

**Plot 3A, Wrexham Industrial Estate**

**An Invertebrate Assessment**

**A report for:  
UES**

**29<sup>th</sup> September 2022**

**By:  
Conops Entomology Ltd**

**Report Number: 19.22**





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# 1 Introduction

- 1.1 Conops Entomology Ltd was engaged by UES, to undertake an invertebrate assessment of Plot 3A, Wrexham Industrial Estate.
- 1.2 The scope of this survey is to undertake an invertebrate assessment of Plot 3A (referred to hereafter as ‘the site’) prior to proposed development works at the site that may partially impact the habitats and/or features of value to invertebrates. The assessment appraised the key habitats and/or features of the site through the recording of invertebrates. The data is used to assess the value to invertebrates of those habitats or features in order to evaluate the site for its importance as an invertebrate resource. From the collection of data and subsequent assessment and valuation, suitable recommendations could then be put forward in the event that some or all of those features or key habitats may be impacted by a proposed development.
- 1.3 The site is located at OS grid reference SJ 39373 50532.
- 1.4 The site is broadly a mosaic of tall perennial flower fields bounded by unmanaged hedgerows and trees. There is also a small area of open mosaic habitats and open waterbodies.

## Methods and timings

- **Sample effort**

- 1.5 The methods used for the assessment are those recommended in the Natural England guidance document *Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation* (Drake *et al.*, 2007). In some instances, a bespoke method has been created for the site assessment but still retains the overall approach to assessing features and habitats for conservation assessment. The bespoke methods relate to the extent of the free-ranging sampling. This prioritized features that showed obvious interest, such as the tufa seepages and short sward and scrub fringe features.

- **Sweep netting**

- 1.6 This method provides the main proportion of the survey element and is the most efficient method for cataloguing a site’s invertebrate resource. Sweep netting involves the use of a long-handled sweep net being swept over vegetation such as stands of emergent vegetation or flowers, or along scrub fringes in order to gather invertebrate material.

- **Spot sampling**

- 1.7 Spot sampling is employed to collect large, conspicuous invertebrates such as bees and wasps from flowering plants, and to supplement the sweep samples. Spot sampling is often the most effective method for recording species from high-fidelity niches.

- **Grubbing**

- 1.8 Fallen deadwood, piles of rotting timber (for deadwood beetles), and short turf (for surface-running beetles) are fingertip-searched for any hiding or crawling invertebrates, principally beetles.

- **Beating**

1.9 Veteran trees and scrub were beaten using a long stick. The dislodged invertebrates were collected on a sheet positioned beneath the branch, and the contents retained.

- **Vacuum sampling**

1.10 Vacuum sampling was undertaken during spring and summer on the open mosaic areas.

- **Pitfall trapping**

1.11 Owing to the area being noted for a great-crested newt population, no pitfall trapping was undertaken at this site.

### **Survey timing**

1.12 The site was visited on five occasions spread throughout the principal flight period of the major groups of invertebrates.

#### *Visit dates*

18 May 2022 – sunny, 18–22°C;

16 June 2022 – sunny, 20–24°C;

11 July 2022 – sunny, 22–30°C;

03 August 2022 – sunny, 21–25°C;

01 September 2022 – sunny, 18–23°C.

## 2 Results summary

2.1 A total of 261 species from the sampled groups were recorded from the survey visits.

2.2 A total of eight species recorded have a national status (see Table 2), though it is recognized by many of the national recording schemes that a number of these no longer warrant their current status and that they may need revising. This total does not include research-only moths.

2.3 The full list of species recorded for the site is provided in Appendix II.

**Table 1 Species breakdown**

| Site | Total no. of species recorded | Total no. of species of importance* | Species of importance (%) |
|------|-------------------------------|-------------------------------------|---------------------------|
| Site | 261                           | 8*                                  | 3.01                      |

\*Some species do not warrant nationally significant status.

**Table 2 Species of importance**

| Scientific name                  | Vernacular name         | National/local status            | Habitat preferences and species notes                                                                                                                                                                                                                                               |
|----------------------------------|-------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Agelastica alni</i>           | alder leaf beetle       | Data Deficient; Nationally Rare* | Foliage feeder on alders ( <i>Alnus</i> spp.). Owing to a significant range expansion, it now no longer warrants a nationally significant status.                                                                                                                                   |
| <i>Coenonympha pamphilus</i>     | Small heath butterfly   | Section 42; Vulnerable           | Prefers structurally varied grass swards with fine-leaved grasses such as bents ( <i>Agrostis</i> spp.) and fescues ( <i>Festuca</i> spp.).                                                                                                                                         |
| <i>Crossocerus distinguendus</i> | A solitary wasp         | Notable a                        | Associated with structurally complex mosaics including brownfield sites.                                                                                                                                                                                                            |
| <i>Erynnis tages</i>             | Dingy skipper           | Section 42                       | Larvae feed on prostrate bird's-foot trefoil when small and potentially taller stands when older. The species appears to require a mosaic of features and habitats from patchy bare ground through to tall swards.                                                                  |
| <i>Hippodamia variegata</i>      | Adonis ladybird         | Notable b*                       | Open mosaics, parched grasslands.                                                                                                                                                                                                                                                   |
| <i>Libellula fulva</i>           | Scarce chaser dragonfly | Near Threatened                  | Slow meandering rivers and large dykes and rhynes. Requires good-quality water and abundant submerged and floating vegetation. Although still a scarcity, the species is spreading and may not be as scarce as its current status suggests. Not thought to be breeding on the site. |
| <i>Merzomyia westermanni</i>     | A fruit fly             | Notable*; Notable                | Associated exclusively with ragworts.                                                                                                                                                                                                                                               |

| Scientific name      | Vernacular name  | National/local status     | Habitat preferences and species notes                                                                                                                                                                                         |
|----------------------|------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pyrgus malvae</i> | Grizzled skipper | Section 42;<br>Vulnerable | Larvae feed on the prostrate-growing forms of a range of Rosaceae plants including creeping cinquefoil ( <i>Potentilla reptans</i> ), agrimony ( <i>Agrimonia eupatoria</i> ), and wild strawberry ( <i>Fragaria vesca</i> ). |

\*Accepted as being more common than this status suggests; likely to be downgraded.

## Results analysis

- 2.4 Tables 3 and 4 have been generated using the Pantheon software package. Pantheon is an analytical tool developed by Natural England and the Centre for Ecology & Hydrology (CEH) to assist invertebrate nature conservation in England. Site data in the form of species lists can be imported into Pantheon, which then analyses the species within the lists, assigning them to habitats and resources. Pantheon also consigns the most up-to-date national status to the species where it is available.
- 2.5 Pantheon is also capable of other outputs such as Specific Assemblage Types (SATs) (see Table 4).
- 2.6 A SAT is characterized by stenotopic species (those that can withstand only a narrow range of environmental conditions). SATs are therefore more tightly defined than ‘habitats’ or ‘resources’ and sit within a parent habitat or Broad Assemblage Type (BAT). More than one SAT can sit within a parent BAT.

Example:

BAT: F2 – grassland and scrub matrix

SAT: F211 – herb-rich dense sward

F212 – dense scrub

- 2.7 The information obtained from Pantheon can then be used to assign quality to sites and their features, assist in management decisions, and facilitate requirement for further surveys, where required and appropriate.
- 2.8 Pantheon was first made publicly accessible in April 2018 and is the primary analytical tool used by entomologists in site evaluation. It is also the tool recognized and preferred by Natural England. For more information on this new resource, see <http://www.brc.ac.uk/pantheon/>.
- 2.9 Not all species of importance are expressed in the following tables, as they do not form part of the Pantheon analysis and/or their specific requirements are not yet fully understood.

**Table 3 Site resource-usage table (taken from Webb et al., 2017)**

| Broad biotope | Habitat                   | No. of species | Species with conservation status (excluding research-only moths) | Conservation status                                                                                                                                          |
|---------------|---------------------------|----------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| open habitats | tall sward & scrub        | 117            | 3                                                                | <i>Hippodamia variegata</i> (Nb*);<br><i>Merzomyia westermanni</i> (N*; N);<br><i>Erynnis tages</i> (S42)                                                    |
| open habitats | short sward & bare ground | 29             | 4                                                                | <i>Merzomyia westermanni</i> (N*; N);<br><i>Crossocerus distinguendus</i> (Na);<br><i>Pyrgus malvae</i> (S42; VU);<br><i>Coenonympha pamphilus</i> (S42; VU) |
| wetland       | acid & sedge peats        | 29             | –                                                                | –                                                                                                                                                            |
| wetland       | marshland                 | 26             | –                                                                | –                                                                                                                                                            |

| Broad biotope   | Habitat               | No. of species | Species with conservation status (excluding research-only moths) | Conservation status              |
|-----------------|-----------------------|----------------|------------------------------------------------------------------|----------------------------------|
| tree-associated | arboreal              | 25             | 1                                                                | <i>Agelastica alni</i> (DD; NR*) |
| tree-associated | shaded woodland floor | 19             | –                                                                | –                                |
| tree-associated | decaying wood         | 13             | –                                                                | –                                |
| wetland         | running water         | 7              | 1                                                                | <i>Libellula fulva</i> (NT)      |
| wetland         | wet woodland          | 7              | –                                                                | –                                |
| tree-associated | wet woodland          | 7              | –                                                                | –                                |
| wetland         | lake                  | 1              | –                                                                | –                                |

\*Accepted as being more common than this status suggests; likely to be downgraded.

**Table 4 Site SAT table (taken from Webb et al., 2017)**

| Broad biotope   | SAT                  | SAT code | No. of species | No. of species with conservation status (excluding research-only moths) | Conservation status                     | Reported condition                     |
|-----------------|----------------------|----------|----------------|-------------------------------------------------------------------------|-----------------------------------------|----------------------------------------|
| open habitats   | rich flower resource | F002     | 19             | 1                                                                       | –                                       | Favourable (19 species, 15 required)   |
| open habitats   | scrub edge           | F001     | 12             | 1                                                                       | <i>Crossocerus distinguendus</i> (Na)   | Favourable (12 species, 11 required)   |
| tree-associated | bark & sapwood decay | A212     | 10             | –                                                                       | –                                       | Unfavourable (10 species, 19 required) |
| open habitats   | bare sand & chalk    | F111     | 2              | –                                                                       | –                                       | Unfavourable (2 species, 19 required)  |
| open habitats   | open short sward     | F112     | 2              | 1                                                                       | <i>Coenonympha pamphilus</i> (S42; VU); | Unfavourable (2 species, 13 required)  |
| tree-associated | heartwood decay      | A211     | 1              | –                                                                       | –                                       | Unfavourable (1 species, 6 required)   |
| wetland         | slow-flowing rivers  | W125     | 1              | 1                                                                       | <i>Libellula fulva</i> (NT)             | Unfavourable (1 species, 4 required)   |

### 3 Discussion

#### Caveats

- 3.1 2022 experienced significantly dry weather for a protracted period of time. Little to no rain for many months, coupled with extreme heat events, has anecdotally (personal communication with a number of other invertebrate ecologists) significantly negatively impacted invertebrate abundance across much of England and Wales. As a consequence, detection of species, particularly those that are elusive, specific to niche features or scarce has been difficult.
- 3.2 Results therefore have been on average lower than expected, and species lists dominated by common species. It is still possible to reflect fairly the value of a site though through the analysis and discussion, and by using the experience of the invertebrate ecologist.

#### Habitats

- 3.3 The site is represented by a range of habitats broadly covering three broad biotopes: ‘open habitats’, ‘tree-associated’, and ‘wetland’. However, it is the open terrestrial biotope that dominates the site in terms of species associations and physical extent of each habitat. This is supported by the other biotopes, both the tree-associated and wetland.
- 3.4 The habitats that are the most prominent across all areas of the compartment are the tall sward and scrub, with a total of 117 species of association recorded. The resource is dominated by beetles, true bugs such as shieldbugs and grassbugs, and also flies. These are complemented by bees, wasps, and butterflies. Three species are noted by Pantheon as being of particular value to the habitat.
- 3.5 The second most speciose habitats on the site are the short sward and bare-ground habitat and the acid and sedge peats, both with 29 species of association.
- 3.6 The short sward and bare-ground habitat is restricted to the south of the site on post-industrial ground. Despite the overall limited area of habitat, it holds species of significance. There are five species in total, dependent on the open and patchy bare-ground habitat including the NERC Act Section 42 dingy skipper and grizzled skipper butterflies.
- 3.7 The tree-associated element of the site is relatively poorly developed, though there are no significant woodlands on the site, only boundary features, so this list is thought to be typical of predominantly open habit mosaic sites. However, the wooded boundaries and edges do provide an important interface with open habitats and are especially important to scrub edge species and solitary wasps that forage along these vertical interfaces. The interface between woodland/scrub and the open flowery sward areas is of particular interest.
- 3.8 The site includes a suite of wetland species including dragonflies and flies. The waterbodies did not form part of this assessment (only terrestrial habitats were sampled), and therefore the species list for the wetland biotope is limited to incidental records of adult-stage specimens such as snail-killing flies and dragonflies.

## SATs

- 3.9 There are two assemblages highlighted by the analysis as being in a 'favourable condition': the rich flower resource (F002) and scrub edge (F001).
- 3.10 The rich flower resource is an extensive and wide-ranging resource that encompasses all flowering plants at the site. The dominant flora are trefoils, especially common bird's-foot trefoil, but also umbellifers, yellow composites, and Asteraceae such as knapweeds (*Centaurea* spp.) and the important late summer flowering species, common fleabane (*Pulicaria dysenterica*).
- 3.11 The scrub fringe (F001) is present across the site in a range of juxtapositions that enable a wide range of species to utilize the feature. In particular, the interface between scrub fringe and tall perennial swards is beneficial for a wide range of flies, while the close proximity of scrub to the open mosaic areas along the southern side of the site benefits predatory solitary wasps and spring flying solitary bees.
- 3.12 Although the bark and sapwood decay SAT (A212) does not reach a favourable condition, it does hold 10 species of close association (threshold = 19) and is thought to be in good condition and of moderate value to the site.
- 3.13 The bare sand and chalk SAT (F111) is not well represented in the analysis, with only two species of association recorded. This is a particularly difficult SAT to reach favourable status, and at this site, although there is bare ground present, much of it is of a gravelly material and does not benefit many of the species of association such as sand-nesting bees and wasps. This is the same for the open short swards (F112) as it is partly reliant on a well-functioning bare sand and chalk for it to also prosper. The SAT though does possess one key species of association, the small heath butterfly (S41; Vulnerable).
- 3.14 There are other SATs noted by Pantheon, though these are presented by single species of association and are not thought to be intrinsic to the site but do indicate the range and variety of niches present.

## Species

- 3.15 The survey of the site recorded 261 species and eight species identified by Pantheon as being of value; a number of species are more common now than their status suggests, so in time this number would be revised downwards as further status reviews are completed.
- 3.16 The lists contain a range of species, reflective of the habitats present on the site. The dominant species on the lists are flowery grassland/short turf species and those dependent upon them for nectar and pollen, and also nesting.
- 3.17 The site also includes a range of species synonymous with tree-associated habitats, in particular woodland edge and scrub fringes, of which there is a strong suite of species, as highlighted by the SAT analysis.
- 3.18 The species lists include a number of localized and increasingly scarce species, especially butterflies.
- 3.19 A suite of butterfly species that are dependent upon open short and sparse swards are present on the site. The dingy skipper, grizzled skipper, and small heath are NERC Act Section 42 species and in decline, with the dingy skipper having declined by 61%<sup>1</sup>, grizzled skipper by 51%<sup>2</sup>, and small heath by 57%<sup>3</sup> since the 1970s (source: Butterfly Conservation). Populations do not appear to be significantly high, but particularly with regard to the two skippers, they are highly mobile and possibly form part of a wider landscape scale metapopulation across the Industrial Estate.
- 3.20 More broadly, as the site has an extensive flowery component, there is a corresponding rich pollinator resource. This resource is reliant on the extensive and diverse flowering plant component ranging from spring blossom through to late flowering grassland species such as knapweeds (*Centaurea* spp.) and yarrow (*Achillea millefolium*). A total of 19 rich flower resource species are noted during these surveys that are intrinsically linked to particular flowers or abundant flowering resources.

## Site assessment summary

- 3.21 The site has a total of 261 species recorded, including eight species of importance. This constitutes 3.01% of the total species recorded.
- 3.22 The overall number of species recorded is not particularly high, but it does reflect well the habitats and species present on the site. The scarce species percentage is also not high but does include three key species to the local area, the three S42 butterflies.
- 3.23 Despite there not being any slow-moving rivers on the site, there was also the Near Threatened scarce chaser dragonfly (*Libellula fulva*) recorded. Although it is not intrinsic to the site, its presence does indicate the value of these large invertebrate abundant grassland areas to predatory species.

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<sup>1</sup> Butterfly Conservation (2022). <https://butterfly-conservation.org/butterflies/dingy-skipper> [Accessed on 22 September 2022].

<sup>2</sup> Butterfly Conservation (2022). <https://butterfly-conservation.org/butterflies/grizzled-skipper> [Accessed on 22 September 2022].

<sup>3</sup> Butterfly Conservation (2022). <https://butterfly-conservation.org/butterflies/small-heath> [Accessed on 22 September 2022].

- 3.24 Although there is no single species or species group of greatest value to the site, the populations of scarce and declining butterflies are of particular note, as they are demanding species requiring significant compensation to allow them to persist on the site. Coupled with these, there are other specialized and demanding groups such as the bees and wasps, both the ground-nesting and also aerial (deadwood)-nesting assemblages that will require optimal and complex habitat mosaics in order to survive on the site alongside a proposed development.

### Site evaluation

- 3.25 The site comprises, or is thought to comprise (see caveats section), a moderately rich invertebrate fauna that includes a number of localized and specialized species.
- 3.26 The valuation of the site takes into consideration the range of species recorded, including the scarce species, the overall assemblages, and the importance of the habitats to the species. It also considers the context of the year's weather, the site and/or its species in relation to the local area and further afield.
- 3.27 From considering the above summary information and data collected from the surveys, it is suggested that any impact on the site's key features and species should be considered to be of at least **District (low) importance**.
- 3.28 The site is considered to be of District (low) importance and not one of a higher status, owing to the site not holding significant populations of NERC Act Section 42 species or other species with a nationally significant status. The site also does not hold, or is not thought to hold, a high diversity of species.
- 3.29 However, it should be noted that this site's invertebrate resources are likely to support other populations across a wider resource of small sites on and around the Industrial Estate that includes scarce and increasingly threatened invertebrates such as the 'brownfield' butterflies and solitary bees and wasps.

## 4 Recommendations

### Important note

- 4.1 The priority should always be to retain key areas of habitat *in situ*.
- 4.2 Where this cannot be done, a further replicant habitat should be created. This should be of high quality and managed to retain its desirable character.
- 4.3 All invertebrate-related mitigation should be undertaken on **low-fertility soils**.
- 4.4 As the site and its key species are associated with a range of features, a complex mosaic of features is ideally required to support the invertebrates that currently use the site.
- 4.5 The success of any mitigation for loss of part or all of the site's key features will be dependent on incorporating key features in juxtaposition with one another and creating features that are **abundant, extensive, and optimal**.

### Short turf and bare ground

- 4.6 The presence of an open, flowery sward with patches of bare ground is an important feature.
- 4.7 To be successful, the mosaic should be exposed to full sun for much of the day, including the key period between 10:00 and 16:00 h, and be created on nutrient-poor subsoils to promote a patchy sward dominated by flowering plants.
- 4.8 Bare ground should comprise approximately 30% of the overall habitat mosaic.
- 4.9 A mosaic of fine-leaved grasses and a range of flowering plants are required to fulfil the requirements of the open flowery mosaics. It is likely that a 'one stop' commercially sourced seed mixture may not be suitable, but a bespoke mix will be required.
- 4.10 The bare-ground element should be topographically varied to include horizontal planes and also near-vertical exposures or banks. These exposures can be low (as little as 20 cm) to over 1 m in height in the form of butterfly banks.

The following plant species should be included as part of the short turf sward:

- common bird's-foot trefoil (*Lotus corniculatus*);
- hawkbits (*Leontodon* spp.);
- Prostrate-growing Rosaceae such as creeping cinquefoil (*Potentilla reptans*);
- other yellow Asteraceae;
- other trefoils (Fabaceae);
- other vetches (*Vicia* spp.);
- red clover (*Trifolium pratense*).

### Flowering swards

- 4.11 As the site is noted for its rich flower resource, it will be important to provide as rich a flowering resource as possible for the site's invertebrates. Flowering areas should be sown/planted with an appropriate mix of flowering plants. This mix should benefit the pollen- and nectar-foraging invertebrates and therefore include the following:
- common bird's-foot trefoil (*Lotus corniculatus*);
  - common knapweed (*Centaurea nigra*);
  - bush vetch (*Vicia cracca*);
  - hawkbits (*Leontodon* spp.);
  - hawkweeds (*Hieracium* spp.);
  - labiates (Lamiaceae);
  - ragwort (*Jacobaea vulgaris*);
  - meadow vetchling (*Lathyrus pratensis*);

- other trefoils (*Fabaceae*);
- other vetches (*Vicia* spp.);
- common fleabane (*Pulicaria dysenterica*);
- ox-eye daisy (*Leucanthemum vulgare*);
- yellow rattle (*Rhinanthus minor*);
- red clover (*Trifolium pratense*); and
- woundworts (*Stachys* spp.).

4.12 The flowering swards should have a very high density of flowers. Most standard mixes do not have a high enough proportion of flowering plants that are suitable for invertebrate mitigation, so a bespoke mix or additional ordering of supplementary flower seed or plugs is advised. On-site resources can also be used.

### Scrub fringe

- 4.13 Scrub is an important interface with open flowery habitats and short turf/bare ground.
- 4.14 Scrub, or specifically spring blossom, is also an integral part of a healthy and functioning invertebrate site. It is a key provider of pollen and nectar in spring from March to late June before the grassland flowers dominate.
- 4.15 Scrub, or any trees, should not shade out important areas of flowery areas or bare ground/short turf. Where scrub is needed to produce an interface, it should be positioned on the northern side of the mosaic.
- 4.16 Where additional scrub planting is required, only use native species. The following species provide a continuity of flowers from early spring to summer:

- apples (*Malus domestica* agg.);
- blackthorn (*Prunus spinosa*);
- cherry plum (*Prunus cerasifera*);
- field maple (*Acer campestre*);
- hawthorn (*Crataegus monogyna*);
- plums (*Prunus domestica* agg.);
- gorse (*Ulex europeaus*);
- rowan (*Sorbus aucuparia*); and
- willows (*Salix* spp.).

### Juxtapositions

- 4.17 As noted in the report, the site's value is in part due to the interfaces between key habitat types, in particular: scrub fringe against short turf and patchy bare ground, scrub fringe as part of a calcareous grassland matrix, and tall grassland against short turf and/or patchy bare ground. Therefore, it is important to ensure through the mitigation a range of juxtapositions that species can exploit, whether for nesting, shelter, hibernation, or hunting. This is best achieved through creation or retention of large units of habitat mosaics, and using a variety of native plant species.

### Mature oak trees

- 4.18 There is a developing deadwood resource on the site that will become richer as the oak trees age and begin to become over-mature to veteran. It is therefore recommended that all mature oak trees and woodland edges be retained to benefit the resource of deadwood species.

## 5 Appendix

*Appendix I: Red Data Book definitions*

*Appendix II: Survey results*

## *Appendix I: Red Data Book definitions*

### **Red Data Book category 1 (RDB 1) – Endangered**

Species that are known or believed to occur as only a single population within one 10-km square of the National Grid.

### **Red Data Book category 2 (RDB 2) – Vulnerable**

Species declining throughout their range or in vulnerable habitats.

### **Red Data Book category 3 (RDB 3) – Rare**

Species that are estimated to exist in only 15 or fewer post-1970 10-km squares. This criterion may be relaxed where populations are likely to exist in over 15 10-km squares but occupy small areas of especially vulnerable habitat.

### **Nationally Notable (Scarce) category A (NS A) – Notable A**

Taxa that do not fall within the RDB category but that are nonetheless uncommon in Great Britain and thought to occur in 30 or fewer 10-km squares of the National Grid or, for less well-recorded groups, between eight and 20 vice counties.

### **Nationally Notable (Scarce) category B (NS B) – Notable B**

Taxa that do not fall within the RDB category but that are nonetheless uncommon in Great Britain and thought to occur in 31–100 10-km squares of the National Grid or, for less well-recorded groups, between eight and 20 vice counties.

### **Nationally Notable (Scarce) (N) – Notable**

Species that are estimated to occur within the range of 16–100 10-km squares. The subdividing of this category into Notable A and Notable B has not been attempted for many species in this part of the review.

## **IUCN categories**

### **EXTINCT (EX)**

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range, have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

### **CRITICALLY ENDANGERED (CR)**

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

### **ENDANGERED (EN)**

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

### **VULNERABLE (VU)**

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

### **NEAR THREATENED (NT)**

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

### **LEAST CONCERN (LC)**

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable, or Near Threatened. Widespread and abundant taxa are included in this category.

### **DATA DEFICIENT**

A taxon is Data Deficient (DD) when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this

category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. DD is therefore not a category of threat.

### **GB Rarity Status categories and criteria**

Broadly speaking, the Nationally Rare category is equivalent to the Red Data Book, namely: Endangered (RDB1), Vulnerable (RDB2), Rare (RDB3), Insufficiently Known (RDBK), and Extinct, which will not be used in this report.

The Nationally Scarce category is directly equivalent to the combined Nationally Notable A (Na) and Nationally Notable B (Nb) categories used in the assessment of various taxonomic groups, e.g. by Hyman and Parsons (1992) in assessing the status of beetles, but never used in a published format to assess these three families.

Nationally Rare Native species recorded from 15 or fewer hectads of the Ordnance Survey National Grid in Great Britain since 31 December 1989 and where there is reasonable confidence that exhaustive recording would not find them in more than 15 hectads. This category includes species that are probably extinct.

Nationally Scarce Native species that are not regarded as Nationally Rare AND have not been recorded from more than 100 hectads of the Ordnance Survey National Grid in Great Britain since 31 December 1989 and where there is reasonable confidence that exhaustive recording would not find them in more than 100 hectads.

England NERC S.41 Biodiversity Lists – England England NERC S.41 Species ‘of principal importance for the purpose of conserving biodiversity’ covered under section 41 (England) of the NERC Act (2006) and therefore need to be taken into consideration by a public body when performing any of its functions with a view to conserving biodiversity. 2008 Natural Environment and Rural Communities Act 2006 – Species of Principal Importance in England (section 41) and Wales (section 42).

## Appendix II: Survey results

Only species with a national status have been annotated. All others are common or local species.

| Scientific name                           | Taxonomic group | National status                  |
|-------------------------------------------|-----------------|----------------------------------|
| <i>Acanthosoma haemorrhoidale</i>         | Hemiptera       |                                  |
| <i>Acetropis (Acetropis) gimmerthalii</i> | Hemiptera       |                                  |
| <i>Adalia bipunctata</i>                  | Coleoptera      |                                  |
| <i>Adelphocoris lineolatus</i>            | Hemiptera       |                                  |
| <i>Aeshna cyanea</i>                      | Odonata         |                                  |
| <i>Aeshna grandis</i>                     | Odonata         |                                  |
| <i>Agelastica alni</i>                    | Coleoptera      | Data Deficient; Nationally Rare* |
| <i>Agriotes sputator</i>                  | Coleoptera      |                                  |
| <i>Altica lythri</i>                      | Coleoptera      |                                  |
| <i>Amara aenea</i>                        | Coleoptera      |                                  |
| <i>Anasimyia contracta</i>                | Diptera         |                                  |
| <i>Anasimyia lineata</i>                  | Diptera         |                                  |
| <i>Anaspis frontalis</i>                  | Coleoptera      |                                  |
| <i>Anaspis maculata</i>                   | Coleoptera      |                                  |
| <i>Anax imperator</i>                     | Odonata         |                                  |
| <i>Andrena bicolor</i>                    | Hymenoptera     |                                  |
| <i>Andrena minutula</i>                   | Hymenoptera     |                                  |
| <i>Andrena nitida</i>                     | Hymenoptera     |                                  |
| <i>Anisosticta novemdecimpunctata</i>     | Coleoptera      |                                  |
| <i>Anomoia purmunda</i>                   | Diptera         |                                  |
| <i>Anthidium manicatum</i>                | Hymenoptera     |                                  |
| <i>Anthocoris limbatus</i>                | Hemiptera       |                                  |
| <i>Anthocoris nemorum</i>                 | Hemiptera       |                                  |
| <i>Aphantopus hyperantus</i>              | Lepidoptera     |                                  |
| <i>Apolygus lucorum</i>                   | Hemiptera       |                                  |
| <i>Argyra leucocephala</i>                | Diptera         |                                  |
| <i>Bembecia ichneumoniformis</i>          | Lepidoptera     |                                  |
| <i>Bembidion dentellum</i>                | Coleoptera      |                                  |
| <i>Bembidion lunulatum</i>                | Coleoptera      |                                  |
| <i>Beris chalybata</i>                    | Diptera         |                                  |
| <i>Beris vallata</i>                      | Diptera         |                                  |
| <i>Bibio marci</i>                        | Diptera         |                                  |
| <i>Bombus hypnorum</i>                    | Hymenoptera     |                                  |
| <i>Bombus lapidarius</i>                  | Hymenoptera     |                                  |
| <i>Bombus pascuorum</i>                   | Hymenoptera     |                                  |
| <i>Brachypterus urticae</i>               | Coleoptera      |                                  |
| <i>Calliopum aeneum</i>                   | Diptera         |                                  |
| <i>Cantharis decipiens</i>                | Coleoptera      |                                  |
| <i>Cantharis lateralis</i>                | Coleoptera      |                                  |

| Scientific name                              | Taxonomic group | National status                            |
|----------------------------------------------|-----------------|--------------------------------------------|
| <i>Cantharis nigricans</i>                   | Coleoptera      |                                            |
| <i>Cantharis rufa</i>                        | Coleoptera      |                                            |
| <i>Capsus ater</i>                           | Hemiptera       |                                            |
| <i>Cercopis vulnerata</i>                    | Hemiptera       |                                            |
| <i>Chaetostomella cylindrica</i>             | Diptera         |                                            |
| <i>Chamaepsila rosae preocc.</i>             | Diptera         |                                            |
| <i>Cheilosia albitarsis</i>                  | Diptera         |                                            |
| <i>Cheilosia latifrons</i>                   | Diptera         |                                            |
| <i>Chloromyia formosa</i>                    | Diptera         |                                            |
| <i>Chorisops tibialis</i>                    | Diptera         |                                            |
| <i>Chorthippus brunneus</i>                  | Orthoptera      |                                            |
| <i>Chorthippus parallelus</i>                | Orthoptera      |                                            |
| <i>Chrysopilus cristatus</i>                 | Diptera         |                                            |
| <i>Closterotomus norwegicus</i>              | Hemiptera       |                                            |
| <i>Coccinella septempunctata</i>             | Coleoptera      |                                            |
| <i>Coenagrion puella</i>                     | Odonata         |                                            |
| <i>Coenonympha pamphilus</i>                 | Lepidoptera     | Section 42 Priority Species;<br>Vulnerable |
| <i>Conocephalus fuscus</i>                   | Orthoptera      |                                            |
| <i>Cordilura albipes</i>                     | Diptera         |                                            |
| <i>Coremacera marginata</i>                  | Diptera         |                                            |
| <i>Coreus marginatus</i>                     | Hemiptera       |                                            |
| <i>Corizus hyoscyami</i>                     | Hemiptera       |                                            |
| <i>Crepidodera aurata</i>                    | Coleoptera      |                                            |
| <i>Crepidodera fulvicornis</i>               | Coleoptera      |                                            |
| <i>Crossocerus distinguendus</i>             | Hymenoptera     | Notable a                                  |
| <i>Crossocerus megacephalus</i>              | Hymenoptera     |                                            |
| <i>Crossocerus podagricus</i>                | Hymenoptera     |                                            |
| <i>Cryptocephalus pusillus</i>               | Coleoptera      |                                            |
| <i>Curculio glandium</i>                     | Coleoptera      |                                            |
| <i>Dasysyrphus albostriatus</i>              | Diptera         |                                            |
| <i>Dasytes aeratus</i>                       | Coleoptera      |                                            |
| <i>Demetrius atricapillus</i>                | Coleoptera      |                                            |
| <i>Deraeocoris (Knightocapsus) lutescens</i> | Hemiptera       |                                            |
| <i>Dicyphus (Dicyphus) epilobii</i>          | Hemiptera       |                                            |
| <i>Dilophus febrilis</i>                     | Diptera         |                                            |
| <i>Discomyza incurva</i>                     | Diptera         |                                            |
| <i>Dolichopus festinus</i>                   | Diptera         |                                            |
| <i>Dolichopus griseipennis</i>               | Diptera         |                                            |
| <i>Dolichopus plumipes</i>                   | Diptera         |                                            |
| <i>Dolichopus wahlbergi</i>                  | Diptera         |                                            |
| <i>Dolycoris baccarum</i>                    | Hemiptera       |                                            |

| Scientific name                                             | Taxonomic group | National status             |
|-------------------------------------------------------------|-----------------|-----------------------------|
| <i>Dryophilocoris (Dryophilocoris) flavoquadrimaculatus</i> | Hemiptera       |                             |
| <i>Ectemnius continuus</i>                                  | Hymenoptera     |                             |
| <i>Ectemnius rubicola</i>                                   | Hymenoptera     |                             |
| <i>Elasmostethus interstinctus</i>                          | Hemiptera       |                             |
| <i>Empis grisea</i>                                         | Diptera         |                             |
| <i>Empis livida</i>                                         | Diptera         |                             |
| <i>Empis picipes</i>                                        | Diptera         |                             |
| <i>Empis tessellata</i>                                     | Diptera         |                             |
| <i>Epistrophe eligans</i>                                   | Diptera         |                             |
| <i>Episyrphus balteatus</i>                                 | Diptera         |                             |
| <i>Eriothrix rufomaculata</i>                               | Diptera         |                             |
| <i>Eristalinus sepulchralis</i>                             | Diptera         |                             |
| <i>Eristalis arbustorum</i>                                 | Diptera         |                             |
| <i>Eristalis intricarius</i>                                | Diptera         |                             |
| <i>Eristalis nemorum</i>                                    | Diptera         |                             |
| <i>Erynnis tages</i>                                        | Lepidoptera     | Section 42 Priority Species |
| <i>Euclidia glyphica</i>                                    | Lepidoptera     |                             |
| <i>Euclidia mi</i>                                          | Lepidoptera     |                             |
| <i>Eupeodes latifasciatus</i>                               | Diptera         |                             |
| <i>Eupeodes luniger</i>                                     | Diptera         |                             |
| <i>Euproctis similis</i>                                    | Lepidoptera     |                             |
| <i>Euthrix potatoria</i>                                    | Lepidoptera     |                             |
| <i>Eutrichapion ervi</i>                                    | Coleoptera      |                             |
| <i>Eysarcoris venustissimus</i>                             | Hemiptera       |                             |
| <i>Favonius quercus</i>                                     | Lepidoptera     |                             |
| <i>Forficula auricularia</i>                                | Dermaptera      |                             |
| <i>Grammoptera ruficornis</i>                               | Coleoptera      |                             |
| <i>Graphomya maculata</i>                                   | Diptera         |                             |
| <i>Grypocoris (Lophyromiris) stysi</i>                      | Hemiptera       |                             |
| <i>Gymnomerus laevipes</i>                                  | Hymenoptera     |                             |
| <i>Haematopota pluvialis</i>                                | Diptera         |                             |
| <i>Halictus tumulorum</i>                                   | Hymenoptera     |                             |
| <i>Helius longirostris</i>                                  | Diptera         |                             |
| <i>Helophilus pendulus</i>                                  | Diptera         |                             |
| <i>Herina lugubris</i>                                      | Diptera         |                             |
| <i>Herina nigrina</i>                                       | Diptera         |                             |
| <i>Heterogaster urticae</i>                                 | Hemiptera       |                             |
| <i>Hilara discoidalis</i>                                   | Diptera         |                             |
| <i>Himacerus (Himacerus) apterus</i>                        | Hemiptera       |                             |
| <i>Hippodamia variegata</i>                                 | Coleoptera      | Notable b*                  |
| <i>Hoplitis claviventris</i>                                | Hymenoptera     |                             |
| <i>Hylaeus brevicornis</i>                                  | Hymenoptera     |                             |

| Scientific name                         | Taxonomic group | National status   |
|-----------------------------------------|-----------------|-------------------|
| <i>Hylaeus communis</i>                 | Hymenoptera     |                   |
| <i>Hylaeus hyalinatus</i>               | Hymenoptera     |                   |
| <i>Iassus lanio</i>                     | Hemiptera       |                   |
| <i>Ischnopterapion loti</i>             | Coleoptera      |                   |
| <i>Ischnura elegans</i>                 | Odonata         |                   |
| <i>Lasioglossum albipes</i>             | Hymenoptera     |                   |
| <i>Lasioglossum morio</i>               | Hymenoptera     |                   |
| <i>Lejogaster metallina</i>             | Diptera         |                   |
| <i>Leptogaster cylindrica</i>           | Diptera         |                   |
| <i>Leptopterna dolabrata</i>            | Hemiptera       |                   |
| <i>Leucozona lucorum</i>                | Diptera         |                   |
| <i>Libellula fulva</i>                  | Odonata         | Near Threatened   |
| <i>Libellula quadrimaculata</i>         | Odonata         |                   |
| <i>Limnia unguicornis</i>               | Diptera         |                   |
| <i>Liocoris tripustulatus</i>           | Hemiptera       |                   |
| <i>Loxocera aristata</i>                | Diptera         |                   |
| <i>Lycaena phlaeas</i>                  | Lepidoptera     |                   |
| <i>Lygus rugulipennis</i>               | Hemiptera       |                   |
| <i>Malachius bipustulatus</i>           | Coleoptera      |                   |
| <i>Maniola jurtina</i>                  | Lepidoptera     |                   |
| <i>Meconema thalassinum</i>             | Orthoptera      |                   |
| <i>Megachile willughbiella</i>          | Hymenoptera     |                   |
| <i>Melanogaster hirtella</i>            | Diptera         |                   |
| <i>Melanostoma mellinum</i>             | Diptera         |                   |
| <i>Melanostoma scalare</i>              | Diptera         |                   |
| <i>Meligethes aeneus</i>                | Coleoptera      |                   |
| <i>Meligethes atratus</i>               | Coleoptera      |                   |
| <i>Merodon equestris</i>                | Diptera         |                   |
| <i>Merzomyia westermanni</i>            | Diptera         | Notable*; Notable |
| <i>Mesembrina meridiana</i>             | Diptera         |                   |
| <i>Microchrysa flavicornis</i>          | Diptera         |                   |
| <i>Microgaster polita</i>               | Hymenoptera     |                   |
| <i>Minettia fasciata</i>                | Diptera         |                   |
| <i>Minettia longipennis</i>             | Diptera         |                   |
| <i>Minettia tubifer</i>                 | Diptera         |                   |
| <i>Miris striatus</i>                   | Hemiptera       |                   |
| <i>Musca autumnalis</i>                 | Diptera         |                   |
| <i>Nabis (Nabicula) flavomarginatus</i> | Hemiptera       |                   |
| <i>Neoascia meticulosa</i>              | Diptera         |                   |
| <i>Neoascia tenur</i>                   | Diptera         |                   |
| <i>Neocrepidodera transversa</i>        | Coleoptera      |                   |
| <i>Nomada fabriciana</i>                | Hymenoptera     |                   |

| Scientific name                                   | Taxonomic group | National status              |
|---------------------------------------------------|-----------------|------------------------------|
| <i>Nomada flava</i>                               | Hymenoptera     |                              |
| <i>Notiophilus substriatus</i>                    | Coleoptera      |                              |
| <i>Ochlodes sylvanus</i>                          | Lepidoptera     |                              |
| <i>Oedemera lurida</i>                            | Coleoptera      |                              |
| <i>Oedemera nobilis</i>                           | Coleoptera      |                              |
| <i>Oncotylus (Oncotylus) viridiflavus</i>         | Hemiptera       |                              |
| <i>Opomyza florum</i>                             | Diptera         |                              |
| <i>Opomyza germinationis</i>                      | Diptera         |                              |
| <i>Osmia caerulea</i>                             | Hymenoptera     |                              |
| <i>Osmia spinulosa</i>                            | Hymenoptera     |                              |
| <i>Pachygaster leachii</i>                        | Diptera         |                              |
| <i>Palomena prasina</i>                           | Hemiptera       |                              |
| <i>Panorpa communis</i>                           | Mecoptera       |                              |
| <i>Paragus haemorrhous</i>                        | Diptera         |                              |
| <i>Pararge aegeria</i>                            | Lepidoptera     |                              |
| <i>Pentatoma rufipes</i>                          | Hemiptera       |                              |
| <i>Phratora vitellinae</i>                        | Coleoptera      |                              |
| <i>Phylidorea ferruginea</i>                      | Diptera         |                              |
| <i>Physocephala rufipes</i>                       | Diptera         |                              |
| <i>Phytocoris (Ktenocoris) varipes</i>            | Hemiptera       |                              |
| <i>Pieris brassicae</i>                           | Lepidoptera     |                              |
| <i>Pieris napi</i>                                | Lepidoptera     |                              |
| <i>Pieris rapae</i>                               | Lepidoptera     |                              |
| <i>Pipiza fasciata</i>                            | Diptera         |                              |
| <i>Pipizella viduata</i>                          | Diptera         |                              |
| <i>Plagiognathus (Plagiognathus) arbustorum</i>   | Hemiptera       |                              |
| <i>Plagiognathus (Plagiognathus) chrysanthemi</i> | Hemiptera       |                              |
| <i>Plateumaris sericea</i>                        | Coleoptera      |                              |
| <i>Platycheirus albimanus</i>                     | Diptera         |                              |
| <i>Platycheirus aurolateralis</i>                 | Diptera         |                              |
| <i>Platycheirus granditarsus</i>                  | Diptera         |                              |
| <i>Platycheirus podagratus</i>                    | Diptera         |                              |
| <i>Platycheirus rosarum</i>                       | Diptera         |                              |
| <i>Poecilobothrus nobilitatus</i>                 | Diptera         |                              |
| <i>Polydrusus cervinus</i>                        | Coleoptera      |                              |
| <i>Polyommatus icarus</i>                         | Lepidoptera     |                              |
| <i>Propylea quattuordecimpunctata</i>             | Coleoptera      |                              |
| <i>Psallus (Hylopsallus) perrisi</i>              | Hemiptera       |                              |
| <i>Psyllobora vigintiduopunctata</i>              | Coleoptera      |                              |
| <i>Ptilinus pectinicornis</i>                     | Coleoptera      |                              |
| <i>Pyrgus malvae</i>                              | Lepidoptera     | Section 42 Priority Species; |

| Scientific name                        | Taxonomic group | National status |
|----------------------------------------|-----------------|-----------------|
|                                        |                 | Vulnerable      |
| <i>Pyronia tithonus</i>                | Lepidoptera     |                 |
| <i>Pyrrhosoma nymphula</i>             | Odonata         |                 |
| <i>Rhabdomiris striatellus</i>         | Hemiptera       |                 |
| <i>Rhagio scolopaceus</i>              | Diptera         |                 |
| <i>Rhagonycha fulva</i>                | Coleoptera      |                 |
| <i>Rhagonycha lignosa</i>              | Coleoptera      |                 |
| <i>Rhamphomyia crassirostris</i>       | Diptera         |                 |
| <i>Rhingia campestris</i>              | Diptera         |                 |
| <i>Rhopalum coarctatum</i>             | Hymenoptera     |                 |
| <i>Rhyzobius litura</i>                | Coleoptera      |                 |
| <i>Riponnensia splendens</i>           | Diptera         |                 |
| <i>Roeseliana roeselii</i>             | Orthoptera      |                 |
| <i>Scaeva pyrastris</i>                | Diptera         |                 |
| <i>Scathophaga stercoraria</i>         | Diptera         |                 |
| <i>Scirtes hemisphaericus</i>          | Coleoptera      |                 |
| <i>Seioptera vibrans</i>               | Diptera         |                 |
| <i>Sepedon sphegea</i>                 | Diptera         |                 |
| <i>Sicus ferrugineus</i>               | Diptera         |                 |
| <i>Siphona geniculata</i>              | Diptera         |                 |
| <i>Sitona lineatus</i>                 | Coleoptera      |                 |
| <i>Sphaerophoria interrupta</i>        | Diptera         |                 |
| <i>Sphaerophoria scripta</i>           | Diptera         |                 |
| <i>Sphenella marginata</i>             | Diptera         |                 |
| <i>Stenodema (Stenodema) laevigata</i> | Hemiptera       |                 |
| <i>Stenus aceris</i>                   | Coleoptera      |                 |
| <i>Stenus boops</i>                    | Coleoptera      |                 |
| <i>Sympetrum striolatum</i>            | Odonata         |                 |
| <i>Syrpitta pipiens</i>                | Diptera         |                 |
| <i>Syrphus torvus</i>                  | Diptera         |                 |
| <i>Tabanus bromius</i>                 | Diptera         |                 |
| <i>Tachyporus dispar</i>               | Coleoptera      |                 |
| <i>Tachyporus hypnorum</i>             | Coleoptera      |                 |
| <i>Temnostethus gracilis</i>           | Hemiptera       |                 |
| <i>Tephritis formosa</i>               | Diptera         |                 |
| <i>Tephritis leontodontis</i>          | Diptera         |                 |
| <i>Tephritis neesii</i>                | Diptera         |                 |
| <i>Tetanocera elata</i>                | Diptera         |                 |
| <i>Tetanocera ferruginea</i>           | Diptera         |                 |
| <i>Tetanocera hyalipennis</i>          | Diptera         |                 |
| <i>Thymelicus sylvestris</i>           | Lepidoptera     |                 |
| <i>Tipula oleracea</i>                 | Diptera         |                 |

| Scientific name                 | Taxonomic group | National status |
|---------------------------------|-----------------|-----------------|
| <i>Tipula paludosa</i>          | Diptera         |                 |
| <i>Tipula vernalis</i>          | Diptera         |                 |
| <i>Tortrix viridana</i>         | Lepidoptera     |                 |
| <i>Trypoxylon attenuatum</i>    | Hymenoptera     |                 |
| <i>Tyria jacobaeae</i>          | Lepidoptera     |                 |
| <i>Urophora quadrifasciata</i>  | Diptera         |                 |
| <i>Vanessa atalanta</i>         | Lepidoptera     |                 |
| <i>Vanessa cardui</i>           | Lepidoptera     |                 |
| <i>Xanthogramma pedissequum</i> | Diptera         |                 |
| <i>Xantholinus linearis</i>     | Coleoptera      |                 |
| <i>Xylota segnis</i>            | Diptera         |                 |
| <i>Xyphosia miliaria</i>        | Diptera         |                 |
| <i>Zygaena filipendulae</i>     | Lepidoptera     |                 |

\*Widely accepted as being much more common than this status suggests; likely to be downgraded.