

Metsähallitus

Management plan for the habitats of Boros schneideri

Laaksonen Mervi
16.3.2021



Funding for producing this material has been received from the European Union's LIFE programme. The content of the material reflects the views of its authors and the European Commission cannot be held responsible for any use which may be made of the information contained in it.

Management plan for the habitats of *Boros schneideri*

Ecology and distribution



Description

Boros schneideri (Panzer, 1796), is a dark brown beetle 11 to 14 mm in length. Its larvae are large and reach the length of 17 to 28 mm. The larvae are flattened in shape and pale in colour. The body of the larva characteristically becomes wider towards the back. The chitinised terminal appendices in the end segment give its rear end the shape of a crown. The larvae may be confused with the larvae of other fairly large beetles that have flat bodies and that live in decaying wood, including the genera *Pytho*, *Schizotus* and *Cucujus*.

Life cycle

An adult *B. schneideri* female lays her eggs under the bark of pine snags in spring (Ilmonen et al. 2001). The species may also live on trunks lying on the ground, especially if a snag has fallen down or its top part has snapped (Gutowski et al. 2014). Larval development takes at least two years. The adults appear out of their chrysalises in the autumn and reproduce after overwintering (Blažytė-Čereškienė et al. 2012). Most observations of the species concern larvae, and the adults are rarely seen in the forest.

Nutrition

Boros schneideri larvae are believed to feed on fungi living under the bark of dead trees. It has been suggested that these fungi include *Ophiostoma minus*, *O. pini* and *Aureobasidium* (Tikkamäki 2007, Gutowski et al. 2014). However, there is no verified evidence of this. In experiments, many larvae living on decaying wood have also been found to feed on other larvae. It is likely that this also occurs in the wild as, in order to grow, the larvae need other trace elements besides those that are naturally readily available in the wood. The adult beetle may be a predator (Gutowski et al. 2014).

Habitats

Boros schneideri lives on pine snags in forests with a reliable continuum of decaying wood. While the species favours sturdy trees, individual larvae may also be found on smaller trunks with a diameter of 10 to 20 cm (Blažytė-Čereškienė et al. 2012, Gutowski et al. 2014). *B. schneideri* larvae have mainly been found on trunks where the bark is loosely attached and partly fallen off (Tikkamäki 2007, Blažytė-Čereškienė et al. 2012, Gutowski et al. 2014). Rather than recently dead or damaged live trees, they prefer trees that have died more than a year ago.

The species appears to do less well on decaying trees that are in shade for a large part of the day (Blažytė-Čereškienė et al. 2012). It is possible that an excessively shady site slows down the larval development in the north, as the growing season is slightly shorter on them than on light-filled sites. A cooler microclimate may also slow down their metabolism. On the other hand, a light and sun-lit site is not ideal for the species, at least not in the southern areas of the range, as the larvae look for shade on the northern side of the trunk or avoid trunks on sunny edges (Gutowski et al. 2014).

In addition to pine trees (*Pinus sylvestris*), *B. schneideri* larvae have been found on the following tree species in the deciduous tree zone: oak (*Quercus robur*), spruce (*Picea abies*), black alder (*Alnus glutinosa*), silver birch (*Betula pendula*), ash (*Fraxinus excelsior*), silver fir (*Abies alba*) and European larch (*Larix decidua*) (Buchholz et al. 2012, Gutowski et al. 2014). However, the species favours pine trees also in the deciduous forest zone and primarily lives in conifer-dominated and mixed conifer forests. In the eastern part of the boreal zone, it also lives on other species of the genus *Pinus*, including the Swiss pine.

B. schneideri is mostly described as a relict species of natural forests (Gutowski et al. 2014). In Finland, it has been found in natural forests and those in which large pines and a continuum of decaying wood have been preserved, as well as in fellings in the vicinity of such areas on retention pine trees that have later died. The species has also been found in Lithuania on so-called biodiversity trees spared in a felling (Blažytė-Čereškienė et al. 2012). In Finland, sites where *B. schneideri* has been observed on commercial forestry land are located in the vicinity of protected areas in which the species occurs, and some observations have been made in forests after a fire.

Consequently, the temporal and spatial connectivity of suitable host trees is more essential to *B. schneideri* occurrence than the age of the forest. The species may live in a forest where trees have been or are being harvested, provided that snags are continuously available in the forest and in its vicinity, and more pine trees continuously die standing up. If few pines die or trees about to die are removed efficiently, the distance between suitable snags grows longer. When the average distance between trees suitable for *B. schneideri* exceeds the threshold value, the species disappears from the area. Apparently, this is what has happened in large parts of Southern and Western Finland.

Distribution and status

Boros schneideri is a rare species and its numbers are low, even in old-growth forests. It is the only species of its family (Boridae) found in Eurasia. The entire family only comprises four species.

B. schneideri is a palearctic species of the deciduous and coniferous zones whose range is presumed to have once included the entire country south of the Arctic Circle. It has later disappeared in most parts of Southern Finland. A few observations have been made in the 2000s in Pirkanmaa and Central Finland. Most of the known occurrences are found close to the eastern border in an area stretching from Ilomantsi to Kuusamo.

B. schneideri is found in central and eastern Europe (Czech Republic, Slovakia, Poland, Germany) all the way to eastern Siberia in Russia. Observations have also been made in Mongolia and China (GBIF Secretariat 2019). In Finland's neighbouring areas, the species is found in Sweden, Estonia, Latvia and Lithuania. In Slovakia it has been found in beech forests on the mountains, where it is extremely rare (Štátna ochrana prírody SR 2021).

B. schneideri is classified as vulnerable in Finland. Factors believed to put the species at risk include a decline in the volume of decaying wood and old heath forests as well as the reduced number of burned sites and other early succession sites.

Administrative status and legislation

EU Habitats Directive Annex II.

Protected under the Finnish Nature Conservation Act. (Nature Conservation Decree 160/1997, Annex 2a 471/2013)

Endangered and under strict protection (Nature Conservation Decree 160/1997, Annex 4 471/2013)

Red List category in 2019: vulnerable (VU)

Habitat management in protected areas

Distribution in protected areas

A temporal and geographical continuum of pine snags is the key to habitat management. In practice, this is mainly realised in old pine-dominated and mixed pine forests where pine snags are created as a result of self-thinning, by different natural disturbances, in connection with diseases or insect damage, and when old trees die.

B. schneideri is known to occur on the following Natura 2000 sites:

Pirkanmaa: Seitsemien (Seitsemien National Park) and Petäjäjärvi,

Central Finland: Pyhä-Häkki area (Pyhä-Häkki National Park),

North Karelia: Koitajoki area (Koivusuo Nature Reserve), Pönttövaara-Pahkavaara, Ruunaa, Patvinsuo (Patvinsuo National Park) and Jäkäläkangas,

Kainuu: Elimyssalo area and Malahvia,

Lapland: Pisavaara (Pisavaara Nature Reserve).

The national parks contained in Natura sites are given in brackets. For more information on Natura sites, visit the Finnish Environment Institute's map services (Finnish Environment Institute 2018). The following sections describe the distribution of *B. schneideri* by regional units of Parks & Wildlife Finland.

Lake Region

The southernmost recent observations of *B. schneideri* were made in Petäjäjärvi and Seitsemien in Ylöjärvi and Ikaalinen. They date back to the 1990s, with follow-up visits made in the 2010s. Old pine forests with thick-barked pines where pines are being replaced by spruces are found on the observation sites. In Seitsemien, there are mesic and sub-xeric heath pine forests of varying ages on moraine ridges as well as esker forests. Representative natural forests are only found in places. In Petäjäjärvi, the surface area of which is over 200 hectares, the forests are mainly well-preserved and natural mixed pine forests.

In Pyhä-Häkki area, the species has been known since the late 1980s. The most recent observation saved to LajiGIS, Metsähallitus' species database, dates back to 2004. The forests in Pyhä-Häkki National Park are excellent natural boreal climax forests with thick-barked old pines and plenty of decaying wood. The westernmost parts of Pyhä-Häkki contain younger pine forests of varying ages.

In North Karelia, *B. schneideri* has been found in Lieksa and Ilomantsi. The southernmost occurrence is located on the Natura site of Koitajoki. The species is found both in Koivujoki Nature

Reserve and in the more southerly parts of the area around Koitajoki. Excentric raised bogs and their islands of heath forests, which mainly consist of pine and mixed pine forest, are characteristic of the area. The occurrence of the species was verified in 2016. On its excursions to Koivusuo Nature Reserve, the beetle working group additionally found the species on two sites outside the protected area in 2002. The other observation site is on lands managed by Metsähallitus, which are protected by landscape ecological means.

In Patvinsuo and Ruunaa, *B. schneideri* was inventoried in 2007 as part of forest restoration and monitoring carried out in the Forest LIFE project (Tikkamäki 2007). The restoration measures aimed for increasing the volume of decaying wood by ring-barking trees. The Natura site of Mujejärvi was also inventoried at the same time, however without finding the species. Since that time, the occurrence of the species has not been monitored in Patvinsuo. The latest individual observation was made in 2008. Characteristics of Patvinsuo area include large mires as well as sub-xeric heath pine forests on soils of gravel and sandy till. In places, there also are sorted soils deposited by ice and water.

The earliest information on the species in Ruunaa saved to the LajiGIS database is from 1998, after which it was found on 17 trunks in an inventory of Tikkamäki. Since then, no observations have been saved from this area. Especially to the north and northeast of Ruunaanjärvi, there are natural old-growth pine forests on coarse moraine soils.

The Natura site of Jäkäläkangas in the area between Ruunaa and Patvinsuo was protected and left to develop naturally after an extensive forest fire. In 1992, 143 hectares of forest and fens burned near the village of Kitsi. *B. schneideri* has been found in the area in studies conducted after the fire (observations recorded in 1998–2008).

In the vicinity of Ruunaa and Jäkäläkangas, observations were also made in state-owned multiple-use forests in the early years of the 2000s, for example on sites of a forest fire study conducted by Joensuu University, or the current University of Eastern Finland. On these sites, a varying number of retention trees were spared in fellings and burned later. Observations outside protected areas have also been made in the vicinity of the Natura sites Ukonsärkkä old-growth forests and Suolaminvaara-Tervasuo. The species is also found in the forest reserve of Ukonsärkkä area.

In Pönttövaara-Pahkavaara in Ilomantsi, the beetle was found in 1975. The occurrence of the species in this area has not been verified since the 1970s. Especially in Pönttövaara area, there are old-growth pine forests.

Ostrobothnia–Kainuu

On its excursions, the beetle working group found the *B. schneideri* beetle in Elimyssalo area of Kuhmo. Elimyssalo is a mosaic of different mires and heath forests. The protected area mainly contains spruce and mixed pine forests which were used for slash-and-burn farming in the past, as well as for obtaining timber needed on wilderness farms. The number of thick-barked ancient pines

is relatively low, and the largest quantities are found further away from the old holdings. While there are no purely pine-dominated forests, there are plenty of wooded mires on the edges of aapa mires. Suitable habitat for the species is found in pine and mixed spruce forests and the natural pine mires of the area.

A viable population of *B. schneideri* lives in Malahvia in Suomussalmi, where natural old-growth pine forests have been well preserved as an extensive whole. There are also pine forests in this area that have been managed by selection cutting or, before they were protected, also by thinning. The area presents a continuum of dead pines and pine snags. The species was found in 1999, and the most recent observation dates back to 2020. Outside Malahvia nature reserve, the species was observed on a prescribed burning site of a felling compartment from where, however, the species has already disappeared.

In Kuusamo, the species occurs on private land outside the protected area near Oulanka. The existence of this occurrence was confirmed in 2019. The species is also likely to occur on the Natura site of Oulanka, which contains large areas of representative boreal natural forests on different site types.

Lapland

The only known *B. schneideri* occurrence in Lapland was found in Pisavaara Nature Reserve in Rovaniemi by Håkan Lindberg in 1951. In Pisavaara, there are pine forests aged over 200 years with plenty of decaying wood as well as different mixed forests. Pisavaara is one of the best-preserved natural areas in Peräpohjola.

Monitoring and habitat management

B. schneideri depends on pine snags. The species lives in old-growth forests where plenty of decaying wood is available, and more is being created continuously. No population viability analyses have been produced that would determine the viability of *B. schneideri* populations as part of the protected area network over the long term. Climate change is not expected to be a threat to Habitats directive beetles living on decaying wood (Pöyry and Aapala 2020).

The species can also be found in commercial forests with suitable host trees and a source population nearby. A managed commercial forest contains little or no decaying wood, the cultivated trees are healthy and of an even age, and they grow a certain distance apart, which means that natural mortality is low. Large numbers of dead trees appear as a result of various disasters, including forest fires. Retention trees offer temporary habitats for *B. schneideri*. Habitats may also be created when seed trees are not harvested in a naturally regenerated compartment, on different small-scale ecological sites, or in unmanaged forests on low-productivity lands.

Retention tree groups also significantly improve the ecological quality of commercial forests. The tree groups should be permanent and, whenever possible, they should cover larger areas than

recommended. Decaying wood in commercial forests supports the connectivity of populations in protected areas.

B. schneideri may occur in forests managed by restoration burning in protected areas, as they provide pine snags, the resource this species needs. While it is not an actual pyrophile, it obviously benefits from forest fires both soon after the fire and over the long term as fire-damaged trees gradually die. Some of the *B. schneideri* occurrences in protected areas are located on fire continuum sites (Hyvärinen and Aapala 2009).

In Seitsemien area, for example, restoration burning has been carried out regularly since 1997. There is also a regular fire continuum in Helvetinjärvi, which is located only 20 km from Seitsemien. Helvetinjärvi area has potential for the species.

Practically all *B. schneideri* occurrences in Ilomantsi and Lieksa are found on Patvinsuo fire continuum site. In addition to Patvinsuo, Ruunaa and Koitajoki area are also part of the actual fire continuum site, but prescribed burning has also been carried out in Pahkavaara-Pönttövaara and the Natura site of old-growth forests on the eastern boundary of Lieksa, for instance.

In the Parks & Wildlife Finland region of Ostrobothnia-Kainuu, all occurrences are found on fire continuum sites. In the vicinity of Pisavaara, the fairly large mire areas of Kilsiaapa-Ristivuoma and Mustiaapa-Kaattasjärvi belong to a fire continuum site. Louevaara old-growth forest is also nearby.

Pine forests in mesic and sub-xeric heath forests become overgrown with spruces over time, providing fewer and fewer trees suitable for *B. schneideri*. This development progresses faster in regions where the growing season is longer. In natural conditions, forest fires that recurred at reasonable intervals maintained pine-dominated forests. Consequently, forest fires also benefit *B. schneideri* indirectly.

The benefits of producing more decaying wood for the species are not known. Potentially, ring-barking pines may promote resin development and influence the later succession of species. The species does not benefit from mechanically produced decaying wood as it lives on snags. In protected areas, prescribed burning of old commercial forests with little decaying wood is a better option for producing more decaying wood and triggering natural development of forest structure in areas close to known occurrences of *B. schneideri*.

In larger protected areas and more connected networks of protected areas, management measures are not necessary. In pine-dominated areas where natural processes produce decaying wood, no measures to promote the species are needed in protected areas. In the vicinity of smaller protected areas, improving the quality of the surrounding landscape is vital. Merely preserving dead trees in final fellings and fairly large, permanent retention tree groups improve the quality of commercial forests for many species. Individual trees can also be spared as permanent retention trees.

In some protected areas, the data on *B. schneideri* occurrences are quite old, and monitoring visits would be needed to verify the occurrence. The species should also be searched for in new protected areas. In Kainuu and Koillismaa close by the eastern border, for example, there are protected areas where occurrences of this species are possible judging by the forest structure, even if it has not yet been found there. The species is protected, which means that a derogation from the protection regulations is always needed for seeking it in the vicinity of known occurrences. Trees suitable for the species must always be examined judiciously and with as light a touch as possible, as detaching the bark destroys the beetles' habitat. The search on the site must be called off immediately if the species is observed on it, or its occurrence is suspected.

Recommendations for habitat management in protected areas

- Verifying occurrences in areas where the observations date back more than 20 years.
- Looking for the species more extensively in protected areas that have occurrences in their vicinity. New occurrences can also be sought in areas where the species has not yet been found. It would make sense to focus the search on areas where a continuum of dead pines has been preserved.
- Restoration burning can help increase the volume of decaying wood, in addition to which it triggers a more natural succession in previously managed forests. In the surroundings of old-growth forests, new habitats can be created from previously managed forests by prescribed burning.
- No management measures for *B. schneideri* are needed in large protected areas with pine forests on well-drained soils if new decaying wood can be clearly seen to form, in other words if they are natural forests, regeneration-age commercial forests, or commercial forests which have not been thinned out substantially.

Consideration for the species in forest management and safeguarding its habitats by ecological management

Boros schneideri lives on dead pines, and it does not harm live trees. Outside protected areas, measures that support its occurrence include retaining trees suitable for the species and promoting structural features of the forests that, over the long term, will create new habitat islands. There are plenty of pine forests in Finland, and the pine has been a popular tree for cultivation because of its many uses and economic value. Consequently, good possibilities exist for significant improvement of the quality and quantity of habitat at landscape level.

The party that owns or controls the forest does not necessarily have to take any measures to promote the species in forest management. The species also benefits from doing nothing. Dead trees can be left in the forest to provide habitats for saproxylic species in all stages of the forest cycle, also in uneven-age forestry.

Recommendations for habitat management on lands used for commercial forestry

- Saving pine snags (diameter at breast height > 15 cm) in regeneration fellings and thinnings. The pines to be preserved can be recently dead (red or yellow-brown needles) or dead for more than a year. However, they should retain their bark in order to benefit *B. schneideri*. Preserving bark-free dead trees benefits other species, however, and is highly recommended for this reason.
- Preserving relatively sturdy (diameter >20 cm) pines in retention tree groups/as individual retention trees to produce decaying wood at a later stage. Preserving retention trees is also recommended in fellings carried out as part of uneven-age forest management.
- The locations of retention tree groups can already be planned in earlier forest management stages (initial thinning, intermediate fellings etc.)
- Prescribed burning of retention tree groups that contain sturdy pines.

Acknowledgements

The management plan was commented on in its various stages by Pekka Vesterinen and Ville Vuorio from Metsähallitus Parks & Wildlife Finland. For the part of forest management measures, the recommendations were commented on by Riitta Raatikainen and Matti Välimäki from the Finnish Forest Centre and Maarit Kaukonen from Metsähallitus. We would like to thank Senior Ministerial Adviser Esko Hyvärinen from the Ministry of the Environment for commenting on the final version.

Sources

Blažytė-Čereškienė, L. & Karalius, V. 2012. Habitat requirements of the endangered beetle *Boros schneideri* (Panzer, 1796)(Coleoptera: Boridae). *Insect Conservation and Diversity*, 5(3), 186-191.

Buchholz L., Olbrycht T. & Melke A. 2012. Występowanie *Boros schneideri* (PANZER, 1796) (Coleoptera: Boridae) w południowo-wschodniej Polsce. *Wiadomości Entomologiczne*, 31: 207–209.

Chobot, K. 2005. Preparation of pSCIs for insect species. *Ochrana Průrody*, 60 (10), 294–297.

Gutowski, J. M., Sućko, K., Zub, K. & Bohdan, A. 2014. Habitat preferences of *Boros schneideri* (Coleoptera: Boridae) in the natural tree stands of the Białowieża forest. *Journal of Insect Science*, 14(1), 276.

Hyvärinen, E. & Aapala Kaisu (eds.) 2009. Metsien ja soiden ennallistamisen sekä harjumetsien paahdeympäristöjen hoidon seurantaohje. Metsähallituksen luonnonsuojelujulkaisuja, Sarja B 118.

Ilmonen, J., Rytteri, T. & Alanen, A. 2001. Luontodirektiivin kasvit ja selkärangattomat eläimet. Suomen Natura 2000-ehdotuksen luonnontieteellinen arviointi. Suomen ympäristö 510, Finnish Environment Institute, Helsinki.

Pöyry, J. & Aapala, K. (eds.) 2020. Lajit ja luontotyytit muuttuvassa ilmastossa. Reports of the Finnish Environment Institute 2/2020.

Tikkamäki, T. 2007. Lahkokapon (*Boros schneideri*) esiintyminen ja seuranta Ruunaan, Patvinsuon ja Mujejärven Natura 2000 -alueilla. Metsähallitus Parks & Wildlife Finland.

Online sources:

GBIF Secretariat 2019. *Boros schneideri* (Panzer, 1795), GBIF Backbone Taxonomy. Checklist dataset <https://doi.org/10.15468/39omei>. Referred to on 20 January 2020.

Štátna ochrana prírody SR 2021. Popis druhu, *Boros schneideri*. <http://www.sopsr.sk/natura/index.php?p=4&sec=7&druh=10> Referred to on 16 March 2021.

Finnish Environment Institute 2018. Finnish Environment Institute's map service. <https://syke.maps.arcgis.com/apps/webappviewer/index.html?id=831ac3d0ac444b78baf0eb1b68076e1a> Referred to on 18 March 2021.