

Metsähallitus

Management plan for the habitats of Pytho kolwensis

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Ecology and distribution



Description

Pytho kolwensis (Sahlberg 1833) is a black, relatively large beetle. A fully grown individual is 11 to 18 mm in length. With its long legs and antennae, it to some extent resembles ground beetles. It has two clear depressions in its pronotum, and its body becomes broader towards the rear. The elytra have longitudinal grooves.

P. kolwensis larvae are flattish and large, up to 3 cm long when fully grown. The larvae have three pairs of visible legs. They are grey-brown in colour, which distinguishes them from the larvae of other beetles in the *Pytho* genus. The larvae of *P. depressus* and *P. abieticola* are similar in shape but light in colour. The key identifying signs, however, can be found in the chitin spines of the last segment. A magnifying glass is needed to see them, especially in smaller larvae. There are also differences in the behaviour of the larvae: *P. kolwensis* larvae are the most active of the three. All three species can be found on fallen spruces.

P. kolwensis larvae feed on the partly decomposed phloem layer. Large larvae produce darkish brown, often moist frass in channels of approx. one centimetre in width under the bark (Pettersson 2014). The larvae do not bore into the wood when feeding, which is why signs of them disappear when the frass layer shakes off.

Life cycle

Pytho kolwensis beetles overwinter under spruce bark and mate as they emerge in late May or early June. The males die soon after mating, and the females die once they have laid their eggs (Pettersson 2014). The females lay the eggs in tunnels made by bark beetles on spruce logs lying on the ground (Mattila 2017). After hatching the larvae go through a number of stages. The larval stages usually last at minimum 5 years (Pettersson 2014).

Fully grown larvae pupate under the bark in late July or early August. The pupation takes two or three weeks, after which an adult beetle crawls out. It carries a nutrition reserve for hardening its elytra and overwintering in its enlarged abdomen. A newly hatched adult spends the winter under the bark.

Nutrition

Pytho kolwensis is a secondary phloem feeder. This means that the larvae feed on the phloem and cambium layers of the tree, which primary phloem eaters have already gnawed. Primary phloem feeders include bark beetles, which attack recently dead trees. While feeding, bark beetle larvae bore tunnels in the phloem and cambium layers, and the bark is loosened from the tree trunk. This allows larger insects access to underneath the bark.

Habitats

Pytho kolwensis lives on spruces logs. Suitable habitats include spruces that have been dead for three or four years and felled by a storm or the snow load. Small larvae may also be found on the trunks of trees that died two years previously (Siitonen and Saaristo 2001). The tree may have fallen with a root plate or broken at the butt, and its trunk is at least partly supported by the shapes of the terrain or suspended on the branches. The species is rarely found on the trunks of trees that die upright and later fall down. The best trees for *P. kolwensis* have sturdy trunks with a diameter at breast height of over 25 cm, but the species also occurs on trunks with a smaller diameter.

P. kolwensis appears to lay its eggs particularly on trees with feeding patterns of *Hylurgops glabratus*. *Ips typographus* lives on similar trunks, but trees colonised by this species lose their bark sooner. The occurrence of *H. glabratus* also affects the composition of the phloem and cambium layers (Pettersson 2014). The species that lived on the trunk earlier, including insects and fungi, may consequently influence the suitability of the trunks.

One spruce trunk remains suitable for the *P. kolwensis* for approx. 10 years, but it has been suspected that on average, only a single generation lives on the same trunk. Larvae of different sizes may only have developed at slightly different paces, even if the eggs have been laid in the same year.

P. kolwensis lives in old-growth forests with a good continuum of spruce logs. Due to historical forestry practices, in the Nordic countries they are mostly found in wooded spruce mires. They commonly are spruce mires along streams, where spruce-dominated mires with some degree of connectivity are found along the same stream and its tributaries. New habitat islands are also created relatively regularly in spruce mires as spruces with rotting butts succumb to the wind or snow load. Nevertheless, *P. kolwensis* also lives in heath forests if new habitat islands are created regularly. This tends to occur in spruce forests on hill slopes, for example.

One reason for the importance of a local decaying wood continuum is that, based on observations, *P. kolwensis* is relatively poorly equipped or unwilling to travel longer distances. Adults often walk, even if they are also able to fly.

The best decaying wood continuum is achieved if the mire or heath forest is not unfertile. *Vaccinium myrtillus* spruce mires and the lush wooded spruce mires and thin-peated spruce mires, and of heath forests, herb-rich heath forests and spruce-dominated herb-rich heath forests are thus more suitable for this species. The species may also occur on more barren sites, at least temporarily, if the site is connected to other habitat islands of the species, or if the area is a remnant of an earlier and larger habitat island.

Distribution and status

Pytho kolwensis was scientifically described by the Finnish entomologist C. R. Sahlberg, who discovered the species in Kolva, Yläne, in 1828 and named it after the observation site. While the species has already disappeared from Southwest Finland and Pirkanmaa, it continues to occur in Suomenselkä area in Central Finland. The southernmost existing occurrence is in Saarijärvi. The strongest population is found in the old-growth forests on the eastern border from Ilomantsi to Suomussalmi. The northernmost occurrences are located in Kuusamo and Rovaniemi.

P. kolwensis is a palearctic species of the boreal zone. Its westernmost occurrences are found in Sweden and Finland. The strongest populations in Sweden are found in Ångermanland, while the northernmost observations have been made in Norrbotten and Luleå Lapland. The species is also found in Estonia and in Białowieża forest in Poland. In the east, its range extends to the eastern parts of Siberia and China (Ilmonen et al. 2001). In Finland's neighbouring areas in Russia, occurrences are known in Leningrad area and the Republic of Karelia.

P. kolwensis has been classified as vulnerable in Finland, and the vitality of its population is threatened by a decline in the volume of decaying wood and old heath forests (Hyvärinen et al. 2019).

Administrative status and legislation

EU Habitats Directive Annexes II and IV.

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

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

Endangered species (Nature Conservation Decree 160/1997, Annex 4 471/2013)

Red List category in 2019: vulnerable

The national action plan for species protection (Finnish Environment Institute 2010–2011) listed *P. kolwensis* as a species needing urgent protection, and it is also included in the updated list of species needing urgent protection from 2020.

The destruction and deterioration of breeding sites and resting places used by specimens of animal species referred to in Annex IV(a) of the Habitats Directive is prohibited under section 49 of the Nature Conservation Act. A precondition for strict protection is that the breeding sites and resting places of the species in question must always be preserved in connection with various projects and actions unless a derogation for their destruction or deterioration has been obtained under Article 16 of the Habitats Directive. On a site where *P. kolwensis* is found, all spruce logs with stage 1 and 2 decay and with bark in forest areas can be interpreted as breeding sites and resting places for the species.

Mattila 2017, Hyvärinen et al. 2019, Finnish Environment Institute 2021

Habitat management in protected areas

Distribution in protected areas

P. kolwensis is found on the following Natura 2000 sites:

Central Finland: Pyhä-Häkki area (Pyhä-Häkki National Park) and Kivineva–Karhukangas,

North Karelia: Koitajoki area (Koivusuo Nature Reserve) and Patvinsuo (Patvinsuo National Park),

Kainuu: areas in Hiidenportti (Hiidenportti National Park), Teerisuo–Losonsuo area, Jonkerinsalo area, Vattuvaara, Elimyssalo area, Murhisalo, Paljakka and Latvavaara,

Koillismaa: Syöte (Syöte National Park),

Lapland: Runkaus (Runkaus Nature Reserve) and Pisavaara (Pisavaara Nature Reserve).

Earlier observations have also been made in Pönttövaara-Pahkavaara and Oulanka (Oulanka National Park) in the 1980s. The national parks and nature reserves 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 section describes *P. kolwensis* distribution by Metsähallitus Parks & Wildlife Finland regional units.

Lake Region

In Pyhä-Häkki area in Saarijärvi, one of the sites where the species is found is located in a spruce mire and the other in an old mixed spruce forest on mineral soil. The area comprises over 60 hectares of spruce-dominated mires with excellent or good representativeness that have plenty of decaying wood, in addition to which there are old-growth forests with their decaying wood continuums on mineral soils. However, only part of them are spruce dominated.

Kivineva–Karhukangas is located to the north of Pyhä-Häkki in Viitasaari. The area consists of five parts, in which an occurrence of *P. kolwensis* was found in the old-growth forest reserve of Niinimäki in 1999 and in Iso-Saukkonen in 2011. Niinimäki comprises natural boreal forests across an area of approx. 40 hectares with significant representativeness throughout. In Iso-Saukkonen, spruce mires with plenty of decaying wood are found, in addition to natural forests. However, the surface area of the entire Iso-Saukkonen site is no more than approx. 12 ha. In 2015, decaying wood was produced in Niinimäki Nature Reserve for the benefit of *P. kolwensis*.

Koitaajoki area in Ilimantsi is characterised by raised bogs and aapa mires. Islands of natural boreal forests are found in the mires and on mineral soils on the banks of the Koitaajoki River. The surface area of representative spruce-dominated mires is approx. 100 hectares, mainly found on the edges of open mires.

In Patvinsuo, there are spruce mires with decaying wood on the wooded edges of open mires. The slopes of hills in this area additionally present narrow strips of spruce mires with excellent representativeness. Natural boreal forests are found on Hietavaara, Autiovaara, Rauvunvaara and Säästö-Maksimansaari, for example. Of these, only Autiovaara and Rauvunvaara have more extensive areas of old-growth forests dominated by spruces.

In the 1980s, observations of the species were also made in Pönttövaara-Pahkavaara in Lieksa. While the status of the occurrence has been assessed as existing, no observations have been made in this area since 1984. The species was searched for in 2012, however with no results. The area continues to offer suitable habitats and mires, including spruce mires, were restored in 2020.

Ostrobothnia–Kainuu

In Hiidenportti area in Sotkamo, *P. kolwensis* occurs in several places in spruce mires on stream banks and on hill slopes with plenty of decaying wood. Narrow strips of lush spruce mires are found in places on the hill slopes. There is plenty of decaying wood, and the crown snow loads of recent years have produced more, especially on the slopes and tops of hills.

In Kuhmo, several occurrences of *P. kolwensis* are known. Large aapa mires and islands of forest characterise the Natura site of Teerisuo-Losonsuo. Suitable habitats for the species are found mainly on stream banks, where spruce mires with decaying wood form a connected chain. Decaying wood is also found on larger islands with forest on mineral soils and in low-lying areas with spruce mires, but the species has so far not been observed in them.

In Jonkerinsalo area on the boundary between Kuhmo and Nurmes, key habitats for the species similarly include wooded spruce mires along stream banks. The area mainly contains pine-dominated heath forests but also low-lying areas with spruce mires and wooded mires on mire edges. Spruce mires suitable for *P. kolwensis* are larger than the currently known occurrences here.

The Natura site of Vattuvaara comprises a large aapa mire and Losovaara hill. There are narrow strips of lush mires on the slopes of the hill, and the hill top has some paludificating old-growth forest.

Elimyssalo area is a large, connected mosaic of aapa mires and old heath forests. While the forests are mainly barren, herb-rich *Vaccinium myrtillus* spruce mires with sturdy spruce trees can be found on stream banks.

In Murhisalo, Suomussalmi, a chain of lakes and ponds is surrounded by rounded hills and small aapa mires. There are spruce mires with decaying wood in places, mainly on stream banks but also in low-lying areas in heath forests. Sites corresponding to mesic heath forest predominate in the area, with fens and lush mires on stream banks in places.

The lush Natura site of Paljakka and Latvavaara in Puolanka is a significant hotspot of threatened species. Spruce forests that have never been felled are found on the tops and slopes of the hills in the nature reserve. There are springs in the forests on hill slopes, and a continuum of sturdy decaying spruce logs can be found near streams and rivulets flowing down from hill top mires.

Syöte National Park consists of four areas, each one of which is a separate Natura site: Salmitunturi-Räापysjärvi, Latva-Korte - Kärppävaara, Maaselkä and Syöte. Of these, the Natura site of Syöte has an occurrence of *P. kolwensis* in a spruce forest on a hill slope. Syöte, and also the other Natura sites, are characterised by natural boreal forests on the slopes and tops of hills. The hill top forests are northern boreal in type, with relatively sparse trees of low productivity. Representative spruce forests on the tops and slopes of hills are suitable *P. kolwensis* habitats, even

if the volume of decaying wood is smaller in hill top forests. Spruce mires are found on stream banks and in connection with aapa mires.

The species was found in Oulanka, Kuusamo, in the national park area in the 1980s. The exact location of the observation site is not known. The species has not been observed since then, but the area contains habitats suitable for it, which is why looking for it in this area would be worthwhile.

Lapland

Runkaus comprises Runkaus Nature Reserve in the areas of Tervola and Simo municipalities. Both of its two parts contain aapa mires and small islands of heath forest. Long natural streams and rivulets can be found in this area, with representative spruce mires on their banks. *P. kolwensis* beetles have been found on several nearby sites in spruce forests on mineral soils and in a lush forest compartment on a stream bank. The more extensive area also contains habitat suitable for the species.

In Pisavaara, the species was already found in the 1950s. It has been observed on three separate sites, and consequently, the status of the population is reasonably good. Hill top spruce forests are found on the highest points of Pisavaara. They are flanked by block and boulder fields, and the high points are separated by ravines. Natural spruce mires are found on the streams and rivulets.

Habitat management

Pytho kolwensis habitats comprise spruce forests on mineral as well as peaty soils. Suitable habitats have decaying spruce logs, at least some of which are relatively sturdy. New logs must also be created regularly. Most of the occurrences of the species have been found in large protected areas. The most significant concentrations of occurrences are in the old-growth forest reserve in the southern parts of Kuhmo and Sotkamo as well as in the Triangle of Lapland.

No actions are needed in protected areas with natural forests and spruce mires containing plenty of decaying wood. It is likely that the large protected areas in the north will safeguard the occurrence of the species for a while. Isolated populations in Kivineva–Karhunkangas and occurrences outside protected areas not connected to more extensive natural forests are at an obvious risk of being lost.

To safeguard the *P. kolwensis* occurrences, priority actions include maintaining and improving connectivity between the occurrences. Measures are needed outside protected areas in particular. Producing more decaying wood by felling existing trees can only be resorted to on sites where the species is at an immediate risk of disappearing. Trees should primarily be felled by an excavator, ensuring that they have a root plate. As this measure lets more light in, it may have an adverse effect on *P. kolwensis* by changing the microclimate. Felling several trees on the same site and thus

creating a small clearing should be avoided. The felling of trees also impacts the volume of decaying wood in the future.

Other primary actions could include mire restoration aiming to re-establish the natural hydrological balance of wooded mires. Over time, this will also influence the dynamics of trees, and the emergence of sufficiently sturdy decaying trees in the area. Humic heath forests and intermediate stages with plenty of spruces are the most important sites for the species.

Occurrences that have not yet been discovered are likely to exist. In particular, this is probable in protected areas with no immediate management needs. For example, the species may also be found in preserved spruce mires along stream banks or, further north, also in spruce forests with decaying wood on mineral soils. *P. kolwensis* is a protected species, which means that a derogation from the protection regulations is always needed for seeking it in the vicinity of known occurrences. Sturdy decaying spruce logs must always be examined judiciously and with as light a touch as possible, as detaching the bark destroys the beetles' microhabitat. 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

- In smaller protected areas, increasing the extent of suitable habitat by producing decaying spruce wood. When producing decaying wood, the reproduction of *Ips typographus* on fresh decaying spruce wood and the risk of forest damage caused by it should always be taken into account, especially in Southern Finland.
- Restoration of drained wooded spruce mires by blocking and damming ditches.

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

Pytho kolwensis is demanding as to its habitats. Little or no spruce mires with plenty of decaying wood exist outside protected areas. In commercial forestry landscapes, the species may be found on spruces felled by the wind on the shady or semi-shaded edges of spruce forests if there is a source population, for example in a spruce mire with plenty of decaying wood.

It would appear that the immediate surroundings of streams and rivulets would offer possibilities for improving the number and connectivity of habitats, and by preserving such areas, suitable habitat can be maintained and created. Some of these areas are included in the habitats of special importance referred to in section 10 of the Forest Act (for more information, see Finnish Forest

Centre 2021). These immediate surroundings of streams subject to statutory preservation and rivulets with a stable bed must have at least near-natural conditions. Over the long term, preserving sites with changing tree species may also create suitable habitats for the species as the trees mature.

Locally significant sites may include spruce mires and their intermediate stages. Of these, natural or near-natural thin-peated rich spruce mires and herb-rich spruce mires are included in particularly important habitats referred to in section 10 of the Forest Act. Restored intermediate stages and humic heath forests may over a longer period revert to habitats suitable for spruce mire species.

Recommendations for managing the habitats of the species on lands used for commercial forestry

- Retaining decaying spruce logs (diameter at breast height over 15 cm) in connection with fellings and when harvesting damaged trees. The spruces can be trees that have died more than a year ago, in which case the risk of forest damage caused by insects can be avoided. Under the Forest Damages Prevention Act, at most 10 cubic metres per hectare of damaged spruces with a butt diameter of over 10 cm may be left in the forest.
- Preserving the surroundings of streams and rivulets. Many sites in the vicinity of streams or rivulets suitable for *P. kolwensis* are included in the habitats of special importance referred to in section 10 of the Forest Act. It is important to preserve on the site trees that, when they die, will produce habitats for saproxylic species. Sites with a deteriorated ecological status may also be left to develop into a more natural state and, in the future, form habitats suitable for the species.
- Restoration of drained wooded spruce mires by blocking and damming ditches.

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