England Biodiversity Indicators 2020

This documents supports

10. Status of pollinating Insects

Technical background document

Gary D. Powney, Colin A. Harrower, Charlotte Outhwaite, Nick J.B. Isaac

For further information on the England Biodiversity Indicators visit
https://www.gov.uk/government/statistics/england-biodiversity-indicators

Biodiversity and Ecosystem Services – status of pollinating insects – technical background document

Gary D. Powney, Colin A. Harrower, Charlotte Outhwaite, Nick J. B. Isaac

Introduction

Pollination is a vital ecosystem service that benefits agricultural and horticultural production, and is essential for maintaining wild flower biodiversity. By improving the yield, quality and resilience of crops, insect pollination has been valued at £400 million per year to the UK economy (POST, 2010). Thirty five percent of the world's agricultural output, by volume, consists of 87 crop types that benefit from pollination by animals (insects, birds and mammals), but because most of these crops are not entirely dependent on animal pollination, the amount of production directly attributable to animals is lower than this value (Klein *et al.*, 2007). There is growing concern regarding the population status of insect pollinators, and in turn the pollination service they provide (Potts *et al.*, 2010; Garratt *et al.*, 2014). As with most other areas of biodiversity, the main threats to pollinators include habitat loss, environmental pollution, climate change and the spread of alien species (Klein *et al.*, 2007; Potts *et al.*, 2010; Vanbergen & The Insect Pollinators Initiative 2013). The widespread application of pesticides is also perceived as a major threat to pollinator diversity (Brittain *et al.*, 2010). In order for governments to act upon these threats they need robust metrics on the national-scale status of pollinators and pollination. Deriving such a metric has previously been limited by the availability of suitable data and analytical techniques. With the increase in citizen science, the availability of large-scale biological record data has increased (Silvertown, 2009). Such data are collected without a standardized survey protocol and therefore extracting reliable trends from them can be difficult. However, with recent analytical advances it is now possible to estimate reliable trends from such data (van Strien *et al.*, 2013; Isaac *et al.*, 2014).

Methods

Data sources

Occurrence records of bee and hoverfly species within 1km grid cells in the UK were extracted from the Bees, Wasps and Ants Recording Society (BWARS) and the Hoverfly Recording Scheme biological records databases. The time-period used for the indicator was 1980 to 2017, as this represents a core period of recording for these taxa in the UK. Bee species were filtered (following expert guidance from BWARS) so that only species considered to be wild pollinators were included. Species that had undergone taxonomic changes or had taxonomic issues during the time frame of the indicator were excluded from the analysis. Furthermore, models based on species with less than 50 records tend to be unreliable (Powney *et al.*, 2019), and were therefore excluded from the analysis. The final composite indicator was based on 377 species of wild pollinator, see Appendix 1 for a list of species covered.

Generating species' trends and the composite indicator

The data used to produce the indicator were not collected using a standardised protocol, but instead are a collation of unstructured biological observations collected by a large network of volunteer recorders. Such data tend to contain many forms of sampling bias and noise, making it hard to detect genuine signals of change (Tingley & Beissinger, 2009; Hassall & Thompson, 2010; Isaac *et al.*, 2014). Recent studies have highlighted the value of Bayesian occupancy models for estimating species occurrence in the presence of imperfect detection (van Strien *et al.*, 2013; Isaac *et al.*, 2014). This approach uses two hierarchically coupled sub-models: an occupancy sub-model (i.e. presence verses absence), and a detection sub-model (i.e. detection verses non-detection). Together these sub-models estimate the conditional probability that a species is detected when present. A Bayesian occupancy model was applied to the data for each species, following van Strien *et al.* (2013) and Isaac *et al.* (2014), with improvements based on Outhwaite *et al.* (2018).

For each site-year combination the model estimates presence or absence for the species in question given variation in detection probability: from this the proportion of occupied sites ('occupancy') was estimated for each year. To estimate the composite indicator trend with uncertainty, the posterior distribution of the annual occupancy estimates for each species was utilised. For 1,000 iterations, the arithmetic mean occupancy estimate (on the unbounded log-odds scale) each year across all species were estimated. These estimates were converted back to the odds scale, then scaled so the mean estimate in the first year (1980) was set to 100, and summarized each year using the mean and 90% credible intervals. The summarized mean estimates are referred to as the composite index, and form the indicator when plotted alongside the 90% credible intervals. A detailed description of the occupancy model underlying this indicator, can be found in the technical document on the Bayesian indicator development. For each iteration, the proportional difference between the 1980 and 2017 (for All Pollinators and hoverflies, or 2018 for bees) was calculated (giving 1,000 proportional differences), these differences were then summarized using the mean and 90% credible intervals. A proportional difference of 0 indicates no change, consequently the trend was assessed as increasing if the lower 90% credible intervals was above 0 and decreasing if the upper 90% credible intervals was below 0. The trend was assessed as stable if the 90% credible intervals spanned 0. The same process was used to assess the short-term trend, but with the first year as 2012 rather than 1980.

Species-specific trends

For each species, the long- and short-term trend in occupancy was estimated as the mean annual percent change (over the time-period in question) across 1,000 estimates from the posterior distribution. Species were grouped into one of 5 categories based on both their short-term and long-term occupancy trend (Table 1). The threshold values for each category were based on those of the wild bird indicator; whether an individual species is increasing or decreasing has been decided by its rate of annual change over the time period (long or short) of interest. If the rate of annual change would lead to an occupancy increase or decrease of between 25% and 49% over 25 years, the species is said to have shown a 'weak increase' or a 'weak decline' respectively. If the rate of annual change would lead to a population increase or decrease of 50% or more over 25 years, the species is said to have shown a 'strong increase' or a 'strong decline' respectively. These thresholds are used in the Birds of Conservation Concern status assessment for birds in the UK.

Table 1: Thresholds used to define individual species trends

Category	**Thresholds**	**Threshold – equivalent**
Category: Strong increase	**Thresholds:** Above +2.81% per annum	**Threshold_equivalent:** +100% over 25 years
Category: Weak increase	**Thresholds:** Between +1.16% and +2.81% p.a.	**Threshold_equivalent:** +33% to +100% over 25 years
Category: Stable	**Thresholds:** Between -1.14 % and +1.16% p.a.	**Threshold_equivalent:** -25% to +33% over 25 years
Category: Weak decrease	**Thresholds:** Between -2.73% and -1.14% p.a.	**Threshold_equivalent:** -50% to -25% over 25 years
Category: Strong decrease	**Thresholds:** Below -2.73% p.a.	**Threshold_equivalent:** -50% over 25 years

Asymmetric percentage change thresholds are used to define these classes as they refer to proportional change, where a doubling of a species index (an increase of 100%) is counterbalanced by a halving (a decrease of 50%).

Results

- This indicator is not directly comparable with the previous publication. An additional 12 species of bee and 6 species of hoverfly now meet the criteria for inclusion, whereas 6 species have been removed due to taxonomic issues, resulting in a net increase of 11 species of bee and 1 species of hoverfly.

- The indicator (Figure 1) shows the average relative change in the area over which each of 377 species of pollinator was found, as measured by the number of 1km grid squares across the UK in which they were recorded – this is referred to as the 'occupancy index'.

- Over the long term (1980 to 2017), the pollinator indicator showed 30% decline, and was therefore assessed as a declining.

- Temporal patterns of change in the pollinator indicator showed a steady decline from 1987 onwards.

- Between 2012 and 2017 the indicator decreased by 2%, therefore the short-term trend was assessed as little change.

- Over the long term, 19% of pollinator species became more widespread (7% showed a strong increase), and 49% became less widespread (24% showed a strong decrease).

- By contrast, over the short term, a greater proportion of species were increasing (46%; with 34% exhibiting a strong increase) than decreasing (43%; with 36% exhibiting a strong decrease).

- As individual pollinator species become more or less widespread, the communities in any given area become more or less diverse, and this may have implications for pollination as more diverse communities are, in broad terms, more effective in pollinating a wide range of crops and wild flowers.

The indicator plot was also produced for the bee (Figure 2) and hoverfly (Figure 3) species separately. Note that available data permits calculation of the indicator up to 2018 for bees, but the headline (bees and hoverflies) and hoverfly indicators only run through 2017.

The bee index was relatively stable up to 2006, before undergoing several years of decline. From 2014 onwards, there was small evidence of a recovery, however, the bee index in 2018 was estimated to be 11% lower than in 1980 and is assessed as decreasing. A larger proportion of bee species had decreased than increased over the long term (42% decreased and 24% increased); similarly, over the short term, a greater number decreased (44%) than increased (40%). The recent decline in bees is striking. A run of wet summers and agricultural practices, including pesticide use, have both been implicated in the recent decline in bees (Stanley *et al*., 2015). However, further research is needed to better understand the relative importance of these potential drivers of change.

With regard to hoverflies, the index was at a peak in 1987 (109% compared to its 1980 value), and then (apart from some minor increases), underwent a progressive decline. Thus, the indicator is approximately 41% lower in 2017 than in 1980 and, over the long term, is assessed as "decreasing". Over the short term (2012 to 2017), the indicator decreases by just over 3%, and is assessed as "declining". A greater proportion of hoverflies have declined than increased in

occupancy over both the long and short term (1980 to 2017: 55% decreased and 16% increased; 2012 to 2017: 50% decreased and 44% increased). It is not clear why hoverflies show a different trend to bees, although differences in the life cycle will mean they respond differently to weather events and habitat change.

Figure 1: Change in the distribution of wild pollinators (n = 377) in the UK between 1980 and 2017. The shaded region is the 90% credible intervals of the annual occupancy estimates and represents the uncertainty surrounding the annual estimates. The solid line illustrates the rescaled indicator value. The proportion of pollinator species in each trend category is based on the mean annual change in occupancy over both a) the long term (1980 to 2017) and b) the short term (2012 to 2017).

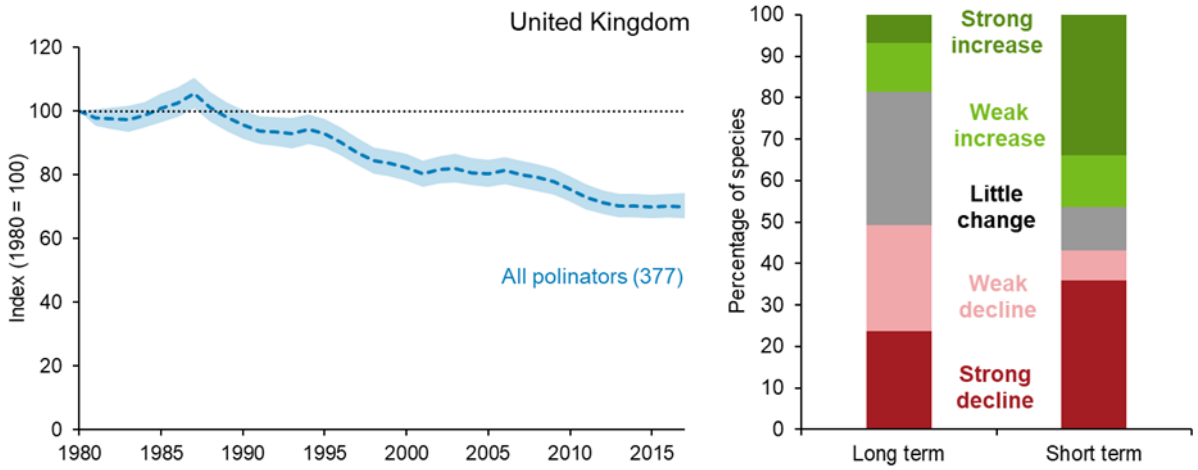


Figure 2: Change in the distribution of pollinating wild bee species (n = 148) in the UK between 1980 and 2018. The shaded region is the 90% credible intervals of the annual occupancy estimates and represents the uncertainty surrounding the annual estimates. The solid line illustrates the rescaled indicator value. The proportion of pollinating wild bee species in each trend category is based on the mean annual change in occupancy over both a) the long term (1980 to 2018) and b) the short term (2013 to 2018).

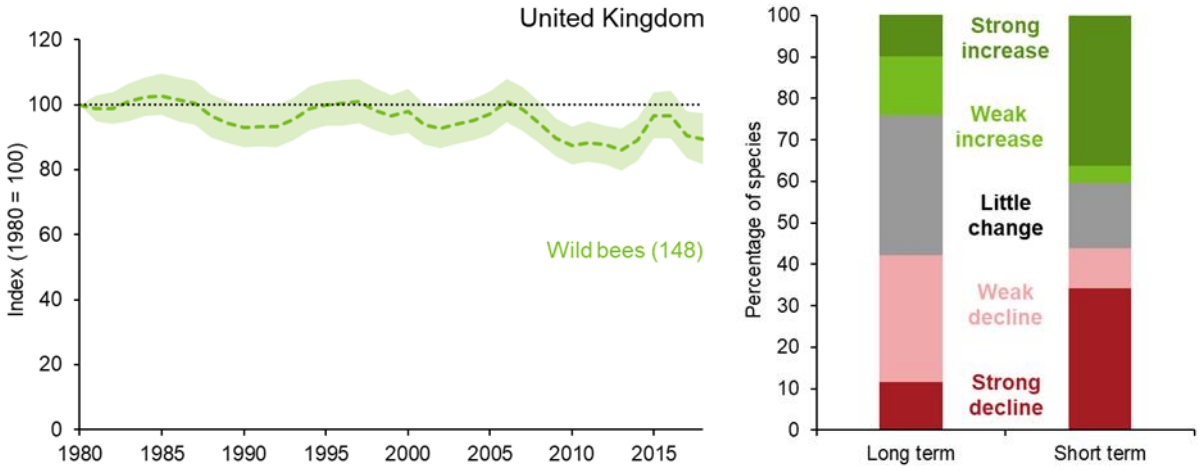
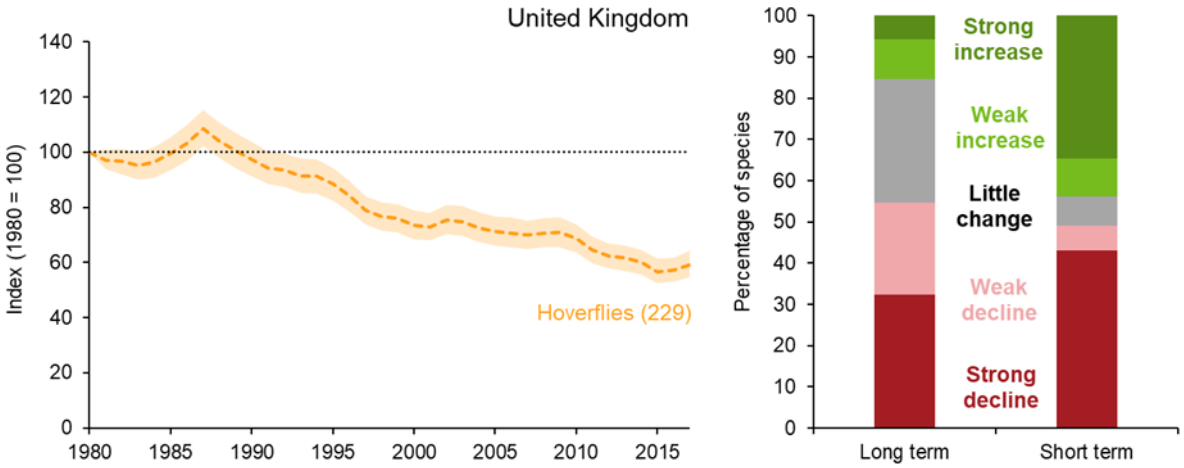


Figure 3: Change in the distribution of hoverfly species (n = 228) in the UK between 1980 and 2017. The shaded region is the 90% credible intervals of the annual occupancy estimates and represents the uncertainty surrounding the annual estimates. The solid line illustrates the rescaled indicator value. The proportion of hoverfly species in each trend category is based on the mean annual change in occupancy over both a) the long term (1980 to 2017) and b) the short term (2012 to 2017).

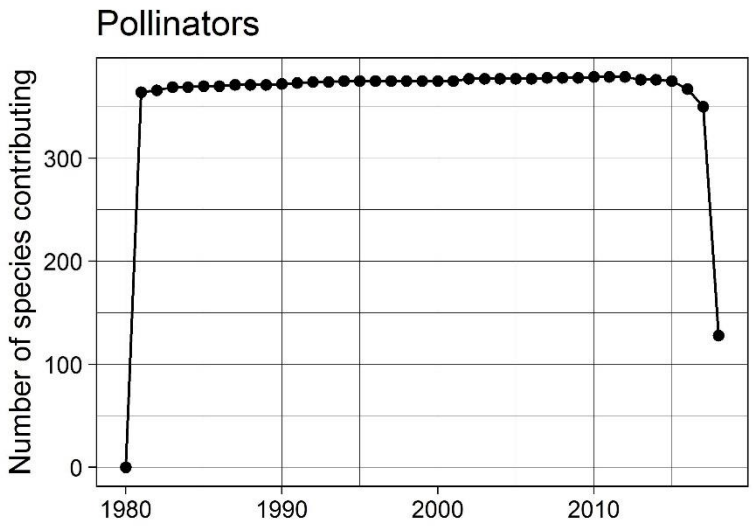


Additional Note on The Indicator.

Species only contribute to the indicator from the year in which they were first recorded, until the year in which they were last recorded. This means that many species only contribute for a subset of years, and hence the number of species contributing varies between years. Figure 4 shows the number of species contributing to the pollinator indicator per year up to 2018. Note that the statistical method used to produce the indicator must treat the number of species in the first year, 1980, as zero.

In the 2019 publication of the indicator, it spanned the period 1980 to 2016. As more data are now available for bees, we have revisited this to decide whether the indicator may be extended. The number of species contributing and the precision of the indicator in a given year are related; generally speaking, the more species, the better the precision. Therefore, as data becomes more sparse towards the end of the time-series (and hence fewer species contribute), we can use these measures to decide on an appropriate cut-off (final year) for the indicator. Based on the dramatic drop in number of species in 2018 – largely because there are no data for hoverflies – it was decided that this year would be dropped from the indicator. While there is a small drop in the number of species from 2016 to 2017 (Fig. 4), the precision of the indicator is similar (Fig. 1), so it was decided that it was justifiable to extend last year's indicator (published in 2019) by one year to 2017.

Figure 4. Number of species contributing to the indicator in each year. Note that the statistical method used to generate the indicator requires that the start year, 1980, must be treated as having zero species.



2017.

References

Breeze, T.D., Bailey, A.P., Balcombe, K.G. & Potts, S.G. (2011) Pollination services in the UK: How important are honeybees? *Agriculture, Ecosystems & Environment*, **142**, 137–143.

Brittain, C. A., Vighi, M., Bommarco, R., Settele, J. & Potts, S.G. (2010) Impacts of a pesticide on pollinator species richness at different spatial scales. *Basic and Applied Ecology*, **11**, 106–115.

Garratt, M.P.D., Truslove, C.L., Coston, D.J., Evans, R.L., Moss, E.D., Dodson, C., Jenner, N., Biesmeijer, J.C. & Potts, S.G. (2014) Pollination deficits in UK apple orchards. *Journal of Pollination Ecology*, **12**, 9–14.

Hassall, C. & Thompson, D.J. (2010) Accounting for recorder effort in the detection of range shifts from historical data. *Methods in Ecology and Evolution*, **1**, 343–350.

Isaac, N.J.B., van Strien, A.J., August, T.A., de Zeeuw, M.P. & Roy, D.B. (2014) Statistics for citizen science: extracting signals of change from noisy ecological data. *Methods in Ecology and Evolution*, **5**, 1052–1060.

Klein, A.-M., Vaissière, B.E., Cane, J.H., Steffan-Dewenter, I., Cunningham, S. A, Kremen, C. & Tscharntke, T. (2007) Importance of pollinators in changing landscapes for world crops. *Proceedings. Biological sciences / The Royal Society*, **274**, 303–13.

Outhwaite, C.L., Chandler, R.E., Powney, G.D., Collen, B., Gregory, R.D. & Isaac N. J. B. (2018) Prior specification in Bayesian occupancy modelling improves analysis of species occurrence data. *Ecological Indicators*, **93**, 333-343

POST (2010) *Insect Pollination*, London.

Potts, S.G., Biesmeijer, J.C., Kremen, C., Neumann, P., Schweiger, O. & Kunin, W.E. (2010) Global pollinator declines: trends, impacts and drivers. *Trends in ecology & evolution*, **25**, 345–53.

Powney, G.D., Carvell, C., Edwards, M., Morris, R.K.A., Roy, H.E., Woodcock, B.A. & Isaac, N.J.B. (2019) Widespread losses of pollinating insects in Britain. *Nature Communications*, **10**, 1018.

Silvertown, J. (2009) A new dawn for citizen science. *Trends in ecology & evolution*, **24**, 467–471.

Stanley, D.A. Garratt, M.P.D., Wickens, J.B., Wickens, V.J., Potts, S.G. & Raine, N.E. (2015) Neonicotinoid pesticide exposure impairs crop pollination services provided by bumblebees. *Nature*, online early.

Van Strien, A.J., van Swaay, C. A. M. & Termaat, T. (2013) Opportunistic citizen science data of animal species produce reliable estimates of distribution trends if analysed with occupancy models. *Journal of Applied Ecology*, **50**, 1450–1458.

Tingley, M.W. & Beissinger, S.R. (2009) Detecting range shifts from historical species occurrences: new perspectives on old data. *Trends in Ecology & Evolution*, **24**, 625–633.

Vanbergen, A.J. & The Insect Pollinators Initiative. (2013) Threats to an ecosystem service: pressures on pollinators. *Frontiers in Ecology and the Environment*, **11**, 251–259.

Woodcock, B.A., Edwards, M., Redhead, J., Meek, W.R., Nuttall, P., Falk, S., Nowakowski, M. & Pywell, R.F. (2013) Crop flower visitation by honeybees, bumblebees and solitary bees: Behavioural differences and diversity responses to landscape. *Agriculture, Ecosystems & Environment*, **171**, 1–8.

Appendix : The list of the 377 species included in the pollinator indicator.

Bees

Andrena alfkenella
Andrena angustior
Andrena apicata
Andrena argentata
Andrena barbilabris
Andrena bicolor
Andrena bimaculata
Andrena bucephala
Andrena chrysosceles
Andrena cineraria
Andrena clarkella
Andrena coitana
Andrena congruens
Andrena denticulata
Andrena dorsata
Andrena falsifica
Andrena ferox
Andrena flavipes
Andrena florea
Andrena fucata
Andrena fulva
Andrena fulvago
Andrena fuscipes
Andrena gravida
Andrena haemorrhoa
Andrena hattorfiana
Andrena helvola
Andrena humilis
Andrena labialis
Andrena labiata
Andrena lapponica
Andrena marginata
Andrena minutula
Andrena minutuloides
Andrena nigriceps
Andrena nigroaenea
Andrena nitida
Andrena nitidiuscula
Andrena niveata
Andrena ovatula
Andrena praecox
Andrena proxima
Andrena rosae
Andrena ruficrus
Andrena scotica
Andrena semilaevis
Andrena similis
Andrena simillima
Andrena subopaca
Andrena synadelpha
Andrena tarsata
Andrena thoracica
Andrena tibialis
Andrena trimmerana
Andrena vaga
Andrena varians
Andrena wilkella
Anthidium manicatum
Anthophora bimaculata
Anthophora furcata
Anthophora plumipes
Anthophora quadrimaculata
Anthophora retusa
Bombus distinguendus
Bombus hortorum
Bombus humilis
Bombus hypnorum
Bombus jonellus
Bombus lapidarius
Bombus muscorum
Bombus pascuorum
Bombus pratorum
Bombus ruderarius
Bombus ruderatus
Bombus soroeensis
Bombus sylvarum
Bombus terrestris
Ceratina cyanea
Chelostoma campanularum
Chelostoma florisomne
Colletes cunicularius
Colletes daviesanus
Colletes floralis
Colletes fodiens
Colletes halophilus
Colletes hederae
Colletes marginatus
Colletes similis
Colletes succinctus
Dasypoda hirtipes
Eucera longicornis
Halictus confusus
Halictus rubicundus
Halictus tumulorum

Heriades truncorum
Lasioglossum albipes
Lasioglossum brevicorne
Lasioglossum cupromicans
Lasioglossum fulvicorne
Lasioglossum laticeps
Lasioglossum leucopus
Lasioglossum malachurum
Lasioglossum morio
Lasioglossum parvulum
Lasioglossum pauxillum
Lasioglossum punctatissimum
Lasioglossum quadrinotatum
Lasioglossum semilucens
Lasioglossum villosulum
Lasioglossum zonulum
Megachile centuncularis
Megachile leachella
Megachile maritima
Megachile willughbiella
Melitta leporina
Osmia aurulenta
Osmia bicornis
Osmia leaiana
Osmia pilicornis
Lasioglossum prasinum
Lasioglossum puncticolle
Lasioglossum rufitarse
Lasioglossum smeathmanellum
Lasioglossum xanthopus
Macropis europaea
Megachile circumcincta
Megachile ligniseca
Megachile versicolor
Melitta haemorrhoidalis
Melitta tricincta
Osmia bicolor
Osmia caerulescens
Osmia parietina
Osmia spinulosa
Osmia xanthomelana
Hoplitis claviventris
Lasioglossum angusticeps
Lasioglossum calceatum
Lasioglossum fratellum
Lasioglossum laevigatum
Lasioglossum lativentre
Lasioglossum leucozonium
Lasioglossum minutissimum
Lasioglossum nitidiusculum
Lasioglossum pauperatum
Lasioglossum prasinum
Lasioglossum puncticolle
Lasioglossum rufitarse
Lasioglossum smeathmanellum
Lasioglossum xanthopus
Lasioglossum nitidiusculum
Lasioglossum pauperatum
Lasioglossum prasinum
Lasioglossum puncticolle
Lasioglossum rufitarse
Lasioglossum smeathmanellum
Lasioglossum xanthopus
Macropis europaea
Megachile centuncularis
Megachile ligniseca
Megachile versicolor
Melitta haemorrhoidalis
Melitta tricincta
Osmia bicolor
Osmia caerulescens
Osmia parietina
Osmia spinulosa
Lasioglossum punctatissimum
Lasioglossum quadrinotatum
Lasioglossum semilucens
Lasioglossum villosulum
Lasioglossum zonulum
Megachile centuncularis
Megachile leachella
Megachile maritima
Megachile willughbiella
Melitta leporina
Osmia aurulenta
Osmia bicornis
Osmia leaiana
Osmia pilicornis
Osmia uncinata
Panurgus banksianus

Hoverflies

Anasimyia contracta	Anasimyia interpuncta
Anasimyia lineata	Anasimyia lunulata
Anasimyia transfuga	Arctophila superbiens
Baccha elongata	Brachyopa bicolor
Brachyopa insensilis	Brachyopa pilosa
Brachyopa scutellaris	Brachypalpoides lentus
Brachypalpus laphriformis	Caliprobola speciosa
Callicera aurata	Callicera rufa
Chalcosyrphus eunotus	Chalcosyrphus nemorum
Chamaesyrphus scaevoides	Cheilosia albipila
Cheilosia albitarsis	Cheilosia antiqua
Cheilosia barbata	Cheilosia bergenstammi
Cheilosia caerulescens	Cheilosia carbonaria
Cheilosia chrysocoma	Cheilosia cynocephala
Cheilosia fraterna	Cheilosia griseiventris
Cheilosia grossa	Cheilosia illustrata
Cheilosia impressa	Cheilosia lasiopa
Cheilosia latifrons	Cheilosia longula
Cheilosia mutabilis	Cheilosia nebulosa
Cheilosia nigripes	Cheilosia pagana
Cheilosia proxima	Cheilosia pubera
Cheilosia scutellata	Cheilosia semifasciata
Cheilosia soror	Cheilosia urbana
Cheilosia variabilis	Cheilosia velutina
Cheilosia vernalis	Cheilosia vicina
Cheilosia vulpina	Chrysogaster cemiteriorum
Chrysogaster solstitialis	Chrysogaster virescens
Chrysotoxum arcuatum	Chrysotoxum bicinctum
Chrysotoxum cautum	Chrysotoxum elegans
Chrysotoxum festivum	Chrysotoxum verralli
Criorhina asilica	Criorhina berberina
Criorhina floccosa	Criorhina ranunculi
Dasysyrphus albostriatus	Dasysyrphus friuliensis
Dasysyrphus pinastri	Dasysyrphus tricinctus
Dasysyrphus venustus	Didea fasciata
Didea intermedia	Doros profuges
Epistrophe diaphana	Epistrophe eligans
Epistrophe grossulariae	Epistrophe melanostoma
Epistrophe nitidicollis	Episyrphus balteatus
Eriozona erratica	Eriozona syrphoides
Eristalinus aeneus	Eristalinus sepulchralis
Eristalis abusivus	Eristalis arbustorum
Eristalis horticola	Eristalis intricarius
Eristalis nemorum	Eristalis pertinax
Eristalis rupium	Eristalis tenax
Eumerus funeralis	Eumerus ornatus
Eumerus sabulonum	Eumerus strigatus
Eupeodes corollae	Eupeodes latifasciatus

Eupeodes luniger
Eupeodes nielseni
Eupeodes nitens
Ferdinandea cuprea
Ferdinandea ruficornis
Helophilus hybridus
Helophilus pendulus
Helophilus trivittatus
Heringia heringi
Heringia latitarsis
Heringia pubescens
Heringia vitripennis
Lejogaster metallina
Lejogaster tarsata
Lejops vittatus
Leucozona glaucia
Leucozona laternaria
Leucozona lucorum
Mallota cimbiciformis
Melangyna arctica
Melangyna cincta
Melangyna compositarum
Melangyna compositarum/labiatarum
Melangyna labiatarum
Melangyna lasiophthalma
Melangyna quadrimaculata
Melangyna umbellatarum
Melanogaster aerosa
Melanogaster hirtella
Melanostoma dubium
Melanostoma mellinum
Melanostoma scalare
Meligramma euchromum
Meligramma guttatum
Meligramma trianguliferum
Meliscaeva auricollis
Meliscaeva cinctella
Merodon equestris
Microdon analis
Microdon devius
Myathropa florea
Myolepta dubia
Neoascia geniculata
Neoascia interrupta
Neoascia meticulosa
Neoascia obliqua
Neoascia podagrica
Neoascia tenur
Orthonevra brevicornis
Orthonevra geniculata
Orthonevra nobilis
Paragus haemorrhous
Parasyrphus annulatus
Parasyrphus lineola
Parasyrphus malinellus
Parasyrphus nigritarsis
Parasyrphus punctulatus
Parasyrphus vittiger
Parhelophilus consimilis
Parhelophilus frutetorum
Parhelophilus versicolor
Pelecocera tricincta
Pipiza austriaca
Pipiza bimaculata
Pipiza fenestrata
Pipiza lugubris
Pipiza luteitarsis
Pipiza noctiluca
Pipizella viduata
Pipizella virens
Platycheirus albimanus
Platycheirus ambiguus
Platycheirus angustatus
Platycheirus clypeatus
Platycheirus discimanus
Platycheirus fulviventris
Platycheirus granditarsus
Platycheirus immarginatus
Platycheirus manicatus
Platycheirus occultus
Platycheirus peltatus
Platycheirus perpallidus
Platycheirus podagratus
Platycheirus rosarum
Platycheirus scambus
Platycheirus scutatus
Platycheirus scutatus
Platycheirus splendidus
Platycheirus sticticus
Platycheirus tarsalis
Pocota personata
Portevinia maculata
Psilota anthracina
Rhingia campestris
Rhingia rostrata
Riponnensia splendens
Scaeva pyrastri
Scaeva selenitica

Sericomyia lappona
Sericomyia silentis
Sphaerophoria batava
Sphaerophoria fatarum
Sphaerophoria interrupta
Sphaerophoria philanthus
Sphaerophoria rueppellii
Sphaerophoria scripta
Sphaerophoria taeniata
Sphaerophoria virgata
Sphegina clunipes
Sphegina elegans
Sphegina sibirica
Sphegina verecunda
Syritta pipiens
Syrphus ribesii
Syrphus torvus
Syrphus vitripennis
Trichopsomyia flavitarsis
Triglyphus primus
Tropidia scita
Volucella bombylans
Volucella inanis
Volucella inflata
Volucella pellucens
Volucella zonaria
Xanthandrus comtus
Xanthogramma citrofasciatum
Xanthogramma pedissequum
Xylota abiens
Xylota florum
Xylota jakutorum
Xylota segnis
Xylota sylvarum
Xylota tarda
Xylota xanthocnema