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NATURE RECLAIMING ITS TERRITORY IN URBAN AREAS. CASE STUDY: VĂCĂREŞTI NATURE PARK, BUCHAREST, ROMANIA

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Abstract: The floristic research carried out at "Balta Văcăreşti", Bucharest, provided the scientific foundation for the establishment of the Văcăreşti Nature Park in 2016. Between 2012 and 2016 a total of 331 species and subspecies were identified in the researched area. Around 80% of the plants are native (including archaeophytes), while 20% are aliens, some of them being recognised as invasive species (*Elodea nuttallii*, *Azolla filiculoides*, *Ailanthus altissima*, *Acer negundo*, *Ambrosia artemisiifolia*, *Fraxinus pennsylvanica*, *Parthenocissus inserta*, *Elaeagnus angustifolia*, etc.). A large number of plants with Least Concern and Data Deficient status in the IUCN Red List was noted, most of which are aquatic and paluster species currently threatened due to the reduction or even loss of their habitat (*Cyperus fuscus*, *Cyperus glomeratus*, *Lemna trisulca*, *Hydrocharis morsus-ranae*, *Persicaria amphibia*, *Sparganium erectum*, *Typha laxmannii*, *Utricularia vulgaris*). As regards species threatened at national level, *Wolffia arrhiza* and *Utricularia vulgaris* were inventoried at "Balta Văcăreşti".
Key words: urban flora, nature park, invasive plants, Văcăreşti, Bucharest, Romania

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Introduction

Studies on species diversity in urban areas have a long history (see Sukopp 2002). They have intensified in the last years and many scientific papers have been published related to urban flora (*e.g.*, Kowarik 1991, Pyšek 1993, Brandes 1995, Pyšek 1998, Celesti-Grapow & Blasi 1998, Brandes 2003, Sukopp 2003, Interdonato *et al.* 2003, Chocholoušková & Pyšek 2003, Kühn *et al.* 2004, McKinney 2006, Moraczewski & Sudnik-Wójcikowska 2007, Godefroid & Koedam 2007, Knapp *et al.* 2008, Thomson & McCarthy 2008, Knapp *et al.* 2010, Milović & Mitić 2012, Eskin *et al.* 2012, Alegro *et al.* 2013, etc.). The subject is very interesting not only in terms of biodiversity knowledge, but also in relation to the issues posed by the urbanisation, by the necessity to manage efficiently green spaces in urban areas or to manage those species that are problematic for citizens health (e.g., *Ambrosia artemisiifolia*).

Thus, as regards flora, urban areas are often associated with low biodiversity (Goddard *et al.* 2010), a decreasing number of native species and increasing number of non-native species (Godefroid & Koedam 2003). However, some urban flora studies

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show an increase in species richness, both native and non-native species (Sukopp 2003, Kühn *et al.* 2004, Wania *et al.* 2006), but also an increasing negative impact on the quality of the flora by the presence of non-native species (Dolan *et al.* 2011, Godefroid 2001) and a high risk of plant invasions that can reduce native species richness (Von der Lippe & Kowarik 2008, Pyšek 1998).

In the process of urbanisation, existing habitats are destroyed or profoundly modified and new habitats are created (Godefroid & Koedam 2007). Thus, the process of urbanisation has effects such as habitats transformation or fragmentation, changes in ecological condition as well as changes in flora composition (Hudina *et al.* 2012). Urbanisation does promote, in many cases, the biological homogenisation (McKinney 2006).

But what happens in a big city, when an area is abandoned over 25 years? How many plant species could be in a such an area? Are there any rare species? What is the proportion of alien species? Where do they originate from? What are the plants communities installed in this area? We had the opportunity to find answers researching such an area in Bucharest city known as "Balta Văcăreşti".

We have to point out that the main data regarding flora of Bucharest are published by Brândză (1876, 1879-1883), Grecescu (1880, 1898), Panţu (1908, 1909, 1910, 1912, 1931), Morariu (1937, 1939, 1941, 1943, 1944, 1946, 1949, 1960), but only a few authors refer to the Văcăreşti area. Thus, Panţu (1908, 1909, 1910) mentions the following plants: *Equisetum palustre* – edge of the ponds near Văcăreşti Penitentiary; *Lemna trisulca* – Bucharest, ponds near Văcăreşti Penitentiary; *Wolffia arrhiza* – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Caltha cornuta* (valid name *Caltha palustris* L.) – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Cardamine pratensis* – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Ranunculus paucistamineus* (probably *Batrachium trichophyllum* var. *paucistamineum* (Tausch) Hand.-Mazz.) – Bucharest, ponds on the edge of Dâmboviţa River, near Văcăreşti Penitentiary; *Prunus spinosa* f. *dasyphylla* – Bucharest, on the slopes near Văcăreşti Penitentiary; *Acer campestre* – Bucharest, on the slopes near Văcăreşti Penitentiary; *Acer tataricum* – Bucharest, on the slopes near Văcăreşti Penitentiary. Later, Morariu (1943) reports from the slopes from Văcăreşti the shrub *Syringa vulgaris*.

Nagodă *et al.* (2013) recently published two new alien species from Văcăreşti area, *Phemeranthus confertiflorus* and *Portulaca pilosa*, and their accompanying species: *Tragus racemosus, Sedum acre, Setaria viridis, Lotus tenuis, Portulaca oleracea* subsp. *oleracea, Vulpia myuros, Eragrostis minor, Eragrostis pilosa, Echium vulgare, Erigeron annuus* s.l., *Digitaria sanguinalis, Galium humifusum, Cichorium intybus, Berteroa incana, Convolvulus arvensis, Petrorhagia prolifera, Plantago lanceolata, Bromus tectorum.*

Material and methods

Investigated area. Bucharest is the capital city of Romania, located in the Romanian Plain, subzone of submesophilous- thermophilous oak tree forests (Doniţă *et al.* 2005). Biogeographic region is continental. According to the Romanian Statistical Yearbook (Andrei 2017), Bucharest has a surface of 240 km^2 and 2,101,413 inhabitants. The average altitude is 85 m. Yearly average of the air temperature is 11°C and the

yearly average of temperature amplitude is 25.1°C. Regarding the precipitations, the yearly average for the last 100 years is 567.7 mm (Andrei 2017).

Our investigated area, "Balta Văcărești", is located in the South-East part of Bucharest (Fig. 1), at 3.6 km away from the second largest building in the world, Palace of the Parliament or the People's House as it is also known as (Fig. 2). This area has a very interesting history. An old mention of Văcărești area dates back to 1770, when the Turks were defeated by the Russian prince Repnin, the capital being at that time occupied by the Russians (Lahovari *et al.* 1899). Another note about Văcărești is found in "Bucureștii de altădată. 1871-1877" by Constantin Bacalbașa (2014). According to this author, more than 140 years ago, more precisely in 1873, there was a marshy ground here, where iron-rich water springs were discovered. For a while, it was a fashion for the elite of Bucharest to come here on weekends and to consume water from the springs while walking around. But the Văcărești area remains known in the history of Bucharest for the monastery that functioned here for over 250 years and which was demolished in 1986 by the order of the dictator Nicolae Ceauşescu. This monastery also functioned as a penitentiary in the second half of the nineteenth century.

Before 1989, "Balta Văcărești" was conceived as part of the complex development of the river Dâmboviţa and remains an unfinished hydrologic project to this day. It stretches over an area of 190 hectares and is enclosed by a concrete dyke. The altitude is about 60-65 m at the level of flat area, and with 10 m higher on the dyke. The flat area presents numerous depressions with water forming a large pond (baltă, in Romanian). Nowadays "Balta Văcărești" includes swampy areas with reedbeds, grassland and ponds fed by underground springs (Fig. 2).

In 2016, "Balta Văcărești" has been declared a Nature Park (Guvernul României 2016). This is the first urban nature park in Romania and the only protected area in Bucharest.

Research methods. The inventory of the plant species was done on walking transects, so that the entire area be covered. The study visits for the complete inventorying of the flora from "Balta Văcărești" were conducted regularly during the vegetation period, between 2012 and 2016, so that all the stages of vegetation be observed and as many species as possible be recorded. In 2016 only seven new species were added to the previous list. For the taxa whose identity was difficult to determine on the field, 1–2 specimens were collected and subsequently identified in the laboratory. Furthermore, the area was thoroughly researched in order to identify the strictly protected plant species and the rare species, mentioned in the Romanian Red Book (Dihoru & Negrean 2009) and in the National Red List (Oltean *et al.* 1994). The data were collected in standard forms and stored electronically. The results obtained were organised in tables using Microsoft Excel, and presented graphically in charts. For each species there were noted and analysed the systematic classification, the geographic element, the life form and the ecological indicators, according to Popescu & Sanda (1998). The definitions and comments suggested by Cristea *et al.* (2004) were taken into account for the interpretation of the data regarding the geographic elements and the life forms. Furthermore, for each species the degree of threat according to international and national documents was noted (Bilz *et al.* 2011, Dihoru & Negrean 2009, Oltean *et al.* 1994).

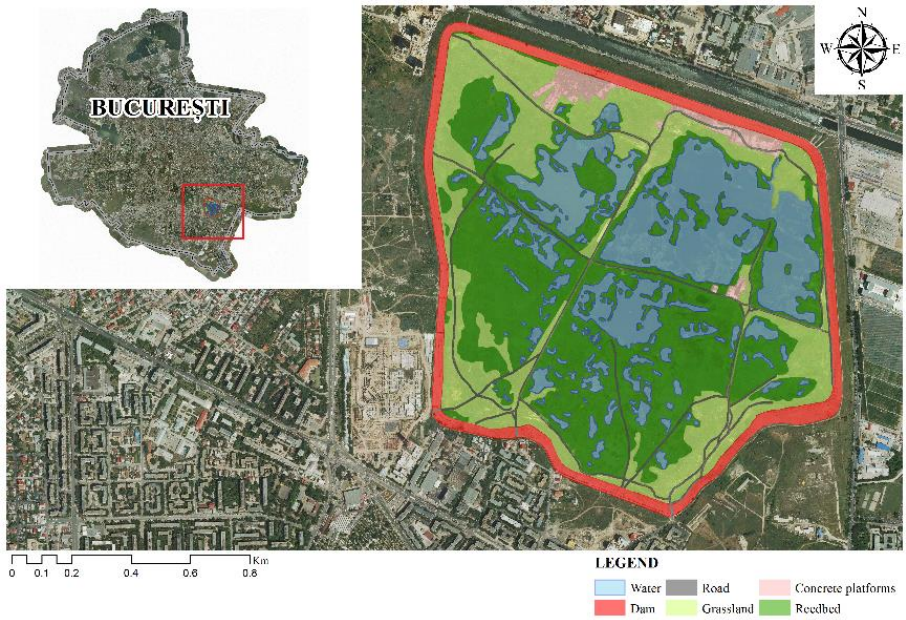

Fig. 1. The location of "Balta Văcăreşti" in Bucharest
(map compiled by Tiberiu Săhlean)

Fig. 2. "Balta Văcăreşti" – view from the East side to West (photo: Cezar Camen-Comănescu).
With red arrow the Parliament House is indicated.

The native status of species is according to the database The Euro+Med PlantBase (http://ww2.bgbm.org/EuroPlusMed). We included here the archaeophytes too. The assessment of the invasiveness status was made using the definitions developed by Richardson *et al.* (2000). For the urbanity status we used BiolFlor (Klotz *et al.* 2002, available at www2.ufz.de/biolflor). The nomenclature of the inventoried species is according to The Plant List (www.theplantlist.org) and Sârbu *et al.* (2013).

Abbreviations used in charts and annexes 1 & 2: **Distribution**: Afr – Africa; Am – America; As – Asia; Balc – Balkanic; Eu – Europe; Euras – Eurasia; Cauc – Caucasus; Circ – Circumboreal; Cosm – Cosmopolite; Temp – Temperate; Trop – Tropical; Cont – Continental; Med – Mediterranean; Submed – Submediterranean; Pont– Pontic; N – North; E – East; S – South; W – West; C – Centre (central). **Life form**: Ch – Chamaephytes; G – Geophytes; H – Hemicryptophytes; Hd – Hydrophytes; HH – Helohydatophytes; Ht – Hemitherophytes; Ph – Phanerophytes; PhL – Liana; PhM – Megaphanerophytes; PhN – Nanophanerophytes; T – Therophytes; **Moisture (M)**: 0 = euriphyte, 1 = xerophyte, 1.5 = xerophyte-xeromesophyte, 2 = xeromesophyte, 2.5 = xeromesophyte-mesophyte, 3 = mesophyte, 3.5 = mesophyte-mesohygrophyte, 4 = mesohygrophyte, 4.5 = mesohygrophyte-hygrophyte, 5 = hygrophyte. **Temperature (T)**: 0 = eurithermophyte, 1 = hekistothermophyte, 1.5 = hekistothermophyte-psichrothermophyte, 2 = psichrothermophyte, 2.5 = psichrothermophyte-microthermophyte, 3 = microthermophyte, 3.5 = microthermophyte-mesothermophyte, 4 = mesothermophyte, 4.5 = mesothermophyte-submesothermophyte, 5 = subthermophyte. **Soil reaction (R)**: 0 – Euryionic; 1 – Extremely acidophilic; 2 – Acidophilic; 3 – Acid-neutral; 4 – Weakly acid-neutral; 5 – Neutrobasiphilic. **IUCN Red List**: LC – Least Concern, DD – Data Deficient, CWR – Crop wild relatives, AqS – Aquatic species. **Urbanity**: 1 = urbanophobic, 2 = moderately urbanophobic, 3 = urbanoneutral, 4 = moderately urbanophilic, 5 = urbanophilic.

Results and discussion

During the 5 years of investigations, we inventoried 331 species and subspecies, of which 266 are natives (including archaeophytes) (Annex 1) and 65 are alien taxa for Romanian flora (Annex 2). The ratio between native and alien is 4.09 / 1. Three inventoried native species have been reported previously from this area: *Lemna trisulca*, *Wolffia arrhiza*, *Ranunculus trichophyllus* (Panţu 1908, 1909, 1910). Even *Sedum rupestre* and *Sedum telephium* subsp. *fabaria* are native taxa in the Romanian flora, it seems to have escaped from the gardens around the investigated area. They grow in the crevices of the dyke's concrete. Other species as *Corydalis solida* subsp. *solida*, *Narcissus poëticus*, *Narcissus pseudonarcissus*, *Phemeranhus confertiflorus*, *Tulipa gesneriana* could be the result of direct human actions, some people throwing away the vegetal waste from their gardens in to places such as "Balta Văcărești". The alien species recorded for "Balta Văcărești" represent about one third (29.6%) of those recorded from Bucharest and its surroundings (Nagodă 2015).

The high level of the vascular plant diversity recorded in the "Balta Văcărești", especially of native ones, is due to the very low impact of human activity in the last 20 years in this area. Usually, the maximal diversity is found in vegetation affected by low human influences (Kowarik 1991).

Native species and subspecies belong to 57 families. Among the richest families in the investigated area are: Asteraceae (41 taxa), Poaceae (36 taxa), Fabaceae (24 taxa), Brassicaceae (13 taxa), Polygonaceae (12 taxa), Cyperaceae (10 taxa), Apiaceae (8 taxa), Rosaceae (8 taxa), Caryophyllaceae (7 taxa), Plantaginaceae (7 taxa) (Fig. 3). Most of the families identified by us as the richest in species are in fact among the 20 top families richest in species, in the world (Christenhusz *et al.* 2017). The pattern for the first four families is similarly to some European cities as Roma, Thessaloniki, Zürich (Stešević & Jovanović 2008).

Approximately 51% (136 taxa) of the native species and subspecies are Eurasian elements (including here Continental and sub-Mediterranean Eurasian domain, as well) (Fig. 4). Most of them are terrestrial plants characteristic to ruderal communities or to dry grasslands. Only a small number of Eurasian elements are found in swamp or aquatic areas: *Alisma lanceolatum*, *Butomus umbellatus*, *Carex acutiformis*, *Carex vulpina*, *Carex riparia*, *Cyperus fuscus*, *Cyperus glomeratus*, *Hydrocharis morsus-ranae*, *Juncus inflexus*, *Juncus compressus*, *Lysimachia nummularia*, *Mentha longifolia*,

Mentha pulegium, *Ranunculus repens*, *Ranunculus trichophyllus*, *Rumex palustris*, *Sparganium erectum*. Another 16% of the identified species and subspecies (43) belong to the European domain (including the Central, Western and Northern European). These are present at the edge of the ponds (*Mentha aquatica* subsp. *aquatica*, *Rumex hydrolapathum*), but especially in the vegetal communities along the roads (*Vicia dasycarpa*, *V. lathyroides*, *V. villosa*, *Geranium pusillum*, etc.).

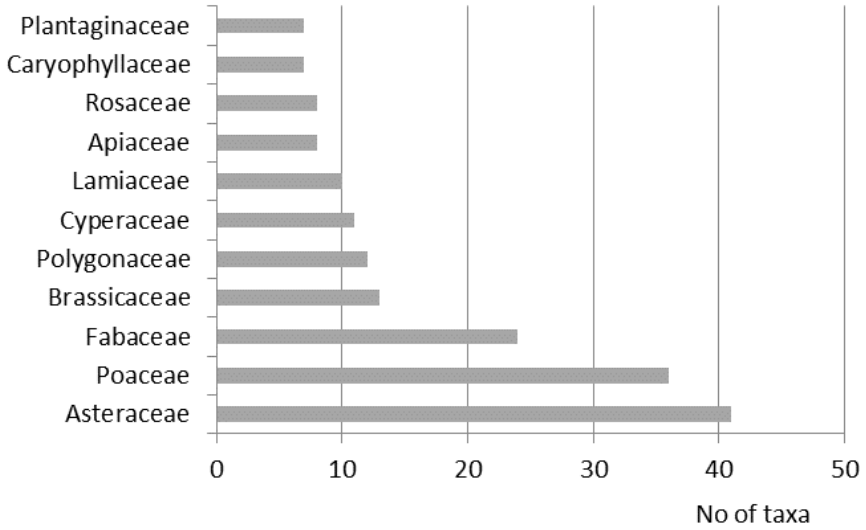

Fig. 3. Taxonomic spectrum of the main plant families of the native species (≥ 7 species) in "Balta Văcăreşti".

Cosmopolite are 12.8% (34 taxa), and circumpolar 6.8% (18 taxa). Among the cosmopolite species there are many aquatic and swamp plants: *Eleocharis palustris*, *Lemna minor*, *Lemna trisulca*, *Phragmites australis*, *Persicaria amphibia*, *P. lapathifolia*, *P. maculosa*, *Schoenoplectus lacustris*, *S. tabernaemontani*, *Typha latifolia*, *Wolffia arrhiza*. The situation is similar for circumpolar elements, many of them being aquatic and swamp plants: *Alisma plantago-aquatica*, *Alopecurus aequalis*, *Berula erecta*, *Myriophyllum spicatum*, *Myriophyllum verticillatum*, *Persicaria hydropiper*, *Potamogeton natans*, *Stachys palustris*, *Typha angustifolia*, *Utricularia vulgaris*. An important category of elements is those of Southern origin which require a mild climate, with a water deficit in the summer time: Mediterranean, Ponto-Balkan, Ponto-Mediterranean, sub-Mediterranean (32 taxa – 12%) (Fig. 4). We mention some of them: *Anchusa ochroleuca*, *Cynanchum acutum*, *Geranium rotundifolium*, *Melissa officinalis*, *Tragus racemosus*, *Vicia grandiflora*.

The dominating life forms in the flora of the "Balta Văcăreşti" are represented by hemicryptophytes, with 90 taxa (34%). These are followed by: therophytes with 68 taxa (25.5%), therophytes-hemitherophytes with 21 taxa (%), hemitherophytes with 19 taxa (8%), geophytes with 13 taxa (5%), hydrophytes with 11 taxa (4.1%), geophytes

(helohydatophytes) with 10 taxa (3.7%), megaphanerophytes with 10 taxa (3.7%), and nanophanerophytes with 8 taxa (3%) and other categories of elements with 16 taxa (Fig. 5).

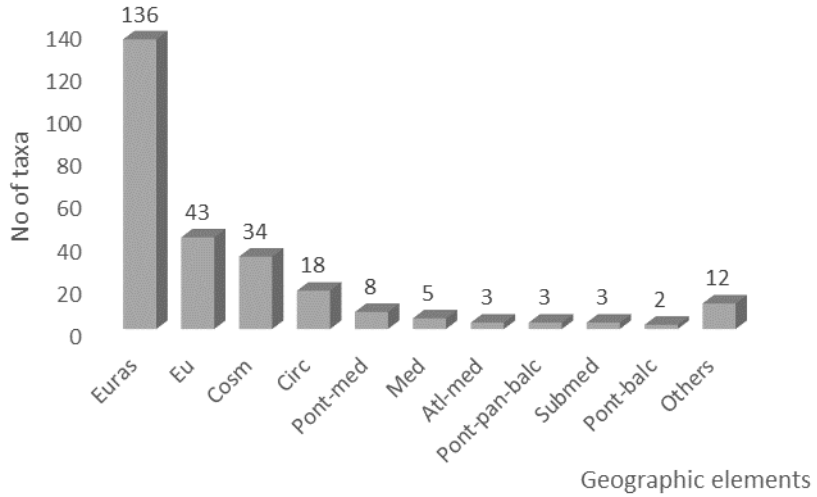

Fig. 4. Spectrum of geographic elements for native species recorded in "Balta Văcăreşti".

According to Cristea *et al.* (2004), hemicryptophytes usually indicate a climate with a thermic and hydric deficit and the abundance of grass formations edified by perennial poaceaes. In the investigated area, 13 of these hemicryptophytes are perennial poaceaes, especially in the dry places. Therophytes are usually associated with a high degree of flora anthropisation. They represent a dominant category in urban areas as Chernihiv – Ukraine (Zavyalova 2008), Split – Croatia (Jasprica *et al.* 2010), Roma, Cagliari, Palermo – Italy (Celesti-Grapow & Blasi 1998), as well as in many old town centres (Brandes 1995). In the "Balta Văcăreşti" the therophytes occur predominantly along the trails and on the dyke. The most geophytes are present at the edge of the ponds. We have to mention here the presence of *Corydalis solida* subsp. *solida*, an unexpected forest species. We supose that people living around the lake brought some plants from the forest for their own gardens, and then they threw away the garden soil and vegetal remains on the ground of "Balta Văcăreşti". Hydrophytes and helohydatophytes are typical of the aquatic and swamp formations. We mention here *Bolboschoenus maritimus*, *Eleocharis palustris*, *Phragmites australis*, *Schoenoplectus lacustris*, *S. tabernaemontani*, *Typha angustifolia*, *T. latifolia*, *T. laxmannii*. A study on British flora reveal that hydrophytes "appeared to be more favoured by urbanization" (Thompson & McCarthy 2008). In "Balta Văcăreşti" area hydrophytes are favoured by the specific condition of the place which is actually a large swamp isolated by the urban space through a big dyke. Phanerophytes are distributed around the ponds (*Salix* spp., *Populus* spp.), but they are also present on the dyke, in concrete's crevices (*Acer platanoides*, *Acer pseudoplatanus*, *Colutea arborescens*, *Cornus sanguinea*, *Rosa canina*, *Ulmus procera*).

The analysis of the ecological indicators of the inventoried plants in ”Balta Văcăreşti” area reveals that the flora of this area is dominated by elements with medium requirements in terms of moisture and heat, but prefer weakly acidneutrophilic soils or euryionic soils (Fig. 6).

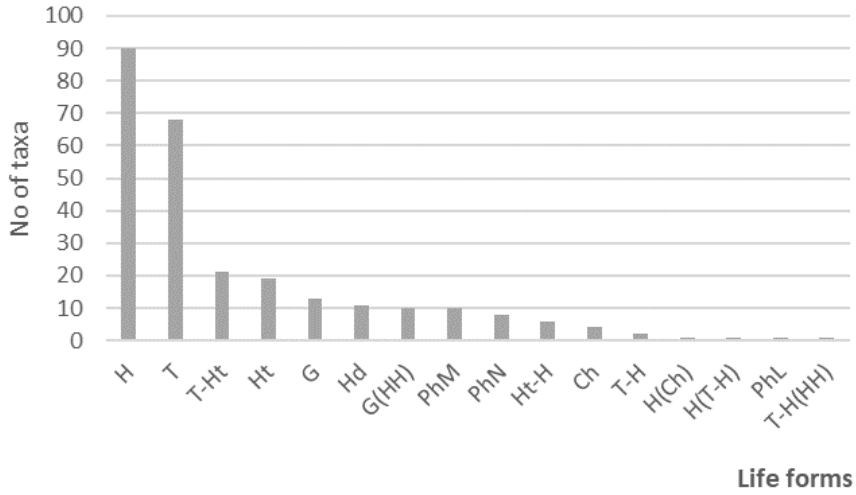

Fig. 5. Spectrum of life forms for native species recorded in “Balta Văcăreşti”.

In terms of the moisture, the highest number of taxa is represented by mesophytes (57 – 21.5%). These are followed by xeromesophytes (47 – 17.7%) and xeromesophytes to mesophytes (46 – 17.3%). 42 taxa (15.8%) are hydrophytes and ultrahydrophytes, characteristic to the aquatic and swamp plants’ communities. Only 11 taxa are euryphytes, adapted to great moisture variations (Fig. 6). Among these we mention: *Bromus hordeaceus*, *Buglossoides arvensis*, *Carex hirta*, *Elymus repens*, *Epilobium tetragonum* subsp. *lamyi*, *Tragus racemosus*, *Tribulus terrestris*, *Tussilago farfara*.

Concerning the requirements in terms of heat, we note the presence of only one thermophilic element (*Botriochloa ischaemum*), growing in the grasslands installed on the dyke, and three microthermic elements (*Festuca pratensis* subsp. *pratensis*, *Silene latifolia* subsp. *alba* and *Viola tricolor*). The great majority is represented by mesothermic (118 taxa – 44.5%), mesothermic to moderate thermohilic (46 taxa – 17.2%) and moderate thermophilic elements (55 taxa – 20.7%) (Fig. 6).

In regard to the plants’ preferences for the soil pH, we noticed the presence of a large number of elements with wide ecological amplitude to soil reaction (97 – 36.6%) and elements which prefer weakly acid to neutral soils (103 taxa – 38.8%) (Fig. 6). The number of elements which prefer neutral to basic soil is very low (5 taxa – 1.8%). “Generally, urban areas appear to favour plants of base-rich soils” (Thompson & McCarthy 2008), but the situation recorded for the “Balta Văcăreşti” area is different, quite similar to that of British flora where “the model for urban frequency of natives indicated highest frequency at intermediate pH values” (Thompson & McCarthy 2008).

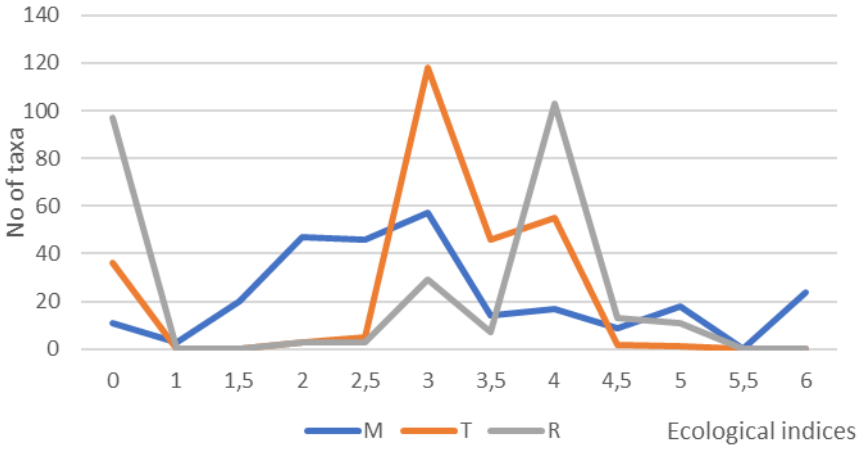

Fig. 6. Spectrum of ecological forms for native species recorded in "Balta Văcăreşti".

The analysis of the floristic inventory shows that 64 taxa are listed in different categories of the IUCN Red List (Bilz *et al.* 2011). A significant percentage of these are aquatic or swamp plants (64% – 41 taxa), listed as Least Concern. Another category is represented by Crop Wild Relative with 21 taxa (32.8%) evaluated as Least Concern. *Agrostis stolonifera* subsp. *stolonifera* is listed as Least Concern both for Aquatic Species and Crop Wild Relative. *Malva sylvestris* is included as Data Deficient taxa in IUCN Red List (Bilz *et al.* 2011).

Utricularia vulgaris and *Wolffia arrhiza* are listed in the National Red List (Oltean *et al.* 1994), as rare and, respectively, insufficiently known. *Wolffia arrhiza* is included also in the Romanian Red Book (Dihoru & Negrean 2011) as endangered species.

The alien taxa are distributed in 32 families (Annex 2), the richest being Asteraceae with 11 species. This is followed by Rosaceae (5 taxa), Poaceae (4 taxa), Amaranthaceae (3 taxa), Chenopodiaceae (3 taxa), Solanaceae (3 taxa) and Ulmaceae (3 taxa). Eight families are represented by two taxa each and 17 families are represented by one taxon each. Most of the alien plant species from "Balta Văcăreşti" are therophytes – 30 taxa (46.1%) (Fig. 7). The second place is occupied by trees (megaphanerophytes) with 20 taxa (30.7%), and the third is occupied by geophytes with 7 taxa (10.7%) (Fig. 7). About half of the alien species recorded in investigated area are the native distribution in America (33 taxa – 50.7%). Other 21 taxa (32.3%) are Asiatic elements. Among them there are a few known for their invasive status: *Acer negundo*, *Ailanthus altissima*, *Amaranthus albus*, *Amaranthus retroflexus*, *Ambrosia artemisiifolia*, *Ambrosia trifida*, *Azolla filiculoides*, *Cuscuta campestris*, *Elaeagnus angustifolia*, *Elodea nuttallii*, *Helianthus tuberosus*, *Iva xanthiifolia*, *Lycium barbarum*, *Panicum capillare*, *Parthenocissus inserta*, *Fallopia japonica*, *Sorghum halepense*, *Veronica persica*, *Xanthium italicum*, *Xanthium spinosum*. The most widespread in the

area is *Ambrosia artemisiifolia* which grows very well especially on the dyke, in the crevices of the concrete, but also in the flat area, even in vegetation with *Phragmites australis*.

According to Kowarik (1991), the spreading processes of alien species start very often from intensively disturbed sites. This is confirmed in the "Balta Văcăreşti" where the most alien species were recorded on the dyke or along the trails, and only few could be find in the aquatic or swamp habitats.

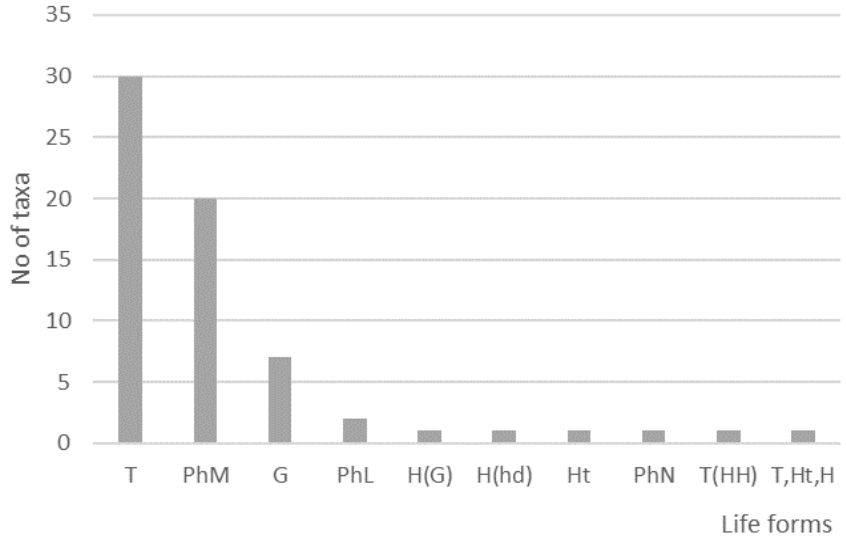

Fig. 7. Spectrum of life forms of the alien species recorded in "Balta Văcăreşti".

The analysis of the urbanity indices reveals a very interesting situation. Despite the fact that the investigated are is located in an urban area, very close to the city centre, about 40% of the taxa are urbanophobic (41 taxa) and moderately urbanophobic (91 taxa) (Fig. 8, Annex 1, 2). With only few exceptions (*Oenothera glazioviana*, *Fraxinus pennsylvanica*, *Narcissus pseudonarcissus*, *Tulipa gesneriana*, *Xanthium italicum*), these are native taxa, characteristic especially for the aquatic and swamp habitats installed in the "Balta Văcăreşti". Urbanophilic taxa (about 7% of the total flora of investigated area) are dominated by alien species, but there are nine native species in this category as well: *Bromus squarrosus*, *Chenopodium strictum*, *Eragrostis minor*, *Eragrostis pilosa*, *Hibiscus trionum*, *Melissa officinalis*, *Portulaca oleracea* subsp. *oleracea*, *Tragus racemosus*, *Verbascum speciosum*. The moderately urbanophilic category (11.7%) is dominated by native elements, with 21 taxa. Among them, there are species very common for the ruderal places of the city: *Artemisia annua*, *Artemisia vulgaris*, *Ballota nigra* subsp. *nigra*, *Chelidonium majus*, *Cynodon dactylon*, *Hordeum murinum*, *Lactuca serriola*, *Sambucus ebulus*, *Tanacetum vulgare*, *Urtica dioica*, *Verbena officinalis*.

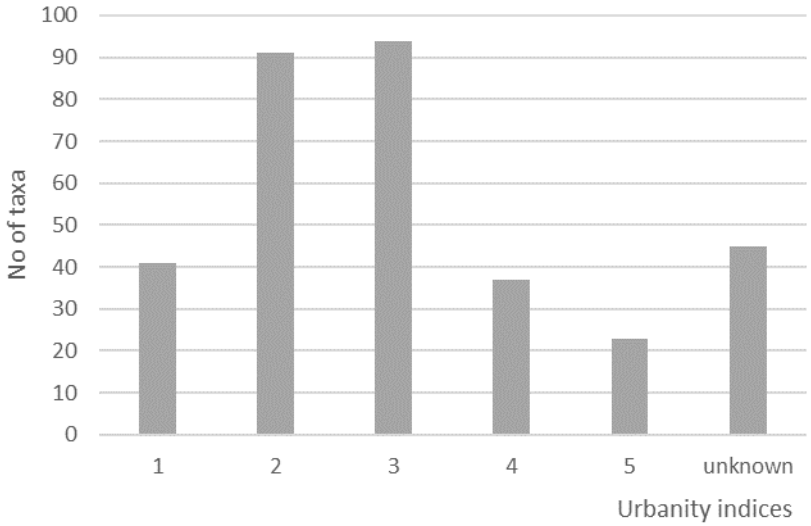

Fig. 8. Spectrum of urbanity indices for the Balta Văcăreşti.

In regard to the vegetation, we identified aquatic communities with *Lemna minor*, *Wolffia arrhiza*, *Lemna trisulca*, *Myriophyllum verticillatum*, *Myriophyllum spicatum*, *Hydrocharis morsus-ranae*, *Ceratophyllum demersum*, *Potamogeton natans*, *Ranunculus trichophyllus*, *Utricularia vulgaris*. Unfortunately, these communities are already contaminated with the alien species *Elodea nuttallii*, now included in the updated list of invasive alien species of the Union Concern (European Comission 2017).

At the edge of ponds there are large communities dominated either by *Phragmites australis*, or by species of cattails (*Typha latifolia*, *Typha angustifolia*, *Typha laxmannii*). These are accompanied by numerous species such as: *Alisma lanceolatum*, *Alisma plantago-aquatica*, *Althaea officinalis*, *Bolboschoenus maritimus*, *Carex riparia*, *Carex acutiformis*, *Carex vulpina*, *Cyperus fuscus*, *Cyperus glomeratus*, *Elaeocharis palustris*, *Epilobium hirsutum*, *Juncus inflexus*, *Lycopus europaeus*, *Lythrum salicaria*, *Mentha aquatica*, *Mentha longifolia*, *Nasturtium officinale*, *Persicaria amphibia*, *Persicaria hydropiper*, *Persicaria lapathifolia*, *Ranunculus repens*, *Rumex hydrolapathum*, *Rumex palustris*, *Shoenoplectus lacustris*, *Sparganium erectum*, *Stachys palustris*, etc.. Few woody species grow also to the edge of ponds: *Salix alba*, *Salix cinerea*, *Salix fragilis*, *Populus nigra*, *Populus canescens*.

In the eastern part of the dyke, on the outside, as well as on the elevated places from the flat area, the grassland dominated by *Botriochloa ischaemum* have been installed. We inventoried here species such as *Artemisia austriaca*, *Bromus hordeaceus*, *Cephalaria transsylvanica*, *Cichorium intybus*, *Chondrilla juncea*, *Carduus acanthoides*, *Plantago lanceolata*, *Petrorhagia prolifera* (Fig. 9).

Fig. 9. The vegetation of "Balta Văcăreşti". In the foreground, grassland with *Botriochloa ischaemum* (Photo: Paulina Anastasiu).

Fig. 10. The vegetation of dyke in "Balta Văcăreşti" (Photo: Paulina Anastasiu).

In crevices of the dyke's concrete (Fig. 10) we recorded: *Ambrosia artemisiifolia*, *Artemisia annua*, *Bromus tectorum*, *Ailanthus altissima*, *Acer negundo*, *Morus alba*, *Cephalaria transsylvanica*, *Petrorhagia prolifera*, *Galium humifusum*, *Erigeron annuus*, *Xanthium italicum*, *Daucus carota* subsp. *carota*, *Euphorbia maculata*, *Gleditsia triacanthos*, *Crepis foetida* subsp. *rhoeadifolia*, *Polygonum aviculare*, *Lolium perenne*, etc.

Between the flat area and the lower part of the dyke, on superficial soil, we inventoried species such as *Phemeranthus confertiflorus*, *Portulaca pilosa*, *Portulaca oleracea*, *Sedum acre*, *Eragrostis minor*, etc.

Along the trails there are communities with *Lolium perenne*, *Elymus repens*, *Polygonum aviculare*, *Sclerochloa dura*, *Erodium cicutarium*.

Conclusions

An abandoned project in Bucharest, the capital of Romania, has given nature opportunities for new habitats and plant species. With minimal human interventions, on a surface of about 190 ha, in over 25 years, nature did its job very well, reclaiming its territory in this urban area. Thus, 331 plant species have grown here, many of them being native to Romania. A robust awarness of the existence of these plants can contribute to a better understanding of the structure and function of urban ecosystems, can provide opportunities to educate the public and policy makers (Pickett & Cadenasso 2008), and can be useful for the management activities in order to protect the biodiversity.

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Annex 1. Native species and subspecies (including archaeophytes) recorded to "Balta Văcărești" between 2012-2016

No.	Taxon	Family	Native Distribution	Life form	H	T	R	IUCN Red List	Urbanity
1.	Acer platanoides L.	Aceraceae	Eu	PhM	3	3	3		3
2.	Acer pseudoplatanus L.	Aceraceae	EuC	PhM	3.5	3	3		3
3.	Achillea millefolium L.	Asteraceae	Euras	H	2	4	3.5		3
4.	Achillea nobilis L. subsp. neilreichii (A.Kern.) Velen.	Asteraceae	Pont-pan-balc	H	2	3.5	4.5		4
5.	Achillea setacea Waldst. & Kit.	Asteraceae	Euras.cont	H	2	3	5		1
6.	Aegilops cylindrica Host	Poaceae	Euras.cont	T	1.5	3	0	LC(CWR)	unknown
7.	Agrimonia eupatoria L.	Rosaceae	Euras	H	2.5	3	4		2
8.	Agrostis stolonifera L. subsp. stolonifera	Poaceae	Circ	H	4	0	0	LC(AqS&CWR)	3
9.	Alisma lanceolatum With.	Alismataceae	Euras	Hd	6	0	4	LC(AqS)	1
10.	Alisma plantago-aquatica L.	Alismataceae	Circ	Hd	6	0	0	LC(AqS)	2
11.	Alopecurus aequalis Sobol.	Poaceae	Circ	T-Ht	5	3	5	LC(AqS)	2
12.	Althaea officinalis L.	Malvaceae	Euras.cont	H	3	4	4		1
13.	Alyssum alyssoides (L.) L.	Brassicaceae	Euras.cont	T	1.5	4	5		1
14.	Anchusa ochroleuca M.Bieb.	Boraginaceae	Pont-cauc	H	2	4	4		unknown
15.	Anthriscus cerefolium (L.) Hoffm. subsp. trichosperma (Schult.) Arcang.	Apiaceae	Pont-med	T	3	4	0		4
16.	Arctium lappa L.	Asteraceae	Euras	Ht	3.5	3	4		4
17.	Arctium minus (Hill) Bernh.	Asteraceae	Eu	Ht	3	3	4.5		4
18.	Arenaria serpyllifolia L. subsp. serpyllifolia	Caryophyllaceae	Circ	T	2	2.5	0		2
19.	Arrhenatherum elatius (L.) P.Beauv. ex J.Presl & C.Presl.	Poaceae	Euras	H	3	3	4		2
20.	Artemisia absinthium L.	Asteraceae	Euras	H	2	3	4		2
21.	Artemisia annua L.	Asteraceae	AsC&SW	T	3	4	4		4
22.	Artemisia austriaca Jacq.	Asteraceae	Euras.cont	Ch	2	4	4.5		3
23.	Artemisia vulgaris L.	Asteraceae	Circ	H	2.5	3	4		4

24.	Astragalus cicer L.	Fabaceae	Euras.cont	H	2.5	4	4	LC(CWR)	2
25.	Atriplex oblongifolia Waldst. & Kit.	Chenopodiaceae	Euras.cont	T	2	3.5	4		2
26.	Atriplex sagittata Borkh.	Chenopodiaceae	Euras.cont	T	3	3	0		3
27.	Atriplex tatarica L.	Chenopodiaceae	Euras	T	2	4	0		3
28.	Avena fatua L.	Poaceae	Euras(submed)	T-Ht	3	3.5	4	LC(CWR)	2
29.	Ballota nigra L. subsp. nigra	Lamiaceae	EuC&NE	H	2	3.5	4		4
30.	Berteroa incana (L.) DC.	Brassicaceae	Euras	T-Ht	2	3	4		3
31.	Berula erecta (Huds.) Coville	Apiaceae	Circ	H(Hd)	6	3.5	0	LC(AqS)	1
32.	Bidens tripartita L.	Asteraceae	Euras	T	4.5	3	0	LC(AqS)	2
33.	Bolboschoenus maritimus (L.) Palla	Cyperaceae	Cosm	G(HH)	4.5	3	5	LC(AqS)	2
34.	Bothriochloa ischaemum (L.) Keng	Poaceae	Euras(submed)	H	1.5	5	3		2
35.	Bromus arvensis L.	Poaceae	Euras(submed)	T-Ht	2.5	3	0		1
36.	Bromus hordeaceus L.	Poaceae	Euras(submed)	T-Ht	0	3	0		3
37.	Bromus inermis Leyss.	Poaceae	Euras.cont	H	2.5	4	4		3
38.	Bromus squarrosus L.	Poaceae	Euras.cont	T-Ht	1.5	4	4		5
39.	Bromus sterilis L.	Poaceae	Euras(submed)	T	2	4	4		3
40.	Bromus tectorum L.	Poaceae	Euras.cont	T	1.5	3.5	0		3
41.	Buglossoides arvensis (L.) I.M.Johnst.	Boraginaceae	Euras	T	0	0	4		2
42.	Butomus umbellatus L.	Butomaceae	Euras	Hd	6	3	0	LC(AqS)	2
43.	Calamagrostis epigeios (L.) Roth	Poaceae	Euras	G	2	3	0		3
44.	Calystegia sepium (L.) R.Br.	Convolvulaceae	Euras	G(H)	5	3	4		3
45.	Capsella bursa-pastoris (L.) Medik.	Brassicaceae	Cosm	T-Ht	3	0	0		3
46.	Carduus acanthoides L.	Asteraceae	Eu	Ht	2	3	0		3
47.	Carex acutiformis Ehrh.	Cyperaceae	Euras	G(HH)	6	3	4	LC(AqS)	2
48.	Carex cuprina (Sándor ex Heuff.) Nendtv. ex A.Kern.	Cyperaceae	Euras	H	5	3	0		2
49.	Carex hirta L.	Cyperaceae	Circ	G	0	3	0		3
50.	Carex riparia Curtis	Cyperaceae	Euras	G	5	4	4	LC(AqS)	1
51.	Carex vulpina L.	Cyperaceae	Euras	H	4	3	4		1
52.	Carthamus lanatus L.	Asteraceae	Pont-med	T	2.5	4	0		unknown

53.	Centaurea biebersteinii DC.	Asteraceae	Pont-pan-balc	Ht-H	1.5	4	4		2
54.	Centaurea iberica Trevir.	Asteraceae	Pont-balc	Ht	1.5	4	0		unknown
55.	Centaurea jacea L.	Asteraceae	Eu	H	3	0	0		unknown
56.	Centaurea nigrescens Willd.	Asteraceae	EuC	H	3.5	3	3		1
57.	Cephalaria transsylvanica (L.) Schrad. ex Roem. & Schult.	Dipsacaceae	Pont-med	Ht	2	3.5	4		unknown
58.	Cerastium dubium (Bastard) Guépin	Caryophyllaceae	Pont-med	T	3	3	0		1
59.	Cerastium semidecandrum L.	Caryophyllaceae	Eu	T	2	3.5	0		2
60.	Ceratophyllum demersum L. s.l.	Ceratophyllaceae	Cosm	Hd	6	3	0	LC(AqS)	1
61.	Chelidonium majus L.	Papaveraceae	Euras	H	3	3	4		4
62.	Chenopodium album L.	Chenopodiaceae	Cosm	T	3	3	0		3
63.	Chenopodium strictum Roth	Chenopodiaceae	EuC	T	2.5	4	0		5
64.	Chondrilla juncea L.	Asteraceae	Euras.cont	Ht-H	1.5	3.5	4		2
65.	Cichorium intybus L.	Asteraceae	Euras	H	3	0	3	LC(AqS)	3
66.	Cirsium arvense (L.) Scop.	Asteraceae	Euras	G	2.5	3	0		3
67.	Cirsium vulgare (Savi) Ten.	Asteraceae	Euras	Ht	3	3	0		3
68.	Clematis vitalba L.	Ranunculaceae	EuC	PhL	3	3	3		3
69.	Colutea arborescens L.	Fabaceae	EuS&SC	PhN	2	4.5	4.5		4
70.	Conium maculatum L.	Apiaceae	Euras	T-Ht	3	3	3		4
71.	Convolvulus arvensis L.	Convolvulaceae	Cosm	G(H)	2.5	3.5	3.5		3
72.	Cornus sanguinea L. s.l.	Cornaceae	EuC	PhN	3	3	4		2
73.	Corydalis solida (L.) Clairv. subsp. solida	Papaveraceae	Eu	G	3	3	4		2
74.	Cota austriaca (Jacq.) Sch.Bip.	Asteraceae	Centr.eur.pont.	T	2	4	4.5		1
75.	Crataegus monogyna Jacq.	Rosaceae	Euras	PhN	2.5	3.5	3		2
76.	Crepis capillaris (L.) Wallr.	Asteraceae	EuC&S	T-Ht	3	3	4		3
77.	Crepis foetida L. subsp. rhoeadifolia (M.Bieb.) Čelak.	Asteraceae	Pont-med	T	2.5	3.5	3		2
78.	Cyanus segetum Hill	Asteraceae	Med(azi Cosm)	Ht	3	4	0		2
79.	Cynanchum acutum L.	Asclepiadaceae	Pont-med	H	2.5	4	0		unknown
80.	Cynodon dactylon (L.) Pers.	Poaceae	Cosm	G	2	3.5	0		4

81.	Cyperus fuscus L.	Cyperaceae	Euras	T	6	3	4	LC(AqS)	1
82.	Cyperus glomeratus L.	Cyperaceae	Euras(submed)	T-H(HH)	5	3	4	LC(AqS)	unknown
83.	Dactylis glomerata L. s.l.	Poaceae	Euras	H	3	0	4		3
84.	Daucus carota L. carota	Apiaceae	Euras	Ht	2.5	3	0	LC(CWR)	3
85.	Descurainia sophia (L.) Webb ex Prantl	Brassicaceae	Euras	T-Ht	2.5	3.5	4		3
86.	Digitaria ischaemum (Schrader) Muhl.	Poaceae	Circ	T	1.5	3	4		3
87.	Digitaria sanguinalis (L.) Scop.	Poaceae	Cosm	T	1.5	0	4		3
88.	Diplotaxis muralis (L.) DC.	Brassicaceae	Centr.eur.med.	T-Ht	2.5	4.5	4.5		3
89.	Dipsacus fullonum L.	Dipsacaceae	Submed	Ht	3.5	3.5	4		3
90.	Dipsacus laciniatus L.	Dipsacaceae	Euras.cont	Ht	4	3.5	4		4
91.	Echinochloa crus-galli (L.) P.Beauv.	Poaceae	Cosm	T	4	0	3		3
92.	Echium vulgare L.	Boraginaceae	Euras	Ht	2	3	4		3
93.	Eleocharis palustris (L.) Roem. & Schult.	Cyperaceae	Cosm	G(HH)	5	0	4	LC(Aqs)	2
94.	Elymus repens (L.) Gould. s.l.	Poaceae	Circ	G	0	0	0		unknown
95.	Epilobium hirsutum L.	Onagraceae	Euras	H	4	3	3		2
96.	Epilobium parviflorum Schreb.	Onagraceae	Euras	H	5	3	4.5		unknown
97.	Epilobium tetragonum subsp. lamyi (F.W.Schultz) Nyman	Onagraceae	Atl-med	H	0	3.5	0		3
98.	Equisetum arvense L.	Equisetaceae	Cosm	G	3	3	0		3
99.	Eragrostis minor Host	Poaceae	EuC-med	T	3	4	0		5
100.	Eragrostis pilosa (L.) P.Beauv.	Poaceae	EuC-med	T	3	3.5	0		5
101.	Erodium cicutarium (L.) L'Hér.	Geraniaceae	Cosm	T	2.5	0	0		3
102.	Erophila verna (L.) DC.	Brassicaceae	Eu	T	2.5	3.5	0		2
103.	Euphorbia cyparissias L.	Euphorbiaceae	Euras	H	2	3	4		2
104.	Euphorbia esula subsp. tommasiniana (Bertol.) Kuzmanov	Euphorbiaceae	Euras.cont	H	2	4	3		3
105.	Falcaria vulgaris Bernh.	Apiaceae	Euras(submed)	T	2	4	4		2
106.	Fallopia convolvulus (L.) Á.Löve	Polygonaceae	Circ	T	2.5	3	3		3
107.	Festuca arundinacea Schreb.	Poaceae	EuC	H	4	3	4		1
108.	Festuca pratensis Huds. subsp. pratensis	Poaceae	Euras	H	3.5	2	0		2

109.	Fraxinus angustifolia Vahl subsp. oxycarpa (Willd.) Franco & Rocha Afonso	Oleaceae	MedW	PhM	4.5	4	4.5		unknown
110.	Fumaria schleicheri Soy.-Will.	Papaveraceae	Euras	T	2.5	4	4		2
111.	Galega officinalis L.	Fabaceae	Pont-med	H	4.5	3	4		2
112.	Galium humifusum M.Bieb.	Rubiaceae	Pont-balc	H	2	4	4.5		unknown
113.	Geranium pusillum L.	Geraniaceae	Eu	T	2.5	3	0		3
114.	Geranium rotundifolium L.	Geraniaceae	Submed	T	2	3.5	4		unknown
115.	Glechoma hederacea L.	Lamiaceae	Euras	H(Ch)	3	3	0		3
116.	Heracleum sibiricum L.	Apiaceae	Euras	Ht-H	3	2.5	5		2
117.	Hibiscus trionum L.	Malvaceae	Euras	T	2.5	4	4		5
118.	Holosteum umbellatum L. subsp. umbellatum	Caryophyllaceae	Euras	T	2	3.5	0		2
119.	Hordeum murinum L.	Poaceae	Euras	T	2.5	4	0	LC(CWR)	4
120.	Hordeum marinum subsp. gussoneanum (P arl.) Thell.	Poaceae	Euras.cont	T	2	4	4.5	LC(CWR)	2
121.	Humulus lupulus L.	Cannabaceae	Euras,AmN	H	3.5	3	4		3
122.	Hydrocharis morsus-ranae L.	Hydrocharitaceae	Euras	Hd	6	3.5	3.5	LC(AqS)	1
123.	Hypericum perforatum L.	Hypericaceae	Euras	H	3	3	0		3
124.	Inula britannica L.	Asteraceae	Euras	Ht	3	3	0		1
125.	Juglans regia L.	Juglandaceae	EuC-balc-cauc	PhM	3	4	4		2
126.	Juncus compressus Jacq.	Juncaceae	Euras	G	4	3	4		2
127.	Juncus inflexus L.	Juncaceae	Euras	H	4	4	4		2
128.	Lactuca saligna L.	Asteraceae	EuC&S	T-Ht	1.5	4	4	LC(CWR)	1
129.	Lactuca serriola L.	Asteraceae	Euras	T-Ht	1.5	3.5	0	LC(CWR)	4
130.	Lamium amplexicaule L.	Lamiaceae	Euras	T	2.5	3.5	0		3
131.	Lamium purpureum L.	Lamiaceae	Euras	T	3	0	0		3
132.	Lappula squarrosa (Retz.) Dumort.	Boraginaceae	Euras	T-Ht	1.5	3.5	4		2
133.	Lathyrus tuberosus L.	Fabaceae	Euras	H	2	4	4	LC(CWR)	2
134.	Lemna minor L.	Lemnaceae	Cosm	Hd	6	3	0	LC(AqS)	unknown
135.	Lemna trisulca L.	Lemnaceae	Cosm	Hd	6	3	4	LC(AqS)	unknown

136.	Lepidium draba L.	Brassicaceae	Euras.med	H	2	4	4		3
137.	Lepidium ruderale L.	Brassicaceae	Euras	T-Ht	2	3.5	0	LC(CWR)	3
138.	Linaria genistifolia (L.) Mill.	Plantaginaceae	Euras.cont	H	1	3.5	5		2
139.	Linaria vulgaris Mill.	Plantaginaceae	Euras	H	2	3	3		3
140.	Lolium perenne L.	Poaceae	Cosm	H	3	3	0	LC(CWR)	3
141.	Lotus corniculatus L.	Fabaceae	Euras	H	2.5	0	0	LC(CWR)	3
142.	Lotus tenuis Waldst. & Kit.	Fabaceae	Euras	H	3.5	3	4		1
143.	Lycopus europaeus L.	Lamiaceae	Euras	H	5	3	0	LC(AqS)	2
144.	Lysimachia nummularia L.	Primulaceae	Euras,AmN	Ch	4	3	3	LC(AqS)	3
145.	Lythrum salicaria L.	Lythraceae	Circ	H	4	2.5	0		2
146.	Malva sylvestris L.	Malvaceae	Euras	Ht-H	3	3	0	DD(CWR)	unknown
147.	Matricaria chamomilla L.	Asteraceae	Euras	T	2.5	3.5	5		3
148.	Medicago falcata L.	Leguminoase	Euras	H	2	3	5		2
149.	Medicago lupulina L.	Leguminoase	Euras	H(T-H)	2.5	3	4	LC(CWR)	3
150.	Medicago minima (L.) L.	Fabaceae	Submed	T	1.5	4	4	LC(CWR)	1
151.	Medicago sativa L.	Fabaceae	EuS,AsC	H	2	3	5	LC(CWR)	unknown
152.	Melica ciliata L.	Poaceae	EuC-med	H	1.5	4	4		1
153.	Melilotus alba Ledeb.	Fabaceae	Euras	Ht	2.5	3	0	LC(CWR)	3
154.	Melilotus officinalis (L.) Pall.	Fabaceae	Euras	Ht	2.5	3.5	0	LC(CWR)	3
155.	Melissa officinalis L.	Lamiaceae	Med	H	2	4	0		5
156.	Mentha aquatica L. subsp. aquatica	Lamiaceae	Eu	H	5	3	0	LC(AqS)	1
157.	Mentha longifolia (L.) L.	Lamiaceae	Euras	H	4.5	3	4		2
158.	Mentha pulegium L.	Lamiaceae	Euras(submed)	H	4.5	3	5	LC(AqS)	2
159.	Myriophyllum spicatum L.	Haloragaceae	Circ	H	6	0	4.5	LC(AqS)	1
160.	Myriophyllum verticillatum L.	Haloragaceae	Circ	H	6	3.5	3.5	LC(AqS)	2
161.	Nasturtium officinale R.Br.	Brassicaceae	Cosm	H	5	2.5	4		1
162.	Odontites vulgaris Moench [syn. Odontites serotina (Lam.) Dumort. s.l.]	Orobanchaceae	Euras(submed)	T	3	3	0		1
163.	Onobrychis viciifolia Scop.	Fabaceae	Euras	H	2	4	4.5	LC(CWR)	1
164.	Ononis spinosa subsp. hircina (Jacq.) Gams	Fabaceae	Euras.cont	H	3	4	0		1

165.	Onopordum acanthium L.	Asteraceae	Euras	Ht	2.5	4	4		4
166.	Papaver rhoeas L.	Papaveraceae	Cosm	T	3	3.5	4		2
167.	Pastinaca sativa L. s.l.	Apiaceae	Euras	Ht	3	4	4		3
168.	Persicaria amphibia (L.) Delarbre	Polygonaceae	Cosm	H	6	3	0	LC(AqS)	2
169.	Persicaria hydropiper (L.) Delarbre	Polygonaceae	Circ	T	5	3	4	LC(AqS)	2
170.	Persicaria lapathifolia (L.) Delarbre	Polygonaceae	Cosm	T	4	0	3	LC(AqS)	2
171.	Persicaria maculosa Gray	Polygonaceae	Cosm	T	4.5	3	0	LC(AqS)	2
172.	Petrorhagia prolifera (L.) P.W.Ball & Heywood	Caryophyllaceae	Atl-med	T	1.5	4	3		1
173.	Phragmites australis (Cav.) Trin. ex Steud.	Poaceae	Cosm	G(HH)	6	0	4	LC(AqS)	2
174.	Picris hieracioides Sibth. & Sm.	Asteraceae	Euras	Ht-H	1.5	3	4		2
175.	Pilosella piloselloides subsp. bauhinii (Schult.) S.Bräut. & Greuter	Asteraceae	EuC&E	H	2.5	3.5	4		2
176.	Plantago lanceolata L.	Plantaginaceae	Euras	H	3	0	0		3
177.	Plantago major L. s.l.	Plantaginaceae	Euras	H	3	0	0		3
178.	Poa angustifolia L.	Poaceae	Euras	H	2	3	0		3
179.	Poa bulbosa L.	Poaceae	Euras	H	1.5	3.5	4		2
180.	Poa compressa L.	Poaceae	Euras.cont	H	1.5	3	0		3
181.	Poa pratensis L. subsp. pratensis	Poaceae	Cosm	H	3	0	0		3
182.	Polygonum aviculare L.	Polygonaceae	Cosm	T	2.5	0	3		3
183.	Populus canescens L.	Salicaceae	Eu	PhM	3.5	3	3		3
184.	Populus nigra L.	Salicaceae	Euras	PhM	4	3	4		2
185.	Portulaca oleracea L. subsp. oleracea	Portulacaceae	Cosm	T	3	0	0		5
186.	Potamogeton natans L.	Potamogetonaceae	Circ	Hd	6	2.5	4		3
187.	Potentilla argentea L.	Rosaceae	Euras	H	2	4	2		2
188.	Potentilla reptans L.	Rosaceae	Euras	H	3.5	4	4		3
189.	Pulicaria dysenterica (L.) Gaertn.	Asteraceae	EuC	H	3.5	3	4		1
190.	Pyrus pyraster (L.) Du Roi	Rosaceae	Eu	PhM	2	3	4		1
191.	Ranunculus ficaria L. s.l.	Ranunculaceae	Euras	H	3.5	3	3		2
192.	Ranunculus repens L.	Ranunculaceae	Euras,Afr	H	4	0	0	LC(AqS)	3

193.	Ranunculus sardous Crantz	Ranunculaceae	Euras-AfrN	T	3	3	4		2
194.	Ranunculus trichophyllus Chaix ex Vill.	Ranunculaceae	Euras	Hd	6	0	0	LC(AqS)	unknown
195.	Reseda lutea L.	Resedaceae	Euras	Ht-H	2	3	0		3
196.	Rorippa austriaca (Crantz) Spach	Brassicaceae	Pont	H	4	3.5	4		1
197.	Rorippa sylvestris (L.) Besser	Brassicaceae	Euras	H	4	3	4	LC(CWR)	1
198.	Rosa canina L.	Rosaceae	Eu	PhN	2	3	3		2
199.	Rubus caesius L.	Rosaceae	Eu	PhN	4.5	3	4		3
200.	Rubus discolor Weihe & Nees [Rubus praecox Bertol.]	Rosaceae	EuC&NW	PhN	2.5	3.5	0		unknown
201.	Rumex confertus Willd.	Polygonaceae	Euras.cont	H	3.5	4	4		unknown
202.	Rumex hydrolapathum Huds.	Polygonaceae	Eu	H	6	4	4	LC(AqS)	1
203.	Rumex maritimus L.	Polygonaceae	Cosm	T	5	3.5	4.5		1
204.	Rumex palustris Sm.	Polygonaceae	Euras	T	5	3	4		1
205.	Rumex patientia L. s.l.	Polygonaceae	Euras.cont	H	3	4	0		4
206.	Rumex thyrsiflorus Fingerh.	Polygonaceae	Eu-S Siberian	H	2	0	4		3
207.	Salix alba L.	Salicaceae	Euras	PhM	5	3	4		2
208.	Salix cinerea L.	Salicaceae	Euras	PhN	5	3	3		2
209.	Salix fragilis L.	Salicaceae	Euras	PhM	5	3	4		2
210.	Sambucus ebulus L.	Caprifoliaceae	Euras-submed	H	3	3	3		4
211.	Schoenoplectus lacustris (L.) Palla	Cyperaceae	Cosm	G(HH)	6	3	4	LC(AqS)	1
212.	Schoenoplectus tabernaemontani (C.C.Gmel.) Palla	Cyperaceae	Cosm	G(HH)	6	3	4	LC(AqS)	2
213.	Sclerochloa dura (L.) P.Beauv.	Poaceae	Med	T	2.5	3	3		1
214.	Securigera varia (L.) Lassen [syn. Coronilla varia L.]	Leguminoase	EuC-submed	H	2	3	4	LC(CWR)	2
215.	Sedum acre L.	Crassulaceae	Euras	H	1	3	0		3
216.	Sedum rupestre L. (cultivar)	Crassulaceae	EuN,C&SW	Ch	1.5	3	2.5		2
217.	Sedum telephium L. subsp. fabaria (W.D.J.Koch) Kirschl.	Crassulaceae	EuW&C	H	2.5	0	4		2
218.	Senecio jacobaea L.	Asteraceae	Euras	H	2.5	3	3		2

219.	Senecio vernalis Franch.	Asteraceae	Euras.cont	T	2.5	4	0		3
220.	Senecio vulgaris L.	Asteraceae	Euras	T	3	3	3		3
221.	Setaria viridis (L.) P.Beauv.	Poaceae	Cosm	T	2	3.5	0		3
222.	Silene latifolia Poir. subsp. alba (Mill.) Greuter & Burdet	Caryophyllaceae	Euras	T-H	3.5	2	3		3
223.	Sisymbrium loeselii L.	Brassicaceae	Euras.cont	T-Ht	2.5	4	3		3
224.	Solanum dulcamara L.	Solanaceae	Euras	Ch	4.5	3	4		3
225.	Solanum nigrum L.	Solanaceae	Cosm	T	3	4	0		3
226.	Sonchus arvensis L.	Asteraceae	Euras	G	3	0	0		2
227.	Sparganium erectum L.	Sparganiaceae	Euras	G(HH)	6	3	0	LC(AqS)	unknown
228.	Stachys palustris L.	Lamiaceae	Circ	H	4	3	4		2
229.	Stellaria media (L.) Vill. s.l.	Caryophyllaceae	Cosm	T-Ht	3	0	0		3
230.	Symphytum officinale L.	Boraginaceae	Euras	T-Ht	4	3	0		2
231.	Tamarix ramosissima Ledeb.	Tamaricaceae	Euras.cont	PhN	0	3.5	4		unknown
232.	Tanacetum vulgare L.	Asteraceae	Euras	H	3	3	4		4
233.	Taraxacum officinale Webb s.l.	Asteraceae	Euras	H	3	0	0		3
234.	Torilis arvensis (Huds.) Link	Apiaceae	EuC	T	2.5	3.5	4		1
235.	Tragopogon dubius Scop.	Asteraceae	EuC-med	T-Ht	2.5	3.5	0		2
236.	Tragus racemosus (L.) All.	Poaceae	Med	T	0	0	4		5
237.	Tribulus terrestris L.	Zygophyllaceae	EuC-med	T	0	4	4		unknown
238.	Trifolium fragiferum L. s.l.	Fabaceae	Euras	H	3	3	5		2
239.	Trifolium pratense L. s.l.	Fabaceae	Euras	H	3	0	0	LC(CWR)	2
240.	Trifolium repens L. s.l.	Fabaceae	Euras	H	3.5	0	0		3
241.	Tripleurospermum maritimum subsp. inodorum (L.) Appleq.	Asteraceae	Euras	T	0	0	3.5		3
242.	Tussilago farfara L.	Asteraceae	Euras	G	0	3	4		3
243.	Typha angustifolia L.	Typhaceae	Circ	G(HH)	6	4	0	LC(AqS)	2
244.	Typha latifolia L.	Typhaceae	Cosm	G(HH)	6	3.5	0	LC(AqS)	2
245.	Typha laxmannii Lepech.	Typhaceae	EuSE,AsC	G(HH)	5	4	0	LC(AqS)	2
246.	Ulmus procera Salisb.	Ulmaceae	Eu	Ph	2	3	3.5		unknown

247.	Urtica dioica L.	Urticaceae	Cosm	H	3	3	4	LC(AqS)	4
248.	Utricularia vulgaris L.	Lentibulariaceae	Circ	Hd	6	0	3.5	LC(AqS)	unknown
249.	Verbascum blattaria L.	Scrophulariaceae	Euras(submed)	Ht	2.5	3.5	3		2
250.	Verbascum phlomoides L.	Scrophulariaceae	EuC&SE	Ht	2.5	3.5	4		2
251.	Verbascum speciosum Schrad.	Scrophulariaceae	Pont-pan-balc	Ht	2	4	4		5
252.	Verbena officinalis L.	Verbenaceae	Cosm	H	2.5	3	0		4
253.	Veronica beccabunga L.	Plantaginaceae	Euras	H	5	3	4	LC(AqS)	1
254.	Veronica hederifolia L.	Plantaginaceae	Euras	T	2.5	3	4		3
255.	Veronica verna L.	Plantaginaceae	Euras	T	2	3	2		1
256.	Vicia dasycarpa Ten.	Fabaceae	Eu	T	3	3	0		unknown
257.	Vicia grandiflora Scop.	Fabaceae	Pont-balc-cauc	T	3	3	0		4
258.	Vicia hirsuta (L.) Gray	Fabaceae	Euras	T	2.5	3	0		2
259.	Vicia lathyroides L.	Fabaceae	Eu	T-Ht	2	4	2.5		2
260.	Vicia sativa subsp. nigra (L.) Ehrh.	Fabaceae	Euras	T	0	3	0		2
261.	Vicia villosa Roth	Fabaceae	Eu	T-Ht	2.5	3.5	2.5		2
262.	Viola arvensis Murray	Violaceae	Cosm	T	3	3	0		2
263.	Viola odorata L.	Violaceae	Atl-med	H	2.5	3.5	4		2
264.	Viola tricolor L.	Violaceae	Euras	T-H	3	2	0		2
265.	Vulpia myuros (L.) C.C.Gmel.	Poaceae	Euras	T	1	3.5	2		1
266.	Wolffia arrhiza (L.) Horkel ex Wimm.	Lemnaceae	Cosm	Hd	6	0	4	LC(AqS)	unknown

Annex 2. Alien species and subspecies recorded to "Balta Văcărești" between 2012-2016

No	Taxon	Family	Native Distribution	Life form	Urbanity
1.	Acer negundo L.	Aceraceae	AmN	PhM	4
2.	Aesculus hippocastanum L.	Hippocastanaceae	Med	PhM	4
3.	Ailanthus altissima (Mill.) Swingle	Simaroubaceae	As(China)	PhM	5
4.	Amaranthus albus L.	Amaranthaceae	AmN&C	T	5
5.	Amaranthus blitoides S.Watson subsp. blitoides	Amaranthaceae	AmN-C&W	T	5
6.	Amaranthus retroflexus L.	Amaranthaceae	AmN	T	3
7.	Ambrosia artemisiifolia L.	Asteraceae	AmN	T	5
8.	Ambrosia trifida L.	Asteraceae	AmN	T	5
9.	Armoracia rusticana P.Gaertn., B.Mey. & Scherb.	Brassicaceae	unknown(EuSE,AsW?)	H(G)	4
10.	Atriplex hortensis L.	Chenopodiaceae	AsC	T	5
11.	Azolla filiculoides Lam.	Azollaceae	AmN	T(HH)	unknown
12.	Bassia scoparia (L.) A.J.Scott	Chenopodiaceae	AsTemp	T	5
13.	Bassia sieversiana (Pall.) W.A.Weber	Chenopodiaceae	As	T	5
14.	Bidens frondosa L.	Asteraceae	AmN	T	3
15.	Brassica juncea (L.) Czern.	Brassicaceae	As	T	4
16.	Bromus madritensis L.	Poaceae	EuS&W	T	4
17.	Cannabis sativa L.	Cannabaceae	AsS&W	T	5
18.	Catalpa bignonioides Walter	Bignoniaceae	AmN	PhM	unknown
19.	Catalpa fargesii Bureau	Bignoniaceae	As(China-Tibet)??	PhM	unknown
20.	Celtis australis L.	Ulmaceae	EuS-med	PhM	unknown
21.	Celtis occidentalis L.	Ulmaceae	AmN	PhM	unknown
22.	Citrullus lanatus (Thunb.) Matsum. & Nakai	Cucurbitaceae	AfrSW	T	unknown
23.	Conyza canadensis (L.) Cronquist	Asteraceae	AmN	T	3
24.	Cucurbita pepo L.	Cucurbitaceae	AmC	T	unknown
25.	Cuscuta campestris Yunck.	Cuscutaceae	AmN	T	3
26.	Datura stramonium L.	Solanaceae	AmN	T	3
27.	Elaeagnus angustifolia L.	Elaeagnaceae	AsTemp	PhM	5

28.	Elodea nuttallii (Planch.) H.St.John	Hydrocharitaceae	AmN	H(Hd)	unknown
29.	Erigeron annuus (L.) Pers. s.l.	Asteraceae	AmN	T,Ht,H	3
30.	Euphorbia maculata L.	Euphorbiaceae	AmN	T	5
31.	Fraxinus americana L.	Oleaceae	AmN	PhM	unknown
32.	Fraxinus pennsylvanica Marshall	Oleaceae	AmN	PhM	2
33.	Gleditsia triacanthos L.	Leguminoase	AmN-C&E	PhM	unknown
34.	Helianthus annuus L.	Asteraceae	AmN	T	4
35.	Helianthus tuberosus L.	Asteraceae	AmN	G	3
36.	Impatiens balfourii Hook.f.	Balsaminaceae	As(Himalaya)	T	unknown
37.	Iva xanthiifolia Nutt.	Asteraceae	AmN	T	4
38.	Lycium barbarum L.	Solanaceae	As(China)	PhN	4
39.	Lycopersicon esculentum Mill.	Solanaceae	AmS	T	4
40.	Malus domestica Borkh.	Rosaceae	AsC	PhM	3
41.	Matricaria discoidea DC.	Asteraceae	AsNE,AmN	T	4
42.	Morus alba L.	Moraceae	As(China)	PhM	unknown
43.	Narcissus poeticus L.	Amaryllidaceae	Med	G	4
44.	Narcissus pseudonarcissus L.	Amaryllidaceae	Atl-med	G	2
45.	Oenothera glazioviana Micheli	Onagraceae	AmN	Ht	1
46.	Panicum capillare L.	Poaceae	AmN	T	5
47.	Panicum dichotomiflorum Michx.	Poaceae	AmN	T	4
48.	Parthenocissus inserta (A.Kern.) Fritsch	Vitaceae	AmN	PhL	4
49.	Parthenocissus quinquefolia (L.) Planch.	Vitaceae	AmN	PhL	unknown
50.	Phemeranthus confertiflorus (Greene) Hershkovitz	Montiaceae	AmN	G	unknown
51.	Portulaca pilosa L.	Portulacaceae	As	T	unknown
52.	Prunus armeniaca L.	Rosaceae	As	PhM	4
53.	Prunus cerasifera Ehrh.	Rosaceae	Pont-balc	PhM	4
54.	Prunus persica (L.) Stokes	Rosaceae	As(ChinaNW)	PhM	4
55.	Prunus cerasus L.	Rosaceae	AsSW&Eu	PhM	3
56.	Fallopia japonica (Houtt.) Ronse Decr.	Polygonaceae	As(Japon)	G	3

57.	Ricinus communis L.	Euphorbiaceae	AfrTrop	T	unknown
58.	Robinia pseudoacacia L.	Leguminoase	AmN	PhM	3
59.	Salix babylonica L.	Salicaceae	As(China)	PhM	unknown
60.	Sorghum halepense (L.) Pers.	Poaceae	AfrN,AsSW	G	5
61.	Tulipa gesneriana L.	Liliaceae	AsSV&C	G	2
62.	Ulmus pumila L.	Ulmaceae	As	PhM	unknown
63.	Veronica persica Poir.	Plantaginaceae	AsSV	T	3
64.	Xanthium italicum Moretti	Asteraceae	AmN&S	T	2
65.	Xanthium spinosum L.	Asteraceae	AmS(Cosm)	T	5