CONSIDERATIONS ON PLANTS AND ECOSYSTEMS DIVERSITY, AND CONSERVATION WITHIN FOUR LOCATIONS ALONG THE RIVER MUREŞ

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***Abstract**: This study was conducted in four sites (each of 3x3 km) along the river Mureş in Arad dept. All plant (cormophytes) species were recorded in search of correlations with the land use categories. We consider 14 categories of land use. The total number of cormophyte species is 369, with vlues per location from 197 (Felnac) to 265 (Vladimirescu). The proportion of (semi-)natural ecosystems is not strongly correlated with a higher plant diversity, as well as the proportion of agricultural fields is not correlated with the number of weed species (variation from 57 to 79). There is no difference in the number of invasive species per location (variation from 12 to 16 species). Amorpha fruticosa is the most important (by occupied area) species. Further studies are needed in order to have a better estimation of agricultural practices influence on natural biodiversity and to increase the tenability of biodiversity management, especially within the Lunca Mureşului National Park.*

***Key words**: plant diversity, agricultural landscape, invasive species, Arad, nature conservation.*

INTRODUCTION

The European landscape is mainly composed by agroecosystems, characteristic which adress the problems of wild life conservation and of agriculture influence on (semi)natural ecosystems; this problem, issued from the contradiction (agriculture) – (nature conservation), is a current one even after the implementation of the new EU agricultural policies (Henle *et al*., 2008). The impact of agricultural activities on biodiversity and agrodiversity is seldom quantified at different scales (Flohre, 2011) by the use of indicators (Billeter *et al.*, 2008; Aavik & Liira, 2012 etc.). These indicators pertain to species diversity, landscape structure and ecosystems services (Swinton et al., 2007; Brookheld & Stocking, 1999).

After the establishment of the national and natural parks administrations (2003), and the accession of Romania to the EU (2007), the conflict (agriculture) – (nature conservation) take different aspects. Intervening changes in Romanian agriculture concern the privatization, the livestock decline, the over-expoitation of some lands concomitant with the agricultural abandon of other surfaces, the implementation of European subsidies and of agro-environemental systems etc. Anthropic agricultural pressure is obvious in plain areas. There are few studies about the impact of agriculture on biodiversity in Romania (e.g. Kuemmerle *et al.*, 2009).

As example for a such study, at regional scale, we choosed the Lunca Mureşului Natural Park (LMNP), which has the shape of a ribbon along the river Mureş, downstream from the city of Arad until the state border with Hungary (fig. 1). Within the LMNP area, we sampled three locations, plus a location outside the park, in order to encompass agroecosystems, as well as (semi)natural ecosystems. In each location, we recorded the cormophytes diversity, its structure in some categories (weeds, invasive species), in correlation with the land use categories.

This study is a part of a larger Romanian-Hungarian research project (HURO/0901/205), werefrom other results are published by Arsene *et al.* (2012)

MATERIAL AND METHODS

The four locations are square-shapped (3 km x 3 km), next to villages of Păuliş, Vladimirescu, Felnac and Igriş. Except Păuliş, all others are inside the NPLM area. As (semi)natural ecosystems types we consider: *Amorpha fruticosa* shrubs, other shrubs, meadows, forests, water surfaces, gravel grounds, reed beds. In the category of anthropic areas, we include: fallows, arrable fields, orchards and vineyards, farms, ballast pits and golf course.

Field research took place in June-August 2012. The species identification was made according to Ciocârlan (2009); the nomenclature follows *Flora Europaea Database* (http://rbg-web2.rbge.org.uk/FE/fe.html). The invasive plant species are considered in Anastasiu & Negrean's (2007) sense. Weeds (segetal species) are considered according to Ciocârlan *et al.* (2004).

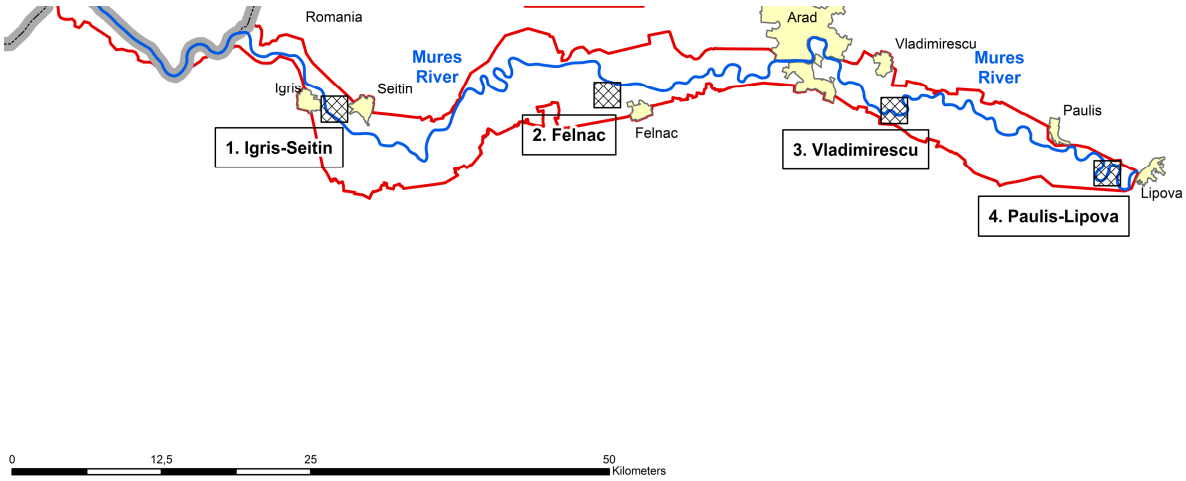


Fig. 1. The 4 studied locations

RESULTS AND DICUSSIONS

We identified a total number of cormophyte species of 369 (the complete list in Arsene *et al*., 2012). The highest specific plant diversity was measured at Vladimirescu (265 species – table 2), the location with the largest seminatural area. The smallest number of species was recorded in Felnac (197 species), i.e. about 75 % of specific diversity in Vladimirescu. The number of plant species in Felnac (197) is close to the number o plant species in Igriş (217); a cluster analysis of the flora table, based on occurence / absence of species (Fig. 2.) shows the similarity between these 2 locations, as well as a discriminations of the studied locations: Igriş and Felnac (from the inferior part of the river), and Vladimirescu and Păuliş (from the upper part of the river).

Table. 1

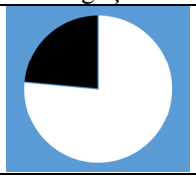
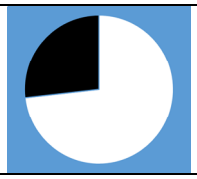
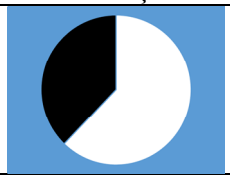
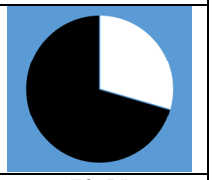
Land – use categories in the 4 sampled locations.

Land use categories	Păuliş		Vladimirescu		Igriş		Felnac		Total ha
	ha	%	ha	%	ha	%	ha	%	
Amorpha fruticosa shrubs	153,654	17,072	12,730	1,414	38,087	4,231	33,632	3,736	238,103
Arable	419,952	46,661	111,155	12,350	292,094	32,454	555,806	61,756	1379,007
Fallow	104,397	11,599	54,255	6,028	23,417	2,601	18,496	2,055	200,565
Forests	58,988	6,554	397,858	44,206	57,237	6,359	146,691	16,299	660,774
Golf course	0	0	45,648	5,072	0	0	0	0	45,648
Gravel	4,330	0,481	3,856	0,428	9,304	1,033	0	0	17,490
Meadows	22,563	2,507	73,599	8,177	269,522	29,946	84,720	9,413	450,404
Orchards and vineyards	0,095	0,010	26,041	2,893	40,072	4,452	0	0	66,208
Ballast pits	12,691	1,410	6,228	0,692	0	0	0	0	85,127
Reed beds	0	0	8,993	0,999	0	0	0	0	8,993
Other shrubs	20,062	2,229	73,916	8,212	13,667	1,518	20,343	2,260	127,988
Villages and farm buildings	2,548	0,283	1,444	0,160	63,045	7,005	0,943	0,104	67,980
Water surfaces	63,287	7,031	59,819	6,646	58,378	6,486	0,295	0,032	181,779

There is no difference between locations in number of invasive species recorded. These species are: *Acer negundo, Ailanthus officinalis, Amaranthus retroflexus, Ambrosia artemisiifolia, Amorpha fruticosa, Asclepias syriaca, Conyza canadensis, Echinnocystis lobata, Erigeron annuus, Fraxinus pensylvanica, Galinsoga parviflora, Helianthus tuberosus, Morus alba, Parthenocissus inserta, Robinia pseudacacia, Rudbeckia laciniata, Sorghum halepense, Xanthium spinosum, Xanthium strumarium (*incl. subsp. *italicum).* By far, the most problematic invasive species is *Amorpha fruticosa*, which occupies large areas in Păuliş (about 17% of the 3x3 km studied square. Almost without exception, *Amorpha* is to be found in the between-dikes zone, and its abundance in Păuliş-Lipova is to be made in relation with the large distance between dikes, existence of former excavated areas and fallows. In Vladimirescu site, where the forest is best represented (about 45 %), *Amorpha* shrubs were found only at the dikes base and along few neglected canals and roads.

Table 2.

Some parameters of land use and plant diversity in the four studied locations.

Location:	Igriş	Felnac	Păuliş	Vladimirescu
% seminatural land (in black)				
	23.54	26.77	37.82	70.55
Total number of	217	197	239	265

cormophyte species				
Number of land uses	10	8	11	13
Number of weeds species	79	57	65	62
Number of invasive species	14	12	16	14

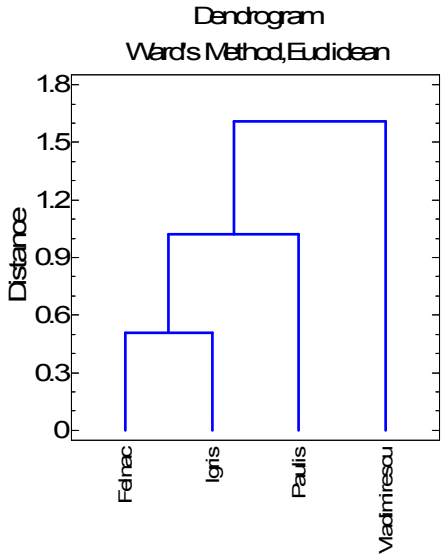


Fig. 2. Dendrogram of four locations's cormophytes flora.

CONCLUSIONS

We identify (spring-summer 2012) 369 plant species. The total number of cormophytes is highest in the 2 locations upstream (Păuliş and Vladimirescu). High differences in the proportions of (semi)-natural ecosystems are not strongly correlated with correspondent differences in plant specific diversity. The variation strand of weeds species number is quite narrow, from 57 (in Felnac) to 79 (in Igriş), and is not correlated with the value of agricultural area. Among the 16 invasive species, *Amorpha fruticosa* is the most problematic; in Păuliş locations we mapped about 150 ha of *Amorpha* shrubs. No measure to bound the expansion of this species is applied, neither inside the Lunca Mureşului Natural Park locations (Felnac and Igriş).

Detailed studies are needed in order to elucidate the influence of agricultural practices on biodiversity in the studied locations and along all the river Mureş. Monitoring plant diversity in seminatural ecosystems could reveal clear correlations between agriculture and natural diversity. Biodiversity indicators (e.g. Paoletti, 1999) could be a good monitoring tool, and could integrate plant diversity parameters.

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