steppes of Crimea, Western Caucasus, in the western part of Georgia, Spain, South France, Yugoslavia, Albania, Bulgaria, Greece, Turkey, North Africa, Arabian Peninsula, Corsica, Sardinia, Sicily and Cyprus, this species could not be found in the Republic of Moldova, it was probably confounded with *Scarabaeus affinis* Brulle, 1832, a common species, recorded on the territory of neighboring country Romania [5]. Referring to other 8 species, it might exist on the territory of the Republic of Moldova, but were not confirmed for last 50 years.

Table 1: *Scarabaeinae* (Coleptera: *Scarabaeidae*) species list associated with meadow and pasture ecosystems in the Republic of Moldova

Species	Collection Locality	Date	Number	Reference
***Onthophagus* Genus**				
O. (*Euonthophagus* Balthasar) *amyntas* (Olivier, 1789)	Colonita	13.04.2011	12	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Gratiesti	14.04.2011	2	
	Braila	29.04.2011	1	
O. (*Palaeonthophagus*) *coenobita* (Herbst, 1783)	Tigheci	16–24.06.2004	2	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Cociulia	31.05–10.06.2006*	10	
	Cociulia	16–24.06.2006	2	
O. (*Palaeonthophagus*) *fracticornis* (Preyssler, 1790)	Cociulia	13–23.06.2005	2	Medvedev, Sapiro 1957; Cilipic 1998
	Cociulia	31.05–10.06.2006*	1	
	Leuntea	26.06.2009	2	
	Durlesti	15.04.2011	2	
	Braila	29.04.2011	5	
	Bacioi	13.05.2011	1	
	Hancesti	15.05.2011	1	
O. (*Furconthophagus*) *furcatus* (Fabricius, 1781)	Colonita	13.04.2011	1	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
O. (*Palaeonthophagus*) *grossepunctatus* Reitter, 1905	Durlesti	15.04.2011	20	Cilipic 1998
	Braila	29.04.2011	9	
	Hancesti	15.05.2011	3	
O. illyricus (Scopoli, 1763)	Braila	29.04.2011	2	Cilipic 1998
	Bacioi	13.05.2011	1	
O. (*Palaeonthophagus*) *furciceps* Marseul, 1869 = *kindermanni* Harold, 1877	Troita Noua	15–27.04.2010*	1	Medvedev, Sapiro 1957; Cilipic 1998
O. (*Palaeonthophagus*) *lemur* (Fabricius, 1781)	Cociulia	31.05–10.06.2006*	1	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Braila	29.04.2011	1	
O. (*Palaeonthophagus*) *nuchicornis* (Linnaeus, 1758)	Braila	29.04.2011	3	Medvedev, Sapiro 1957
O. (*Palaeonthophagus*) *ovatus* (Linnaeus, 1767)	Cociulia	16.05–26.05.2004*	1	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Cociulia	19–26.07.2004	1	
	Cociulia	31.05–10.06.2006*	6	
	Tomai	28.04.2010	10	
	Bacioi	1.04.2011	1	
	Bacioi	27.04–6.05.2011*	10	
	Colonita	29.04.2011	6	
	Bacioi	06–17.05.2011*	1	
O. ponticus Harold, 1883 = *furcicornis* Reitter, 1893	Bacioi	18–27.04.2011*	3	Miller, Zubowski 1917; Medvedev, Sapiro 1957;
O. (*Palaeonthophagus*) *ruficapillus* Brulle, 1832 =*ovatus* var *ruficapitullus* Reitter, 1893	Laguta	19–26.07.2004*	1	Cilipic 1998
	Cociulia	19–26.07.04	1	
	Cociulia	31.05–10.06.2006*	1	
	Tomai	28.04.2010	5	
	Colonita	13.04.2011	28	
	Durlesti	15.04.2011	2	
	Braila	29.04.2011	56	
	Bacioi	17–27.05.2011*	2	

O. (*Palaeonthophagus*) *semicornis* (Panzer, 1798)	Colonita	13.04.2011	3	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
O. taurus (Schreber, 1759)	Cociulia	19–27.07.2004*	1	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Gratiesti	14.04.2011	1	
	Braila	29.04.2011	39	
	Bacioi	13.05.2011	1	
	Hancesti	15.05.2011	1	
O. (*Palaeonthophagus*) *vacca* (Linnaeus, 1767)	Gradinita	14.05.2009	4	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Leuntea	26.06.2009	4	
	Colonita	13.04.2011	4	
	Durlesti	15.04.2011	4	
	Braila	29.04.2011	51	
	Bacioi	13.05.2011	10	
O. (*Palaeonthophagus*) *verticicornis* Leicharting, 1781	Cociulia	31.05–10.06.2006*	2	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Cociulia	16–24.06.2006*	1	
	Salcuta	25.05.2009	1	
O. (*Palaeonthophagus*) *vitulus* (Fabricius, 1776)	Cociulia	16–24.06.04*	1	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic
	Cociulia	31.05–10.06.2006*	5	
	Bacioi	18–27.04.2011*	17	
	Bacioi	27.04–6.05.2011*	10	
***Caccobius* Genus**				
C. schreberi (Linnaeus, 1767)	Bacioi	06.05.2011	2	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Bacioi	13.05.2011	10	
	Gratiesti	16.06.2011	11	
***Copris* Genus**				
C. lunaris (Linnaeus, 1758)	Braila	29.04.2011	5	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Troita Noua	15–27.04.2010*	2	
***Oniticellus* Genus**				
O. pallipes (Fabricius, 1781)				Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
O. fulvus (Goeze, 1777)	Tomai	28.04.2010	3	Miller, Zubowski 1917; Medvedev, Sapiro 1957; Cilipic 1998
	Gratiesti	14.04.2011	4	
	Durlesti	15.04.2011	3	
	Braila	29.04.2011	3	
	Bacioi	13.05.2011	2	
	Gradinita	14.05.2009	6	
***Chironitis* Genus**				
C. hungaricus Herbst, 1789				Miller, Zubowski 1917; Medvedev, Sapiro 1957
***Onitis* Genus**				
O. damoetas Steven, 1806				Miller, Zubowski 1917; Medvedev, Sapiro 1957

* Pitfall trap survey

Dung beetles community structure is determined by species´ habitat preferences, by food source allocation in pasture, by migration ability of adults and by the size and quality of dung pats [7, 8, 9, 11, 13, 14, 17, 19]. According to the trophic preferences species from *Scarabaeinae* subfamily are mainly coprophagous, consuming dejections of large and small mammals such as: cattle, horses, donkey, sheep, goats, dogs, gophers and other small rodents [4, 16, 20]. Some species can also be found on the cadavers of mammals [1]. Thus, from the list of investigated dung

beetles, 27 species prefers dejections of large mammals, especially in spring time, when they need more food for egg-laying, the females lay their eggs in the balls of dung and bury them in the soil, but later, in fall some of those species can be also found on the feces of small mammals [18]. The following two species, *O. furciceps* and *O. ponticus* are typical for small mammal dejections, and commonly found in burrows of gopher. In our survey, these two species were collected in pitfall traps, namely, traps containing dead and high level decayed cadavers of mice, that have fallen accidentally.

Dung beetles are commonly regarded as a very important element of the entomological fauna of meadow and pasture ecosystems in Republic of Moldova. Nevertheless, the dung beetle fauna is still relatively poorly known, both from systematic and biogeographical points of view. The current literature offers very few general contributions dealing with the biogeographical analysis of the dung beetles in Republic of Moldova. Thereby, first geographical analyses of the *Scarabaeinae* beetles associated with meadow and pasture ecosystems in the Republic of Moldova revealed that most of the species are widely distributed throughout the palearctic region.

Table 2: Ecological and geographical features of *Scarabaeinae* beetles associated with meadow and pasture ecosystems in the Republic of Moldova

Species	Trophic preference	Ecological peculiarities	Geographical Distributions
Scarabaeus sacer	Cattle, horse dung	Populate sandy soils	South Ukraine, Crimea, western Caucasus, western Georgia, Spain, South France, Yugoslavia, Albania, Bulgaria, Greece, Turkey, North Africa, Arabian Peninsula, Corsica, Sardinia, Sicily, Cyprus
Gymnopleurus geoffroyi	Cattle, horse dung	Mesophilic species most commonly found on sandy soils, but also in forest ecosystems	Southern Russia to Voronezh and Samara, southern Urals, Ukraine, Crimea, Caucasus, Southern Europe to middle France, northern Italy, North Africa, Iran, Afghanistan
G. mopsus	Cattle, horse, sheep, small rodents dung, sometimes human feces	Inhabit arid biotopes, steppes and different kind of desserts	North Caucasus, western Ukraine, Georgia, Western Europe to Belgium, southern Germany, southern Poland, Algeria, Tunisia, Morocco, the islands of Sardinia and Sicily
Sisyphus schaefferi	Cattle, horse, sheep dung	Common species, widespread in the xerophytic stations	North Caucasus, western Ukraine, Georgia, Western Europe to Belgium, southern Germany, southern Poland, Algeria, Tunisia, Morocco, the islands of Sardinia and Sicily
Onthophagus amyntas	Cattle, horse dung	Common for all climate complexes of the republic	Europe, Asia Minor, Central Asia, Russia, Ukraine, Azerbaijan, Armenia
O. coenobita	Cattle, horse, sheep, dog, bird dung, human feces, small animals cadavers	Inhabit steppe and forest complex	Central and South Europe, Transcaucasia, Asia Minor, Transcaspia, Turkestan
O. fracticornis	Cattle, horse dung, human feces	Inhabit steppes with high dicotyledonous plants and sandy soils	Europe and Central Asia, Turkey, Spain, Iran

O. furcatus	Cattle, horse, sheep, dog dung, human faces	Common in the forest steppe zone, prefer xerophytic biotopes and sandy soil	South Europe, Asia Minor, Transcaucasia, Syria, Iraq, Arabia, Morocco
O. gibbulus	Cattle, horse dung	Euribiont species, inhabit grassland and sandy soils	Central Europe, Hungary, Balkan Peninsula, Ukraine, Asia Minor, Transcaucasia, Syria, Iraq, Turkestan, Mongolia, Siberia to Ussuri area, China, Korea, Japan
O. grossepunctatus	Cattle, sheep, dog	Common species in deciduous forests	Southwest Europe, Italy, Sicily, Balkan Peninsula, Hungary, Czech Republic, Slovakia
O. illyricus	Cattle, horse, sheep	Prefers limestone and sandy soil	Central and South Europe, Asia Minor, Syria, Iraq, Iran, Afghanistan, Turkestan
O. furciceps	Gopher and other small rodents dung	Inhabit burrows of gopher and other small rodents	Turkey, Bulgaria, Yugoslavia, Macedonia, Hungary, Romania, Ukraine, Libya, Syria, Iraq, Iran
O. lemur	Cattle, horse, sheep, goat dung, human faces	Inhabit steppes and forest-steppe zones	Central and South Europe, Transcaucasia, Asia Minor
O. lucidus	Cattle, horse, sheep dung	Inhabit forest-steppe zones and xerophytic biotopes	South-East Europe, Hungary, Slovakia, Ukraine, Crimea, Asia Minor, Syria, Transcaucasia, Iraq
O. nuchicornis	Cattle, horse, sheep dung	Forest ecosystems, xerophytic biotopes and sandy soils	Europe except extreme north, Asia Minor, Caucasus, Turkestan, Siberia, Mongolia, Introduced to Canada: Alberta, British Columbia, Newfoundland, Nova Scotia, Ontario, Quebec, USA: Connecticut, Idaho, Maine, Maryland, Massachusetts, Michigan
O. ovatus	Cattle, horse, sheep, dung	Copro-necrophagous species, common for all climate complexes, except alpine steppes	Europe except extreme north, Asia Minor, Transcaucasia, Turkestan
O. ponticus	Gopher and other small rodents dung	Inhabit steppe zones	South European Russia, Syria, Libya, Iran, Azerbaijan, Armenia, Turkey, Georgia, Romania, Greece
O. ruficapillus	Cattle, horse, sheep, dog dung	Common for all climate complexes of the republic	Europe, Asia Minor, Syria, Transcaspia, Hungary, Austria, Slovakia, Israel
O. semicornis	Cattle, horse, sheep, gopher dung	Prefer steppe ecosystems, xerophytic biotopes	Central and South Europe, Transcaucasia, Turkestan, Portugal, Spain, France, Italy, Switzerland, Austria, Germany, Poland, Serbia, Macedonia, Hungary, Czech Republic, Romania, Bulgaria, South Russia, Ukraine, Greece, Turkey
O. taurus	Cattle, horse, sheep, dog dung	Common for all climate complexes of the republic	Europe, Morocco, Algeria, Tunisia, Syria, Iraq, Transcaucasia, Asia Minor, Iran, Afghanistan, Central Asia
O. vacca	Cattle, horse, sheep, dog dung	Common for all climate complexes of the republic	Central and South Europe, Morocco, Azores, Crete, Asia Minor, Syria, Transcaucasia, Iran, Transcaspia
O. verticicornis	Cattle, horse, sheep dung	Common for all climate complexes of the republic	Central and South Europe, Asia Minor, Transcaucasia, Syria, Turkestan

O. vitulus	Cattle, horse, sheep, gopher and other small rodents dung	Common for all climate complexes of the republic	Ukraine, Transcaucasia, Armenia, Balkan Peninsula, Hungary, Austria, Czech Republic, Slovakia, Greece, Kirgizstan, Poland, Bulgaria, Kazakhstan
Caccobius schreberi	Cattle, horse dung	Common for all climate complexes of the republic	Europe except the north, Asia Minor, Iran, Syria, Egypt, Morocco, Algeria, Tunisia, Libya
Copris lunaris	Cattle, horse, sheep dung	Inhabit steppe ecosystems	Europe, Russia: Moscow – Siberia, Ukraine, Caucasus, Kazakhstan, Turkey, Syria, Iran
Oniticellus pallipes	Horse, donkey dung	Inhabit steppe ecosystems	Europe and Asia Minor
O. fulvus	Cattle, horse, sheep, dog dung	Inhabit steppes and forest-steppe zones	Central and southern Europe, Asia Minor and North Africa
Chironitis hungaricus	Cattle, horse	Characteristic for steppe, desert and semi-desert	South Russia, south Ukraine, Crimea, Spain, south France, Italy, Hungary, Syria
Onitis damoetas	Cattle, horse	Inhabit steppe ecosystems	Balkan Peninsula, Asia Minor, Aegean Islands, Caucasus, Armenia, Iran, Syria, Libya

Coprophagous beetles play an important role in functioning of meadow and pasture ecosystems, they contribute to animal dejections degradation, enriching the soil structure. At the same time, their activity facilitates the access of other groups of organisms into the superficial soil layer, and maintains animal health by recycling manure. Incorporated manure into pasture soils by scarabeidae beetles have a greater ability to hold and retain water in the soil, leading to better plant growth. *Scarabaeidae* beetles, also represents an important trophic source for birds and insectivorous mammals in grasslands and pastures, what is very important for ecological balance maintaining.

Conclusions

As a result of our research conducted in meadows and pastures of the Republic of Moldova the presence of only 21 species of *Scarabaeinae* beetles on the investigated territory has been reconfirmed. The initial list contained 29 species from this subfamily, but not all of them were reconfirmed for half a century, including species *Scarabaeus sacer*, mentioned by Miller and Zubovschi in 1917, Medvedev and Sapiro in 1957. The most abundant species in meadows and pastures were *Onthophagus ruficapillus*, followed by *O. vacca* and *O. taurus*. The lowest number of individuals was recorded for species *O. furciceps, O. furcatus*, *O. lemur*, *O. illyricus*, *O. nuchicornis, O. ponticus,* and *O. semicornis*.

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REFERENCES

1. Anton, E., Niederegger, S., Beutel, R., 2011, Beetles and flies collected on pig carrion in an experimental setting in Thuringia and their forensic implications, *Medical and Veterinary Entomology* **25**: 353–364, http://onlinelibrary.wiley.com/doi/10.1111/j.1365–2915.2011.00975.x/pdf.
2. Bang, H., Lee, J-H., Kwon, O., Na, Y., Jang, Y., Kim, W., 2005, Effects of paracoprid dung beetles (Coleoptera: *Scarabaeidae*) on the growth of pasture herbage and on the underlying soil, *Appl. Soil Ecol.* **29**: 165–171.
3. Bertone, M., 2004, Dung beetles (Coleoptera: *Scarabaeidae* and *Geotrupidae*) in North Carolina Pasture Ecosystem, *In Entomology North Carolina University*, Raleigh,134 pp.
4. Carpaneto, Giuseppe Maria, Mazziotta, A., Piattella, E., 2005, Changes in food resources and conservation of scarab beetles: from sheep to dog dung in a green urban area of Rome (Coleoptera, *Scarabaeoidea*), *Biological Conservation*, **123**: 547–556. www.elsevier.com/locate/biocon.
5. Chimișliu, C., Pașol, P., 2002, Contribuții la cunoașterea istoricului taxonomiei scarabaeideelor (Insecta: Coleoptera: *Scarabaeoidea*), *Oltenia. Stud și com. Șt. Nat.* **XVIII**. *Muzeul Olteniei Craiova:* 149–155.
6. Cilipic, G., 1998, Fauna, biologia și ecologia scarabeidelor (Coleoptera, *Scarabaeidae*) din R. Moldova, *Autoreferat al tezei de doctor în științe biologice: 03.00.09./ Institutului de Zoologie al A.Ș.M.* Chisinău, 23.
7. Finn, J.A., Gittings, T., Giller, P.S., 1999, Spatial and temporal variation in species composition of dung beetle assemblages in southern Ireland, *Ecol. Entomol.,* **24**: 24–36.
8. Finn, J.A., Giller, P.S., 2000, Patch size and colonisation patterns: an experimental analysis using north temperate coprophagous dung beetles, *Ecography,* **23**: 315–327.
9. Finn, J.A., Giller, P.S., 2002, Experimental investigations of colonisation by north temperate dung beetles of different types of domestic herbivore dung, *Appl. Soil Ecol.,* **20**: 1–13.
10. Gittings, T., Giller, P.S., Stakelum, G., 1994, Dung decomposition in contrasting temperate pastures in relation to dung beetle and earthworm activity, *Pedobiologia,* **38**: 455–474.
11. Gittings, T., Giller, P.S., 1998, Resource quality and the colonisation and succession of coprophagous dung beetles. *Ecography*, **21**: 581–592.
12. Hanski, I., Cambefort, Y. 1991, *Dung Beetle Ecology.* Princeton University Press, Princeton, New Jersey, 481 pp.
13. Hutton, S.A., Giller, P.S., 2004, Intra-and interspecific aggregation of north temperate dung beetles on standardised and natural dung pads, *Ecol. Entomol.*, **29**: 594–605.
14. Lee, C., Wall, R., 2006, Distribution and abundance of insects colonizing cattle dung in South West England. *J. Natural Hist,* **40**: 1167–1177.
15. Miller, E., Zubowski, N., 1917, Materalien zur entomologischen Fauna Bessarabiens, *Travaux Soc. Natur. und Amat. Sc. Natur. Bessarabie.* Kishinef, **6**: 119–150.
16. Panin, S., 1955, *Fam. Scarabaeidae I. Faune R.P.R., 10 (3),* Edit., Acad. Rom*., 121,* Bucuresti: 45–99.
17. Roslin, T., 2000, Dung beetle movements at two spatial scales, *Oikos,* **91**: 323–335.
18. Sowig, P., Wassmer, T., 1994, Resource Partitioning in Coprophagous Beetles from Sheep Dung: Phenology and Microhabitat Preferences. *Zool. Jb. Syst.,* **121**: 171–192.
19. Wassmer, T., 1995, Selection of the spatial habitat of Coprophagous beetles in the Kaiserstuhl area near Freiburg (SW-Germany), *Acta Oecol.*, **16**: 461–478.
20. Кабаков, О., 2006, *Пластинчатоусые жуки подсемейства Scarabaeinae* (Insecta: *Coleoptera: Scarabaeidae) фауны России и сопредельных стран.* Москва. Товарищество научных изданий КМК, 374.
21. Крыжановсий, О., 1965, *Определитель насекомых Европейской части СССР, т. 2,* Москва: 668.
22. Медведев, С., Шапиро, Д., К познанию фауны жуков (Coleoptera) Молдавской ССР и сопредельных районов Украины. *Учён. зап. Харьков. Ун-та. 1957. Т. 90: Тр. НИИ биол. и биол. фак.,* **30**:173–206.

CONTRIBUȚII LA CUNOAȘTEREA COLEOPTERELOR COPROFAGE (COLEOPTERA, *SCARABAEINAE*) DIN PAJIȘTI ȘI PĂȘUNI DIN REPUBLICA MOLDOVA
(Rezumat)

Lucrarea prezintă studiul actual al subfamiliei *Scarabaeinae* în pajiștile și pășunile din Republica Moldova, incluzând unele date ecologice și aria de răspândire a speciilor, pe baza materialelor colectate în perioada anilor 2004–2011. În rezultat a fost reconfirmată prezența a 21 de specii pe teritoriul republicii, inclusiv în pajiști și pășuni. Subfamilia *Scarabaeinae* este reprezentată în fauna de coleoptere a Republicii Moldova prin 29 de specii din 9 genuri. Cele mai frecvente specii întâlnite în teritoriu au fost: *Onthophagus ruficapillus*, *O. vacca* și *O. taurus* în timp ce speciile: *O. furciceps*, *O. furcatus* și *O. lemur* au fost evidențiate în număr minim de exemplare.

AQUASCAPING AS ADVANCED ENVIRONMENTAL ENRICHMENT TOOL PRELIMINARY CONSIDERATIONS REGARDING THE DESIGN AND WORKING OF HEAVILY PLANTED AQUARIUM CLOSED SYSTEMS – AN EXPERIMENTAL MODEL FOR PHYTOPHILE FISH SPECIES EX-SITU CONSERVATION

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Abstract: Aquascaping model chosen for this study has the tropical plants association as focal point that is built and controlled in order to maintain a stable and healthy environment for fish and invertebrates. The paper shows the evolution of two closed aquarium systems through the results obtained from the monitoring and control of water physical and chemical parameters in close accordance with plants bioproductive features, health status of fish and breeding rate of aquatic invertebrates. The vegetal communities from the experimental tanks contain compatible species according to their ecological requirements (especially those referring to limiting physical, chemical parameters: temperature, pH, hardiness). Algae invasive development is one of the risk factor in heavily planted aquaria working and several objectives were fixed in order to algae control: accurate dosing of macro- and micronutrients, weekly analysis and correction of them, a proper vegetal composition and populating of the tanks with some animal algae eater species: *Crossocheilus siamensis, Gyrinocheilus aymonieri, Caridina japonica.* Special equipments for special lighting, carbon dioxide supplying, biological filtering, simulating of vertical convection through the bottom substrate were described and used in order to built the artificial ecosystem. It was noticed the relevance of oxidation reduction potential for analysis of artificial ecosystem components status.

Keywords: aquascaping, aquarium plant growing, limitative factors, water dissolved oxygen content, oxidation reduction potential.

Introduction

Advanced planning techniques of natural aquatic biotope and vegetables biocoenosis were used in order to obtain a healthy and stable aquatic environment. The results of working of heavily planted aquaria encouraged us to promote some ex-situ conservation projects of some endangered phytophilic freshwater fish species in the next future.

Aquascaping represents a part of aquariology.

Aquascaping is the craft of arranging aquatic plants, as well as rocks, stones or driftwood, in an aesthetically pleasing manner within an aquarium in effect, gardening under water. Aquascape designs include a number of distinct styles, including the gardenlike Dutch style applied in experimental tanks from this study.

The technical aspects of aquatic plant maintenance must also be taken into consideration. Many factors must be balanced in the closed system of an aquarium tank to ensure the success of an aquascape. These factors include filtration, maintaining carbon dioxide at levels sufficient to support photosynthesis underwater, substrate and fertilization, lighting, and algae control.

Materials and methods

Biotope elements

- two tanks, 650 l/tank.
- Special light: T5 fluorescent bulb AquaMedic/Plant Grow, 4500 K, 4 × 80 W per tank; metal halide lamp, 5000 k, 3 × 150 W/tank
- Under gravel heater that uniformly covers the bottom tank, 70 W.
- Bottom substrate (with fertile and inert composition too): JBL Manado (that filters and enhances plant grow) and JBL Aquabasis (containing all essential nutrients such as iron, minerals and trace elements).
- Water fertilizations methods and techniques: carbon dioxide injection with pH controller, daily and weekly adding of macronutrients (KNO_3, KH_2PO_4) and micronutrients.
- External filter for mechanical and biological filtration, 2600 l/h recirculation flow.
- Continuously UV-C radiation sterilization.

Biotic components:

- Schooling Fish species
  - *Paracheirodon axelrodi* (Schultz, 1956), Fam. Characidae
  - *Hemigrammus rhodostomus* Ahl, 1924, Fam. Characidae
  - *Hyphessobrycon herbertaxelrodi* Géry, 1961
- Algae eater fish and shrimps species.
  - *Crossocheilus siamensis* (Smith, 1931), fam. Cyprinidae
  - *Gyrinocheilus aymonieri* (Tirant, 1883)
  - *Caridina multidentata* Stimpson, 1860, ord. Decapoda
- Other invertebrate species
- *Atyopsis moluccensis* De Hann, 1849, ord. Decapoda
- *Neocharidina heteropoda* Liang, 2002 ord. Decapoda
- Plant species grown into aquaria are recorded in table 1.

We used for water monitoring and control: a centralized, modular microprocessor for aquariums that includes an USB interface to connect to a PC, as well as a temperature sensor (for water thermoregulation), pH sensor, low range conductivity sensor, ORP (oxidation-reduction potential) sensor.

It was analyzed the level of some chemical water parameters: carbon dioxide, water hardiness (KH), nitrate, phosphate, total iron (weekly) and ammonium/ammonia, dissolved oxygen, alkalinity (periodically) with HACH DR-890 colorimeter.

Tab. 1: Plants species list used during the experiment and main biological features.

Plant species	*Family*	*Location*	*Tank number*	*Lighting requirements*	*Tank placement*	*Water hardiness (°G)*	*pH*	*Water temperature (°C)*	*Can be grown emersed*
Alternanthera reineckii 'liliacina'	Amaranthaceae	South America	1st	Strong lighting	mid-ground	4–8	5.8–7	22–28	yes
Anubias nana var 'nana'	Araceae	Africa	1st, 2nd	low lighting	foreground	4–30	5.5–8	22–28	yes
Bacopa caroliniana	Scrophulariaceae	North America	2nd	strong lighting	mid-ground	4–12	5–8	15–30	yes
Blyxa aubertii	Hydrocharitaceae	Asia	2nd	strong lighting	foreground	4–6	5.5–7.5	22–28	no
Bolbitis heudelotii	Lomariopsidaceae	West Africa	1st	low lighting	mid-ground	4–8	6–7.2	22–27	
Ceratopteris pteriodes	Pteridaceae	tropical	2nd	strong lighting	mid-ground	4–30	6.5–7.5	22–30	
Didiplis diandra	Lythraceae	North America	1st, 2nd	medium lighting	mid-ground	4–8	5.8–7.2	22–28	yes
Eleocharis parvula	Cyperaceae	tropical	1st	strong lighting	foreground	4–8	5.5–7.5	18–25	
Eusteralis stellata	Lamiaceae	South-East Africa	2nd	strong lighting	mid-ground	4–8	5–7.0	22–28	yes
Glossostigma elatinoides	Scrophulariaceae	Australia, New Zealand	2nd	strong lighting	foreground	4–8	5.5–7	15–26	yes
Hemianthus micranthemoides	Scrophulariaceae	North America and West India	1st, 2nd	medium lighting	foreground	4–8	5.8–7.3	22–28	yes
Heteranthera zosterifolia	Pontederiaceae	Central and South America	1st	medium lighting	mid-ground	4–8	6.2–7	22–26	yes
Lilaeopsis novae-zealandiae	Apiaceae	New Zealand	1st	strong lighting	foreground	4–8	4–12	15–26	no
Limnophila aromatica	Scrophulariaceae	South-East Africa	2nd	strong lighting	mid-ground	4–6	6.4–7	22–25	yes
Limnophila sessiliflora	Scrophulariaceae	South-East Africa	2nd	medium lighting	background	4–8	6.5–7	20–25	yes
Ludwigia arcuata	Onagraceae	USA	2nd	strong lighting	mid-ground	4–8	6–7.2	18–25	
Marsilea angustifolia	Marsileaceae	cosmopolitan	1st	medium lighting	foreground	4–8	5.5–6.5	22–28	no
Mayaca fluviatilis	Mayacaceae	Central and South America	1st	medium lighting	mid-ground	4–8	6.2–7	22–28	yes
Microsorium pteropus	Polypodiaceae	South-East Africa	1st, 2nd	medium lighting	mid-ground	4–30	5–8	18–30	
Monosolenium tenerum	Monoseleniaceae	Asia	1st	low lighting	foreground	4–12			yes
Pogostemon helferi	Lamiaceae	Asia	1st	medium lighting	foreground	4–8			yes
Riccia fluitans	Ricciaceae	cosmopolitan	1st	strong lighting		4–12	5.5–7.5	20–30	
Rotala indica	Lythraceae	Asia	1st	strong lighting	mid-ground	4–8	5.8–7	22–26	yes
Rotala macrandra	Lythraceae	Asia	1st	strong lighting	mid-ground	4–12	6–7	22–28	yes
Rotala rotundifolia	Lythraceae	Asia	2nd	medium lighting	background	4–8	5.8–7	22–26	yes
Rotala wallichii	Lythraceae	South-East Africa	1st	medium lighting	background	4–6	5–7	20–26	yes
Vesicularia dubyana (Taxiphyllum barbieri), java moss	Hypnaceae	South-East Africa	1st	medium lighting	background	4–12	6–7.5	22–28	

Results and discussions

In the life-environment unit, the develop of living organisms is limited by the medial factors. A factor has a limiting effect when it reaches too low or too high concentrations and it has an inhibitory effect. The action of these environment factors is expressed by several laws [2].

Several abiotic factors are responsible for photosynthetic capacity of cells plants and the rate of this process directly influences the developing and propagation of the plants.

The light, water temperature and water carbon dioxide content represent ones of the most important factors with limitative effect on the plants physiology and the excess or deficit of one factor inhibits optimal growth plants. Each of these factors acts as limiting only after it has reached the edge of the specific tolerance range. (fig. 1).

Aquarium light. Spectrum features of the light bulbs, color temperature, lighting time.

The design of lighting system was made having in view two criteria:

- Qualitative features of the light bulbs by choosing of a proper light spectrum according to plant photosynthetic demands.
- Quantitative features of light bulbs: the light power and intensity are in concordance with plants demands, tanks dimensions.

The light visible spectrum contains all the spectrum colors (ROGVAIV) between UV-A radiation (<400 nm) and infrared (>700 nm). The wavelengths range of visible light radiation is 380–780 nm and each spectrum color induces a certain effect on aquatic plants. The peaks of the photosynthetic response efficiency are situated on the boundary of red and blue radiations ranges that are mainly absorbed by the aquatic plants (fig.2).

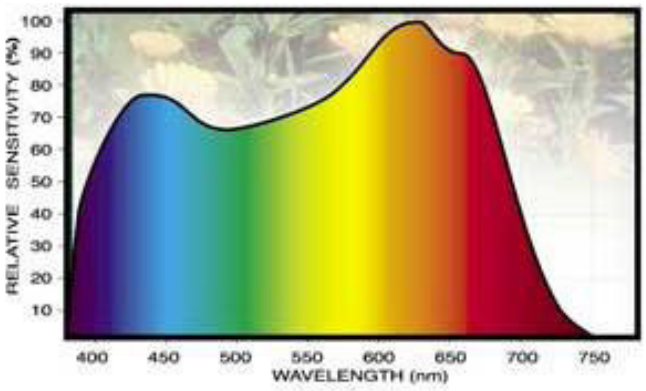


Fig. 1: Photosynthetic response of aquatic plants according to light wavelength

- wavelengths between 400–550 nm with a peak at 420 nm represents the absorption range of blue radiation by chlorophyll a (typical for plants), C2 (typical for algae) and peridinina (the main carotenoid pigment of photosynthetic algae species);
- Wavelengths between 620–700 nm with a peak of 670 nm represent the absorption range of red radiation by chlorophyll a and c2.
- A slope of photosynthetic efficiency curve occurs at 555 nm wavelength (which is the maximum visible point for human eye) typical for green – yellow radiation that is reflected by the plants leaves.
- Blue light is very important for leaves growing and red light promotes flowering and freshwater plants health.

Color temperature represents another qualitative light feature, the value of 6400 k corresponds to a peak of photosynthetic active radiation (typical summer light). Freshwater aquarium plants benefit from lighting with a Kelvin temperature in the range of 5500–6500 degrees.

Light radiation absorption into the water column differed with depth. Red light is the first to be filtered out and can only penetrate a short distance. As light waves penetrate deeper into the water, orange and yellow are lost next. Of all the colors of the spectrum blue light penetrates the deepest.

The light intensity is another important parameter that favors the photosynthesis. The minimum light intensity should be no less than 3,000-lux when it reaches the deepest part of the aquarium The literature mentions that, having in view an optimal light intensity of 10,000–30,000 lx at the aquarium water surface, there is a loss of 69% in a 40 cm water column (Sauer, 1989 quoted by Kasselmann, 2003). Between different light sources, the using of metal halides is proper for freshwaters aquariums due to depth penetration, output, spectrum, very good lumen/watt ratio. The chosen model for our experiments also allows a high percentage of red radiation to reach the substrate, given water depth (52 cm).

Regarding the day lighting time applied during the experiment, we had in view the origin of the plant species: aquatic or marshy ecosystems with tropical and subtropical geographical range up to 30° latitude (tab. 2).

Tab. 2: Day light period according to geographical latitude

Geographic latitude	Day light (hours)
0°	12 constant
10°	11:30 – 12:40 (depending on season)
20°	11:00 – 13:20
30°	10:12 – 14:05

Therefore, the light/dark photoperiod was applied in concordance to this criteria: 12:12/L:D by a gradual daily increasing/decreasing of light intensity (tab. 3) and also a progressive growing of lighting time from 8 to 12 hours/day during the experiment according to balance of abiotic and biotic relationships.

Tab. 3: Lighting time used during the experiment.

Ligting time	Lighting device	
	Aqualine T5 bulb, 4×80 watt	Metal halide Aqualine 3×150 watt
Between 8^{00} – 20^{00}	X	
Between 11^{30} – 16^{00}		X

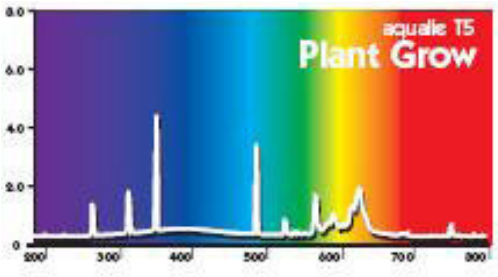


Fig. 2: Bulb light spectrum used during experiment (T5 type, high output)

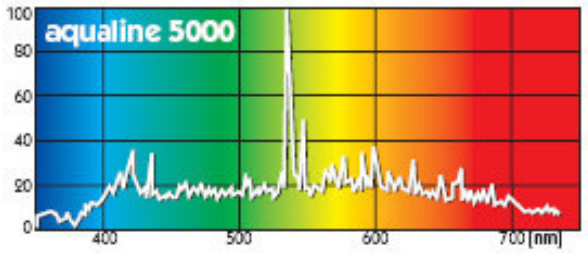


Fig. 3: Metal halid light spectrum (HQI)

The response of different plant species composing the aquarium phytocoenosis was difficult to assess because it is not pursued the effect of a single factor. In addition, beyond ensuring the ecological plants demands in connection with light quantity and quality, the studies have

shown that these plant species are able, within certain limits, to adapt to color light spectrum (chromatic adaptation) due to their assimilatory pigmentation (Kasselmann, 2003) and this process can take several weeks.

However, the observations regarding the plants growing rate, leaves integrity, pigmentation system development (e.g. enhancement of brown and red coloring agents carotenoids) was made in order to assess the effect of light quantity and quality, daily and seasonally photoperiod on plants physiology. But many other factors (that partially will be discussed below) act on the plants photosynthesis, that's why this assumption may raise controversy and it was not treated exclusively.

A poor light leads to the deficient plants growing, increased internodes length or leaves decomposition.

Carbon dioxide content, alkalinity, water hardiness.

The carbon represents a vital element for the nutrition of higher plants. The aquatic plants allow their carbon requirements from the different inorganic carbon compounds in water (CO_2 – carbon dioxide, H_2CO_3 – carbonic acid, HCO^-_3 – hydrogen carbonate, CO_3^{2-} – carbonation, $Ca(HCO_3)^2$ – calcium hydrogen carbonate).

Carbon dioxide which transforms to carbonic acid by combining with water constitutes one of the most essential nutrients for the plants photosynthesis and this is extracted from the water through the plants assimilation process. As soon as the carbon dioxide in the water has been exhausted, the plants will behave very differently. Whereas in some species growth will cease, other aquatic plants are able to also assimilate and utilize the hydrogen carbonate ions (biogenic decalcification) and this is the case of aquatic tropical plants species that populate natural habitats with calcium – rich water and an alkaline pH value. We have in view some future studies for 'building' of these kind of phytocoenosis in order to obtain a good enrichment environment for ex-situ conservation of *Scardinius racovitzai,* a critically endangered fish from Petea thermal ecosystem.

The plants origin used during the present experiments live in weak acid, calcium and salt deficient water which contains an enough supply of free carbon dioxide and carbonic acid. Most of them have an extreme dependency on this gas and they are not or are only to a limited degree, able to extract hydrogen carbonate from the water. For their photosynthesis efficiency, an enough supply of carbon dioxide, above all, is essential in the aquarium because the CO_2 content. A small installation (with CO_2 reusable cylinder, solenoid valve, counter bubble, water/gas reactor, pH controller) allows an additional and optimum CO_2 supply and maintains the pH value between 6.5 – 6.55.

For the plants growing in aquariums, not only the relationship between pH value and carbon dioxide content is important but also the connection between carbonate hardness (also referred to as alkalinity or acid-binding capability) and carbon dioxide. The higher carbonate hardness the more carbon dioxide is required to maintain de the calcium hydrogen carbonate in soluble form, in other words to prevent the precipitation of lime. That's way we use a RO filtration apparatus in order to remove the mostly high carbonate hardness from tap water. Aquarium water with a low KH has decreased pH stability. Our target is to have a basic water source with a KH between 3–5^{0}G and we obtain good results in plants and fish welfare.

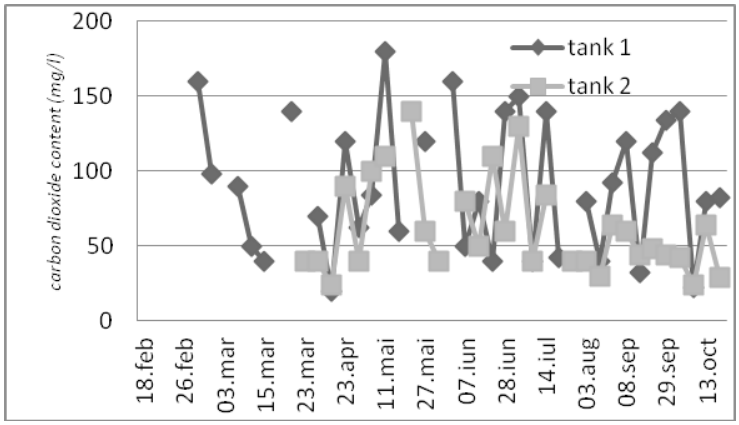


Fig. 4: The carbon dioxide content from water during the experiment.

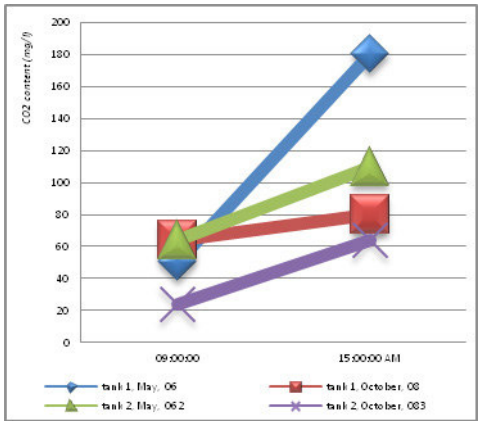


Fig. 5: The daily carbon dioxide content dynamic (mg CO2/l)

Alkalinity is another important chemical water parameter for planted aquarium keeping.

Alkalinity actually represents a carbon dioxide "reservoir" for plants and it has been linked to a "bicarbonate battery" that stores CO_2. During the day, plants draw on the "battery" and deplete the water of bicarbonates. Alkalinity goes down. At night, though, the "battery" is "recharged" with fresh CO_2 from the respiration of plants, fish and bacteria. Alkalinity goes back up.

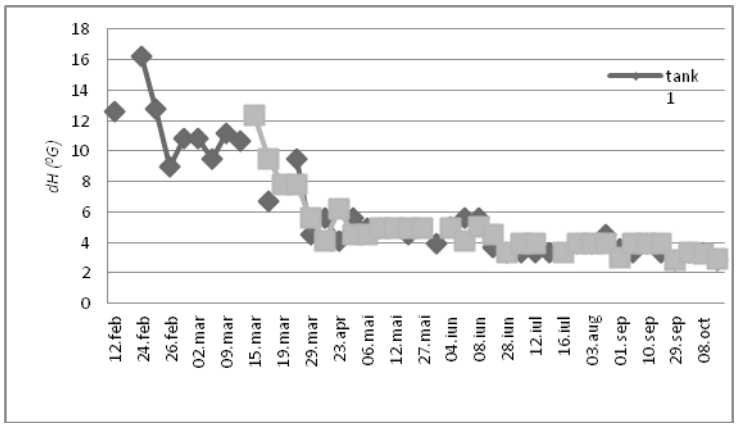


Fig. 6: The Carbonate hardness (dH) dynamic during the experimental period

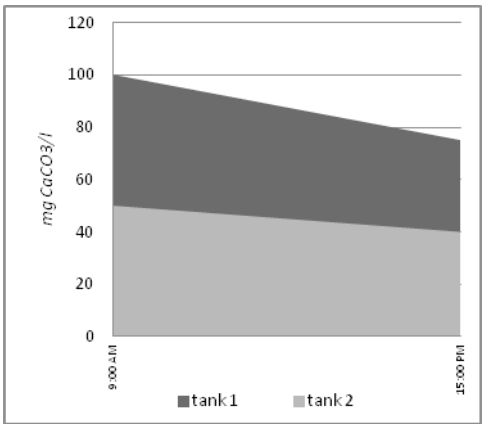


Fig. 7: The daily alkalinity dynamic (mg CaCO3/l)

Temperature effect.

Keeping an optimum and constant level of water temperature corresponding to plants and animals ecological requirements is another important way that has a decisive influence on plant metabolism, its growing and development.

The target temperature range, between 23.9 – 25.8^{0}C constitutes an optimum level for the all vegetable species chosen for our experiments.

There is a moderate difference in temperature between day and night that is conducive to plant growing (a gap of 1.70^{0}C).

At the same time, considering a number of maintained aquarium plants from temperate and subtropical zone, we induce a reducing of maximum water temperature during winter by 10C.

However, the effect of water temperature on the plants physiology is strongly interconnected with other limitative factors, light and CO2 content especially (fig. 8).

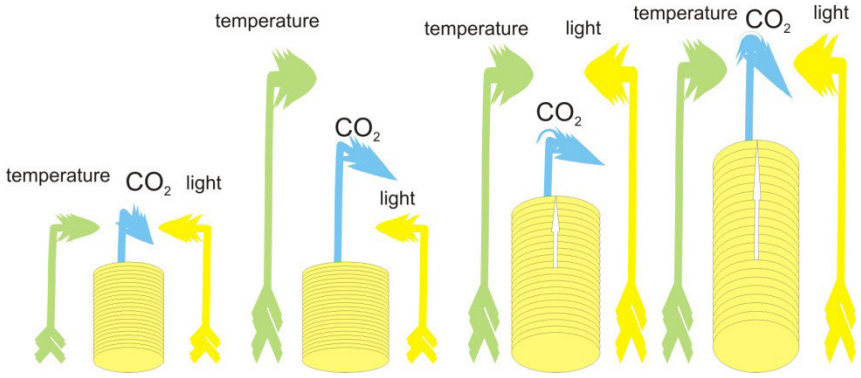


Fig. 8: The cumulative effect of temperature, light and CO2 content on plants growing. Various combinations of factors with different levels lead to different rate of plants growing.

The aquarium substrate: chosen type, the nutrients content, convection waves.

The cultivated aquarium plants are both submerged species and marsh adapted species.

In the first group, nutrient absorption occurs through the root system as well as through the leaves surface area, their root system has a mainly fixing role. In contrast to this, the marsh plants develop a strong root system that extracts most of their nutrients demands from the substrate. That why, a special nutrient enriched substrate and a mathematical methods of water fertilization are essential for good results in plants growing.

The aquarium plants originate from tropical and subtropical areas where there is a big diversity of the soils but the laterite-containing substrates (red soils) are typical. These kinds of soils are identifiable by their red color and are poor in nutrient content, rich in iron/aluminum oxide, a pH value within the acid to neutral range. The rapid mineralization of the organic matter as well as the generally low water conductivity promotes quickly absorption of the released nutrients by the plants.

The plants species from these ecosystems with weak acid to neutral soils are ecologically stenotopes having a reduced adaptive potential to the aquarium water pH and hardiness. In contrast, the plants species from typical aquatic living environments with alkaline soils (such are the great African lakes) display a large tolerance range and they can easily be cultivated into aquarium.

Having in view these considerations regarding the aquatic soils types from tropical and subtropical areas, the following features of the aquarium substrates were allowed in building of aquarium environment:

- Low or null content of decomposable matter (e.g. humic acids).
- Weak acid substrate.
- The lower substrate layer is a clay type enriched with essential nutrients such as iron, minerals and trace elements that are gradually released to the plants.
- The upper substrate layer has a dark color (allowing the heat absorption generated by light bulbs), coarse grained structure and low density (with an important role in the water and nutrients circulation, substrate aeration, adsorption of excess nutrients, allows a large colonization area for pollutant-adsorbing bacteria and favors negative phototropism of plants root system).
- A good aerated substrate guarantees an optimum rate of microbiological processes that develop at this level.

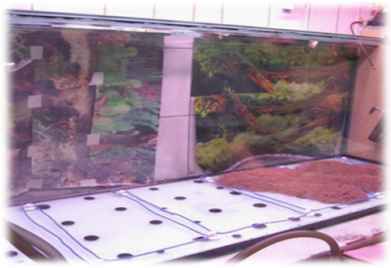


Fig. 9: Experimental aquarium with under gravel heater.

- Using of an undergravel heater integrates the substrate into the aquarium matter and energy flow by the way of convection (vertical) waves induction through it, similarly to mechanisms from natural aquatic ecosystems that allow a constant rate of nutrients supplying to root system, a solubilization of nutrients that are more accessible for plants.
  A constant and optimum temperature through the substrate is conducive to biochemical reactions that also supply nutrients avoiding the organic and toxic gases storages that could affect the aquarium balance. The inducing of convection waves is also conducive to substrate leaching by the inhibitory allelochemicals.

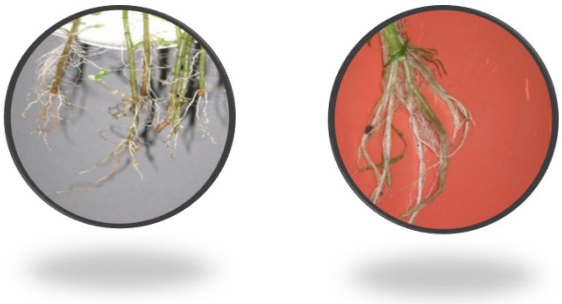


Fig. 10: Roots of two aquarium species (Bacopa caroliniana, left and Limnophila aromatic, right) with a healthy growing through the well aerated substrate.

So, importance of substrate as artificial ecosystem ecological factor was not neglected while a daily supplying with liquid macro- and micronutrients was applied in order to stimulate plants growing as a main way of inhibition and control of algae spreading. Trace elements: iron, potassium, calcium, magnesium, zinc, copper, manganese, molybdenum are weekly added in aquarium in favorable combination and plant-available form (chelated form, oxidizing protected and easily assimilated by plants). The micronutrients as non-chelated form are daily added in aquarium and quickly take up by plants otherwise they are unstable and its transform in unavailable plant-compound.

Macronutrients: nitrogen, phosphorus and potassium are daily supplied as KNO3 and KH2PO4 solutions (1ppm nitrate/day and 0.1 ppm phosphate/day respectively). We weekly measured the nitrate, iron and phosphate levels in order to maintain the target concentrations.

Tab. 4: Target macronutrients and iron concentrations during start-up and maturation of artificial ecosystem (ppm)

Nutrient	NO_3^- (ppm)	PO_4^- (ppm)	Fe (ppm)
Target inițial	5	0,5	0,1
Target intermediar	10	0,1	0,2
Target final	15	1,5	0,20 – 0,5

It was not noticed morphological modifications of plants duo to ions deficiencies.

Tab. 5: Some of the minerals required by plants and their function (Walstad, 1999)

Element	Nutrient form	Major function in plant
Carbon	CO_2, HCO_3^-	Structural component of all organic compounds
Calcium	Ca^{2+}	Emzyme activator, intracellular „secondary messenger", essential for cell membrane permeability and cell wall structure.
Iron	Fe^{2+}, Fe^{3+}	Component of enzymes for electron transport and other oxidation-reduction reactions.
Potassium	K^+	Enzyme activator, charge balance.
Nitrogen	NH_3, NH_4^+, NO_2^-, NO_3^-	Component of proteins, nucleic acids etc.
Phosphorus	PO_4^{3-}	Component of ATP, NADP, nucleic acids, membrane phospholipids.

Iron and magnesium deficiency induces leaves discoloration (chlorosis).

Bacterial processes. Nitrogen flow and nitrification. There are several microbiological processes that occur in aquatic ecosystems.

The aquarium is an artificial environment where we apply various methods and techniques and the bacterial metabolism depends on specific nutrients storage and it places between certain limits. But the beneficial action of these processes – that cannot all be assessed by usual methods – observes as the physical, biological and chemical balance stabilizes.

Heterotrophic bacteria met into an aquarium closed system use the organic matter as energy source while the chemoautotrophic bacteria use the inorganic substance. The most of the organisms use the oxygen to accept electron for their respiration.

Among the microbiological processes that occur in natural aquatic ecosystems (hydrogen sulfide or methane oxidizing, aerobe and anaerobe decomposition, anaerobe reducing of manganese, iron or sulphate ions, denitrification etc) two of them have a significantly development into an aquarium artificial ecosystem: aerobe decomposition of organic matter and nitrification.

Nitrification reactions are a part of aquatic natural nitrogen flow:

$$NH4^+ \xrightarrow[\text{Nitrosomonas sp}]{\text{oxigen}} NO_2^- \xrightarrow[\text{Nitrobacter sp}]{\text{oxigen}} NO_3^-$$

The toxic ammonia is transformed into a less toxic nitrate ion under the presence of bacteria and aerobe environment. The biological external filter is special built to fix the nitrification bacteria. Bu also the plants have a significant contribution to biological filtration of water, they take up the ammonium first and then the nitrate. Ammonium and nitrite levels decreased after the aquarium system start up as the ecological balance stabilizes.

The fig. 11 and 12 show the dynamics of ammonium and nitrite concentrations during the experiments. The ammonium level tends to 0 while the nitrite remains in water (even traces, at safe level for fish and invertebrates) that proves an imbalance between nitrification bacteria populations from the external filter probably caused by variable supplying of nutrients that are used by other competing biological processes or removed by maintenance operations, absolutely necessary to control organic matter, allelochemicals or nitrate level.

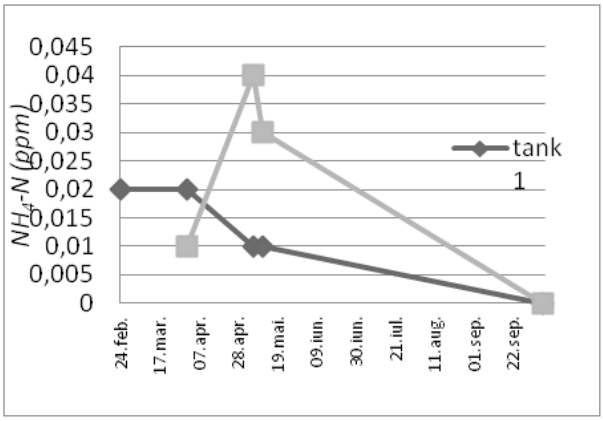


Fig. 11: The ammonium level dynamic during the experiments (ppm)

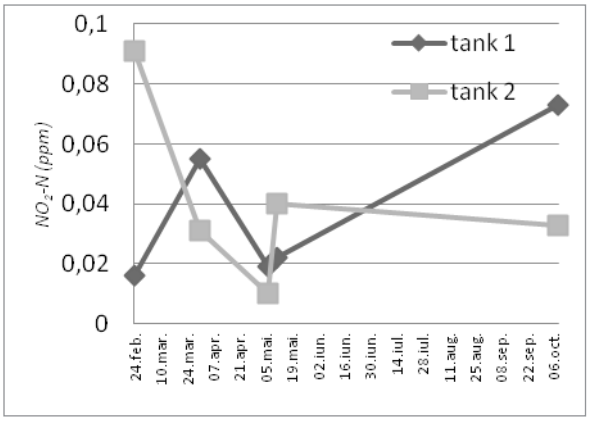


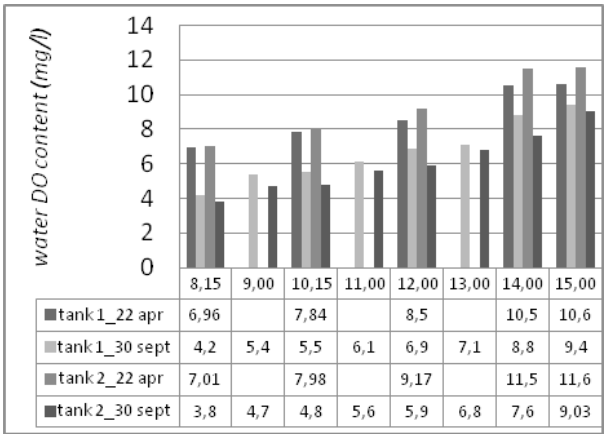
Fig. 12: The nitrite level dynamic during the experiments (ppm)

The importance of oxygen and oxidation-reduction potential.

The oxygen has undoubtedly an important function in aquatic ecosystem and there is a strong relationship between the oxygen producers and the consumers, past including animals, microorganisms and plants not least during the dark phase of their metabolism.

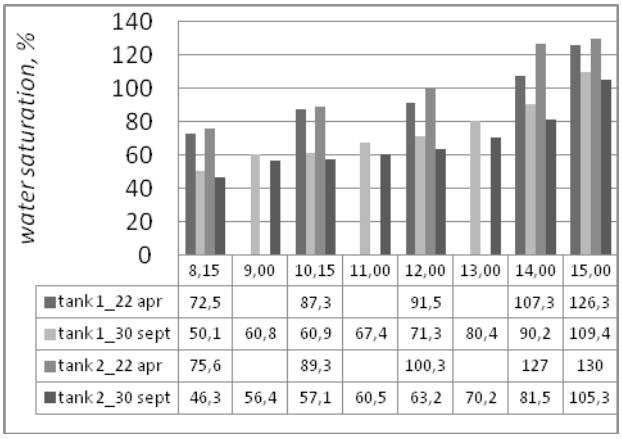
The dissolved oxygen demands of aquatic organisms and the respiration intensity increase with water temperature and water saturation in dissolved oxygen (DO) also depends on temperature.

The figures below show the dynamics of water dissolved oxygen content and oxygen saturation during the experiments. The results are in concordance with the mechanisms from natural densely planted aquatic environment from tropical and subtropical areas where DO content records values between 4 – 14 ppm with frequently exceeding of saturation point. A water saturation level between 70 – 130% represents an optimum range.



	8,15	9,00	10,15	11,00	12,00	13,00	14,00	15,00
tank 1_22 apr	6,96		7,84		8,5		10,5	10,6
tank 1_30 sept	4,2	5,4	5,5	6,1	6,9	7,1	8,8	9,4
tank 2_22 apr	7,01		7,98		9,17		11,5	11,6
tank 2_30 sept	3,8	4,7	4,8	5,6	5,9	6,8	7,6	9,03

Fig. 13: Diurnal variation of water DO content (ppm)



	8,15	9,00	10,15	11,00	12,00	13,00	14,00	15,00
tank 1_22 apr	72,5		87,3		91,5		107,3	126,3
tank 1_30 sept	50,1	60,8	60,9	67,4	71,3	80,4	90,2	109,4
tank 2_22 apr	75,6		89,3		100,3		127	130
tank 2_30 sept	46,3	56,4	57,1	60,5	63,2	70,2	81,5	105,3

Fig. 14: Diurnal variation of water DO saturation (%)

As the DO consumers and biological processes DO consuming increase due to biological reactions, the DO water content during morning significantly decreases and increases during evening as result of plants photosynthesis.

There are controversial opinions regarding the optimum DO content for plants growing.

Krausse and others (1990) quoted by Kasselmann (2003) refers to negative impact of high DO content (bigger as 4–5 ppm) on nutrients level from water and plants growing rate; he sustains this opinion by frequently depletion of DO content below 3.5–5.5ppm from tropical

basins with lush populations of aquatic plants as result of outflow of groundwater with high nutrients supply but nearly oxygen-free.

A detailed analysis of our results and other scientific references do not confirm the above theory:

- The respiratory intensity of higher aquatic plants increases when the DO content tends to saturation limit (Gessner, 1959 quoted by Kasselmann, 2003) and also the aeration of the substrate acts as limiting factor on the respiration of the roots. The respiratory processes represent an indicator of plant metabolism and its growing rate.
- The aquatic biocoenosis from tropical area are characterized by a large range of dissolved oxygen content, 4–14 mg/l frequently tending over saturation limit.
- During the dark phase of their metabolism, the aquatic plants use the dissolved oxygen for photosynthesis and an optimum content of oxygen has a positive effect especially on the fast-growing plants species that can be considered an indicator of a good balanced environment from the physical, bio-chemical point of view.
- It can be considered as optimum a saturation level between 70–130%.
- An optimum content of dissolved oxygen could also have an inhibitory effect on blue-green algae developing (Kasselmann, 2003). Into an aquarium with an optimum nutrient supply rate and high amount of light, the algae blossom is one of the risk factor that can inhibit the plants growing.
- The oxygen is important for both heterotrophic and chemoautotrophic bacteria that use the atom as electron acceptor for respiration.

The oxidation reduction potential (ORP) depends on DO water content but also several factors determine a certain level of ORP value. The intensity of redox processes from water is a measure of a well balanced and healthy aquatic environment.

A value of 700 – 800 mV shows an oxidized environment (strong oxidizing agents that can withdraw electrons from bacteria killing them, are ozone, chlorine, chloramine and hydrogen peroxide) while a redox of – 250 ÷ - 350 mV is typical for reduced water (reducing agents such as magnesium, calcium, sodium or organic matter readily donats its electrons to oxygen radicals and blocks interaction of the active oxygen with various molecules). The substances that have the ability to counteract active oxygen by supplying electrons are called scavengers. The photosynthesis involves oxidation and reduction both and our redox potential dynamic measured into experimental tanks is influenced by the optimum level of this biological process, organic matter mineralization and all biochemical reaction from water, weak acid pH, UV-C radiation (that has sterilization effect but also acts in the same way as ozone), addition of new minerals (fertilization) or partially water change (with new ions supplying and electrolytes balancing).

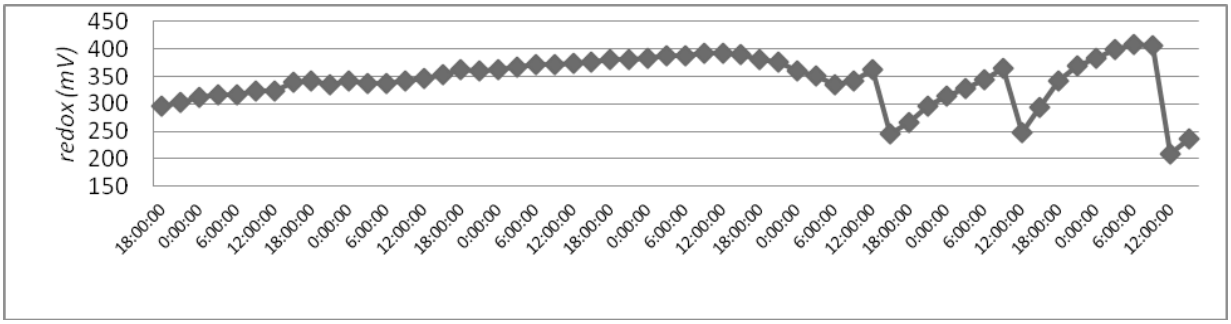


Fig. 15: The water oxidation reduction potential (mV) during aquarium set up (first stage of artificial ecosystem start-up)

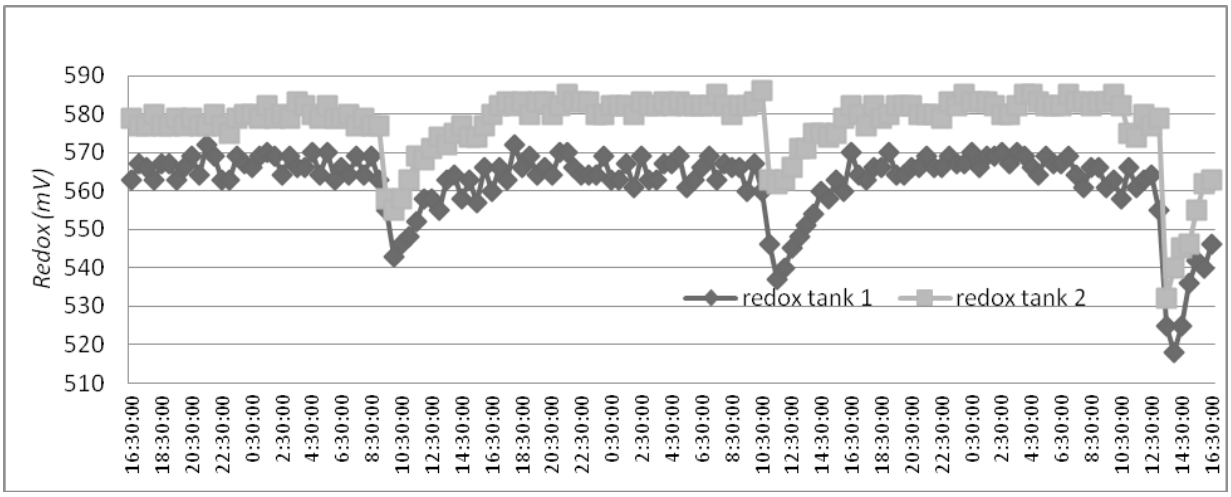


Fig. 16: The day-night dynamic of ORP (mV) after 7 months from the tanks start-up.

An optimum level of redox potential has a positive effect on fish respiration and osmoregulation, immunity and general health status. The recorded high values of water ORP from the experimental tanks indicate a low organic matter loading as result of proper mechanical filtration and high rate of mineralization reactions.

Conclusions

- No morphological changes in plants were observed due to mineral deficiency (leaves discoloration).
- Algae development at the beginning of the experimental period was immediately inhibited by competition induced with the adaptive response of fast-growing plants species *Heteranthera zosteripholia, Limnophila sessiliflora, Bacopa caroliniana, Ceratopteris pteriodes*.
- There is a complex of limiting ecological factors with strong interrelationships that influences adaptation and survival of plants and animals. As this factors system tends to ecological pessimum point, the strength of living organisms decreases.
- There are various combinations of analyzed ecological factors that can produce similar effects due to their ability to substitute each other. Therefore it is difficult to find an unitary pattern of ecological factors acting on vegetal association from the tanks and growing difficulties of plant species such as *Alternanthera reineckii* or *Rotala macrandra* (high demanding species) still remain under study.

BIBLIOGRAPHY

1. Kasselmann, C., 2003, *Aquarium plants*, Krieger Publ. Comp., USA.
2. Stugren, B., 1982, *Bazele Ecologiei Generale*, Edit. șt. și encicloped., București: 24 – 31.
3. Walstad, D., 1999, *Ecology of planted aquarium*, Echinodorus Publish., 193 pp.
4. Wurts, W. A., Durborow, R. M., 1992, *Interactions of pH, Carbon Dioxide, Alkalinity and Hardness in Fish Ponds Southern*, SRAC publications: 464.

AQUASCAPING – INSTRUMENT PERFORMANT DE ÎMBOGĂȚIRE MEDIALĂ A ACVARIILOR. CONSIDERAȚII PRELIMINARE PRIVIND PROIECTAREA SI FUNCȚIONAREA SISTEMELOR ÎNCHISE DE ACVARII DENS PLANTATE: MODEL EXPERIMENTAL PENTRU CONSERVAREA EX-SITU A SPECIILOR FITOFILE DE PEȘTI

(Rezumat)

În prezent, acvariile publice din lume au un rol tot mai bine definit în programele privind *conservarea ex-situ sau/și in-situ* a diferitelor organisme acvatice cu diferite grade de periclitare.

Aquascaping este un capitol al acvaristicii în care biotopurile sau asociațiile vegetale acvatice reprezintă punctul focal contribuind la construcția unor ecosisteme acvatice artificiale cu rol important asupra bunăstării animalelor din colecția de animale menținută în acvariu.

Dintr-o mare varietate de posibilități de punere în spațiu a unui acvariu de aquascaping (tehnicile olandeză începută încă din 1930, precum și cea japoneză fiind recunoscute în domeniu), în lucrarea de față ne-am propus modelul olandez și respectiv reproducerea unor elemente naturale de biotop și biocenoze acvatice în strânsă interdependență în vederea obținerii unui sistem stabil.

Asociațiile vegetale sunt alcătuite în funcție de cerințele ecologice, similare ale speciilor (în special în privința factorilor hidro-chimici limitativi: duritate, pH, temperatură), fiind depășite barierele geografice ale zonelor de proveniență. Aceleași caracteristici abiotice dar și spectrul trofic (și mai ales rolul în combaterea algelor, unul din factorii critici în menținerea unui acvariu plantat) al diferitelor specii de nevertebrate și pești au fost avute în vedere în realizarea compoziției subacvatice.

Studiul urmărește evoluția unui astfel de sistem închis prin intermediul monitorizării și controlului parametrilor hidro-chimici în strânsă concordanță cu parametrii bioproductivi ai plantelor acvatice, starea sanitară a animalelor. Un aspect important și interesant în ecologia organismelor acvatice, respectiv interacțiile alelopatice dintre plante, alge, bacterii, nevertebrate și pești ramâne deschis.

THE USE OF NATURAL SHELTERS BY THREE DORMICE SPECIES IN TRANSYLVANIAN PLATEAU, ROMANIA

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Abstract: There have been presented the results of the research done between 2008 – 2010 concerning the manner in which the three species of dormice use natural shelters in deciduous forests from Transylvanian Plateau, Tarnave area. The nests of the dormice are placed in hollows, fat dormouse and forest dormouse preferring those chopped in oaks. Common dormouse builds round shaped arboreal nests, placed in shrubs near branche joints, at a medium height of 60 cm. The dormice make a selection of the habitat, being often encountered in the forests which have shrubs of different ages, with a rich arboreal stratum, which provides food through the year active life. Common dormouse is most often met in the arbustive level of the oak forests, which are coppiced from time to time, and forest dormouse in forests with old trees and numerous species of shrubs, while fat dormouse has a preference for high canopy tree forests which allow it to move better. The material used in making round shape nests by the common dormouse are the leaves of the shrub which they inhabit, to which it adds a great variety of soft materials.

Keywords: tree hollow, arboreal nests, undergrowth.

Introduction

In Romania, there have been reported four species of dormouse: common dormouse, *Muscardinus avellanarius* (Linnaeus, 1758), fat dormouse, *Glis glis* (Linnaeus, 1766), garden dormouse, *Eliomys quercinus* (Linnaeus, 1766), and forest dormouse, *Dryomys nitedula* (Pallas, 1778). Data come from different periods of time and it wasn't possible a systematic research of the whole territory, so in the meantime, some populations might have disappeared, ex. garden dormouse populations. Most data also come from more accessible areas: hills and low mountains. In the Carpathians, the data comes mainly from sites located in valleys or in protected areas, ex. national parks. Consequently, large areas of the Carpathian Mountains, covered with vast forests, have yet to be investigated. After analyzing the data, we believe that the fat dormouse is well spread in hilly areas and sub-Carpathian as shown by Sevianu [15], as well as the common dormouse [4], The forest dormouse, although spread everywhere, forms small isolated populations in some places, for example, forests from Dobrudja [12]. Garden dormouse, although previously reported in several villages belonging to the Carpathians and the hilly area of southern Romania [18, 2], has not been found presently, the last certain spotting occurring from over 25 years ago in the province of Oltenia [10]. In the Romanian Plain and the Western Plain (Pannonian) as in Dobrudja steppe, where forests are scarce, these animals have been reported only sporadically [11].

The question we ask ourselves: Is there a preference of dormouse in choosing the habitat? And if so, what determines this? We were also interested in the relation between different types of shelter/ housing natural that use each of the three species.

Our paper focuses on the personal data collected during three years 2008–2010 in Târnavelor Plateau, an area with hills of medium height 400–800 m, at the heart of Transylvania, central province of Romania, with a plateau aspect, filled with some earlier observations.

Materials and methods:

We see that the presence of dormice in deciduous forests from the Târnavelor Plateau is influenced by: the type of habitat, age composition of forest trees, solar exhibition and isolation of human settlements and human activities in the forest, for example – forest management and grazing. Dormice preferred forest habitats vary from species to species. Juškaitis & Šiožinytė (2003) have shown that common dormouse prefer young forests, understorey, resulting from coppiced. Rather than, fat dormouse prefers mature forests, with a high and continuous canopy. In the north of Europe, the dormice can be usually found in mixed forests as Juškaitis [5] pointed out, or even in coniferous forest. In Romania as well, big dormice can be found in coniferous forests, in Carpathian Mountains and forest dormouse in more arid forests of turkey oak and downy oak from South West territory, as Duma [1] pointed out. Hecker et al. [3] have shown that in Hungary the forest dormouse appeared very often in the vegetation types of arid character like sessile and turkey oak and also usually it appeared in common oak. The same, in Transylvania, forest dormouse prefer driest and multi-storey tree forests, together with a variety of trees and shrubs.

How can we know if in the forest living dormice? Besides usual methods such as to place the nest-boxes, in trees, at a variable height average of 1.5–4 m, and Sherman traps on the ground or on tree branches, looking bone debris night raptors (analysis of owl pellets), looking specifically gnawed hazelnuts, etc..., we are looking for natural nests placed in different natural shelters/abodes. These could be: tree hollows, arboreal nests in bracken of bushes, tangled wild clematis strings, and special shelters: under tree stumps, gaps behind old tree bark that exfoliate, nourisher for deer, in the buildings located within or forest edge, etc.

Natural hollows are preferred by all three species of dormice [16, 13, 14].

Pat Morris [9], have shown also that tree holes may be the main natural nests used by dormice, not the nest built for themselves. However, edible dormouse is the one which dwells there with predilection. Therefore, the species is present in old forests, natural, or the multi-year, secondary, but composed of different age trees.

Natural forests are very rare, and small area in the Târnavelor Plateau, which is a relatively well-populated area, so I looked for hollows in forests, composed of trees of different ages.

Here, there is even competition between the fat dormouse and forest dormouse in filling these shelters. Common dormouse uses hollows in young tree, with small diameter of the trunk, or small hollows of mature trees and behind old tree bark that exfoliate.

They took out the following habitat variables of trees hollows: the species of tree, tree trunk diameter, the state of vegetation shaft, height above ground in hollow entry, gallery type, horizontal or vertical: most are vertical, the degree of sunshine: sunny areas, forest edges or ridges of hills, along the forest roads, distance from forest edge and clearings: small, generally, marks: the presence of ammonia odor, the presence of droppings on the entry or on the base of the tree, the presence of hairs of fur flying around entry insects (flies in general).

Hollows in mature oaks occupied by edible dormouse. Moreover some authors as Juškaitis [5] show that wide canopies of oak-trees create good connections with canopies of other trees for

arboreal movement by dormice and forest stands with hollow trees should be preferred by fat dormouse. Since these trees are rare in secondary forests, most nests are found in trees with a diameter of less than 80 cm, in general attacked by fungi.

In rotten wood of trees trunk develops insect larvae and then woodpeckers each year excavate a new hole (by both parents) that create and submit nest eggs. Over time these holes become the natural shelters for dormice and birds. Natural evolution is towards increasing the diameter of hole with the dying tree and gradually infiltrating rainwater, leading to leave the shelters. But not all shelters are arranged in holes excavated by woodpeckers. Some are natural hollows resulting from drying of twigs, so the rot spreads to the trunk. Gradually forming a cavity whose entrance is enlarged by woodpeckers or even dormice.

Results and discussions

There have been found 39 hollows and holes occupied by dormice, most in the West and South of the territory (the number of hollows is obviously higher, those occupied representing about 1/4). Of the total, some of the hollows/hole were abandoned, at the entrance there were spider nets, or were occupied by bats, moth, insects such as wasps, social hornets, or ants. Most hollows were occupied permanently by dormice in summer – it provides great comfort. Their position was recorded using a GPS.

Report on the species of trees show as that many nests were built by dormice inside oak hollows (Fig. 1)

For the fat dormouse, it is obvious that the species used mainly hollows of oaks (Fig. 2), a tree which is widely used by woodpeckers in excavating holes used for nesting. The other two species are simpatrice rarely fail to use large hollows and small hollows are formed in other essences (Fig. 3 & 4). Common dormouse prefers to build their arboreal nest and the forest dormouse prefers underground shelters; many animals are caught in traps placed on the ground in young forests with high understorey, apparently devoid of hollows. Forest dormouse moves on the ground looking for animal feed.

Height which is hollow tree, from ground level is different. The average is 143 cm.

50% of hollows are placed under one meter of soil, 31.25% are between one and two meters, and 18.75% are over two meters. Of the 32 hollows in which we have data, the highest was 5 m in a 1.2m diameter oak, is occupied by a family of forest dormouse. There could not be verified hollows located at a height, although it is known that most woodpeckers, for example, great spotted-woodpecker, middle spotted woodpecker and green woodpecker excavate their nest holes at a height of less than 2 m. This fact to believe that the number of hollows is much higher than the one checked! To that effect, Pat Morris (2011) has shown that radio tracking also revealed that over 70 % of the natural nests of common dormouse were more than three meters above the ground.

Arboreal nests built in bracken of bushes of common dormouse. We founded 27 arboreal nests in the last three years, some with dormice, others empty. Most of them can be seen in August, when they become visible, but these are deserted en masse by the end of September or early October, after the first cold rains. In mid-October there are no longer nesting animals. No nests were collected while the animals were there.

Many arboreal nests were found in the hornbeam shrubs, and in maples, oaks and blackthorns, representing over 60% of the total (Fig. 5). The remaining nests – one in various other plants, is uncommon to build nests there. Nests are located at an average height of 60 cm above ground! We have generally inspected the stratum of the shrubs and tall grassy plants from the

interior of mature forests with coppiced canopy. Duma [1], shows that common dormice from SW of Romania build their arboreal at a height comprised between 0.6 and 1.5 meters, 68 % but the majority of the nests have been found in blackthorn trees which form in agricultural fields. Different types of arboreal nests for the common dormouse (Fig. 6)

Amongst the bracken (the fork of branches) and to be very well hidden – the vegetation consists of climbing plants around, and tendril and bramble, or twigs supporting the nest are very numerous, rich in leaves (Fig. 7 & 8).

What did they use in their construction: the leaves of plants that are nearby, especially those on the plant which is located the nest. Hanna Zaytseva [19] have shown that the leaves constituted the greatest part of the nest material 62% in Ukraina. Some other authors show that the leaves are constantly used to build arboreal nests from nest boxes, such as oak in Moldavia [7], beech in Ukrain [17], hazel in Great Britain [8]. Common dormouse usually uses the leaves of a single species of arbor to which it adds in small proportions herbal leaves, moss, tree bark, and internal chamber is built from very soft materials such as animal hair, feathers, feathery pappus of different Cirsium, etc. There are more elaborate than in nest-boxes.

The presence of dormice populations in Târnavelor plateau is directly related to the type of forest habitat. Wood and age composition of the forest trees are the most important factors involved. Regarding the age composition of forest trees, populations are more numerous in the multi-year forests (consisting of trees of different ages), where forest management is not hard. Natural forests are rare inside Târnavelor Plateau, but secondary/quite natural forests, resulting from natural regeneration following their coppiced (cutting bushes, for example: hazel, hornbeam, that are used for fire, and still stand mature). The forest takes on a youthful appearance. The solar exhibition is important for all species of dormice, but especially in the case of common dormouse, because all the arboreal nests have been found in places which could be heated at least few hours per day.

Forest habitat types found in the Târnavelor Plateau (according to the classification system NATURA 2000) are the following:

91IO* Euro-Siberian steppic woods with *Quercus* spp. Sessile oak, oak, ash, lime, cherry – form the upper (canoppy). Common maple, tatar maple, wild apple and wild pear – form the second floor. Schrub level is very rich, for example: hazel, common hawthorn, cornelian cherry, herbal and undergrowth are well developed.

91YO*Dacian oak & hornbeam forests. **S**essile oak, oak, lime, norway maple, beech – form the upper (canopy). Hornbeam and common maple – form the second floor. Coverage is 80–90%. Shrub layer is poorly developed due to shading made of hornbeam, and the herbaceous undergrowth and is also poorly.

Both types of forests are generally present in the western plateau. It is characterized by small areas, often isolated from each other or connected by natural blackthorn bushes, hip, separating crops, or woody vegetation accompanying the valleys. It allows migration of animals from one forest to another.

The first two types of forest habitats are favorable to existence of all three species and the forest dormouse is often encountered, used to move the second floor of.

91G0* Pannonic woods with sessile oak and hornbeam. Sessile oak, beech, cherry, lime – form the canoppy. Hornbeam, common maple, wild apple, wild pear – form the second floor. The bushes are variable and developed differently, depending on the shade. The coverage is about 80–100%. They can be found more in the South of the plateau where the hills are taller, up to

600 m and higher moisture (similar to the previous one, only more shady, due to the increase in the frequency of hornbeam).

9130* Asperulo-Fagetum beech forests. Beech with little hornbeam, little sessile oak,cherry, sycamore, elm, ash – form the upper level (canopy). The coverage is 80–100%. The second layer is generally missing, while the shrub and grassy is underdeveloped as a rule. It is present in South-eastern plateau, where the hills reach 700 m or more. In this type of forest habitat there do not develop the second floor of trees because the beech is a powerful shading and all the trees of other species are as tall as the beech. In the first three types of habitats, oak allows for the existence of a second layer of trees. There is a phenomenon of invasion of beech and hornbeam, which replace natural oak forests. There are forests with an intense forest management. Here, fat dormouse is very well spread and common dormouse appears only at the edge of the forests or where the forest has been cleared or coppiced.

91HO * Pannonian woods with downy oak**.** The canopy, are formed by pubescent oak, oak, tatar maple, wild pear**,** achieved coverage of 40–60% in the woods, and heights of 6–12 m in 100 years. Sometimes canopy is rennet**.** Bushes grow in clumps layer, alternating with steppe grasslands. Shrub layer consists of corn, carp, hazel, hawthorn, etc. Herbaceous layer is well developed, the plants grow on steep slopes, exposed to sun, adjacent bushes. Usually present in southern and western plateau with other woods. There is fat dormouse as well as common dormouse but their number is small, only 1–3 individuals / ha.

40A0 * Subcontinental peri-Pannonic scrub. Blackthorn and hawthorn bushes with dense coverage of 100%, it highlights the sometimes arboreal layer, consisting of acacia and wild hair, and one composed of blackberry undergrowth. Lianes as tendril are more common. It is found near forests in dry areas, and between crops. Common dormouse is often present, and the other two species, we suppose they use this habitat to migrate from one forest to another.

Thermophilous forests of western area allow the existence of three simpatric species, common dormouse, fat dormouse and forest dormouse.

Influence of forest management on forest look is very important for the presence of dormice. In old oak forest, hollows are present, there understorey result after coppiced in the form of GPS (cracks), so the habitat is good for the common dormouse jointly, but there are two other species. In some case undergrowth but with pre-existing trees, shrub layer is well developed yet, there are hollows and bushes with a height, which favors the movement of forest dormouse. Fat dormouse occupies hollows (Fig. 9) and holes, mainly excavated by woodpeckers and the other two species can be found both in the hollows, nest tree or underground galleries. Forest dormouse is a competitor of fat dormouse in filling hollows (Fig.10). In the young oak forest, regeneration results are missing hollows and trees were about the same size.

Among the species of trees, oak, poplar and cherry are forming hollows in which arranged their abodes dormouse/shelter. Common dormouse used primarily arboreal nests, camouflaged in the vegetation at low height, located at the junction of branches, with a complex structure consisting of an outer layer of leaf and one internal (core nest) finest, made from an amazing variety the fine material.

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REFERENCES

1. Duma, I., 2010, *Cercetări ecologice asupra micromamiferelor din zona Banatului.* Rezumatul tezei de doctorat. – Universitatea "Al.I.Cuza" Iași.
   -[http://www.uaic.ro/uaic/bin/download/Academic/Doctorate_februarie_2010/DumaI.Ioan.pdf].
2. Hamar, M., 1967, *Din viața rozătoarelor*, Editura Științifică, București, 174 pp.
3. Hecker, K., Bakó, B. & Csorba, G., 2003, Distribution ecology of the Hungarian dormouse species, based on the national biodiversity monitoring system, *Acta Zoologica Academiae Scientiarum Hungaricae*, **49** (Suppl. 1): 45–54.
4. Istrate, P., 2005, Remarks on the habitat of *Muscardinus avellanarius* (Linnaeus, 1758) in the Târnava Plateau (Transylvania, Romania), *Transylvanian review if systematical and ecological research*, Sibiu (2). Târnava River Basin: 173–182.
5. Juškaitis R., 2003, New data of distribution, habitats and abundance of dormice (Gliridae) in Lithuania. – *Acta Zoologica Academiae Scientiarum Hungaricae*, **49**, (Suppl. 1): 55–62.
6. Juškaitis R. & Šiožinytė V., 2008, Habitat requirements of the common dormouse *Muscardinus avellanarius* and the fat dormouse *Glis glis* in mature mixed forest in Lithuania, *Ekologia*, Bratislava, **27**, No. 2: 143–151.
7. Lozan, M.N., 1970, Gryzuny Moldavii, AN MSSR Publisher (1), Kisinev: 79–117 pp.
8. Morris, P.A., Bright, P.W.&Woods, D., 1990, Use of nestboxes by the Dormouse *Muscardinus avellanarius*. – *Biol. Conserv.*, **51**: 1–13.
9. Morris, P., 2011, *Dormice*, Whittet Books Ltd, Stansted, 144 pp.
10. Murariu, D., Lungeanu, A., Gavrilă, D., &Stepan, C.. 1985, Preliminary data concerning the study of the karyotype of *Eliomys quercinus* (Linnaeus, 1766) (Mammalia, Gliridae), *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"*, **27**: 271–274.
11. Nania, I., 1990, *Vânatul pe teritoriul României*, Editura Sport-Turism, București, 344 pp.
12. Popescu, A., 1968, Observații asupra rozătoarelor din nord-vestul Dobrogei, *Studii și Cercetări de Biologie*, Seria Zoologie, Ed.Academiei, **20**: 153 – 165.
13. Rossolimo, O.L., Potapova, E.G., Pavlinov, I.Ya., Kruskop, S.V., Voltzit, O.V., 2001, *Dormice (Myoxidae) of the world* (in Russian), Moscow University Publisher, Moscow, 229 pp.
14. Ścinśki, M. & Borowski, Z., 2008, Spatial organization of the fat dormouse *Glis glis* in an oak-hornbeam forest during the mating and post-mating season, *Mammalian Biology Zeitschrift fur Saugetierkunde*, **73**, Issue: 2: 119–127.
15. Sevianu, E., 2009, Dormice of Transylvania, Research and conservation, *The dormouse monitor*, *autumn 2009*: 6–9. [http://greenboot.files.wordpress.com/2009/09/2009_autumn_dormouse_monitor.pdf accesed 13.11.2011].
16. Storch, G., 1978, *Glis glis* (Linnaeus, 1766) – Siebenschläfer. In: Niethammer J. & Krapp F. (eds). Handbuch der Säugetiere Europas. Band 1. *Akademische Verlagsgesellschaft, Wiesbaden*: 243–258.
17. Tatarinov, K.I., 1956, Zviri zahidnykh oblastej Ukrainy, AN URSR Publisher, 254 pp.
18. Vasiliu, D., 1937, *Rozătoarele din România și combaterea lor*, Imprimeria Centrală, București, 103 pp.
19. Zaytseva, H., 2006, Nest material of the common dormouse (*Muscardinus avellanarius L.*) used in nestboxes, Podilla (West Ukraine), *Polish journal of Ecology*, **54**: 397–401.

UTILIZAREA ADĂPOSTURILOR NATURALE DE CĂTRE TREI SPECII DE PÂRȘI ÎN PODIȘUL TRANSILVANIEI, ROMÂNIA
(Rezumat)

Sunt prezentate rezultatele cercetărilor care au avut loc între anii 2008–2011 legate de modalitatea în care trei specii de pârși utilizează adăposturile naturale în pădurile cu frunze căzătoare din Podișul Transilvaniei, zona Târnavelor. Cuiburile pârșilor sunt plasate în scorburi, pârșul mare și pârșul cu coadă stufoasă preferându-le pe acelea scobite în stejari. Pârșul comun își construiește cuiburi arboricole rotunde, plasate în arbuști, la îmbinarea crengilor și la o înălțime medie de 60 cm de sol. Pârșii realizează o selecție a habitatului, fiind cel mai adesea legați de pădurile care au arbori de vîrste diferite și cu un strat arbustiv bogat, care le furnizează hrană pe întreg parcursul anului când sunt activi. Pârșul comun este cel mai adesea găsit în stratul arbustiv al pădurilor de stejar, care este tăiat din timp în timp și pârșul cu coadă stufoasă, în pădurile cu arbori vechi și numeroase specii de arbuști, în timp ce pârșul mare manifestă o preferință pentru coronamentul înalt al arborilor din păduri, care îi permite să se miște cel mai bine. Materialul utilizat în construcția cuiburilor circulare de către pârșul comun este reprezentat de frunzele arbuștilor în care ei trăiesc, la care adaugă o mare varietate de materiale fine.

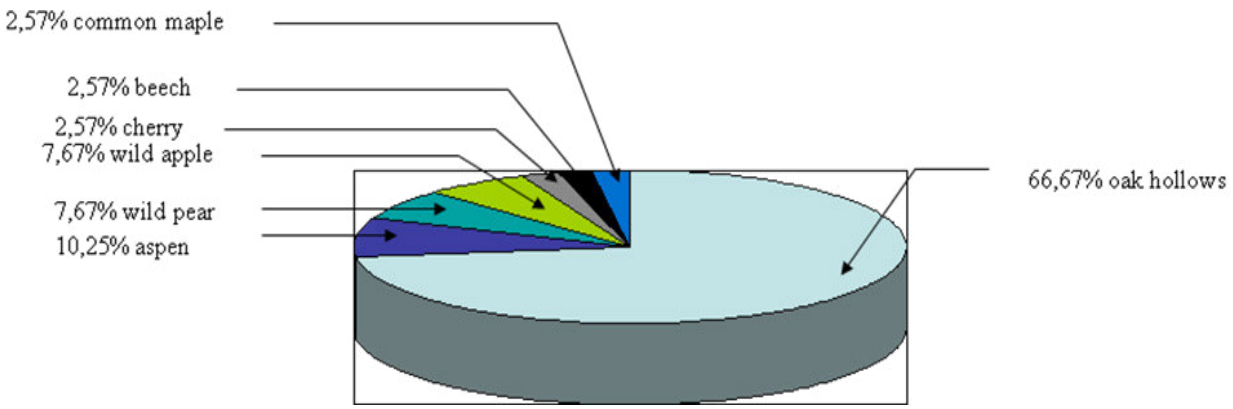

Fig. 1: % hollows/holes from different trees occupied by dormice

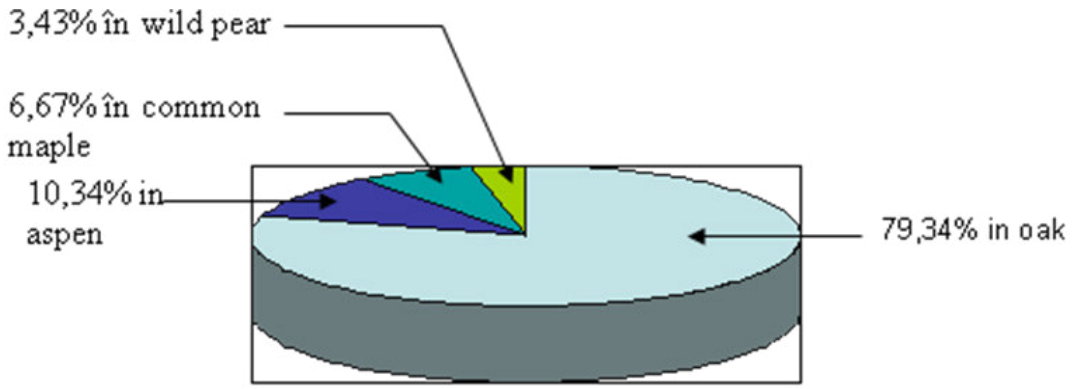

Fig. 2: Occurence rate of fat dormouse in different hollow/hole trees

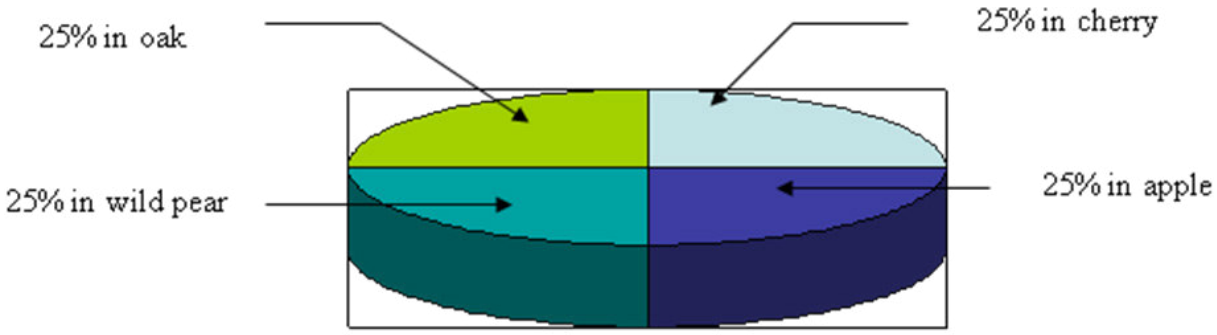

Fig. 3: Occurence rate of common dormouse in different hollow/hole trees

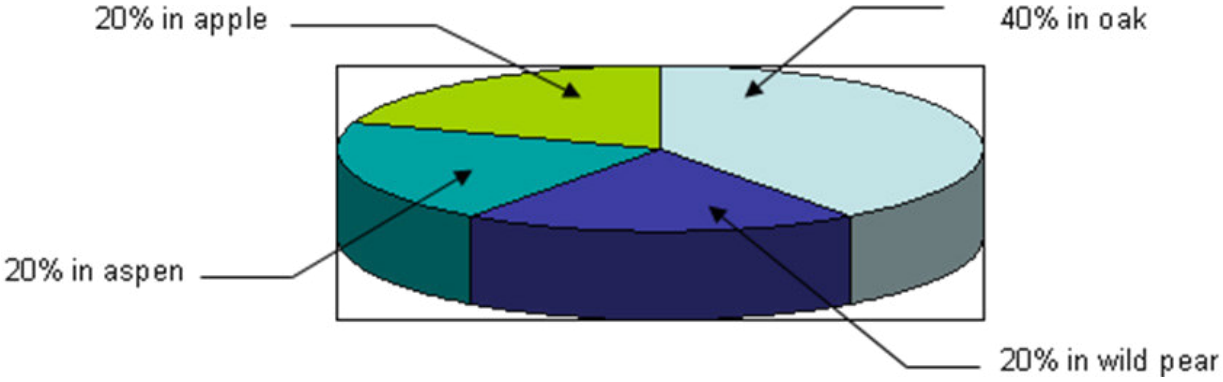

Fig. 4: Occurence rate of forest dormouse in different hollow/hole trees

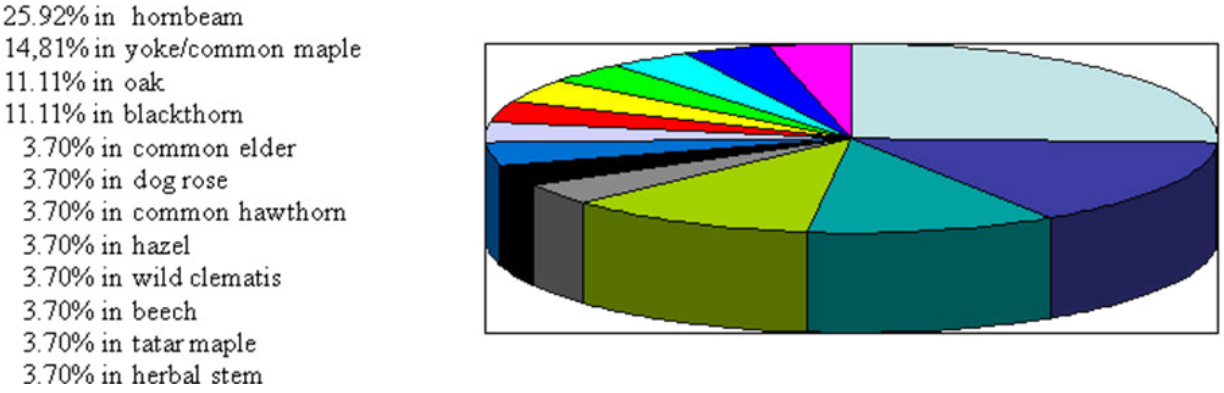

Fig. 5: Occurence rate of common dormouse nests for different arboreal species

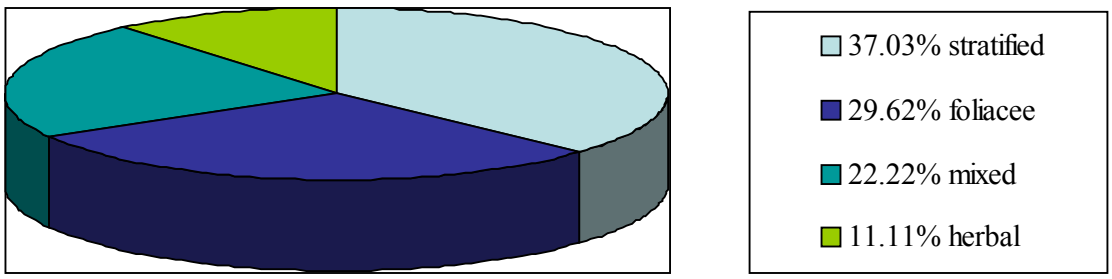

Fig. 6: Occurence rate of different arboreal nest types for common dormouse

Fig. 7: Petru Vasile Istrate. Arboreal nest of a common dormouse in a small shrub of common maple

Fig. 8: Petru Vasile Istrate. Arboreal nest of common dormouse masked by the strings of clematis liana.

Fig. 9: Petru Vasile Istrate. Fat dormouse in a hollow of sessile oak

Fig. 10: Petru Vasile Istrate. Garden dormouse in a hollow of wild pear.

THE CATALOG OF THE BIRD OOLOGIC COLLECTION OF THE MUREŞ COUNTY MUSEUM, NATURAL SCIENCE DEPARTMENT TÂRGU-MUREŞ

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Abstract: The oologic collection of the Museum of Târgu Mureş consists of six parts (Table 2) and is composed of 382 clutches, counting 1879 eggs, representing 82 bird species. Over 90% of the eggs were collected between 1960 and 1964 and come from subsequent purchases or donations. In addition, during 1958–2011 (54 years), 46 nests, received, or collected and prepared by us, were also recorded. Table 4 shows that 370 clutches were collected from Mureş county, and only 12 nests come from elsewhere.

The publication of these historical data enrich our knowledge of the areas mentioned, and it is a true, verifiable inventory, which preserves and completes the picture of the yesteryear avifauna, along with the other catalogs of collections, published in the yearbook of our museum [33, 34].

Keywords: oologic collection, birds, Mureş County Museum

Introduction

The importance of a museum depends largely on the size and the scientific value of collections. Preservation and valorisation of patrimony is a permanent concern of the specialized staff. Preparation and publication of a collection catalog gives the opportunity to those interested to know not only exhibits, but all the values stored in the museum storehouse. After the publication of ornithological collection inventory and partial skeletons of birds [33, 34], this paper is the third catalog, which presents ornithological material existing in 2011 at the museum.

The question is "Why the need for such a collection?"

- It is an undeniable physical evidence of the existence of old ornithofauna.
- It shows followers should strive towards the rehabilitation of the local avifauna.
- It is a true database on species diversity area.
- Provides valuable information about reproducing species.
- The chemical analysis of eggshells [7] one can see unwanted consequences of chemicalization agriculture (charging with DDT, HCH and so on, as well as negative effects on bird reproduction). It is an incriminating evidence of our responsibility towards nature, towards future generations.
- "The mere existence of egg is documenting a lot the bird and zoogeographic studies" – says Mr. Thomas L.Béczy in his book [3]. "It is a valuable document of the past,

containing historical, genetic, biochemical information, and data on natural habitats from which they were collected." [17]

- The largest oologic collection in the world is in the Museum of Natural History in Britain, containing over a million samples [42].

Oologic collection in Romania

Table 1 gives some data about oologic collections in Romania. This knowledge has been obtained from the cited references [3, 9, 17, 19, 37, 38, 40], and data on oologic collection of the Museum of Timişoara were obtained from dr. Kiss András [10], whom we thank in this way. Most of them are in museum collections. In addition to these, there are other collections in various institutions or individuals, unpublished yet. At country level, a full situation could only be made after the publication of all existing data on these collections.

Table 1: Oologic collections of România

Owners	Species	Clutches	Eggs
Muzeul Ţării Crişurilor – Oradea	659	3573	13812
Muzeul Banatului – Timişoara	198	537	2184
Kalabér Ladislau – Reghin (private collection)	116	413	2009
Mureş County Museum	82	382	1879
Complexul Muzeal de Ştiinţe ale Naturii "Răsvan Angheluţă" Galaţi	101	592	1670
Muzeul Vrancei. Secţia Ştiinţele Naturii – Focşani	107	?	432
Lupean Dorin – Sibiu (private collection)	100	?	400
Muzeul Olteniei – Craiova	158	?	352
Institutul de Cercetări Eco-Muzeale Tulcea, Centrul Muzeal Eco-Turistic Delta Dunării	55	320	?

Material analysis

The oologic collection of the Museum of Târgu Mures consists of six distinct collections of 382 clutches, counting 1879 eggs, representing 82 bird species (!). (Table 2)

Table 2: Oologic collection of Mureş County Museum

Collection	No of species	No of clutches	No of eggs	Observations
Bartha Tibor	49	115	560	donation
Bujanovics Ede	52	123	635	acquisition
György István	24	30	141	acquisition
Mureş County Museum	25	46	217	collected
Stoia Vasile	1	5	18	donation
Szombath Ştefan	33	63	308	acquisition
Total	**82**	**382**	**1879**	

The first clutch (*Pica pica*) reached in the museum collection on May 22nd, 1958, and the last one (*Buteo buteo*) on June 26th, 2006. Over 90% of the eggs were collected between 1960 and 1964 and come from subsequent purchases or donations. In addition, during 1958–2011

(54 years), 46 nests, received, or collected and prepared by us, were also recorded. (Note that although the Museum staff did not encourage collecting eggs and nests, however, nests brought by different people – the result of "Sunday family or holiday expeditions" – were accepted, but not without an environmental education made as "thanksgiving").

Preparation

We share this minimal knowledge about preparation with the thought that novice restaurateurs should not refuse any nests torn because of unwanted human intervention.

Piercing shell is made with a triangular needle (used for sewing leather), or a thin bar of iron, sharpened at the top, similar to a star-point screwdriver. Emptying content can be performed through a single hole made on the circumference line drawn by the small diagonal of the egg. A too wider hole weakens the egg resistence. A glass tube with a thinner end (hand-blown), or a syringe fitted with a needle bent at 45 degrees can be used to empty it.

No chemicals were used during preparation, the eggs being emptied using air jet, and washed with clear water afterwards. To our knowledge, no other collectors used chemicals such as KOH, NaOH, formalin, Hg biclorat [9] for preparation.

In the case of incubated eggs, the drilling was done with the egg submerged in water; otherwise it may explode due to increased internal pressure (method dictated by the first failure). The eggs are left to dry on blotting paper, with the hole facing down, in the shade, and at a constant temperature. After drying, the egg is numbered (inventory no., or code). The eggs are kept in the boxes lined with wool, or in tubes, in the dark, in controlled environment.

The origin of the material (Table 3)

For this table we used the existing data and the personal knowledge about collectors or owners. "Unknown" title is used for the person who brought an unprepared clutch to the museum, and XY fisherman is a suggested person from whom Bartha Tibor acquired a great bustard egg, poorly drilled with a nail and emptied. The introduction of it in the collection is motivated by the rarity of the species, almost extinct from the country fauna today.

It is known that in some cases the name of the owner and of the collector is not the same (the above example), due to exchanges performed between them; some eggs were received as a gift or inherited, as reflected in our table. The important fact is that, once in the museum, the material became public collection, part of the national heritage. Its maintenance is ensured by conservatives, it can be studied by specialists and their published data contribute to enlarge our knowledge of the avifauna of past periods.

Table 3: The origin of the oologic material

Collector's name	No. of clutches	No. of eggs	Collecting period
Bartha Tibor	114	559	1959.04.01 – 1964.06.08
Bujanovics Ede	61	344	1960.04.19 – 1963.04.07
Csereznyés Szilárd	1	4	1961.05.21
Deák Attila	1	1(+1)	2006.06.26
Godan Elena	1	4	1996.05.04
György István	33	155	1960.04.24 – 1964.05.12

Keszeg Arnold	5	18	1998.03.14 – 2001.04.15
Kónya István	6	40	1958.05.22 – 1967.05.06
Necunoscut	1	5	1995.03.27
Orbán Albert	1	5	1968.04.25
Sîncrăian Marcu	1	2	1987.05.06
Szentkirályi Miklós	59	283	1960.04.24 – 1963.04.21
Szilágyi Alexandru	5	33	1968.04.17 – 21
Szombath Zoltán	92	425	1960.06.14 – 1995.05.21
XY fisherman	1	1	1963.04.28

Table 4 shows that 370 clutches were collected from Mureș county, and only 12 nests come from elsewhere.

Table 4: Oologic material distribution by county of origin

County	Clutches	Eggs
AB – Alba, RO	5	18
CT – Constanța, RO	1	3
BH – Bihor, RO	2	14
HR – Harghita, RO	2	9
MS – Mureș, RO	370	1830
TL – Tulcea, RO	1	1
BK – Bács-Kiskun, HU	1	4

Table 5 is useful to those who collect zoological data to complete faunal lists of localities, and to those who compile lists of nesting birds in the named counties. We find that much of the material comes from the surroundings of Târgu Mureș city, an area with a highly human impact. The correct spelling of localities was revised according to the dictionary of localities [20].

Table 5: Oologic material distribution by locality

No	Locality	Clutches	Eggs	Species
1	Acățari, MS	4	24	4
2	Bălăușeri, MS	1	7	1
3	Berghia, MS	2	7	2
4	Beșa, MS	3	12	3
5	Bistra Mureșului, MS	1	6	1
6	Bozed, MS	1	1	1
7	Brâncovenești, MS	1	4	1
8	Budiu Mic, MS	4	27	4
9	Câmpenița, MS	2	11	2
10	Cipău, MS	8	25	3
11	Cristești, MS	6	33	4
12	Cuci, MS	2	15	2
13	Curteni, MS	22	104	5
14	Dumbrăvioara, MS	20	94	13

15	Ernei, MS	1	9	1
16	Fărăgău, MS	6	31	4
17	Fülöpháza, HU	1	4	1
18	Găiești, MS	1	5	1
19	Glodeni, MS	2	8	2
20	Gornești, MS	1	4	1
21	Gurghiu, MS	2	8	2
22	Icland (Ernei), MS	5	38	3
23	Lechința. MS	1	2	1
24	Livezeni, MS	1	4	1
25	Lodroman, AB	5	18	1
26	M.ții Harghita, HR	1	4	1
27	Miheșu de Câmpie,MS	17	79	2
28	Morești, MS	32	152	13
29	Mureșeni, MS	1	3	1
30	Murgești, MS	4	26	3
31	Pădureni, MS	1	5	1
32	Pănet, MS	1	3	1
33	Periș, MS	1	5	1
34	Petelea, MS	1	4	1
35	Răstolița, MS	1	5	1
36	Reghin, MS	7	45	5
37	Remetea, MS	2	11	2
38	Săbed, MS	24	93	11
39	Sărmașu, MS	1	5	1
40	Sfântu Gheorghe, TL	1	1	1
41	Sâncraiu de Mureș, MS	1	6	1
42	Sângeru de Pădure, MS	3	15	2
43	Sângeorgiu de Mureș, MS	3	16	3
44	Sânmartin, HR	1	5	1
45	Sinoe, CT	1	3	1
46	Sântana de Mureș, MS	3	13	3
47	Sântioana de Mureș, MS	2	12	2
48	Tarcea, BH	1	11	1
49	Târgu Mureș, MS	153	775	49
50	Valea lui Mihai, BH	1	3	1
51	Vălenii, MS	4	30	4
52	Vălureni, MS	3	14	3
53	Voivodeni, MS	1	5	1
54	Zau de Câmpie, MS	7	29	3
	Total	**382**	**1879**	**82**

Table of species (Table 6) reflects the data of 81 species tested, plus one doubled, but questioned. It is the case of a *Strix aluco*, found in a nest of *Corvus cornix* sat on an oak tree, at 16 meters high, visited by the author on November 4th, 1974. In the nest there were four fluffy chicks and two incubated eggs, which have been collected for collection. Egg dimensions are: 40 × 30.8 and 40.6 × 32.7 mm respectively. The egg color is white, but with points, lines and brown freckles splattered all over. This aspect of the egg was preserved under a protective layer of nitro, as water wiped the stains. Judging by size and aspect, these two egg look more like the last egg (slightly colored) of *Falco tinnunculus* and *F. subbuteo*, species that hatch in the months of May-June. We believe that the lack of data requires a reserved attitude towards determining species.

The seven species of 24 raptor nests collected may seem today a crime against nature, but their destruction was once mandatory for hunters throughout the year. Their appearance was not tolerated at the newly established pheasantry near Târgu Mureș either. The history of a crow's nest (*Corvus corax*) in the *Stejăriș* forest, eloquently demonstrates this managing trend of the game:

- February 25th,1962 – 5 raven eggs in the nest
- March 20th – male killed by the poison meant for wolves and foxes
- March 27th – 2 adult ravens rotate and chicks can be heard in the nest
- April 3rd – a pair of black kite – *Milvus migrans* robbed the nest
- April 20th – 4 black kite eggs are taken out of the nest
- May 11th – 3 black kite eggs are taken out of the nest
- May 18th – 2 small booted eagle eggs – *Hieraaetus pennatus* are taken out of the nest and the female is shot.

Today the three clutches are kept at the museum in Târgu Mureș.

Stork eggs were collected from destroyed nests when changing thatched roof with tiles. A part of reed bird nests were collected during desiccation of wetlands, before burning reed, or when flooding ponds. The museum staff was announced by the fisheries engineer at Cipău about the mowing of aquatic plants. So we managed to harvest some great crested grebe clutches (*Podiceps cristatus*), but dozens of nests were chopped by the floating mower. In the case of collected abandoned nests, the clutches are not always complete, however we believe that they are valuable because they provide important data.

In the Cuckoo (*Cuculus canorus*) case, eggs were inventoried with the same number as the parasite species, using the letters / a, / b, (see 11 / a, 11 / b, and 98 / a, 98 / b) to differentiate them, and the third cuckoo egg (inv. No. 356) remained single because the eggs of the parasitized species – Great Reed Warbler – (*Acrocephalus arundinaceus*) were broken.

In 1963–64, in Morești, there was a colony of Rook (*Corvus frugilegus*) of about 500 nests, which was destroyed in the following years. 14 nests were collected from here. On May 5th, 1960, the bank of Mureș River collapsed, where there was a colony of Sand Martin (*Riparia riparia*). 18 clutches were saved from here for collection and dozens of other nests were washed away by water. Sterile or incubated Lanner Falcon (*Falco biarmicus*) eggs were received from an aviary, courtesy to Keszeg Arnold [31]. We have listed these cases to demonstrate that a collection can be gathered over time, without causing primary damages to nature.

Uncontrolled human interventions affecting most nesting avifauna are:

- Logging during vegetation without preliminary observations made for inventorying hatching fauna of the land and reporting protected species.
- Spring derating carried on defense embankments of watercourses
- Trimming trees in cities during April-August, under the pretext of sanitation and cleaning

- Pruning hedges during the incubation period of paseriforms
- Destruction of raptors nests by the poachers
- Mowing aquatic vegetation in ponds during hatching
- Burning reeds during spring
- Flooding of fish ponds from April to July
- Sand and gravel excavation regardless of the location of colonies of *Riparia riparia*
- Destruction of Grebe and Tern nests in ponds
- Agricultural works performed regardless of the annual biorhythm of nesting species
- Disinfection of crops, forests and settlements
- Demolition of old houses without taking measures to protect nesting birds found here
- Cleaning the old chimneys, inhabited by birds etc.

These are just some destructive activities, hidden in silence, during which many bird nests are destroyed. If one cannot avoid these damages, why not then donate the destroyed nests to museums, where they can be prepared and properly stored, being valued by museum pedagogy? Protection laws are clear, but they are violated in areas with conflict of interests. On one hand, they force the letter of the law, and on the other hand, there is the old adage "an uncaught thief is an honest merchant". Isn't it possible to free much of this sense of hidden guilt by a closer cooperation between institutions? Let's not bury our fauna riches in the pit of indifference! The moral responsibility strengthens the spirit of the law, and it is superior to every paragraph written by people.

Table 6: Situation of the collection species

No	Species (in alphabetical order)	No of clutches	No of eggs
1	*Accipiter gentilis*	3	7
2	*Acrocephalus arundinaceus*	11	49
3	*Acrocephalus palustris*	1	4
4	*Acrocephalus scirpaceus*	3	12
5	*Actitis hypoleucos*	1	3
6	*Alcedo atthis*	1	7
7	*Anas platyrhynchos*	5	45
8	*Aquila pomarina*	1	2
9	*Ardea cinerea*	1	3
10	*Asio otus*	6	24
11	*Buteo buteo*	4	6
12	*Caprimulgus europaeus*	1	1
13	*Carduelis carduelis*	4	19
14	*Carduelis chloris*	6	29
15	*Charadrius dubius*	4	15
16	*Ciconia ciconia*	2	9
17	*Cinclus cinclus*	1	4
18	*Coccothraustes coccothraustes*	10	48
19	*Columba oenas*	6	11
20	*Columba palumbus*	3	5
21	*Corvus corax*	5	27
22	*Corvus cornix*	7	32

23	*Corvus frugilegus*	16	75
24	*Corvus monedula*	9	36
25	*Coturnix coturnix*	3	30
26	*Crex crex*	1	8
27	*Cuculus canorus*	3	3
28	*Dendrocopos medius*	2	11
29	*Dendrocopos minor*	1	5
30	*Emberiza citrinella*	1	3
31	*Erithacus rubecula*	3	18
32	*Falco biarmicus*	5	18
33	*Falco tinnunculus*	9	45
34	*Fringilla coelebs*	6	29
35	*Fulica atra*	2	12
36	*Galerida cristata*	5	23
37	*Gallinula chloropus*	5	27
38	*Garrulus glandarius*	16	95
39	*Hieraaetus pennatus*	1	2
40	*Hirundo rustica*	3	14
41	*Ixobrychus minutus*	4	18
42	*Jynx torquilla*	2	16
43	*Lanius collurio*	16	77
44	*Lanius minor*	4	21
45	*Larus ridibundus*	1	3
46	*Limosa limosa*	1	4
47	*Luscinia luscinia*	1	5
48	*Merops apiaster*	2	12
49	*Milvus migrans*	3	10
50	*Motacilla alba*	5	26
51	*Motacilla cinerea*	1	6
52	*Muscicapa striata*	1	4
53	*Nycticorax nycticorax*	1	2
54	*Oenanthe oenanthe*	2	10
55	*Oriolus oriolus*	1	4
56	*Otis tarda*	1	1
57	*Parus caeruleus*	6	59
58	*Parus major*	7	62
59	*Parus palustris*	2	21
60	*Passer domesticus*	28	134
61	*Passer montanus*	9	40
62	*Perdix perdix*	1	11
63	*Phasianus colchicus*	5	59
64	*Phoenicurus phoenicurus*	1	5
65	*Pica pica*	16	96
66	*Picus viridis*	1	5
67	*Podiceps cristatus*	6	18
68	*Riparia riparia*	21	98

69	*Sitta europaea*	2	11
70	*Streptopelia decaocto*	2	4
71	*Streptopelia turtur*	4	8
72	*Strix aluco*	1	3
73	*Strix aluco (?)*	1	2
74	*Sturnus vulgaris*	6	29
75	*Sylvia atricapilla*	3	16
76	*Sylvia borin*	1	5
77	*Sylvia communis*	1	3
78	*Tachybaptus ruficollis*	1	3
79	*Troglodytes troglodytes*	2	13
80	*Turdus merula*	15	71
81	*Turdus philomelos*	16	65
82	*Vanellus vanellus*	1	3
	Total	**382**	**1879**

The publication of these historical data enrich our knowledge of the areas mentioned, and it is a true, verifiable inventory, which preserves and completes the picture of the yesteryear avifauna, along with the other catalogs of collections, published in the yearbook of our museum [33, 34].

For the classification of species we have used the multilingual dictionary of bird species in Romania [15], the Nomenclature of Birds in Romania [22] and the website *Fauna europaea* [36]. Of course, none of these is forever true because of the continuing development of molecular biology, which always brings new changes in bird taxonomy, accepted or ignored by ornithologists. This classification should be seen as a true reflection of the situation.

Abbreviations used in the catalog:

1. **Collector's name (Legit)**

Name	Initials
Bartha Tibor	B.T
Bujanovics Ede	B. E.
Cseresznyés Szilárd	CS. SZ.
Deák Attila	D. A.
Godan Elena	G. E.
György István	GY. I.
Keszeg Arnold	K. A.
Kónya István	K. I.
Necunoscut	X
Orbán Albert	O. A.
Sîncrăian Marcu	S. M.
Szentkirályi Miklós	SZ. M.
Szilágyi Alexandru	SZ. A.
Szombath Zoltán	SZ. Z.
XY unidentified fisherman	XY

2. **Notes on some characteristics of eggs (column "Phase", abbreviations)**

Phase I – fresh: the egg is translucent without blood network.
Phase II – incubated: the egg with visible blood network.
Phase III – very incubated: the egg in which cartilaginous skeleton occurs.
Phase 0 – sterile: the egg unfertilized, remained in the nest after the incubation period. They are worn, have pale color and more fragile skin.
The first three phases can not be expressed in days because they differ greatly between species.

Oologic catalog

Podicipediformes Order
Podicipedidae Family

Inventory No.	Collecting site	Collecting date	Legit	No. of eggs	Phase
Tachybaptus ruficollis (Pallas)					
370	Cipău, MS	1989.05.27	Sz. Z.	3	I
Podiceps cristatus (Linnaeus)					
364	Cipău, MS	1988.06.20	Sz. Z.	3	I
365	Cipău, MS	1988.06.20	Sz. Z.	3	I
366	Cipău, MS	1988.06.20	Sz. Z.	3	I
367	Cipău, MS	1989.05.27	Sz. Z.	3	I
368	Cipău, MS	1989.05.27	Sz. Z.	3	I
369	Cipău, MS	1989.05.27	Sz. Z.	3	I

Ciconiiformes Order
Ardeidae Family

Ixobrychus minutus (Linnaeus)					
5	Cristești, MS	1960.06.01	B. E.	7	II
154	Târgu Mureș, MS	1963.04.17	B. T.	5	I
155	Târgu Mureș, MS	1964.05.04	B. T.	3	I
277	Fărăgău, MS	1961.05.27	Sz. Z.	3	II
Nycticorax nycticorax (Linnaeus)					
363	Zau de Câmpie, MS	1987.05.06	S. M.	2	I
Ardea cinerea Linnaeus					
214	Moreşti, MS	1960.04.28	Gy. I.	3	II

Ciconiidae Family

Ciconia ciconia (Linnaeus)

1	Voivodeni, MS	1960.04.19	B. E.	5	I
168	Dumbrăvioara, MS	1961.05.21	B. T.	4	II
229	M.ții Harghita, HR	1963.07.01	Gy. I.	4	II

Anseriformes Order
Anatidae Family

Anas platyrhynchos Linnaeus

2	Cuci, MS	1962.04.23	B. E.	10	I
263	Târgu Mureș, MS	1962.05.06	K. I.	10	II
269	Fărăgău, MS	1963.05.05	Sz. Z.	5	I
334	Fărăgău, MS	1968.04.12	Sz. Z.	9	I
338	Tarcea, BH	1968.05.02	Sz. Z.	11	II

Falconiformes Order
Accipitridae Family

Milvus migrans (Boddaert)

158	Târgu Mureș, MS	1962.04.20	B. T.	4	I
159	Târgu Mureș, MS	1962.05.11	B. T.	3	I
179	Pănet, MS	1962.04...	B. E.	3	II

Accipiter gentilis (Linnaeus)

157	Târgu Mureș, MS	1959.04.10	B. T.	3	I
281	Săbed, MS	1961.04.16	Sz. Z.	3	II
372	Bozed, MS	1995.05.01	Sz. Z.	1	0

Buteo buteo (Linnaeus)

161	Beșa, MS	1959.04.01	B. T.	2	I
180	Târgu Mureș, MS	1962.05.02	B. E.	2	I
371	Săbed, MS	1995.05.21	Sz. Z.	1	0
374	Sângeorgiu de Mureș, MS	2006.06.26	D. A.	1	I

Aquila pomarina C. L. Brehm

162	Săbed, MS	1960.06.05	B. T.	2	II

Hieraaetus pennatus (Gmelin)

160	Târgu Mureș, MS	1962.05.18	B. T.	2	II

Falconidae Family

Falco tinnunculus Linnaeus

163	Dumbrăvioara, MS	1960.05.27	B. T.	4	I
164	Dumbrăvioara, MS	1960.06.26	B. T.	5	III
165	Săbed, MS	1961.05.14	B. T.	6	II
166	Săbed, MS	1961.05.23	B. T.	4	III
167	Săbed, MS	1961.05.23	B. T.	5	II
213	Moreşti, MS	1960.05.19	Gy. I.	6	I
282	Săbed, MS	1961.04.30	Sz. Z.	5	I
283	Săbed, MS	1961.05.14	Sz. Z.	5	II
284	Săbed, MS	1961.05.23	Sz. Z.	5	II

Falco biarmicus Temminck

376	Lodroman, AB	1998.03.14	K. A.	2	0
377	Lodroman, AB	1998.04.28	K. A.	5	0
378	Lodroman, AB	1998.04.08	K. A.	3	0
379	Lodroman, AB	2001.03.20	K. A.	4	0
380	Lodroman, AB	2001.04.15	K. A.	4	0

Galliformes Order
Phasianidae Family

Perdix perdix (Linnaeus)

4	Murgeşti, MS	1961.07.13	B. E.	11	II

Coturnix coturnix (Linnaeus)

131	Târgu Mureş, MS	1961.06.11	B. T.	12	I
178	Vălenii, MS	1962.06.22	B. E.	9	III
358	Ernei, MS	1960.06.07	B. E.	9	I

Phasianus colchicus Linnaeus

172	Târgu Mureş, MS	1963.05.09	B. T.	14	II
173	Târgu Mureş, MS	1963.05.11	B. T.	13	I
183	Acăţari, MS	1961.07.01	B. E.	8	II
212	Budiu Mic, MS	1960.06.10	Gy. I.	12	I
280	Târgu Mureş, MS	1964.05.19	Sz. Z.	12	II

Gruiformes Order
Rallidae Family

Crex crex (Linnaeus)

3	Vălenii, MS	1962.06.13	B. E.	8	III

Gallinula chloropus (Linnaeus)

223	Târgu Mureş, MS	1960.05.?	Gy. I.	4	II
267	Târgu Mureş, MS	1964.05.12	Gy. I.	7	III

275	Sântioana de Mureş, MS	1961.05.16	Sz. Z.	6	II
276	Sângeorgiu de Mureş, MS	1961.05.23	Sz. Z.	7	I
360	Valea lui Mihai, BH	1968.05.02	Sz. Z.	3	I

Fulica atra Linnaeus

273	Fărăgău, MS	1961.05.07	Sz. Z.	6	II
274	Sântioana de Mureş, MS	1961.05.16	Sz. Z.	6	I

Otididae Family

Otis tarda Linnaeus

174	Sfântu Gheorghe, TL	1963.04.28	X.Y.	1	-

Charadriiformes Order

Charadrii Suborder

Charadriidae Family

Charadrius dubius Scopoli

181	Târgu Mureş, MS	1962.05.31	B. E.	4	III
270	Târgu Mureş, MS	1960.06.14	Sz. Z.	3	I
271	Târgu Mureş, MS	1961.06.19	Sz. Z.	4	I
272	Moreşti, MS	1964.04.26	Sz. Z.	4	I

Vanellus vanellus (Linnaeus)

170	Zau de Câmpie, MS	1962.04.18	B. T.	3	I

Scolopacidae Family

Limosa limosa (Linnaeus)

6	Fülöpháza, HU	1961.05.21	Cs. Sz.	4	-

Actitis hypoleucos (Linnaeus)

184	Târgu Mureş, MS	1962.05.31	B. E.	3	I

Lari Suborder

Laridae Family

Larus ridibundus Linnaeus

169	Sinoe, CT	1964.04.14	B. T.	3	I

Columbiformes Order

Columbidae Family

Columba oenas Linnaeus

141	Târgu Mureş, MS	1963.04.19	B. T.	2	I
142	Târgu Mureş, MS	1963.04.19	B. T.	2	I

143	Târgu Mureș, MS	1963.05.07	B. T.	2	II
144	Târgu Mureș, MS	1963.05.07	B. T.	2	II
145	Săbed, MS	1963.04.25	B. T.	1	I
216	Târgu Mureș, MS	1960.06.19	Gy. I.	2	I

Coumba palumbus Linnaeus

278	Săbed, MS	1961.04.16	Sz. Z.	2	I
335	Săbed, MS	1968.04.27	Sz. Z.	1	0
336	Săbed, MS	1968.07.21	Sz. Z.	2	I

Streptopelia decaocto (Frivaldszky)

187	Târgu Mureș, MS	1961.05.07	Sz. M.	2	I
224	Târgu Mureș, MS	1962.05.?	Gy. I.	2	I

Streptopelia turtur (Linnaeus)

171	*Târgu Mureș, MS*	1961.04.19	B. T.	2	II
227	*Târgu Mureș, MS*	1963.06.12	Gy. I.	2	I
279	*Lechința. MS*	1963.05.26	Sz. Z.	2	I
350	*Târgu Mureș, MS*	1967.05.24	Sz. Z.	2	I

Cuculiformes Order
Cuculidae Family

Cuculus canorus Linnaeus

11/b	Târgu Mureș, MS	1960.06.01	Sz. M.	1	I
98/b	Târgu Mureș, MS	1960.05.02	B. T.	1	I
356	Moreşti, MS	1968.05.26	Sz. Z.	1	II

Strigiformes Order
Strigidae Family

Strix aluco Linnaeus

268	Târgu Mureș, MS	1964.04.06	Gy. I.	3	II
362	Berghia, MS	1974.04.11	Sz. Z.	2	0

Asio otus (Linnaeus)

156	Săbed, MS	1962.05.02	B. T.	3	I
175	Brâncovenești, MS	1962.04.27	B. E.	4	II
176	Târgu Mureș, MS	1962.05.20	Sz. M.	4	III
177	Curteni, MS	1963.04.21	Sz. M.	5	I
285	Săbed, MS	1963.04.21	Sz. Z.	4	II
286	Săbed, MS	1962.05.02	Sz. Z.	4	I

Caprimulgiformes Order

Caprimulgidae Family

Caprimulgus europaeus Linnaeus

220	Vălureni, MS	1960.05.?	Gy. I.	1	I

Coraciiformes Order

Alcedinidae Family

Alcedo atthis Linnaeus

288	Moreşti, MS	1961.06.14	Sz. Z.	7	I

Meropidae Family

Merops apiaster Linnaeus

85	Moreşti, MS	1964.06.08	B. T.	6	I
287	Moreşti, MS	1963.06.16	Sz. Z.	6	II

Piciformes Order

Picidae Family

Jynx torquilla Linnaeus

230	Vălureni, MS	1963.05.18	Gy. I.	10	I

Picus viridis Linnaeus

239	Târgu Mureş, MS	1960.04.24	Gy. I.	5	I

Dendrocopos medius (Linnaeus)

70	Târgu Mureş, MS	1960.05.05	B. E.	5	II
259	Târgu Mureş, MS	1961.05.01	B. T.	6	I

Dendrocopos minor (Linnaeus)

95	Târgu Mureş, MS	1961.05.01	B. T.	5	I

Passeriformes Order

Alaudidae Family

Galerida cristata (Linnaeus)

32	Dumbrăvioara, MS	1960.06.24	B. E.	5	I
33	Târgu Mureş, MS	1962.04.22	Sz. M.	4	I
111	Dumbrăvioara, MS	1960.06.26	B. T.	4	I
112	Câmpeniţa, MS	1962.05.02	B. T.	5	II
326	Târgu Mureş, MS	1964.05.31	Sz. Z.	5	I

Hirundinidae Family

Riparia riparia (Linnaeus)

241	Curteni, MS	1960.06.05	Sz. M.	5	I
242	Curteni, MS	1960.06.05	Sz. M.	4	I
243	Curteni, MS	1960.06.05	Sz. M.	5	I
244	Curteni, MS	1960.06.05	B. E.	4	I
245	Curteni, MS	1960.06.05	B. E.	5	I
246	Curteni, MS	1960.06.05	B. E.	5	I
247	Curteni, MS	1960.06.05	B. E.	4	I
248	Curteni, MS	1960.06.05	B. E.	4	II
249	Curteni, MS	1960.06.05	B. E.	4	II
250	Curteni, MS	1960.06.05	B. E.	5	I
251	Curteni, MS	1960.06.05	B. E.	4	I
252	Curteni, MS	1960.06.05	B. E.	5	II
253	Curteni, MS	1960.06.05	B. T.	6	II
254	Curteni, MS	1960.06.05	B. T.	5	II
255	Curteni, MS	1960.06.05	B. T.	5	II
256	Curteni, MS	1960.06.05	B. T.	5	II
257	Curteni, MS	1960.06.05	B. T.	5	II
258	Curteni, MS	1960.06.05	B. T.	5	I
323	Târgu Mureş, MS	1961.05.30	Sz. Z.	5	I
324	Târgu Mureş, MS	1964.05.31	Sz. Z.	4	I
353	Glodeni, MS	1967.06.26	Sz. Z.	4	I

Hirundo rustica Linnaeus

69	Dumbrăvioara, MS	1961.06.21	B. E.	4	I
96	Târgu Mureş, MS	1960.05.18	B. T.	5	I
97	Miheşu de Câmpie, MS	1960.06.29	B. T.	5	I

Motacillidae Family

Motacilla cinerea Tunstal

348	Bistra Mureşului, MS	1970.05.31	Sz. Z.	6	I

Motacilla alba Linnaeus

40	Acăţari, MS	1961.06.07	B. E.	6	I
234	Târgu Mureş, MS	1962.05.06	Gy. I.	4	II
316	Târgu Mureş, MS	1961.05.26	Sz. Z.	6	II
317	Târgu Mureş, MS	1963.04.28	Sz. Z.	5	I
318	Pădureni, MS	1964.04.19	Sz. Z.	5	I

Troglodytidae Family

Troglodytes troglodytes (Linnaeus)

68	Târgu Mureş, MS	1961.05.01	B. E.	7	I
93	Târgu Mureş, MS	1962.05.19	B. T.	6	I

Turdidae Family

Erithacus rubecula (Linnaeus)

12	Târgu Mureş, MS	1962.05.13	B. E.	6	I
13	Remetea, MS	1960.05.01	Sz. M.	6	I
98/a	Târgu Mureş, MS	1960.05.02	B. T.	6	I

Luscinia luscinia (Linnaeus)

94	Dumbrăvioara, MS	1960.05.13	B. T.	5	I

Phoenicurus phoenicurus (Linnaeus)

61	Sânmartin, HR	1960.05.22	B. E.	5	I

Oenanthe oenanthe (Linnaeus)

64	Cuci, MS	1962.04.28	B. E.	5	I
325	Moreşti, MS	1964.04.26	Sz. Z.	5	I

Turdus merula Linnaeus

135	Budiu Mic, MS	1960.04.15	B. T.	4	I
136	Târgu Mureş, MS	1960.05.24	B. T.	4	I
137	Târgu Mureş, MS	1961.04.24	B. T.	5	I
197	Târgu Mureş, MS	1960.04.28	B. E.	5	II
198	Remetea, MS	1960.05.01	Sz. M.	5	II
199	Târgu Mureş, MS	1961.04.25	B. E.	4	II
200	Târgu Mureş, MS	1961.04.25	B. E.	6	II
201	Târgu Mureş, MS	1962.04.20	Sz. M.	4	II
264	Târgu Mureş, MS	1964.05.03	K. I.	5	II
305	Târgu Mureş, MS	1961.05.02	Sz. Z.	5	I
306	Târgu Mureş, MS	1961.04.28	Sz. Z.	6	II
307	Târgu Mureş, MS	1961.05.21	Sz. Z.	4	I
308	Târgu Mureş, MS	1961.06.02	Sz. Z.	4	II
351	Târgu Mureş, MS	1967.05.30	Sz. Z.	5	I
352	Târgu Mureş, MS	1967.06.03	Sz. Z.	5	I

Turdus philomelos C. L. Brehm

116	Târgu Mureş, MS	1960.04.24	B. T.	4	I
117	Dumbrăvioara, MS	1960.04.27	B. T.	4	I
118	Beşa, MS	1960.05.12	B. T.	5	II
119	Târgu Mureş, MS	1960.05.08	B. T.	2	I
120	Târgu Mureş, MS	1961.05.01	B. T.	6	I
188	Târgu Mureş, MS	1960.04.31	B. E.	4	II
189	Târgu Mureş, MS	1960.05.02	Sz. M.	3	I
190	Târgu Mureş, MS	1960.05.02	B. E.	5	II
191	Târgu Mureş, MS	1961.04.25	Sz. M.	5	II
192	Târgu Mureş, MS	1961.05.01	B. E.	5	II
193	Târgu Mureş, MS	1962.05.02	Sz. M.	3	II

219	Livezeni, MS	1960.04.30	Gy. I.	4	I
302	Târgu Mureş, MS	1961.04.28	Sz. Z.	4	II
303	Târgu Mureş, MS	1961.04.30	Sz. Z.	2	I
304	Târgu Mureş, MS	1961.04.30	Sz. Z.	4	II
346	Vălenii, MS	1968.04.25	O. A.	5	II

Sylviidae Family

Acrocephalus palustris (Bechstein)

67	Târgu Mureş, MS	1960.06.09	Sz. M.	4	I

Acrocephalus scirpaceus (Hermann)

100	Fărăgău, MS	1961.05.28	B. T.	4	I
321	Fărăgău, MS	1961.05.28	Sz. Z.	4	II
322	Târgu Mureş, MS	1963.05.29	Sz. Z.	4	I

Acrocephalus arundinaceus (Linnaeus)

7	Cristeşti, MS	1960.06.01	B. E.	5	I
8	Sântana de Mureş, MS	1960.05.31	Sz. M.	5	II
9	Cristeşti, MS	1960.06.01	B. E.	3	I
10	Târgu Mureş, MS	1960.06.14	Sz. M.	5	II
11/a	Târgu Mureş, MS	1960.06.01	Sz. M.	4	I
91	Târgu Mureş, MS	1960.05.22	B. T.	5	I
92	Târgu Mureş, MS	1960.05.29	B. T.	4	I
319	Târgu Mureş, MS	1961.05.26	Sz. Z.	5	II
320	Moreşti, MS	1961.06.14	Sz. Z.	4	I
347	Cipău, MS	1968.05.12	Sz. Z.	4	I
355	Moreşti, MS	1968.05.26	Sz. Z.	5	I

Sylvia communis Latham

115	Mureşeni, MS	1960.07.08	B. T.	3	I

Sylvia borin (Boddaert)

65	Curteni, MS	1960.05.28	Sz. M.	5	II

Sylvia atricapilla (Linnaeus)

39	Târgu Mureş, MS	1961.05.01	Sz. M.	5	I
110	Târgu Mureş, MS	1960.05.16	B. T.	6	I
231	Târgu Mureş, MS	1964.05.10	Gy. I.	5	II

Muscicapidae Family

Muscicapa striata (Pallas)

66	Târgu Mureş, MS	1961.05.13	Sz. M.	4	I

Paridae Family

Parus palustris Linnaeus

62	Reghin, MS	1961.04.23	B. E.	10	I
63	Târgu Mureş, MS	1962.05.06	B. E.	11	I

Parus caeruleus Linnaeus

36	Târgu Mureş, MS	1962.05.02	B. E.	11	I
37	Târgu Mureş, MS	1962.05.06	B. E.	10	II
38	Târgu Mureş, MS	1962.05.06	Sz. M.	14	I
102	Târgu Mureş, MS	1960.05.02	B. T.	14	I
236	Târgu Mureş, MS	1962.06.02	Gy. I.	4	I
357	Budiu Mic, MS	1961.06.02	Sz. Z.	6	I

Parus major Linnaeus

34	Reghin, MS	1961.04.23	B. E.	10	I
35	Bălăuşeri, MS	1962.06.19	B. E.	7	I
103	Târgu Mureş, MS	1960.05.05	B. T.	9	I
104	Târgu Mureş, MS	1962.06.04	B. T.	12	I
240	Târgu Mureş, MS	1961.06.02	Gy. I.	5	I
345	Icland (Ernei) MS	1968.04.24	Sz. Z.	12	I
361	Târgu Mureş, MS	1961.05.28	Sz. Z.	7	I

Sittidae Family

Sitta europaea Linnaeus

53	Târgu Mureş, MS	1960.04.31	B. E.	5	III
54	Târgu Mureş, MS	1962.04.28	Sz. M.	6	II

Oriolidae Family

Oriolus oriolus (Linnaeus)

225	Moreşti, MS	1963.06.05	Gy. I.	4	I

Laniidae Family

Lanius collurio Linnaeus

55	Curteni, MS	1960.05.27	Sz. M.	4	I
56	Târgu Mureş, MS	1960.06.09	Sz. M.	4	I
57	Târgu Mureş, MS	1960.05.21	B. E.	4	I
58	Acăţari, MS	1961.05.19	Sz. M.	5	I
59	Târgu Mureş, MS	1961.06.18	Sz. M.	5	I
105	Dumbrăvioara, MS	1960.05.27	B. T.	5	I
106	Dumbrăvioara, MS	1960.05.27	B. T.	5	I
107	Gurghiu, MS	1960.07.05	B. T.	4	II
108	Târgu Mureş, MS	1960.07.08	B. T.	5	II
109	Târgu Mureş, MS	1960.07.08	B. T.	4	II
226	Moreşti, MS	1963.06.12	Gy. I.	5	I

238	Răstolița, MS	1960.06.21	Gy. I.	5	I
310	Târgu Mureș, MS	1963.06.04	Sz. Z.	5	I
311	Târgu Mureș, MS	1963.06.02	Sz. Z.	6	III
312	Târgu Mureș, MS	1963.06.08	Sz. Z.	5	II
349	Târgu Mureș, MS	1967.05.30	Sz. Z.	6	I

Lanius minor Gmelin

60	Curteni, MS	1960.05.28	Sz. M.	5	II
101	Periș, MS	1960.05.20	B. T.	5	I
313	Câmpenița, MS	1964.05.24	Sz. Z.	6	I
327	Târgu Mureș, MS	1963.05.22	Sz. Z.	5	I

Corvidae Family

Garrulus glandarius (Linnaeus)

121	Bețșa, MS	1960.05.15	B. T.	5	II
122	Dumbrăvioara, MS	1960.05.27	B. T.	6	I
123	Târgu Mureș, MS	1961.04.24	B. T.	6	I
124	Târgu Mureș, MS	1961.04.25	B. T.	5	II
125	Târgu Mureș, MS	1962.04.20	B. T.	6	I
126	Târgu Mureș, MS	1962.04.21	B. T.	7	I
127	Târgu Mureș, MS	1962.05.01	B. T.	5	II
128	Târgu Mureș, MS	1962.05.02	B. T.	7	I
129	Târgu Mureș, MS	1962.05.03	B. T.	4	I
202	Târgu Mureș, MS	1960.05.01	B. E.	6	III
203	Reghin, MS	1961.04.23	Sz. M.	6	I
204	Târgu Mureș, MS	1962.04.28	Sz. M.	6	I
218	Târgu Mureș, MS	1960.04.24	Gy. I.	6	I
266	Târgu Mureș, MS	1964.05.10	Gy. I.	5	I
297	Săbed, MS	1962.05.02	Sz. Z.	7	I
343	Vălenii, MS	1968.04.19	Sz. A.	8	I

Pica pica (Linnaeus)

132	Dumbrăvioara, MS	1960.05.16	B. T.	6	I
133	Dumbrăvioara, MS	1961.05.03	B. T.	6	I
134	Târgu Mureș, MS	1963.06.08	B. T.	5	I
209	Glodeni, MS	1960.04.19	B. E.	4	I
210	Cristești, MS	1960.05.18	Sz. M.	7	II
211	Târgu Mureș, MS	1960.05.24	Sz. M.	5	II
260	Cristești, MS	1958.05.22	K. I.	7	I
261	Morești, MS	1964.04.19	K. I.	6	III
262	Sângeorgiu de Mureș, MS	1964.04.26	K. I.	8	I
299	Săbed, MS	1961.04.16	Sz. Z.	4	I
300	Morești, MS	1964.04.26	Sz. Z.	7	I
301	Morești, MS	1964.04.26	Sz. Z.	6	II
340	Icland (Ernei), MS	1968.04.17	Sz. A.	7	I
341	Icland (Ernei), MS	1968.04.17	Sz. A.	7	I
342	Petelea, MS	1967.05.06	K. I.	4	II
354	Icland (Ernei) MS	1968.04.17	Sz. A.	7	I

Corvus monedula Linnaeus

138	Târgu Mureş, MS	1960.05.05	B. T.	3	II
139	Dumbrăvioara, MS	1960.05.16	B. T.	4	II
140	Dumbrăvioara, MS	1960.05.16	B. T.	4	I
185	Dumbrăvioara, MS	1960.05.16	B. E.	4	II
186	Murgeşti, MS	1960.05.06	B. E.	5	I
217	Moreşti, MS	1960.05.11	Gy. I.	5	I
298	Moreşti, MS	1961.04.23	Sz. Z.	4	I
359	Moreşti, MS	1961.04.23	Sz. Z.	3	I
373	Sântana de Mureş, MS	1996.05.04	G. E.	4	I

Corvus frugilegus Linnaeus

148	Moreşti, MS	1960.04.03	B. T.	5	I
149	Moreşti, MS	1961.04.23	B. T.	5	II
150	Moreşti, MS	1961.04.23	B. T.	4	II
205	Moreşti, MS	1961.04.23	Sz. M.	5	II
206	Murgeşti, MS	1961.05.02	B. E.	5	I
207	Murgeşti, MS	1961.04.23	B. E.	5	II
215	Moreşti, MS	1962.04.28	Gy. I.	5	I
265	Moreşti, MS	1964.04.19	Gy. I.	6	II
289	Moreşti, MS	1961.04.23	Sz. Z.	4	I
290	Moreşti, MS	1961.04.23	Sz. Z.	4	I
291	Moreşti, MS	1961.04.23	Sz. Z.	4	II
292	Moreşti, MS	1961.04.23	Sz. Z.	5	III
293	Moreşti, MS	1961.04.23	Sz. Z.	5	II
294	Moreşti, MS	1961.04.23	Sz. Z.	4	I
332	Moreşti, MS	1964.04.23	Sz. Z.	4	I
333	Moreşti, MS	1964.04.23	Sz. Z.	5	II

Corvus cornix Linnaeus

151	Săbed, MS	1961.04.30	B. T.	4	I
152	Săbed, MS	1961.05.30	B. T.	5	II
153	Săbed, MS	1961.05.30	B. T.	5	I
208	Sângeru de Pădure, MS	1962.05.14	B. E.	4	I
296	Săbed, MS	1963.04.21	Sz. Z.	4	II
339	Târgu Mureş, MS	1968.04.14	Sz. Z.	5	I
337	Icland (Ernei) MS	1968.04.24	Sz. Z.	5	II

Corvus corax Linnaeus

146	Sângeru de Pădure, MS	1962.03.04	B. T.	6	I
147	Găieşti, MS	1962.03.11	B. T.	5	I
182	Sângeru de Pădure, MS	1963.04.07	B. E.	5	II
295	Sâncraiu de Mureş, MS	1962.03.05	Sz. Z.	6	III
375	Budiu Mic, MS	1995.03.27	X.	5	II

Sturnidae Family

Sturnus vulgaris Linnaeus

130	Săbed, MS	1961.05.14	B. T.	5	I
194	Reghin, MS	1961.04.23	B. E.	4	II
195	Reghin, MS	1961.04.23	Sz. M.	5	II
196	Reghin, MS	1961.04.23	Sz. M.	5	I
221	Sântana de Mureș, MS	1960.05.21	Gy. I.	4	I
328	Săbed, MS	1963.04.21	Sz. Z.	6	I

Passeridae Family

Passer domesticus (Linnaeus)

17	Târgu Mureș, MS	1960.06.14	Sz. M.	6	I
18	Târgu Mureș, MS	1960.06.13	B. E.	6	II
19	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	4	II
20	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	4	II
21	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	5	II
22	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	5	II
23	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	5	II
24	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	4	I
25	Miheșu de Câmpie, MS	1960.06.17	Sz. M.	4	II
26	Dumbrăvioara, MS	1960.06.19	Sz. M.	5	I
27	Târgu Mureș, MS	1960.06.28	B. E.	6	I
71	Dumbrăvioara, MS	1960.05.21	B. T.	4	I
72	Miheșu de Câmpie, MS	1960.06.05	B. T.	4	I
73	Miheșu de Câmpie, MS	1960.06.05	B. T.	4	II
74	Miheșu de Câmpie, MS	1960.06.06	B. T.	5	II
75	Miheșu de Câmpie, MS	1960.06.07	B. T.	5	I
76	Miheșu de Câmpie, MS	1960.06.08	B. T.	5	I
77	Zau de Câmpie, MS	1960.06.12	B. T.	6	I
78	Zau de Câmpie, MS	1960.06.12	B. T.	4	I
79	Zau de Câmpie, MS	1960.06.13	B. T.	6	I
80	Zau de Câmpie, MS	1960.06.14	B. T.	4	II
81	Zau de Câmpie, MS	1960.06.15	B. T.	4	II
82	Miheșu de Câmpie, MS	1960.06.16	B. T.	5	I
83	Miheșu de Câmpie, MS	1960.06.16	B. T.	6	II
84	Sărmașu, MS	1960.06.24	B. T.	5	II
233	Cristești, MS	1960.07.25	Gy. I.	4	I
329	Miheșu de Câmpie, MS	1960.06.16	B. T.	5	II
330	Miheșu de Câmpie, MS	1960.06.05	B. T.	4	I

Passer montanus (Linnaeus)

28	Târgu Mureș, MS	1960.05.26	Sz. M.	5	I
29	Târgu Mureș, MS	1960.05.28	Sz. M.	4	I
30	Reghin, MS	1961.04.23	B. E.	5	I
31	Târgu Mureș, MS	1962.05.06	Sz. M.	4	II
228	Târgu Mureș, MS	1963.07.04	Gy. I.	4	II
235	Târgu Mureș, MS	1960.06.23	Gy. I.	6	I
237	Berghia, MS	1960.06.10	Gy. I.	5	I
314	Târgu Mureș, MS	1961.05.26	Sz. Z.	4	I
315	Târgu Mureș, MS	1962.05.26	Sz. Z.	3	I

Fringillidae Family

Fringilla coelebs Linnaeus

46	Târgu Mureș, MS	1960.04.24	B. E.	5	I
47	Târgu Mureș, MS	1960.04.24	Sz. M.	5	I
48	Târgu Mureș, MS	1962.05.06	Sz. M.	5	III
49	Târgu Mureș, MS	1962.05.13	Sz. M.	5	II
113	Târgu Mureș, MS	1961.05.01	B. T.	5	II
114	Gurghiu, MS	1960.07.05	B. T.	4	II

Carduelis chloris (Linnaeus)

50	Târgu Mureș, MS	1960.06.06	Sz. M.	4	I
51	Târgu Mureș, MS	1961.05.05	Sz. M.	6	I
52	Târgu Mureș, MS	1961.05.13	Sz. M.	5	I
88	Târgu Mureș, MS	1960.06.28	B. T.	4	I
89	Târgu Mureș, MS	1961.06.22	B. T.	6	I
90	Târgu Mureș, MS	1961.06.22	B. T.	4	I

Carduelis carduelis (Linnaeus)

14	Târgu Mureș, MS	1961.05.12	Sz. M.	6	I
15	Târgu Mureș, MS	1961.05.28	Sz. M.	4	-
16	Acățari, MS	1961.06.02	B. E.	5	-
99	Dumbrăvioara, MS	1960.05.13	B. T.	4	I

Coccothraustes coccothraustes (Linnaeus)

41	Târgu Mureș, MS	1960.04.24	Sz. M.	5	I
42	Târgu Mureș, MS	1960.04.31	Sz. M.	4	I
43	Târgu Mureș, MS	1962.04.27	B. E.	4	I
44	Târgu Mureș, MS	1962.05.13	Sz. M.	4	II
45	Târgu Mureș, MS	1962.05.10	Sz. M.	5	II
86	Târgu Mureș, MS	1960.04.27	B. T.	6	I
87	Târgu Mureș, MS	1962.05.04	B. T.	6	II
232	Târgu Mureș, MS	1960.04.29	Gy. I.	5	I
309	Târgu Mureș, MS	1962.05.04	Sz. Z.	5	I
344	Gornești, MS	1968.04.21	Sz. A.	4	I

Emberizidae Family

Emberiza citrinella Linnaeus

222	Vălureni, MS	1960.05.25	Gy. I.	3	II

REFERENCES

1. Antal, V., Szombath, Z., 1971, Recensământul coloniilor de *Riparia riparia* (L.) și *Merops apiaster* (L.) de-a lungul Mureșului între Tg. Mureș și Pecica (județul Arad), *Studii și comunicări. (Muzeul de Științele Naturii Bacău)*: 301–308.
2. Antal, V., Szombath, Z., 1972, Avifauna pădurii „Perimetrul Experimental Săbed", *Ocrotirea Naturii*, nr. **1**/1972, T.**16**., București: 47 – 55.
3. Béczy, Thomas, L., 1971, *Catalogue of the oological collection of the Museum in Oradea. Criș – Rivers Region Museum*, Oradea.
4. Ciochia, V., 1999, *Păsările clocitoare din România*, București.
5. Guide, Hamlin, 1999, *Păsările din România și Europa*. (1999) (versiunea română Dan Munteanu).
6. Hoeher, Siegfrid, 1973, *Gelege der Vögel Mitteleuropas*. (1973) D. D. R.
7. Kalabér, L., 1974, Contribuții la cunoașterea compoziției chimice a învelișului calcaros de ou la unele păsări sălbatice. (Beiträge zur Kenntnis der chemischen Zusammensetzung der kalkigen Eierschale bei einigen Wildvögeln), *Nymphaea* **2**: 135 – 157.
8. Kalabér, L., Szombath, Z., 1975, Contribuții la cunoașterea nidobiologiei și a dezvoltării postembrionale la șoimul rîndunelelor (*Falco subbuteo* L. 1758), *Studii și comunicări (Muzeul de Științe Naturale)* nr. **8**., Bacău: 237 – 252.
9. Kalabér, L., 1976, Catalogul ouălor de păsări din colecția Ladislau Kalabér (Katalog der Eiersammlung L. Kalabér), *Muzeul de Științele Naturii Bacău, Studii și comunicări*: 285–335.
10. KISS, A., 1997, Repertoarul colecției oologice de la Muzeul Banatului din Timișoara, *An.Ban.Șt.Nat.*, Vol.**III**, Timișoara: 277–312.
11. Kiss, Sz. Z., Kohl, St., Kónya, I., Sárkány-Kiss, A., Szombath, Z., 1987, Studiul complex al lacului Fărăgău. *Ziridava XVII. (lucrări prezentate la cea de a III-lea conferință de ecologie)* Arad 4 – 7 iulie 1987: 323 – 324.
12. Kohl, St., Szombath, Z., Kónya I., Lőrincz I., Libus A., Szombath I., 1995, The birds of the Mureș (Maros) River (in The Maros/Mureș River Valley, Szolnok – Szeged – Târgu Mureș, *Tiscia* – monograf series): 235 – 244.
13. Kónya, I., Szombath, Z., Kohl, I., 1983, Observații ornitologice de-a lungul Mureșului, între Izvorul Mureșului și Arad (1978), *Analele Banatului* **1**. (Șt. Nat.) Timișoara: 243 – 251.
14. Makatsch, W., 1974, *Die Eier der Vögel Europas*, vol. **I**. vol. **II**., Neumann Verlag, DDR.
15. Munteanu, D., 2001, *Dicționar poliglot al speciilor de păsări din România*, Societatea Ornitologica Română: 1 – 58.
16. Munteanu, D., Papadopol, A., Weber, P., 2002, *Atlasul păsărilor clocitoare din România*. Ed.II.
17. Patriche, G., Manci, C.-O., 2006, *Colecția oologică Ion Cătuneanu din Complexul Muzeal de Științele Naturii Galați*, Ed. Mongabit, Galați, 105 pp.
18. Rey, E., 1905, *Die Eier der Vögel Mitteleuropas*, vol. **1**, **2**, **3**.
19. Ridiche, M., 2003, Catalogul colecției de oologie a Muzeului Olteniei Craiova, *Oltenia. Studii și comunicări. Științele Naturii*, vol. **XIX**, Craiova: 207–217.
20. Szabó M. Attila, Szabó M. Erzsébet, 2003, *Dicționar de localități din Transilvania (Erdélyi Helységnévszótár, Orstnamenferzeichnis für Siebenbürgen)*, Ed. Kriterion, Cluj.
21. Szabó, I., Szombath, Z., 1984, Însemnări ornitologice din zona Iernut, *Revista Vînătorul și Pescarul Sportiv* nr. **2**/1984: 10.
22. Szabó-Szeley, L., Baczó, Z., 2006, *Nomenclatorul păsărilor din România – Nomenclator Avium Romaniae*. Ed. AVES, Odorheiu Secuiesc, 117 pp.
23. Szombath, Z., Antal, V., 1972, Observații ornitologice de-a lungul Mureșului între Tg.Mureș și Pecica (jud Arad), *Studii și materiale* vol. **III – IV** (Muzeul Județean Mureș), Tîrgu Mureș: 27 – 42.
24. Szombath, Z., Gombos, A., 1975, Observații privind pescărașul albastru (*Alcedo atthis* L.) de-a lungul Mureșului. *Nymphaea* vol. **III**. (Muzeul Țării Crișurilor). Oradea: 179 – 190.
25. Szombath, Z., Kohl, I., Kónya, I., Szombath, I., Gombos, A., 1983, Observații ornitologice de-a lungul Mureșului, între Izvorul Mureșului și Arad, *Analele Banatului* **1**. (Șt.Naturale) Timișoara: 227–237.
26. Szombath, Z., Antal, V., 1983, Observații privind biologia corbului (*Corvus corax* L. 1758), *Marisia* **XI–XII**, (Muzeul Județean Mureș) Fasc. **1**. Târgu Mureș: 161 – 165.
27. Szombath, Z., Antal, V., 1983, Prezența ordinului *Ciconiiformes* în avifauna văii Mureșului între Dumbrăvioara și Iernut, Marisia **XI–XII** (Muz. Jud. Mureș) Târgu Mureș Fasc. **1**: 167–176.
28. Szombath Z., Kohl St., Kónya I., Sárkány Kiss A., Weber P., 1995, Avifauna rîului Mureș (1989), *Marisia* **13–14**, fasc. **2**. (Muz.Jud. Mureș) Târgu Mureș: 475 – 488.
29. Szombath, Z., 1991, Ornitofauna clocitoare a lacurilor de la Iernut și Cipău, jud. Mureș. *Buletin de Informare al Soc.Orn. Rom. Mediaș,*. nr. **1**.: 11–12.

30. Szombath, Z., Szabó J., 1997, Avifauna eleșteelor de la Iernut în primii 5 ani de la amenajarea lor. Marisia XXV (Muzeul Jud. Mureș) Târgu Mureș, pp 439 – 454.
31. Szombath, Z., 2003 – 2004, Sólyomtenyésztés Erdélyben I, II, III, *Erdélyi Nimród*, 2003/6 p. 10–14, 2004/1 p 14–19, 2004/2: 12–15.
32. Szombath, Z., 2006, Acvila țipătoare mică (*Aquila pomarina*), *Marisia* **XXVIII**, (Muzeul Jud. Mureș) Târgu Mureș: 80 – 90.
33. Szombath, Z., 2010, The ornithological collection of Mureș Counthy Museum, Natural Science Branch, *Marisia* **XXIX – XXX**, Științele Naturii, Târgu Mureș: 117–154.
34. Szombath, Z., 2011, Catalogul sistematic al colecției de schelete parțiale a Muzeului Județean Mureș, din Târgu Mureș, *Marisia* **XXXI**: 73–99.
35. Weber, P., 1994, *Atlasul provizoriu al păsărilor clocitoare din România*. Publ. S.O.R. 2, Mediaș.
36. WWW faunaeuropaea.org
37. http://www.hoinari.ro/colectia-oologica-kalaber-ladislau-reghin-transilvania-
38. www.adevarul.ro/locale/sibiu
39. http://www.averea.ro
40. www.muzeulbanatului.ro/stiintele_naturii/a_m_kiss.
41. http://www.besttourism.ro/ghid-europa-romania.html
42. http://www.cancan.ro/actualitate/intern/colectie-de-oua-interzise-la-oradea-12142.html

CATALOGUL COLECȚIEI OOLOGICE DE PĂSĂRI A MUZEULUI JUDEȚEAN MUREȘ, SECȚIA DE ȘTIINȚELE NATURII
(Rezumat)

Colecția oologică a muzeului din Târgu Mureș este alcătuită din șase părți (Tabelul 2) și este compusă din 382 de ponte constând din 1879 de ouă, provenind de la 82 de specii de păsări. Peste 90% dintre piese au fost colectate între anii 1960 – 1964, iar restul provin din achiziții sau donații. În afară de acestea, în perioada 1958 – 2011 (54 ani) s-au mai inregistrat 46 de cuibare primite sau colectate și preparate de noi. Din tabelul 4 reiese că 370 de ponte au fost colectate din județul Mureș și doar 12 cuibare provin din altă parte.

Publicarea acestor date oferă informații despre corologia speciilor și îmbogățește cunoștințele despre biodiversitatea avifaunistică a acestor zone și este un inventar fidel, controlabil, care păstrează și completează imaginea avifaunei de odinioară, la fel ca și celelalte cataloage de colecții, publicate în anuarul muzeului nostru [33, 34].

Fig. 1: Nestle destroyed by crows

Fig. 2: Storage

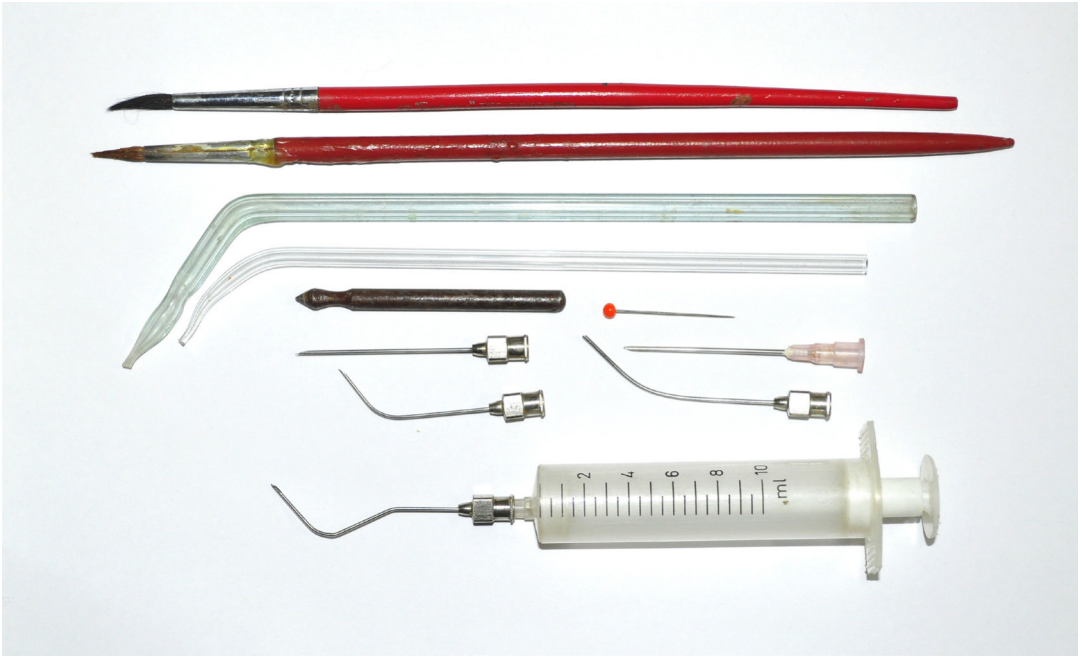

Fig. 3: Tools for eggs conservation

Fig. 4: Ways to storage eggs collection

Fig. 5: Clutches with cuckoo eggs

PALEONTOLOGY AND MINERALOGY

ON THE PRESENCE OF FALLOW DEER (*DAMA DAMA* L., 1758) IN SOME TRANSYLVANIAN SITES (ROMANIA)

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Abstract: This paper discusses four extinct populations, those that had existed in Mureș, Alba and Satu Mare counties. Causes of extinction: the wolves, stray dogs or sheep flocks dogs, poaching, lack of quiet and water.

Keywords: Fallow Deer, Transylvania, Romania.

Introduction

The Fallow Deer was introduced in many counties from Romania [1] but, for various reasons, some of the populations have become extinct. Between 1966 and 1988, Fallow Deer nuclei kept forming, the specimens originating from the counties of Timiș, Alba and Arad. Therefore, colonizations took place among counties and inside counties, the animals being moved from capture to destination sites by lorry. In some places adjustment enclosures were built, in others the Fallow Deer were released directly into the wild.

Material and methods

In order to follow the formation, population dynamics and extinction of the Fallow Deer nuclei studied, field investigations have been conducted (also enquiries among foresters, hunters and some locals) and statistical materials identified in the archives of some forestry units, have been consulted.

Gurghiu nucleus (Mureș County)

The Fallow Deer was colonized in the neighburhood of Gurghiu Commune, on Orșova Hunting Fund (630–700 m alt.), Dosul Forest [1], Poiana Mănăstirii Sector (20 km east of Reghin Town), in the Orșova Valley, 2 km east of Orșova-Pădure Villlage, at the southern ending of the Reghin Hills.

In May 1966, several individuals were brought from Șarlota Park (Timiș County) along the Șarlota-Deva-Alba Iulia-Târgu Mureș-Gurghiu route, by charcoal fuelled lorry (over a 400 km distance). Among the 20 specimens, four were fawns under one year of age, the oldest individuals being 5–6 years old.

The animals were kept in an enclosure (Poiana Mănăstirii area) surrounded by a 2 m – high wire net. The vegetation of the two-hectare enclosure consisted mostly of common oak, but also of hornbeam and beech.

In autumn 1966 the inmates were released into the wild. No fawn had been born in the enclosure. As long as the animals had been enclosed, food was the thrown over the fence lest they got used to man. Water was supplied by the Orșova Brook, as part of it ran through the enclosure. Two weeks after the animals had been released the enclosure was dismantled. In the beginning, Fallow Deer used to come back for food, but after a while they no longer did, spreading out in the surrounding forests as far as Mociar Forest (towards Reghin Town, at 15 km west from colonisation site) and farther towards Gurghiu. Some specimens were seen also towards the south-east, heading to Sovata spa-resort. In the following years, some does and fawns being observed.

In March 1967, Fallow Deer numbered about 20 individuals, from 1968 to 1970 there were constantly 25 (10 bucks and 15 does), subsequently decreasing steadily. Wolves and stray dogs account for the extinction of the species in 1980.

Iezerul Ighiel-Bărăbanț nucleus (Alba County)

In 1966, a one-hectare enclosure (enlarged to 6.5 ha in 1970) was built on Mount Vârtop (925–1,000 m alt.), Trascău Unit (Apuseni Mts) close to the Iezerul Ighiel Lake at 10 km from Ighiel Village (40 km north-east of Alba Iulia Town). The species was colonized beside other mammals. The region`s annual mean air temperature 8°C, precipitation totalling 650 mm/year on average. Seventy per cent of the enclosure area was beech forest and thirty per cent meadow land.

In 1966, seven Fallow Deer were brought from Socodor Forest (Arad County), another 7 (2 bucks, 5 does) coming from Șarlota Park (Timiș County) in March 1968. The 2m-high enclosure was surrounded by wire and barbed wire net.

The population increased from 23 specimens at the end of 1968 to 39 (16 bucks, 23 does) in 1976 and to 43 (17 bucks, 26 does) in 1977, representing the largest effective. In 1973, three specimens were captured and transferred to the forests near Ungurei (Alba County). In 1978 all individuals from Iezerul Ighiel enclosure were captured, carried by lorry and released into the wild in Bărăbanț (Dumbrava Șardului) Forest (15 km to the south-east) close to Alba Iulia Town.

The long strip-like forest extends on the Dumbrava-Bilag Hills (286–427 m alt.). Annual mean temperature at Ighiu (1.5 km west) is 9.3°C, the average precipitation 568.7 mm. The forest (370 ha) has a *Quercus* vegetation (*Q. petraea, Q. robur, Q. pubescens, Q. cerris*).

The Bărăbanț Forest nucleus kept decreasing steadily: 15 in 1978 (7 bucks, 8 does), 14 in 1979 (6 bucks, 8 does), 12 in 1980 (5 bucks, 7 does) and 6 in 1981 (2 bucks, 4 does).

Poaching and water shortage led to the extinction of the species (1982–1983).

Ungurei nucleus (Alba County)

Attempts had been made to enclose the species in the central part of the Secaș Plateau, Livada Forest, west/southwest of Ungurei Village (Roșia de Secaș Commune), eastern ending of Alba County (Ohaba Hunting Fund). The name of the forest derives from the homonymous brook, a tributary of the Secașul Mic River. Dominant forest vegetation (335–492 alt): *Quercus petraea*.

In December 1973, a number of three Fallow Deer (an adult doe and two male fawns) were brought (85 km) from the Iezerul Ighiel enclosure (Alba County) in a light lorry and released into the wild (Livada Forest), feeding sites being stuffed with leaves and corn combs.

In 1976, there were five specimens (2 bucks and 3 does), next year there were two pairs, and in 1978 the last two specimens were seen in Gârdan Forest, 5–6 km away from the release site.

In the years 1975 and 1976, attempts were made (but failed) to capture a few individuals from Pianu Forest (near Sebeș Town) to increase the Ungurei nucleus Later on, the idea was abandoned. What led to the species extinction in 1979 was the small number of individuals initially colonised and subsequently abandoned attempts to enlarge it; shepherd dogs and occasionally wolves came in, too.

Cerhat nucleus (Satu Mare County)

In 1988, at 20 km south of Satu Mare Town, Fallow Deer populated Giungi Hunting Fund, Cerhat Oak Forest (750 ha, 137–168 m alt. in the Someș Plain) between Ghirișa and Rătești villages. The specimens were brought by lorry from Chișineu-Criș Town (Arad County, 210 km) and released into the wild. From 1990 to 1992 there were 25 Fallow Deer (5 bucks and 20 does), 30 in 1993 and 1994 (10 bucks and 20 does), only 2 bucks were over 3 years old, 3 females were mature and 2 were old, the others being fawns. In 1995 and 1996 five pairs had remained and no more than 2 specimens were seen after 1997. In 1998 the species was extinct in this area [2].

A few Cerhat Forest individuals migrated 2 km north, to Ghiarmat oak forest (127–133 m alt.) between the settlements of Baba Novac and Ardud (Terebești Hunting Fund). The first animals (5 does) were seen in March 1991; subsequently in the spring of 1992, 1993 and 1994 there were 5 pairs each; a few specimens returned to Cerhat Forest in 1995. Causes of extinction: inability to adjust to local conditions and poaching.

Conclusions

The paper discuses four extinct populations in the counties of Mureș (Gurghiu), Alba (Iezerul Ighiel-Bărăbanț and Ungurei) and Satu Mare (Cerhat). Nuclei kept disappearing between 1979 and 1983 (Gurghiu, Iezerul Ighiel-Bărăbanț and Ungurei), as well as in 1998 at Cerhat.

REFERENCES

1. Cotta, V., Bodea, M., Micu, I. 2008, *Vânatul și vânătoarea în România*, Edit. Ceres, București, 789 pp.
2. * * * 1988–1998, Evidența compartimentului vânătoare, *Arhiva Direcției Silvice Satu Mare*, Satu Mare.

DESPRE EXISTENȚA CERBILOR LOPĂTARI ÎN UNELE LOCURI DIN TRANSILVANIA
(Rezumat)

Colonizări cu cerb lopătar s-au realizat în numeroase județe din țară, dar din diferite cauze, unele populații ale acestui mamifer au dispărut. În lucrare ne-am oprit asupra a numai patru dintre nucleele extincte de pe teritoriile județelor: Mureș (Gurghiu), Alba (Iezerul Ighiel-Bărăbanț și Ungurei) și Satu Mare (Cerhat). Nucleele populaționale au fost create în perioada 1966–1988, exemplarele fiind aduse din județele Timiș, Alba și Arad. Transportul indivizilor de la locurile de capturare la cele de colonizare s-a realizat cu camioane. În unele locuri s-au construit țarcuri de acomodare, iar în altele, cerbii lopătari aduși s-au lăsat direct liberi. Extincția nucleelor s-a înregistrat în intervalul 1979–1983 (Gurghiu, Iezerul Ighiel-Bărăbanț și Ungurei) și în 1998 la Cerhat. Cauzele extincțiilor au fost: lupii, câinii vagabonzi sau de la turmele de oi, braconajul, lipsa liniștii și a apei.

MAIN PLIOCENE COAL-GENERATING PHYTOCOENOSES IN DANUBE–MOTRU AREA (ROMANIA)

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Abstract: In the Danube–Motru area five main Pliocene biotopes were identified, which acted as coal-generating swamps in Oltenia. Documented by floristic analyzes, they are the following zones: marginal, seasonally flooded, almost permanently covered by water, permanently covered by water exceeding 2 m (≤ 2 m) in depth, permanently covered by water exceeding 3 m (≥ 3 m). In Pliocene the main coal-generating phytocoenoses of Danube-Motru area were generally dominated by one of these taxa: *Glyptostrobus europaeus, Byttneriophyllum tiliaefolium, Phragmites oeningensis, Salix s*sp., *Pandanus* ssp. Sometimes two of these taxa were associated, rarely three. In these paleophytocoenoses, *Carya denticulata, Platanus platanifolia, Acer tricuspidatum, Carpinus betulus, Typha latissima, Liquidambar europaeum* etc. were secondary elements.

Keywords: Pliocene, phytocoenoses, environments, Oltenia, Romania.

Introduction

The micro – and macrofloristical research of the vegetal fossil remains allow a reconstruction of the biotopes, phytocoenoses and climatic factors that favored the development of luxuriant vegetation in coal-generating swamps, where the parental vegetal material of coals accumulated. Thus, focusing the researches in the Danube – Motru area, mainly in the Husnicioara open pit and the related outcrops, based on new data and of the principle of actuality, according to living correspondents of plants and animal fossils, one can estimate and reconstruct the Pliocene environments.

Previous researches

The first attempts in reconstructing the Pliocene coal-generating vegetation from Oltenia based on macrofloras researches belonged to Ţicleanu et al. [18, 19, 14]. After, Ţicleanu [16, 17], Ţicleanu & Diaconiţă [20] outlined a detailed reconstitution of similar coal-generating vegetation, but for the first time these researchers integrated the vegetal communities in phytocoenoses. The importance of some Pliocene phytocoenoses coal-generating coals in the Danube-Motru area is emphasized also by Diaconu [2], identifying the dominant species of coal-generating flora recorded in Husnicioara open pit.

Based on sporo-pollen studies, Petrescu et al. [11] presented a reconstruction of the plant communities for the Late Pliocene (Romanian) in Roşia Jiu – Turceni area, i.e. from the central part of the coal basin, where these researchers outlined four plant assemblages. Similar

attempts were carried out in Zegujani, Husnicioara and Izvorul Aneștilor areas by Petrescu et al. [12, 13].

Although previously in Husnicioara Petrescu et al. [12] made a general environmental reconstruction, the one presented by Diaconu & Țicleanu [7] was the first to underline the coal-generating swamps where the parental vegetal material accumulated for the generation of coals from seams I–IV, with detailed analysis of biotopes and plant communities (phytocoenoses and vegetal assemblages).

The ecological study of the floristic repertory of the Mio-Pliocene macrofloras from Danube – Motru sector indicated [5] the presence of distinct biotopes: coniferous forests, deciduous forests, hygrophyte deciduous forests, river meadows and marsh forests.

In her Ph.D. thesis, Diaconu [6] stressed out also a reconstruction of the Uppermost Miocene-Pliocene phytocoenoses in Danube – Motru area.

Geological and gitologic settings

Based on genesis, relationship to one of the three lithostratigraphic units and the extending area, the coal seams in Oltenia were grouped into three coal complexes [1]:

- Vișenilor Valley Complex (layers D and I–IV) in Berbești Formation (mainly psammitic; Early Dacian),
- Motru Complex, the most important (coal seams V–XIV), in Jiu-Motru Formation (pelite-psammite-humitic; Romanian – Parscovian),
- Bălcești Complex of the Cândești Formation (psammite-psephitic), developed only in the central area of the basin with minor importance (coal seams XV–XVIII; Middle Romanian – Early Pleistocene).

In Danube – Motru area there are only two of these coal complexes: Vișenilor Valley Complex, characteristic of this sector and Motru complex, weakly extended, in which occur only the coal seams V–VIII with coal mining levels in the northwestern sector (the Western Motru mining perimeter). For coal layers from the two complexes are delimited and exploited of the deposits in perimeters: Husnicioara (layers I, III and IV) Zegujani (layer I) and Western Motru (Layer V).

Between the coals deposits listed above, the most representative for the studied sector is one from Husnicioara, where they accessible for research, the main layers (I, III and IV) of the Complex of Vișenilor Valley. In the exploration drilling of coals for the Danube – Motru sector, Diaconu [5] highlights the lithological sequences of different types in the lithological succession of Romanian-Dacian deposits with coals.

This sequence shows the composition of the most common rhythms for the main coals layers from researched sector, like in all throughout Oltenia and reflects the phases sequence: telmatic, lacustrine, fluviatil and fluvial-lacustrine. However, taking into account that between layer I and IV the deposits corresponding of the rhythms containing coal layers II and III are missing, we must accept that at the base of the sands with oblique stratification there is a discordance, it more so, since the layer III in perimeter of the Husnicioara occurs either as a distinct gitologic unit or associated to coal layer IV.

Material and methods

The method used in reconstructing the coal-generating vegetation relies on data provided by the fossil plants collected from the coal deposits and on the coal facies analysis in Husnicioara open pit. The results were compared to the previous geological, pollen and gitologic researches.

Fossil plants are originating from the roof of the coal seams IV and VI of Husnicioara, the yellowish grey marl on Balota Hill and Dedovița and of the clays and silt clays from Bâcleș.

It is considered that the fossil plants had nearly the same coenotic exigencies and ecological requirements as the living correspondents.

The reconstruction of the main pliocene coal-generating phytocoenoses

In the Pliocene deposits of the Danube-Motru sector were identified [18, 12, 2, 3, 21, 9, 10] the following taxa presented in the table 1.

Table 1: Pliocene plant genera and species recorded in Danube-Motru area

No.	Taxa	Husnicioara	Dedovița	Balota Hill	Bâcleș
1	*Sequoia abietina* (BRONGNIART) KNOBLOCH		+	+	+
2	*Pinus* sp.		+		
3	*Taxodium dubium* (STERNBERG) HEER				+
4	*Glyptostrobus europaeus* (BRONGIART) UNGER	+	+	+	
5	*Glyptostroboxylon tenerum*	+			
6	*Ceratophyllum* sp. aff. *C. demersum* LINNE	+			
7	*Platanus platanifolia* (ETTINGSHAUSEN) KNOBLOCH	+			+
8	*Liquidambar europaea* AL. BRAUN		+	+	
9	*Alnus* cf. *gaudinii* (HEER) KNOBLOCH & KVACEK		+		
10	*Alnus* sp.		+		+
11	*Betula* cf. *macrophylla* (GOEPPERT) HEER		+		
12	*Carpinus grandis* UNGER		+		
13	*Carpinus betulus* LINNE – leaves	+	+		
14	*Carpinus betulus* LINNE – bracts	+		+	
15	?*Myrica lignitum* (UNGER) SAPORTA	+			
16	*Carpinus pyramidalis* GAUD		+		
17	*Fagus attenuata* GOEPPERT		+		
18	*Quercus roburoides* BERENGER		+		+
19	*Quercus* cf. *muehlembergii* ENGELMAN				+
20	*Quercus* sp.	+			
21	*Ulmus laevis* LINNE				+
22	*Ulmus pyramidalis* GOEPPERT				+
23	*Acer* cf. *tricuspidatum* BRONN				+
24	*Acer* cf. *campestre* LINNE				+
25	*Acer* sp.	+			
26	*Carya denticulata* (WEBER) ILJINSKAIA	+			+
27	*Carya serraefolia* (GOEPPERT) KRAUSEL		+		
28	*Juglans acuminata* ALL. BRAUN		+		
29	*Salix integra* GOEPPERT		+		
30	*Salix ștefănescui* LAURENT & MARION	+			
31	*Salix* sp. aff. *S. varians* AL. BRAUN		+		
32	*Salix* sp.	+			+
33	*Byttneriophyllum tiliaefolium* (AL. BRAUN) KNOBLOCH & KVACEK	+		+	
34	*Pandanus austriacus* ETTINGSHAUSEN	+			
35	*P. trinervis* ETTINGSHAUSEN	+			
36	*P. barbui* PETRESCU & DUȘA	+			
37	*Potamogeton* cf. *nodosus* POIR	+			
38	*Phragmites oeningensis* AL. BR.	+			

In the Danube – Motru area was identified the five main paleobiotopes (Fig. 1) that formed the coal-generating swamps from Oltenia during the Pliocene.

1. The marginal zone – The Sequoia Forest is a marginal biotope dominated of the forests with *S. abietina*, *Pinus* sp. *G. europaeus*, *Cedrus* and *Sciadopitys*.

2. The seasonally flooded zone – The deciduous forests is the biotope in the central part of the coal-generating swamps, with herbaceous vegetation dominated by *Carex* species, various *Pandanus* species and probably *Myrica lignitum* bushes.

In same seasonal flooded areas, in a more advanced stage of vegetation, hygrophyte deciduous forests with multi-plant assemblages dominated by *B. tiliaefolium* or various *Salix* species installed. *Salix* associations were probably related to the outside biotope and *Myrica lignitum*, *Alnus* sp., *Liquidambar europaeum*, *Carya aquatica* type, *Juglans barbui*, probably *Nyssa* and *Acer tricuspidatum*.

3. The almost permanently covered by water zone – The swamp forest *Glyptostrobus* is a biotope absolute dominated by *G. europaeus* assemblages, with *B. tiliaefolium*, *Taxodium dubium*, *Nyssa*. This plant community was characterized by the presence of a discontinuous bed of ferns, especially *Osmunda regalis*. Sometimes the distance between trees reached several meters allowing installing the beds of *Phragmites* and even meshes water with *Stratiotes dacicus*.

4. The permanently covered by water zone (≤ 2 m) – The swamp with *Phragmites* and *Pandanus* was a biotope permanently covered with water, from a few centimeters to 2 m in depth, dominated by *Phragmites oeningensis* plant assemblage with: *Typha latissima*, *Pandanus* div. sp., *Sparganium* sp. and occasionally other species.

5. The permanently covered by water zone (≥ 3 m) – The swamp with aquatic plants was dominated by assemblages with: *Stratiotes dacicus*, *Nelumbo protospeciosa*, *Nymphaea luteum, N. alba*, *Ceratophyllum demersum* and *Potamogeton* div. sp.

Each of the plant communities (phytocoenoses, associations) led to a distinct coal facies with specific environmental factors, forming different lithotypes [15, 20].

The Sequoia forest led to form the xylitic coal with many roots which; unfortunately, because of their marginal position these roots were eroded. The coal facies of the grassy swamps with *Carex*, *Pandanus* and *Myrica*, and all the forest swamps with hygrophyte deciduous woods formed the detritic coals, but poor xylitic coal in small quantity.

The swampy forests with *Glyptostrobus* generated lithotypes as: coal xylitic and xylite, these two being genetically related. Țicleanu's [14, 15] researches showed that more than 80% of the fossil wood passed into xylite derived from *Glyptostrobus europaeus*, one of the trees that make an important contribution to the establishment of parental vegetal material of the coal from Oltenia.

The swamps with reed (*Phragmites*, *Pandanus* and *Typha*) were much extended when the coal seam IV formed, generating the detritic coal and very little weak xylitic coal. The detritic coal is the most widespread lithotype in the coals from Oltenia. The associations with aquatic plants, depending on their density and the input of suspended clayey minerals formed detritic coals, clayey coals and coal clay.

The changes in water depth due to the changes of the rate of subsidence or flooding, caused alternations in time of the phytocoenoses and formation of the genetic series reported [4] in Husnicioara open pit.

Conclusions

The main Pliocene coal-generating phytocoenoses in Danube-Motru sector were dominated by one of these taxa: *Glyptostrobus europaeus, Byttneriophyllum tiliaefolium, Phragmites oeningensis, Salix s*sp., *Pandanus* ssp. or by two, rarely three of them together. In these phytocoenoses *Carya denticulata, Platanus platanifolia, Acer tricuspidatum, Carpinus betulus, Typha latissima, Liquidambar europaeum* etc. were secondary elements.

Depending on each phytocoenose and vegetal association recorded in the coal seams I–IV from the Danube-Motru sector, the next coal facies may be outlined:

- The Forest with Sequoia, the swamps with *Carex* div. sp and *Pandanus*, replaced in time of the swamp with *Salix* and *Myrica*;
- The swamps with deciduous hydrophytes with tow variants (with *Salix* div. sp. and *Liquidambar europaeum*, *Acer tricuspidatum*, *Alnus* sp., *Carya aquatica*, *Juglans barbui* etc., or with *B. tiliaefolium*);
- The swampy forests with *Glyptostrobus* associated or not with *Taxodium dubium* and/or *Nyssa* sp.;
- The assemblages with *Phragmites* and *Pandanus*, with or without *Typha latissima*, *Sparganium* etc.
- The vegetal assemblages with monocoenoses dominated by taxa: *Stratiotes dacicus*, *Nymphaea*, *Ceratophyllum*, *Nelumbo*, etc.

Each of these facies generated different lithotype of coals. The dominance of the xylite and coal xylitic lithotype shows low values of the pH during the accumulation the parental vegetal material for the layer I and for the layer IV dominated the neutral environments to slightly alkaline that characterize swamps with *Carex*, especially the ones with *Phragmites*.

The dominant anaerobic environment of the coal-generating swamps that has accumulated the parental vegetal material of the layer 1 allowed the preservation of wood fossil, fact noted in the macro-petrographic profiles where the xylite mostly predominates. The parental vegetal material of the coal seam IV accumulated under anaerobic conditions, or less aerobe ones, evidence being the large amount of the coal originating from the detritic facies in swamps with *Phragmites* and less with xylitic coal with origins in the facies coal of the forest with *Glyptostrobus*.

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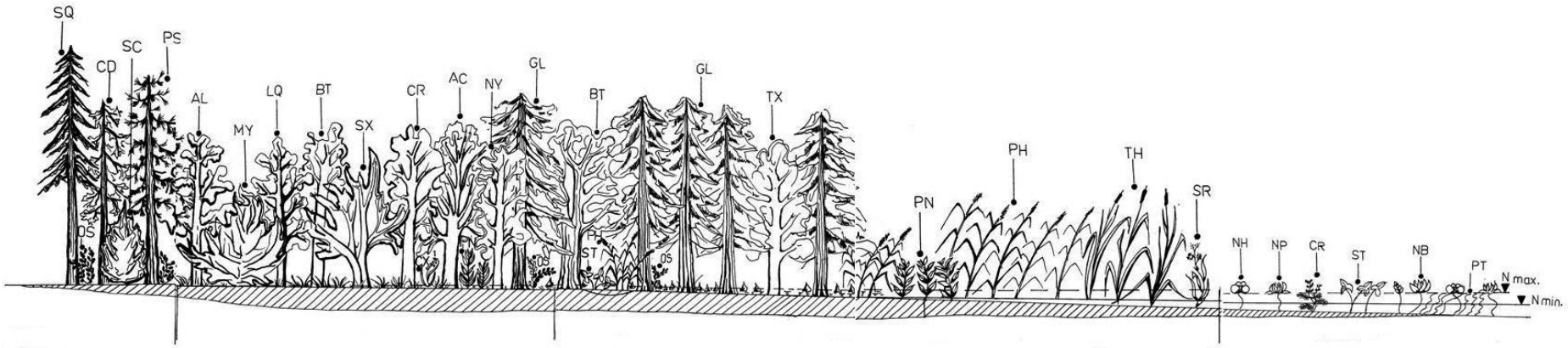

The marginal zone
The Sequoia Forest

SQ - *Sequoia abietina*
CD - *Cedrus* sp.
SC - *Sciadopitys* sp.
PS - *Pinus* sp.

The seasonally flooded zone
The deciduale deciduous forests

AL - *Alnus* sp.
MY - *Myrica lignitum*
LQ - *Liquidambar europaea*
SX - *Salix* div. sp.
CR - *Carya* tip aquatica
CX - *Carex* div. sp.
AC - *Acer tricuspidatum*
PN - *Pandanus* div. sp.
NY - *Nyssa disseminata*
GL - *Glyptostrobus europaeus*

The zone of almost permanently covered
The swamp forest *Glyptostrobus*

GL - *Glyptostrobus europaeus*
BT -*Byttneriophyllum tiliaefolium*
ST - *Stratiotes dacicus*
PH - *Phragmites oeningensis*
OS - *Osmunda regalis*
TX - *Taxodium dubium*

The zone of permanently covered
The swamp with *Phragmites* and *Pandanus*

PN - *Pandanus* div. sp
PH - *Phragmites oeningensis*
TH - *Typha latissima*
SR - *Sparganium neglectum*

The zone of permanently covered
The swamp with aquatic plants

NH - *Nymphaea luteum*
NP - *Nymphaea alba*
CR - *Ceratophyllum demersum*
NB - *Nelumbo protosepeciosa*
PT - *Potamogeton* div. sp

Fig. 1: The main Pliocene biotopes identified in the Danube – Motru area (original)

REFERENCES

1. Andreescu, I., Țicleanu, N., Pană, I., Pauliuc, S., Pelin, M., Barus, T., 1985, Stratigraphie des dépôts pliocènes á charbons zone est d'Olténie (secteur Olt-Jiu). *Analele Universității București, Geologie*, București, **XXXIV**: 87–96.
2. Diaconu, F., 2000, Date preliminare privind studiul paleoflorei din cariera Husnicioara Vest, *Armonii naturale* nr. **4**. Arad.
3. Diaconu, F., 2002, Observații recente în punctele fosilifere pliocene dintre Dunăre și Motru, *Drobeta*, **X-12**. Editura Radical, Drobeta Turnu Severin: 199–207.
4. Diaconu, F., 2004, Caracteristici petrografice ale ligniților din cariera Husnicioara (Județul Mehedinți), *Argessis, Studii și comunicări. Seria Științele Naturii*, **XII**: 23–33.
5. Diaconu, F., 2007, The floristic repertory of the mio-pliocene macrofloras from Danube – Motru sector (Mehedinți District), *Oltenia. Studii și Comunicări. Științele naturii*, **XXII**: 191–196.
6. Diaconu, F., 2008, *Reconstituirea mediilor carbogeneratoare pliocene dintre Dunăre și Motru*, Edit. Universitaria Craiova: 321 pp.
7. Diaconu, F., Țicleanu, N., 2006, Reconstituirea paleomediilor carbogeneratoare în sectorul Dunăre-Motru (sud-vestul Olteniei), *Oltenia. Studii și Comunicări, Științele naturii*, **XXII**: 11–14.
8. Diaconu, F., Enache, C., 2007, Considerations concerning the Balota hill Site (Mehedinți District). *Drobeta, Științele Naturii*, **XVII**: 17–27.
9. Diaconu, F., Țicleanu, N., 2008, Contributions concerning the Dacian flora in southwest of Oltenia, *Oltenia. Studii și Comunicări, Științele naturii*, **XXIV**:11–14.
10. Enciu, P., Diaconu, F., Popescu A., 2006, Despre evoluția paleogeografică a sectorului Bâcleș din Piemontul Bălăciței, *Oltenia. Studii și Comunicări, Științele naturii*, **XXII**, Craiova:15–27.
11. Petrescu, I., Codrea, V., Pătrușoiu, I., Meilescu, C., 1987, Contributions à la connaissance de la géologie, de la paléontologie, de la palynologie et de la genèse des formations de charbon du Pliocène supérieur (Romanien) de la zone Roșia-Peșteana-Turceni (Département de Gorj)*, Studia Universitatis Babeș-Bolyai, Geologie-Geografie*, **XXXII/2**: 11–27.
12. Petrescu, I., Cernita, P., Meilescu, C., Codrea, V., Pascovici, N., Vădan, M., Hosu, Al., Manda, S., Bengulescu, L. 1989 a, Preliminary Approaches to the Palynology of Lower Pliocene (Dacian) Deposits in the Husnicioara Area (Mehedinți Country, S.W. Romania)*, Studia Universitatis Babeș-Bolyai, Geologie-Geografie*, **XXXIV/2**: 67–74.
13. Petrescu, I., Nica, T., Filipescu, S., Barbu, O., Carmen, Chira, Avram, R., Valaczkai, T., 1989 b, Paleoclymatical significance of the Palynological Approach to the Pliocene Deposits of Lupoaia (Gorj County. *Studia Universitatis Babeș-Bolyai, Geologie-Geografie*, **XXXIV/2**: 75–82.
14. Țicleanu, N., 1986, Date preliminare privind studiul paleobotanic al unor foraje de referință pentru cărbunii de Oltenia. *Dări de Seamă, Institutul de Geologie și Geofizică*, **70–71/ 3**: 235–248.
15. Țicleanu, N., 1992, *Studiul genetic al principalelor zăcăminte de cărbuni neogeni din România pe baza paleofitocenozelor caracteristice, cu privire specială la Oltenia*, Teză de doctorat. Universitatea din București.
16. Țicleanu, N., 1992 a, Main Coal generating paleophytocaenoses in the Pliocene of Oltenia, *Romanian Journal of Paleontology*, **75/3**: 75–80.
17. Țicleanu, N., 1995, Macroflore et végétation daciènnes du Bassin Dacique, in *Chronostratigraphie und Neostratotypen, P l1, Dazien*, Editura Academiei Române: 473–498.
18. Țicleanu, N., Huică I., Țicleanu M., 1982, Contributions a la connaissance de la flore pliocène de la Roumanie. La flore dacienne de Dedovița (District de Mehedinți)*, Dări de Seamă, Institutul de Geologie și Geofizică*, **LXVI/3**: 127–143.
19. Țicleanu, N., Roman, Șt., Givulescu, R., Bițoianu, C., 1985, Considerații paleofloristce și petrografice privind geneza ligniților din vestul Olteniei, *Dări de Seamă, Institutul Geologie Geografie*, **LXIX**: 71–87.
20. Țicleanu, N., Diaconița, D., 1997, The main coal facies and lithotypes of the Pliocene coal basin Oltenia, Romania, *European Coal Geology and Technology Geological Society*, Special Publication, **125**: 131–139.
21. Țicleanu, N., Enciu, P., Pătrușoiu, I., Paraschiv, V., 2001, Fossil plants from Romanian deposits of Bâcleș. Dolj district, Romania, *Studia Universitatis Babeș-Bolyai, Geologia*, **XLVI/2**: 23–34.

PRINCIPALELE FITOCENOZE CARBOGENERATOARE PLIOCENE DIN SECTORUL DUNĂRE-MOTRU (ROMÂNIA)
(Rezumat)

În sectorul Dunăre–Motru au fost identificate cele cinci paleobiotopuri principale care au existat în mlaștinile carbogeneratoare din Oltenia în timpul Pliocenului, fapt ce rezultă din analiza elementelor floristice: zona marginală, zona sezonier inundată, zona apropape permanent acoperită de apă, zona permanent acoperită de apă (adâncime ≤ 2 m), zona permanent acoperită de apă (adâncime ≥ 3 m).

Principalele fitocenoze carbogeneratoare pliocene din sectorul Dunăre–Motru au fost dominate de unul din taxonii: *Glyptostrobus europaeus, Byttneriophyllum tiliaefolium, Phragmites oeningensis, Salix s*sp., *Pandanus* ssp. sau de doi, rar trei dintre ei. În aceste fitocenoze au fost următoarele elemente secundare: *Carya denticulata, Platanus platanifolia, Acer tricuspidatum, Carpinus betulus, Typha latissima, Liquidambar europaeum, etc.*