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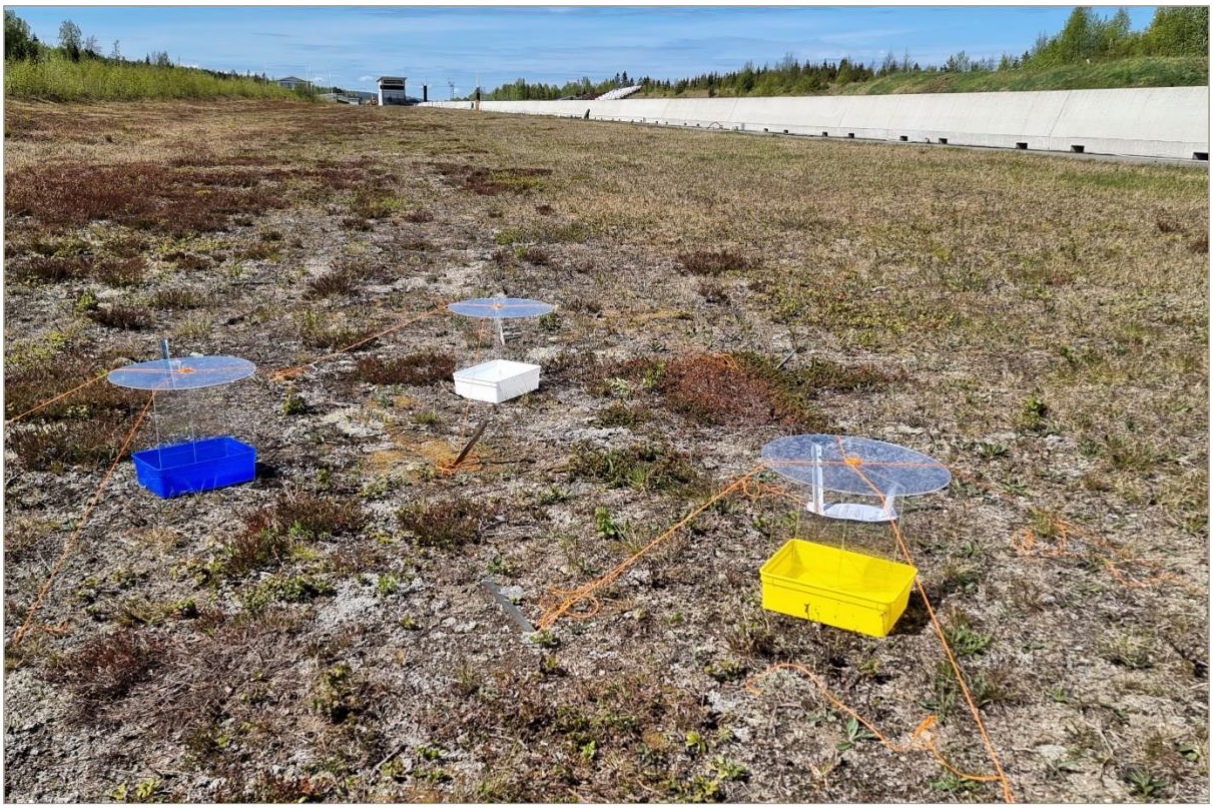

Species inventory for the Swedish Automobile Sports Federation 2022

Insect inventory for three race car tracks

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Cover: The picture depicts colour vessels placed by the race car track at Sundsvall Raceway

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Content

1 Summary 4

2 Introduction 4

Commission 4
Background 4
Area description 4

3 Methodology and implementation 8

Methodological description 8
Timing of work and execution staff 9

4 Results 9

4.1 Annebergsbanan 9
4.2 Sundsvall Raceway 9
4.3 Höljes 10
4.4 Species presentations 10

5 Discussion and management 12

5.1 Annebergsbanan 13
5.2 Sundsvall Raceway, Sättna 13
5.3 Höljes 14
5.4 Natural values linked to dry land in bloom 14
5.5 Aculeate fauna in comparison with other biotopes 15
5.6 Need for a management plan 15

6 References 15

Appendix 1 - Total insect species list 16

1 Summary

In 2022, three race car tracks were inventoried for pollinator species-rich habitats. Annebergsbanan in Halland, Höljes race car track in Värmland and Sundsvall Raceway in Sättna in Medelpad were investigated. All three sites have species-rich habitats but they manifest themselves in different ways. Management of grasslands and hedgerows needs to be developed in a site-specific way for the insect fauna to thrive and develop in the best way possible at all three sites. During the 2022 inventory, 390 species of insects were found. Most species encountered belong to the Hymenoptera insect order's Aculeata subclade, which includes bumblebees, solitary bees and wasps. Also beetles, butterflies and flies were investigated, and this has contributed to increase our understanding of what we know about fauna at race car track locations. During the inventory, five red-listed species were found. Our conclusion is that all three race car track locations studied have high species richness. We propose that biodiversity management plans be developed for all race track locations. Such a management plan can identify the natural habitats specific to a given race car track and suggest management practices and conservation measures to preserve and develop the species richness of insects and other species groups. It should be possible to finance management plans with support from municipalities (e.g. LONA) or with EU funding.

2 Introduction

Commission

In 2022, Calluna AB was commissioned by the Swedish Automobile Sports Federation to conduct an insect inventory at three race car tracks in different locations in Sweden. The assignment included a survey of the pollinator fauna in the environs of the race car tracks.

Background

It is well known that the hay meadows and pastures of the agricultural landscape are valuable from a conservation standpoint. However, it is only in recent years that other man-made environments have also proven to be species-rich for plants and animals. A compilation has shown that Sweden has over 190,000 hectares of managed grassland and over 240,000 hectares of managed shrubland in connection with infrastructure such as airports, railways, roads, power lines and ports (Swedish Board of Agriculture 2013). In these environments, tens of thousands of species have their habitats, and many of them are found nowhere else in the country than at these infrastructures. About 2 500 species have been recorded at railway stations alone (Bernes, 2011). It is clear that infrastructure biotopes such as roadsides, power line corridors, railway stations, meadow landscapes at airports, race care tracks and port areas provide habitats for entire species groups that were previously much more dispersed in the agricultural landscape.

Area description

The inventory was carried out at three race car tracks around Sweden, Annebergsbanan in Halland, Sundsvall Raceway in Medelpad and Höljes race car stadium in Värmland (Figure 1).

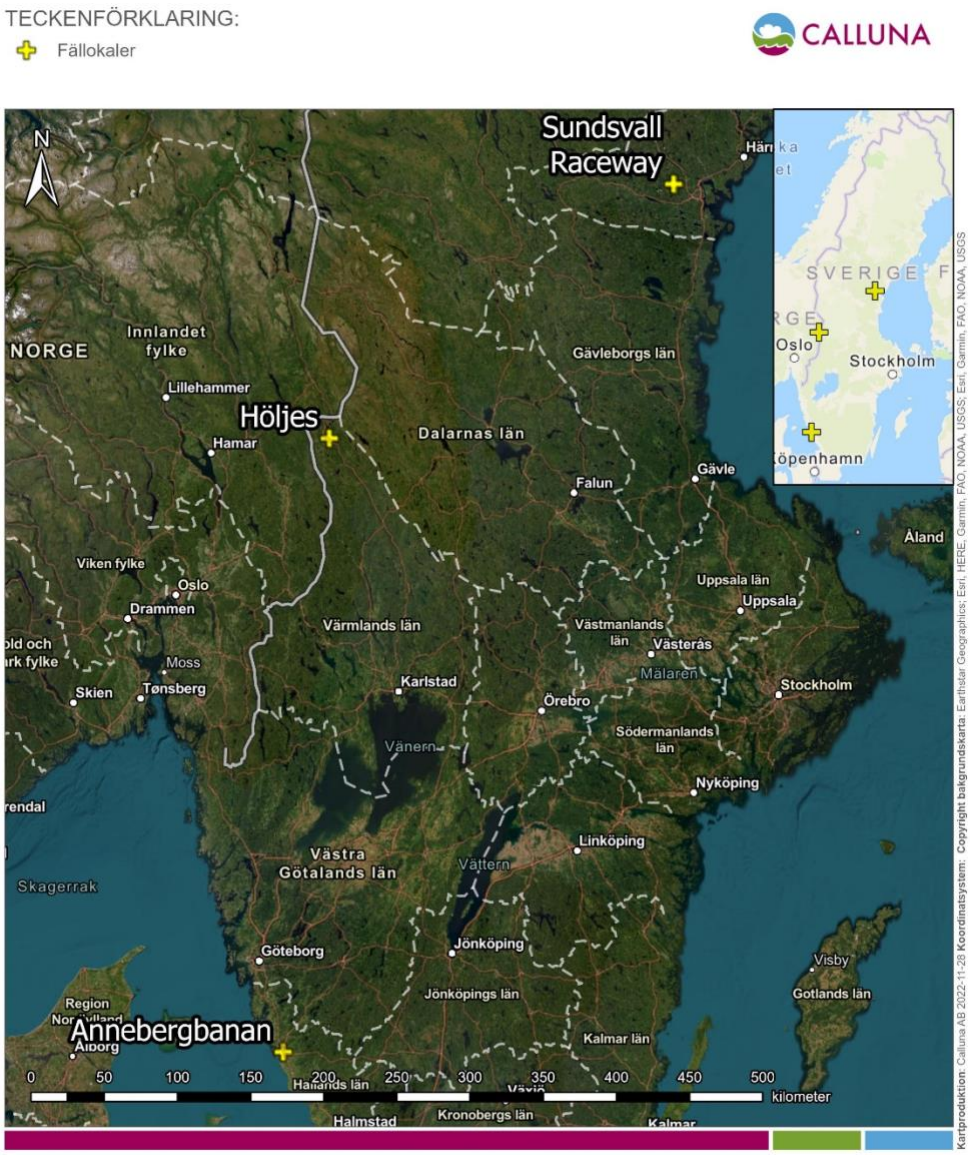

Figure 1. Map showing the three race car tracks' locations in Sweden

Annebergsbanan

The race car track is located just north of Trönninge and a few kilometres north of Varberg in Halland and about four kilometres from the sea. Both motorsport and motorcycle racing take place on the dirt and gravel track. The area slopes, partly steeply, to the northwest and the southern, more elevated part is partly more exposed to the west, and is partly relatively protected by surrounding mixed forest and hillside sectors. The course is embedded in an urban forest area, but the wider landscape is dominated by agricultural land with smaller forest patches on sand and sandy moraine (Figure 2).

Figure 2. Annebergsbanan, view to the north.

Sundsvall Raceway

On a former airstrip at Sättna about 8.5 km west of Kovland in Medelpad, various types of motorsport are pursued. The track consists of asphalt but sandy areas are present around the track (Figure 3). The landscape around the motorway consists largely of moraine and peat, but post-glacial deposits of gravel and sand are present in the near north and west.

Figure 3. Sundsvall Raceway with colour vessels in the foreground.

Höljes race car track

The race car stadium is located on the outskirts of Höljes in northwestern Värmland, a few miles (as the crow flies) from the border with Norway. It consists of both asphalt and gravel with sandy heathy areas around it (Figure 4). Just west of the motorway runs the Klarälven--the river valley is characterised by glacial sediment and the river's unique meandering course. The sedimentation along the river forms sandy nips and banks with a highly specialised insect fauna.

Figure 4. View towards the south over the race car track in Höljes.

3 Methodology and implementation

Methodological description

The race car tracks were visited on three occasions--the dates of the visits varied, since the geographical location of the sites differed considerably. The southernmost site, Annebergsbanan in Halland, has a comparatively longer season than the other two, so the first visit could be made earlier. Other circumstances that influenced the timing of the visits were mainly weather and activity on the tracks.

The inventory of insects was carried out by means of colour trays and net collection. The colour vessels were placed in two kits on each track (three at Sundsvall raceway) at the first visit. One kit consisted of three vessels in different colours: yellow, white and blue. In each colour vessel a plexiglass cross was placed with a plexiglass roof over it, all anchored to the ground with cords and tent pegs to withstand the elements, etc. The design of the colour vessels can be clearly seen on the cover of this report. The vessels were emptied for the first time at visit number two and emptied for the last time and collected at the third visit. Net collection was performed at each visit and lasted approximately one hour per session.

Sorting and species identification of collected insect material was done continuously during the summer and autumn of 2022.

Timing of work and execution staff

The Anneberg race car track was visited by Frida Nettelbladt and the first visit was made on 9/5, the second on 14/6 and the third on 19/7.

Sundsvall raceway was visited by Magnus Stenmark and Elin Lönnberg--the first visit took place on 20/5, the second on 23/6 and the third on 19/7.

Höljes was visited by Joel Hallqvist--the first visit took place on 17/5, the second on 9/6 and the third on 14/7.

4 Results

A total of 2 788 insect individuals were recorded during the inventory, divided into 390 different species, of which 140 are aculeate fauna. Five red-listed insect species were found--lists of the most interesting species from the inventory are given in Tables 1-3 below.

4.1 Annebergsbanan

A total of 140 insect species were recorded at the Anneberg railway, of which 62 species were aculeate fauna. Two red-listed insect species were recorded--the list of interesting finds is given in Table 1.

Table 1. Species of interest found at Annebergsbanan in Halland. Under group, the systematic affiliation, order and family (in parentheses) to which the species belongs is indicated.

Species name	English name	Group	Comment
Sibinia pyrrhodactyla	(None)	Beetles (true weevils)	NT
Margarinotus purpurascens	(None)	Beetles (clown beetles)	NT
Dasypoda hirtipes	Pantaloon bee	Hymenopteran (melittid bees)	Previously red-listed
Halictus confusus	Confusing furrow bee	Hymenopteran (sweat bees)	Previously red-listed
Sphecodes miniatus	False margined blood bee	Hymenopteran (sweat bees)	Previously red-listed
Eucera longicornis	Long-horned bee	Hymenopteran (stingless bees)	Indicates high values

4.2 Sundsvall Raceway

236 species of insects were recorded at the Sättna site, of which 90 were aculeate fauna. One red-listed species was found--the list of interesting finds is given in Table 2.

Table 2. Species of interest found at Sundsvall Raceway, Sättna in Medelpad. Under group, the systematic affiliation, order and (in parentheses) the family to which the species belongs are indicated.

Species name	English name	Group	Comment
Mallota megilliformis	(None)	Flies (hover flies)	VU
Cryptocephalus sexpunctatus	Six-spotted pot beetle	Beetles (leaf beetle)	Previously red-listed
Curimopsis paleata		Beetles (pill beetles)	Rare

Species name	English name	Group	Comment
Protapion trifolii	Clover seed weevil	Beetles (apionid weevils)	New Medelpad
Myopa buccata		Flies (thick-headed flies)	New Medelpad

4.3 Höljes

In Höljes, a total of 152 insect species were recorded, of which 68 species were aculeate fauna. Two red-listed species were recorded in Höljes--for a list of interesting finds, see table 3.

Table 3. Species of interest found at the Höljes race car track in Värmland. Under group, the systematic affiliation, order and family (in parentheses) to which the species belongs is indicated.

Species name	English name	Group	Comment
Physocephala nigra		Flies (thick-headed flies)	VU
Hemaris tityus	Narrow-bordered hawkmoth	Butterfly (sphinx moths)	NT
Arachnospila opinata	(None)	Aculeate fauna (spider wasps)	Previously red-listed
Nysson maculosus		Aculeate fauna (sand wasps)	Ny Värmland

4.4 Species presentations

Physocephala nigra **VU**

A specimen of this endangered aculeate fly was captured on a sunny day at the Höljes motor track. There are very few previous records of the species in Sweden and it has not previously been observed in Värmland. The fly lives as a parasite on other aculeate fauna such as bumblebees and wasps, its main habitat being open dry land. The species is classified as VU in Norway and CR in Finland.

Mallota megilliformis **VU**

This red-listed hover fly is very rare in Svealand and Norrland. The species is relatively large and woolly yellow-haired over almost its entire body. It seems to be associated with hollow trees. A male ended up in a colour vessel at Sundsvall raceway.

Narrow-bordered hawkmoth *Hemaris tityus* **NT**

This red-listed butterfly species occurs in large parts of southern and central Sweden. The larvae feed mainly on weeds such as meadow heather and field weed. However, the butterfly visits a variety of flowering plants in search of nutrients, stopping its rapid journey between the peduncles to stand still in the air in front of a flower and suck nectar for a few seconds before leaving again. One individual was observed foraging for nectar next to the race car track. The species is still relatively common in some parts of the country, but its overall distribution has declined. A number of earlier sightings have been made along the Klarälven and not far from Höljes.

Sibinia pyrrhodactyla **NT**

Three specimens of this weevil were caught in colour vessels at Annebergsbanan. The species is mainly found along the coasts of southern Sweden and lives on corn spurrey in dry sandy environments. Corn spurrey is a very common plant spread over almost the whole country, but despite this the weevil has a much more limited distribution. Halland is one of the regions,

together with Skåne, Blekinge and possibly Småland (together with Öland), that has the most important occurrences.

Margarinotus purpurascens **NT**

This beetle lives in open dry environments where it hunts other insects in connection with droppings, composts, carcasses and the like. One individual was found in the colour vessels on the Anneberg race car track.

Pantaloon bee *Dasypoda hirtipes*

This magnificent wild bee, which was previously red-listed, can be found in the southern part of the country up to the Gävle region. The species prefers sandy open habitats with a good supply of asters and daisies in which to search for pollen. One individual was found in the colour vessels on the Anneberg race car track.

Confusing furrow bee *Halictus confusus*

A previously red-listed furrow bee that occurs along the coasts of Götaland, mainly distributed on Öland, in Skåne and along the west coast. The species prefers sandy, heathy habitats where it frequents flowers such as sheepbit and breckland thyme. Four individuals were recorded from the colour vessels at Annebergsbanan.

False margined blood bee *Sphecodes miniatus*

This bee was previously listed as *Vulnerable* (VU) but has been classified as *Viable* (LC) in the last two Red Lists (2015 and 2020). However, it is a rare bee found mainly in the southernmost parts of the country where it lives in sandy environments, preferably with steep slopes where it parasitizes the red-listed species tufted furrow bee (*Lasioglossum nitidiusculum)*, among others. One specimen was found at Annebergsbanan.

Long-horned bee *Eucera longicornis*

The long-horned bee collects pollen only from pea plants and occurs mainly in natural pastures that have a rich and varied flora of pea plants, indicating high biodiversity in meadows and pastures. The nest is established in dry, loamy-sandy soil, usually on south-facing slopes.

Arachnospila opinata

Previously red-listed, this spider wasp thrives best in sandy environments, preferably where disturbance occurs regularly. A male was caught in a colour vessel next to the track in Höljes.

Myopa buccata

A thick-headed fly that has not previously been found in Medelpad. It lives as a parasite on wild bees. One specimen was caught in a colour vessel at Sundsvall Raceway.

Six-spotted pot beetle *Cryptocephalus sexpunctatus*

A conspicuous beetle, orange with black spots or bands on the upper surface. The species prefers dry open ground where it is found on leaves of birch, willow, hazel and others. Tree species. Captured in a colour vessel in Sättna.

Clover seed weevil *Protapion trifolii*

An apionid weevil that lives on various clovers. It has not previously been found in Medelpad, but is otherwise widespread in the southern half of the country and has been found as far north as Pajala. Two individuals were caught in the colour vessels at Sundsvall Raceway.

Curimopsis paleata

A rarely found pill beetle that lives in dry places, especially on sandy and muddy beaches. The species is found over a large part of the country but sparsely and always singly. One individual was caught in a colour vessel at the Sättna runway.

5 Discussion and management

The results of the inventory differed quite a lot between the tracks--at Sundsvall Raceway in Sättna, three kits with colour vessels were deployed, which is probably the reason why by far the most species were found there. Other differences in species composition between the tracks can probably be attributed mainly to geographical location and soil type.

By promoting herbs and insects, biodiversity can be enhanced. At race car tracks, the conditions are often good since wear and tear from spectators and vehicles can in many cases be controlled to act in moderation, favouring herbs and creating patches of soil and sand that favour insects.

Below are some general management suggestions for the type of areas to which the race car tracks belong.

- Mow vegetation late in the summer so that flowers can seed. Plots with lush and nutrient-influenced vegetation can be mowed early and preferably several times per season to reduce the nutrient content of the soil.
- Regularly raking away cut vegetation after mowing will gradually reduce the nutrient content of the soil and hopefully allow valuable flora to develop.
- In order to create open sandy areas or heathy areas around the lanes, the top layer of soil can be scraped or bulldozed away in some places. This increases the conditions for aculeate fauna to build nests and for their host plants to become established (Figure 5).
- An alternative to bulldozing is to burn areas of last year's vegetation in early spring, thus promoting flora attractive to aculeate fauna.
- Save sallows and other flowering shrubs such as blackthorn and hawthorn, which are important sources of food for many insects. Such trees and shrubs can also be used to create attractive hedgerow environments where possible around the tracks.
- Prevent overgrowth and densification by planting pine, spruce and other tree species in areas that are valuable to keep open.
- Create bee habitats by placing flat piles of sand in sunny locations. Where sand is present in the soil, pits can be used in appropriate places to create valuable structures with exposed slopes, notches and the like.
- If tree trunks and branches are available, they can be placed in sunny locations to create "fauna pools".

Figure 5. Example of scraped surface from Höljes. Sandy mineral soil has been exposed next to areas with e.g. bird's foot trefoil, a good breeding ground for dryland flora and a habitat for aculeate fauna.

5.1 Annebergsbanan

The Anneberg race car track is the southernmost track covered by the inventory. The southern and coastal location is reflected in the results by the appearance of species such as the confusing furrow bee, the insect *Oedostethus quadripustulatus* and the red-listed weevil *Sibinia pyrrhodactyla*. The nature on and around Annebergsbanan is varied, with partly fresh fields with lush vegetation, but also with drier areas where, for example, mats of common kidneyvetch spread out. The composition of the flora, such as blue echium, indicates that the soil has some mineral content with basic pH, or that there are remnants of a shell bank. This variation means that many plant species of different character can be found. This in turn allows a wide range of insects with different needs and nutritional requirements linked to the flora to be accommodated within the area. As many as 15 species of bumblebees were recorded in the inventory, among which the short-haired humble-bee can be highlighted as a more demanding species that is particularly attracted to the abundant presence of common kidneyvetch. The surrounding woodland is probably grown on former pasture land and is varied with a significant amount of deadwood and a very high proportion of flowering and berry-producing trees and shrubs, providing good conditions for a rich insect fauna. The area has a number of sun-exposed embankments with sparse vegetation, which provides good conditions for species that make their nests in the ground. However, pure sand is almost completely absent, the substrate is instead slightly sandy soil with a lot of gravel mixed in. The course is equipped with a sprinkler system used in dry weather to reduce dust formation, which can affect the living conditions for some species. If you want to build bee habitats, there is a corner located in the north-eastern part of the track where such constructions would probably be particularly good. The surface is usually used by cars waiting to enter the track and there is no irrigation on this surface.

5.2 Sundsvall Raceway, Sättna

The insect fauna at Sättna is characterised by a high species richness of wild bees, sand wasps, hover flies and beetles. Many insect species are associated with the dryland flora of the grasslands on and around the race car track. Here, for example, you will find the sweat bee - a

species that specialises in collecting pollen from asters and daisies. Among the beetles, the pill beetle *Curimopsis paleata* and the six-spotted pot beetle are two species associated with dry environments. There was also a rich fauna of sand wasps and spider wasps - two groups that are largely herbivorous. Some of the sand wasps and some of the spider wasps live in cavities and benefit from deadwood and remaining stems. They hunt other insects, which they paralyse and fly or drag to their nest. The high presence of parasitic aculeate species suggests that the insect community on and around the race car track at Sättna is species-rich and has continuity. The track at Sättna is the northernmost of the three covered by the inventory, and the geographical location is made clear by northern species such as the bee *Panurginus romani* and the sporadic bumblebee.

There is also a clear element of wood-associated insects--this is evident among the hover flies, of which several are associated with tree environments, such as hover flies from the genus *Xylota* and the fly *Mallota megilliformis*, classified as vulnerable in the 2020 Red List (SLU Species Database 2020).

5.3 Höljes

The vegetation at Höljes is largely composed of brushwood such as heather and lingonberry, areas of dandelion, bird's foot trefoil, as well as asters and daisies, also providing important nutritional resources for insects. Exposed sand is found throughout the area and the insect fauna at Höljes is largely dominated by dryland species. It is clear that the sandy heathland environments on and around the track are of great importance for the insects in the area. There is a clear presence of wood-dwelling beetle species caught in the colour vessels, probably coming from surrounding woodland areas and ending up in the traps as they flew over the vegetation, either attracted by the colour of the trays or looking for developmental substrate. In Höljes, far fewer wild bees were recorded than on the other sites, but there was greater diversity among groups such as spider wasps, sand wasps and cuckoo wasps. As many as 13 species of spider wasps were recorded from Höljes, several of which, such as *Evagetes sahlbergi*, *Arachnospila trivialis* and *Arachnospila opinata,* are distinctive sandy soil species. The finding of the *Nysson maculosus* sand wasp, a southern dryland species, also indicates that there are significant values associated with the land around the race car track. Insects have previously been searched for in the area around the race car track, partly as a result of an inventory carried out by the County Administrative Board in 2008. In that inventory, the red-listed small scabious mining bee *Andrena marginata* was noted in a dry river channel just outside the motor stadium towards the river. The small scabious mining bee burrows in compacted fine-grained sand and depends on pincushion flowers for pollen supply. The small scabious mining bee was not found in this year's survey and no pincushion flowers were observed at the stadium, but it is not impossible that some parts of the area could be used by the species for nest building. *A potential measure to benefit this species could include the planting of devilsbit, Succisa pratensis. on suitable areas within the site.*

5.4 Natural values linked to dry land in bloom

Aculeate fauna and other dryland insect species clearly show high biodiversity linked to dry meadows, sandy environments and warm hedgerows. Many of the species are associated with anthropogenic, i.e. man-made environments, since they need regular disturbance of their environment, requiring open sand and good access to herbs that establish themselves in open sandy soils. The open, flower-rich drylands provide habitats for a wide range of demanding species. In addition, most of the species of conservation interest listed in the report are associated with open sand or exposed soil for their nests.

5.5 Aculeate fauna in comparison with other biotopes

From a biodiversity perspective, all three race car tracks compare well with other dryland areas. In other comparable surveys, a similar number or fewer species of aculeate fauna were found. For example, in an inventory carried out in 2015 and 2016 at Hansta race car track in Sollentuna, a total of 189 insect species were recorded, of which 110 were aculeate fauna. However, in that inventory, six colour vessel kits were used over two years (Stenmark 2015) (Åhlén Mulio & Stenmark 2016).

Grasslands in airport areas usually have far fewer species of aculeate fauna compared to race car tracks. The grasslands at Arlanda Airport were surveyed in 2012. Arlanda Airport covers about 300 hectares of more or less dry grasslands that are mowed several times during the season to keep the three runways clear. In the extensive inventory at Arlanda, 240 species of insects were detected (Stenmark 2012). Of these, 86 species were aculeate fauna. Dry fields at other airports have also been surveyed in the country in 2013-2014 and found to house from 10 to more than 70 species of aculeate fauna.

Sand and gravel pits often have aculeate fauna comparable to that found at race car tracks, since there are often plenty of open sandy areas, slopes and level ground with an established dryland flora. In both quarries and motorways, regular disturbance maintains a species-rich dryland flora. A survey of 25 sand and gravel pits in Örebro County in 2008 found an average of 116 species of aculeate fauna in one pit (Stenmark 2010).

5.6 Need for a management plan

It is clear that motorways create good conditions for species-rich habitats for pollinators. Several race car tracks already have active management of vegetation to support biodiversity. We propose that all race car tracks have a management plan that identifies and highlights the conservation measures being taken to maintain and develop biodiversity. We believe that the management plans can be simple guiding documents that describe how to work and what changes are to be made in the management of lawns, grasslands, shrub zones, sand fields and other natural habitats that may be directly adjacent to the motorways.

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Appendix 1 - Total insect species list

List of all insect species identified during the survey. Any red listing category is indicated for the species concerned.

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Coleoptera	**beetles**					
Anthicidae	**ant-like flower beetles**					
Anthicus ater	(no English name)				1	1
Notoxus monocerus	(no English name)		1			1
Apionidae	**seed weevils**					
Eutrichapion facetum	(no English name)				1	1
Protapion trifolii	clover seed weevil				2	2
Byrrhidae	**pill beetles**					
Curimopsis paleata	(no English name)				1	1
Byturidae	**fruitworms**					
Byturus ochraceus	(no English name)				1	1
Byturus tomentosus	raspberry beetle				4	4
Cantharidae	**soldier beetles**					
Cantharis fusca	(no English name)			5	4	9
Cantharis nigricans	(no English name)				3	3
Cantharis obscura	(no English name)			1	7	8
Cantharis quadripunctata	(no English name)				11	11
Cantharis rufa	Red-spotted soldier beetle				3	3
Cantharis rustica	Soldier beetle			7	1	8
Rhagonycha fulva	Common red soldier beetle		1			1
Rhagonycha nigriventris	(no English name)				2	2
Carabidae	**ground beetles**					
Amara familiaris	Familiar harp round beetle			2		2
Amara lunicollis	(no English name)			1		1
Amara plebeja	(no English name)		1			1
Bembidion femoratum	Light-legged riverbank ground beetle			1	1	2
Bembidion quadrimaculatum	(no English name)				5	5
Cicindela campestris	Green tiger beetle		1	3	4	8
Harpalus laevipes	(no English name)				1	1
Harpalus rufipes	Strawberry harp ground beetle		3			3
Lebia cruxminor	(no English name)			1	1	2
Poecilus cupreus	(no English name)		1			1
Pterostichus oblongopunctatus	(no English name)			1		1

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Trechus rubens	Tawny riverbank ground beetle			2		2
Cerambycidae	**Longhorn beetles**					
Gnathacmaeops pratensis	(no English name)			1		1
Pogonocherus fasciculatus	(no English name)				1	1
Rhagium inquisitor	Ribbed pine borer			7		7
Rhagium mordax	(no English name)				2	2
Stenurella melanura	(no English name)		1	2	6	9
Stictoleptura rubra	(no English name)		1			1
Chrysomelidae	**Leaf beetles**					
Altica oleracea	(no English name)			1	1	2
Bromius obscurus	Western grape rootworm				1	1
Bruchus loti	(no English name)				1	1
Cassida rubiginosa	Thistle tortoise beetle		1			1
Cassida vittata	Bordered tortoise beetle		1			1
Chaetocnema hortensis	(no English name)				2	2
Chrysomela populi	Red poplar leaf beetle			1	1	2
Cryptocephalus bipunctatus	(no English name)				1	1
Cryptocephalus moraei	(no English name)		1			1
Cryptocephalus sexpunctatus	Six-spotted pot beetle				1	1
Galerucella calmariensis	Black-margined loosestrife beetle				6	6
Gonioctena viminalis	(no English name)			1		1
Lochmaea caprea	Willow leaf beetle				5	5
Oulema melanopus	Cereal leaf beetle		1			1
Phratora vitellinae	Brassy willow beetle				1	1
Phyllotreta undulata	Turnip flea beetle				1	1
Coccinellidae	**Ladybirds**					
Coccinella hieroglyphica	Hieroglyphic ladybird				2	2
Coccinella quinquepunctata	Five-spot ladybird		2	1		3
Coccinella septempunctata	Seven-spot ladybird		97	2	6	105
Coccinula quatuordecimpustulata	(no English name)		2	25	14	41
Exochomus quadripustulatus	Pine ladybird			1		1
Hippodamia variegata	Ladybird beetle		1			1
Nephus bisignatus	(no English name)			4		4
Nephus redtenbacheri	(no English name)				1	1
Propylea quatuordecimpunctata	Fourteen-spot ladybird		8		1	9
Psyllobora vigintiduopunctata	Twenty-two-spot ladybird		1			1
Scymnus frontalis	Ladybird beetle			1		1
Scymnus nigrinus	(no English name)			1	4	5
Cryptophagidae	**Silken fungus beetles**					

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Antherophagus pallens	(no English name)		1			1
Antherophagus similis	(no English name)			1	1	2
Curculionidae	**True weevils**					
Acalyptus carpini	(no English name)				1	1
Anthonomus rubi	Strawberry-blossom weevil				1	1
Brachyderes incanus	Weevil			6		6
Hylastes cunicularius	(no English name)			1		1
Hylobius pinastri	(no English name)			2		2
Hypera arator	(no English name)		2			2
Magdalis frontalis	(no English name)			1		1
Magdalis violacea	(no English name)			1		1
Miarus campanulae	(no English name)			2	52	54
Otiorhynchus carinatopunctatus	(no English name)			1		1
Phyllobius pyri	Common leaf weevil			1	1	2
Pityogenes chalcographus	(no English name)			1	7	8
Pityophthorus micrographus	(no English name)				1	1
Polydrusus cervinus	Weevil				2	2
Polydrusus pilosus	(no English name)				1	1
Rhamphus pulicarius	(no English name)				1	1
Rhinocyllus conicus	Weevil		8			8
Rhinoncus pericarpius	(no English name)			3		3
Sibinia pyrrhodactyla	(no English name)	**NT**	3			3
Sitona suturalis	(no English name)				3	3
Strophosoma capitatum	(no English name)			5		5
Tachyerges salicis	(no English name)				1	1
Tachyerges stigma	(no English name)				1	1
Dasytidae	Soft-winged flower beetles					
Dasytes niger	(no English name)			29	27	56
Dasytes obscurus	(no English name)			1	18	19
Dolichosoma lineare	(no English name)		1		2	3
Dermestidae	**Skin beetles**					
Anthrenus museorum	Museum beetle			2		2
Megatoma undata	(no English name)				1	1
Elateridae	**Click beetles**					
Adrastus pallens	(no English name)		3			3
Agriotes lineatus	Lined click beetle		2			2
Agriotes obscurus	Dusky wireworm			1	2	3
Agrypnus murinus	(no English name)				1	1
Ampedus balteatus	(no English name)			3	1	4

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Ampedus nigrinus	(no English name)			2	1	3
Ampedus tristis	(no English name)			1		1
Anostirus castaneus	Chestnut coloured click beetle				1	1
Cardiophorus ruficollis	(no English name)				1	1
Dalopius marginatus	(no English name)		1	13		14
Hypnoidus riparius	(no English name)			1		1
Oedostethus quadripustulatus	(no English name)		1			1
Pheletes aeneoniger	(no English name)			3	22	25
Prosternon tessellatum	Chequered click beetle			27		27
Selatosomus aeneus	(no English name)				2	2
Sericus brunneus	(no English name)			23	43	66
Zorochros dermestoides	(no English name)				6	6
Erotylidae	**Pleasing fungus beetles**					
Triplax russica	(no English name)			1		1
Helophoridae	**Water scavenger beetles**					
Helophorus brevipalpis	(no English name)			1	10	11
Helophorus flavipes	(no English name)				5	5
Histeridae	**Clown beetles**					
Margarinotus purpurascens	(no English name)	**NT**	1			1
Hydrophilidae	**Water scavenger beetles**					
Hydrobius fuscipes	(no English name)			1	1	2
Latridiidae	**Fungus beetles**					
Cortinicara gibbosa	(no English name)				3	3
Leiodidae	**Round fungus beetles**					
Sciodrepoides watsoni	(no English name)			2	1	3
Monotomidae	**Root-eating beetles**					
Rhizophagus fenestralis	(no English name)			1		1
Mordellidae	**Tumbling flower beetles**					
Mordella aculeata	(no English name)			11	42	53
Mordellistena parvula	(no English name)				2	2
Nemonychidae	**Pine flower weevils**					
Cimberis attelaboides	(no English name)		1			1
Nitidulidae	**Sap beetles**					
Carpophilus hemipterus	Dried fruit beetle		1			1
Glischrochilus hortensis	(no English name)		1		3	4
Glischrochilus quadripunctatus	(no English name)				1	1
Meligethes denticulatus	(no English name)			3	1	4

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Omosita colon	Sap-feeding beetle			1		1
Soronia grisea	(no English name)		1		2	3
Soronia punctatissima	(no English name)			1		1
Thalycra fervida	(no English name)			1	1	2
Oedemeridae	**False blister beetles**					
Chrysanthia geniculata	(no English name)		2			2
Chrysanthia viridissima	(no English name)		1			1
Oedemera lurida	(no English name)		1			1
Oedemera subrobusta	(no English name)				2	2
Oedemera virescens	(no English name)			10	68	78
Pyrochroidae	**Cardinal beetles**					
Schizotus pectinicornis	Scarce cardinal beetle			1		1
Scarabaeidae	**Scarab beetles**					
Cetonia aurata	Rose chafer		1	7		8
Phyllopertha horticola	Garden chafer		1	2		3
Protaetia metallica	(no English name)		4	129	62	195
Trichius fasciatus	Bee beetle			9	16	25
Scraptiidae	**False flower beetles**					
Anaspis frontalis	(no English name)				1	1
Silphidae	**Large carrion beetles**					
Aclypea opaca	Silphid beetle		1			1
Nicrophorus vespilloides	(no English name)				1	1
Oiceoptoma thoracicum	Red-breasted carrion beetle				1	1
Staphylinidae	**Rove beetles**					
Aleochara bilineata	Rove beetle		9			9
Aleochara bipustulata	Rove beetle		3			3
Aloconota gregaria	(no English name)		2			2
Anotylus rugosus	Rove beetle		1		2	3
Bisnius nigriventris	(no English name)			1		1
Gauropterus fulgidus	(no English name)				1	1
Mycetoporus lepidus	(no English name)				3	3
Philonthus carbonarius	(no English name)		1	1	2	4
Philonthus laminatus	(no English name)			1		1
Philonthus marginatus	(no English name)				1	1
Philonthus succicola	(no English name)				1	1
Quedius mesomelinus	(no English name)			6	7	13
Sepedophilus littoreus	(no English name)				2	2
Tachyporus hypnorum	(no English name)		1			1
Tachyporus nitidulus	(no English name)		1			1

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Trichophya pilicornis	(no English name)				1	1
Tenebrionidae	**Darkling beetles**					
Lagria hirta	(no English name)				2	2
Throscidae	**False click beetles**					
Trixagus dermestoides	(no English name)			1	2	3
Diptera	**True flies**					
Asilidae	**Robber flies**					
Cyrtopogon lateralis	(no English name)				3	3
Leptogaster cylindrica	(no English name)		4	1	3	8
Neoitamus socius	(no English name)		1		1	2
Rhadiurgus variabilis	(no English name)				7	7
Tolmerus atricapillus	(no English name)				1	1
Conopidae	**Thick-headed flies**					
Myopa buccata	(no English name)			1	1	2
Physocephala nigra	(no English name)	**VU**		1		1
Sicus ferrugineus	(no English name)			3	2	5
Dryomyzidae	**(no English name)**					
Dryomyza anilis	(no English name)				1	1
Syrphidae	**Hover flies**					
Cheilosia fraterna	(no English name)			1		1
Chrysotoxum bicinctum	(no English name)				1	1
Chrysotoxum fasciolatum	(no English name)			1		1
Dasysyrphus albostriatus	(no English name)		1			1
Dasysyrphus pinastri	(no English name)				2	2
Eristalis interrupta	(no English name)				1	1
Eristalis obscurata	(no English name)		1			1
Eristalis picea	(no English name)				1	1
Eupeodes corollae	(no English name)		4			4
Helophilus pendulus	(no English name)		1			1
Mallota megilliformis	(no English name)	**VU**			1	1
Melanostoma mellinum s.lat.	Hover fly				1	1
Meliscaeva cinctella	American thintail fly				2	2
Parasyrphus macularis	Hover fly				1	1
Pipizella viduata	(no English name)				1	1
Rhingia borealis	(no English name)				1	1
Scaeva pyrastri	(no English name)				1	1
Sericomyia lappona	(no English name)				2	2
Sericomyia nigra	(no English name)				1	1
Sericomyia silentis	(no English name)				2	2
Sphaerophoria batava	(no English name)				2	2

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Sphaerophoria interrupta	(no English name)				2	2
Sphaerophoria philantha	(no English name)				1	1
Sphaerophoria scripta	(no English name)		2		3	5
Sphaerophoria taeniata	(no English name)				1	1
Syritta pipiens	Hover fly		1			1
Syrphus ribesii	Common flower fly				1	1
Xylota segnis	Brown-toed forest fly				11	11
Xylota tarda	(no English name)				1	1
Tachinidae	**Tachinid flies**					
Cylindromyia brassicaria	(no English name)				1	1
Cylindromyia interrupta	(no English name)				14	14
Eriothrix rufomaculatus	(no English name)		20	7	155	182
Nowickia ferox	(no English name)				2	2
Tachina fera	(no English name)				5	5
Tephritidae	**Fruit flies**					
Tephritis ruralis	(no English name)				1	1
Therevidae	**Stiletto flies**					
Spiriverpa lunulata	(no English name)			1		1
Hemiptera	**True bugs**					
Coreidae	**Squash and leaf-footed bugs**					
Coreus marginatus	(no English name)			1		1
Cydnidae	**Burrower bugs**					
Tritomegas bicolor	Pied shieldbug		2			2
Pentatomidae	**Shield bugs**					
Aelia acuminata	Bishop's mitre		7		2	9
Dolycoris baccarum	Sloe bug		3	1	11	15
Eurydema oleracea	Cabbage bug		16	1		17
Hymenoptera	**Aculeate fauna**					
Ampulicidae	**Sand wasps**					
Dolichurus corniculus	(no English name)			2	1	3
Andrenidae	**Mining bees**					
Andrena barbilabris	Long-lipped miner			1		1
Andrena carantonica	Chocolate mining bee		1			1
Andrena cineraria	Ashy mining bee			6	5	11
Andrena fucata	Painted mining bee				3	3
Andrena fulva	Mining bee		2			2
Andrena fulvida	(no English name)			1	2	3
Andrena haemorrhoa	Early mining bee		3	4	2	9
Andrena intermedia	(no English name)			1	2	3

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Andrena lapponica	Bilberry mining bee				3	3
Andrena nigroaenea	Buffish mining bee		4	1		5
Andrena ruficrus	Northern mining bee			2	9	11
Andrena subopaca	Impunctate mini-miner				2	2
Andrena wilkella	Andrenine bee		2			2
Panurginus romani	(no English name)				4	4
Apidae	**Bees**					
Apis mellifera	Honey bee		13	12		25
Bombus bohemicus	Gipsy cuckoo-bee		5		1	6
Bombus hortorum	Garden bumblebee		6	1	6	13
Bombus hypnorum	New garden bumblebee		4		22	26
Bombus jonellus	Heath bumblebee			11	7	18
Bombus lapidarius	Large red-tailed humble-bee		5			5
Bombus lucorum	Small earth humble-bee			3	1	4
Bombus lucorum coll.	Earth humble-bees		6	58	159	223
Bombus norvegicus	(no English name)		1			1
Bombus pascuorum	Common carder bee		6	9	20	35
Bombus pratorum	Early humble-bee		8	1	81	90
Bombus ruderarius	Red-shanked bumblebee		2			2
Bombus rupestris	Hill cuckoo-bee		2		2	4
Bombus soroeensis	Broken-belted humble-bee		4		27	31
Bombus sporadicus	(no English name)				1	1
Bombus subterraneus	Short-haired humble-bee		2			2
Bombus sylvarum	Knapweed carder-bee		5			5
Bombus sylvestris	Four-coloured cuckoo-bee		1		6	7
Bombus terrestris	Buff tailed bumblebee		22		5	27
Epeolus variegatus	Black-thighed epeolus		1			1
Eucera longicornis	Long-horned bee		1			1
Nomada flavoguttata	Little nomad bee				2	2
Nomada fusca	(no English name)				3	3
Nomada goodeniana	Gooden's nomad bee		2		1	3
Nomada lathburiana	Lathbury's nomad bee				1	1
Nomada leucophthalma	Early nomad bee				4	4
Nomada marshamella	Marsham's nomad bee		3			3
Nomada panzeri	Panzer's nomad bee		1	2	7	10
Nomada striata	Blunt-jawed nomad bee			1	1	2
Nomada tormentillae	(no English name)				1	1
Chrysididae	**Gold wasps**					

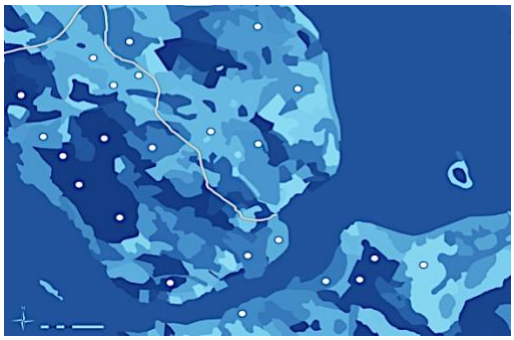
Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Chrysis illigeri	(no English name)				1	1
Chrysis ruddii	(no English name)			1	1	2
Chrysis viridula	(no English name)				1	1
Chrysura hirsuta	Northern Osmia ruby-tailed wasp			1		1
Hedychridium ardens	(no English name)			6	2	8
Hedychrum niemelai	(no English name)			11		11
Hedychrum nobile	(no English name)			26		26
Trichrysis cyanea	(no English name)			1	1	2
Colletidae	**Plasterer bees**					
Colletes similis	Bare-saddled colletes		3			3
Hylaeus annulatus	Annulate masked bee				1	1
Hylaeus brevicornis	Short-horned yellow-face bee			1		1
Hylaeus communis	Common yellow-face bee		1			1
Hylaeus confusus	White-jawed yellow-face bee				2	2
Hylaeus dilatatus	Chalk yellow-face bee		2			2
Hylaeus incongruus	White-lipped yellow-face bee		2			2
Crabronidae	**Sand wasps**					
Cerceris ruficornis	(no English name)				2	2
Cerceris rybyensis	(no English name)		3			3
Crabro scutellatus	(no English name)		1			1
Crossocerus elongatulus	(no English name)			1		1
Crossocerus podagricus	(no English name)			1		1
Crossocerus wesmaeli	(no English name)		2	1	1	4
Diodontus medius	(no English name)			2	1	3
Dryudella pinguis	(no English name)			25	3	28
Ectemnius borealis	(no English name)				2	2
Gorytes quadrifasciatus	(no English name)			1	1	2
Harpactus lunatus	(no English name)			1	1	2
Lindenius albilabris	(no English name)			1	1	2
Mellinus arvensis	(no English name)			1		1
Nysson distinguendus	(no English name)				1	1
Nysson maculosus	(no English name)			1		1
Nysson niger	(no English name)				1	1
Oxybelus uniglumis	(no English name)			4	1	5
Pemphredon montana	(no English name)				1	1
Tachysphex obscuripennis	(no English name)			49		49
Tachysphex pompiliformis	(no English name)				14	14
Formicidae	**Ants**					

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Formica fusca	Silky ant				1	1
Lasius flavus	Blond field ant				1	1
Halictidae	**Sweat bees**					
Halictus confusus	Confusing furrow bee		4			4
Halictus rubicundus	Orange-legged furrow bee			20	7	27
Halictus tumulorum	Bronze furrow bee		5			5
Lasioglossum albipes	Bloomed furrow bee				1	1
Lasioglossum calceatum	Common furrow bee				3	3
Lasioglossum fratellum	Smooth-faced furrow bee			4	14	18
Lasioglossum leucopus	White-footed furrow bee		5	2	35	42
Lasioglossum leucozonium	Sweat bee			1	1	2
Lasioglossum morio	Green furrow bee		58	1	4	63
Lasioglossum rufitarse	Rufous-footed furrow bee		1	38	39	78
Lasioglossum semilucens	Small shiny furrow bee		4		1	5
Lasioglossum villosulum	Shaggy furrow bee		2			2
Sphecodes ephippius	Bare-saddled blood bee		1			1
Sphecodes geoffrellus	Geoffroy's blood bee		1	1	17	19
Sphecodes miniatus	False margined blood bee		1			1
Sphecodes pellucidus	Sandpit blood bee				2	2
Megachilidae	**Mason and leaf cutter bees**					
Anthidium punctatum	(no English name)		2			2
Chelostoma campanularum	Carpenter bee		2			2
Coelioxys conicus	Large sharp-tail bee				1	1
Coelioxys elongatus	Dull-vented sharp-tail bee				2	2
Hoplitis claviventris	Welted lesser mason bee				3	3
Hoplitis tuberculata	(no English name)				1	1
Megachile alpicola	(no English name)				3	3
Megachile analis	(no English name)				1	1
Megachile circumcincta	Black-headed leafcutter bee			2	4	6
Megachile nigriventris	(no English name)				1	1
Megachile willughbiella	Rosecutter-bee		1		5	6
Osmia bicornis	Red mason bee			1	1	2
Osmia nigriventris	(no English name)			2		2
Osmia parietina	Wall mason bee			2	1	3
Melittidae	**Melittid bees**					
Dasypoda hirtipes	Pantaloon bee		1			1
Macropis europaea	Yellow loosestrife bee		1			1

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Melitta haemorrhoidalis	Bellflower blunthorn bee		1			1
Mutillidae	**Velvet ants**					
Smicromyrme rufipes	Small velvet ant				1	1
Pompilidae	**Spider wasps**					
Anoplius infuscatus	(no English name)		2			2
Anoplius nigerrimus	(no English name)		1			1
Anoplius viaticus	Black-banded spider wasp		5	8	7	20
Arachnospila anceps	(no English name)		2	1		3
Arachnospila fumipennis	(no English name)			1	3	4
Arachnospila hedickei	(no English name)			2		2
Arachnospila opinata	(no English name)			1		1
Arachnospila spissa	(no English name)		1	1		2
Arachnospila trivialis	(no English name)			6	1	7
Ceropales maculata	Spider wasp			3		3
Dipogon subintermedius	(no English name)		1			1
Evagetes crassicornis	(no English name)		1	5		6
Evagetes sahlbergi	(no English name)			20		20
Homonotus sanguinolentus	Bloody spider-hunting wasp			1		1
Priocnemis exaltata	(no English name)			1		1
Priocnemis perturbator	(no English name)		4			4
Priocnemis schioedtei	(no English name)			3		3
Sphecidae	**Sand wasps**					
Ammophila pubescens	Heath sand wasp			9		9
Ammophila sabulosa	Red banded sand wasp		5	3	5	13
Podalonia hirsuta	Hairy sand wasp				1	1
Tiphiidae	**Tiphiid wasps**					
Tiphia femorata	(no English name)		1			1
Vespidae	**Paper wasps**					
Ancistrocerus oviventris	(no English name)			3	4	7
Ancistrocerus trifasciatus	(no English name)				1	1
Dolichovespula norwegica	Norwegian wasp			1	1	2
Dolichovespula saxonica	(no English name)		2	1	2	5
Eumenes pedunculatus	(no English name)				1	1
Euodynerus quadrifasciatus	(no English name)				1	1
Gymnomerus laevipes	(no English name)			1		1
Odynerus spinipes	(no English name)		1		6	7
Symmorphus bifasciatus	(no English name)				1	1
Symmorphus crassicornis	(no English name)				1	1
Vespa crabro	European hornet		1			1

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Vespula rufa	Red wasp			4		4
Vespula vulgaris	Guêpe vulgaire			1		1
Tenthredinidae	**Common sawflies**					
Tenthredo arcuata	(no English name)				1	1
Lepidoptera	**Butterflies and moths**					
Geometridae	**Geometrid moths**					
Chiasmia clathrata	Latticed heath		4			4
Siona lineata	Black-veined moth		1			1
Hesperiidae	**Skippers**					
Erynnis tages	Dingy skipper			1		1
Ochlodes sylvanus	Large skipper		1	1	3	5
Thymelicus lineola	Essex skipper		1			1
Lycaenidae	**Gossamer-winged butterflies**					
Callophrys rubi	Green hairstreak			9		9
Cyaniris semiargus	Mazarine blue				2	2
Lycaena phlaeas	American copper		1			1
Lycaena virgaureae	Scarce copper				1	1
Polyommatus icarus	Common blue		2			2
Noctuidae	**Owlet moths**					
Autographa gamma	Silver Y		1			1
Nymphalidae	**Brush-footed butterflies**					
Aglais io	Peacock		5			5
Aglais urticae	Small tortoiseshell		2		1	3
Aphantopus hyperantus	Ringlet		1			1
Argynnis adippe	High brown fritillary				1	1
Argynnis aglaja	Dark green fritillary				1	1
Argynnis paphia	Silver-washed fritillary		1			1
Boloria euphrosyne	Pearl-bordered fritillary				3	3
Boloria selene	Silver-bordered fritillary				1	1
Brenthis ino	Lesser marbled fritillary				1	1
Coenonympha pamphilus	Small heath		1			1
Maniola jurtina	Meadow brown		1			1
Polygonia c-album	Comma			1	1	2
Vanessa atalanta	Red admiral		1			1
Vanessa cardui	Painted lady		1			1
Pieridae	**Pierid butterflies**					
Anthocharis cardamines	Orange tip		3			3
Gonepteryx rhamni	Brimstone		1		2	3
Pieris napi	Green-veined white		2		1	3

Taxa	English name	Red listing	Annebergbanan	Höljes	Sättna	Total
Pieris rapae	Cabbage butterfly		1			1
Sphingidae	**Sphinx moths**					
Hemaris tityus	Narrow-bordered hawkmoth	**NT**		1		1
Total number of species			**140**	**152**	**236**	**390**
Number of species of aculeate fauna			**62**	**68**	**90**	**140**
Total number of individuals			**518**	**827**	**1443**	**2788**



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