

Ecological network for *Osmoderma eremita* and other species dependent on
veteran trees

LIFE16 NAT/LT/000701

AFTER-LIFE CONSERVATION PLAN



Vilnius, 2022

A short introduction to the project

Main goal of the project “Ecological network for *Osmoderma eremita* and other species dependent on veteran trees” (LIFE16 NAT/LT/000701, LIFE OSMODERMA) was to create a functional ecological network for hermit beetle (*Osmoderma eremita*, Figure 1) and other species dependent on deciduous veteran trees by habitat management in core habitats for the species, development of the steppingstone elements within the network area and re-establishing hermit beetle population in the restored historical habitat of the species. The project aimed on improvement of the conservation status of *O. eremita* by managing its habitats, which are closely related to habitat types: 9020* Fennoscandian hemiboreal natural old broad-leaved deciduous forests, 9070 Fennoscandian wooded pastures, and 9180 * Tilio-Acerion forests, but also improving the habitat conditions for the species dependent on the fallen deadwood like *Cucujus cinnaberinus*. The project targeted the following Natura 2000 sites designated for *O. eremita*: Kaunas Oak Forest (LTKAU0020), Dūkštos Oak Forest (LTVIN007, which was 2019 incorporated into the Surroundings of Neris River Loops (LTELE0005)), the Slope of Neris River by Verkiiai (LTVIN0012), Kauno Marios Regional Park (LTKAU0007), Strėvininkai Forest (LTKAI0002), Vaiguva Forest (LTKAI0004).

The project consortium was formed by 3 Lithuanian and 1 Latvian partner, the formers being Lithuanian Fund for Nature (Coordinating Beneficiary), Municipality of Kaunas City, Lithuanian Zoological Garden, and later being Daugavpils University Nature Studies and Environmental Education Centre. The consortium successfully implemented this project, which took place from the end of 2017 to the beginning of 2022, and reached all the set goals.



Figure 1. *Osmoderma eremita* – the target species of the project (Author – Remigijus Karpuška)

Overview of the project results

Before we begin with main actions

To develop the Cross-border Ecological Network for the Species Dependent on Broad-leaved Veteran Trees, large scale research was carried out. Territories that could be potentially suitable for the *O. eremita* (previous sighting sites, old manors' parks, etc.) were selected throughout Lithuania. Each territory was visited by the project team and its suitability for the target species was evaluated and documented. In those territories which showed high potential, during the summer seasons pheromone traps were used to confirm, whether the hermit beetle inhabits them. The beetles were quickly released in the same spot of capture, but not before a sample (a small piece of tarsus from the tip of beetle leg, which does not significantly impair the beetle) for genetic analysis was collected. After the analysis of 134 collected samples from Lithuania and the genetic data collected in Latvia during another LIFE project, EREMITA MEADOWS (LIFE09 NAT/LV/000240) Daugavpils University Nature Studies

and Environmental Education Centre developed the map of the *O. eremita* metapopulations in Latvia and Lithuania. This map together with GIS analyses of distribution of habitats and other data were later used in the development of the Cross-border Ecological Network for the Species Dependent on Broad-leaved Veteran Trees, which is now [available online](#) for the public and scientific usage. In 2021 a scientific article covering this topic was published in the journal “Insect Conservation and Diversity”.

While doing the preparatory work for establishing an ecological network between Kaunas Oak Forest, Dūkštos Oak Forest, and the Slope of Neris River by Verkiai, the project team has found, described, and documented 1590 valuable large dimension broad-leaved trees between these territories. The agreements with landowners were signed for 643 trees out of all inventoried trees. The agreement stated that the landowner agrees to protect that tree and do not harm it directly or degrade its habitat, and the project team commits to do arboristic management to prolong the life of that tree. The length of the established practical ecological network is 106 km.

To implement the intended habitat management activities, the management plans for 2 Natura 2000 sites were prepared and legally approved by the Minister of Environment. Those sites were Kaunas Oak Forest (LTKAU0020) and the Slope of Neris River by Verkiai (LTVIN0012). To spread the best practice and to create the possibilities for the replication of project activities, Guidelines for Management of Veteran Trees and Deadwood were developed and distributed to the municipalities and the regional and national parks.

Live long the oak!

To prolong the lives of veteran oaks and other old broad-leaved trees, several approaches were used. The internationally certified arborists managed and restored 643 old trees: 420 in Kaunas Oak Forest, 40 in the slope of the river Neris by Verkiai, 26 in Dūkštos Oak Forest, and 157 in the corridor between these Natura 2000 sites, and that is 161 % of what was initially planned. This was done by strategic pruning (weight or height reduction, rejuvenating pruning, etc., **Error! Reference source not found.**), trunk bracing, aeration and mulching of the root zone, forming the root protection zone in arable fields, and increasing the lighting conditions by the removal of overgrowth. 24 trees in Kaunas Oak Forest have received additional management regarding their large cavities located at the ground level, like the removal of concrete from previously mismanaged trees (it was believed that concrete would stabilize and cure the tree from rotting, it is now proven otherwise). Since Kaunas Oak Forest is a park located at the heart of the city, a protection from vandalism is in need, therefore, the fire prevention



equipment and the natural looking covers were installed in some of those cavities. The covers were designed to ensure the free movement of air and small fauna (insects, bats) into the cavities.

The lighting conditions were improved for additional ~90 trees when dispersal corridors for the

Figure 2. An arborist shortens a dead branch. This reduces the crown weight, makes the park safer for visitors, and some tough deadwood is still left for biodiversity (Author – SIA “Lābie Koki”)

hermit beetle were created and when the invasive tree species *Acer negundo* was eradicated in two core areas. Using accurate chemical treatment with glyphosates injection to the stumps and felling afterwards, 60.83 ha of Kaunas Oak Forest and 6.73 ha of the slope of the river Neris by Verkiai were freed from this invader in the years 2019-2020, with control checking of any missed seedlings in 2021. And that is 563 % of what was initially foreseen! 751 solid cubic meters of trees that overshadowed old oaks and limes were also felled in Kaunas Oak Forest, and additional 47.69 solid cubic meters in Dūkštos Oak Forest. Since the project aimed at improving the habitat conditions for the species dependent on the fallen deadwood, one of the goals was to increase the quantity of such wood in the targeted habitats. Therefore, the felled trees from overgrowth and pruned branches were left on part of the sites close to the veteran trees for natural biodegradation, thus creating more microhabitats for species associated with deadwood both in urban and wooded areas.

Back to the historical habitat

For the re-establishment of hermit beetle population in the restored historical habitat of the species in the Slope of Neris River by Verkiai (LTVIN0012), the agreement with the re-introduction plan was received from the competent authority (the Ministry of Environment) and the Directorates of both donor site and the recipient site very early in the process. Then the methodology of reintroduction of *O. eremita* and the methodology for captive breeding of *O. eremita* were prepared. These methodologies were distributed to the target groups (zoological gardens with rare species breeding programs, entomological societies, and scientists) of Lithuania and other European countries, where the hermit beetle is found. In the preparation of re-introduction, the reason for previous local extinction – the degradation of the habitat – was taken care of when the invasive trees were eliminated from this site.

Along with other actions, the captive-bred population was started by the capable hands of the entomologists of the Lithuanian Zoological Garden. Kaunas Oak Forest which holds the biggest hermit beetle population in Lithuania was chosen to be the donor population. Several adults were captured, and the *ex-situ* breeding program began.

To play it safer, it was decided to release the captive-bred larvae not directly into the cavities of trees, but into artificial habitats, where the project team could have better control of the re-introduction process. For this purpose, wood mould boxes (Figure 3) were built based on the experience of the project LIFE BTG (LIFE15 NAT/SE/000772). Additional 4 oak trunks with living larvae of the hermit beetle were transported to the same site



Figure 3. A wooden mould box - an artificial habitat for saproxylic species placed in a sunny position

from the Strėvininkai forest (LTKAI0002), where sadly part of the forest, inhabited by the hermit beetle was felled for the timber trade.

When both natural and artificial habitats were ready, the captive-bred hermit beetles were moved into the wood mould boxes in the spring of 2020 and 2021. In total 441 larvae and 80 cocoons were released in the historical habitat, and some were left in captivity for the continuation of the breeding. In the summer of 2021, the first adult beetles were finally seen flying in this historical habitat after 16 years of absence.

The effect of the project

During 2019-2021 the project team has implemented the monitoring of two beetle species (*O. eremita* and *Cucujus cinnaberinus*), and one fungus species (*Fistulina hepatica*), all of which are dependent on the decaying wood. As for the monitoring of the hermit beetle, the pheromone traps are the most precise tool for finding this secretive species, but it demands a lot of effort, time, and carbon footprint. The adults of this species are actively flying and looking for the mating partner on the hottest days of summer. If a beetle is lured to the trap, it must be removed from it as soon as possible to survive the summer heat. And this is not so easy if the research area covers large or remote territories. Researcher must visit the traps every day or simply live next to them for several weeks. To solve this problem, the project team developed and tested the smart pheromone traps with great success. In this case, the major smart part was a minicamera, which sends pictures every 2 hours via the internet to the database, which can be checked as often as one likes with no carbon footprint. In total 50 smart traps were developed. These smart traps can be used not only for the hermit beetle but also for other species of insects that can be lured by their specific pheromone. 247 locations in total were monitored and out of those 97 locations have been proven to be inhabited by the hermit beetle, and that is a very large number of locations for such a rare species.

The *Cucujus cinnaberinus* and *Fistulina hepatica* monitoring was carried out in 91 locations. These two species spread slowly, therefore it was no surprise that they both were found only in 4 locations. Due to their ecology, these species will feel the real benefits of this project after this project has ended.

The felling of spruce and invasive *Acer negundo*, also leaving the felled trees in the sites as new deadwood helped to improve the conservation status of 9070 Fennoscandian wooded pastures and 9180* Tilio-Acerion Forest in at least 30 ha. After the project, these habitats will continue to progress towards the favourable conservation status.

The project was aiming at popularizing the arboristic culture of tree management as a much better option for the trees and the biodiversity. Due to the specific actions of this project, working places for professional arborists were created. During the project, the number of internationally certified arborists increased from 1 to 10 and the need of arborists with such high certification was noted and taken into practice by Kaunas City Municipality.

800 visitors of the core areas of the project were interviewed and the change of opinion towards more nature-friendly status were registered. Even the understanding that the tree felling can also be one of nature conservation activities (felling of young and invasive trees to save the veteran oaks, limes, and maples) started to dawn in the minds of local societies and municipalities.

Lithuanian Fund for Nature have submitted data to the Ministry of Environment about 21 site which meets the qualifications as a proposed Sites of Community Importance (pSCI). Out of them 3 territories were establish as a pSCI.

Spreading the word

Implementation of the nature conservation project is almost meaningless if no one knows about it. Therefore, the project team did a lot of dissemination and communication activities with the aim of changing the behaviour towards more nature friendly. More than 100 educational events, excursions, and lectures, 3 hosted international conferences, 10 created short educational films, a lot of articles in the press, social media, interviews in television and radio, 8 publications of project material, also, 2 km long nature educational trail was prepared in Kaunas Oak Forest, information boards installed in 3 core areas. The project team has shared the knowledge about conservation strategies of the species and practical experience on habitat restoration between the experts during more than 40 conferences and seminars, and how the demonstrative methods developed by the project can be transferred and replicated in other contexts and countries. Fruitful cooperation with the project “Optimizing the management of Natura 2000 network in Lithuania” (LIFE IP PAF-NATURALIT, LIFE16 IPE/LT/016) also took place. In 2021 a scientific article about *O. eremita* monitoring methods was published in “Baltic Journal of Coleopterology”.

After-LIFE conservation plan

Action	When/how long	By whom	Possible financial sources
Usage of the Cross-border Ecological Network for the species dependent on broad-leaved veteran trees	On demand	Project partners, State Service for Protected Areas	Own funds, state funds
The established ecological network between project’s core areas: the protection of valuable large dimension broad-leaved trees from felling	At least 30 years	Municipalities, State Forest Enterprise	Municipal funds, state funds
Protection of the veteran trees in the ecological corridor between core areas	At least 30 years	Private and state landowners, with whom the protection agreements were signed	Private/state funds
The renewal of 2 nature management plans	Every 10 years	State Service for Protected Areas	State funds
The follow-up of the proposal made to the Ministry of Environment regarding the territories that meet the criteria for establishment of the new Natura 2000 sites	In 2024	Lithuanian Fund for Nature	Own funds
Protection of the veteran trees in Kaunas Oak Forest:			
- The removal of the juvenile invasive <i>Acer negundo</i> and the offshoots of felled trees that were overshadowing veteran trees	Annually	Kaunas City Municipality	Municipal funds
- Arborist assessment of the veteran trees by internationally certified arborist	Every 3-5 years and/or after extreme weather conditions (e. g. strong		

	wind, heavy snowfall)		
- Arboristic management of veteran trees	Based to the need according to the assessment		
Protection of the veteran trees in the Slope of Neris River by Verkiai: the removal of the juvenile invasive <i>Acer negundo</i>	Annually	Directorate of Pavilniai and Verkiai Regional Parks	Funds of directorate of Pavilniai and Verkiai Regional Parks
Protection of the veteran trees in Dūkštos Oak Forest:			
- The control of the undergrowth around trees inhabited by <i>Osmoderma</i>	At least every 3 years	State Forest Enterprise	Funds of State Forest Enterprise
- The periodical felling of the undergrowth for easier sprouting of the new oak generation	At least every 2 years		
Restoration of viable <i>Osmoderma</i> population:			
- The maintenance of the artificial habitats (2 wood mould boxes and 4 tree trunks)	Annually	Directorate of Pavilniai and Verkiai Regional Parks	Funds of directorate of Pavilniai and Verkiai Regional Parks
- The breeding and the maintenance of the <i>ex-situ</i> <i>Osmoderma</i> population	Weekly	Lithuanian Zoological Garden	Funds of Lithuanian Zoological Garden, state funds
Monitoring of <i>Osmoderma eremita</i> and <i>Cucujus cinnaberinus</i> in Natura 2000 sites	According to the national monitoring program	Directorates of the regional and national parks	State funds
Dissemination and communication:			
- Usage of the created educational material for school children	On request	Lithuanian Zoological Garden	Funds of Lithuanian Zoological Garden
- Maintenance of educational trail in Kaunas Oak Forest	Annually	Kaunas City Municipality	Municipal funds
- Maintenance of info-boards in Natura 2000 sites	Annually	Directorate of Pavilniai and Verkiai Regional Parks, Directorate of Neris Regional Park	Funds of directorate of Regional Parks

- Maintenance of the project webpage	At least 5 years	Lithuanian fund for Nature	Own funds
Knowledge exchange, replication, transferability: usage of the accumulated knowledge and the results of the project in preparation of other projects, scientific publications, consultations of state institutions and other target groups	On demand	All project partners	Own funds, state funds, international funds
New project application upscaling this project submitted during 2021 call	2022-2029	Lithuanian Fund for Nature, Lithuanian Zoological Garden, Daugavpils University and 5 other partners	LIFE programme funds, Ministry of Environment funds, own funds
Participation in XXVI International Congress of Entomology with a scientific report "Smart pheromone traps for automatic remote monitoring of genus <i>Osmoderma</i> (Coleoptera, Scarabaeidae, Trichiinae) species"	July 17-22, 2022	Daugavpils University Nature Studies and Environmental Education Centre	Own funds
Development of the manuscript of the scientific article "Smart pheromone traps for automatic remote monitoring of genus <i>Osmoderma</i> (Coleoptera, Scarabaeidae, Trichiinae) species". The article will be submitted in WoS/Scopus indexed scientific journal publishing articles in the field of Conservation Biology.	In 2022	Daugavpils University Nature Studies and Environmental Education Centre	Own funds

Authors of the pictures is LIFE OSMODERMA project team, unless specified differently.

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