West Winch Housing Access Road

Environmental Statement Chapter 8: Biodiversity: Appendix 9: Terrestrial Invertebrate Report (2021)

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Survey Area

1.1.1 The 'Survey Area' covered the entire (previous) Scheme Boundary including proposed access roads and construction compounds which was assessed for its potential to support important terrestrial invertebrate assemblages. Distinct parcels of terrestrial habitat (often geographically separated from each other) identified with potential to support valuable invertebrate assemblages were then subject to targeted survey. The overall Survey Area and targeted survey parcels are shown on Figure 1 (Appendix D) (all maps have been updated with the latest Scheme Boundary (October 2023)).

Invertebrate habitat potential assessment

1.1.2 The Field Survey Area (shown on Figure 1, Appendix D) was assessed for its potential to support important terrestrial invertebrate assemblages by a suitably experienced entomologist, on 29 April 2021. Survey effort was focussed on habitats that were most likely to be directly impacted by the preferred scheme option (e.g., through habitat loss).

1.1.3 An invertebrate habitat potential assessment survey was undertaken with reference to the as yet unpublished Invertebrate Habitat Potential Protocol (Dobson and Fairclough, unpublished). A record was made regarding the habitats present and features considered likely to be of significant value or potentially valuable for notable invertebrate assemblages. Such features can include areas with dense patches of flowering plants (including on roadside verges); south facing banks; patchy mosaic habitat including aggregations of bare ground; margins of scrub/woodland and substrate containing high organic content; mature trees, including standing and fallen dead wood and temporary areas of standing water. (Permanent aquatic habitats (e.g., rivers, ditches and ponds) were not included in this assessment as these are

considered in the aquatic invertebrate report) (e.g., ephemeral pools and seepages) and associated terrestrial habitat (e.g., marshy grassland). To enable a baseline characterisation of the Proposed Scheme for invertebrates, the habitat assessment included observations of features that might limit invertebrate interest, as well as those which might be of value for invertebrates.

1.1.4 The distribution and extent of features of potential value informed the design of targeted terrestrial invertebrate surveys that were subsequently conducted at the Proposed Scheme.

Targeted survey for terrestrial invertebrates

1.1.5 Distinct areas of terrestrial habitat (often geographically separated from each other) identified during the habitat potential assessment with potential to support valuable invertebrate assemblages, were allocated land parcel numbers 1 to 4 (Figure 1, Appendix D) and subject to targeted survey. These parcels predominantly comprise matrices of damp / marshy grassland, neutral grassland, ruderal vegetation and scrub; tree-lined hedgerows (and their margins); and overmature trees. Therefore, the targeted survey was designed to target data collection of key indicator groups associated with such habitats. This approach relates to the guidance set out in Drake *et al*. (2007); which lists many of the target taxa of field layer and arboreal assemblages and their value in assessment. Coleoptera (beetles), aculeate Hymenoptera (bees, ants and wasps), Lepidoptera (butterflies and moths), Hemiptera (true bugs) and Orthoptera (grasshoppers and crickets) are four orders that are strongly represented in such assemblages. Certain families (and suborders) of the order Diptera (flies) (e.g., Syrphidae (hoverflies) and other families of the larger Brachycera were also targeted. Observations of other invertebrate taxa including were also recorded.

1.1.6 The following sampling methods were employed: pan traps, pitfall traps, window traps, sweep-netting, beating and grubbing. These methods are described below.

Pan Traps

1.1.7 Clusters of three to five pan (or water) traps were set out in flower-rich areas in April and June 2021. The pan traps comprised a mixture of yellow, blue and white plastic trays into which a small amount of water was poured (along with a few drops of detergent to break the surface tension). Such traps mimic large flowers and attract flying insects of many groups' especially aculeate Hymenoptera and certain Diptera, which become trapped in the fluid and can be collected later. During each visit the traps were set at the start of the survey and collected in at the end of the survey; each trap collected invertebrates for a period of at least 36 hrs. Photograph 1 shows a pan trap deployed in situ.

Pitfall Traps

1.1.8 Pitfall traps were set out in clusters of three in areas shown on Figure 2a and 2b (Appendix D). Pitfall trapping involved the use of circular plant pot trays (24 cm diameter x 5 cm depth) sunk into an excavated circular hole with the tray rims flush with the surrounding ground level. Preserving fluid (and a drop of detergent to break the surface tension) was poured into the trays until they were half full. Lastly, a piece of mesh was secured over the tray to prevent capture of small mammals, amphibians and reptiles. Traps were operational during the periods 29 April to 13 May 2021 (in Parcels 1, 2 and 3) and 25 June to 6 July 2021 (in Parcels 2 and 3). Photograph 2 shows a pitfall trap deployed in situ.

Window Flight Interception Traps

1.1.9 A window flight interception trap (referred to hereafter as 'window trap') was used to target the dead wood fauna of an over mature tree in Parcel 2. The trap was composed of four 2 L. plastic drinks bottles, securely locked in place at the base, and so contained within a circular plant pot tray (24 cm diameter x 5 cm depth), which also acted as a roof to shield the trap from excessive rain water. Wire fittings were used to bind the four bottles to the circular tray. An outward facing rectangular hole (the 'window') was cut out of each bottle. The constructed trap was inverted and therefore suspended from its base by

hanging it over a cavity in the tree. Approximately 30 ml of preserving fluid, comprising 1 part ethylene glycol (antifreeze) to 2 parts water was poured into each bottle via the 'windows' made on each bottle. Photograph 3 shows a window trap deployed in situ. The locations of the window traps are illustrated on Figure 2a (Appendix D). The trap was remained for the duration of the survey (April to July 2021).

Sweep Netting

1.1.10 Sweep netting involved walking at a steady pace through the vegetation and passing an entomologist's sweep net back and forth through vegetation in a figure of eight motion. Sweep netting was accompanied by 'spot-sweeping' where individual invertebrates (e.g., butterflies and day flying moths) were targeted and collected via a single sweep. Sweep netting was conducted during spring and summer seasonal survey events (April and June 2021), within all Parcels.

Beating

1.1.11 Beating is a useful technique for extracting arboreal invertebrates from overhanging branches. This method involves placing a beating tray beneath a branch before delivering several sharp blows to the branch, sending any dislodged invertebrates into the beating tray for inspection. Beating was conducted during spring and summer seasonal survey events (April and June 2021), within all Parcels, targeting scrub edge habitat and lower reaches of tree canopies, where present.

Grubbing

1.1.12 Grubbing is the name generally applied to the extraction of invertebrates by hand from a variety of media such as: dead wood or fungi and under bark; from moist cracked ground in seasonally inundated habitats; in dung, or from dense aggregations of leaf matter and detritus (e.g., base of grass tussocks, fern shuttlecocks and leafy / woody deposits). If appropriate, to assist in the detection of small beetles, material was sieved or placed in a bucket of water to capture invertebrates moving to the surface. Grubbing from such media

(where present) took place during spring and summer seasonal survey events (April and June 2021), within Parcels 1, 2 and 3.

Sample Sorting and Identification

1.1.13 For all surveys, whilst some species could be identified in the field, the majority of specimens were stored in 70% IMS for later identification, using a stereoscopic microscope with the aid of identification literature. For all target groups identification was taken down to species level.

Dates of Survey and Personnel

1.1.14 The team for this survey and reporting involved the following personnel:

1.1.15 The lead surveyor was a principal consultant entomologist (BSc, PhD, MCIEEM) with extensive experience undertaking invertebrate surveys and assessment at over 100 development sites.

1.1.16 The invertebrate identification specialist (MSc, FRES) is a fellow of the Royal Entomological Society and Curator of Natural Science at Bolton Museum. He specialises in invertebrate identification, particularly Coleoptera, and has carried out work for a wide range of clients across the UK over the last 10 years.

1.1.17 Table 1-1 shows the weather conditions on the days of survey and gives details of the weather in the week preceding surveys.

Table 1-1 – Weather conditions during terrestrial invertebrate surveys

Survey date	Survey type	Survey Effort (Hours)	Weather conditions
29 - 30 April 2021	Habitat potential assessment Targeted survey (sweep, beat, pan trap, pitfall trap setting, window trap setting)	10	Preceding week: Prolonged dry, but cool weather. Dates of Survey: Cool and dry. Gentle breeze. Cloud cover – 1-3 Oktas. Max temp. 14ºC.
13 May 2021	Targeted survey (spot sweeping, pitfall trap retrieval)	3	Preceding week: Cool conditions, with some scattered rainfall and sunny spells. Date of Survey: Mild, overcast conditions with sunny spells later in the afternoon. Cloud cover – 5-6 Oktas. Max temp. 18ºC
25 June 2021	Targeted survey (sweep, beat, pan trap, pitfall trap setting, window trap re-setting)	7	Preceding week: Frequent rain showers; unseasonably cool. Dates of Survey: Warm and dry after a wet start. Light breeze. Cloud cover – 5-8 Oktas. Max temp. 18ºC.

Survey date	Survey type	Survey Effort (Hours)	Weather conditions
6 July 2021	Targeted survey (spot sweeping, pitfall trap and window trap retrieval)	3	Preceding week:. Warm, sunny and mostly dry conditions. Date of Survey: Overcast, dry conditions. Gentle breeze. Cloud cover 6-8 Oktas. Max temp. 20 ^{o}C.

Data Analysis

1.1.18 The results and discussion section places a value on the rare and notable invertebrates found at the Proposed Scheme dependent on their current national status. Further information on status definitions and criteria of invertebrate groups can be found in Appendix A.

Pantheon Assemblage Analysis

1.1.19 The list of species derived from the invertebrate surveys was analysed using the "Pantheon" database tool developed by Natural England and the Centre for Ecology and Hydrology (Webb *et al.*, 2018). For each species recognised by Pantheon, various attributes relating to associated habitats and resources, assemblage types and habitat fidelity scores are placed against them. Reports can then be generated including those that provide:

- information on each individual species entered into the database;
- a list of species belonging to different feeding guilds (e.g., xylophagous, saprophagous, nectivorous);
- a list of species with different associations (e.g., to certain groups of plant, fungi or animal);

- a summary of the number of species within the sample that have a particular score or fidelity and, if relevant an overall score that provides insight into the quality of the site that the sample has come from; and
- summary tables that assess where species live and what assemblages they are associated with.

1.1.20 In the context of this assessment, it is the report that Pantheon provides relating to where species live and with which assemblages they are associated, that is considered most useful in evaluating the relative importance of a site for its invertebrates. This considers the habitats and resources used by an invertebrate species at various hierarchical levels, from broad biotopes (e.g., tree associated, wetland, coastal) at the highest level, down to specific habitats (e.g., tall sward and scrub, decaying wood, arboreal, marshland) at a mid-level, and resources (e.g., sapwood & bark decay, heart-rot and fungal fruiting bodies all associated with the decaying wood habitat) at the finest level. The assessment also considers the "ISIS" (Invertebrate Species-habitat Information System) assemblage types that had previously been developed by Natural England (Drake *et al*., 2007). The original Specific Assemblage Types (SATs) are therefore carried forward in their original form, although 'Habitats' have replaced the ISIS Broad Assemblage Types (BATs).

1.1.21 SATs include only habitat specific species, which are normally faithful to a single habitat or resource, which are often closely associated with sites of higher conservation value. Analysis of SATs is helpful to inform the determination of the nature conservation value of a site for invertebrates; sites with high-scoring SATs are considered to have good quality invertebrate assemblages.

1.1.22 The original role of ISIS was to guide Natural England on assessing the conservation value of SSSIs for their invertebrate assemblages (especially for the purposes of Common Standards Monitoring) (Drake et al., 2007). This was done by identifying whether an assemblage associated with a site was in a "favourable condition" (i.e., where it was considered to be of sufficient

condition to meet the threshold criteria for an assemblage of SSSI-level value). However, whilst the condition assessment function is still retained within Pantheon, it is not the sole use. Accordingly, the analysis may be used in other situations (e.g., by nature reserve managers or those assessing the effects of a development) to help understand which assemblages (SATs) within a site are considered likely to be of value.

1.1.23 A useful measure of the quality of a site for its invertebrate assemblage is to count and assign scores that are more heavily weighted towards the rarer species. The Species Quality Index (SQI) is a numerical scoring system contained within Pantheon that does exactly this. Each species recorded from a sample is given a Species Quality Score (SQS) based on their conservation status. The SQI is the sum of all SQSs divided by the number of species in that sample. This score is multiplied by 100 to give a 3 figure value without decimal places (e.g.,100 rather than a 1.00). This SQI score is preferred to the SQS since it eliminates, to a greater extent the effect of recorder effort. Notwithstanding this, sites where little effort has been made to record the common species could result in overly amplified SQI scores. There is presently no published guidance on what SQI score might be classed as ‘good’ or ‘average’ as this might vary between habitats and regions (e.g., northern vs. southern England). However, as a general rule of thumb, based on the experience of the author, a habitat with an SQI score exceeding 125 is likely to be of some value and merit further consideration.

Notes and Limitations

1.1.24 Surveys conducted between April and July covers the optimal survey period for invertebrates. However, survey in autumn was not completed. This represents a constraint in interpreting the data, particularly for species that are associated with dead wood and fungal fruiting bodies.

1.1.25 The survey approach has been designed with reference to guidance set out in Drake *et al*. (2007). It should be noted that the confidence in the ISIS / Pantheon analysis of SATs is reduced where survey work does not follow the precise ISIS sampling protocols. The objective of the survey was to identify a

broad a range of invertebrates across target groups in predicted key areas of habitat, hence, the methods employed do vary slightly from the ISIS protocol. In such instances Webb *et al*. (2018) advises that caution is applied when using the SAT assessments, and that confidence in a favourable condition should be considered as 'Medium' for semi-ISIS compliant samples. In the present context, the analysis is considered to be broadly indicative; and may therefore give further steer to help understand which assemblages within the Scheme Boundary are likely to be of value.

1.2 Results

Field Survey

Terrestrial invertebrate habitat potential assessment

1.2.1 Parcels of complementary habitats within the Field Survey Area were distinguished based on suitability to support terrestrial invertebrates. This informed subsequent targeted surveys as to where important invertebrate assemblages were more likely to be encountered.

1.2.2 Figure 1 (Appendix D) shows the location of the areas assessed for invertebrates, showing locations of higher suitability (subjected to further targeted survey), and the remainder of the Field Survey Area with lower suitability (these areas are left blank on the plan). The habitat descriptions (below) are accompanied by photographs of features / habitats of note (Appendix B). For ease of reference, place names derived from the OS Explorer Map (OL10; 1:25,000 scale) have been used to aid the descriptions of the Field Survey Area; and specific parcels of land where targeted survey for invertebrates has been undertaken have been numbered Parcels 1 to 4.

General habitat description

Seasonal ponds, scrub and tall herb (Parcel 1)

1.2.3 A wetland complex is in the north of the Field Survey Area where a series of seasonal ponds are located in low-lying depressions, with surrounding scrub and tall ruderal vegetation. This area provides good structural diversity to invertebrates, with short Rabbit-grazed turf (dominated by Ground Ivy

Glechoma hederacea) surrounding the ponds and much taller ruderal vegetation elsewhere, with scattered scrub and localised patches dense Bramble *Rubus fruticosus* agg. and Hawthorn *Crataegus monogyna* dominated scrub and Grey Willow *Salix cinerea* scrub. The ruderal vegetation includes abundant Nettle *Urtica dioica*, Creeping Thistle *Cirsium arvense*, Cow Parsley *Anthriscus sylvestris* and Hemlock *Conium maculatum* amongst coarse grasses. Whilst not offering a variety of species (in terms of overall floristic diversity), those species that are abundant include labiates, umbellifers, composites, and roses (Hawthorn and Bramble), all of which are important families of pollen and nectar plants for invertebrates. The unmanaged nature of the habitat provides structural diversity, also, and undisturbed overwintering opportunities for invertebrates in grass tussocks and hollow stems of umbellifers and Bramble, for example.

1.2.4 Lesser Pond Sedge *Carex acutiformis*, Reedmace *Typha latifolia*, Rushes (*Juncus effusus* and *Juncus inflexus*) and Gypsywort *Lycopus europaeus* are frequent to locally abundant in and adjacent to the ponds. Marginal vegetation, reedbed habitat and surrounding Willow scrub also contributes to the local structural diversity, linking to the terrestrial habitats. Water levels in the ponds fluctuates frequently, which may benefit those species that favour the moist mud and damp leaf litter on the edge of the water, as it recedes from late spring and through the summer (such as various ground beetles, rove beetles, crane-flies, marsh flies, shore bugs and molluscs).

Young woodland, scrub and grassland mosaic with sparsely distributed over mature oak trees (Parcel 2)

1.2.5 There is a large area of semi-natural habitat in the north of the Field Survey Area that is formed by a mosaic of young woodland, scrub and unmanaged species-poor grassland. In some parts of this area, grassland dominates with extensive stands of Wood Small-reed *Calamagrostis epigejos* and scattered shrubs (Photograph 5). These areas have uniform structure and limited species diversity; therefore, are not considered to be of high invertebrate habitat potential.

1.2.6 However, there are pockets of more diverse habitat within the Parcel that were considered to be of have elevated importance for terrestrial invertebrate assemblages; and these areas formed the focus of survey effort. This included, for example, a complex area of scrub and grassland with impeded drainage in the north of this Parcel. Here the scrub and grassland formed a matrix offering considerable structural diversity for invertebrates, with sheltered 'hot-spots' in the lee of shrubs and trees. Wetter parts included frequent Common Reed *Phragmites australis*, Hard Rush and short, heavily grazed grasses (including Creeping Bent *Agrostis stolonifera*, Yorkshire Fog *Holcus lanatus* and Rough Meadow Grass *Poa trivialis*). Ground Ivy is locally abundant and provides a nectar and pollen source, together with woody species including Willow *Salix sp*., Bramble and Hawthorn. Trees include Pedunculate Oak *Quercus robur*; although none is of sufficient age or stature to provide an important source of dead wood for invertebrates.

1.2.7 Along the roadside are two over mature oak trees, one of which has collapsed, revealing a hollowed cavity in the trunk (Photograph 3). Considerable quantities of large diameter standing and fallen dead wood is associated with these trees and this is likely to offer good habitat for saproxylic (dead wood loving) species of invertebrate. Another large, over mature oak is positioned close to a small pond on a spur of semi-natural habitat extending from the southern tip of Parcel 2 (Photograph 6). This also has interest for saproxylic invertebrates and its position in a more open situation contrasts with the two in the north of the parcel, so may offer different conditions for a different saproxylic invertebrate assemblage.

1.2.8 In the east of the parcel, alongside a much older block of established woodland (immediately east of the Field Survey Area) Grey Willow is the most frequently encountered woody species and a closed canopy is formed by willow scrub in the east, that gradually becomes more open further west. The closed canopy willow scrub (Photograph 7) is on relatively flat ground and close to a drain that forms the eastern boundary of the Parcel (and the Field Survey Area). Willow scrub of this type, with small quantities of dead wood,

high predicted humidity levels and occurring in association with a more extensive area of established woodland to the east can be expected to support an invertebrate assemblage of some interest. For example, there are many specialist invertebrates (especially Diptera) associated with the better examples of this type of habitat.

Hedgerows and Ditches

1.2.9 Most of the field boundaries of the Field Survey Area are considered likely to be of relatively low value to invertebrates, these being for example uniform and species-poor hedgerows that are likely to permit movement of wildlife (including invertebrates) along these corridors, but not being of sufficient structural complexity and size, or floral species diversity to be of inherent value. These were therefore discounted in terms of further targeted survey.

1.2.10 Several boundary features are however of greater interest and were subject to further targeted survey on account of their likely higher suitability for invertebrates. These include Parcels 3 and 4.

Mature Tree-line (Parcel 3)

1.2.11 Between Chequers Land and Rectory Lane is an 'L-shaped' line of trees with occasional shrubs, including Elder *Sambucus nigra* and a ground cover of Ivy *Hedera helix* and Bramble forming a boundary feature between arable fields. There are approximately five large, over-mature Pedunculate Oak trees in the Field Survey Area and several mature Ash *Fraxinus excelsior* trees. The considerable age of the Oak trees (estimated to be at least 150 to 200 years old) and the presence of standing dead wood (including hollows at the base of trunks) and several large fallen limbs, mean that this tree line is likely to be important for saproxylic species.

Seasonal ditch with wide field margins (Parcel 4)

1.2.12 In the south of the Field Survey Area is a linear ditch which originates from within an arable field and passes south and east, beyond the Field Survey Area. The ditch is steep sided, with shallow water at its base. Marginal vegetation along the ditch includes frequent Meadowsweet *Filipendula*

ulmaria and Reed Canary Grass *Phalaris arundinacea*, whilst Bramble and Willow scrub is encroaching along the banks. On the banktop is a wide strip of unmanaged grassland, either side of the ditch. This strip includes mostly tall, coarse grasses, that provide a tussocky structure, although robust herbs such as Hogweed *Heracleum sphondylium*, Common Knapweed *Centaurea nigra*, Cow Parsley, Creeping Thistle and Dead Nettle species *Lamium spp*. are all frequent to locally abundant. The established nature of the grassland strip combined with the bankside and marginal vegetation of the ditch combine to provide localised microtopographic variation and shelter for invertebrates in an otherwise large expanse of arable land use. However, the relatively isolated position of this feature may restrict its value also.

Agricultural fields

1.2.13 The arable fields within the Field Survey Area are of low suitability to invertebrates owing primarily to their homogenous structure and dominance of relatively few plant species; and also, to their exposed nature (many of these fields are very large and windswept), lack of exposed soil and intensive / routine management. On these grounds fields of this nature have been excluded in respect to further invertebrate survey.

Invertebrate species assemblage

1.2.14 The results of the targeted terrestrial invertebrate surveys provide an indication of the relative species diversity within the targeted groups of invertebrates. Over 500 specimens were collected or recorded over the course of the surveys, allowing 110 species to be identified from the Field Survey Area.

1.2.15 Of the target groups, Coleoptera were most diverse, with 69 species recorded. Hemiptera was represented by ten species and Diptera by eight species. Other orders, with fewer than eight species included (but was not limited to) Hymenoptera, Lepidoptera, Araneae (spiders), Orthoptera (grasshoppers and crickets), Dermaptera (earwigs), Julida (snake-millipedes), Polydesmida (flat-backed millipedes) and Isopoda (woodlice).

1.2.16 Of the species recorded, 89 (c. 81 %) are without any recognised status, being widely distributed and common, and exhibiting little habitat specificity; and 19 species are regarded as locally common or locally scarce. Two species (c. 2 %) are currently regarded as Nationally Scarce, see below. Further information on status definitions and criteria of invertebrate groups can be found in Appendix A. The full list of invertebrates recorded within the Field Survey Area is displayed in tabular format in Appendix C.

1.2.17 Further information relating to species which were recorded with an assessed status, is provided below.

Coleoptera (beetles)

Chrysomelidae (Leaf Beetles) *Chrysolina sturmi* - UK Status: Nationally Scarce

1.2.18 This distinctive species feeds on the foliage of Ground Ivy, especially on sunny banks. It is locally distributed in Southern England, and very local in northern and central England and scarce in south east Wales (Duff, 2016). It has been recorded in most months of the year. The status of this species has recently been reviewed by Hubble (2014).

1.2.19 One beetle was taken from a pitfall trap in Parcel 2 (where Ground Ivy was frequent), retrieved in July 2021. See Appendix B for photograph of specimen (Photo 10).

Hemiptera (True Bugs)

Delphacidae (Planthoppers) *Asiraca clavicornis* - UK Status: Nationally Scarce

1.2.20 The British Bugs website (accessed 11 November 2021) describes this bug as ‘formerly more widespread in southern Britain but is now restricted mainly to the London area and Thames estuary, where it can be locally frequent in rough grasslands and wastelands’. The bug has also been recorded recently from Cambridgeshire and Norfolk.

1.2.21 One specimen was taken from sweeping of vegetation in Parcel 2 in late April 2021.

Pantheon Assemblage Analysis

1.2.22 As explained in the methodology section, the Pantheon database has been used principally to help understand which assemblages within the site are likely to be important. The species list derived from the targeted surveys across the Field Survey Area was entered into Pantheon. The data output from the analysis is shown in Tables 1-2 and 1-3 below which considers invertebrate assemblages at two different levels.

Broad Biotopes

Table 1-2 – Summary of Pantheon output for broad biotopes

Broad biotope	Number of species	Number of species with conservation status recognised by Pantheon
Open habitats	65	2
Tree-associated	19	0
Wetland	9	0

1.2.23 Table 1-2 shows that there are three broad assemblage habitat types within the Field Survey Area which are recognised by Pantheon. The best represented is that belonging to open habitats. This is explained by the fact that much of the habitat surveyed was open habitat, including that associated with scrub and hedgerows, which also falls within the broad biotope of open habitats.

1.2.24 Considerable and proportionate effort was expended in sampling the dead wood fauna of the mature and over mature trees within the Field Survey Area, notably those associated with a hedgerow (Parcel 3) and an over mature Oak tree (Parcel 2). This included, grubbing in dead wood, beating of overhanging tree and shrub canopy and use of pitfall traps at the base of the trees and a window trap in the decayed trunk of an over mature tree. Despite this survey

effort a relatively low number of species was returned associated with trees, with no species of conservation status.

1.2.25 The wetland habitat, represented by nine species, was primarily associated with the wetland habitat in Parcel 1. No species of conservation status were taken from this Parcel or attributed to the wetland habitat biotope.

Habitats

Broad biotope	Habitat	Number of species	SQI	Number of species with conservation status recognised by Pantheon
Open habitats	tall sward & scrub	51	106	1 (*Chrysolina sturmi*)
Open habitats	short sward & bare ground	10	N/A	1 (*Asiraca clavicornis*)
Other habitats	Arboreal, decaying wood, shaded woodland floor, marshland, wet woodland, acid & sedge peats	<10	N/A	0

1.2.26 Table 1-3 adds a finer level of detail to Table 1-2, sub-dividing broad biotopes into habitats. The most prominent habitat that features is that of 'tall sward scrub' that lies within the broad biotope of open habitats, for which 51 species were recorded. Only one species with conservation status was taken from this habitat. This explains the low SQI score of 106, which is based on the proportion of scarce species recorded. The species with conservation status is *Chrysolina sturmi*, which is associated with Ground Ivy; a plant that was frequent in Parcel 1 and 2 (and adjoining 'off-site' areas), although the Leaf Beetle was only found in Parcel 1.

1.2.27 The short sward and bare ground habitat was represented by only 10 species, one of which has a conservation status. It is not possible to analyse the SQI score for this habitat as fewer than 15 species were recorded associated with the habitat. This indicates that the habitat did not make a significant contribution (in terms of habitat quality and quantity) across the Field Survey Area; which is certainly likely to be the case as areas of bare ground (aside from those associated with arable field and their margins) were not noted within the site. The nationally scarce Planthopper *Asiraca clavicornis* was recorded from this habitat. This is described as a species associated with rough grassland and wasteland; the former of which was plentiful not just in Parcel 2 (where it was recorded from), but on adjoining land outside the Field Survey Area.

Specific Assemblage Types

1.2.28 It is not appropriate to assess favourable condition of any of the Specific Assemblage Types (SATs) recognised by Pantheon. This is because for all SATs recognised, the number of species was below the threshold levels to make a meaningful assessment of condition. This is likely to be explained by the fact that the habitats sampled are not of sufficiently high quality to support enough species with specialised habitat requirements.

Evaluation of Invertebrate Assemblages

1.2.29 There is no widely accepted published guidance presently available that provides a clear description of how to evaluate an invertebrate assemblage of a site. Various authors (e.g., Plant, undated) have previously proposed that threshold levels of species with a recognised conservation status could be used to distinguish sites of varying levels of importance across a geographical scale (e.g., a site with more than ten Nationally Scarce species might merit Regional value). However, this relies on relatively comprehensive surveys being undertaken covering a broad range of groups, and the constant state of flux of status applied to species compounds the difficulty in applying such an approach. Former English Nature guidance (English Nature, 2005) advised that an appropriate approach is to compare with other sites of similar nature

and habitat. So, for example, a site in the Norfolk is of County importance if it compares well with other similar sites in Norfolk. This however introduces doubt, especially where useful data are unavailable (e.g., poorly recorded areas or where data have not been shared with Local Record Centres).

1.2.30 For the purposes of the present evaluation, it is considered to be more useful to rely on a combination of factors in making a qualitative assessment of the invertebrate value of the Field Survey Area. This considers the Pantheon output, including the number of species with a recognised conservation status found within the Field Survey Area during surveys, the SQI scores and number and condition of SATs. It also takes into account desk study information; and professional judgement of the author, based on a knowledge and understanding of the invertebrate importance of sites across the particular geographic region (in this case East Anglia).

1.2.31 Overall, the Field Survey Area supports an unexceptional invertebrate fauna, which includes mostly common and widespread species, with only a very small proportion of species with conservation status. A range of habitats within the Field Survey Area offered potentially suitable habitat for invertebrate assemblages; however, the relatively low numbers of species recorded, and lack of rare and nationally scarce species indicates that those habitats sampled (which ranged from habitat mosaics of scrub and grassland, to over mature trees) are not of significant importance for invertebrates. As an example, aculeate Hymenoptera were poorly represented. This is a group of invertebrates that can often include dozens of species, including rarities, in areas of higher value for open habitats. However, a lack of bare ground and dense aggregations of flowers providing nectar and pollen is likely to have restricted their presence and abundance. Those species with conservation status that were recorded are associated with rough grassland habitat, especially that with Ground Ivy (in the case of *Chrysolina sturmi*), which is habitat that is readily re-creatable and abundant both within the Field Survey Area and on adjoining land.

1.2.32 In conclusion, the invertebrate assemblage of the site is considered likely to be of Local Importance.

1.3 References

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