

Cultural heritage at the service of nature conservation. *Osmoderma barnabita* MOTSCHULSKY, 1845 (Coleoptera: Scarabaeidae) migration corridor in Rīga, Latvia

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Abstract: The role of cultural heritage in the understanding of the present distribution of the internationally protected beetle species *Osmoderma barnabita* in Rīga is discussed in this paper. The correlation between former and existing settlements (manors) and manor parks around Rīga in the 16th to 21th centuries and the present distribution of *O. barnabita* is illustrated. Suggestions for securing the species' protection in the eastern part of Rīga are also provided.

Key words: *Osmoderma* species complex, *Osmoderma barnabita*, nature conservation, migration corridor, Latvia, Rīga, cultural heritage & traditions.

Introduction

As a result of long-term studies on the distribution and ecology of the protected invertebrate species *Osmoderma barnabita* in Latvia, researchers have been able to find a clear correlation between the traditional lifestyle in Latvia and the present distribution of *O. barnabita* in the north-eastern part of the city of Rīga. This correlation can be considered crucial for the proper

understanding of the anthropogenic role in the recent occurrence and distribution of *Osmoderma* LEPELETIER et SERVILLE, 1828 in Latvia.

Under complex and various circumstances, this originally sylvicola species nowadays mainly inhabits antropogenous landscapes such as old avenues, tree parks, and pasture meadows. The presence of *Osmoderma* in the tree hollow microhabitat indicates high species richness, but threatens invertebrate

species that reside in old trees (Ranius 2002).

Article No. 2.1 of the action plan for *Osmoderma* in Latvia describes the role of the ecological network (or corridors) between the known metapopulations in Latvia (Telnov 2005) and the Baltic region in order to ensure gene flow and natural migration for the protected species. The natural migration for this species is quite limited; imagos rarely fly and usually do not move further than 250 m from their “mother tree” (Telnovs, Gailis 2006), but habitat fragmentation compound the problem.

This study presents the results of the long-term research of *Osmoderma* in the heart of the Baltic region, specifically Rīga, Latvia, the territory around Lakes Juglas and Ķīšezers.

See chapter “The object of study” below for comments on *Osmoderma* species-complex in Europe.

Material and methods

This study, carried out between 2006 and 2011 (with the first data originating from 1990), was partly performed for the following projects:

- Action plan for *O. eremita* (Telnov 2005),
- Inventory of microreserve invertebrates species in Rīga

(2005, results not published),

- Inventory of new localities, preparing the locality registry and establishing micro-reserves for the Latvian population of Hermit Beetle *Osmoderma eremita* (2006, results not published),
- Compiling the locality database registry for protected animal species *Osmoderma eremita* (2008, results not published), and
- Entomological inventory of the territory of Mežaparks, Rīga (2011, results not published).

The study area is situated within the administrative borders of Rīga, near the eastern border of the city (Fig. 1). Rīga is situated in the central part of the Maritime Lowland (Latvian: Piejūras zemīene). The Maritime Lowland stretches along the Baltic Sea and the Gulf of Riga, forming a low-lying region comprised of various sediments (Kasparinskis et al. 2008), the most common of which being dune sand. The mouths of several rivers surround Rīga historically formed various islands and oxbows in their deltas. Two large eutrophic lakes, Ķīšezers (area of 17.3 km², average depth of 2.4 m, maximum depth of 4.5 m (Tidriķis 1995b)) and Juglas (area of 5.7 km², average depth of 1.7 m, maximum depth of 4.2 m (Tidriķis 1995a)) are also found in the surrounding area.

Open and dry boreal Scots Pine (*Pinus sylvestris* L.) forests are dominant on the sandy soils of the Maritime Lowland. Most of the eastern bank of the River Daugava in Central Latvia was covered by pine forests. Large patches of forest

in Biķernieki, Ulbroka, and Šmerlis were also preserved during the eastward expansion of Rīga in 20 century. Beyond the eastern border of Rīga, dry pine forests are still prevalent for the next 30 km. On alluvial and accumulated soils along

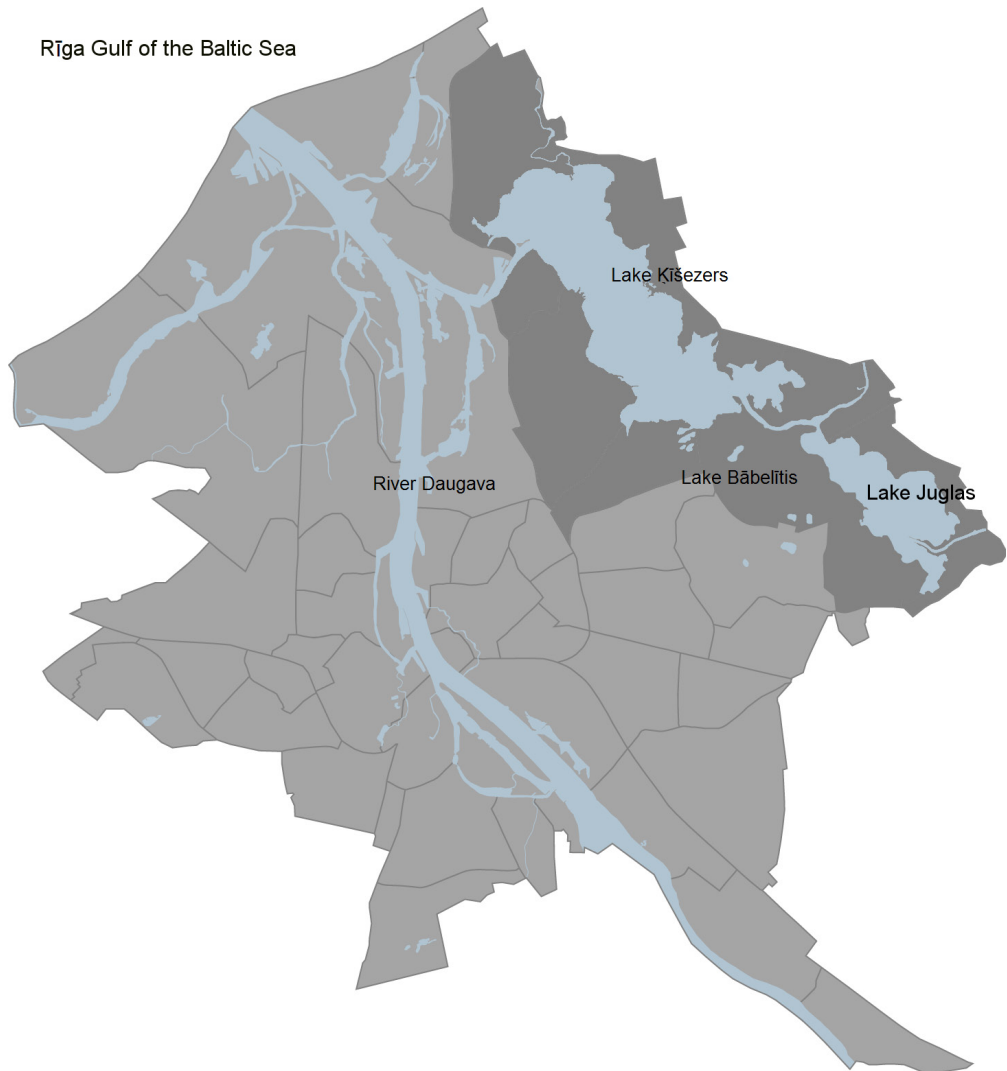


Figure 1. Study area (dark grey shadowed) on the general map of Rīga.

bodies of water, stands of Black Alder (*Alnus glutinosa* L.) and willow (*Salix* spp.) are common. Other trees species are also prevalent, but in lower proportions. The species composition and types of forest vegetation along both lakes, including the presence of tree species other than Scots Pine, characterise the Ķīšezers-Jugla interlake depression, a lagoon bar from the former Littorina Sea (Jerāns 1988).

The main observation method used was visual (mechanical); no traps of any kind were used or installed, including pheromone traps or other attractants. This method was chosen because of the very specific location of the research area within the borders of a metropolis, with a population of around one million. The benefits of any advanced collecting methods would be quickly offset by trap loss due to vandalism. In spite of the simple methodology (tree hollows and trunks searched for fresh excrement of *Osmoderma* larvae, fresh body fragments, and beetle imago), the authors succeed in finding over 50 imagos and 115 larvae in the field studies.

The object of study

Osmoderma eremita (SCOPOLI, 1763) is perhaps “the most protected”

invertebrate species in the world. This species is protected by the Bern Convention (Bern 1979), is listed as a high priority species by the European Union’s Habitats Directive (Luce 1996), and is red listed in most countries that lie in its habitat range.

Osmoderma barnabita (MOTSCHULSKY, 1845) (Coleoptera: Scarabaeidae) is one of four European varieties of the *eremita* species-species. It was described over 160 years ago, but was often ignored or regarded as synonymous with *O. eremita* (SCOPOLI, 1763), and has recently recovered because of its both morphological peculiarities (Sparacio 2001) and genome (Audisio et al. 2007). For the DNA studies, numerous specimens from different geographical parts of Latvia have also been used (Telnov, unpublished data).

Based on the results of genome studies and on the morphological analysis of *Osmoderma* specimens from over 25 different localities in Latvia (Telnov, unpublished data), we hypothesise the absence of *O. eremita* but the presence of *O. barnabita* in Latvia. Consequently, all previous records of *O. eremita* from Latvia should be referred as *O. barnabita* unless any reliable record for *O. eremita* can be confirmed for Latvia.

According to Ranius et al. (2005), the preservation of the *O. eremita* species-complex is related

to three general tasks that pertain to the conservation of nature in Europe: “(1) to preserve those small remnants of natural forest that still exist, (2) to preserve and restore habitats connected with old agricultural landscapes, and (3) to preserve those small pieces of nature that still exists in urban areas”.

Results

Traditions of tree planting in Latvian culture

Planting decorative tree gardens in the actual territory of Latvia is an ancient tradition. In the Russian Empire, the tradition of standing different decorative trees in special parks started in the 16th century, which was inspired by famous European gardens, such as those in Italy and France. The first public gardens in Rīga were established in the first part of the 18th century (Dāvidsone 1988).

Since 14th century, Rīga’s wealthy have built manors (summer houses) outside of the city, where they spent their free time. Such manors, known as “muižas” in Latvian, were often built near bodies of water, particularly on the shores of the nearest large lakes – Lake Kīšezers and Lake Juglas; these two lakes were rather popular since they could be quickly reached from Rīga using the waterways

(Viese 2001). Traditionally, planned decorative tree parks were planted near such manors. In addition, closely situated tree alleys marked the roads between manors.

From the 16th to 19th centuries, at least 21 manors were built near the shores of these two lakes (in our study, we mostly concentrated on W and SW sides of both lakes, because available information about historical parks and avenues on eastern lakesides was limited during preparing process of current manuscript). Using the available historical information, at least 15 of the 21 manors (71%) had decorative tree parks, 4 had no such parks, and the two remaining manors had no correct information collected.

Up to 2011, eight decorative tree parks out of the 15 have survived (53%): Mangaļu, Saules dārzs (Grāve), Arķirēja, Zorgenfreija, Strazdumuiža, Krēgermuiža, Zēluste, and Brekši manor parks.

The other seven parks out of the 15 (47%) did not fully survive. Only some trees, including either a part of a park or tree alley, are currently present in the following manors: Annas, Jaunā, Juglas, Katrīnas, Gravenheide, Meijera, and Trūverta manors.

There is no precise historical information about any tree parks near the following manors: Mīlgrāvja, Volanska, Dragūnu, Mērmaņa, Gīze, and Dannemana manors.

Disposition of human settlements around Lakes Juglas and Ķīšezers prior to WWI

A network of standalone manors belonging to Baltic Germans was well developed in most parts of Latvia, but manors were especially concentrated around Rīga. The construction of these manors was almost always accompanied by the planting of a tree park or fruit garden. In Latvia, this tradition began from at least the 14th century. But for Rīga, first properly documented historical data on manors are only from 16th century (it is important to understand the role of Soviet occupation rule and WWI / WWII in destroying information about historical German buildings in Latvia).

The 1905 Revolution in Russian Empire (which Latvia was a part of at the time) triggered many social and political changes for the Baltic Germans in Latvia. Armed conflict broke out between Latvian revolutionaries and the Baltic German landlords, resulting in the burning of approximately 500 manors across the country, of them more than 400 in Kurzeme and Vidzeme regions (Stranga 2006).

Lifestyle changes after the WWII and its affect on the vegetation around Lakes Juglas and Ķīšezers

During the Soviet period in Latvia (1944-1991), the land and its resources, including the trees, belonged to the public (state). Industrialisation was stimulated in Rīga during this period, which prompted new building progress on the city's outskirts. This contributed to the full or partial destruction of several manor tree parks. This new building development in the outskirts of Rīga included many multi-storey housing areas (e.g. the sleeping districts of Jugla, Mangaļi, Mežaparks, and Vecmīlgrāvis in E and NE part of Rīga), private houses and small gardens areas (e.g. Makšķernieku ciemats, Juglas zvēraudzētavas ciemats, and Juglas papīrfabrikas ciemats), and different factories or other economic facilities in this part of the city (e.g. Rīga's first thermal power plant, several military high schools, a paper mill, and one sport hall).

The first attempts to collect information and stimulate law protection of veteran and valuable trees in Latvia took place in the 1970s. For example, in 1972 only 83 of 700 Latvian tree parks (12%) were protected under state legislation (Linkaitis, Rīts 1972). The first

popular publication describing valuable and old trees in Latvia was published two years later (Saliņš 1974).

On 15 April 1977, the Council of Ministers of Latvian SSR accepted the first rule for the protection of old trees; this rule listed 825 veteran trees. Under various circumstances, only few of these protected trees grew within administrative borders of Rīga.

**Current distribution of
Osmoderma barnabita and the
disposition of inhabited and
potential trees around Lakes
Juglas and Ķīšezers in Rīga**

After the data from our investigations were summarised and digitised on maps, we came to the following conclusions:

- The natural wooden habitats around Lakes Juglas and Ķīšezers in Rīga consist predominantly of Scots Pine forests, which are unsuitable for *O. barnabita*. Fragments of this large dry pine forest make up a large part of Rīga and the city's eastern outskirts. The only native trees suitable for *O. barnabita* in this area are the Black Alders that nowadays grow irregularly around both lakes.

- The actual distribution of *O. barnabita* around Lakes Juglas and Ķīšezers in Rīga is correlated with the historical disposition of the manors

around Rīga, along with the historical routes that connect these manors to each other and to Rīga.

- During the last 50 years, the population of *O. barnabita* around Lakes Juglas and Ķīšezers in Rīga possibly declined due to the construction of new large housing districts on former suburban territories and partly or completely destroying tree parks and alleys, especially near Jugla.

- The role of Latvian cultural heritage (e.g. the culture and tradition of planting broad-leaved trees around manors, single family houses, and roads) is considered very important to habitat building for *O. barnabita* on an example of Rīga.

- The broad-leaved tree lines and / or avenues that were planted in the study area during the Soviet period are now good-quality habitats and (if preserved) are becoming suitable for *O. barnabita*.

- The cluster of inhabited and potential *O. barnabita* sites around Lakes Juglas and Ķīšezers in Rīga can be classified as one of the few documented ecological corridors for *Osmoderma* in the Baltic region (Telnov 2006, unpublished). Latvian cultural heritage, old manors surrounded by remnants of tree parks and alleys, now allowing natural gene flow and specimens migration.



Figure 2. Disposition of *Osmoderma barnabita* known and potential sites around Lake Kīšezers in E Rīga in 2011 (Google Earth map data used).

Legends to the figure 2: **green** - currently protected sites with *O. barnabita* inhabited trees; **red** - unprotected sites with *O. barnabita* inhabited trees; **yellow** - sites with potential trees for *O. barnabita* or incompletely studied sites.

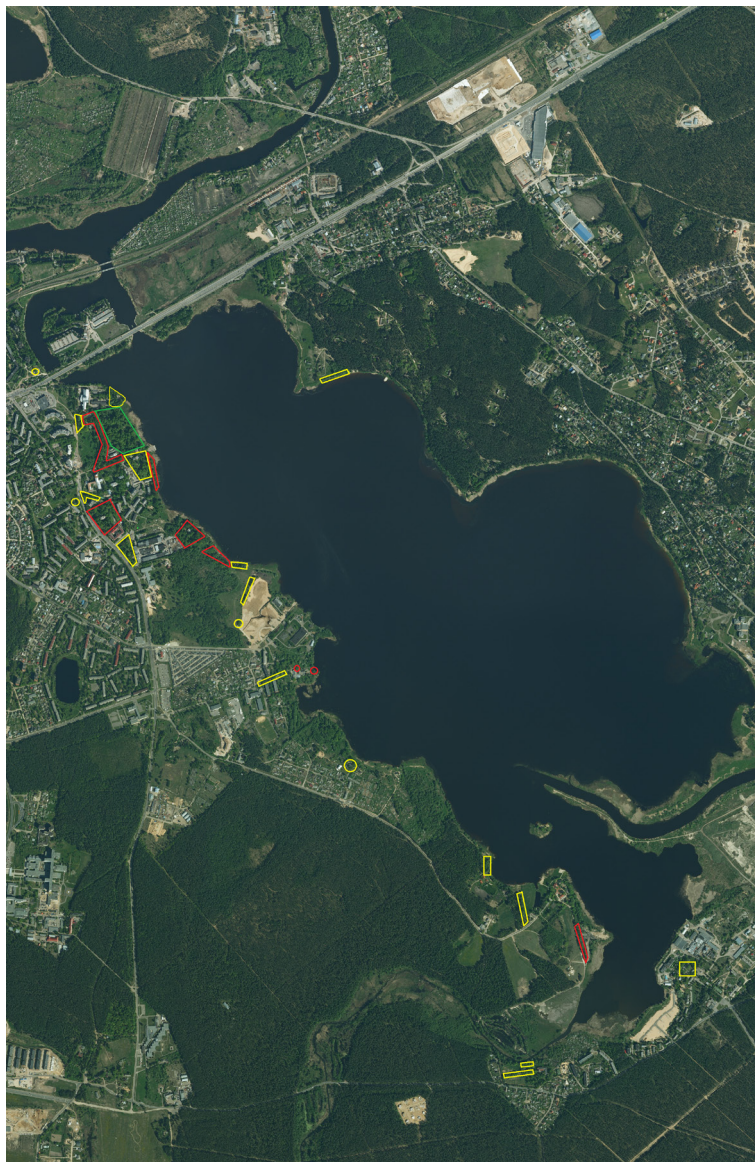


Figure 3. Disposition of *Osmoderma barnabita* known and potential sites around Lake Juglas in E Rīga in 2011 (Google Earth map data used).

Legends to the figure 2: **green** - currently protected sites with *O. barnabita* inhabited trees; **red** - unprotected sites with *O. barnabita* inhabited trees; **yellow** - sites with potential trees for *O. barnabita* or incompletely studied sites.

The current distribution of *O. barnabita* in this part of Rīga is presented on Figs 2-3. In total, 63 *O. barnabita* inhabited trees and at least 485 potential trees were documented in this study. These inhabited and potential trees make up a large habitat of about 50 km², as well as one of the few well-known migration corridors for *O. barnabita*, one of the largest in the Baltic region.

Most of the known *Osmoderma* inhabited and potential trees are located along the southern and western sides of both lakes and near small Lake Bābelītis. In addition, three *O. barnabita* sites are also situated along the eastern and northern side of Lake Ķīšezers: on the lake's flood zone near Mežares Street, on Liepusalas peninsula, and in Ozolkalni, the first two of which include the protected nature territory of Jaunciems (Fig. 1).

Not all of the trees currently inhabited by *O. barnabita* in this part of Rīga are a result of cultural planting. These separate trees are mostly situated along the lakesides, where patches of some natural and semi-natural forests (mostly Black Alder and Pedunculate Oak) have survived. Furthermore, the current disposition of *O. barnabita* microhabitats (trees) in the eastern part of Rīga is a result of the former (cultural) human activity and is concentrated in the remnants of the old manor tree parks and avenues

(especially along the former road network which previously connected the manors and Rīga). A high potential for the further existence of *Osmoderma* populations is ensured by the presence of a large network of mid-aged broad-leaved trees, planted both prior to and during the Soviet period.

In total, three micro-reserves (i.e., Kokneses Street avenue, Saules dārzs park, and Strazdumuiža manor park) and one particularly protected nature territory (Jaunciems) partly ensure the protection of some existing populations of the *O. barnabita* in eastern part of Rīga.

For protective reasons, we do not give the exact location information of the inhabited and potentially inhabited trees.

An “umbrella effect”

Osmoderma are also known as a “key” or “umbrella” species (Ranius et al. 2005). The presence of these beetles in a tree hollow / habitat automatically means that a number of another uncommon species of invertebrates will also be present. Protecting the *O. barnabita* has multiple positive effects on all another species of invertebrates, vertebrates, and plants connected with the aforementioned trees.

Eleven other uncommon or

threatened species of invertebrates study. These are presented in Table 2, (Lārmanis et al. 2000, Regulations and most of them developed strong, 2000) were found during the current vital populations in eastern Rīga.

Table 1. *Osmoderma barnabita* inhabited and potential cultural-historical sites around Lakes Juglas and Ķīšezers in eastern part of Rīga.

Legends to the Table 1: X – present; (X) – potentially present; (-) – not present; ? – data deficient; c. – century.

No	Manor name (original German and actual Latvian)	Coordinates of the manor	Anno	Presence of a tree park	Park status (2011)	<i>Osmoderma</i> population
1	Magnushof - Mangaļu muiža	57°03'17" / 24°05'33"	16 th c.	X	X	(X)
2	Rodenbergshof - Mīlgrāvja muiža	57°01'39" / 24°07'03"	17 th c.	?	(-)	(-)
3	Meiershof - Meijera muiža	57°00'25" / 24°10'08"	19 th c.	X	(-)	(X)
4	Annenhof - Annas muiža	57°00'21" / 24°10'13"	19 th c.	X	(-)	(-)
5	Gravenhof - Grāves muiža (Saules dārzs)	57°00'05" / 24°10'27"	17 th c.	X	X	X
6	Wolansky - Volanska muiža	56°59'53" / 24°10'18"	19 th c.	?	(-)	(-)
7	Dragunshof - Dragūnu muiža	56°59'39" / 24°10'23"	19 th c.	?	(-)	(-)
8	Neuhof - Jaunā muiža	56°59'48" / 24°10'56"	19 th c.	X	(-)	(X)
9	Archiereis Hofchen - Arkirēja muiža	56°59'31" / 24°12'20"	19 th c.	X	X	(X)
10	Sorgenfrei - Zorgenfreijas muiža	56°59'33" / 24°12'46"	?	X	X	X
11	Katharinenhof - Katrīnas muiža	56°59'42" / 24°13'32"	17 th c.	X	X	(X)
12	Mehrmans hoffgen - Mērmaņa muiža	56°59'33" / 24°14'32"	17 th c.	?	(-)	(-)
13	Giesenhoff - Gīzes muiža	56°59'24" / 24°14'33"	17 th c.	?	(-)	(-)
14	Dannemannshof - Dannemana muiža	56°59'24" / 24°14'41"	19 th c.	?	(-)	(-)
15	Strassenhof – Strazdumuiža (old & new buildings)	56°59'12" / 24°15'10" 56°59'02" / 24°15'00"	16 th c.	X	X	X
16	Krogeshof - Krēgermuiža	56°59'00" / 24°15'28"	19 th c.	X	X	X
17	Gravenheide - Gravenheides muiža	56°58'36" / 24°15'59"	18 th c.	X	(-)	X
18	Baumhof - Trūverta muiža	56°58'21" / 24°16'16"	?	X	(-)	(X) avenue
19	Selust - Zēlustes muiža	56°57'59" / 24°17'23"	17 th c.	X	X	X
20	Harmshof - Brekšu muiža	56°57'29" / 24°17'15"	19 th c.	X	X	X
21	Baumhof - Juglas muiža	56°57'46" / 24°18'00"	18 th c.	X	X	(X)

Table 2. Rare or protected invertebrate species found in old tree parks, avenues and stand-alone old trees around Lakes Ķīšezers and Juglas in Rīga.

Species (in an alphabetic order)	Locality (in an alphabetic order)	Tree species or habitat
<i>Aromia moschata moschata</i> (LINNAEUS, 1758)	Ķīšezers SE lakeside, Mežares iela [street] Liepusālas pussala [peninsula] Mežaparks Saulesdārzs [park]	<i>Salix</i> spp.
<i>Clausilia dubia</i> DRAPARNAUD, 1805	Brīvdabas muzejs [Open-air museum] Liepusālas pussala [peninsula] Strazdumuiža [park]	deciduous forests with a quantity of dead wood on the ground
<i>Helix pomatia</i> LINNAEUS, 1785	Brīvdabas muzejs [Open-air museum] Mangaļu muiža [manor's park]	parks, deciduous forests, semiopen mixed forests
<i>Lasius fuliginosus</i> (LATREILLE, 1798)	former soviet military quarter between Ezermalas iela [street] and S lakeside of Ķīšezers Kokneses prospekts [avenue] Ķīšezers SE lakeside, Mežares iela [street] Mežaparks Ozolkalni Saulesdārzs [park] Zelustes muiža [manor's park] and environs	<i>Acer platanoides</i> , <i>Tilia</i> spp., <i>Quercus robur</i>
<i>Liocola lugubris</i> (HERBST, 1786) = <i>marmorata</i> (FABRICIUS, 1792)	Gravenheides muiža [manor's park] Grāves muiža [manor's park] Kokneses prospekts [avenue] Meijera muiža [manor's park] Mežaparks Ozolkalni Saulesdārzs [park] Strazdumuiža [park] Zorgenfreijas muiža [manor's park] Zelustes muiža [manor's park] and environs	<i>Acer platanoides</i> , <i>Tilia</i> spp., <i>Quercus robur</i>

Table 2. Continuation.

Species (in an alphabetic order)	Locality (in an alphabetic order)	Tree species or habitat
<i>Mycetophagus quadripuctulatus</i> (LINNAEUS, 1761)	former soviet military quarter between Ezermalas iela [street] and S lakeside of Ķīšezers Juglas muiža [manor's park] Ķīšezers SE lakeside, Mežares iela [street] Kokneses prospekts [avenue] Mangaļu muiža [manor's park] Saulesdārzs [park]	<i>Alnus glutinosa</i> , <i>Tilia</i> spp., <i>Quercus robur</i>
<i>Neatus picipes</i> (HERBST, 1797)	Brekšu muiža [manor's park] most of Jugla [urban district of Rīga] Kokneses prospekts [avenue] Saulesdārzs [park] Strazdumuiža [park] and environs	<i>Tilia</i> spp., <i>Quercus robur</i>
<i>Necydalis major</i> LINNAEUS, 1785	Mežaparks, at the pier suitable trees and habitats available on several other places along both lakes, but this species has never been specially studied in Latvia before	<i>Alnus glutinosa</i> , <i>Quercus robur</i>
<i>Prionychus ater</i> (FABRICIUS, 1775)	Brekšu muiža [manor's park] Kokneses prospekts [avenue] Krēgermuiža [manor's park] Mežaparks Ozolkalni Saulesdārzs [park] Strazdumuiža [park] W lakeside of Lake Juglas [natural and seminatural forest fragments along the lake] Zelustes muiža [manor's park] and environs	<i>Acer platanoides</i> , <i>Alnus glutinosa</i> , <i>Tilia</i> spp., <i>Quercus robur</i>
<i>Platycerus caraboides caraboides</i> (LINNAEUS, 1758)	Mežaparks Saulesdārzs [park] Strazdumuiža [park]	various deciduous trees
<i>Platyrhinus resinosus</i> (SCOPOLI, 1763)	Mangaļu muiža [manor's park]	<i>Alnus glutinosa</i> , <i>Quercus robur</i>

Discussion

Planting trees in urban environment, such as recreation areas, tree parks and avenues, is one among the most common practices of achieving a “green lifestyle” on a cost-effective budget. Other green city planning and development around the world cannot compete with traditional parks and avenues due to their extremely high costs.

All the historically planted trees, especially when combined with any kind of buildings or architectural ensembles, are bound to become a part of cultural heritage, and, consequently, in future will be classified as state or municipal monuments. On one hand, this fact is very positive for all species connected with old (often hollow) trees. On the other hand, conflicts are common between the requirements of cultural heritage preservation and the needs for the conservation of natural heritage (in our case, the species related to old, hollow trees).

It is possible to balance the above-mentioned interests through official legislation; this pilot project could be a challenge for Latvia. However, even if official legislation is passed (for example, the legal requirement of biological expertise for all existing and newly evaluated cultural heritage sites), conservation efforts for many protected species could be made more

effective.

During the last 70 years, “green quarters” around Lakes Juglas and Ķīšezers in Rīga were mostly spontaneously developed without any vision of how the needs for recreation areas and urban territories would be balanced. In fact, plans for tree planting existed during the Soviet period, but these plans were used for bureaucratic (and even political) purposes, and were not actually carried out. Despite of the lack of management policies for urban planting in the peripheral areas of Rīga for a long period, the *O. barnabita* population has managed to successfully survive in this area. Moreover, the potential and vitality of several micropopulations of *O. barnabita* in this part of Latvia cannot be underestimated. A high number (485) of potential trees for *O. barnabita* has been counted and mapped; indeed, this is a very high number for such a small (~50 km²) and dense populated territory.

The following main threats are identified to the population of *O. barnabita* in eastern part of Rīga around Lakes Juglas and Ķīšezers:

- The lack of the communication between the state nature conservation institutions, the Rīga municipality, and nature conservators;
- The low number of established micro-reserves for *O. barnabita* and

the high proportion of unprotected inhabited / potentially inhabited trees;

- The lack of understanding and official acceptance on a municipality or state level, in terms of sustainable management of the corridors between the four protected areas that exist in this part of Rīga;

- The high recreational potential, the high land demand, and the high immobility price for most areas around Lakes Juglas and Kīšezers;

- The ease of land use transformation (weak and corrupted legal law);

- The lack of management plans for established micro-reserves, surrounding areas and whole corridor;

- The weak control mechanism and lack of control and monitoring systems for the localities of protected species;

- The weak judicial system and the insufficient penalties for protected species (micro-) habitat destruction;

- Planned changes in the development plan for Rīga (next major update planned for 2012);

- The insufficient financial allocation for nature conservation in Rīga's municipal budget;

- The lack of competent specialists in municipal institutions;

- The conflict of interest between nature conservationists and municipal arborists.

The analysis of the current situation and the awareness of the main threats presented above are sufficient enough for a turnover in the conservation of *O. barnabita* in Rīga and the whole Baltic region. On the other hand, the current situation illustrates a high demand for continued conservation management, with the aim of ensuring optimal conditions for a long-term existence of an *O. barnabita* metapopulation in Rīga and further development in this migration corridor.

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