

PHYTOSOCIOLOGICAL RESEARCHES CONCERNING HABITATS WITH LIGULARIA SIBIRICA (L.) CASS FROM MERIDIONAL CARPATHIANS

MONICA NEBLEA *

Abstract. The phytosociological investigations effected in the North part of the Căpățâni Mountains (Latorița Quays) and Bucegi Mountains (Zănoaga Quays, Ialomița Cave) had permitted the identification of the coenoses with *Ligularia sibirica*: *Asplenio – Cystopteridetum fragilis* Oberd. (1939) 1949, *Asperulo capitatae-Seslerietum rigidae* (Zólyomi 1939) Coldea 1991, *Adenostylo alliariae – Doronicetum austriaci* Horvat 1956, *Cirsio waldsteinii – Heracleetum transsilvanici* Pawl et Walas 1949 and *Cardamino-Chrysosplenietum alternifolii* Maas 1959 em. Zechmeister 1993.

The mobility of detritus from Zănoaga Quays like other places which contain *Ligularia sibirica*, reduced the intensity of coenotic competition, in this way assuring the continuity of this coenoses, in this place being identified a new plant association *Ligulario sibiricae-Ribetum petraei* Neblea 2003.

Key words: plant associations, *Ligularia sibirica*, Meridional Carpathian, Romania

Introduction

Species with eurosiberian origin, *Ligularia sibirica* vegetates especially in habitats from Central and Eastern Europe (Austria, Romania, Bulgaria, ex-Czechoslovakia, Hungary, Poland, ex-USSR) and Asia (Siberia). *Ligularia sibirica* meets in wet and cold stations presenting a generally plane or concave topography and a variable illumination (full light in moderate shade). It develops on crystalline or basaltic substrate, in situation of slightly acid pH to neutral.

Ligularia sibirica is considered to be a glacial relicte in regression, in Europe, appeared in Appendices I of Bern Convention, but also in Appendices II of Habitats Directive, which are referred to animal and plant species of very strong patrimonial interest, and their conservation required the delimitation of a special preservation zones.

The plant communities with *Ligularia sibirica* occupy various habitats: tall herb (*Ligulario sibiricae-Polygonetum bistortae*), meso-oligotrophic peat bogs (*Scheuchzerietalia* order) and wet meadows (*Ligulario sibiricae-Molinietum caeruleae*). These vegetal grouping with *Ligularia sibirica* realize a coverage about 35%, being identified in Oriental Pyrenees, the majority of stations being localized between 1000-1200 m.s.m.

In Romania, *Ligularia sibirica* had been identified in coenotic environment of the next plant associations: *Caricetum diandrae* Görs 1968, *Caricetum diandrae caricetosum nigrae* Coldea 1981, *Junco-Caricetum nigrae* Rybnicek 1974, *Junco-Caricetum nigrae calamagrostetum neglectae* Coldea 1981, *Sphagno-Caricetum rostratae* Rybnicek 1974, *Carici echinatae-Sphagnetum* Soó (1934) 1954, *Carici flavae-Eriophoretum caricetosum nigrae* Soó 1957, *Carici flavae-Eriophoretum caricetosum gracilis* (Gergely 1966) Coldea 1977, *Carici flavae-Eriophoretum menthetosum longifolii* (Rațiu F. 1972) Coldea 1977, *Carici blysmetum compressii* Coldea 1977, *Filipendulo-Geraniumetum palustris* W. Koch

* University of Pitesti, str. Tg. Din Vale, nr. 1, Pitesti, Arges County, e-mail: monica_neb@yahoo.com

1926, *Carici remotae – Calthetum laetae* Coldea (1972) 1978 *ligularietosum sibiricae* nova subass.

Material and methods

In the analyses of the vegetation have been used the methods of research elaborated by J. Braun-Blanquet, in the spirit of central-european school of Zürich-Montpellier and adapted by Al. Borza, to the particularities of the vegetation in our country. The basical syntaxonomical unity adopted has been the plant association. The name of the plant associations has been adopted according to the syntaxonomical foresights established in the code of phytosociological nomenclature [2].

Results and discussions

Ligularia sibirica had been identified in Ialomita Valley (Zănoaga Quays, Ialomița Cave), in the coenotic environment of the tall herb (*Adenostylo alliariae – Doronicetum austriaci* Horvat 1956, *Cirsio waldsteinii – Heracleetum transsilvanici* Pawl et Walas 1949) (tab I). The floristic composition is represented by species with poligenetic origin, which have ecological exigencies of the humidity and soil trophicity, so that is localized in valleys, along the torrents or on the coluvial wet soil, rich in nutritive substances. The floristic structure of these phytocoenoses is characterized by the presence of the numerous species of tall herb from *Adenostylyon* alliance, *Adenostyletalia* order (*Leucanthemum waldsteinii*, *Rumex alpinus*, *Senecio germanicus*, *Chaerophyllum hirsutum*, *Cirsium waldsteinii*, *Aconitum toxicum*, *Delphinium elatum* ssp. *elatum*) and *Mulgedio-Aconitetea* class (*Athyrium distentifolium*, *Ranunculus platanifolius*, *Cicerbita alpina*, *Valeriana sambucifolia*).

The mobility of detritus from Zănoaga Quays, like others places which contain *Ligularia sibirica* reduced the intensity of coenotic competition, in this way assuring the continuity of these coenoses, which vegetate on soils with basic pH, wet, cold, rich in nutritive substances, in this place being identified a new plant association *Ligulario sibiricae-Ribetum petraei* Neblea 2003.

The bushes of *Ligularia sibirica* from the course of this valley were recorded by Al. Beldie [3]. The coenoses of this association are dominated by the components of *Adenostyletalia* order: *Alnus viridis*, *Geranium sylvaticum*, *Cortusa matthioli*, *Valeriana sambucifolia*, *Delphinium elatum* ssp. *elatum*, *Aconitum variegatum* ssp. *paniculatum* (tab I). Beside of these, in the studied coenoses are represented species to *Alno-Ulmion* (*Geum rivale*, *Geranium phaeum*, *Astrantia major*, *Filipendula ulmaria*) and *Sambuco-Salicion* alliances (*Salix capraea*, *Sambucus racemosa*, *Sorbus aucuparia*).

Ligularia sibirica had been identified in Zănoaga Quays, in the chasmophytic phytocoenoses, with mesophilous character of the *Asplenio- Cystopteridetum fragilis* Oberd. (1939) 1949, which vegetate on the calcareous substratum, on slopes with 80° inclination degree. The characteristic species is *Asplenium viride*, near by this appear typical species from *Cystopteridion* alliance, *Potentilletalia caulescentis* order and *Asplenetetea* class (*Campanula carpatica*, *Cortusa matthioli* *Cystopteris fragilis*, *Asplenium trichomanes*, *Ctenidium molluscum*, *Cardaminopsis arenosa*, *Poa nemoralis*, *Valeriana*

tripteris). In this case, this eurasian element, occupies a reduced surface, being represented by few individuals.

Relevées 1 (altitude 1300 m, exposition V, slope 80⁰, surface 9 m², coverage 30%, data – 15.08.2004: *Campanula carpatica* +, *Cortusa matthioli* +, *Cystopteris fragilis* +, *Asplenium viride* 2, *Poa nemoralis* +, *Ctenidium molluscum* +, *Achillea schurii* +, *Viola biflora* +, *Silene pusilla* +, *Saxifraga luteo-viridis* +, *Hepatica transsilvanica* +, *Doronicum carpaticum* +, ***Ligularia sibirica*** +, *Ranunculus oreophilus* +, *Saxifraga mutata* ssp. *demissa* +).

Relevées 2 (Altitude 1300 m, exposition E, slope 80⁰, surface 9 m², coverage 40%, data – 15.08.2004: *Campanula carpatica* +, *Cortusa matthioli* +, *Cystopteris fragilis* 2, *Asplenium viride* 1, *Asplenium trichomanes* +, *Cardaminopsis arenosa* +, *Veronica urticifolia* +, *Fragaria vesca* +, *Aconitum toxicum* +, *Solidago virgaurea* +, *Spiraea chamaedrifolia* +, *Digitalis grandiflora* +, *Silene pusilla* +, *Saxifraga luteo-viridis* +, *Hepatica transsilvanica* +, *Dianthus spiculifolius* +, *Hypericum maculatum* +, *Campanula patula* ssp. *abietina* +, *Doronicum carpaticum* +, ***Ligularia sibirica*** +, *Valeriana tripteris* +, *Scabiosa lucida* +, *Hieracium rotundatum* +).

The plant communities edified by *Cardamine amara* and *Chrysosplenium alternifolium* are frequently in Latorița Quays (Căpățâni Mountains), where populate the rivers and springs on the crystalline substratum. This ecological environment had assured favourable conditions to development of the *Ligularia sibirica* populations (altitude 1100 m, exposition E, slope 70⁰, surface 9 m², coverage 20%, data 1.08.2006): *Cirsium waldsteinii* +, *Angelica archangelica* +, *Epilobium alpestre* +, *Poa nemoralis* +, *Solidago virgaurea* +, ***Ligularia sibirica*** +, *Veronica urticifolia* +, *Cardamine amara* 1, *Chrysosplenium alternifolium* +, *Caltha laeta* +, *Silene pusilla* +, *Cirsium oleraceum* +, *Equisetum sylvaticum* +, *Parnassia palustris* +, *Salix silesiaca* +).

The *Asperulo capitatae-Seslerietum rigidae* (Zóly. 1939) Coldea 1991 association, established on the ground of the basionim, specified by Zólyomi (*Seslerietum rigidae praebiharicum* Zólyomi 1939), has a large spreading on the calcareous abrupts from South-Eastern Carpathian. The floristic composition is dominated by *Sesleria rigida*, *Galium lucidum*, *Campanula carpatica*, but the principal recognition species is *Asperula capitata*. Beside of recognition species of the *Seslerion rigidae* alliance and *Seslerietalia* order, appear rupicolous species of the *Asplenietea* class (*Valeriana tripteris*, *Cystopteris fragilis*, *Campanula carpatica*, *Asplenium trichomanes*, *Cardaminopsis arenosa*, *Poa nemoralis*, *Saxifraga paniculata*, *Doronicum carpaticum*).

These sesleriets shelter endemic species, as part of these being identified *Ligularia sibirica*, near to Ialomița Cave – Bucegi Mountains (altitude 1700 m, exposition E, slope 80⁰, surface 100 m², coverage 65%, data – 14.07.2008: *Sesleria rigida* 3, *Asperula capitata* 1, *Carex sempervirens* +, *Dianthus spiculifolius* +, *Hieracium villosum* +, *Gentiana lutea* +, *Pedicularis comosa* +, *Thymus comosus* +, *Saxifraga luteo-viridis* +, *Primula veris* ssp. *columnae* +, *Helianthemum alpestre* +, *Delphinium elatum* ssp. *elatum* +, *Ranunculus oreophilus* +, *Euphrasia salisburgensis* +, *Scabiosa lucida* +, *Polygonum viviparum* +, *Festuca versicolor* +, *Anthemis tinctoria* +, *Cystopteris fragilis* +, *Saxifraga paniculata* +, *Cardaminopsis arenosa* +, *Valeriana montana* +, *Parnassia palustris* +, *Poa nemoralis* +, *Cnidium silaifolium* +, ***Ligularia sibirica*** +, *Campanula carpatica* +, *Silene nutans* ssp. *dubia* +, *Erysimum witmannii* +, *Lilium martagon* +, *Galium album* +, *Digitalis grandiflora* +, *Laserpitium latifolium* +, *Cirsium erisithales* +, *Melampyrum sylvaticum* +, *Astrantia*

major +, *Spiraea chamaedrifolia* +, *Picea abies* +, *Solidago virgaurea* ssp. *minuta* +, *Cortusa matthioli* +, *Asplenium ruta-muraria* +, *Trifolium alpestre* +, *Teucrium chamaedrys* +, *Fragaria vesca* +, *Coeloglossum viride* +, *Valeriana sambucifolia* +, *Aconitum toxicum* +, *Leucanthemum waldsteinii* +, *Polygala amara* +).

Conclusions

Although, *Ligularia sibirica* is known as a component of some mesotrophic and oligotrophic peat bogs, on the acid substratum, of coenoses with *Caltha palustris* ssp. *laeta*, but in case of other coenoses identified by us in Bucegi Mountains (*Mulgedio-Aconitetea* class), *Ligularia sibirica* vegetates on the calcareous substratum, wet, rich in nutritive substances. The high inclination degree of the slopes, shading, humidity were the principal factors which created favourable ecological conditions to development of this species in the coenotic environment of the *Asplenio-Cystopteridetum fragilis*, *Asperulo capitatae-Seslerietum rigidae* associations.

Populations of *Ligularia sibirica* from Romania had a tardiglacial or würmian pleniglacial oldness, but other authors (like Ehrendorfer) considered that vestiges could have a greater oldness, being preglacial relicts.

REFERENCES

1. ALEXIU V., STANCU D., 2003 - Carici remotae-Calthetum laetae Coldea (1972) 1978 ligularietosum sibiricae nova subass. in the Brusturet Gorges (Piatra Craiului), in Pop. O. ed., Research in Piatra Craiului National Park, Braşov, 94-97.
2. BARKMAN J. J., MORAVEČ J., RAUSCHERT S., 1986 - Code der Pflanzensoziologischen Nomenklatur, Vegetatio, Uppsala, **67**, 3: 145-195.
3. BELDIE AL., 1967 - *Flora și vegetația Munților Bucegi*, Edit. Acad. Rom., București.
4. COLDEA GH., 1991 - Prodrome des associations végétales des Carpates du sud-est (Carpates Roumaines). Documents Phytosociologiques, Camerino, **13**: 317-539.
5. CRISTEA V., GAFTA D., PEDROTTI F., 2004 - *Fitosociologie*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
6. TUTIN T. G. et al. (Eds.), 1964-1980 - *Flora Europaea*, **1-5**, Cambridge University Press.
7. ****, 1966-1976 - *Flora R.S.R.*, **IX**, Edit. Acad. Rom., București.
8. www.pole-tourbiers.org/does/ligularia_sibirica.pdf

Table I – Plant associations from *Mulgedio-Aconitetea* class with *Ligularia sibirica*

Relevées	1	2	3	4	5	6	7	8	9	10
Altitude (mx10)	140	130	130	150	150	140	140	130	130	130
Exposition	SE	S	S	V	E	N	E	E	NE	E
Slope (degree)	5	10	15	80	80	-	-	-	-	-
Surface	40	30	30	25	25	25	25	25	25	25
Coverage of the arborescent layer (%)	-	-	-	1	2	60	70	50	10	50
Coverage of the herbaceous layer (%)	80	40	50	80	70	20	30	45	45	40
Char. ass.										
<i>Heracleum transsilvanicum</i>	+	1	+	.	.	.	.	.	.	.
<i>Cirsium waldsteinii</i>	3	2	3	1	+	.	.	.	.	.
<i>Doronicum austriacum</i>	.	.	1	+	1	.	.	.	.	.
<i>Adenostylles alliariae</i>	.	.	.	3	3	.	.	.	.	.
<i>Ligularia sibirica</i>	+	+	+	+	+	+	2	2	2	2
<i>Ribes petraeum</i>	.	.	.	.	.	3	3	2	+	+
Adenostylien et Adenostyletalia										
<i>Senecio germanicus</i>	+	+	.	1	+	+	+	+	1	+
<i>Rumex alpinus</i>	.	.	.	+	.	+	.	+	.	.
<i>Thalictrum aquilegifolium</i>	+	+	+	+	+	+	.	+	+	+
<i>Alnus viridis</i>	.	.	.	.	.	+	+	.	+	+

<i>Delphinium elatum</i> ssp. <i>elatum</i>	.	.	.	.	.	+	.	+	+	.
<i>Aconitum variegatum</i> ssp. <i>paniculatum</i>	.	.	.	.	.	.	+	+	+	.
<i>Cortusa matthioli</i>	.	.	.	.	.	+	+	.	.	+
<i>Gentiana asclepiadea</i>	.	.	.	.	.	.	.	+	.	+
<i>Achillea distans</i>	.	.	.	.	.	.	+	.	.	.
<i>Leucanthemum waldsteinii</i>	+	+	+	+	+	.	.	.	.	.
<i>Veratrum album</i>	.	.	.	.	+	.	.	.	.	.
<i>Chaerophyllum hirsutum</i>	+	+	1	1	.	+	+	+	+	.
<i>Carduus personatus</i>	2	.	+	+	.	.	.	.	.	+
<i>Stellaria nemorum</i>	.	+	+	+	+	+	+	+	+	+
<i>Aconitum toxicum</i>	1	.	.	2	.	.	.	.	.	.
<i>Rumex arifolius</i>	+	+	.	+	+	+	.	.	.	.
Mulgedio-Aconitetea										
<i>Geranium sylvaticum</i>	.	+	.	.	.	+	.	.	.	.
<i>Athyrium distentifolium</i>	.	.	.	+	.	.	.	.	.	.
<i>Viola biflora</i>	.	+	.	.	.	.	.	.	.	.
<i>Ranunculus platanifolius</i>	.	.	1	.	+	.	.	.	.	.
<i>Myosotis sylvatica</i>	+	+	.	.	.	.	.	.	.	.
<i>Milium effusum</i>	1	+	.	.	.	.	.	.	.	.
<i>Valeriana sambucifolia</i>	+	.	.	.	+	.	+	.	+	.

<i>Cicerbita alpina</i>	.	+	.	.	+	.	.	.	.	.
<i>Polygonatum verticillatum</i>	+	.	+	.	.	.	1	+	.	.
<i>Calamagrostis arundinacea</i>	.	.	.	.	.	.	+	1	1	1
<i>Valeriana tripteris</i>	.	.	.	.	.	.	.	.	.	+
Variae syntaxa										
<i>Geum rivale</i>	+	.	+	+	.	1	+	+	+	.
<i>Aegopodium podagraria</i>	.	.	.	.	.	+	+	+	+	.
<i>Filipendula ulmaria</i>	.	.	.	.	+	+	+	+	.	.
<i>Athyrium filix-femina</i>	+	+	.	.	.	.	.	.	+	+
<i>Urtica dioica</i>	.	.	.	.	+	1	.	.	1	.
<i>Alnus incana</i>	.	.	.	.	+	.	.	.	.	.
<i>Geranium phaeum</i>	.	.	.	.	.	.	+	.	.	.
<i>Equisetum sylvaticum</i>	.	.	.	.	.	.	+	.	.	.
<i>Daphne mezereum</i>	+	.	.	+	.	+	+	.	+	.
<i>Dentaria glandulosa</i>	.	.	.	+	.	.	.	.	.	.
<i>Geranium robertianum</i>	.	.	.	.	+	.	.	.	.	.
<i>Oxalis acetosella</i>	.	.	.	+	.	.	+	.	.	+
<i>Symphytum tuberosum</i>	.	.	.	.	.	.	+	.	.	.
<i>Hordelymus europaeus</i>	.	.	.	.	.	+	.	.	.	.
<i>Luzula luzuloides</i>	+	.	.	.	.	.	.	.	+	+

<i>Astrantis major</i>	.	.	.	.	.	.	.	.	+	.	.
<i>Poa nemoralis</i>	1	+	.	.	.	.	.	.	1	+	.
<i>Hepatica transsilvanica</i>	.	.	.	.	.	.	.	.	1	+	.
<i>Acer pseudoplatanus</i>	.	.	.	.	+	+	.	.	.	+	.
<i>Veronica urticifolia</i>	+	+	.	+	.	.	.	.	+	+	+
<i>Scrophularia scopolii</i>	.	.	.	.	.	.	+	.	.	.	.
<i>Picea abies</i>	.	.	.	.	+	+	+	+	+	+	1
<i>Lonicera nigra</i>	.	.	.	.	+	.	+	1	.	.	1
<i>Clematis alpina</i>	.	.	.	.	+	.	1	.	.	+	+
<i>Vaccinium vitis-idaea</i>	.	.	.	.	.	.	.	.	+	.	+
<i>Soldanella hungarica</i> ssp. <i>major</i>	.	.	.	+	.	.	.	.	.	.	.
<i>Sorbus aucuparia</i>	.	.	.	.	+	+	+	.	.	+	+
<i>Lycopodium annotinum</i>	.	.	.	.	.	.	.	.	.	.	+
<i>Brachypodium sylvaticum</i>	.	.	.	.	.	.	+	.	.	.	.
<i>Rosa pendulina</i>	.	.	.	.	.	.	.	+	.	.	.
<i>Pulmonaria rubra</i>	+	+	.	+	+	+	.	.	.	.	.
<i>Angelica archangelica</i>	.	+	.	+	.	.	.	.	.	.	.
<i>Rubus idaeus</i>	+	+	.	+	+	2	1	1	.	.	.
<i>Fragaria vesca</i>	.	.	.	.	.	.	.	+	.	+	+
<i>Epilobium alpestre</i>	+	+	.	.	.	.	.	.	.	.	.
<i>Hypericum maculatum</i>	.	.	+	.	+	+	.	.	+	+	+

<i>Alchemilla xanthochlora</i>	.	.	.	.	.	+	.	+	+	.
<i>Solidago virgaurea</i>	+	+	.	.	.	.	.	+	.	+
<i>Silene vulgaris</i>	+	.	.	.	.	.	.	.	.	.
<i>Sedum vulgare</i>	+	+	.	.	.	.	+	.	.	.
<i>Polygonum bistorta</i>	+	.	.	.	.	.	.	.	.	.
<i>Dryopteris carthusiana</i>	+	+	.	.	.	.	.	.	.	.
<i>Campanula patula</i> ssp. <i>abietina</i>	+	.	.	.	.	.	.	.	+	.
<i>Doronicum carpaticum</i>	.	.	.	+	.	.	.	.	.	.
<i>Sambucus racemosa</i>	.	.	.	+	.	.	.	+	+	+
<i>Anthriscus sylvestris</i>	.	.	.	.	+	.	.	.	.	.
<i>Valeriana officinalis</i>	.	.	.	.	+	.	.	.	.	.
<i>Valeriana montana</i>	.	.	.	.	+	.	.	.	.	.
<i>Cardamine amara</i>	.	.	.	.	+	.	.	.	.	.
<i>Cirsium erisithales</i>	.	.	.	.	+	.	.	+	+	+
<i>Parnassia palustris</i>	.	.	.	.	.	.	.	+	+	+
<i>Salix caprea</i>	.	.	.	.	.	.	2	2	1	3
<i>Petasites hybridus</i>	.	.	.	.	.	.	+	.	.	1
<i>Gymnocarpium robertianum</i>	.	.	.	.	.	.	.	+	.	+
<i>Asplenium viride</i>	.	.	.	.	.	.	.	+	.	+
<i>Scabiosa lucida</i>	.	.	.	.	.	.	.	.	+	+
<i>Saxifraga cuneifolia</i>	.	.	.	.	.	.	.	.	.	+

<i>Thymus comosus</i>	.	.	.	.	.	.	+	.	.	+
<i>Epilobium angustifolium</i>	.	.	.	.	.	+	.	.	.	.
<i>Anthemis tinctoria</i>	.	.	.	.	.	.	.	+	.	.
<i>Polystichum lonchitis</i>	.	.	.	.	.	.	.	+	.	.
<i>Campanula cochlearifolia</i>	.	.	.	.	.	.	.	+	.	.
<i>Saxifraga luteo-viridis</i>	.	.	.	.	.	.	.	+	.	.
<i>Dianthus spiculifolius</i>	.	.	.	.	.	.	.	+	.	.
<i>Silene nutans</i> ssp. <i>dubia</i>	.	.	.	.	.	.	.	.	+	.
<i>Campanula carpatica</i>	.	.	.	.	.	.	.	.	+	.
<i>Campanula persicifolia</i>	.	.	.	.	.	.	.	.	+	.
<i>Cnidium silaifolium</i>	.	.	.	.	.	.	.	.	.	+
<i>Phleum alpinum</i>	.	.	.	.	.	.	.	.	+	.

1, 2, 3 – *Cirsio waldsteinii*-*Heracleetum transsilvanici* Pawl et Walas 1949 – Zănoaga Quays (15.08.2004); 4,5 - *Adenostylo alliariae*-*Doronicetum austriaci* Horvat 1956 – Ialomița Cave (10.09.2004); 6, 7, 8, 9, 10 – *Ligulario sibiricae*-*Ribetum petraei* Neblea 2003 – Zănoaga Quays (9.09.2004).