INVENTORY OF RARE ALLOCHTONOUS SPECIES IN DAUGAVPILS CITY

Natalija Romanceviča


The aforementioned territory is investigated by excursion method. In total 41 rare alien plant species from 14 families are found in Daugavpils after collecting data from literature and inventory during 2007-2008 vegetation periods and at spring 2009. There are conclusions made about distribution of alien species after analysis of maps of findings – alien species are distributed around railways, highways, and gardens. It is known that railways and roads are main routes where alien species enter any state or city inadvertently, while gardens and plantations near housing are main sources from which deliberately introduced alien species can spread to degraded and semi-natural habitats, afterwards – to natural habitats (for example, *Asparagus officinalis*). Six species sometimes emerge in flora in Daugavpils, nevertheless they are fluctuating and quickly disappear. The rare allochthonous flora of Daugavpils consists from anthropophytes 4%, hemerophytes 4%, epekophytes 22%, ergasiophysytes 19%, ephemerophytes 30%, neoindigenophytes 21%.

Key words: Daugavpils, allochtone species, distribution, adventive species.

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INTRODUCTION

The inventory data about Latvian flora shows that 633 alien species (33% of all plant species) are found in Latvian wild flora nowadays. Nevertheless most of these species are rare and distribution of them in Latvia is uneven. It is necessary to determine the state of these plant species for the evaluation of present distribution of them in Latvia, the estimation of potential probability of following distribution and anticipation of possible changes in ecosystem structure and landscapes.

The alien species traditionally are divided in archaeophytes (species found before the 16th century) and neophytes (after 16th century). The archaeophytes are naturalized usually and are considered as autochthonous species. Most of the alien species in Latvia have entered during the 19th century. Most of species, entered Latvia at the 20th century, especially at the end of the century, are rare and unevenly distributed (Priede 2006).

The last data about the whole Daugavpils allochtonous flora were collected in the time of the Soviet Union (Гаврилова & Табака 1985). However since then there have happened changes in intensity of industrial and agro activity and traffic roads. City has developed new connections with foreign countries, but several old ones are partly or completely stopped. These factors had
influence on weak adventive plant species – they disappeared and new species came in to the city. In 2002 student of Daugavpils University, Oksana Sokolova, developed bachelor paper about flora of railway in Daugavpils city, where non-native plant species were looked partly and did not disclose situation about the whole city. For that reason new research was done, it includes the whole territory of Daugavpils city and allows recognizing new non-native species and their distribution, they temporary are rare.

Daugavpils is the second largest city in Latvia, the area is full of production factories, which operations are fully or partially stopped, such as Chemical Fibre factory, Ditton Driving Chain Factory, Electrical Instrument Works, Locomotive Repair Plant. Besides factories there are also various food manufacturing companies and other industries - large and small enterprises.

Daugavpils origins are linked to the Daugava River trade route - one of the largest East European river traffic trunk over several centuries. Today, when modern road is used for logistics and river transport means in practice are not used, Daugavpils has kept the role of the biggest East Latvian transport hub securing the rail and auto traffic to the Latvian cities, as well as Lithuania, Belarus, Russia, Poland and other countries and cities small towns.

Daugavpils city is also known as the commercial and industrial centre. The railway traffic introduced radical changes in the economic life of the city and marketing communications. It also contributed to the entry of vigorous non-native plant. Railway is one of the primary habitats, which promotes introduction of adventitious seeds into the country and city with materials and goods transported by the railway. In the second half of the 19th century in the Daugavpils began to function railway lines Petersburg - Warsaw, Riga - Daugavpils, Riga - Orel. Traffic intensity and economic development promoted more intensive introduction of adventitious plants (Rinkeviča 2000).

In 1985 in Daugavpils city altogether 898 vascular plant species from 98 families were identified, 153 species were adventive. However approximately 50 species, including 37 local and 13 introduced species, were not found (Гаврилова & Табака 1985).

Nowadays also most of adventitious species first appear along the rail and urban industrial areas, as well as in ruderal locations. This is due to the fact that these habitats have low competition of domestic plant (Фукварек et al. 1982).

Given the fact that Daugavpils is located in Southeast part of Latvia, where the climate is moderately continental, medium moist and warm, many southern and Southeast species, that are unable to grow in other Latvian locations, appear and survive in the city. For example, some perennial epikophyte, which are rare in Riga and its surroundings, occur much more frequently in Daugavpils and in some places form extensive stands: *Nonea pulla* (L.) DC., *Cardaria draba* (L.) Desv., *Euphorbia cyparissias* L., *Artemisia austriaca* Jacq., *Sisymbrium wolgense* M. Bieb. ex E. Fourn., *Salvia verticillata* L., *Veronica prostrata* L. (Шульц 1972).

Core elements of anthropogenic effects on plant cover and flora formation in Daugavpils are:
- introduction and distribution of species along the rail lines and car trunk;
- array of residential and industrial construction, which promotes ruderal habitat creation, which leads to loss of natural, local vegetation;
- recreational use of separate parts of the city (water body shores and forests);
- deforestation for city building requirements;
- grazing and mowing of River Daugava coasts;
- The local road and canal construction;
- Waste water pollution, which affects individual water bodies, as well as the surrounding sites.

In the territory of so big city as Daugavpils anthropogenic effects of various factors usually cover each other or are alongside. They all,
except for the direct introduction of plants and
distribution along the railway lines and the car
trunks, form peculiar anthropogenic terrain.

Apart from the basic elements local agrophyto-
cenoses - vineyards, orchards and kitchen
gardens, play certain role in widening of city
flora species.

In the result of anthropogenic influence contents
of city flora are intensively supplemented with
new, mostly introduced species. Significant
part of these plants continue to grow and spread
(above the railway line intervention and weed
place), sometimes encroaching upon the natural
phytocenoses. At the same time many native spe-
cies, which in the past were not at all uncom-
appear or have already disappeared from the
flora of the city and its surroundings (modern
boroughs), (Гаврилова & Табака 1985).

MATERIALS AND METHODS

The main method that was used for rare non-
native vascular plant inventory in Daugavpils
city, were the tours - the mapping method.
Regular grid (square size 500 x 500 m) was used
for mapping of alien species, it included the entire
city area. The total number of squares – 307.
Maps are bound to Latvian coordinate system
LKS-92. Topographic maps at 1:10 000 created
by Latvian Geospatial Information Agency were
used for the cartographic base.

The rarity of these species were reviewed in
„Flora of the Baltic countries‟, part 1, 2, and 3
and “List of alien species of Latvia” (http://biodiv.
.lv/gma.gov.lv). For estimation of geographic
distribution of species the system of squares
where the taxon is found is applied – very rare
(1-10 squares), rare (11-30), rarely (31 -100), not
often (101 -250), quite often (251 – 500), often
(501 -750), very often (>751). The estimation of
distribution relates to the whole territory of Latvia
(Fatare 1992).

Previously known indications of the findings
were surveyed and the data, obtained during
visits to The University of Latvia, the Faculty
of Biology, Institute of Botany Laboratory
were analyzed. The researches done in 2008
from May to September and spring, 2009. Data
of researches done in 2007 were used better
reflection of distribution of rare plants in the
surveyed area.

Classification advised by Pyšek and Richardson
(Pyšek et al. 2004) was used for classification of
allohtonous species:

I. Anthropophytes- introduced by people
regardless time and means;

II. Hemerophytes – introduced intentionally:
   1. Ergasiophytes – found only in cultiva-
tion;
   2. Ergasiophygophytes – found in cultiva-
tion and occasionally escaping;
   3. Ergasiolipophytes – formerly planted,
currently occurring in the territory
   without need of human intervention;

III. Xenophytes - any unintentionally intro-
duced:
   1. Archaeophytes - alien introduced before
c.a.1500 (approximate date corresponding
to the discovery of America (1492), both
deliberately and accidentally, regardless
of invasion status;
   2. Neophytes - alien introduced after ca.1500,
both deliberately or accidentally, regard-
less of invasion status:
      a. Ephemerophytes - occurring tempo-
rarily in human-made habitats;
      b. Epekophytes - established in human-
made habitats; naturalized or invasive in
human-made habitats;
      c. Neoindigenophytes – established in the
region, occurring in human-made habitats
and penetrating to natural habitats, too.

RESULTS

The placement of all findings detected during
the research (Fig. 1.) shows that the alien spe-
cies are found mainly near railways, roads and
surrounding gardens. Railways and highways are
among the main unintentional introductions of
alien species in any country and city. However
gardens and greenery near homes are among the
main sources from which deliberately imported
non-native species can spread first to degraded, then semi-natural habitats, and later also to natural habitats, for example *Asparagus officinalis* L.

Looking at the fig.2, it can be concluded that in Daugavpils majority of 47 found species are ephemerophytes, which represent 30% of all identified species, 22% are epekophytes, 21% - neoindigenophytes, 19% - ergasiophygophytes. The least percentage have hemerophytes and anthropophytes, each amount to 4% of the species identified during researches. 

Summarizing the literature data about the flora of Daugavpils and performing re-inventory in 2007, 2008 and 2009 totally 47 rare non-native species were found. Within three seasons 41 rare adventive species from 14 families found. There
Table 1. Rare non-native species found in Daugavpils city during researches

<table>
<thead>
<tr>
<th>Species name in latin</th>
<th>Time when species first time recognize in Daugavpils</th>
<th>Floristic status</th>
<th>Invasiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allium angulosum</td>
<td>1981, Stropi</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Alysium turkestanicum</td>
<td>1972, whole territory of city</td>
<td>Ephemero phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Amaranthus paniculatus</td>
<td>2008, Ķemeri</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Asparagus officinalis</td>
<td>1979, Grīva</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Atriplex hortensis</td>
<td>1972, Grīva</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Atriplex oblongifolia</td>
<td>1981, Grīva</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Atriplex rosea</td>
<td>1893, railway Daugavpils - Rīga</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Atriplex sagittata</td>
<td>1972, whole territory of city</td>
<td>Anthropophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Cardaria draba</td>
<td>1940, coast of river Daugava</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Cardaus acanthoides</td>
<td>1979, Stropi</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Centarea diffusa</td>
<td>1974, ?</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Centarea rhenana</td>
<td>1975, Forštate</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Cerastie minor</td>
<td>1984, Stropi</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Chondrilla juncea</td>
<td>?, railway Daugavpils - Rīga</td>
<td>Ephemero phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Corispermum algidum</td>
<td>1977, railway, Daugavpils - Vīļņa</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Corispermum declinatum</td>
<td>1980, railway Daugavpils - Rīga</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Diploptaxis muralis</td>
<td>1978, railway Daugavpils - Rīga</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Dracocephatum thymi- florum</td>
<td>1939, Grīva</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Elsholtzia ciliata</td>
<td>2008, Liginišķi</td>
<td>Anthro phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Erysimum canescens</td>
<td>1976, railway Daugavpils - Rīga - Vīļņa</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Erysimum hieracioliun</td>
<td>1884, ?</td>
<td>Ephemero phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Geranium sibiricum</td>
<td>1976, Grīva</td>
<td>Ephemero phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Jovarbarba globifera</td>
<td>1898, Liginišķi</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Kochia densiflora</td>
<td>1968, ?</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Leonurus quinquelobatus</td>
<td>?, whole territory of city</td>
<td>Hemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Lepidium densiflorum</td>
<td>?, whole territory of city</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Lepidium ruderale</td>
<td>1870, ?</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Lobularia maritima</td>
<td>2008, Jaunbūve</td>
<td>Hemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Lunaria annua</td>
<td>2009, Ķemeri</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Myosotis sylvatica</td>
<td>1971, Stropi</td>
<td>Neoindigenophytes</td>
<td>Potentially invasive</td>
</tr>
<tr>
<td>Nonea pulla</td>
<td>1969, Stropi, Mežciems</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Oxalis dillenii</td>
<td>2008, Ķemeri, Līsabāde, Jaunie Stropi</td>
<td>Epekophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Papaver somniferum</td>
<td>1894, Grīva</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Phacalroma annuanum</td>
<td>2008, Jaunbūve, Ķemeri</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Plantago arenaria</td>
<td>1895, railway</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Potentilla bifurca</td>
<td>1969, ?</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Potentilla supina</td>
<td>1972, ?</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Reynoutria japonica</td>
<td>2006, Stropi</td>
<td>Ergasiophy phytes</td>
<td>Potentially invasive</td>
</tr>
<tr>
<td>Reynoutria sachulinenisis</td>
<td>2008, Ķemeri</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Rorippa austriaca</td>
<td>1972, bank of railway</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Sedum album</td>
<td>2008, Ķemeri</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Sedum rupestre</td>
<td>2008, Ķemeri</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Sedum sexangulare</td>
<td>2008, Ķemeri</td>
<td>Ephemerophytes</td>
<td>Not invasive</td>
</tr>
<tr>
<td>Sedum spuriun</td>
<td>2008, Ķemeri</td>
<td>Ergasiophy phytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Stachys recta</td>
<td>1977, railway Daugavpils - Krāslava</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Vaccaria hispanica</td>
<td>1892, Liginišķi</td>
<td>Ephemerophytes</td>
<td>Non invasive</td>
</tr>
<tr>
<td>Viola odorata</td>
<td>2008, Jegeli, Ķemeri</td>
<td>Neoindigenophytes</td>
<td>Non invasive</td>
</tr>
</tbody>
</table>

* unknown year or recognized place.

In references invasiveness was no indicated for 22 species. 20 species are listed as non-invasive. *Myosotis sylvatica* Ehrh. ex Hoffm. and *Reynoutria japonica* Houtte. are listed as potentially invasive. The author considers the second species, *Reynoutria sachalinensis* (F. Schmidt) Nakai to be included in the list of potentially invasive species.

In 2007, 2008 and 2009 80 rare non-native plant herbarium were collected, herbarium stored in DAU (herbarium of Daugavpils University Institute of Systematic Biology). For 19 species the first herbarium of DAU herbarium were collected.

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