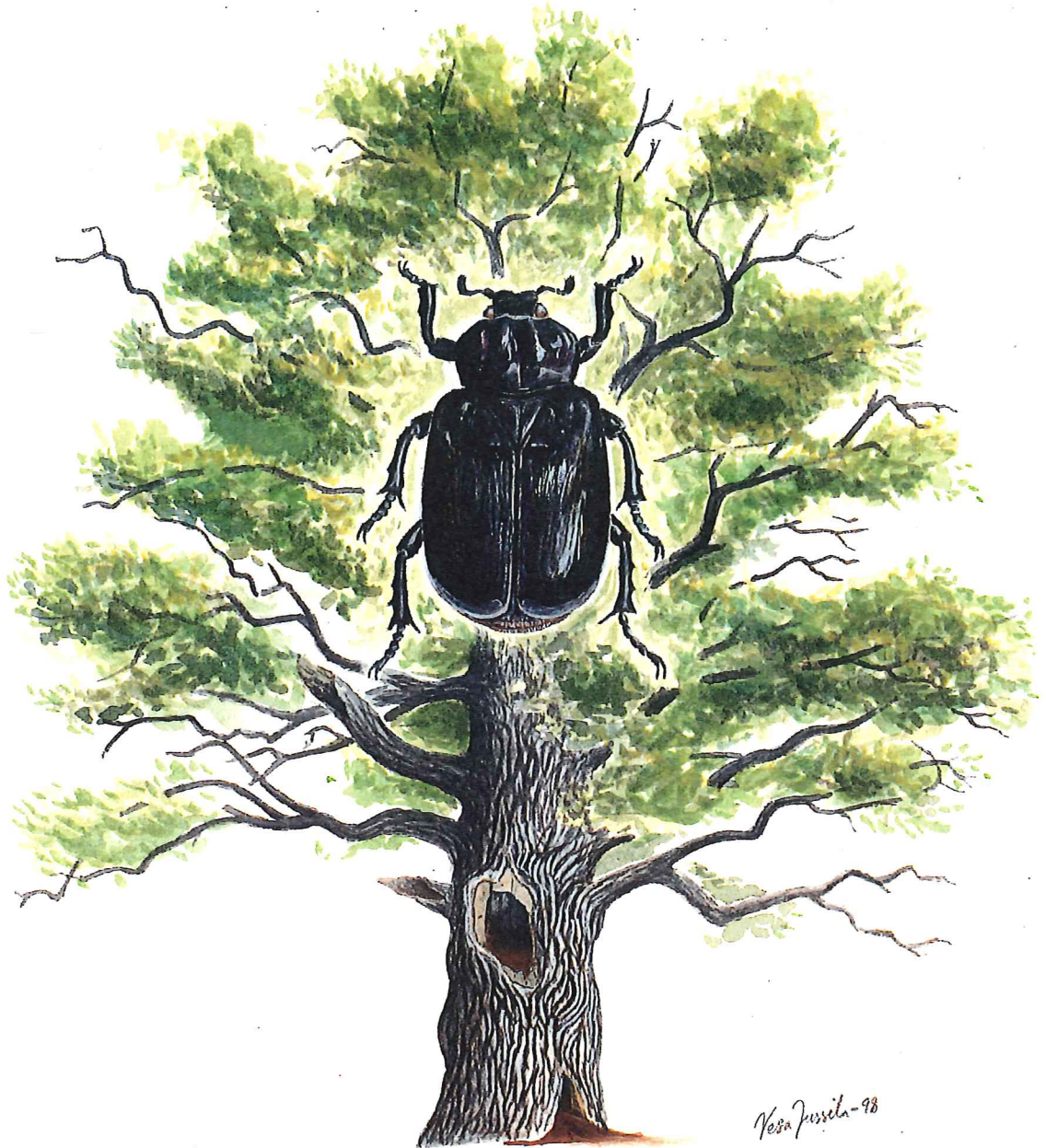


THE HERMIT BEETLE

(Osmoderma eremita)

Ecology and Habitat Management



Swedish Environmental Protection Agency

GLOSSARY

In a publication of this sort the occurrence of difficult scientific terminology is unavoidable. In order to facilitate comprehension some terms are explained below.

biotope	<i>a habitat of a special character, e.g. oak pasture, beech forest, etc.</i>
habitat	<i>locality inhabited by a species</i>
pollard	<i>removal of the upper part of a tree to a greater or lesser extent, the cuttings often being used as animal feed</i>
maintenance	<i>grazing or cutting</i>
imago	<i>adult insect, as distinct from egg, larva or pupa</i>
crown thinning	<i>removal of heavy branches from the crown of a tree</i>
cryptogams	<i>lichens, mosses and fungi</i>
landscape planning	<i>planning of measures and division of environments in the landscape, e.g., fields, pastures, broadleaf forests and old trees</i>
locality	<i>limited area where a certain species occurs</i>
population	<i>all the individuals of a certain species in a certain area</i>
remnant habitat	<i>an isolated area that was once more extensive</i>
red list	<i>national list of threatened species and those requiring special care</i>
outlying woodland	<i>grazed woodland that in former times was the only grazing available, since the land closer to the farm was used for fields and hay meadows</i>
host tree	<i>the tree upon which a species is dependent for its development</i>
age distribution	<i>the classification of trees as a stand or in a forest according to their age</i>

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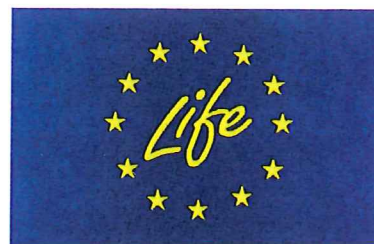
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WHY A PUBLICATION ABOUT THE HERMIT BEETLE?

You may well wonder why so much attention is focused on the Hermit Beetle and what is so special about this species. The answer is that the Hermit Beetle has very demanding requirements. It lives an obscure life deep inside a hollow broadleaf tree. Together with other beetles it performs an important role in the decomposition of hollow trees. But most important of all is the species as an indicator of valuable habitats. Wherever it occurs there is also a host of other threatened insects, lichens, fungi, etc.

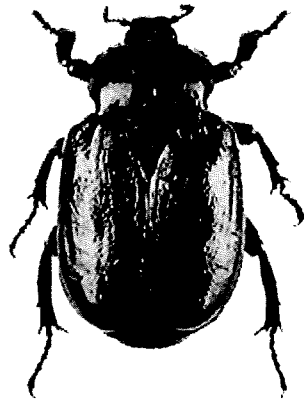
In order to protect these oak pastures and other threatened biotopes and species, the Life-Nature Fund from EU and The Swedish Environmental Protection Agency invest money in a conservation project in Sweden. The project includes the formation of reserves and their management in the form of clearing, grazing and cutting in 45 areas in Southern Sweden. Together with the landowners management plans for the different areas are drawn up. Afterwards, more or less comprehensive measures are applied in accordance with a special programme of measures to be taken. The areas are included in the European network of protected areas, Natura 2000, and within the framework for the application of the EU directive for the conservation of wild animals and plants in their habitats (the so-called Habitat Directive).

This publication is intended to help increase knowledge about the Hermit Beetle and its habitat, and also to inform about how to manage the different kinds of habitat where it occurs. Together with the publication called 'Oak Giants' it would therefore form a good foundation for a landowner and others responsible for the management of areas with old hollow broadleaf trees.

THE DISTRIBUTION AND ECOLOGY OF THE HERMIT BEETLE

The Hermit Beetle (*Osmoderma eremita*) is about 3 cm long and inhabits old hollow trees, especially oaks. It belongs to the Scarab beetle family, to which chafers and dung beetles also belong. At present it is threatened in several countries, including Sweden. However, it is not considered to be an endangered species here, as it can still be found in over a hundred most valuable oak and broadleaf localities in Southern Sweden. Traces of the beetle have been found in about a hundred other areas, indicating that though it must have inhabited those areas, it is not certain that it still exists there.

The reason for the reduced distribution of the Hermit Beetle is that it is dependent on old trees and in agriculture and forestry trees have not been allowed to become sufficiently old. This is why it mainly remains in the most ancient cultural landscapes. The oaks have to be at least 150-200 years old before they begin to develop hollows with woody compost at the centres of their trunks.



*Recent records of Hermit beetle
(Osmoderma eremita) in Sweden 2001.*

The Hermit Beetle is an excellent symbol and signal species for areas with oak and other broadleaf trees, which are among the most species-rich and valuable habitats we have in the country. In the larger of these areas there are thousands of species that are bound to the trees, most of which are insects. This is why efforts are concentrated on the Hermit Beetle and its habitats in Sweden and they are aimed to protect and preserve hollow trees and other important environments in Swedish broadleaf forest areas.

THE DISTRIBUTION OF THE HERMIT BEETLE

The Hermit Beetle was originally distributed over most of Europe. Now the species is drastically reduced and only occurs locally in small areas. The Hermit beetle is presumably extinct in most of Northwest Europe. More substantial occurrences are described above all from Sweden and France.

But the problem with a species that has such a hidden existence in old hollow trees is that it can occur in certain areas, but no one has looked for it. At the same time, there is sometimes a tendency to overestimate populations because the accumulated remains of several decades can give an exaggerated impression of the distribution and status of the species.

The distribution map on the next page shows the situation as it is known at present in Europe, with reservations that certain finds are old. This can mean

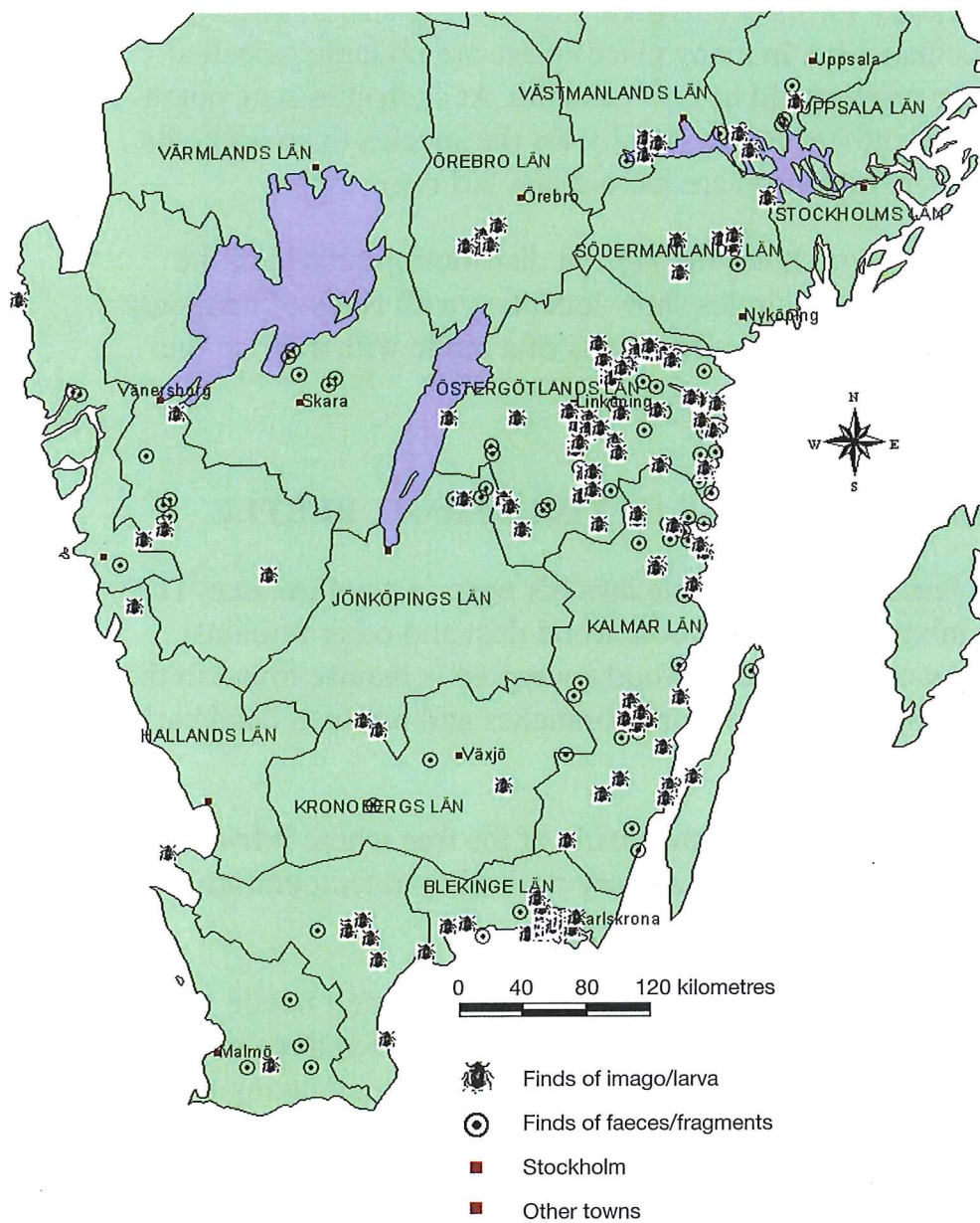


Map of the distribution of the Hermit Beetle in Europe. Each dot represents only its occurrence in each country, irrespective of the number of localities in that country. Generally there are only isolated localities in every country. The presence of several localities is an exception. The present knowledge of its distribution in Southeast Europe is scant, but may be improved in the coming years.

that the species has become extinct in some places. Moreover, it is possible that a similar species of the genus *Osmoderma* occurs from the Balkans and eastwards is included. This has not yet been clarified.

ITS DISTRIBUTION IN SWEDEN

In Sweden about 115 localities are known to have recent finds of live Hermit Beetles. At about a further 75 localities faeces or fragments of the beetle have been found. As these faeces and fragments might survive in the trees for several decades, it means that the beetles either still occur there or have occurred earlier but have now died out.



As far as we know the main distribution of the Hermit Beetle is in Sweden. It is known to occur in most Southern Swedish provinces up to Västmanland. Most localities lie in the provinces of Östergötland, Eastern Småland and Blekinge.

Many localities lie in the south-eastern part of Östergötland, with a strong concentration at estates and mansions. Research has shown that in the Bjärka-Säby area south of Linköping, there is a Hermit Beetle population of 3000-4000 individuals. (Ranius, T. & Nilsson, S.G. 1997)

At several localities in Sweden the number of existing host trees is too small for the long-term survival of the Hermit Beetle. There are examples of Hermit Beetle localities with only single hollow trees, but in general at least 10-20 such trees are necessary for its occurrence. The average size of a Hermit Beetle locality is less than 3 ha. In many places there are no large oaks that can take over when the existing old hollow oaks die. At such sites new potential host trees must be identified in the vicinity for the species to continue its existence after the present host trees are too old and fall over.

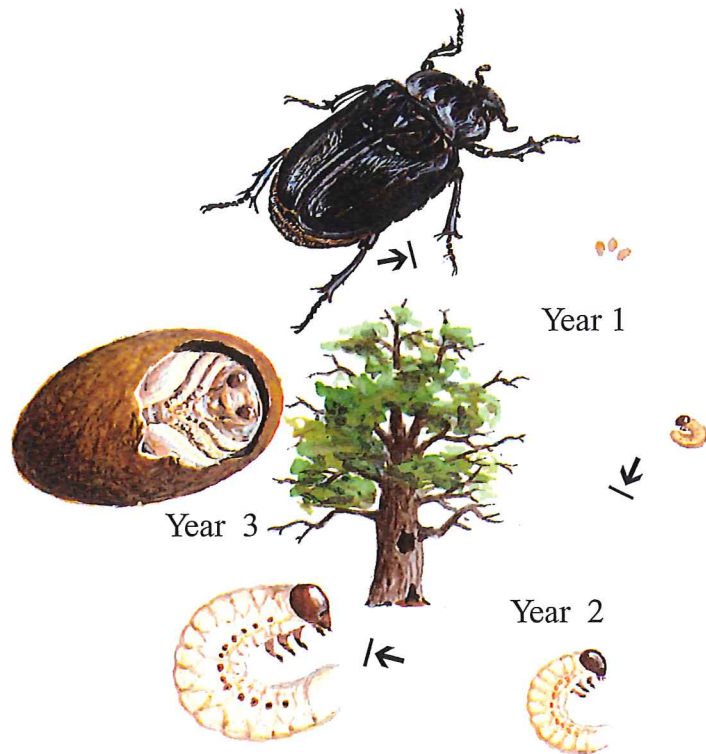
The map on the previous page shows the present distribution (2001) of the Hermit Beetle in Sweden. Solid circles show localities with finds of imagoes (adult beetles). Other finds are shown by means of a circle with a dot in the middle.

THE ECOLOGY AND LIFE CYCLE OF THE HERMIT BEETLE

After copulation the female Hermit Beetle lays her eggs in a hollow tree. The larvae appear in the mixture of rotten wood, wood dust and other remains, collectively known as woody compost. Woody compost is mainly found in the hollow parts of trunks, but can also occur in branches and between dead bark and wood.

The larva chews the rotten wood from the inside of the tree where it lives for three years. However, its development can vary according to temperature and availability of food.

The fully-grown larva pupates in the early summer and the adult beetle (imago) emerges during the second half of July. The beetle then lives in and on the tree for 2-5 weeks, during which time copulation and egg laying takes place. The imago is thought not to eat at all. The Hermit Beetle occurs in the hollow parts of standing living or dead broadleaf trees. If the tree falls to the ground, the beetle disappears within a few years.



The Hermit Beetle has a three-year life cycle consisting of the Egg, Larva, Pupa and Imago (adult) stages.

WHY IS THE HERMIT BEETLE THREATENED AND RARE?

There are two important factors that affect the survival of the Hermit Beetle. The first is the threat to its habitat in the form of overgrowth, fragmentation and the felling of hollow trees. The other is the limited ability of the Hermit Beetle to find new localities.

The Threats against the Hermit Beetle's Habitat

Compared with former times, we have at present only fractions of the numbers of old hollow trees that were once common in the countryside. Until the end of the eighteenth century the oak was protected. But when in the nineteenth century the felling of oaks on private land was permitted, their destruction became intensive in many places. It was almost only the landed gentry who preserved the oaks. This has led to the present situation when large distances separate areas with valuable oaks. It is therefore absolutely necessary to save all old and hollow trees and to increase their number. At most localities ten times the number of hollow trees are necessary.

Sometimes whole generations of oak with a high timber value are felled, leaving the old hollow trees without successors. This problem can be hard to overcome.

During the latter half of the twentieth century we have had a continuous overgrowth of the countryside caused mainly by reduced maintenance of pastures and meadows with trees. But even if society tries in different ways to do something to stop this deterioration, the effects will be marginal. Overgrowth causes great damage to the flora and fauna since many species that demand warmth in these latitudes are dependent on maximum sunshine in order to complete their life cycles.

The Spreading Ability of the Hermit Beetle

The Hermit Beetle belongs to the category of those species that occur in stable habitats and stay in the same place for a long time. This means that it often remains in the same tree throughout its life and seldom leaves to search for new areas. Though like many other beetles, it has the ability to fly it does not venture to fly long distances. Recent research has shown that the longest flight recorded was about 200 metres. This implies that the Hermit Beetle can only continue to inhabit an area for any length of time if there are several host trees close to each other.

Of the present Hermit Beetle localities it is estimated that only about 20-30% have populations that are large enough to be considered secure in the long run. This means that there must be enough oaks of all age groups to prevent a future generation gap.

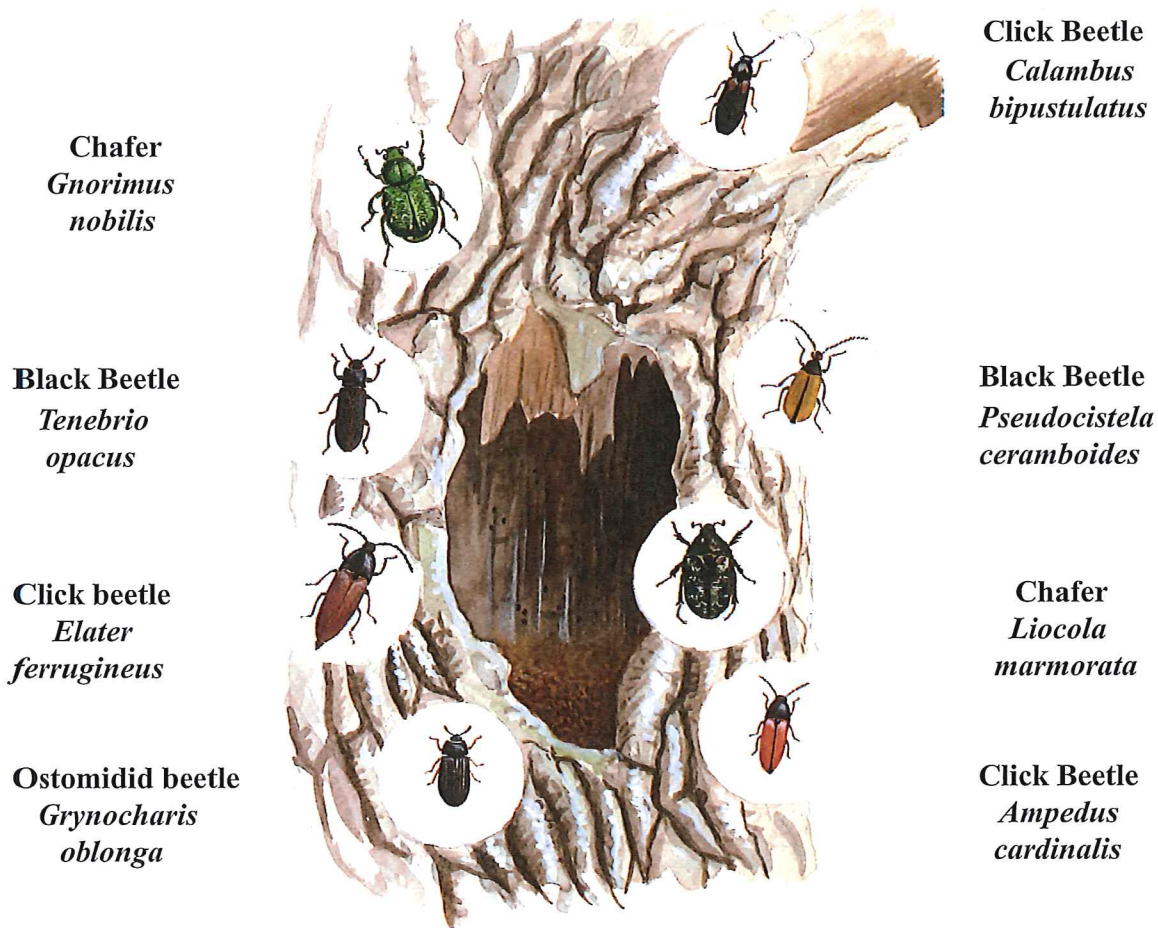
The conservation of the Hermit Beetle must in the first place aim both at improving the conditions where it is found at present and the conditions of the surrounding areas. This is where the landowner and the authorities must co-operate to increase the number of oaks and other hollow trees and make sure they continue to exist in the long term. This is also a bonus for the whole diversity of plants and animals that are dependent on old hollow trees.

THE HERMIT BEETLE AS AN INDICATOR FOR HABITATS RICH IN SPECIES

Pastures with old hollow oaks and other hollow trees are the richest habitats found in Sweden. Attempts have been made in countries such as England and Sweden to estimate how many species are bound to such trees. A conservative estimate suggests that at least 700 species of insects are bound to oak. If the parasitic wasps that are dependent on these insects are included then the figure will be doubled. Furthermore, there are large numbers of cryptogams, especially lichens and fungi, that live mainly on oak. Many of the flora and fauna that live on oak are so rare and threatened that they are on the Red Data list of threatened species in Sweden.

Apart from oak, the Hermit Beetle's habitat can also include hollow trees such as beech, ash and lime, etc. These provide habitats for a total of at least 200 red-listed species. The Hermit Beetle is clearly an excellent indicator for habitats especially worth protecting. It is therefore cost-effective to protect and conserve its habitats and at the same time prevent the extinction of many threatened species. The illustration shows a selection of threatened species that are dependent on hollow oaks and other hollow trees. Further examples of such species are given in the brochures, 'Ekjättar' and 'Eklandskapet' (in Swedish)

The Hermit Beetle is such a good indicator species because of its limited spreading ability. It occurs only where there have been plenty of hollow oaks for a long time. As it does not fly about much it seldom ends up in mediocre areas.



Chafer
Gnorimus nobilis

Click Beetle
Calambus bipustulatus

Black Beetle
Tenebrio opacus

Black Beetle
Pseudocistela ceramboides

Click beetle
Elater ferrugineus

Chafer
Liocola marmorata

Ostomidid beetle
Grynocharis oblonga

Click Beetle
Ampedus cardinalis

The illustration shows just a few examples of the very rich biodiversity that occurs in an old hollow tree.

When a group of hollow trees is examined less than half of the trees are shown to be inhabited by Hermit Beetles at a given time. This is why it is important for the constant presence of several hollow oaks among the trees, so that there is a constant supply of suitable trees.

SOME OF THE OAKLAND TREASURES WITH HERMIT BEETLES IN SWEDEN

Fortunately there are still relatively many valuable oak and broadleaf woodlands left round the estates of Southern Sweden. Furthermore all these areas are of great cultural value. The places mentioned below are therefore to be regarded only for their outstanding species-richness and precious biotopes.

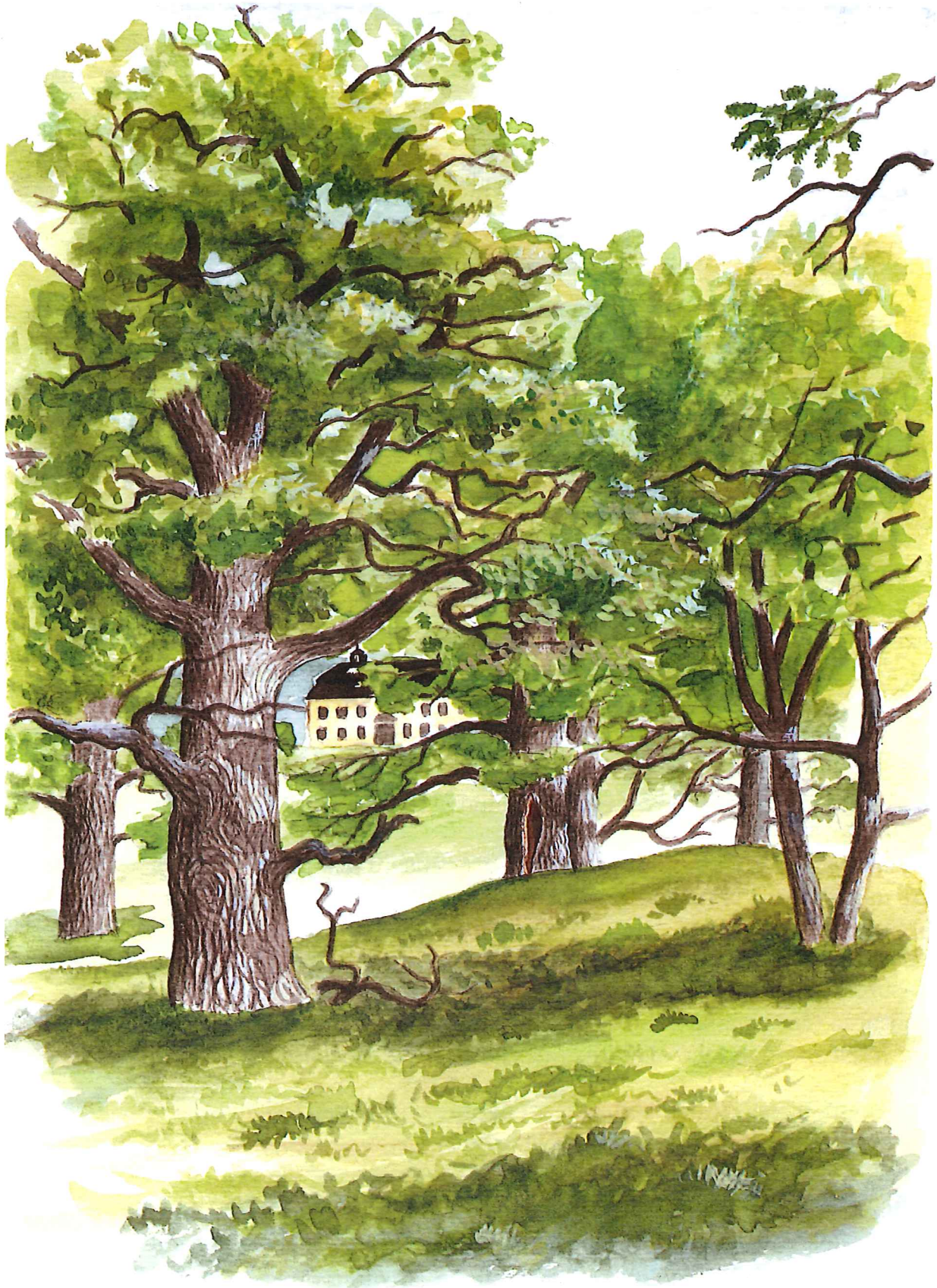
The area that is most worth a mention is The Oakland between Linköping and Åvidaberg in Östergötland. This area of 50 km² consists to a large extent of broadleaf woodland and pastures and is completely dominated by a number of large estates in an environment rich in lakes. Also in Östergötland, there are considerable areas with oaks in and around Norrköping, as well as round the large estates by the Slätbacken fjord and in the St. Anna archipelago.

Also very important among the Swedish oak woodlands is the area between Mönsterås and Nybro in the county of Kalmar. The entomologically well-known areas at Hornsö and Ålem have several oak-dependent beetles that are unique to Sweden and Northern Europe. The impressive oaks at Halltorp on Öland are also well known with their unique fauna. However, at Halltorp there are only a few really old oaks left and there is a large age gap down to the next generation, which can cause a considerable reduction in the amount of habitats in the future.

Down in the Southeast there is a considerable area of oak-rich country from Karlskrona in the east to Ronneby in the west. Along large parts of the coast of Blekinge, including the islands, the oaklands are continuous and of great value.

Around the lakes Mjörn and Sävelången in Västergötland there are also a number of estates that have preserved large areas of oak. Several of these lie so close together that some spreading and exchange between the localities can occur.

The most valuable oak lands within the northern limit of the distribution of oaks lie at Strömsholm, Tidö and Kungsör by the shores of Lake Mälaren in Västmanland. Apart from the large biodiversity, this is where there are certain warm-loving species that are unique to the country. This also applies to the oaklands in the Stockholm area. Though the Hermit Beetle is absent here, there are some other very rare species.



THE MANAGEMENT OF THE HABITAT OF THE HERMIT BEETLE

BASIC PRINCIPLES

Practically all overgrown woodland pastures and broadleaf woodlands with large trees ought to be cleared of scrub, thinned out and grazed. To what extent this should be done and how quickly is discussed on the following pages.

The presence of broad-crowned and thick limbed trees of such species as birch, oak, lime and ash in a stand of broadleaf trees indicates that these trees were previously free standing. Many of the flora and fauna that were dependent on the tree when it was free-standing disappear fairly quickly from the locality if it is not opened out again. If, however, the broadleaf woodland area has been overgrown for a long time, a swift clearance can be damaging. If such an area is to be opened out, it should be done in stages.

Another basic principle for all clearing/thinning is that most of the woody debris and timber is quickly dealt with and either burnt or transported away. If left, insects that live on fine woody debris will lay their eggs in it. When it is removed, a large part of the developing generation will be lost, thereby either eliminating or drastically reducing the populations of those insects in that area. However, some of the debris should be left in small heaps in a sunny place for at least 3-5 years, thereby helping weak populations of threatened species that inhabit broadleaf fine wood debris.

The fundamental aim for all conservation work is to ensure that those species that are most limited in their abilities to spread have food, refuge, as well as possibilities for breeding and overwintering.

Before measures are taken to combat overgrowth in a woodland pasture, it should be ensured that grazing animals are available. If that is not the case, it is better just to clear around the old large trees as an acute measure.

Sometimes a conflict can arise when old trees of another species hinder or overshadow the giant trees. In such cases a priority choice has to be made, but the decision must never be made to sacrifice one valuable tree at the expense of another. It is in any case very unusual for one tree to grow so close to another that they negatively affect each other. If the tree that overshadows/ competes is not too old and there are other similar trees in the area, then that tree should be felled or ring-barked without hesitation.

LAND THAT SHOULD NOT BE OPENED UP

With the present conditions concerning environmental grants from the EU in mind, it may be appropriate to describe those biotopes that are not suitable for clearing, thinning or grazing.

Groves with a flora sensitive to grazing sometimes have large trees and can be difficult to differentiate from overgrown woodland pastures. Such biotopes ought not to be opened to grazing. A grove habitat can be recognised by examining its ground flora and by noticing that the crowns of its older trees are somewhat elongated compared to the trees of overgrown woodland pastures.

Even woodland pastures that have not been managed for more than 50 years, or have only been slightly kept up for a long time, are

doubtful objects for clearing, thinning and grazing. In such cases different factors must be weighed up against each other. Is there a well-established grove flora? Does the area in question have very old woodland pasture trees and do light-dependent species occur on these trees? What are the chances for the land being grazed? These aspects are weighed against each other in consultation with an experienced biologist before decisions can be made as to what measures are to be taken.



PLAN FOR OAKS/LARGE TREES IN THE LANDSCAPE

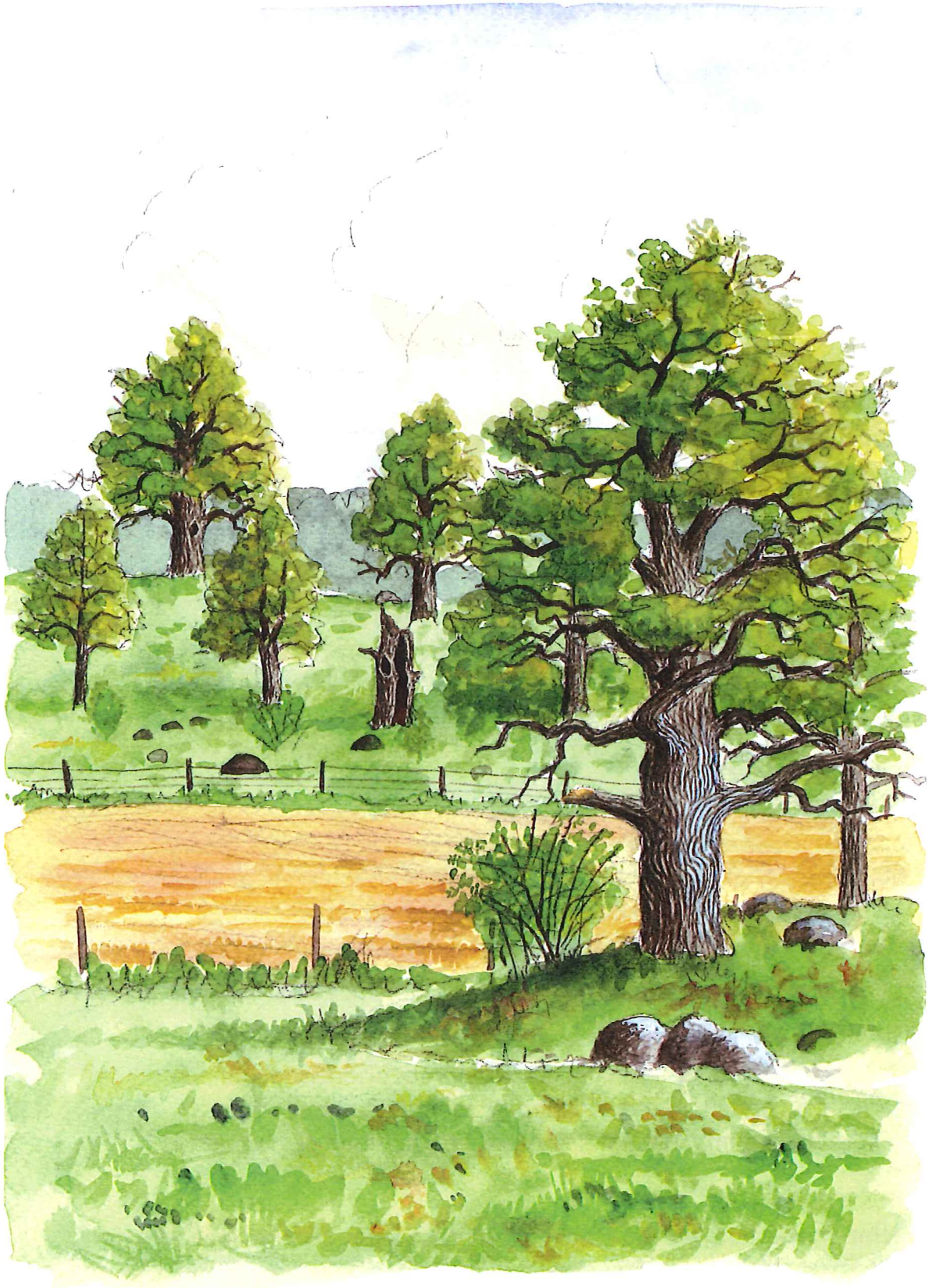
When working with trees, some of which reach several times a man's life span, great importance is placed on long-term planning. Responsible planning of a stand of trees in an area ought always to result in the presence of different generations of trees on the property. As far as oak is concerned the maximum generation gap can be 50-100 years, while for other species of trees the interval is usually shorter. It is however important to point out that not all these trees have to be on the same woodland pasture.

From a given point in a local oakland the aim ought to be to ensure that all oak copses and oak pastures are spaced by less than 200-300 metres. All the oaklands in the area ought to be included in landscape planning and in every section of the landscape there ought to be oaks of different generations/age categories. However, this does not mean that the landscape should just consist of densely placed woodland pastures. There must be a mixture of open, half-open and more dense parts in the landscape as a whole.

If we have decided that the goal for a certain area is to have a constant number of about 100 giant oaks, then there must be at least 200 trees of the next generation down, etc. This implies that very large numbers of small oak saplings are required to reach the final goal. Because, during a long period of time, all trees are constantly subjected to different kinds of stress factors, such as pollution, drought, freezing, fungi, insect attack, etc, a large excess is necessary to finally ensure the survival of 100 trees. Furthermore, the planning must include the felling of oaks to make the project financially worthwhile.

A special problem arises when there is a gap of one or several generations of oak in an area with oaks. If the problem is that the existing really old oak trees cannot be succeeded in 25-50 years then a premature ageing process of the younger trees ought to be considered. One way to do this is to introduce important fungi into the tree in question. At the same time this ought to be combined with preventing/delaying the death of the older oaks. In Sweden, however this method is still at the experimental stage.

In order for the conservation work to succeed this long-term planning must permeate the whole community. It is not only the landowner who plays a decisive roll in this issue. All, from the private summer cottage owner and cemetery administration, to the municipality and large land bailiffs ought to try to include this way of thinking in their planning.



It is important to plan the conservation of a stand of oaks in a landscape perspective. Trees of the same age lead to shortages in the future.

OVERGROWN OAK PASTURES - BROADLEAF WOODLAND PASTURES

Depending on how much overgrowth has taken place, clearing and thinning should be carried out in several stages. In woodland pastures that have not been maintained for more than 50 years, perhaps instead of only clearing around giant trees, striving to achieve a woodland pasture might be considered, if grazing animals are available. The alternative is to clear around the giant trees and let the area grow without interference. See also pp. 23-24.

Woodland pastures that have not been kept up for 20-50 years should be cleared and thinned in stages, beginning with clearing the giant trees and admitting grazing animals. This is followed by clearing/thinning at least once during 3-5 years.

Woodland pastures that have not been kept up during the last 1-20 years can usually be opened up in one go. All clearing and thinning is then done at the same time, but sometimes a little 'trimming' is necessary after 2-4 years. Grazing is started during the season after clearing. Heavy grazing is important the year after clearing in order to keep vigorous re-growth under control. Grazing during the season before clearing is also excellent if the measures are carried out during the winter months. This gives the grazing animals a start, which facilitates keeping down the coming brushwood re-growth.

The ultimate aim is a sparse oak pasture with old oaks, together with plenty of younger trees, representing successive generations with intervals of about 100 years. Between the trees there should also be some flowering bushes such as hawthorn, rose bushes and sloe. These aims are achievable in the somewhat larger woodland pastures without the trees and bushes becoming too dense.

In small woodland pastures (<2-3 ha) the older trees are prioritised and replacement trees are planted with the landscape in mind. Younger trees must be present in the vicinity, but not necessarily in the same pasture as the giant trees.

The above recommendations are illustrated on the next page. The left side of the upper illustration shows a recently overgrown woodland pasture, while the right side shows more advanced overgrowth. The final aim in both cases is illustrated in the lower.



The upper illustration shows an oak pasture before, and the lower after, clearing and thinning measures. Don't forget to save the dead wood and flowering bushes.

PARKS, CEMETERIES, GARDENS AND AVENUES

Today there are certain areas where the Hermit Beetle is only to be found in parks and avenues.

Even if they are found in parks, cemeteries, gardens and avenues it is most important to ensure that the trees are free-standing and that there is a succession of ages of the trees in the stand, so that no generation gaps occur in the future.

When there are old oaks in the vicinity it is possible for lime, ash, beech and elm to become the host trees for the Hermit Beetle and they have even been found in other species of broadleaf trees in cultivated environments.

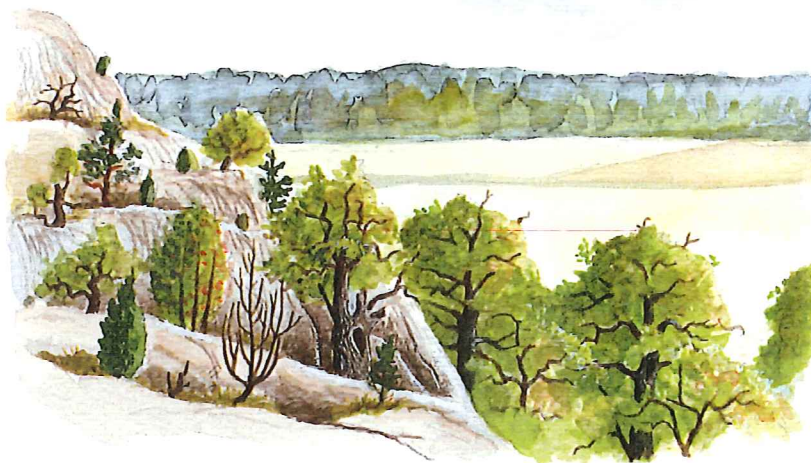
If the host trees happen to be lime and ash, the possibility of re-pollarding trees that have previously been pollarded must be considered. Within certain limits, these trees are best at tolerating pollarding. But trees that have not been pollarded for over 50 years may be too sensitive for such treatment and die. In such cases an expert should be consulted.

It is important to remember that it is often the oldest trees that are the most valuable in providing habitats and it is not always possible to manage such habitats only from aesthetic or cultural aspects. If the oldest trees are felled, it is always done at the risk of eliminating a number of threatened species from the area. A better solution would then be to remove branches, which can improve aesthetics without risking the tree's habitat value.

It is a common conception that biodiversity is only found in undisturbed natural areas and the main aims for the care of old trees at farms and built-up areas ought to be aesthetic and cultural. However, the impoverishment of natural areas of old trees has led to every old tree, wherever it grows, to constituting an important part of biodiversity. We are all responsible for the preservation of that diversity.



The parks round large estates and mansions provide important habitats for many threatened flora and fauna. The upper illustration before and the lower after management.



Often only the lower part of a rocky slope needs management.

ROCKY SLOPES WITH OAK AND OTHER BROADLEAF TREES

Sometimes the Hermit Beetle occurs in oaks and other broadleaf trees that grow on rocky slopes. This is where management must be adapted according to the conditions. If the host tree is heavily shaded, bushes and trees must be removed to allow it to be more exposed.

It is often the case, however, that this biotope is so dry and poor that overgrowth hardly becomes a problem. This normally means that active management is not necessary. Nevertheless, as the lower slopes are often less steep and more fertile, overgrowth can be more vigorous, as shown in the above illustration.

As with other environments, it is important to ensure that no generation gap arises in the tree succession. There must be trees to represent all the 50 -100 year intervals within the area. It is also important to remember that steep rocky slopes with broadleaf trees provide very important habitats for threatened flora and fauna, irrespective of whether the Hermit beetle occurs or not. Rocky slopes do not provide the conditions for trees to grow as large. Though the Hermit Beetle does not necessarily prefer large trees, the amount of suitable trees on rocky slopes is very limited. This implies that every tree is even more valuable.

A type of habitat that has covered fairly large areas of Southern Sweden is combined oak and pine forest that is often bound to bare rock. Old undisturbed forests of this type provide very valuable natural habitats and may have provided the original biotopes for some of the flora and fauna of oak pastures.

OUTLYING FORESTS WITH BEECH AND OAK

It is difficult to say whether outlying forests with old hollow beeches and oaks have been a common habitat and whether the Hermit Beetle was plentiful there. Whatever the case, areas that look like overgrown outlying forests still exist, Hallands Väderö being an example.

The aim in managing such biotopes is not to create an open woodland pasture with large hollow trees. Instead it is a question of achieving an open forest with glades and verges that have old hollow trees. The first step is to clear around the oldest trees, fence in the area and introduce grazing animals. The existing glades and those that seem to have recently appeared are then enlarged. If there already are 100-200 year-old trees in these glades, so much the better. If not, trees of that age group should also be cleared so that there are at least as many, if not twice as many trees in the next generation down from the old trees.

The area should be grazed so hard that immediate overgrowth of the glades does not take place, but it is also important to allow the growth of the occasional oak sapling. Like other biotopes, flowering bushes and trees must be present here and there in sunny glades that act like meeting and feeding places for insects among other things. Hawthorn is the most important in this context.

Several of the grazed forests that we have today are either relatively recently used for grazing or have not been grazed for a very long time. Very mature grazed outlying forests are very rare phenomena nowadays. Characteristically, these forests are open with trees of different ages, many

of which are broadleaf trees. Glades are found here and there. The trees and bushes show clear browsing levels and the ground vegetation is characteristic of woodland pastures.



Outlying forests or those that have been grazed for a long time are rare phenomena in Sweden nowadays. Those few that are left must be maintained and managed in the right way. The upper illustration shows before and the lower after management.

Grazed outlying forests are perhaps the type of natural environment that has reduced most drastically. About 100 years ago they were perhaps a fairly common part of the landscape, but can now be considered to be nearly eradicated. All remaining forests of this type have an especially high preservation merit.

TWIGS, BRANCHES AND PRUNING

There are conflicting views as to whether dead twigs and branches should or should not be removed from old trees. Different starting points cause these differences of opinion. But generally speaking, it is better to leave alone than cut away especially when dead branches are important to woodpeckers.

If there is a shortage of fine woody debris in the area, it is of course more important to leave dead twigs and branches, even if there is plenty of coarse woody debris. The closer giant trees are to each other, the more important it is to prune the branches in order to let light fall on the trunks.

Whether to pollard oaks or not has been a topic for discussion for many years in Sweden. However, nowadays most people are beginning to agree that if a tree has managed to reach a great age it must have gone through some form of crown thinning. Most likely the thick branches that grew upwards at an angle have been removed to reduce cracking. It is also likely that such a measure, carried out long ago, was equivalent to what we now call pollarding. The fact that it was done to protect the timber is another story. It is still not clear if such speculation applies to oak.

What is to be done with the debris and wood after thinning/clearing? This topic is also dealt with on page 14. Commercial timber is of course dealt with in the usual way, to be sold, even if some thick dead branches should always be left lying on the ground. Some thick logs should also be left in every area. In order to meet the need for dead fine woody debris, 10 % of it together with coarse woody debris are saved and placed in small heaps in sunny locations. The rest of the debris and brushwood is either burned on site or left in heaps to be collected for chipping. The heaps must either be dealt with immediately or left for 2-3 years to avoid them becoming traps attracting beetles to lay all their eggs that are then destroyed.



The debris from clearing must either be taken away directly or left for at least two years. Leaving it to lie about for only one year has a negative effect on the insect fauna. If the brushwood is taken away, it is always important to leave small heaps behind.

FURTHER READING

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Ranius, T. & Nilsson, S.G. 1997. Habitat of *Osmoderma eremita* Scop. (Coleoptera: Scarabaeidae), a beetle living in hollow trees. *Journal of Insect Conservation* 1:193-204.

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This publication deals with the Hermit Beetle and how its habitat of old large oaks and other broadleaf trees is to be managed.

In the European nature conservation work the Hermit Beetle has been prioritized in the EU directive on the conservation of habitats and wild animals and plants (the habitat directive) and the establishment of the European network of protected natural areas, Natura 2000.

The publication has been produced within the framework of a project the aim of which is to protect the Hermit Beetle and its habitats. The project is financed from the EU Life Nature Fund and the Swedish Environmental Protection Agency. It includes conservation, management and information concerning 45 areas that have suitable habitats for the Hermit Beetle in southern Sweden.

It is the hope of the Swedish Environmental Protection Agency that this publication will increase knowledge and contribute to a real investment on what is perhaps our most species-rich type of habitat.



The European Commission has produced a brochure with the title "Natura 2000 - we manage our natural inheritance", with information on how to build up a network of protected natural areas within the framework of Natura 2000. The brochure can be ordered free of charge from the European Commission, TRMF 02/04.200 rue de la loi, B-1049 Brussels, Belgium. Fax: 00932-2-296-95-56 or via the Commission's home page: <http://Europa.eu.int/en/comm/dg11/dg11home.html>.