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Survey of aculeate Hymenoptera and Diptera assemblages at Morfa Dyffryn NNR and Morfa Harlech NNR, 2018 and 2019

N. Jones & I. Cheeseborough

NRW Evidence Report No. 382

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1. Crynodeb Gweithredol

Cynhaliwyd arolwg o wenyn a gwenyn meirch colynnog a phryfed (Diptera) twyni Morfa Dyffryn a Morfa Harlech yn 2018 a 2019 er mwyn ceisio canfod cyflwr presennol y ddau safle o ran y grwpiau tacsonomig hyn.

Ym Morfa Dyffryn, cofnodwyd 51 o rywogaethau Hymenoptera colynnog yn ystod yr arolwg, gan gynnwys gwenynen fregus yr Undeb Rhyngwladol dros Gadwraeth Natur (IUCN) Ewropeaidd *Colletes fodiens*, dwy wenynen feirch sy'n Brin yn Genedlaethol, gwenynen sy'n Brin yn Genedlaethol, tair o wenyn meirch sy'n Anfynych yn Genedlaethol, a dwy wenynen sy'n Anfynych yn Genedlaethol. Cofnodwyd 32 o rywogaethau Hymenoptera colynnog o gasgliad infertebratau twyni tywod Cymru, ond ni chanfuwyd saith rhywogaeth a gofnodwyd o'r blaen. Cofnodwyd tair rhywogaeth Hymenoptera golynnog sy'n newydd i restr y safle o rywogaethau'r casgliad twyni tywod, gan gynnwys yr heliwr corrod Anfynych yn Genedlaethol *Arachnospila wesmaeli*. Cofnodwyd 110 o rywogaethau Diptera (gwir bryfed), gan gynnwys 32 a gydnabyddir yn rhan o'r casgliad o infertebratau twyni tywod. Ychwanegwyd naw o rywogaethau pryfed sy'n ddibynnol ar dwyni at restr y safle, a chofnodwyd naw o bryfed sy'n Anfynych yn Genedlaethol, yr oedd dau ohonynt yn newydd i Morfa Dyffryn. **Bellach, cyfansymiau cyffredinol yr Hymenoptera colynnog a Diptera sy'n ddibynnol ar dwyni yw 39 a 44 o rywogaethau, yn y drefn honno.**

Ym Morfa Harlech, cofnodwyd 57 o rywogaethau Hymenoptera colynnog yn ystod yr arolwg, gan gynnwys gwenynen fregus IUCN Ewropeaidd *Colletes fodiens*, gwenynen feirch sy'n Brin yn Genedlaethol, gwenynen sy'n Brin yn Genedlaethol, pedair o wenyn meirch sy'n Anfynych yn Genedlaethol, a thair o wenyn sy'n Anfynych yn Genedlaethol. Cofnodwyd 29 o rywogaethau Hymenoptera colynnog o gasgliad infertebratau twyni tywod Cymru, ond ni chanfuwyd deg rhywogaeth a gofnodwyd o'r blaen. Cofnodwyd un rhywogaeth sy'n Anfynych yn Genedlaethol a gydnabyddir yn rhan o gasgliad y twyni, sy'n newydd i restr y safle. Cofnodwyd 128 o rywogaethau Diptera (gwir bryfed) (gan gynnwys dwy rywogaeth a gofnodwyd yn 2017), gan gynnwys 28 a gydnabuwyd yn rhan o'r casgliad infertebratau twyni tywod. Ychwanegwyd wyth o rywogaethau pryfed sy'n ddibynnol ar dwyni at restr y safle, gan gynnwys chwe phryfyn sy'n Anfynych yn Genedlaethol ac un "Data Diffygiol". **Bellach, cyfansymiau cyffredinol Hymenoptera colynnog a Diptera sy'n ddibynnol ar dwyni yw 38 a 41 o rywogaethau, yn y drefn honno.**

Cafodd canlyniadau'r arolwg eu dadansoddi gan ddefnyddio dull cronfa ddata Pantheon a awgrymodd fod rhywogaethau sy'n gysylltiedig â 'sialc a thywod moel' ac 'adnodd blodau cyfoethog' ar Forfa Dyffryn a Morfa Harlech mewn cyflwr ffafriol. Fodd bynnag, mae hyn i'w ystyried yn erbyn cefndir o golli 62% o dywod moel ar Forfa Dyffryn ers y 1940au, gyda ffigur cyfatebol o 72% wedi'i golli ym Morfa Harlech. Bydd y colledion hyn wedi cael effaith niweidiol ar infertebratau sy'n gysylltiedig ag amodau twyni arloesol ac felly dylid trin asesiadau Pantheon â gofal.

2. Executive Summary

A survey of the aculeate bees & wasps and flies (Diptera) of Morfa Dyffryn and Morfa Harlech dunes was undertaken in 2018 and 2019 in an attempt to determine the current condition of the two sites for these taxonomic groups.

At Morfa Dyffryn, 51 aculeate Hymenoptera species were recorded during the survey including one European IUCN Vulnerable bee *Colletes fodiens*, two Nationally Rare wasps, one Nationally Rare bee, three Nationally Scarce wasps and two Nationally Scarce bees. 32 aculeate Hymenoptera species of the Welsh sand dune invertebrate assemblage were recorded, but seven previously-recorded species were not found. Three aculeate Hymenoptera species new to the site list of sand dune assemblage species were recorded, including the Nationally Scarce spider wasp *Arachnospila wesmaeli*. 110 Diptera (true-flies) species were recorded, including 32 recognised as part of the sand dune invertebrate assemblage. Nine dune-dependent fly species were added to the site list, and nine Nationally Scarce flies were recorded of which two were new to Morfa Dyffryn. **The overall totals for dune-dependent aculeate Hymenoptera and Diptera now stand at 39 and 44 species respectively.**

At Morfa Harlech, 57 aculeate Hymenoptera species were recorded during the survey including one European IUCN Vulnerable bee *Colletes fodiens*, one Nationally Rare wasp, one Nationally Rare bee, four Nationally Scarce wasps and three Nationally Scarce bees. 29 aculeate Hymenoptera species of the Welsh sand dune invertebrate assemblage were recorded, but ten previously-recorded species were not found. One Nationally Scarce species recognized as part of the dune assemblage was recorded new to the site list. 128 Diptera (true-flies) species were recorded (including two species recorded in 2017), including 28 recognised as part of the sand dune invertebrate assemblage. Eight dune-dependent fly species were added to the site list, including Six Nationally Scarce and one “Data Deficient” fly. **The overall totals for dune-dependent aculeate Hymenoptera and Diptera now stand at 38 and 41 species respectively.**

Survey results were analysed using the Pantheon database tool which suggested that species associated with ‘Bare sand & chalk’ and ‘Rich flower resource’ on both Morfa Dyffryn and Morfa Harlech are in favourable condition. However, this is set against a backdrop of a 62% loss of bare sand on Morfa Dyffryn since the 1940s, with a corresponding figure of 72% loss on Morfa Harlech. These losses will have had a detrimental impact upon invertebrates associated with pioneer dune conditions and therefore the Pantheon assessments should be treated with caution.

3. Introduction

Morfa Dyffryn and Morfa Harlech are important elements of the west coast dune systems which have developed between south Wales and the borders of Scotland. Many systems support populations of rare or threatened invertebrate species and important invertebrate assemblages associated with pioneer, sandy and xeric habitats. These include threatened aculeate bees and wasps or aculeates with a predominantly southern distribution whose range and distribution extends northwards via these dune systems. In addition, a number of Diptera species strongly associated with dune and other coastal habitats occur on dune systems in Wales. A provisional attempt by the Countryside Council for Wales to determine the species components of the assemblage identified 157 species at Morfa Dyffryn and 154 species at Morfa Harlech (Table 1; Appendix 1) although, as this was undertaken nine years ago, it is likely to be out of date with new species recorded and changes in species' statuses (Mike Howe, pers. comm.). At that time, the total included 36 species of aculeate Hymenoptera at Morfa Dyffryn and 37 species at Morfa Harlech.

Table 1. Taxa comprising the dune invertebrate assemblage on Morfa Dyffryn and Morfa Harlech SSSIs prior to current survey (NRW data). See Appendix 1 for explanation of Grade 1 to 3 species.

Morfa Dyffryn	Grade 1	Grade 2	Grade 3	Total
aculeate Bees & Wasps	1	7	28	36
other Wasps	1	0	0	1
Beetles	11	20	26	57
Bugs	1	1	8	10
Flies	8	11	16	35
Lacewings	1	0	0	1
Moths	2	3	3	8
Spiders	0	2	6	8
Woodlice	0	1	0	1
Total	25	45	86	157

Morfa Harlech	Grade 1	Grade 2	Grade 3	Total
aculeate Bees & Wasps	2	8	27	37
other Wasps	1	0	0	1
Beetles	11	16	28	55
Bugs	0	2	12	14
Flies	7	9	17	33
Lacewings	1	0	0	1
Moths	1	2	3	6
Spiders	1	2	3	6
Woodlice	0	1	0	1
Total	24	40	90	154

The priority objective of the 2018-19 survey was to confirm the current status of all previously-recorded Nationally Rare and Nationally Scarce aculeate species as these are likely to form an important part of the dune invertebrate assemblage SSSI feature. A secondary objective was to confirm the status of dune-associated Diptera (flies) on Morfa Dyffryn and Morfa Harlech dunes.

4. Methods

Six days were spent on Morfa Dyffryn and five days were spent on Morfa Harlech between 9 May 2018 and 25 August 2019, visiting when suitable warm and sunny conditions were forecast. On each day, at least two entomologists undertook survey work. The majority of the fieldwork was undertaken by the authors, Nigel Jones and Ian Cheeseborough, assisted on occasion by Richard Becker and Charles Mitchell. Survey days were:

9 May 2018: Warm with sunny conditions throughout the day: Morfa Dyffryn and Morfa Harlech;

6 June 2018: Very warm with sunny conditions throughout the day: Morfa Dyffryn;

6 July 2018: Very warm with sunny conditions throughout the day: Morfa Dyffryn and Morfa Harlech;

22 July 2018: Very warm with sunny conditions throughout the day; Morfa Dyffryn;

9 June 2019: Warm with sunny conditions throughout the day: Morfa Harlech;

15 July 2019: Very warm with sunny conditions throughout the day: Morfa Dyffryn and Morfa Harlech.

25 August 2019: Very warm with sunny conditions throughout the day: Morfa Dyffryn and Morfa Harlech.

Both sites are extensive and it was not possible to explore the whole area of either site in a single day, so the survey attempted to sample from key areas for the dune assemblage of aculeate Hymenoptera and Diptera. The approach taken was to focus searches in a variety of situations including dune slacks, particularly around edges of slacks and on raised areas within slacks. Other areas sampled were the sparsely-vegetated edges of mobile dunes, damp areas within slacks, foliage of trees scattered around the site, and at Harlech, an area that had recently been clear-felled of conifers. On Morfa Harlech, the furthestmost northern part of the site was largely neglected, as it would have used too much of the working day to walk to this part of the site. It was only sampled on 15 July 2019, when motorised transport was provided by the site manager.

Survey techniques employed were; search and capture (mainly for aculeate Hymenoptera) and sweep netting through vegetation, over water, across tree foliage, and across sparsely vegetated areas. Banks of five pan-traps were set in various situations in sparsely-vegetated and bare sand areas. These were set out on arrival at each site and taken in at the end of the survey day or half day.

Areas and habitats important for aculeate Hymenoptera were noted. Locations of nest aggregations and significant species were recorded using GPS. Care was taken to minimise damage to plants or habitat whilst traversing the dunes.

Voucher specimens of cryptic species are retained in the private collections of Ian Cheeseborough and Nigel Jones.

5. Results

5.1 Aculeate Hymenoptera

Morfa Dyffryn

51 species of aculeate Hymenoptera were recorded during the survey including one IUCN red-listed in Europe bee (*Colletes fodiens*), three Nationally Rare species (*Colletes cunicularius*, *Mimumesa littoralis* and *Oxybelus mandibularis*) and five Nationally Scarce species (*Arachnospila wesmaeli*, *Dasypoda hirtipes*, *Megachile leachella*, *Oxybelus argentatus* and *Podalonia hirsuta*). *Arachnospila wesmaeli* is an addition to the Morfa Dyffryn site list of dune assemblage aculeates.

Seven species (22%) of dune assemblage aculeates previously recorded from Morfa Dyffryn were not detected in 2018-19 - *Coelioxys rufescens*, *Dryudella pinguis*, *Harpactus tumidus*, *Hedychridium cupreum*, *Megachile circumcincta*, *Osmia aurulenta* and *Tiphia femorata*. 32 of the species recorded are recognized as part of the Morfa Dyffryn dune assemblage (Table 2), but new site records of three dune-dependent species - *Arachnospila trivialis*, *A. wesmaeli* and *Epeolus variegatus* (all Grade 3 species) have been added as a consequence of this survey.

Morfa Harlech

57 species of aculeate Hymenoptera were recorded during the survey including one IUCN red-listed in Europe bee (*Colletes fodiens*), one Nationally Rare species (*Colletes cunicularius*) and seven Nationally Scarce species (*Arachnospila wesmaeli*, *Dasypoda hirtipes*, *Hedychridium cupreum*, *Megachile leachella*, *Osmia aurulenta*, *Oxybelus argentatus* and *Podalonia hirsuta*). *Arachnospila wesmaeli* is an addition to the Morfa Harlech site list of dune assemblage aculeates.

Ten species (27%) of dune assemblage aculeates previously recorded from Morfa Harlech were not detected in 2018-19 - *Arachnospila trivialis*, *Coelioxys mandibularis*, *Crabro cribrarius*, *Dryudella pinguis*, *Evagetus crassicornis*, *Harpactus tumidus*, *Megachile circumcincta*, *Mimumesa littoralis*, *Oxybelus mandibularis* and *Sapyga quinquepunctata*. 28 of the species recorded are recognized as part of the Morfa Harlech dune assemblage (Table 2), including a new site record of dune-dependent *Arachnospila wesmaeli* (a Grade 3 species).

Table 2. Aculeates recorded in 2019 that are recognized as part of the Morfa Dyffryn and Morfa Harlech dune invertebrate assemblage. Statuses taken from Falk, 1991a. Legend: x = recorded in 2018-19; **yellow** = not recorded in 2018-19; New = new to site list of dune assemblage aculeates

Morfa Dyffryn

Species	Family	Status	Grade	2019
<i>Andrena barbilabris</i>	Apidae	Local	3	x
<i>Coelioxys conoidea</i>	Apidae	Local	3	x
<i>Coelioxys elongata</i>	Apidae	Local	3	x
<i>Coelioxys rufescens</i>	Apidae	Unknown	3	-
<i>Colletes cunicularius</i>	Apidae	Nationally Rare	1	x
<i>Colletes fodiens</i>	Apidae	Common	3	x
<i>Colletes similis</i>	Apidae	Local	3	x
<i>Dasypoda hirtipes</i>	Apidae	Nationally Scarce	2	x
<i>Epeolus variegatus</i>	Apidae	Local	3	New
<i>Megachile circumcincta</i>	Apidae	Common	3	-
<i>Megachile leachella</i>	Apidae	Nationally Scarce	2	x
<i>Megachile maritima</i>	Apidae	Unknown	3	x
<i>Osmia aurulenta</i>	Apidae	Local	3	-
<i>Sphecodes pellucidus</i>	Apidae	Local	3	x
<i>Hedychridium ardens</i>	Chrysididae	Common	3	x
<i>Hedychridium cupreum</i>	Chrysididae	Nationally Scarce	2	-
<i>Cerceris arenaria</i>	Crabronidae	Common	3	x
<i>Crabro cribrarius</i>	Crabronidae	Local	3	x
<i>Crabro peltarius</i>	Crabronidae	Local	3	x
<i>Crossocerus wesmaeli</i>	Crabronidae	Common	3	x
<i>Dryudella pinguis</i>	Crabronidae	Local	2	-
<i>Harpactus tumidus</i>	Crabronidae	Local	3	-
<i>Mimumesa littoralis</i>	Crabronidae	Nationally Rare	2	x
<i>Oxybelus argentatus</i>	Crabronidae	Nationally Scarce	2	x
<i>Oxybelus mandibularis</i>	Crabronidae	Nationally Rare	2	x
<i>Oxybelus uniglumis</i>	Crabronidae	Common	3	x
<i>Tachysphex nitidus</i>	Crabronidae	Local	2	x
<i>Tachysphex pompiliformis</i>	Crabronidae	Local	3	x
<i>Myrmosa atra</i>	Mutillidae	Local	3	x
<i>Anoplius infuscatus</i>	Pompilidae	Local	3	x
<i>Arachnospila trivialis</i>	Pompilidae	Local	3	New
<i>Arachnospila wesmaeli</i>	Pompilidae	Nationally Scarce	3	New
<i>Ceroptera maculata</i>	Pompilidae	Local	3	x
<i>Episyron rufipes</i>	Pompilidae	Local	3	x
<i>Evagetes crassicornis</i>	Pompilidae	Local	3	x
<i>Pompilus cinereus</i>	Pompilidae	Local	3	x
<i>Ammophila sabulosa</i>	Sphecidae	Local	3	x
<i>Podalonia hirsute</i>	Sphecidae	Nationally Scarce	3	x
<i>Tiphia femorata</i>	Tiphidae	Local	3	-

Morfa Harlech

Species	Family	Status	Grade	2019
<i>Andrena barbilabris</i>	Apidae	Local	3	x
<i>Coelioxys elongate</i>	Apidae	Local	3	x
<i>Coelioxys mandibularis</i>	Apidae	Nationally Rare	1	-
<i>Colletes cunicularius</i>	Apidae	Nationally Rare	1	x
<i>Colletes fodiens</i>	Apidae	Common	3	x
<i>Dasypoda hirtipes</i>	Apidae	Nationally Scarce	2	x
<i>Epeolus cruciger</i>	Apidae	Local	3	x
<i>Epeolus variegatus</i>	Apidae	Local	3	x
<i>Megachile circumcincta</i>	Apidae	Common	3	-
<i>Megachile leachella</i>	Apidae	Nationally Scarce	2	x
<i>Megachile maritima</i>	Apidae	Unknown	3	x
<i>Osmia aurulenta</i>	Apidae	Nationally Scarce	3	x
<i>Sphecodes pellucidus</i>	Apidae	Local	3	x
<i>Hedychridium ardens</i>	Chrysididae	Common	3	x
<i>Hedychridium cupreum</i>	Chrysididae	Nationally Scarce	2	x
<i>Cerceris arenaria</i>	Crabronidae	Common	3	x
<i>Crabro cribrarius</i>	Crabronidae	Local	3	-
<i>Crabro peltarius</i>	Crabronidae	Local	3	x
<i>Crossocerus wesmaeli</i>	Crabronidae	Common	3	x
<i>Dryudella pinguis</i>	Crabronidae	Local	2	-
<i>Harpactus tumidus</i>	Crabronidae	Local	3	-
<i>Mimumesa littoralis</i>	Crabronidae	Nationally Rare	2	-
<i>Oxybelus argentatus</i>	Crabronidae	Nationally Scarce	2	x
<i>Oxybelus mandibularis</i>	Crabronidae	Nationally Rare	2	-
<i>Oxybelus uniglumis</i>	Crabronidae	Common	3	x
<i>Tachysphex nitidus</i>	Crabronidae	Local	2	x
<i>Tachysphex pompiliformis</i>	Crabronidae	Local	3	x
<i>Myrmosa atra</i>	Mutillidae	Local	3	x
<i>Anoplius infuscatus</i>	Pompilidae	Local	3	x
<i>Arachnospila trivialis</i>	Pompilidae	-	3	-
<i>Arachnospila wesmaeli</i>	Pompilidae	Nationally Scarce	3	New
<i>Ceropales maculata</i>	Pompilidae	Local	3	x
<i>Episyron rufipes</i>	Pompilidae	Local	3	x
<i>Evagetes crassicornis</i>	Pompilidae	Local	3	-
<i>Pompilus cinereus</i>	Pompilidae	Local	3	x
<i>Sapyga quinquepunctata</i>	Sapygidae	Common	3	-
<i>Ammophila sabulosa</i>	Sphecidae	Local	3	x
<i>Podalonia hirsuta</i>	Sphecidae	Nationally Scarce	3	x

Small numbers of of *Colletes fodiens* were detected at both sites, particularly around ragwort flowers at Morfa Dyffryn. *C. fodiens* is Vulnerable in Europe but widespread on dunes in the UK.

At Morfa Dyffryn, *Colletes cunicularius* was observed quite frequently on *Salix repens* flowers and a large nesting aggregation was noted at SH568233. An individual was also noted at sycamore flowers. At Morfa Harlech, good numbers and a nesting

aggregation were observed around SH564327. An individual was also seen at SH567330.

The wasp *Mimumesa littoralis* was observed at Morfa Dyffryn in two areas within 1km squares SH5525 (at the northern end of the site) and SH5623 (at the southern end of the site, where several were seen. A single specimen was collected from a pantrap at SH566233. It was seen on three separate days across 2018/19. This indicates that there is probably a robust population of *M. littoralis* present at Morfa Dyffryn.

The wasp *Oxybelus mandibularis* was seen just once, and only at Morfa Dyffryn, where two males were found at SH566233. Its cogener *O. argentatus* appears to be more widespread across both sites, with specimens observed on three days in 2018/19. At Morfa Dyffryn it was observed at SH56472352, SH56512347 and SH55262552, and at Morfa Harlech it was observed within SH5632, SH5534 and at SH557346. At both locations pantraps yielded several specimens. *O. argentatus* appears to be well established at both sites.

The wasp *Podalonia hirsuta* appears to have robust populations at both sites with specimens observed on five survey days across 2018-19. At Morfa Dyffryn it was noted within SH5623 and at SH568233, whilst at Morfa Harlech it was noted within SH5632, and at SH569327 and SH569317.

The chrysidid wasp *Heychridium cupreum* was collected from a single pantrap in an area of clear-felled woodland on Morfa Harlech at SH568329.

Arachnospila wesmaeli was discovered for the first time at both sites – within SH5623 at Morfa Dyffryn and within SH5534 at Morfa Harlech.

The bee *Dasypoda hirtipes* was observed in low numbers at both sites in 2018, but was not observed in 2019. At Morfa Dyffryn it was noted within SH5525, SH5623 and SH5624; at Morfa Harlech it was noted at SH569327 and SH570321.

The leaf-cutting bee *Megachile leachella* (previously *M. dorsalis*) was found in low numbers at both sites: at Morfa Dyffryn within SH5525 and at SH55682505; at Morfa Harlech within SH5632 and at SH570321.

The bee *Osmia aurulenta* was seen only at Morfa Harlech; a single female within SH5632. In addition, the Site Manager Rhodri Daffyd reported having seen an individual at Morfa Harlech in May 2018.

5.2 Diptera

Morfa Dyffryn

110 Diptera species were recorded during the 2018-19 survey. Table 3 lists the Diptera families recorded.

31 of the species recorded are identified as part of the dune invertebrate assemblage. 13 species that have been previously recorded, and are considered to be part of the dune invertebrate assemblage, were not recorded in 2018-19 (see Table 4), but nine dune assemblage species were added to the site dune

assemblage list, bringing the total of dune assemblage Diptera species recorded from Morfa Dyffryn to 44.

One Near Threatened species (*Helina parcepilosa*) and nine Nationally Scarce species (*Pamponerus germanicus*, *Dialineura anilis*, *Phthiria pulicaria*, *Dolichopus notatus*, *Tetanops myopinus*, *Pherbellia nana*, *Sarcophila latifrons*, *Coenosia minutalis* and *C. verrallii*) were recorded in 2018–9. One Critically Endangered (*Tachytrechus ripicola*), two Nationally Rare (*Nephrotoma quadristriata* and *Trupanea amoena*) and three Nationally Scarce species (*Pherbellia grisescens*, *Helina quadrinotata* and *Coenosia karli*) previously recorded from Morfa Dyffryn were not found in 2018–9 (see Table 4).

Morfa Harlech

128 Diptera species were recorded during the 2018-19 survey. Table 3 lists the Diptera families recorded.

28 of the species recorded are identified as part of the dune invertebrate assemblage. 13 species that have been previously recorded and are considered to be part of the dune invertebrate assemblage were not recorded in 2018-19 (see Table 4), but eight dune assemblage species were added to the site dune assemblage list, bringing the total of dune assemblage Diptera species recorded from Morfa Harlech to 41.

Six Nationally Scarce species (*Dialineura anilis*, *Phthiria pulicaria*, *Dolichopus notatus*, *Eumerus sabulonum*, *Tetanops myopinus* and *Sarcophila latifrons*) and one Data Deficient (formerly RDB3) species *Crossopalpus setiger* were recorded in 2018-19. One Critically Endangered species (*Tachytrechus ripicola*), one Nationally Rare (*Nephrotoma quadristriata*) and six Nationally Scarce species (*Pamponerus germanicus*, *Cheilosia mutabilis*, *Lasiamba palposa*, *Pherbellia grisescens*, *Pteromicra glabricula* and *Coenosia verrallii*) previously recorded from Morfa Harlech were not found in 2018-19 (see Table 4).

Table 3. Diptera families recorded in 2018-19.

Family	English name (if any)
Anthomyiidae	-
Asilidae	Robberflies
Bibionidae	St Mark's flies
Bombyliidae	Bee-flies
Calliphoridae	Blowflies
Canacidae	-
Carnidae	-
Chamaemyiidae	Silver-flies
Chloropidae	Frit-flies
Chyromyidae	-
Conopidae	Thick-headed flies
Diastatidae	-
Dolichopodidae	Long-legged flies
Drosophilidae	Fruit flies
Empididae	Dance flies
Ephydridae	Shore-flies

Family	English name (if any)
Helcomyzidae	-
Heterocheilidae	-
Hybotidae	-
Lauxaniidae	-
Milichiidae	Free-loader flies
Muscidae	House flies
Piophilidae	Skipper flies
Pipunculidae	Big-headed flies
Platystomatidae	-
Psilidae	-
Rhagionidae	Snipe-flies
Rhinophoridae	Woodlouse flies
Sarcophagidae	Flesh flies and Satellite flies
Scathophagidae	Dung flies
Sciomyzidae	Snail-killing flies
Sepsidae	-
Sphaeroceridae	Lesser dung flies
Syrphidae	Hoverflies
Tachinidae	Parasitoid flies
Tephritidae	a family of Picture-wing flies
Therevidae	Stiletto flies
Trixoscelidae	-
Ulidiidae	a family of Picture-wing flies

Table 4. Diptera regarded as being part of the SSSI dune assemblage. Statuses are drawn from: Ball & Morris, 2014; Drake, 2017, 2018; Falk, 1991b; Falk, & Crossley, 2005; Falk *et al.*, 2016; Falk & Pont, 2017. Legend: x = recorded in 2018-19; yellow = not recorded in 2018-19.

Morfa Dyffryn

Species	Family	Status	Grade	2019
<i>Nephrotoma quadristriata</i>	Tipulidae	pRDB2	1	-
<i>Nephrotoma submaculosa</i>	Tipulidae	Local	3	-
<i>Janetiella frankumi</i>	Cecidomyiidae	Local	3	-
<i>Dysmachus trigonus</i>	Asilidae	Local	3	x
<i>Pamponerus germanicus</i>	Asilidae	Nationally Scarce	1	x
<i>Philonicus albiceps</i>	Asilidae	Local	3	x
<i>Dialineura anilis</i>	Therevidae	Nationally Scarce	1	x
<i>Acrosathe annulata</i>	Therevidae	Local	3	x
<i>Thereva bipunctata</i>	Therevidae	Local	3	x
<i>Villa modesta</i>	Bombyliidae	Local	1	-
<i>Phthiria pulicaria</i>	Bombyliidae	Nationally Scarce	1	x
<i>Hilara cantabrica</i>	Empididae	Local	3	x
<i>Dolichopus acuticornis</i>	Dolichopodidae	Local	3	x
<i>Dolichopus notatus</i>	Dolichopodidae	Nationally Scarce	3	x
<i>Tachytrechus insignis</i>	Dolichopodidae	-	2	New

Species	Family	Status	Grade	2019
<i>Tachytrechus ripicola</i>	Dolichopodidae	Critically Endangered	2	-
<i>Trupanea amoena</i>	Tephritidae	pRDB2	2	-
<i>Tomosvaryella littoralis</i>	Pipunculidae	-	1	New
<i>Tetanops myopinus</i>	Ulidiidae	Nationally Scarce	2	x
<i>Helcomyza ustulata</i>	Helcomyzidae	Local	3	-
<i>Chamaemyia flavipalpis</i>	Chamaemyiidae	-	3	x
<i>Trixoscelis obscurella</i>	Heleomyzidae	Local	2	x
<i>Pherbellia grisea</i>	Sciomyzidae	Notable/Nb	3	-
<i>Pherbellia nana</i>	Sciomyzidae	Notable/Nb	2	New
<i>Tethina albosetulosa</i>	Canacidae	-	2	New
<i>Tethina illota</i>	Canacidae	-	3	New
<i>Philygria punctatonevosa</i>	Ephydriidae	-	2	x
<i>Meromyza pratorum</i>	Chloropidae	-	2	x
<i>Gonia ornata</i>	Tachinidae	Local	2	x
<i>Siphona variata</i>	Tachinidae	-	1	New
<i>Senotainia conica</i>	Sarcophagidae	Local	2	x
<i>Sarcophaga hirticrus</i>	Sarcophagidae	-	3	New
<i>Sarcophila latifrons</i>	Sarcophagidae	Nationally Scarce	3	New
<i>Delia albula</i>	Anthomyiidae	-	1	x
<i>Delia pallipennis</i>	Anthomyiidae	Local	1	New
<i>Helina parcepilosa</i>	Muscidae	pNear threatened	1	x
<i>Helina protuberans</i>	Muscidae	Local	1	x
<i>Helina pubescens</i>	Muscidae	pNear threatened	2	-
<i>Helina quadrinotata</i>	Muscidae	Nationally Scarce	2	-
<i>Villeneuveia aestuum</i>	Muscidae	Local	3	-
<i>Coenosia lacteipennis</i>	Muscidae	-	3	-
<i>Coenosia karli</i>	Muscidae	Nationally Scarce	3	-
<i>Coenosia minutalis</i>	Muscidae	Nationally Scarce	2	x
<i>Coenosia verrallii</i>	Muscidae	Nationally Scarce	3	x

Morfa Harlech

Species	Family	Status	Grade	2019
<i>Nephrotoma quadristriata</i>	Tipulidae	pRDB2	1	-
<i>Nephrotoma submaculosa</i>	Tipulidae	Local	3	-
<i>Aspistes berlinensis</i>	Scatopsidae	Local	2	-
<i>Dysmachus trigonus</i>	Asilidae	Local	3	x
<i>Pamponerus germanicus</i>	Asilidae	Nationally Scarce	1	-
<i>Philonicus albiceps</i>	Asilidae	Local	3	x
<i>Dialineura anilis</i>	Therevidae	Nationally Scarce	1	x
<i>Acrosathe annulate</i>	Therevidae	Local	3	x
<i>Thereva bipunctata</i>	Therevidae	Local	3	x
<i>Phthiria pulicaria</i>	Bombyliidae	Nationally Scarce	1	x
<i>Crossopalpus setiger</i>	Empididae	Data Deficient	2	x
<i>Chersodromia incana</i>	Hybotidae	Local	2	-
<i>Hilara cantabrica</i>	Empididae	Local	3	x

Species	Family	Status	Grade	2019
<i>Dolichopus acuticornis</i>	Dolichopodidae	Local	3	x
<i>Dolichopus notatus</i>	Dolichopodidae	Nationally Scarce	3	x
<i>Tachytrechus insignis</i>	Dolichopodidae	-	2	New
<i>Tachytrechus ripicola</i>	Dolichopodidae	Critically Endangered	2	-
<i>Tomosvaryella littoralis</i>	Pipunculidae	Local	1	x
<i>Cheilosia mutabilis</i>	Syrphidae	Nationally Scarce	3	-
<i>Eumerus sabulonum</i>	Syrphidae	Nationally Scarce	3	x
<i>Tetanops myopinus</i>	Ulidiidae	Nationally Scarce	2	x
<i>Helcomyza ustulata</i>	Helcomyzidae	Local	3	x
<i>Chamaemyia flavipalpis</i>	Chamaemyiidae	-	3	x
<i>Trixoscelis obscurella</i>	Trixoscelidae	Local	3	New
<i>Pherbellia grisescens</i>	Sciomyzidae	Notable/Nb	3	-
<i>Pteromicra glabricula</i>	Sciomyzidae	Notable/Nb	3	-
<i>Tethina albasetulosa</i>	Canacidae	-	2	New
<i>Tethina grisea</i>	Canacidae	-	3	New
<i>Tethina illota</i>	Canacidae	-	3	New
<i>Philygria punctatonervosa</i>	Ephydriidae	-	2	x
<i>Lasiambia palposa</i>	Chloropidae	p Nationally Scarce	3	-
<i>Meromyza pratorum</i>	Chloropidae	-	2	x
<i>Gonia ornata</i>	Tachinidae	Local	2	-
<i>Sarcophaga hirticrus</i>	Sarcophagidae	Unknown	3	-
<i>Sarcophila latifrons</i>	Sarcophagidae	Nationally Scarce	3	New
<i>Delia albula</i>	Anthomyiidae	-	1	x
<i>Delia pallipennis</i>	Anthomyiidae	-	1	New
<i>Delia penicillosa</i>	Anthomyiidae	-	2	x
<i>Delia setigera</i>	Anthomyiidae	-	2	New
<i>Helina protuberans</i>	Muscidae	Local	1	x
<i>Coenosia verrallii</i>	Muscidae	p Nationally Scarce	3	-

6. Discussion

The survey attempted to gather data for species that are often present on sites in low numbers and thus can be difficult to locate. In hindsight, trying to achieve the survey's aim of finding such scarce species, over two large areas, in six days, was probably too ambitious. The survey team visited both sites on three survey days, when time constraints meant that only a relatively small area of each site could be surveyed. Single site visits were made on the other three survey days and these permitted a more satisfactory coverage of a site. It is recommended that future surveys allow enough time for each site to receive a minimum of five full-days survey time during a season.

A further hindrance for the survey was the exceptionally hot and dry weather of summer 2018. The drought conditions drove insect numbers down dramatically, so that by mid July the majority of species' seasons were over or near their end. The three survey days in June and July 2018 were severely impacted by the high temperatures, which caused the floral resource to "shut down" its nectar offer for

nectaring insects, so that by around 13:00 hrs insect activity was greatly diminished and flying insects were very hard to find. Thus, the opportunity to sample a wide diversity of the species present was probably severely constrained. It is also quite likely that the extreme weather conditions of 2018 had a knock-on effect into the 2019 season, when aculeate and Diptera numbers again appeared to be well down on seasons previous to 2018.

With the foregoing in mind, the results of the survey, with a fairly high percentage of dune assemblage aculeate Hymenoptera and Diptera species being re-found at both sites, indicates that the dune assemblage population is probably in a reasonably favourable condition.

Anecdotally, large areas of stabilised dunes at Morfa Harlech yielded little aculeate Hymenoptera and Diptera (both in quantity and diversity). By contrast, on the same site, the most productive area was an area of recently clear-felled coniferous woodland (around SH568330) that had exposed much sand which for the most part was sparsely vegetated. Encouraging numbers of aculeate Hymenoptera were present here, and this demonstrated the possible benefits, to dune assemblage aculeates, of actively managing parts of the site to expose bare sand. Intriguingly, undisturbed areas immediately abutting the clear-felled area yielded very little by way of aculeates. Further investigation of the fauna in the clear-felled area and the areas close-by would be useful to better understand the possible benefits of active management by conifer removal.

Table 5. Taxa comprising the dune invertebrate assemblage on Morfa Dyffryn and Morfa Harlech SSSIs incorporating records from the 2018-19 survey. See Appendix 1 for explanation of Grade 1 to 3 species.

Morfa Dyffryn	Grade 1	Grade 2	Grade 3	Total
aculeate Bees & Wasps	1	8	30	39
other Wasps	1	0	0	1
Beetles	11	20	26	57
Bugs	1	2	8	11
Flies	11	14	19	44
Lacewings	1	0	0	1
Moths	2	3	3	8
Spiders	0	2	6	8
Woodlice	0	1	0	1
Total	28	50	92	170

Morfa Harlech	Grade 1	Grade 2	Grade 3	Total
aculeate Bees & Wasps	2	8	28	38
other Wasps	1	0	0	1
Beetles	11	16	28	55
Bugs	0	2	12	14
Flies	8	12	21	41
Lacewings	1	0	0	1
Moths	1	2	3	6
Spiders	1	2	3	6
Woodlice	0	1	0	1
Total	25	43	95	163

Morfa Dyffryn

Aculeate Hymenoptera

Before 2018, 36 aculeate Hymenoptera species considered as part of the Welsh dune invertebrate assemblage had been recorded from the site. 29 (80%) of these species were refound in 2018-19, and three species new to the site were recorded: *Arachnospila trivialis* is a locally common spider-hunting occurring mainly on sand dunes in Wales; *A. wesmaeli* is a Nationally Scarce species, confined to sand dunes in Wales, and the cuckoo bee *Epeolus variegatus*, a cleptoparasite of *Colletes* species, probably *C. fodiens* and *C. similis* on coastal dunes.

Species not noted in 2018-19 included six rather local species: *Coelioxys rufescens*, *Megachile circumcincta*, *Osmia aurulenta*, *Drydella pinguis*, *Harpactus tumidus* and *Tiphia femorata*; and the Nationally Scarce *Hedychridium cupreum*.

The overall total for sand dune aculeates on Morfa Dyffryn now stands at 39 species (Table 5).

Diptera

Before 2018, 35 Diptera species considered as part of the Welsh dune invertebrate assemblage had been recorded from the site. 22 (63%) of these were refound in 2018-19, and nine dune assemblage species new to the site were recorded:

Tachytrechus insignis - a local fly of damp sandy places; *Tomosvaryella littoralis* – a fly strongly associated with dune habitats; *Pherbellia nana* – a Nationally Scarce fly of damp sandy places; *Tethina albopetiolosa* and *T. illota* – both strongly associated with dune habitats; *Siphona variata* a rarely-recorded parasite of the marram grass feeding moth *Mythimna litoralis*; *Sarcophaga hirticrus* - strongly associated with dune systems in Wales; *Sarcophila latifrons* – Nationally Scarce fly associated strongly with dune systems in Wales, and *Delia pallipennis* – strongly associated with dune systems in Wales.

The overall total for sand dune flies on Morfa Dyffryn now stands at 44 species (Table 5).

Morfa Harlech

Aculeate Hymenoptera

Before 2018, 37 aculeate Hymenoptera species considered as part of the Welsh dune invertebrate assemblage had been recorded from the site. 27 (73%) of these species were refound in 2018-19, and one species new to the site was recorded: *Arachnospila wesmaeli* (see Morfa Dyffryn above for details).

Species not noted in 2018-19 included the normally widespread wasp of sandy habitats *Crabro cribrarius* and the widespread cuckoo-wasp *Sapyga quinquepuncta*; five rather local species of sand dunes in Wales - *Megachile circumcincta*, *Drydella pinguis*, *Harpactus tumidus*, *Arachnospila trivialis* and *Evagetes crassicornis*; and three Nationally Rare species - *Coelioxys mandibularis*, *Mimumesa littoralis* and *Oxybelus mandibularis*.

The overall total for sand dune aculeates on Morfa Harlech now stands at 38 species (Table 5).

Diptera

Before 2018, 33 Diptera species considered as part of the Welsh dune invertebrate assemblage had been recorded from the site. 20 (61%) of these were refound in 2018-19, and eight dune assemblage species new to the site were recorded: *Tachytrechus insignis* (details above), *Trixoscelis obscurella* – a local fly of coastal sand dunes in Wales; *Tethina albosetulosa*, *T. illota* and *T. grisea* – all strongly associated with sand dune systems; *Sarcophila latifrons* (details above); *Delia pallipennis* (details above) and *D. setigera* – strongly associated with sand dune systems in Britain.

The overall total for sand dune flies on Morfa Harlech now stands at 41 species (Table 5).

Key to the maintenance of populations of aculeates on sand dunes is the provision of suitable areas of bare sand that provide suitable nesting habitat and the warm microclimate preferred by many species, with often extensive areas of forage and food plants. Work to create new areas of exposed sand in the fixed dunes should provide suitable conditions for nesting sand-mining species. Scrub areas and stands of Ragwort *Senecio jacobaea*, Hogweed *Heracleum sphondylium*, Rosebay Willow-herb *Epilobium angustifolium* and *Rubus* species not only provide forage sources but their stems provide nesting habitat for aerial breeding species. There appears to be a good supply of forage and nectar resources across the two sites so lack of this resource is unlikely to be a significant issue.

Pantheon Assessment of the Morfa Dyffryn and Morfa Harlech dune invertebrate assemblages

The data for invertebrate species made by the 2018-19 survey was uploaded to the Pantheon database tool (Webb et al., 2017). Pantheon provides an indication of the quality and condition of a site for invertebrate assemblages found in a wide range of habitats. Ideally, a comprehensive set of records, covering most invertebrate orders should be used to make assessments. The 2018-19 dataset is strongly focussed on Aculeate Hymenoptera and Diptera only and, with this in mind, the assessment provided by Pantheon must be regarded as at best indicative. None-the-less the analysis reported “Favourable Condition” for two species assemblage types:

Morfa Dyffryn:

Bare sand & chalk SAT: Based on the occurrence of 36 species represented in the national set of 453 SAT species;

Rich flower resource SAT: Based on the occurrence of 21 species represented in the national set of 219 SAT species.

Morfa Harlech:

Bare sand & chalk SAT: Based on the occurrence of 31 species represented in the national set of 453 SAT species;

Rich flower resource SAT: Based on the occurrence of 20 species represented in the national set of 219 SAT species.

However, this is in a scenario of decreasing bare sand on UK dunes since the 1940s with a 87% loss of bare sand on Welsh dune systems (Howe *et al.*, 2012). 23ha of bare sand is found on Morfa Harlech, just 2% of the dune system and representing a 72% loss since the 1950s. Morfa Dyffryn is the most dynamic system in Wales and still supports 62ha of bare sand, 9% of the dune system and a 62% loss since the 1950s. As these losses will have had a detrimental impact upon invertebrates associated with pioneer dune conditions, as populations have become restricted to ever-decreasing areas of suitable habitat, the analyses should be treated with caution.

7. Acknowledgements

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9. Appendices

Appendix 1. Invertebrate species identified as likely components of the Morfa Dyffryn and Morfa Harlech SSSI qualifying dune assemblage by Natural Resources Wales. Grade 1 species are restricted to sand dunes in the UK, Grade 2 species are restricted to sand dunes in Wales and Grade 3 species are predominantly found in Wales on dunes. Dune codes are given in Appendix 2. Note that all aculeate bees are now classified within a single family, Apidae.

Morfa Dyffryn

Species	Order	Family	Status	Grade	Dune Code
<i>Corizus hyoscyami</i>	Hemiptera	Rhopalidae	Local	3	SD460
<i>Liorhyssus hyalinus</i>	Hemiptera	Rhopalidae	Local	3	SD460
<i>Dicranocephalus agilis</i>	Hemiptera	Stenocephalidae	Nationally Scarce	3	SD440
<i>Gampsicoris punctipes</i>	Hemiptera	Berytinidae	Common	3	SD460
<i>Macrotylus paykulli</i>	Hemiptera	Miridae	Common	3	SD460
<i>Monosynamma sabulicola</i>	Hemiptera	Miridae	Nationally Scarce	2	SD545
<i>Dicyphus annulatus</i>	Hemiptera	Miridae	Common	3	SD460
<i>Trigonotylus psammaecolor</i>	Hemiptera	Miridae	Nationally Scarce	1	SD510
<i>Agallia laevis</i>	Hemiptera	Cicadellidae	Local	3	SD521
<i>Muirodelphax aubei</i>	Hemiptera	Delphacidae	Local	3	SD500
<i>Chrysopa abbreviata</i>	Neuroptera	Chrysopidae	Nationally Scarce	1	SD510
<i>Cicindela maritima</i>	Coleoptera	Carabidae	Nationally Scarce	1	SD450
<i>Dyschirius impunctipennis</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Dyschirius nitidus</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Dyschirius politus</i>	Coleoptera	Carabidae	Local	3	SD440
<i>Dyschirius salinus</i>	Coleoptera	Carabidae	Local	3	SD430
<i>Broscus cephalotes</i>	Coleoptera	Carabidae	Local	3	SD935
<i>Bembidion pallidipenne</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Pogonus chalceus</i>	Coleoptera	Carabidae	Local	3	SD930
<i>Calathus erratus</i>	Coleoptera	Carabidae	Common	3	SD440
<i>Calathus mollis</i>	Coleoptera	Carabidae	Local	3	SD935
<i>Amara convexiuscula</i>	Coleoptera	Carabidae	Local	3	SD930
<i>Amara lucida</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD460
<i>Amara nitida</i>	Coleoptera	Carabidae	Nationally Scarce	3	SD460
<i>Amara spreta</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD510
<i>Amara tibialis</i>	Coleoptera	Carabidae	Local	3	SD460
<i>Harpalus anxius</i>	Coleoptera	Carabidae	Local	3	SD520
<i>Harpalus attenuatus</i>	Coleoptera	Carabidae	Local	3	SD520
<i>Harpalus neglectus</i>	Coleoptera	Carabidae	Local	2	SD440
<i>Harpalus tardus</i>	Coleoptera	Carabidae	Local	3	SD460
<i>Demetrias monostigma</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD510
<i>Halacritus punctum</i>	Coleoptera	Histeridae	Nationally Rare	2	SD930
<i>Hypocaccus rugiceps</i>	Coleoptera	Histeridae	Nationally Scarce	2	SD910
<i>Baeckmanniolus dimidiatus</i>	Coleoptera	Histeridae	Nationally Scarce	1	SD910
<i>Omalius rugulipenne</i>	Coleoptera	Staphylinidae	Nationally Rare	2	SD930
<i>Bledius fergussoni</i>	Coleoptera	Staphylinidae	Local	3	SD435
<i>Bledius fuscipes</i>	Coleoptera	Staphylinidae	-	2	SD435
<i>Bledius subniger</i>	Coleoptera	Staphylinidae	Local	2	SD435
<i>Paederus caligatus</i>	Coleoptera	Staphylinidae	Nationally Rare	2	SD545
<i>Gabrieus osseticus</i>	Coleoptera	Staphylinidae	Nationally Scarce	3	SD435

Species	Order	Family	Status	Grade	Dune Code
<i>Ocypus compressus</i>	Coleoptera	Staphylinidae	Local	3	-
<i>Heterothops binotatus</i>	Coleoptera	Staphylinidae	Local	3	SD001
<i>Phytosus balticus</i>	Coleoptera	Staphylinidae	Local	2	SD930
<i>Phytosus spinifer</i>	Coleoptera	Staphylinidae	-	2	SD001
<i>Arena tabida</i>	Coleoptera	Staphylinidae	Nationally Rare	2	SD910
<i>Atheta exigua</i>	Coleoptera	Staphylinidae	-	2	SD001
<i>Polystomota punctatella</i>	Coleoptera	Staphylinidae	-	3	SD930
<i>Aegialia arenaria</i>	Coleoptera	Scarabaeidae	Local	1	SD450
<i>Aphodius plagiatus</i>	Coleoptera	Scarabaeidae	Nationally Scarce	2	SD830
<i>Euheptaulacus villosus</i>	Coleoptera	Scarabaeidae	Nationally Scarce	2	SD910
<i>Onthophagus similis</i>	Coleoptera	Scarabaeidae	Local	3	SD910
<i>Anomala dubia</i>	Coleoptera	Scarabaeidae	Local	1	SD520
<i>Byrrhus pustulatus</i>	Coleoptera	Byrrhidae	Local	3	SD460
<i>Dryops striatellus</i>	Coleoptera	Dryopidae	Nationally Rare	3	SD110
<i>Agrypnus murinus</i>	Coleoptera	Elateridae	Local	3	SD520
<i>Phylan gibbus</i>	Coleoptera	Tenebrionidae	Local	1	SD930
<i>Melanimon tibialis</i>	Coleoptera	Tenebrionidae	Local	1	SD440
<i>Phaleria cadaverina</i>	Coleoptera	Tenebrionidae	Local	1	SD930
<i>Cylindrinotus pallidus</i>	Coleoptera	Tenebrionidae	Nationally Scarce	1	SD510
<i>Notoxus monocerus</i>	Coleoptera	Anthicidae	Local	3	SD440
<i>Cryptocephalus hypochaeridis</i>	Coleoptera	Chrysomelidae	Local	3	SD520
<i>Chrysomela populi</i>	Coleoptera	Chrysomelidae	Local	3	SD545
<i>Psylliodes marcida</i>	Coleoptera	Chrysomelidae	Local	1	SD500
<i>Protapion ononidis</i>	Coleoptera	Apionidae	Local	3	SD460
<i>Holotrichapion ononis</i>	Coleoptera	Apionidae	Local	3	SD460
<i>Otiorhynchus atroapterus</i>	Coleoptera	Curculionidae	Local	1	SD510
<i>Philopedon plagiatum</i>	Coleoptera	Curculionidae	Local	2	SD445
<i>Sitona griseus</i>	Coleoptera	Curculionidae	Local	1	SD460
<i>Collicularia microgrammana</i>	Lepidoptera	Tortricidae	Nationally Scarce	2	SD460
<i>Euxoa tritici</i>	Lepidoptera	Noctuidae	Common	3	SD520
<i>Agrotis vestigialis</i>	Lepidoptera	Noctuidae	Local	3	SD520
<i>Agrotis ripae</i>	Lepidoptera	Noctuidae	Nationally Scarce	1	SD500
<i>Actebia praecox</i>	Lepidoptera	Noctuidae	Nationally Scarce	3	SD545
<i>Sideridis albicolon</i>	Lepidoptera	Noctuidae	Nationally Scarce	2	SD500
<i>Mythimna litoralis</i>	Lepidoptera	Noctuidae	Nationally Scarce	1	SD510
<i>Nephrotoma quadristriata</i>	Diptera	Tipulidae	Nationally Rare	1	SD435
<i>Nephrotoma submaculosa</i>	Diptera	Tipulidae	Local	3	SD510
<i>Janetiella frankumi</i>	Diptera	Cecidomyiidae	Local	3	SD720
<i>Dysmachus trigonus</i>	Diptera	Asilidae	Local	3	SD521
<i>Pamponerus germanicus</i>	Diptera	Asilidae	Nationally Rare	1	SD521
<i>Philonicus albiceps</i>	Diptera	Asilidae	Local	3	SD450
<i>Dialineura anilis</i>	Diptera	Therevidae	Nationally Rare	1	SD520
<i>Acrosathe annulata</i>	Diptera	Therevidae	Local	3	SD440
<i>Thereva bipunctata</i>	Diptera	Therevidae	Local	3	SD450
<i>Villa modesta</i>	Diptera	Bombyliidae	Local	1	SD520
<i>Phthiria pulicaria</i>	Diptera	Bombyliidae	Nationally Scarce	1	SD520
<i>Hilara lundbecki</i>	Diptera	Empididae	Local	3	SD500
<i>Dolichopus acuticornis</i>	Diptera	Dolichopodidae	Local	3	SD001
<i>Dolichopus notatus</i>	Diptera	Dolichopodidae	Nationally Scarce	3	SD545
<i>Tachytrechus ripicola</i>	Diptera	Dolichopodidae	Nationally Rare	2	SD930
<i>Trupanea amoena</i>	Diptera	Tephritidae	Nationally Rare	2	SD520
<i>Tetanops myopinus</i>	Diptera	Ulidiidae	Nationally Scarce	2	SD510
<i>Helcomyza ustulata</i>	Diptera	Helcomyzidae	Local	3	SD930
<i>Chamaemyia flavipalpis</i>	Diptera	Chamaemyiidae	-	3	SD510
<i>Trixoscelis obscurella</i>	Diptera	Heleomyzidae	Local	2	SD910
<i>Pherbellia grisescens</i>	Diptera	Sciomyzidae	Nationally Scarce	3	SD435
<i>Philygria punctatonervosa</i>	Diptera	Ephydriidae	-	2	SD440
<i>Meromyza pratorum</i>	Diptera	Chloropidae	-	2	SD510
<i>Gonia ornata</i>	Diptera	Tachinidae	Local	2	SD440
<i>Senotainia conica</i>	Diptera	Sarcophagidae	Local	2	SD450

Species	Order	Family	Status	Grade	Dune Code
<i>Delia albula</i>	Diptera	Anthomyiidae	Unknown	1	SD520
<i>Helina parcepilosa</i>	Diptera	Muscidae	Nationally Rare	1	SD001
<i>Helina protuberans</i>	Diptera	Muscidae	Local	1	SD440
<i>Helina pubescens</i>	Diptera	Muscidae	Nationally Rare	2	SD740
<i>Helina quadrinotata</i>	Diptera	Muscidae	Nationally Rare	2	SD001
<i>Villeneuveia aestuum</i>	Diptera	Muscidae	Local	3	SD500
<i>Coenosia lacteipennis</i>	Diptera	Muscidae	-	3	SD001
<i>Coenosia karli</i>	Diptera	Muscidae	Nationally Scarce	3	SD001
<i>Coenosia minutalis</i>	Diptera	Muscidae	Nationally Scarce	2	SD500
<i>Coenosia verrallii</i>	Diptera	Muscidae	Nationally Scarce	3	SD001
<i>Perilampus aureoviridis</i>	Hymenoptera	Chalcidae	Unknown	1	SD440
<i>Hedychridium ardens</i>	Hymenoptera	Chrysididae	Common	3	SD921
<i>Tiphia femorata</i>	Hymenoptera	Tiphiidae	Local	3	SD520
<i>Myrmosa atra</i>	Hymenoptera	Tiphiidae	Local	3	SD921
<i>Pompilus cinereus</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Evagetus crassicornis</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Anoplius infuscatus</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Episyron rufipes</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Ceropales maculata</i>	Hymenoptera	Pompilidae	Local	3	SD921
<i>Dryudella pinguis</i>	Hymenoptera	Sphecidae	Local	2	SD440
<i>Tachysphex pompiliiformis</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Tachysphex nitidus</i>	Hymenoptera	Sphecidae	Local	2	SD450
<i>Crabro cribrarius</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Crabro peltarius</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Crossocerus wesmaeli</i>	Hymenoptera	Sphecidae	Common	3	SD450
<i>Oxybelus argentatus</i>	Hymenoptera	Sphecidae	Nationally Scarce	2	SD440
<i>Oxybelus mandibularis</i>	Hymenoptera	Sphecidae	Nationally Scarce	2	SD440
<i>Oxybelus uniglumis</i>	Hymenoptera	Sphecidae	Common	3	SD445
<i>Mimumesa littoralis</i>	Hymenoptera	Sphecidae	Nationally Rare	2	SD510
<i>Ammophila sabulosa</i>	Hymenoptera	Sphecidae	Local	3	SD445
<i>Podalonia hirsuta</i>	Hymenoptera	Sphecidae	Nationally Scarce	3	SD445
<i>Harpactus tumidus</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Cerceris arenaria</i>	Hymenoptera	Sphecidae	Common	3	SD450
<i>Colletes fodiens</i>	Hymenoptera	Apidae	Common	3	SD450
<i>Colletes similis</i>	Hymenoptera	Apidae	Local	3	SD450
<i>Colletes cunicularius</i>	Hymenoptera	Apidae	Nationally Rare	1	SD450
<i>Andrena barbilabris</i>	Hymenoptera	Andrenidae	Local	3	SD445
<i>Sphecodes pellucidus</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Dasypoda altercator</i>	Hymenoptera	Apidae	Nationally Scarce	2	SD440
<i>Osmia aurulenta</i>	Hymenoptera	Apidae	Local	3	SD520
<i>Megachile dorsalis</i>	Hymenoptera	Apidae	Nationally Scarce	2	SD450
<i>Megachile circumcincta</i>	Hymenoptera	Apidae	Common	3	SD440
<i>Megachile maritima</i>	Hymenoptera	Apidae	-	3	SD445
<i>Coelioxys elongata</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Coelioxys rufescens</i>	Hymenoptera	Apidae	-	3	SD921
<i>Coelioxys conoidea (vectis)</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Armadillidium album</i>	Isopoda	Armadillidiidae	Nationally Scarce	2	SD930
<i>Argenna subnigra</i>	Araneae	Dictynidae	Local	3	SD440
<i>Zelotes electus</i>	Araneae	Gnaphosidae	Local	2	SD440
<i>Xysticus kochi</i>	Araneae	Thomisidae	Local	3	SD720
<i>Xerolycosa miniata</i>	Araneae	Lycosidae	Local	2	SD520
<i>Arctosa perita</i>	Araneae	Lycosidae	Local	3	SD510
<i>Pelecopsis nemoralioides</i>	Araneae	Linyphiidae	Local	3	SD510
<i>Ceratinopsis romana</i>	Araneae	Linyphiidae	Nationally Scarce	3	SD510
<i>Troxochrus scabriculus</i>	Araneae	Linyphiidae	Local	3	SD510

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Species	Order	Family	Status	Grade	Dune Code
<i>Corizus hyoscyami</i>	Hemiptera	Rhopalidae	Local	3	SD460
<i>Liorhyssus hyalinus</i>	Hemiptera	Rhopalidae	Local	3	SD460

Species	Order	Family	Status	Grade	Dune Code
<i>Chorosoma schillingi</i>	Hemiptera	Rhopalidae	Local	3	SD521
<i>Dicranocephalus agilis</i>	Hemiptera	Stenocephalidae	Nationally Scarce	3	SD440
<i>Nysius thymi</i>	Hemiptera	Lygaeidae	Common	3	SD460
<i>Trapezonotus arenarius</i>	Hemiptera	Lygaeidae	Common	3	SD520
<i>Neides tipularius</i>	Hemiptera	Berytinidae	Local	2	SD460
<i>Gampsicoris punctipes</i>	Hemiptera	Berytinidae	Common	3	SD460
<i>Macrotylus paykulli</i>	Hemiptera	Miridae	Common	3	SD460
<i>Chlamydatus pullus</i>	Hemiptera	Miridae	Common	3	SD460
<i>Dicyphus annulatus</i>	Hemiptera	Miridae	Common	3	SD460
<i>Orthocephalus saltator</i>	Hemiptera	Miridae	Common	3	SD520
<i>Globiceps cruciatus</i>	Hemiptera	Miridae	Nationally Scarce	3	SD545
<i>Psammotettix sabulicola</i>	Hemiptera	Cicadellidae	Local	2	SD510
<i>Chrysopa abbreviata</i>	Neuroptera	Chrysopidae	Nationally Scarce	1	SD510
<i>Cicindela maritima</i>	Coleoptera	Carabidae	Nationally Scarce	1	SD450
<i>Dyschirius impunctipennis</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Dyschirius nitidus</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Dyschirius politus</i>	Coleoptera	Carabidae	Local	3	SD440
<i>Broscus cephalotes</i>	Coleoptera	Carabidae	Local	3	SD935
<i>Bembidion pallidipenne</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD930
<i>Pogonus chalceus</i>	Coleoptera	Carabidae	Local	3	SD930
<i>Calathus erratus</i>	Coleoptera	Carabidae	Common	3	SD440
<i>Calathus mollis</i>	Coleoptera	Carabidae	Local	3	SD935
<i>Amara lucida</i>	Coleoptera	Carabidae	Nationally Scarce	2	SD460
<i>Amara praetermissa</i>	Coleoptera	Carabidae	Nationally Scarce	3	SD460
<i>Amara tibialis</i>	Coleoptera	Carabidae	Local	3	SD460
<i>Harpalus anxius</i>	Coleoptera	Carabidae	Local	3	SD520
<i>Harpalus neglectus</i>	Coleoptera	Carabidae	Local	2	SD440
<i>Harpalus smaragdinus</i>	Coleoptera	Carabidae	Nationally Scarce	3	SD460
<i>Harpalus tardus</i>	Coleoptera	Carabidae	Local	3	SD460
<i>Hypocaccus rugiceps</i>	Coleoptera	Histeridae	Nationally Scarce	2	SD910
<i>Baeckmanniolus dimidiatus</i>	Coleoptera	Histeridae	Nationally Scarce	1	SD910
<i>Leiodes ciliaris</i>	Coleoptera	Leiodidae	Nationally Scarce	2	SD830
<i>Omalius rugulipenne</i>	Coleoptera	Staphylinidae	Nationally Rare	2	SD930
<i>Bledius fergussoni</i>	Coleoptera	Staphylinidae	Local	3	SD435
<i>Bledius fuscipes</i>	Coleoptera	Staphylinidae		2	SD435
<i>Bledius longulus</i>	Coleoptera	Staphylinidae	Local	2	SD435
<i>Anotylus maritimus</i>	Coleoptera	Staphylinidae	Local	2	SD930
<i>Ocypus compressus</i>	Coleoptera	Staphylinidae	Local	3	
<i>Phytosus balticus</i>	Coleoptera	Staphylinidae	Local	2	SD930
<i>Aegialia arenaria</i>	Coleoptera	Scarabaeidae	Local	1	SD450
<i>Aphodius foetidus</i>	Coleoptera	Scarabaeidae	Common	3	SD910
<i>Onthophagus nuchicornis</i>	Coleoptera	Scarabaeidae	Nationally Scarce	2	SD910
<i>Onthophagus joannae</i>	Coleoptera	Scarabaeidae	Local	3	SD910
<i>Onthophagus similis</i>	Coleoptera	Scarabaeidae	Local	3	SD910
<i>Anomala dubia</i>	Coleoptera	Scarabaeidae	Local	1	SD520
<i>Byrrhus pustulatus</i>	Coleoptera	Byrrhidae	Local	3	SD460
<i>Dryops nitidulus</i>	Coleoptera	Dryopidae	Nationally Rare	2	SD435
<i>Agrypnus murinus</i>	Coleoptera	Elateridae	Local	3	SD520
<i>Phylan gibbus</i>	Coleoptera	Tenebrionidae	Local	1	SD930
<i>Melanimon tibialis</i>	Coleoptera	Tenebrionidae	Local	1	SD440
<i>Phaleria cadaverina</i>	Coleoptera	Tenebrionidae	Local	1	SD930
<i>Cylindrinotus pallidus</i>	Coleoptera	Tenebrionidae	Nationally Scarce	1	SD510
<i>Nacerdes melanura</i>	Coleoptera	Oedemeridae	Local	3	SD930
<i>Notoxus monocerus</i>	Coleoptera	Anthicidae	Local	3	SD440
<i>Cryptocephalus aureolus</i>	Coleoptera	Chrysomelidae	Nationally Scarce	3	SD520
<i>Cryptocephalus hypochaeridis</i>	Coleoptera	Chrysomelidae	Local	3	SD520
<i>Chrysomela populi</i>	Coleoptera	Chrysomelidae	Local	3	SD545

Species	Order	Family	Status	Grade	Dune Code
<i>Psylliodes marcida</i>	Coleoptera	Chrysomelidae	Local	1	SD500
<i>Protapion ononidis</i>	Coleoptera	Apionidae	Local	3	SD460
<i>Holotrichapion ononis</i>	Coleoptera	Apionidae	Local	3	SD460
<i>Otiorhynchus atroapterus</i>	Coleoptera	Curculionidae	Local	1	SD510
<i>Philopodon plagiatum</i>	Coleoptera	Curculionidae	Local	2	SD445
<i>Sitona griseus</i>	Coleoptera	Curculionidae	Local	1	SD460
<i>Hypera dauci</i>	Coleoptera	Curculionidae	Nationally Scarce	2	SD460
<i>Hypera ononidis</i>	Coleoptera	Curculionidae	Nationally Rare	3	SD460
<i>Ceutorhynchus atomus</i>	Coleoptera	Curculionidae	Nationally Scarce	3	SD440
<i>Glocianus punctiger</i>	Coleoptera	Curculionidae	Nationally Scarce	3	SD520
<i>Mecinus circulatus</i>	Coleoptera	Curculionidae	Nationally Scarce	3	SD460
<i>Bryotropha umbrosella</i>	Lepidoptera	Gelechiidae	Local	2	SD545
<i>Chesias rufata rufata</i>	Lepidoptera	Geometridae	Nationally Scarce	3	SD720
<i>Agrotis vestigialis</i>	Lepidoptera	Noctuidae	Local	3	SD520
<i>Agrotis ripae</i>	Lepidoptera	Noctuidae	Nationally Scarce	1	SD500
<i>Actebia praecox</i>	Lepidoptera	Noctuidae	Nationally Scarce	3	SD545
<i>Nephrotoma quadristriata</i>	Diptera	Tipulidae	Nationally Rare	1	SD435
<i>Nephrotoma submaculosa</i>	Diptera	Tipulidae	Local	3	SD510
<i>Aspistes berolinensis</i>	Diptera	Scatopsidae	Local	2	SD445
<i>Dysmachus trigonus</i>	Diptera	Asilidae	Local	3	SD521
<i>Pamponerus germanicus</i>	Diptera	Asilidae	Nationally Rare	1	SD521
<i>Philonicus albiceps</i>	Diptera	Asilidae	Local	3	SD450
<i>Dialineura anilis</i>	Diptera	Therevidae	Nationally Rare	1	SD520
<i>Acrosathe annulata</i>	Diptera	Therevidae	Local	3	SD440
<i>Thereva bipunctata</i>	Diptera	Therevidae	Local	3	SD450
<i>Phthiria pulicaria</i>	Diptera	Bombyliidae	Nationally Scarce	1	SD520
<i>Drapetis setigera</i>	Diptera	Empididae	Nationally Rare	2	SD001
<i>Chersodromia incana</i>	Diptera	Hybotidae	Local	2	SD445
<i>Hilara lundbecki</i>	Diptera	Empididae	Local	3	SD500
<i>Dolichopus acuticornis</i>	Diptera	Dolichopodidae	Local	3	SD001
<i>Dolichopus notatus</i>	Diptera	Dolichopodidae	Nationally Scarce	3	SD545
<i>Tachytrechus ripicola</i>	Diptera	Dolichopodidae	Nationally Rare	2	SD930
<i>Tomosvaryella littoralis</i>	Diptera	Pipunculidae	Local	1	SD445
<i>Cheilosia mutabilis</i>	Diptera	Syrphidae	Nationally Scarce	3	SD590
<i>Eumerus sabulorum</i>	Diptera	Syrphidae	Nationally Scarce	3	SD460
<i>Tetanops myopinus</i>	Diptera	Ulidiidae	Nationally Scarce	2	SD510
<i>Helcomyza ustulata</i>	Diptera	Helcomyzidae	Local	3	SD930
<i>Chamaemyia flavipalpis</i>	Diptera	Chamaemyiidae		3	SD510
<i>Pherbellia grisescens</i>	Diptera	Sciomyzidae	Nationally Scarce	3	SD435
<i>Pteromicra glabricula</i>	Diptera	Sciomyzidae	Nationally Scarce	3	SD110
<i>Philygria punctatonervosa</i>	Diptera	Ephydriidae		2	SD440
<i>Lasiambia palposa</i>	Diptera	Chloropidae	Nationally Scarce	3	SD520
<i>Meromyza pratorum</i>	Diptera	Chloropidae		2	SD510
<i>Gonia ornata</i>	Diptera	Tachinidae	Local	2	SD440
<i>Sarcophaga hirticrus</i>	Diptera	Sarcophagidae	Unknown	3	SD440
<i>Delia albula</i>	Diptera	Anthomyiidae	Unknown	1	SD520
<i>Delia penicillosa</i>	Diptera	Anthomyiidae	Unknown	2	SD001
<i>Helina protuberans</i>	Diptera	Muscidae	Local	1	SD440
<i>Coenosia verrallii</i>	Diptera	Muscidae	Nationally Scarce	3	SD001
<i>Perilampus aureoviridis</i>	Hymenoptera	Chalcidae	Unknown	1	SD440
<i>Hedychridium ardens</i>	Hymenoptera	Chrysididae	Common	3	SD921
<i>Hedychridium cupreum</i>	Hymenoptera	Chrysididae	Nationally Scarce	2	SD921
<i>Myrmosa atra</i>	Hymenoptera	Tiphiidae	Local	3	SD921
<i>Sapyga quinquepunctata</i>	Hymenoptera	Sapygidae	Local	3	SD921
<i>Pompilus cinereus</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Arachnospila trivialis</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Evagetes crassicornis</i>	Hymenoptera	Pompilidae	Local	3	SD445

Species	Order	Family	Status	Grade	Dune Code
<i>Anoplius infuscatus</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Episyron rufipes</i>	Hymenoptera	Pompilidae	Local	3	SD445
<i>Ceropales maculata</i>	Hymenoptera	Pompilidae	Local	3	SD921
<i>Dryudella pinguis</i>	Hymenoptera	Sphecidae	Local	2	SD440
<i>Tachysphex pompiliiformis</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Tachysphex nitidus</i>	Hymenoptera	Sphecidae	Local	2	SD450
<i>Crabro cribrarius</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Crabro peltarius</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Crossocerus wesmaeli</i>	Hymenoptera	Sphecidae	Common	3	SD450
<i>Oxybelus argentatus</i>	Hymenoptera	Sphecidae	Nationally Scarce	2	SD440
<i>Oxybelus mandibularis</i>	Hymenoptera	Sphecidae	Nationally Scarce	2	SD440
<i>Oxybelus uniglumis</i>	Hymenoptera	Sphecidae	Common	3	SD445
<i>Mimumesa littoralis</i>	Hymenoptera	Sphecidae	Nationally Rare	2	SD510
<i>Ammophila sabulosa</i>	Hymenoptera	Sphecidae	Local	3	SD445
<i>Podalonia hirsuta</i>	Hymenoptera	Sphecidae	Nationally Scarce	3	SD445
<i>Harpactus tumidus</i>	Hymenoptera	Sphecidae	Local	3	SD450
<i>Cerceris arenaria</i>	Hymenoptera	Sphecidae	Common	3	SD450
<i>Colletes fodiens</i>	Hymenoptera	Apidae	Common	3	SD450
<i>Colletes cunicularius</i>	Hymenoptera	Apidae	Nationally Rare	1	SD450
<i>Andrena barbilabris</i>	Hymenoptera	Apidae	Local	3	SD445
<i>Sphecodes pellucidus</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Dasypoda altercator</i>	Hymenoptera	Apidae	Nationally Scarce	2	SD440
<i>Osmia aurulenta</i>	Hymenoptera	Apidae	Local	3	SD520
<i>Megachile dorsalis</i>	Hymenoptera	Apidae	Nationally Scarce	2	SD450
<i>Megachile circumcincta</i>	Hymenoptera	Apidae	Common	3	SD440
<i>Megachile maritima</i>	Hymenoptera	Apidae	-	3	SD445
<i>Coelioxys elongata</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Coelioxys mandibularis</i>	Hymenoptera	Apidae	Nationally Rare	1	SD921
<i>Epeolus cruciger</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Epeolus variegatus</i>	Hymenoptera	Apidae	Local	3	SD921
<i>Armadillidium album</i>	Isopoda	Armadillidiidae	Nationally Scarce	2	SD930
<i>Zelotes electus</i>	Araneae	Gnaphosidae	Local	2	SD440
<i>Philodromus fallax</i>	Araneae	Philodromidae	Nationally Scarce	1	SD510
<i>Xerolycosa miniata</i>	Araneae	Lycosidae	Local	2	SD520
<i>Alopecosa cuneata</i>	Araneae	Lycosidae	Local	3	SD440
<i>Arctosa perita</i>	Araneae	Lycosidae	Local	3	SD510
<i>Troxochrus scabriculus</i>	Araneae	Linyphiidae	Local	3	SD510

Appendix 2. A provisional attempt by Natural Resources Wales to assign invertebrate species to microhabitats, in this case dune habitats. This classification is now redundant and likely to be superseded by the Pantheon classification developed by Natural England and the Biological Records Centre.

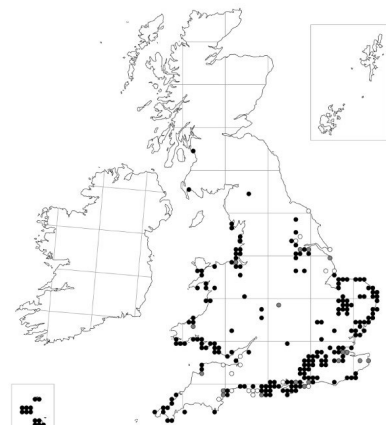
Code	Dune Habitat
SD001	Sand dunes and pits (unspecified)
SD110	dune pools & shallow sandy streams
SD330	tall fen (eg. reedbeds) in dune slacks, etc.
SD430	bare mud in mature dune slacks, saltmarsh transition, pool margins, etc.
SD435	wet or damp bare and sparsely vegetated sand (pioneer dune slacks etc.)
SD440	dry bare/sparsely vegetated sand
SD445	dry bare or sparsely vegetated loose sand (mainly fore-dunes)
SD450	dry bare or sparsely vegetated firm sand (blow-outs, margins of paths, etc.)
SD460	phytophagous on low plants in open sand
SD500	beach flora (Cakile, Beta, Agropyron, etc.)
SD510	tussocks/litter in yellow dunes (marram and lyme grass)
SD515	litter in stable dune grassland
SD520	dry herb-rich grassland (fixed dune)
SD521	tall sward dune grassland

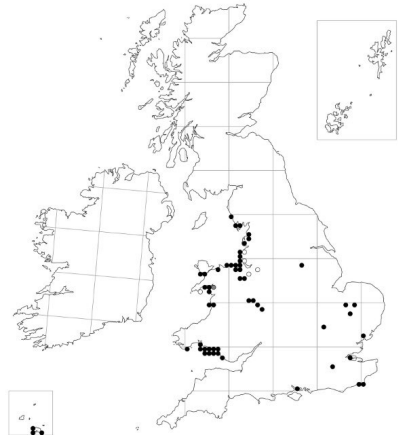
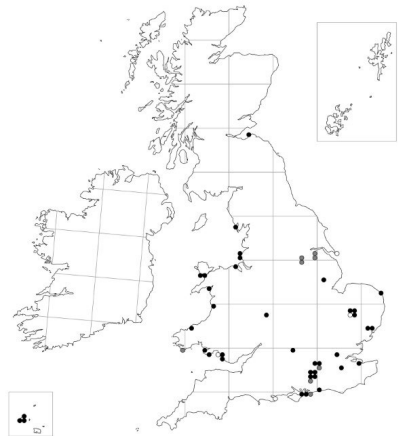
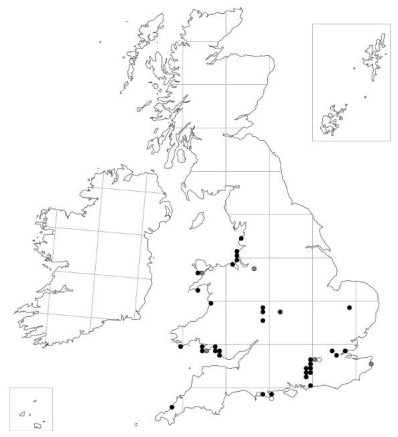
Code	Dune Habitat
SD545	wet or damp vegetated areas (mature dune slacks etc.), inc. creeping willow
SD570	hollow plant stems (bramble etc.)
SD590	ruderals (thistles, Epilobium, etc.)
SD600	dune heath
SD720	dune scrub (inc. aspen, hawthorn, burnet rose, etc.)
SD740	willow and alder carr
SD830	-
SD910	dung or carrion on sand
SD920	-
SD921	-
SD930	strandline (including accumulations of decaying seaweed) & lower shore
SD935	-

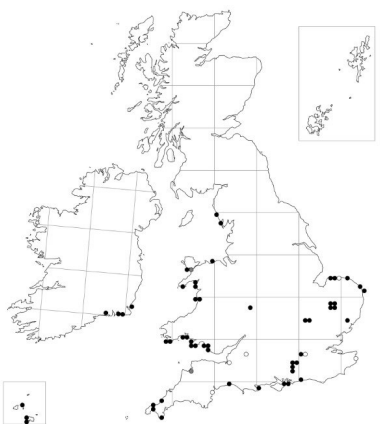
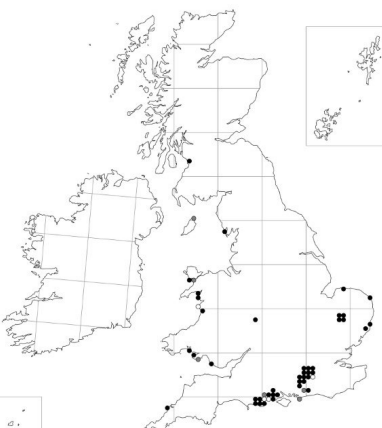
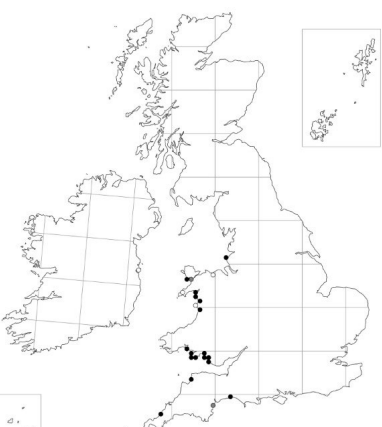
Appendix 3. Profiles of Nationally Rare and Nationally Scarce Aculeate Hymenoptera recorded on Morfa Dyffryn and Morfa Harlech Dunes.

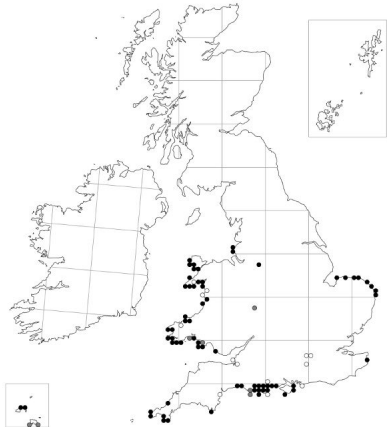
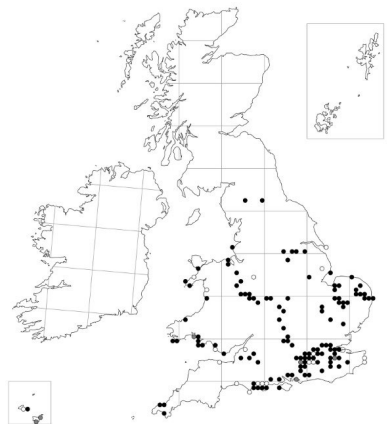
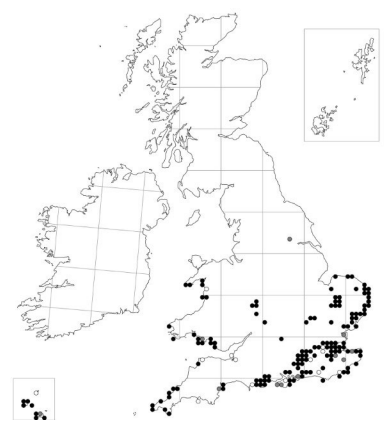
Maps are courtesy of the Bees, Wasps and Ants Recording Society and show validated records held by the society at September 2019. Black dots are for post 1990 records. Grey dots are 1960 – 1989. Open circles are pre 1960. The ranges of some species have changed considerably since the status review by Falk (1991a) and the maps show that some species are now more widespread than in 1990, although their designated statuses have not been updated.

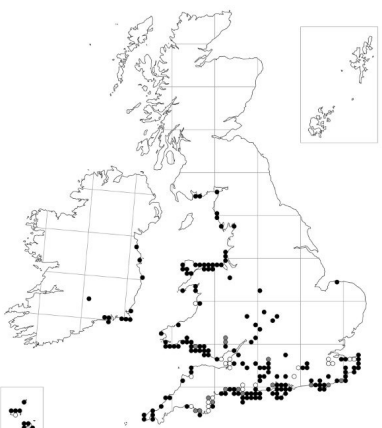
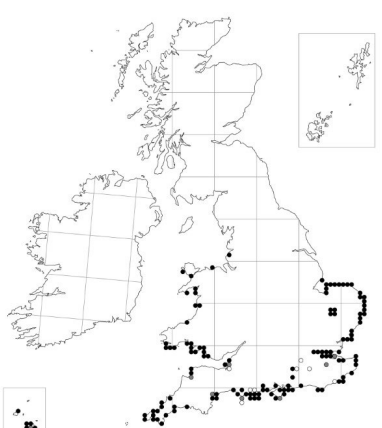
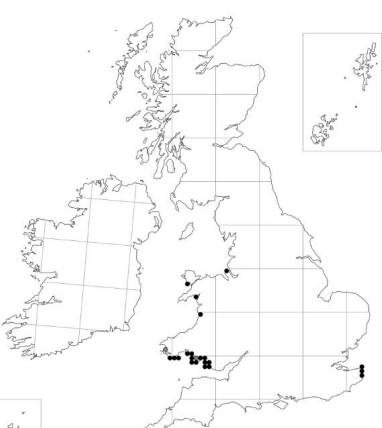
Larger maps can be viewed and downloaded at <https://www.bwars.com/content/bwars-maps-and-species-concepts>

Species information	Distribution map
<u>Colletes fodiens</u> Distribution Widespread in sandy districts in southern and central England and Wales, scarcer towards the north. Status: IUCN Red-listed as Vulnerable in Europe. The populations of this species are generally in decline in western and central Europe, while in southern Europe <i>Colletes fodiens</i> is widespread but not common and populations seem to be isolated. Flight period: June – early September Pollen collected: Oligolectic on the pollen of flowers in the family Asteraceae. Especially found at ragwort (<i>Senecio jacobaea</i>). Nesting Biology: A ground nesting bee. Recorded in and 2018-19 from Morfa Dyffryn and Morfa Harlech	

Species information	Distribution map
<u>Colletes cunicularius</u> Distribution: Historically, the species has an unusual distribution, being confined to a number of extensive coastal sand dune systems in north-west England and north-west and south Wales. Since 2011 there has been a marked expansion of range inland across England and Wales. Status: Listed in Galk (1991) as RDB3. Flight period: This is the only British <i>Colletes</i> to fly in the spring (early April to the end of May, rarely mid-June). Pollen collected: females forage for pollen largely on creeping willow (<i>Salix repens</i>). Nesting Biology: In exposed sand. Recorded in and 2018-19 from Morfa Dyffryn and Morfa Harlech	
<u>Hedychridium cupreum</u> Distribution: In Wales, records are confined to the coast. Otherwise scattered records across England and southern Scotland. Status: Listed in Falk (1991a) as Nationally Notable (Nb). Flight Period: June – August – mainly July. Parasitic Biology: A parasitoid on the mature larvae, or a cleptoparasite on the food stores of the sphecid wasp <i>Dryudella pinguis</i> (Dahlbom). The female enters the subterranean burrow of its host and lays an egg in each of the cells. No further information has been found. Recorded in 2018-19 from Morfa Harlech – a single specimen.	
<u>Arachnospila wesmaeli</u> Distribution: Found on coastal sand dunes and dry heath land in southern England, south Wales, mid Wales, Lancashire and Cheshire. Status: Listed in Falk (1991a) as Nationally Notable (Na). Flight Period: June to September. Prey Collected: <i>Lycosidae</i>, <i>Gnaphosidae</i> and <i>Salticidae</i>. (Arachnida) Recorded in 2018-19 from Morfa Dyffryn and Morfa Harlech.	

Species information	Distribution map
<u>Oxybelus argentatus</u> Distribution: This species occurs locally on coastal dunes and inland heaths in southern England and west Wales. Status: Listed in Falk (1991a) as Nationally Notable (Na). Flight Period: Late June to end of August. Prey Collected: Family <i>Therevidae</i> (Diptera) Nesting Biology: Little is known of the nesting behaviour except that females provision their nests with dipterans, particularly <i>Therevidae</i> that are carried, impaled on the sting. Flowers Visited: On coastal sand dunes it frequently visits sea spurge <i>Euphorbia paralias</i> and thistle flowers. Recorded in 2018-19 from Morfa Dyffryn and Morfa Harlech	
<u>Oxybelus mandibularis</u> Distribution: A very local wasp, confined to southern England and west Wales. Status: Listed as Rare (pRDB3) in Falk (1991a). Flight period: End of June to late August. Nesting Biology: Little appears to be known of its nesting behaviour, but it is likely to be broadly similar to <i>O. uniglumis</i>. In Fennoscandia, nests are provisioned with adult Diptera; each cell containing four to six flies. Recorded in 2019 from Morfa Dyffryn.	
<u>Mimumesa littoralis</u> Distribution: Largely confined to coastal dune systems of the western seaboard (S.Devon, N.Devon, W.Wales to N.Lancashire). Status: Listed in Falk (1991a) as Rare <i>RDB3</i>. Habitat: Most records are from coastal dunes, where it is associated with the marram zone. Flight Period: July to September. Prey Collected: Probably stocks nest cells with auchenorrhynchos bugs. Nesting Biology: Has been observed nesting in sandy ground. One specimen recorded in 2019. Compartment 3 at SN605936 Recorded in 2018-19 from Morfa Dyffryn	

Species information	Distribution map
<u>Podalonia hirsuta</u> Distribution: Along southern and western coasts from West Sussex to Lancashire. Status: Listed in Falk (1991a) as Nationally Notable (Nb) Habitat: A mainly coastal species and which is common on sandy soils. Flight Period: Late March to mid September. Prey Collected: Large naked noctuid larvae (Lepidoptera). Nesting Biology: The nest burrow is dug in sand after the prey has been captured. The prey is usually hung on a tuft of grass whilst the burrow is dug. Recorded in 2018-19 from Morfa Dyffryn and Morfa Harlech	
<u>Nysson dimidiatus</u> Distribution: Recorded widely but sparingly across England and Wales as far north as Yorkshire. Status: Listed in Falk (1991a) as Nationally Notable (Nb). Habitat: Recorded from heathland, coastal dunes and coastal landslips. Favours sparsely vegetated or short-cropped areas on dry sandy or clayey soils. Flight Period: Univoltine; June to September. Nesting Biology: A cleptoparasite of <i>Harpactus tumidus</i> and usually occurring alongside that species. Flowers Visited: Umbellifers such as hogweed and wild carrot. Not recorded in 2018-19.	
<u>Dasypoda hirtipes</u> Distribution: Southern England and Wales, northwards to Merionethshire and Norfolk. Status: Listed in Falk (1991a) as Nationally Notable (Nb). Habitat: Sandy soils, particularly on heath lands and coastal dunes. Flight Period: Univoltine; Late June to end of August, or early September. Pollen Collected: Oligolectic on Asteraceae; plants visited include common ragwort <i>Senecio jacobaea</i>, fleabane <i>Pulicaria dysenterica</i>, creeping thistle <i>Cirsium arvense</i>, cats-ear <i>Hypochaeris radicata</i>, hawkbit <i>Leontodon hispidus</i>, perennial sow-thistle <i>Sonchus arvensis</i> and smooth hawksbeard <i>Crepis capillaris</i>. Nesting Biology: Females excavate their nests in sandy, sparsely vegetated, level soil. Some sites contain nest aggregations of great extent. Recorded in 2018-19 from Morfa Dyffryn and Morfa Harlech	

Species information	Distribution map
<u>Osmia aurulenta</u> Distribution: Locally common in many coastal localities in England and Wales. Status: Listed in Falk (1991a) as Nationally Notable b. Habitat: Coastal dunes, shingle ridges, landslips, disused quarries. Pollen collected: Probably polylectic in Britain; pollen collection observed from <i>Lotus corniculatus</i>. Nesting Biology: Empty snail shells. Flowers visited: <i>Glaucium flavum</i>, <i>Viola</i> sp., <i>Anthyllis vulneraria</i>, <i>Hippocrepis comosa</i>, <i>Rubus fruticosus</i> agg., <i>Rosa spinosissima</i>, <i>Salix repens</i>, <i>Armeria maritima</i>, <i>Linaria</i> sp., <i>Glechoma hederacea</i>, <i>Taraxacum officinale</i> agg. Recorded in 2018-19 from Morfa Harlech.	
<u>Megachile leachella</u> (formerly <i>M. dorsalis</i>) Distribution: Principally restricted to coastal sites in south and southeast England and south and west Wales. Status: Listed in Falk (1991a) as Nationally Notable (Nb). Habitat: Closely associated wind blown sands of coastal dunes, where it normally frequents the mid dunes and requires warm, sunny areas such as south-facing slopes and sheltered slacks for nesting. Flight Period: June to late August. Nesting Biology: Female <i>M. dorsalis</i> excavate their nest burrows in sandy soil and construct their nest cells from leaf sections cut from various plants. Pollen Collected: Pollen sources have not been established. <i>M. dorsalis</i> visits a wide variety of plants. Recorded in 2018-19 from Morfa Dyffryn and Morfa Harlech	
<u>Coelioxys mandibularis</u> Distribution: A coastal species with records confined to three discontinuous areas of Britain: Merseyside and Wallasey area of S. Lancashire and Cheshire; south and west Wales and W. Sussex and E. Kent in south-east England. Status: Listed in Falk (1991a) as Rare <i>RDB</i> 3. Habitat: In Britain it is recorded exclusively from coastal sand dunes. Flight Period: Univoltine; June to late August. Nesting Biology: A cleptoparasite of bees in the genus <i>Megachile</i>. Recorded in 2018-19 from Morfa Dyffryn	

Appendix 4. Insects recorded from Morfa Dyffryn and Morfa Harlech in 2018-19.

Morfa Dyffryn

Family	Species	Grid Ref	Date	Abundance	Sex
Apidae	<i>Andrena barbilabris</i>	SH568233	09/05/2018	numerous	-
Apidae	<i>Andrena barbilabris</i>	SH569230	09/05/2018	-	m
Apidae	<i>Andrena barbilabris</i>	SH5623	06/06/2018	-	m & f
Apidae	<i>Andrena fucata</i>	SH5623	09/05/2018	-	m
Apidae	<i>Andrena fulva</i>	SH5623	09/05/2018	1	f
Apidae	<i>Andrena haemorrhoa</i>	SH5623	09/05/2018	1	f
Apidae	<i>Andrena haemorrhoa</i>	SH56472352	06/06/2018	3	-
Apidae	<i>Andrena haemorrhoa</i>	SH56682334	06/06/2018	-	-
Apidae	<i>Andrena scotica</i>	SH5623	09/05/2018	-	-
Apidae	<i>Bombus lapidarius</i>	SH5624	22/07/2018	-	f
Apidae	<i>Bombus lapidarius</i>	SH5623	25/08/2019	-	-
Apidae	<i>Bombus pascuorum</i>	SH5623	09/05/2018	-	Q
Apidae	<i>Bombus pascuorum</i>	SH5624	22/07/2018	-	f
Apidae	<i>Bombus pascuorum</i>	SH5623	25/08/2019	-	-
Apidae	<i>Bombus pratorum</i>	SH5624	22/07/2018	-	-
Apidae	<i>Bombus terrestris</i>	SH5623	09/05/2018	several	Q
Bethylidae	<i>Bethylus fuscicornis</i>	SH566234	06/06/2018	-	f
Chrysididae	<i>Hedychridium ardens</i>	SH5623	06/06/2018	1	-
Chrysididae	<i>Hedychridium ardens</i>	SH5623	15/07/2019	2	-
Apidae	<i>Colletes cunicularius</i>	SH568232	09/05/2018	1	-
Apidae	<i>Colletes cunicularius</i>	SH568233	09/05/2018	numerous	m & f
Apidae	<i>Colletes fodiens</i>	SH5525	06/07/2018	-	-
Apidae	<i>Colletes fodiens</i>	SH5624	22/07/2018	2	-
Apidae	<i>Colletes fodiens</i>	SH5624	22/07/2018	-	m
Apidae	<i>Colletes fodiens</i>	SH566233	22/07/2018	1	m
Apidae	<i>Colletes fodiens</i>	SH5623	15/07/2019	1	m
Apidae	<i>Colletes similis</i>	SH5623	15/07/2019	1	f
Apidae	<i>Epeolus variegatus</i>	SH5624	22/07/2018	1	f
Apidae	<i>Epeolus variegatus</i>	SH5623	22/07/2018	several	m & f
Apidae	<i>Epeolus variegatus</i>	SH5623	25/08/2019	-	-
Apidae	<i>Hylaeus brevicornis</i>	SH5623	06/06/2018	3	-
Crabronidae	<i>Cerceris arenaria</i>	SH5623	06/06/2018	-	-
Crabronidae	<i>Cerceris arenaria</i>	SH5525	06/07/2018	-	-
Crabronidae	<i>Cerceris arenaria</i>	SH5623	22/07/2018	-	m
Crabronidae	<i>Cerceris arenaria</i>	SH5623	15/07/2019	1	m
Crabronidae	<i>Crabro cribrarius</i>	SH5623	06/06/2018	10+	-
Crabronidae	<i>Crabro peltarius</i>	SH5525	06/07/2018	-	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5623	06/06/2018	1	m & f
Crabronidae	<i>Crossocerus wesmaeli</i>	SH56682334	06/06/2018	2	f
Crabronidae	<i>Crossocerus wesmaeli</i>	SH56472352	06/06/2018	5	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH566233	06/06/2018	7	m & f
Crabronidae	<i>Crossocerus wesmaeli</i>	SH56472351	06/06/2018	-	-

Family	Species	Grid Ref	Date	Abundance	Sex
Crabronidae	<i>Crossocerus wesmaeli</i>	SH565238	06/06/2018	3	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH55262552	06/07/2018	2	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5525	06/07/2018	-	m & f
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5624	22/07/2018	1	-
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5623	22/07/2018	-	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5623	25/08/2019	-	-
Crabronidae	<i>Diodontus minutus</i>	SH5623	06/06/2018	2	-
Crabronidae	<i>Diodontus minutus</i>	SH5525	06/07/2018	2	m & f
Crabronidae	<i>Diodontus minutus</i>	SH55262552	06/07/2018	-	m
Crabronidae	<i>Mellinus arvensis</i>	SH5525	06/07/2018	2	-
Crabronidae	<i>Mellinus arvensis</i>	SH5525	06/07/2018	several	m & f
Crabronidae	<i>Mellinus arvensis</i>	SH5624	22/07/2018	-	f
Crabronidae	<i>Mimumesa littoralis</i>	SH5525	06/07/2018	4	f
Crabronidae	<i>Mimumesa littoralis</i>	SH5623	22/07/2018	numbers	-
Crabronidae	<i>Mimumesa littoralis</i>	SH5623	15/07/2019	1	f
Crabronidae	<i>Oxybelus argentatus</i>	SH56472352	06/06/2018	-	-
Crabronidae	<i>Oxybelus argentatus</i>	SH56512347	06/06/2018	-	1
Crabronidae	<i>Oxybelus argentatus</i>	SH55262552	06/07/2018	-	m & f
Crabronidae	<i>Oxybelus mandibularis</i>	SH566233	22/07/2018	2	m
Crabronidae	<i>Oxybelus uniglumis</i>	SH56472352	06/06/2018	2	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH566233	06/06/2018	-	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH56472351	06/06/2018	-	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH5623	06/06/2018	2	f
Crabronidae	<i>Oxybelus uniglumis</i>	SH55262552	06/07/2018	-	m & f
Crabronidae	<i>Oxybelus uniglumis</i>	SH5623	15/07/2019	6	m & f
Crabronidae	<i>Oxybelus uniglumis</i>	SH5623	15/07/2019	8	m & f
Crabronidae	<i>Oxybelus uniglumis</i>	SH5623	25/08/2019	-	-
Crabronidae	<i>Pemphredon lethifera</i>	SH564236	06/06/2018	5	m
Crabronidae	<i>Tachysphex nitidus</i>	SH5623	06/06/2018	1	-
Crabronidae	<i>Tachysphex nitidus</i>	SH56472351	06/06/2018	-	-
Crabronidae	<i>Tachysphex pompiliformis</i>	SH5623	06/06/2018	-	-
Crabronidae	<i>Tachysphex pompiliformis</i>	SH5623	22/07/2018	-	-
Crabronidae	<i>Tachysphex pompiliformis</i>	SH5623	15/07/2019	1	f
Apidae	<i>Lasioglossum leucozonium</i>	SH5624	22/07/2018	-	-
Apidae	<i>Sphecodes pellucidus</i>	SH568233	09/05/2018	1	several
Apidae	<i>Sphecodes pellucidus</i>	SH5623	06/06/2018	f	-
Apidae	<i>Sphecodes pellucidus</i>	SH5623	15/07/2019	-	f
Apidae	<i>Coelioxys conoidea</i>	SH5623	15/07/2019	1	m
Apidae	<i>Coelioxys elongata</i>	SH5525	06/07/2018	several	f
Apidae	<i>Coelioxys elongata</i>	SH5623	15/07/2019	1	f
Apidae	<i>Megachile leachella</i>	SH5525	06/07/2018	-	f
Apidae	<i>Megachile leachella</i>	SH55682505	22/07/2018	-	m & f
Apidae	<i>Megachile maritima</i>	SH5623	22/07/2018	1	f
Apidae	<i>Megachile willughbiella</i>	SH5623	06/06/2018	1	m
Apidae	<i>Dasypoda hirtipes</i>	SH5525	06/07/2018	-	-

Family	Species	Grid Ref	Date	Abundance	Sex
Apidae	<i>Dasypoda hirtipes</i>	SH5623	22/07/2018	-	m
Apidae	<i>Dasypoda hirtipes</i>	SH5624	22/07/2018	1	f
Mutillidae	<i>Myrmosa atra</i>	SH5525	06/07/2018	-	m
Mutillidae	<i>Myrmosa atra</i>	SH5624	22/07/2018	1	f
Pompilidae	<i>Anoplius infuscatus</i>	SH56245623	06/06/2018	1	m
Pompilidae	<i>Anoplius infuscatus</i>	SH56245623	06/06/2018	1	m
Pompilidae	<i>Anoplius infuscatus</i>	SH5623	22/07/2018	1	m
Pompilidae	<i>Anoplius infuscatus</i>	SH5623	15/07/2019	2	m
Pompilidae	<i>Arachnospila anceps</i>	SH5623	22/07/2018	2	-
Pompilidae	<i>Arachnospila anceps</i>	SH5624	22/07/2018	-	f
Pompilidae	<i>Arachnospila anceps</i>	SH5623	22/07/2018	1	f
Pompilidae	<i>Arachnospila trivialis</i>	SH5623	06/06/2018	1	-
Pompilidae	<i>Arachnospila wesmaeli</i>	SH5623	22/07/2018	-	-
Pompilidae	<i>Ceropales maculata</i>	SH566234	06/06/2018	1	-
Pompilidae	<i>Ceropales maculata</i>	SH5623	06/06/2018	1	f
Pompilidae	<i>Ceropales maculata</i>	SH5525	06/07/2018	-	f
Pompilidae	<i>Ceropales maculata</i>	SH5623	22/07/2018	3	f
Pompilidae	<i>Episyron rufipes</i>	SH5623	22/07/2018	1	m & f
Pompilidae	<i>Episyron rufipes</i>	SH5624	22/07/2018	several	f
Pompilidae	<i>Episyron rufipes</i>	SH5623	15/07/2019	2	m
Pompilidae	<i>Evagetes crassicornis</i>	SH56682334	06/06/2018	2	f
Pompilidae	<i>Evagetes crassicornis</i>	SH5623	06/06/2018	1	f
Pompilidae	<i>Pompilus cinereus</i>	SH5623	06/06/2018	1	f
Pompilidae	<i>Pompilus cinereus</i>	SH5623	22/07/2018	20+	f
Pompilidae	<i>Pompilus cinereus</i>	SH5623	15/07/2019	5	m & f
Pompilidae	<i>Pompilus cinereus</i>	SH5623	15/07/2019	-	-
Pompilidae	<i>Pompilus cinereus</i>	SH5623	15/07/2019	several	m & f
Pompilidae	<i>Pompilus cinereus</i>	SH5623	25/08/2019	-	-
Sphecidae	<i>Ammophila sabulosa</i>	SH5623	22/07/2018	1	m&f
Sphecidae	<i>Ammophila sabulosa</i>	SH5623	25/08/2019	-	-
Sphecidae	<i>Podalonia hirsuta</i>	SH568233	09/05/2018	1	f
Sphecidae	<i>Podalonia hirsuta</i>	SH5623	22/07/2018	3	m&f
Anthomyiidae	<i>Delia albula</i>	SH5623	09/05/2018	-	-
Anthomyiidae	<i>Delia albula</i>	SH5623	06/06/2018	-	f
Anthomyiidae	<i>Delia albula</i>	SH5525	06/07/2018	-	m & f
Anthomyiidae	<i>Delia pallipennis</i>	SH5632	06/07/2018	1	m
Anthomyiidae	<i>Delia platura</i>	SH5623	06/07/2018	-	m
Anthomyiidae	<i>Egle rhinotmeta</i>	SH5623	09/05/2018	-	-
Asilidae	<i>Dysmachus trigonus</i>	SH5622	09/05/2018	-	-
Asilidae	<i>Dysmachus trigonus</i>	SH5623	09/05/2018	-	-
Asilidae	<i>Dysmachus trigonus</i>	SH5525	22/07/2018	-	-
Asilidae	<i>Machimus cingulatus</i>	SH5525	22/07/2018	2	m
Asilidae	<i>Pamponerus germanicus</i>	SH5622	09/05/2018	several	-
Asilidae	<i>Pamponerus germanicus</i>	SH5623	09/05/2018	-	-
Asilidae	<i>Philonicus albiceps</i>	SH5622	09/05/2018	numerous	-

Family	Species	Grid Ref	Date	Abundance	Sex
Asilidae	<i>Philonicus albiceps</i>	SH5623	09/05/2018	-	-
Asilidae	<i>Philonicus albiceps</i>	SH5525	22/07/2018	-	-
Bombylidae	<i>Phthiria pulicaria</i>	SH5623	09/05/2018	-	-
Bombylidae	<i>Phthiria pulicaria</i>	SH5622	06/06/2018	several	-
Bombylidae	<i>Phthiria pulicaria</i>	SH5525	06/07/2018	several	-
Bombylidae	<i>Phthiria pulicaria</i>	SH567232	22/07/2018	2	-
Calliphoridae	<i>Melanomya nana</i>	SH5622	06/06/2018	-	-
Calliphoridae	<i>Melanomya nana</i>	SH5623	06/06/2018	-	-
Calliphoridae	<i>Melanomya nana</i>	SH5525	06/07/2018	-	-
Canacidae	<i>Tethina albosetulosa</i>	SH5623	15/07/2019	numbers	m & f
Canacidae	<i>Tethina albosetulosa</i>	SH5623	15/07/2019	-	-
Canacidae	<i>Tethina illota</i>	SH5525	06/07/2018	numerous	m & f
Canacidae	<i>Tethina illota</i>	SH5623	06/07/2018	numbers	m & f
Chamaemyiidae	<i>(Leucopis griseola) tbc</i>	SH570320	15/07/2019	1	m
Chamaemyiidae	<i>Chamaemyia aridella</i>	SH5623	06/06/2018	-	m
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH5623	06/06/2018	-	m & f
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH5525	06/07/2018	-	m & f
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH5525	22/07/2018	-	-
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH566233	22/07/2018	-	f
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH5623	15/07/2019	4	m & f
Chamaemyiidae	<i>Chamaemyia herbarum</i>	SH5623	06/06/2018	-	f
Chloropidae	<i>Meromyza pratorum</i>	SH5623	06/06/2018	-	-
Chloropidae	<i>Meromyza pratorum</i>	SH5525	06/07/2018	-	-
Chloropidae	<i>Meromyza pratorum</i>	SH5623	15/07/2019	-	m & f
Chloropidae	<i>Trachysiphonella scutellata</i>	SH5623	06/07/2018	1	f
Diastatidae	<i>Diastata adusta</i>	SH5623	06/06/2018	-	f
Dolichopodidae	<i>Campsicnemus curvipes</i>	SH5622	06/06/2018	-	m
Dolichopodidae	<i>Campsicnemus scambus</i>	SH5622	06/06/2018	-	m
Dolichopodidae	<i>Chrysotimus molliculus</i>	SH5623	06/06/2018	-	f
Dolichopodidae	<i>Chrysotimus molliculus</i>	SH5525	06/07/2018	-	f
Dolichopodidae	<i>Chrysotimus molliculus</i>	SH5623	15/07/2019	-	-
Dolichopodidae	<i>Chrysotus gramineus</i>	SH5622	06/06/2018	-	m
Dolichopodidae	<i>Chrysotus palustris</i>	SH557250	22/07/2018	-	m
Dolichopodidae	<i>Chrysotus cilipes</i>	SH566233	22/07/2018	-	f
Dolichopodidae	<i>Chrysotus pulchellus</i>	SH5525	06/06/2018	-	m
Dolichopodidae	<i>Chrysotus pulchellus</i>	SH5623	22/07/2018	-	m
Dolichopodidae	<i>Dolichopus acuticornis</i>	SH566233	22/07/2018	-	m
Dolichopodidae	<i>Dolichopus acuticornis</i>	SH5623	22/07/2018	-	m
Dolichopodidae	<i>Dolichopus notatus</i>	SH557250	22/07/2018	1	f
Dolichopodidae	<i>Gymnopternus aerosus</i>	SH5623	06/06/2018	-	m
Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH5623	15/07/2019	1	m
Dolichopodidae	<i>Hercostomus gracilis</i>	SH5623	15/07/2019	several	m
Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH5622	06/06/2018	-	-
Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH5525	06/07/2018	-	-
Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH566233	22/07/2018	-	f

Family	Species	Grid Ref	Date	Abundance	Sex
Dolichopodidae	<i>Hilara cantabrica</i>	SH5623	06/06/2018	2	m
Dolichopodidae	<i>Hydrophorus praecox</i>	SH5623	06/06/2018	-	m
Dolichopodidae	<i>Medetera petrophiloides</i>	SH5623	06/06/2018	-	m
Dolichopodidae	<i>Sciapus platypterus</i>	SH566233	22/07/2018	-	f
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH557250	22/07/2018	-	m
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH5623	15/07/2019	-	-
Dolichopodidae	<i>Tachytrechus insignis</i>	SH5623	06/06/2018	-	-
Dolichopodidae	<i>Tachytrechus insignis</i>	SH5525	06/07/2018	numbers	m & f
Dolichopodidae	<i>Tachytrechus insignis</i>	SH557250	22/07/2018	-	m
Empididae	<i>Empis punctata</i>	SH5623	09/05/2018	-	-
Ephydriidae	<i>Philygria punctatonervosa</i>	SH5623	06/06/2018	-	-
Ephydriidae	<i>Philygria punctatonervosa</i>	SH566233	22/07/2018	-	-
Ephydriidae	<i>Philygria punctatonervosa</i>	SH557250	22/07/2018	1	-
Heleomyzidae	<i>Tephrochlaena oraria</i>	SH5623	06/07/2018	1	f
Hybotidae	<i>Hybos culiciformis</i>	SH566233	22/07/2018	-	m
Hybotidae	<i>Hybos culiciformis</i>	SH5623	15/07/2019	-	f
Lauxaniidae	<i>Homoneura c.f subnotata</i>	SH5623	22/07/2018	-	-
Lauxaniidae	<i>Meiosimyza decempunctata</i>	SH5623	06/06/2018	-	-
Lauxaniidae	<i>Meiosimyza decempunctata</i>	SH5623	15/07/2019	-	-
Lauxaniidae	<i>Sapromyza quadripunctata</i>	SH5525	06/07/2018	-	f
Lonchopteridae	<i>Lonchoptera furcata</i>	SH557250	22/07/2018	-	f
Lonchopteridae	<i>Lonchoptera lutea</i>	SH5623	09/05/2018	-	-
Muscidae	<i>Coenosia femoralis</i>	SH5623	09/05/2018	-	-
Muscidae	<i>Coenosia femoralis</i>	SH5623	09/05/2018	-	-
Muscidae	<i>Coenosia femoralis</i>	SH5623	06/06/2018	-	m
Muscidae	<i>Coenosia femoralis</i>	SH5525	06/07/2018	-	m
Muscidae	<i>Coenosia femoralis</i>	SH566233	22/07/2018	-	-
Muscidae	<i>Coenosia femoralis</i>	SH5623	15/07/2019	-	m
Muscidae	<i>Coenosia mollicula</i>	SH5623	15/07/2019	-	m
Muscidae	<i>Coenosia pedella</i>	SH5623	06/07/2018	1	f
Muscidae	<i>Coenosia testacea</i>	SH5525	06/07/2018	-	m
Muscidae	<i>Coenosia testacea</i>	SH566233	22/07/2018	-	m
Muscidae	<i>Helina impuncta</i>	SH5623	15/07/2019	-	-
Muscidae	<i>Helina parcepilosa</i>	SH566233	22/07/2018	1	-
Muscidae	<i>Helina protuberans</i>	SH5524	09/05/2018	Abundant	m & f
Muscidae	<i>Helina protuberans</i>	SH5623	06/07/2018	2	f
Muscidae	<i>Helina protuberans</i>	SH5623	15/07/2019	-	-
Muscidae	<i>Helina quadrum</i>	SH557250	22/07/2018	-	m
Muscidae	<i>Helina reversio</i>	SH5524	09/05/2018	Numerous	m & f
Muscidae	<i>Hydrotaea cyrtoneurina</i>	SH5623	09/05/2018	-	-
Muscidae	<i>Limnophora maculosa</i>	SH566233	22/07/2018	-	f
Muscidae	<i>Schoenomyza litorella</i>	SH5622	06/06/2018	-	-
Muscidae	<i>Schoenomyza litorella</i>	SH564234	06/07/2018	-	-
Muscidae	<i>Schoenomyza litorella</i>	SH5525	06/07/2018	-	-
Muscidae	<i>Schoenomyza litorella</i>	SH566233	22/07/2018	-	-

Family	Species	Grid Ref	Date	Abundance	Sex
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5524	09/05/2018	Numerous	m & f
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5525	06/07/2018	-	m
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5623	22/07/2018	-	m
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH566233	22/07/2018	3	f
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5623	15/07/2019	-	f
Platystomatidae	<i>Rivellia syngenesiae</i>	SH5622	06/06/2018	abundant	m & f
Platystomatidae	<i>Rivellia syngenesiae</i>	SH5525	06/07/2018	-	-
Platystomatidae	<i>Rivellia syngenesiae</i>	SH5623	15/07/2019	-	-
Rhagionidae	<i>Chrysopilus cristatus</i>	SH5623	15/07/2019	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH5525	22/07/2018	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH566233	22/07/2018	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH567232	22/07/2018	numbers	m & f
Rhinophoridae	<i>Rhinophora lepida</i>	SH566233	22/07/2018	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH5623	15/07/2019	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH5623	15/07/2019	-	-
Sarcophagidae	<i>Metopia argyrocephala</i>	SH564236	06/06/2018	-	f
Sarcophagidae	<i>Sarcophaga carnaria</i>	SH567234	25/08/2019	-	m
Sarcophagidae	<i>Sarcophaga haemorrhoea</i>	SH557250	22/07/2018	-	m
Sarcophagidae	<i>Sarcophaga hirticrus</i>	SH567234	25/08/2019	-	m
Sarcophagidae	<i>Sarcophaga nigriventris</i>	SH5623	15/07/2019	-	m
Sarcophagidae	<i>Sarcophaga subvicina</i>	SH567234	25/08/2019	-	m
Sarcophagidae	<i>Sarcophaga vagans</i>	SH567234	25/08/2019	-	m
Sarcophagidae	<i>Sarcophaga variegata</i>	SH567234	25/08/2019	-	m
Sarcophagidae	<i>Sarcophila latifrons</i>	SH5623	15/07/2019	-	f
Sarcophagidae	<i>Senotainia conica</i>	SH564235	06/06/2018	-	m
Sarcophagidae	<i>Senotainia conica</i>	SH5525	06/07/2018	-	m
Sarcophagidae	<i>Senotainia conica</i>	SH567232	22/07/2018	numbers	m & f
Sarcophagidae	<i>Senotainia conica</i>	SH5623	15/07/2019	-	-
Sarcophagidae	<i>Senotainia conica</i>	SH567234	25/08/2019	-	m & f
Sciomyzidae	<i>Coremacera marginata</i>	SH566233	22/07/2018	-	-
Sciomyzidae	<i>Dichetophora oblitterata</i>	SH566233	22/07/2018	2	f
Sciomyzidae	<i>Dictya umbrarum</i>	SH564234	06/07/2018	-	-
Sciomyzidae	<i>Hydromya dorsalis</i>	SH5525	06/07/2018	-	m & f
Sciomyzidae	<i>Limnia unguicornis</i>	SH5623	06/06/2018	-	-
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5623	09/05/2018	-	-
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5623	06/06/2018	-	-
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5525	22/07/2018	-	-
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5623	22/07/2018	-	-
Sciomyzidae	<i>Pherbellia nana</i>	SH5525	06/07/2018	-	f
Sphaeroceridae	<i>Copromyza stercoraria</i>	SH5623	15/07/2019	-	f
Syrphidae	<i>Cheilosia bergenstammi</i>	SH5623	09/05/2018	-	m & f
Syrphidae	<i>Epistrophe eligans</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Eristalis nemorum</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Eristalis pertinax</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Eristalis tenax</i>	SH5524	09/05/2018	-	-

Family	Species	Grid Ref	Date	Abundance	Sex
Syrphidae	<i>Eupeodes corollae</i>	SH5623	09/05/2018	-	-
Syrphidae	<i>Helophilus pendulus</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Melanostoma mellinum</i>	SH5623	09/05/2018	-	-
Syrphidae	<i>Melanostoma scalare</i>	SH5623	09/05/2018	-	-
Syrphidae	<i>Paragus haemorrhous</i>	SH5623	06/06/2018	-	m
Syrphidae	<i>Paragus haemorrhous</i>	SH564238	22/07/2018	-	-
Syrphidae	<i>Platycheirus manicatus</i>	SH5623	09/05/2018	-	-
Syrphidae	<i>Rhingia campestris</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Sericomyia silentis</i>	SH5524	09/05/2018	-	-
Syrphidae	<i>Sphaerophoria scripta</i>	SH566233	22/07/2018	-	-
Syrphidae	<i>Sphaerophoria scripta</i>	SH566233	22/07/2018	-	m
Tabanidae	<i>Haematopota pluvialis</i>	SH557250	22/07/2018	-	f
Tachinidae	<i>Exorista fasciata</i>	SH567234	25/08/2019	-	m
Tachinidae	<i>Gonia ornata</i>	SH569230	06/06/2018	1	f
Tachinidae	<i>Siphona variata</i>	SH5525	06/07/2018	1	m
Tephritidae	<i>Sphenella marginata</i>	SH5623	06/06/2018	-	-
Tephritidae	<i>Sphenella marginata</i>	SH5525	22/07/2018	-	-
Tephritidae	<i>Terellia serratulae</i>	SH5525	22/07/2018	-	-
Tephritidae	<i>Xyphosia miliaria</i>	SH5623	06/06/2018	-	-
Therevidae	<i>Acrosathe annulata</i>	SH5623	15/07/2019	-	f
Therevidae	<i>Acrosathe annulata</i>	SH5623	15/07/2019	2	m & f
Therevidae	<i>Dialineura anilis</i>	SH5623	09/05/2018	-	-
Therevidae	<i>Dialineura anilis</i>	SH5623	06/06/2018	-	-
Therevidae	<i>Thereva bipunctata</i>	SH5623	06/06/2018	-	m
Therevidae	<i>Thereva nobilitata</i>	SH5623	06/06/2018	-	-
Therevidae	<i>Thereva nobilitata</i>	SH5525	06/07/2018	-	f
Trioxscelidae	<i>Trioxscelis obscurella</i>	SH5623	06/06/2018	-	-
Trioxscelidae	<i>Trioxscelis obscurella</i>	SH5525	22/07/2018	-	-
Trioxscelidae	<i>Trioxscelis obscurella</i>	SH566233	22/07/2018	-	m & f
Trioxscelidae	<i>Trioxscelis obscurella</i>	SH5623	22/07/2018	-	-
Trioxscelidae	<i>Trioxscelis obscurella</i>	SH5623	15/07/2019	-	-
Ulidiidae	<i>Tetanops myopinus</i>	SH5623	06/06/2018	1	-
Carabidae	<i>Cicindela maritima</i>	SH5623	10/05/2018	Numbers	-
Aderidae	<i>Notoxus monocerus</i>	SH5623	22/07/2018	-	-
Chrysomelidae	<i>Oulema melanopus</i>	SH5623	22/07/2018	-	-

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Family	Species	Grid Ref	Date	Abundance	Sex
Apidae	<i>Andrena barbilabris</i>	SH564330	09/05/2018	1	m&f
Apidae	<i>Andrena barbilabris</i>	SH566330	09/05/2018	numerous	-
Apidae	<i>Andrena barbilabris</i>	SH5632	09/06/2019	-	f
Apidae	<i>Andrena barbilabris</i>	SH5534	15/07/2019	1	m
Apidae	<i>Andrena barbilabris</i>	SH5534	15/07/2019	-	-
Apidae	<i>Andrena barbilabris</i>	SH569317	15/07/2019	-	-
Apidae	<i>Andrena haemorrhoa</i>	SH5633	09/05/2018	-	-
Apidae	<i>Andrena nigroaenea</i>	SH569317	15/07/2019	-	f

Family	Species	Grid Ref	Date	Abundance	Sex
Apidae	<i>Bombus hortorum</i>	SH5633	09/05/2018	several	Q
Apidae	<i>Bombus lapidarius</i>	SH5632	09/06/2019	-	f
Apidae	<i>Bombus lapidarius</i>	SH5632	25/08/2019	-	f
Apidae	<i>Bombus lucorum</i>	SH5632	09/06/2019	-	m
Apidae	<i>Bombus lucorum agg.</i>	SH5633	09/05/2018	1	Q
Apidae	<i>Bombus pascuorum</i>	SH5633	09/05/2018	1	Q
Apidae	<i>Bombus pascuorum</i>	SH5632	25/08/2019	-	f
Apidae	<i>Bombus pascuorum</i>	SH5632	25/08/2019	-	f
Apidae	<i>Bombus terrestris</i>	SH5633	09/05/2018	several	Q
Chrysididae	<i>Hedychridium ardens</i>	SH569327	06/07/2018	1	f
Chrysididae	<i>Hedychridium ardens</i>	SH5632	09/06/2019	-	f
Chrysididae	<i>Hedychridium ardens</i>	SH569317	15/07/2019	-	-
Chrysididae	<i>Hedychridium ardens</i>	SH5534	15/07/2019	-	-
Chrysididae	<i>Hedychridium cupreum</i>	SH568329	09/06/2019	-	-
Apidae	<i>Colletes cunicularius</i>	SH567330	09/05/2018	1	-
Apidae	<i>Colletes cunicularius</i>	SH564327	09/05/2018	numerous	m & f
Apidae	<i>Colletes fodiens</i>	SH569327	06/07/2018	-	f
Apidae	<i>Colletes succinctus</i>	SH5632	25/08/2019	-	m
Apidae	<i>Epeolus cruciger</i>	SH570321	27/07/2014	-	-
Apidae	<i>Epeolus variegatus</i>	SH570321	27/07/2014	-	-
Apidae	<i>Hylaeus brevicornis</i>	SH570322	14/06/2017	1	m
Apidae	<i>Hylaeus brevicornis</i>	SH568329	09/06/2019	-	-
Apidae	<i>Hylaeus brevicornis</i>	SH568329	09/06/2019	-	m
Apidae	<i>Hylaeus confusus</i>	SH568329	09/06/2019	-	f
Apidae	<i>Hylaeus confusus</i>	SH5632	09/06/2019	-	f
Crabronidae	<i>Cerceris arenaria</i>	SH569327	06/07/2018	several	m & f
Crabronidae	<i>Cerceris arenaria</i>	SH5632	25/08/2019	-	f
Crabronidae	<i>Crabro peltarius</i>	SH5632	09/06/2019	-	m
Crabronidae	<i>Crossocerus elongatulus</i>	SH568333	06/07/2018	-	-
Crabronidae	<i>Crossocerus elongatulus</i>	SH5632	06/07/2018	1	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH570322	14/06/2017	4	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH569327	06/07/2018	5	f
Crabronidae	<i>Crossocerus wesmaeli</i>	SH5632	06/07/2018	-	-
Crabronidae	<i>Crossocerus wesmaeli</i>	SH570320	09/06/2019	2	m
Crabronidae	<i>Crossocerus wesmaeli</i>	SH569317	15/07/2019	-	-
Crabronidae	<i>Diodontus minutus</i>	SH569327	06/07/2018	1	f
Crabronidae	<i>Diodontus minutus</i>	SH5632	09/06/2019	-	f
Crabronidae	<i>Diodontus minutus</i>	SH569317	15/07/2019	-	-
Crabronidae	<i>Ectemnius continuus</i>	SH569327	06/07/2018	1	f
Crabronidae	<i>Ectemnius continuus</i>	SH568329	09/06/2019	-	-
Crabronidae	<i>Mellinus arvensis</i>	SH5632	25/08/2019	-	f
Crabronidae	<i>Oxybelus argentatus</i>	SH5632	09/06/2019	-	f
Crabronidae	<i>Oxybelus argentatus</i>	SH557346	15/07/2019	1	m
Crabronidae	<i>Oxybelus argentatus</i>	SH5534	15/07/2019	2	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH569327	06/07/2018	1	f

Family	Species	Grid Ref	Date	Abundance	Sex
Crabronidae	<i>Oxybelus uniglumis</i>	SH5632	09/06/2019	-	m & f
Crabronidae	<i>Oxybelus uniglumis</i>	SH557346	15/07/2019	1	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH569317	15/07/2019	-	m & f
Crabronidae	<i>Oxybelus uniglumis</i>	SH5632	15/07/2019	-	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH5632	15/07/2019	-	-
Crabronidae	<i>Oxybelus uniglumis</i>	SH5632	25/08/2019	-	f
Crabronidae	<i>Pemphredon lethifer</i>	SH5632	15/07/2019	-	-
Crabronidae	<i>Pemphredon morio</i>	SH557346	15/07/2019	1	f
Crabronidae	<i>Psenulus pallipes</i>	SH568329	09/06/2019	-	f
Crabronidae	<i>Tachysphex nitidus</i>	SH5632	09/06/2019	-	f
Crabronidae	<i>Tachysphex pompiliformis</i>	SH5632	09/06/2019	-	f
Crabronidae	<i>Tachysphex pompiliformis</i>	SH5632	15/07/2019	-	-
Dryinidae	<i>Gonatopus distinctus</i>	SH557346	15/07/2019	1	f
Formicidae	<i>Lasius fuliginosus</i>	SH570321	27/07/2014	-	-
Formicidae	<i>Lasius niger</i>	SH570321	27/07/2014	-	-
Formicidae	<i>Myrmica ruginodis</i>	SH569327	06/07/2018	1	f
Apidae	<i>Lasioglossum calceatum</i>	SH5632	09/06/2019	-	f
Apidae	<i>Lasioglossum leucozonium</i>	SH5632	09/06/2019	-	f
Apidae	<i>Lasioglossum leucozonium</i>	SH5534	15/07/2019	-	-
Apidae	<i>Lasioglossum leucozonium</i>	SH5632	25/08/2019	-	m
Apidae	<i>Sphecodes geoffrellus</i>	SH5632	09/06/2019	-	f
Apidae	<i>Sphecodes pellucidus</i>	SH5632	09/06/2019	-	f
Apidae	<i>Coelioxys elongata</i>	SH569327	06/07/2018	several	f
Apidae	<i>Coelioxys elongata</i>	SH568329	09/06/2019	3	m & f
Apidae	<i>Coelioxys elongata</i>	SH5534	15/07/2019	1	f
Apidae	<i>Megachile centuncularis</i>	SH569327	06/07/2018	several	m
Apidae	<i>Megachile centuncularis</i>	SH5534	15/07/2019	-	-
Apidae	<i>Megachile circumcincta</i>	SH569327	06/07/2018	1	f
Apidae	<i>Megachile circumcincta</i>	SH5632	09/06/2019	-	m
Apidae	<i>Megachile circumcincta</i>	SH570320	15/07/2019	-	m
Apidae	<i>Megachile leachella</i>	SH570321	27/07/2014	-	-
Apidae	<i>Megachile leachella</i>	SH5632	25/08/2019	-	m & f
Apidae	<i>Megachile maritima</i>	SH570321	27/07/2014	-	-
Apidae	<i>Megachile maritima</i>	SH569327	06/07/2018	1	f
Apidae	<i>Megachile maritima</i>	SH5534	15/07/2019	1	m
Apidae	<i>Megachile maritima</i>	SH5632	25/08/2019	-	f
Apidae	<i>Megachile versicolor</i>	SH569327	06/07/2018	-	m
Apidae	<i>Megachile versicolor</i>	SH5632	25/08/2019	-	f
Apidae	<i>Osmia aurulenta</i>	SH5632	09/06/2019	-	f
Apidae	<i>Dasypoda hirtipes</i>	SH570321	27/07/2014	-	-
Apidae	<i>Dasypoda hirtipes</i>	SH569327	06/07/2018	-	-
Mutillidae	<i>Myrmica atra</i>	SH5632	25/08/2019	-	f
Pompilidae	<i>Anoplius infuscatus</i>	SH569327	06/07/2018	several	f
Pompilidae	<i>Anoplius infuscatus</i>	SH570320	09/06/2019	2	m
Pompilidae	<i>Anoplius infuscatus</i>	SH5534	15/07/2019	-	-

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Pompilidae	<i>Anoplius infuscatus</i>	SH5534	15/07/2019	-	-
Pompilidae	<i>Anoplius infuscatus</i>	SH5632	25/08/2019	-	f
Pompilidae	<i>Anoplius nigerrimus</i>	SH569317	15/07/2019	-	f
Pompilidae	<i>Anoplius nigerrimus</i>	SH5632	25/08/2019	-	f
Pompilidae	<i>Arachnospila wesmaeli</i>	SH5534	15/07/2019	-	-
Pompilidae	<i>Ceropales maculata</i>	SH5632	09/06/2019	-	f
Pompilidae	<i>Ceropales maculata</i>	SH5632	25/08/2019	-	f
Pompilidae	<i>Dipogon variegatus</i>	SH5534	15/07/2019	-	-
Pompilidae	<i>Dipogon variegatus</i>	SH5632	25/08/2019	-	f
Pompilidae	<i>Episyron rufipes</i>	SH570321	27/07/2014	-	-
Pompilidae	<i>Episyron rufipes</i>	SH568329	09/06/2019	-	m & f
Pompilidae	<i>Episyron rufipes</i>	SH556346	15/07/2019	1	-
Pompilidae	<i>Episyron rufipes</i>	SH5534	15/07/2019	2	-
Pompilidae	<i>Pompilus cinereus</i>	SH570321	27/07/2014	-	-
Pompilidae	<i>Pompilus cinereus</i>	SH569327	06/07/2018	1	f
Pompilidae	<i>Pompilus cinereus</i>	SH5632	06/07/2018	-	-
Pompilidae	<i>Pompilus cinereus</i>	SH5632	09/06/2019	-	m & f
Pompilidae	<i>Pompilus cinereus</i>	SH557346	15/07/2019	2	f
Pompilidae	<i>Pompilus cinereus</i>	SH557346	15/07/2019	6	-
Pompilidae	<i>Pompilus cinereus</i>	SH556346	15/07/2019	14	-
Pompilidae	<i>Pompilus cinereus</i>	SH569317	15/07/2019	-	-
Pompilidae	<i>Pompilus cinereus</i>	SH5632	15/07/2019	-	-
Pompilidae	<i>Pompilus cinereus</i>	SH5632	25/08/2019	-	-
Sphecidae	<i>Ammophila sabulosa</i>	SH570321	27/07/2014	-	-
Sphecidae	<i>Ammophila sabulosa</i>	SH569327	06/07/2018	several	f
Sphecidae	<i>Ammophila sabulosa</i>	SH5632	09/06/2019	-	m & f
Sphecidae	<i>Ammophila sabulosa</i>	SH5632	25/08/2019	-	f
Sphecidae	<i>Podalonia hirsuta</i>	SH569327	06/07/2018	1	f
Sphecidae	<i>Podalonia hirsuta</i>	SH5632	09/06/2019	-	f
Sphecidae	<i>Podalonia hirsuta</i>	SH569317	15/07/2019	-	f
Sphecidae	<i>Podalonia hirsuta</i>	SH5632	15/07/2019	-	-
Anthomyiidae	<i>Delia albula</i>	SH5534	15/07/2019	-	m & f
Anthomyiidae	<i>Delia pallipennis</i>	SH5731	14/07/2013	-	m
Anthomyiidae	<i>Delia pallipennis</i>	SH570320	09/06/2019	1	m
Anthomyiidae	<i>Delia penicillosa</i>	SH5731	14/07/2013	-	m
Anthomyiidae	<i>Delia penicillosa</i>	SH5633	06/07/2018	-	-
Anthomyiidae	<i>Delia platura</i>	SH568329	09/06/2019	-	m
Anthomyiidae	<i>Delia platura</i>	SH5732	09/06/2019	-	m
Anthomyiidae	<i>Delia setigera</i>	SH5731	14/07/2013	-	m
Anthomyiidae	<i>Hylemya vagans</i>	SH568329	09/06/2019	-	f
Anthomyiidae	<i>Hylemya variata</i>	SH5633	09/05/2018	-	-
Anthomyiidae	<i>Hylemyza partita</i>	SH568329	09/06/2019	-	m & f
Anthomyiidae	<i>Zaphne ambigua</i>	SH5632	09/06/2019	-	m
Asilidae	<i>Dysmachus trigonus</i>	SH5632	06/07/2018	-	-
Asilidae	<i>Dysmachus trigonus</i>	SH568329	09/06/2019	-	-

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Asilidae	<i>Dysmachus trigonus</i>	SH5732	09/06/2019	-	-
Asilidae	<i>Philonicus albiceps</i>	SH5633	06/07/2018	-	-
Asilidae	<i>Philonicus albiceps</i>	SH5732	09/06/2019	-	-
Asilidae	<i>Philonicus albiceps</i>	SH5534	15/07/2019	-	-
Bibionidae	<i>Dilophus febrilis</i>	SH5633	25/08/2019	-	m
Bombyliidae	<i>Phthiria pulicaria</i>	SH5632	06/07/2018	-	-
Bombyliidae	<i>Phthiria pulicaria</i>	SH569317	09/06/2019	-	-
Bombyliidae	<i>Phthiria pulicaria</i>	SH556346	15/07/2019	-	-
Calliphoridae	<i>Bellardia viarum</i>	SH568329	09/06/2019	-	m
Calliphoridae	<i>Lucilia sericata</i>	SH568329	09/06/2019	-	f
Calliphoridae	<i>Pollenia labialis</i>	SH568329	09/06/2019	-	m
Calliphoridae	<i>Pollenia rudis</i>	SH568329	09/06/2019	-	m
Calliphoridae	<i>Pollenia rudis</i>	SH5633	25/08/2019	-	m
Canacidae	<i>Tethina albosetulosa</i>	SH570320	09/06/2019	-	-
Canacidae	<i>Tethina albosetulosa</i>	SH568329	09/06/2019	-	-
Canacidae	<i>Tethina illota</i>	SH570320	09/06/2019	-	f
Carnidae	<i>Meoneura vagans</i>	SH556346	15/07/2019	-	m
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH5632	06/07/2018	-	m & f
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH556346	15/07/2019	-	m & f
Chamaemyiidae	<i>Chamaemyia flavipalpis</i>	SH556346	15/07/2019	numbers	m & f
Chamaemyiidae	<i>Chamaemyia herbarum</i>	SH5633	06/07/2018	-	f
Chamaemyiidae	<i>Chamaemyia herbarum</i>	SH556346	15/07/2019	-	f
Chamaemyiidae	<i>Chamaemyia juncorum</i>	SH5632	06/07/2018	-	f
Chamaemyiidae	<i>Chamaemyia juncorum</i>	SH5633	06/07/2018	-	f
Chloropidae	<i>Meromyza pratorum</i>	SH5632	06/07/2018	-	-
Chloropidae	<i>Meromyza pratorum</i>	SH5632	06/07/2018	-	f
Chloropidae	<i>Meromyza pratorum</i>	SH557346	15/07/2019	-	m
Chloropidae	<i>Meromyza pratorum</i>	SH5534	15/07/2019	-	m & f
Chyromyidae	<i>Gymnochyromyia inermis</i>	SH568329	09/06/2019	1	m
Dolichopodidae	<i>Campsicnemus scambus</i>	SH5732	09/06/2019	1	m
Dolichopodidae	<i>Chrysotimus molliculus</i>	SH5633	06/07/2018	-	-
Dolichopodidae	<i>Chrysotus cilipes</i>	SH5534	15/07/2019	-	m & f
Dolichopodidae	<i>Chrysotus gramineus</i>	SH5632	06/07/2018	1	m
Dolichopodidae	<i>Dolichopus acuticornis</i>	SH557346	15/07/2019	-	m
Dolichopodidae	<i>Dolichopus plumipes</i>	SH5534	15/07/2019	-	m
Dolichopodidae	<i>Dolichopus plumipes</i>	SH556346	15/07/2019	-	m
Dolichopodidae	<i>Dolichopus simplex</i>	SH5633	06/07/2018	-	-
Dolichopodidae	<i>Dolichopus unguatus</i>	SH568329	09/06/2019	several	m & f
Dolichopodidae	<i>Gymnopternus aerosus</i>	SH568329	09/06/2019	-	m
Dolichopodidae	<i>Hercostomus germanus</i>	SH5633	06/07/2018	-	-
Dolichopodidae	<i>Hercostomus germanus</i>	SH5534	15/07/2019	-	m
Dolichopodidae	<i>Hercostomus germanus</i>	SH556346	15/07/2019	-	m
Dolichopodidae	<i>Hercostomus gracilis</i>	SH5633	06/07/2018	-	-
Dolichopodidae	<i>Hercostomus gracilis</i>	SH5632	06/07/2018	-	-
Dolichopodidae	<i>Hercostomus gracilis</i>	SH5632	06/07/2018	-	m

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Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH5632	06/07/2018	-	-
Dolichopodidae	<i>Hercostomus nigriplantis</i>	SH568329	09/06/2019	-	m
Dolichopodidae	<i>Medetera saxatilis</i>	SH5632	06/07/2018	-	m
Dolichopodidae	<i>Medetera saxatilis</i>	SH5633	06/07/2018	-	m
Dolichopodidae	<i>Medetera saxatilis</i>	SH568329	09/06/2019	numerous	m
Dolichopodidae	<i>Sciapus wiedemanni</i>	SH568329	09/06/2019	-	f
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH5633	09/05/2018	-	m & f
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH5732	09/06/2019	-	m
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH5534	15/07/2019	-	-
Dolichopodidae	<i>Sympycnus desoutteri</i>	SH556346	15/07/2019	-	m
Empididae	<i>Empis punctata</i>	SH5633	09/05/2018	-	m & f
Empididae	<i>Hilara fulvibarba</i>	SH567330	09/06/2019	-	m
Ephydriidae	<i>Philygria punctatonevosa</i>	SH5632	06/07/2018	-	-
Heterocheilidae	<i>Heterocheila buccata</i>	SH570320	09/06/2019	-	-
Hybotidae	<i>Bicellaria sulcata</i>	SH568329	09/06/2019	-	m
Hybotidae	<i>Crossopalpus setiger</i>	SH556346	15/07/2019	-	m
Hybotidae	<i>Hybos culiciformis</i>	SH568329	09/06/2019	-	m & f
Lauxaniidae	<i>Minettia lupulina</i>	SH568329	09/06/2019	1	f
Milichiidae	<i>Phyllomyza donisthorpei</i>	SH568329	09/06/2019	1	m
Muscidae	<i>Coenosia femoralis</i>	SH556346	15/07/2019	-	m
Muscidae	<i>Coenosia femoralis</i>	SH5534	15/07/2019	-	m & f
Muscidae	<i>Coenosia femoralis</i>	SH556346	15/07/2019	-	m
Muscidae	<i>Coenosia mollicula</i>	SH5633	09/05/2018	-	-
Muscidae	<i>Coenosia mollicula</i>	SH5632	09/06/2019	-	m & f
Muscidae	<i>Coenosia mollicula</i>	SH557346	15/07/2019	-	m
Muscidae	<i>Coenosia pedella</i>	SH556346	15/07/2019	5	m
Muscidae	<i>Coenosia pumila</i>	SH5633	06/07/2018	-	-
Muscidae	<i>Coenosia pumila</i>	SH5632	06/07/2018	-	-
Muscidae	<i>Coenosia pumila</i>	SH556346	15/07/2019	4	m
Muscidae	<i>Coenosia testacea</i>	SH5633	09/05/2018	-	-
Muscidae	<i>Coenosia testacea</i>	SH5632	06/07/2018	-	m & f
Muscidae	<i>Coenosia testacea</i>	SH5632	09/06/2019	-	m
Muscidae	<i>Coenosia tigrina</i>	SH5632	06/07/2018	-	-
Muscidae	<i>Coenosia tigrina</i>	SH5732	09/06/2019	-	f
Muscidae	<i>Eudasyphora cyanella</i>	SH568329	09/06/2019	-	-
Muscidae	<i>Eudasyphora cyanicolor</i>	SH568329	09/06/2019	-	-
Muscidae	<i>Hebecnema umbratica</i>	SH5632	06/07/2018	-	m
Muscidae	<i>Helina evecta</i>	SH5633	25/08/2019	-	f
Muscidae	<i>Helina impuncta</i>	SH5633	25/08/2019	-	m
Muscidae	<i>Helina protuberans</i>	SH5633	09/05/2018	Abundant	m & f
Muscidae	<i>Helina protuberans</i>	SH570320	09/06/2019	2	m
Muscidae	<i>Helina reversio</i>	SH5633	09/05/2018	-	m f
Muscidae	<i>Hydrotaea albipuncta</i>	SH5632	06/07/2018	-	m
Muscidae	<i>Lispe pygmaea</i>	SH5632	09/06/2019	1	m
Muscidae	<i>Neomyia viridescens</i>	SH5633	25/08/2019	-	f

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Muscidae	<i>Phaonia tuguriorum</i>	SH556346	15/07/2019	1	m
Muscidae	<i>Schoenomyza litorella</i>	SH568329	09/06/2019	-	-
Muscidae	<i>Schoenomyza litorella</i>	SH5534	15/07/2019	-	-
Opomyzidae	<i>Geomyza tripunctata</i>	SH5732	09/06/2019	-	-
Piophilidae	<i>Prochyliza nigrimana</i>	SH568333	06/07/2018	-	-
Pipunculidae	<i>Cephalops varipes</i>	SH567330	09/06/2019	1	f
Pipunculidae	<i>Jassidophaga beatricis</i>	SH567330	09/06/2019	2	m
Pipunculidae	<i>Jassidophaga fasciata</i>	SH567330	09/06/2019	1	m
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5632	06/07/2018	-	-
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH5632	06/07/2018	-	f
Pipunculidae	<i>Tomosvaryella littoralis</i>	SH556346	15/07/2019	-	m
Pipunculidae	<i>Verrallia aucta</i>	SH5632	06/07/2018	-	-
Pipunculidae	<i>Verrallia aucta</i>	SH568329	09/06/2019	3	m & f
Pipunculidae	<i>Verrallia aucta</i>	SH5732	09/06/2019	-	m
Platystomatidae	<i>Rivellia syngenesiae</i>	SH568329	09/06/2019	-	-
Platystomatidae	<i>Rivellia syngenesiae</i>	SH568329	09/06/2019	-	-
Platystomatidae	<i>Rivellia syngenesiae</i>	SH5732	09/06/2019	-	-
Platystomatidae	<i>Rivellia syngenesiae</i>	SH5534	15/07/2019	-	-
Rhagionidae	<i>Chrysopilus cristatus</i>	SH5732	09/06/2019	-	-
Rhagionidae	<i>Chrysopilus cristatus</i>	SH5534	15/07/2019	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH557346	15/07/2019	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH556346	15/07/2019	-	-
Rhinophoridae	<i>Rhinophora lepida</i>	SH5534	15/07/2019	-	-
Rhinophoridae	<i>Tricogena rubricosa</i>	SH568329	09/06/2019	1	m & f
Rhinophoridae	<i>Tricogena rubricosa</i>	SH568329	09/06/2019	-	m & f
Sarcophagidae	<i>Ravinia pernix</i>	SH568329	09/06/2019	-	m
Sarcophagidae	<i>Sarcophaga crassimargo</i>	SH568329	09/06/2019	-	m
Sarcophagidae	<i>Sarcophaga incisilobata</i>	SH568329	09/06/2019	-	m
Sarcophagidae	<i>Sarcophaga nigriventris</i>	SH569317	09/06/2019	-	m
Sarcophagidae	<i>Sarcophaga nigriventris</i>	SH570320	09/06/2019	-	m
Sarcophagidae	<i>Sarcophaga teretirostris</i>	SH568329	25/08/2019	-	m
Sarcophagidae	<i>Sarcophaga vagans</i>	SH568329	09/06/2019	-	m
Sarcophagidae	<i>Sarcophila latifrons</i>	SH557346	15/07/2019	-	m
Sarcophagidae	<i>Senotainia conica</i>	SH569317	09/06/2019	-	-
Sarcophagidae	<i>Senotainia conica</i>	SH568329	09/06/2019	numerous	m & f
Sarcophagidae	<i>Senotainia conica</i>	SH568329	09/06/2019	numerous	m & f
Sarcophagidae	<i>Senotainia conica</i>	SH556346	15/07/2019	-	-
Sarcophagidae	<i>Senotainia conica</i>	SH5534	15/07/2019	-	m & f
Scathophagidae	<i>Scathophaga scybalaria</i>	SH568333	06/07/2018	-	-
Scathophagidae	<i>Scathophaga stercoraria</i>	SH5534	15/07/2019	-	-
Sciomyzidae	<i>Coremacera marginata</i>	SH5632	06/07/2018	-	-
Sciomyzidae	<i>Elgiva cucularia</i>	SH5633	06/07/2018	-	-
Sciomyzidae	<i>Limnia unguicornis</i>	SH568329	09/06/2019	-	f
Sciomyzidae	<i>Limnia unguicornis</i>	SH556346	15/07/2019	-	m & f
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5633	09/05/2018	abundant	-

Family	Species	Grid Ref	Date	Abundance	Sex
Sciomyzidae	<i>Pherbellia cinerella</i>	SH568329	09/06/2019	-	m & f
Sciomyzidae	<i>Pherbellia cinerella</i>	SH5534	15/07/2019	-	-
Sciomyzidae	<i>Pherbellia griseola</i>	SH556346	15/07/2019	-	m
Stratiomyidae	<i>Chorisops tibialis</i>	SH568333	06/07/2018	-	-
Stratiomyidae	<i>Nemotelus notatus</i>	SH5534	15/07/2019	-	m & f
Stratiomyidae	<i>Nemotelus notatus</i>	SH556346	15/07/2019	1	f
Stratiomyidae	<i>Nemotelus uliginosus</i>	SH556346	15/07/2019	1	f
Syrphidae	<i>Cheilosia bergenstammi</i>	SH5633	09/05/2018	numbers	m & f
Syrphidae	<i>Eristalis intricarius</i>	SH5633	09/05/2018	-	-
Syrphidae	<i>Eristalis nemorum</i>	SH5633	09/05/2018	-	-
Syrphidae	<i>Eristalis nemorum</i>	SH5633	25/08/2019	-	-
Syrphidae	<i>Eristalis pertinax</i>	SH5633	09/05/2018	-	-
Syrphidae	<i>Eristalis tenax</i>	SH5633	09/05/2018	-	-
Syrphidae	<i>Eumerus sabulonum</i>	SH568329	09/06/2019	2	-
Syrphidae	<i>Helophilus pendulus</i>	SH5633	09/05/2018	-	-
Syrphidae	<i>Melanostoma mellinum</i>	SH5633	09/05/2018	-	m & f
Syrphidae	<i>Melanostoma mellinum</i>	SH5534	15/07/2019	-	-
Syrphidae	<i>Platycheirus albimanus</i>	SH5534	15/07/2019	-	-
Syrphidae	<i>Platycheirus manicatus</i>	SH5633	09/05/2018	1	m & f
Syrphidae	<i>Platycheirus manicatus</i>	SH5534	15/07/2019	-	-
Syrphidae	<i>Scaeva pyrastris</i>	SH5632	06/07/2018	-	-
Syrphidae	<i>Sphaerophoria scripta</i>	SH5632	06/07/2018	-	m
Syrphidae	<i>Sphaerophoria scripta</i>	SH557346	15/07/2019	-	m
Syrphidae	<i>Sphaerophoria scripta</i>	SH5633	25/08/2019	-	m
Tachinidae	<i>Prosenia siberita</i>	SH5632	06/07/2018	-	-
Tachinidae	<i>Prosenia siberita</i>	SH5633	25/08/2019	-	-
Tachinidae	<i>Siphona geniculata</i>	SH5632	06/07/2018	-	-
Tephritidae	<i>Noeeta pupillata</i>	SH5632	06/07/2018	-	-
Tephritidae	<i>Noeeta pupillata</i>	SH5632	06/07/2018	-	-
Tephritidae	<i>Tephritis vespertina</i>	SH5632	09/06/2019	-	f
Tephritidae	<i>Terellia tussilaginis</i>	SH5632	06/07/2018	-	m
Therevidae	<i>Acrosathe annulata</i>	SH568329	09/06/2019	-	m
Therevidae	<i>Acrosathe annulata</i>	SH568329	09/06/2019	-	m
Therevidae	<i>Acrosathe annulata</i>	SH5633	25/08/2019	-	m
Therevidae	<i>Dialineura anilis</i>	SH570320	09/06/2019	-	m & f
Therevidae	<i>Thereva bipunctata</i>	SH568329	09/06/2019	-	f
Therevidae	<i>Thereva bipunctata</i>	SH5732	09/06/2019	-	m
Therevidae	<i>Thereva nobilitata</i>	SH5633	06/07/2018	-	-
Therevidae	<i>Thereva nobilitata</i>	SH568333	06/07/2018	-	-
Tipulidae	<i>Nephrotoma scurra</i>	SH5633	25/08/2019	-	f
Trioxoscelidae	<i>Trioxoscelis obscurella</i>	SH5632	06/07/2018	-	-
Trioxoscelidae	<i>Trioxoscelis obscurella</i>	SH568333	06/07/2018	-	-
Trioxoscelidae	<i>Trioxoscelis obscurella</i>	SH569317	09/06/2019	-	-
Trioxoscelidae	<i>Trioxoscelis obscurella</i>	SH5732	09/06/2019	-	-
Ulidiidae	<i>Tetanops myopinus</i>	SH572317	09/06/2019	-	m & f

Family	Species	Grid Ref	Date	Abundance	Sex
Ulidiidae	<i>Tetanops myopinus</i>	SH572317	09/06/2019	-	m & f
Aderidae	<i>Notoxus monocerus</i>	SH568333	06/07/2018	-	-
Heteroptera	<i>Dicranocephalus agilis</i>	SH568329	09/06/2019	-	-
Heteroptera	<i>Gampsocoris punctipes</i>	SH569317	09/06/2019	-	-
Heteroptera	<i>Neides tipularius</i>	SH569317	09/06/2019	-	-

10. Data Archive Appendix

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] Species records, which are held on the NRW Recorder 6 database.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <http://libcat.naturalresources.wales> or <http://catllyfr.cyfoethnaturiol.cymru> by searching 'Dataset Titles'. The metadata is held as record no 124635.