SINANTHROPUS ASSOCIATIONS FROM ROVINARI-TURCENI AREA (GORJ COUNTY, ROMANIA)

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Abstract. Due to the fact that the studied area is strongly industrialized, the sinanthropus phytocoenoses develop greatly. Some of the presented associations have a wide spreading both in Oltenia, but also at national level. What is considered interesting is the fact that they have also been identified on the waste dumps, where the stationary conditions are other than the ones from the nitrophile places where there usually develop (*Calamagrostietum epigei*, *Onopordetum acanthii* subas. *carduetosum acanthoidis*). In the industrial areas that we botanically researched, we identified 7 Sinanthropus associations and a sub-association. Only the herbaceous Sinanthropus vegetation has been studied, because the ligneous one from the area has been disorganized and slowly replaced by the herbaceous Sinanthropus vegetation. There are acacia plantations just on the waste dumps (*Robinia pseudacacia*).

Keywords: Sinanthropus vegetation, Rovinari, Turceni, Oltenia.

Rezumat. Asociaţii sinantrope din zona Rovinari-Turceni (judeţul Gorj, România). Deoarece zona studiată este puternic industrializată, fitocenozele sinantropice cunosc o dezvoltare mare. Unele asociaţii prezentate au o largă răspândire atât în Oltenia cât şi la nivel naţional. Interesant este că ele au fost identificate şi pe haldele de steril, unde condiţiile staţionale sunt altele decât cele din locurile nitrofile unde sunt de regulă (*Calamagrostietum epigei*, *Onopordetum acanthii* subas. *carduetosum acanthoidis*). În zonele industriale pe care le-am cercetat botanic am identificat 7 asociaţii şi o subasociaţie sinantropică. A fost luată în studiu doar vegetaţia ierboasă sinantropică deoarece cea lemnoasă din zonă a fost dezorganizată şi treptat înlocuită de cea ierboasă sinantropică. Doar pe haldele de steril se află plantaţii de salcâm (*Robinia pseudacacia*).

Cuvinte cheie: vegetaţie sinantropă, Rovinari, Turceni, Oltenia.

INTRODUCTION

Within the exploitation perimeters, in the area of Rovinari-Turceni, the natural vegetation has been partly destroyed. In some places, especially within the areas with old, abandoned activities, there can be noticed a trend of recovery of the herbaceous vegetation (RĂDUŢOIU, 2008). We mention some common species lacking botanical value, but important in the process of enriching the soil with organic substances (BUIA et al., 1961; IELENICZ, 1999).

The process of vegetation recovery in the places where there are no mining loads is rapid, but we can not longer find the species characteristic before the beginning of the exploitation (DIHORU, 1977; RĂDUŢOIU & RĂDUŢOIU, 2008). There are in general annual plants which contribute to the fixing of the soil and to its preparation for the recovery of the vegetation specific to the area. It is actually the beginning of a secondary ecologic succession emerged after the destruction of the natural vegetation previously present here.

In the process of exploitation, the aquatic and swamp vegetation has also suffered (DIHORU, 1977). So, the swamp or highly humid regions have locally been drained. Consequently, the characteristic vegetation has almost completely disappeared.

MATERIAL AND METHODS

The geo-botanic research of the Sinanthropus vegetation in this area was made through observation, description, measuring and summary or profound experimentations, depending on the purpose.

In the study of the vegetation the research methods of the central European school, elaborated by Braun-Blanquet were used. We adopted as basic sintaxonomic unity the vegetal association (BORZA & BOŞCAIU, 1965; CRISTEA et al., 2004).

The description of the associations was made with the help of characteristic, self-evident, dominant and differential species. For the classification of the associations there have been used synthesis works on the Romanian vegetation, elaborated by different authors or collective ones (BORHIDI, 1996; GEHU, 1992; MUCINA, 1997; POP et al., 2000; RĂDUŢOIU, 2008; RODWELL, 2002).

For establishing the floristic composition and the structure of the association structure we accomplished field and laboratory work. During our field work we watched as much as it was possible the present status of the vegetation, its dynamics in time and space, the succession of directions of the most important phytocoenoses on these territories where the human influence is strongly felt.

The notations in the notebook comprise information regarding the stationary conditions and the floristic and coenotic compositions of the vegetal population, which make up the individual association.

The phytocoenological superordinated units of the association are often insufficiently and differently interpreted from the floristic and ecologic point of view, which causes difficulties in framing some associations (BORZA, 1957; BORZA, 1966; CÂRŢU, 1971; POP et al., 2000; RESMERIŢĂ & ROMAN, 1975; SANDA, 2002). It was

intended, though, to indicate for each association those delimitated units on the basis of the recognition species from the researched territory and their framing in a corresponding centaxonomic system.

RESULTS AND DISCUSSIONS

The identified phytocoenoses in this area are framed in the following cenotaxonomic system:

Cl. Artemisietea vulgaris LOHM, PRSG. & TX. 1950
Ord. Onopordetalia acanthii BR.-BL. & R. TX. ex KLIKA & HADAČ 1944
Al. *Onopordion acanthii* BR.-BL. et al. 1936
1. *Onopordetum acanthii* BR.-BL. et al. 1936 subas. *carduetosum acanthoidis* (ALL. 1922) SOÓ 1964
Al. T*ussilaginion* (SZABO 1971 n.n.) em. POPESCU & SANDA 1988
2. *Tussilaginetum farfarae* OBERD. 1949
Ord. Agropyretalia repentis OBERD. et al. 1967
Al. *Convolvulo-Agropyrion repentis* GÖRS 1966
3. *Convolvulo-Agropyretum repentis* FELFÖLDY 1943
Cl. Galio – Urticetea PASSARGE 1967 em KOPECKY 1969
Ord. Lamio albi – Chenopodietalia boni-henrici KOPECKY 1969
Al. *Galio – Alliarion* LOHM. & OBERD. 1967 in OBERD. et al. 1967
4. *Sambucetum ebuli* FELFÖLDY 1942
Cl. Epilobietea angustifolii TX. & PRSG. in TX. 1950
Ord. Atropetalia VLIEGER 1937
Al. *Epilobion angustifolii* SOÓ 1933 em. TX. 1950
5. *Calamagrostietum epigei* JURASZEK 1928
Cl. Stellarietea mediae R. TX., LOHM. & PRSG. in R. TX. 1950
Ord. Sisymbrietalia J. TX. in LOHM. et al. 1962
Al. *Sisymbrion officinalis* TX., LOHM. & PREISING 1950
6. *Hordeetum murini* LIBBERT 1932 em. PASS. 1964
Cl. Sedo-Scleranthetea BR.-BL. 1955
Ord. Thero-Airetalia OBERD. in OBERD. et al. 1967
Al. *Thero-Airion* TX. ex OBERD. 1957
7. *Filagini – Vulpietum* OBERD. 1938

1. *Onopordetum acanthii* BR.-BL. et al. 1936 subas. *carduetosum acanthoidis* (ALL., 1922) SOÓ 1964 (*Carduetum acanthoidis* MORARIU, 1939).

It develops on the fields with decomposing organic substances (places for rubbish disposing, ruderal fields, and low up-kept crops) or on the waste dumps at Fărcăşeşti (Fig. 1). The identified phytocoenoses *Carduus acanthoides* are not temperature-dependent.

In the floristic structure of the sub-association, one can find species characteristic to the superior centotaxons, but also an important number of species of Stellarietea or Festuco-Brometea.

The complexity of the vegetal groups ecology emphasized by *Carduus acanthoides*, which allows them to appear in varied stations, is also underlined by Bujorean and Grigore (BUJOREAN & GRIGORE, 1967).

The identification of the phytocoenoses of this centotaxon and those on the waste dumps at Fărcăşeşti reinforces the idea launched by Resmeriță and Roman (RESMERIȚĂ & ROMAN, 1975), according to which the species *C. acanthoides* is not a species with preferences for soils rich in nitrogen. If in that perimeter there are no other phytocoenoses installed, meaning they have no competition, they develop very well.

In spring, these surfaces are occupied by some annual species of Stellarietea. Afterwards the physiognomy of these places changes at the same time with the flowering of the different species for this sub-association.

2. *Tussilaginetum farfarae* OBERD. 1949

They install themselves on the clayey portions near the water bank or on the escarpments with moist clays near the sides of the roads. The phytocoenoses of this association represent an excellent fixing agent of the breakages (RĂDUȚOIU, 2008). The floristic composition is heterogeneous enough depending on the altitude, soil and vegetal formations near it. It is remarkable the fact that the majority of species are present in 1-4 ground surveys, which shows the character of open pioneer association, with fluctuations of the number of species from a station to the other. Another argument is represented by the great number of therophytes and hemiterophytes. There are also hemicryptophytes, geophytes and phanerophytes (Table 1). Out of the geo-elements the Euro-Asian ones predominate. They are followed at a big distance by the Cosmopolite, European, Circumpolar ones. The coverage is of about 75%.

The dominant plant has pharmaceutical and culinary utilizations.

3. *Convolvulo – Agropyretum repentis* FELFÖLDY 1942

The characteristic species *Elymus repens* and *Convolvulus arvensis* are perennial plants and unusually install themselves at the abuts of the cultivated fields, on the plots that are not annually tilled.

Cardaria draba, *Setaria pumila*, *Hibiscus trionum*, *Stachys annua*, *Cirsium arvense*, *Sinapis arvensis*, *Polygonum aviculare* are frequent species developing together with these coenoses; in the cases when the lying fallow

process is more advanced, there appear meadow perennial elements, such as: *Poa pratensis*, *Medicago sativa*, *Agrostis stolonifera*, *Festuca pratensis*.

Table 1. *Tussilaginetum farfarae* OBERD. 1949.

Biof.	Geoel.	Survey number	1	2	3	4	5	K
		Altitude (m)	210	200	220	180	190	
		Exposure	N	V	E	E	V	
		Inclination (^{0})	5	10	5	10	15	
		Vegetation covering (%)	70	75	80	70	70	
		Survey area (m^2)	40	40	40	40	40	
		Characteristic species of the association						
G.	Euras.	*Tussilago farfara*	5	4	5	5	4	V
		Artemisietea & Artemisietalia						
HT.	Euras.	*Cirsium vulgare*	+	+	+	-	+	IV
HT .	Eur.	*Carduus acanthoides*	-	+	+	-	+	III
H.	Cosm.	*Urtica dioica*	+	-	+	+	-	III
H.	Euras. (Submedit)	*Sambucus ebulus*	+	+	-	-	-	II
H.	Euras.	*Linaria vulgaris*	-	-	+	+	-	II
		Alno-Ulmion						
T.	Cont. Eur.	*Euphorbia stricta*	+	+	-	+	+	IV
G.	Circ.	*Equisetum telmateia*	+	-	+	-	+	III
		Querco-Fagetea						
H.	Circ.	*Geum urbanum*	-	+	-	-	+	II
		Variaesyntaxa						
H.	Euras.	*Origanum vulgare*	+	+	-	-	+	III
T.-HT.	Cosm.	*Capsella bursa-pastoris*	+	+	-	-	+	III
T.-H.	Cosm.	*Poa annua*	+	-	+	+	-	III
Ph.	Euras.	*Salix purpurea*	+	+	+	-	-	III
T.	Euras.	*Bidens tripartita*	+	-	+	-	+	III
HT.	Euras.	*Echium vulgare*	-	+	-	-	+	II
G.	Euras.	*Sonchus arvensis*	-	+	+	-	+	II

Legend: Species present in one survey: T., Cosm. *Solanum nigrum* T., Cosm. (5); H., Euras. *Plantago major* (4); T., Cosm. *Polygonum aviculare* (2); HT., Euras. *Daucus carota* (3); H., Euras. *Mentha longifolia* (1).
Place and date of performing the surveys: 1. Rovinari (April 4, 2008); 2. Turceni (May 1, 2008); 3. Bâlteni (March 16, 2009); 4. Balta Unchiaşului (April 4, 2009); 5. Beterega (April 1, 2009).

4. *Sambucetum ebuli* FELFÖLDY 1942

Sambucus ebulus becomes mono-dominant in some ruderal phytocoenoses, forming tall weeds. Besides the recognition species, on these surfaces, there are constant companions like *Bromus sterilis*, *Galium aparine*, *Urtica dioica*, *Artemisia vulgaris*, *Dactylis glomerata,* and *Elymus repens*, but, generally, few species develop in these clumps.

They install themselves on low compact soils rich in organic substances, in places where waste is deposited.

In the floristic composition of the association, there are recognition species of the class, order (Table 2) and a series of other taxons belonging to *Artemisietea vulgaris*. The edificatory species is remarked through a high coverage and constancy. Through its characteristic habitat, it imprints a special physiognomy specific to these phytocoenoses. The mesophilous species have the main role.

5. *Calamagrostietum epigei* JURASZEK 1928 (Table 3)

This association is met in the relatively recent parquetry from the waste dumps from Rovinari, Turceni, Moi, Fărcăşeşti (Fig. 2).

Figure 1. General aspect with *Onopordetum acanthii* subas. *carduetosum acanthoidis.* / Figura 1. Aspect general cu *Onopordetum acanthii* subas. *carduetosum acanthoidis* (original).

Figure 2. Patches of *Calamagrostis epigeios.* / Figura 2. Pâlcuri cu *Calamagrostis epigeios* (original).

These phytocoenoses have a poor floristic composition due to the dominant and characteristic species, which develops very well, having a well developed rhizomal system. Animals avoid these places because the component species have a low fodder value. They can be easily identified during the vegetation period due to the dominant species, which maintains itself a very long time.

Table 2. *Sambucetum ebuli* FELFÖLDY 1942.

Biof.	Geoel.	Survey number	1	2	3	4	5	6	K
		Altitude (m)	20	21	22	20	20	18	
			0	0	0	0	0	0	
		Exposure	E	E	-	-	S	-	
		Inclination (^{0})	5	5	-	-	5	-	
		Vegetation covering (%)	10	10	10	95	10	95	
			0	0	0		0		
		Survey area (m^2)	60	60	60	80	80	60	
		Characteristic species of the association							
H.	Euras. (Submedit.)	*Sambucus ebulus*	5	5	5	5	5	5	V
		Galio-Alliarion & Lamio albi-Chenopodietalia boni-henrici							
H.	Circ.	*Geum urbanum*	+	+	+	+	-	+	V
H.	Cosm.	*Urtica dioica*	+	+	+	-	+	+	V
H.	Euras.	*Chelidonium majus*	-	-	+	+	+	+	IV
		Galio-Urticetea							
T.	Circ.	*Galium aparine*	+	+	+	+	+	+	V
T., H.	Euras.	*Silene latifolia subsp. alba*	+	+	+	-	-	+	IV
		Molinio-Arrhenatheretea							
(G.)H.	Cosm.	*Convolvulus arvensis*	+	+	+	+	-	+	V
G.	Circ.	*Elymus repens*	+	+	+	+	+	-	V
H.	Euras.	*Potentilla reptans*	+	-	+	+	-	+	IV
HT.	Euras.	*Daucus carota*	+	+	-	-	-	+	III
H.	Euras.	*Achillea millefolium*	-	+	+	-	+	-	III
H.	Cosm.	*Prunella vulgaris*	+	-	+	-	-	-	II
		Artemisietea vulgaris							
H.	Circ.	*Artemisia vulgaris*	+	+	+	+	+	+	V
		Arction lappae							
HT.	Euras.	*Arctium lappa*	+	+	+	+	+	-	V
HT.	Euras.	*Conium maculatum*	+	+	-	-	+	-	III
		Variaesyntaxa							
H.	Euras.	*Mentha longifolia*	+	-	+	+	+	+	V
T.	Euras.	*Lithospermum arvense*	-	+	+	+	-	+	IV
H.	Euras.	*Lotus corniculatus*	+	+	+	-	-	+	IV
H	Submedit.	*Agrimonia eupatoria subsp. grandis*	+	+	-	+	-	+	IV
HT.-H.	Euras.	*Heracleum sphondylium*	+	+	+	-	+	-	IV
T.	Euras.	*Lamium purpureum*	-	+	+	+	-	+	IV
HT.	Eur.	*Carduus acanthoides*	+	-	+	-	-	+	III
G.	Euras.	*Cirsium arvense*	-	+	-	+	-	+	III
H.	Euras.	*Hypericum perforatum*	+	-	+	-	-	+	III
T., HT., H.	Adv. (N. Am.)	*Erigeron annuus subsp. strigosus*	+	-	+	-	-	+	III
T.	Adv. (N. Am.)	*Conyza canadensis*	+	+	-	-	-	+	III
T.	S. Eur.	*Xanthium italicum*	-	+	+	-	-	+	III
T.	Centr. Eur.	*Torilis arvensis*	-	+	+	-	-	+	III
H.	Euras.	*Cichorium intybus*	-	+	-	-	-	+	II
H.	Euras., N.Am.	*Humulus lupulus*	-	+	-	-	-	+	II
H.	Cosm.	*Verbena officinalis*	-	+	-	-	-	+	II
T.	Euras.	*Veronica polita*	-	+	-	+	-	-	II

Legend: Species present in one survey: H., Euras. *Origanum vulgare* (3); T.-HT., Cosm. *Capsella bursa-pastoris* (2).
Place and date of performing the surveys: 1. Fărcăşeşti (June 12, 2008); 2. Turceni (June 16, 2008); 3. Rovinari (June 29, 2009); 4. Fărcăşeşti (May 13, 2009); 5. Bâlteni (August 28, 2009); 6. Turceni (September 15, 2009).

6. *Hordeetum murini* LIBBERT 1932 em. PASS. 1964

The representative phytocoenoses of these associations have been identified in numerous points from the researched area. They usually install themselves on the sides of the roads, in the ruderal places where the recognition species forms quite a compact carpet. On certain surfaces, it almost becomes exclusivist. In the floristic composition, there are numerous species belonging to the cenotaxonomic units the association is part of: *Descuriainia sophia*, *Bromus arvensis*, *Convolvulus arvensis*, *Centaurea solstitialis*, *Xanthium italicum*, *Conyza canadensis*, and also other classes. (Table 4).

The presence in all the ground surveys of the species *Poa pratensis* makes us believe that the evolution of these phytocoenoses cleared by *Hordeum murinum* is towards *Poetum pratensis*.

7. *Filagini – Vulpietum* OBERD. 1938.

The association is frequently encountered on fallows with sandy soil, of variable sizes. The floristic composition is characterized by an obvious heterogeneity imposed by the presence of a number of transgressives from Chenopodietea (*Bromus arvensis*, *B. hordeaceus*, *Cichorium intybus*, *Echium vulgare* and others) and Festuco-Brometea (*Achillea collina*, *Festuca valesiaca* etc.) together with the characteristic species of the association, alliance and class (*Vulpia myuros*, *Filago arvensis*, *Bromus tectorum*, *Kohlrauschia prolifera* and others).

Table 3. *Calamagrostietum epigei* JURASZEK 1928.

Biof.	Geoel.	Survey number	1	2	3	4	5	K
		Altitude (m)	200	190	195	185	185	
		Exposure	E	E	-	SE	-	
		Inclination (^{0})	5	5	-	5	-	
		Vegetation covering (%)	95	90	95	90	90	
		Survey area (m^2)	50	50	50	50	50	
		Characteristic species of the association						
G.	Euras.	*Calamagrostis epigejos*	4	5	5	5	5	V
		Carici piluliferae-Epilobion &Atropetalia						
T.	Adv., N. Am.							II
		Conyza canadensis	-	+	+	-	-	
		Cirsium arvense	+	-	+	-	-	II
		Festuco-Brometea						
H.	Euras.	*Plantago media*	+	-	-	+	-	II
H.	Euras.	*Hypericum perforatum*	+	-	+	-	-	II
H.	Euras.	*Agrimonia eupatoria*	+	-	-	-	-	I
		Molinio-Arrhenatheretea						
H.	Euras.	*Lotus corniculatus*	+	+	+	-	-	III
HT.	Euras.	*Daucus carota*	+	-	+	-	-	II
H.	Euras.	*Cichorium intybus*	+	-	+	-	-	II
		Stellarietea mediae						
H.	Euras.	*Lathyrus tuberosus*	+	+	+	-	-	III
		Variaesyntaxa						
Ph.	N. Am.	*Robinia pseudoacacia*	-	+	+	-	+	III
G. (HH.)	Cosm.	*Phragmites australis*	-	+	+	+	-	III
HT.	Euras.	*Melilotus officinalis*	-	+	+	-	-	II
H.	Euras.	*Plantago major*	-	-	+	+	-	II
H.	Euras.	*Origanum vulgare*	-	-	-	+	-	I

Legend: Place and date of performing the surveys: 1. East Rovinari (June 17, 2007); 2. Turceni (June 16, 2008); 3. Rovinari (June 29, 2009); 4. Urdari terrace (May 13, 2009); 5. Fărcăşeşti (May 13, 2009).

Table 4. *Hordeetum murini* LIBBERT 1932.

Biof.	Geoel.	Survey number	1	2	3	4	5	6	7	8	K
		Altitude (m)	200	190	180	200	185	185	180	178	
		Exposure	E	E	S-E	S	V	E	S-V	E	
		Inclination (^{0})	20	20	10	15	10	15	5	10	
		Vegetation covering (%)	100	95	95	90	95	90	95	95	
		Survey area (m^2)	50	50	60	80	50	60	50	80	
		Characteristic species of the association									
T.	Euras.	*Hordeum murinum*	5	5	5	4	5	4	4	5	V
		Sisymbrion officinalis, Sisymbrietalia & Stellarietea mediae									
T.-HT.	Euras.	*Descurainia sophia*	+	+	+	-	+	-	-	+	IV
(G.)H.	Cosm.	*Convolvulus arvensis*	-	+	+	-	-	+	+	+	IV
T.-HT.	Euras.	*Matricaria perforata*	+	-	+	+	+	-	-	+	IV
HT.-H.	Euras.	*Malva sylvestris*	+	-	+	-	+	+	+	+	IV
T.	S. Eur.	*Xanthium italicum*	+	+	+	+	+	-	-	+	IV
T.	Adv. (N. Am.)	*Conyza canadensis*	+	+	-	+	+	-	+	+	IV
		Variaesyntaxa									
H.	Euras.	*Potentilla argentea*	+	+	+	-	+	+	+	+	V
T.	Adv. (N. Am.)	*Amaranthus retroflexus*	+	+	+	+	+	+	-	+	V
H.	Euras.	*Plantago lanceolata*	+	+	+	-	+	+	-	-	IV
H.	Cosm.	*Verbena officinalis*	+	+	-	+	+	+	-	+	IV
T.-HT.	Cosm.	*Capsella bursa-pastoris*	+	-	+	+	+	+	-	+	IV
H.	Centr. and NE. Eur.	*Ballota nigra*	+	+	+	-	+	-	-	+	IV
HT.	Euras.	*Cirsium vulgare*	+	+	-	+	-	+	+	+	IV
T.	Cosm.	*Portulaca oleracea*	-	-	+	-	-	+	-	+	II
T.-H.	Euras.	*Medicago lupulina*	+	-	-	-	-	+	+	-	II
H.	Euras.	*Potentilla reptans*	-	+	-	-	-	-	+	-	II
T.	Atl.-Medit.	*Kohlrauschia prolifera*	-	+	-	-	-	+	+	-	II

Legend: Species present in one survey: HT., Euras. *Onopordum acanthium* (8); H., Euras. *Mentha longifolia* (6).
Place and date of performing the surveys: 1. Fărcăşeşti (June 12, 2008); 2. Turceni (June 16, 2008); 3. Rovinari (June 29, 2009); 4. Fărcăşeşti (May 13, 2009); 5. Bâlteni (August 28, 2009); 6. Turceni (September 15, 2009). 7. Urdari terrace (June 12, 2009); 8. East Rovinari (June 12, 2009).

The bioform spectrum is manifested through equilibrium between therophytes and hemiterophytes. In reality, the association is dominated by the first ones, the second group being made up of the ones, which migrated from nearby meadows and which later on will replace the phytocoenoses of this association.

From the dynamic point of view, we can say that the phytocoenoses of this association can scrape together on meadows in competition with the phytocoenoses from Onopordetalia and develop towards the xerophile or xero-mesophilous meadows characteristic to the studied area.

CONCLUSIONS

Unlike the classic places where these associations are mentioned (nitrophile places, rubbish, fallows), it has been noticed that some phytocoenoses can also vegetate in other stations (waste dumps). If the anthropogenic factor from the area reduced its impact, some of these would be slowly replaced by plants characteristic to that area.

As a conclusion, we can state that, in the heavily polluted areas, the native vegetation is replaced by the ruderal Synanthrope one, made up in the researched areas, of the same species, which perpetuate like an industry-climax.

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