Species	Family	Order	Conservation status
Tingis ampliata	Tingidae	Hemiptera	common
Tingis cardui	Tingidae	Hemiptera	common
Trioza remota	Triozidae	Hemiptera	common
Trioza urticae	Triozidae	Hemiptera	common
Microvelia reticulata	Veliidae	Hemiptera	common
Velia (Plesiovelia) caprai	Veliidae	Hemiptera	common
Ampullaceana balthica	Lymnaeidae	Hygrophila	common
Lymnaea stagnalis	Lymnaeidae	Hygrophila	common
Andrena florea	Andrenidae	Hymenoptera	RDB 3
Andrena fulva	Andrenidae	Hymenoptera	common
Andrena haemorrhoa	Andrenidae	Hymenoptera	common
Andrena minutula	Andrenidae	Hymenoptera	common
Apis mellifera	Apidae	Hymenoptera	common
Bombus hortorum	Apidae	Hymenoptera	common
Bombus hypnorum	Apidae	Hymenoptera	common
Bombus lapidarius	Apidae	Hymenoptera	common
Bombus lucorum	Apidae	Hymenoptera	common
Bombus pascuorum	Apidae	Hymenoptera	common
Bombus pratorum	Apidae	Hymenoptera	common
Bombus terrestris	Apidae	Hymenoptera	common
Cephus pygmeus	Cephidae	Hymenoptera	common
Colletes hederae	Colletidae	Hymenoptera	common
Crabro cribrarius	Crabronidae	Hymenoptera	common
Ectemnius lituratus	Crabronidae	Hymenoptera	common
Pemphredon inornata	Crabronidae	Hymenoptera	common
Pemphredon lugubris	Crabronidae	Hymenoptera	common
Andricus aries	Cynipidae	Hymenoptera	common
Andricus kollari	Cynipidae	Hymenoptera	common
Andricus quercuscalicis	Cynipidae	Hymenoptera	common
Biorhiza pallida	Cynipidae	Hymenoptera	common
Diplolepis rosae	Cynipidae	Hymenoptera	common
Neuroterus quercusbaccarum	Cynipidae	Hymenoptera	common
Neuroterus numismalis	Cynipidae	Hymenoptera	common
Neuroterus albipes	Cynipidae	Hymenoptera	common
Lasius brunneus	Formicidae	Hymenoptera	Na
Lasius fuliginosus	Formicidae	Hymenoptera	local
Lasius niger	Formicidae	Hymenoptera	common
Lasius platythorax	Formicidae	Hymenoptera	common
Myrmica rubra	Formicidae	Hymenoptera	common
Myrmica ruginodis	Formicidae	Hymenoptera	common
Myrmica scabrinodis	Formicidae	Hymenoptera	common
Temnothorax nylanderi	Formicidae	Hymenoptera	local

Species	Family	Order	Conservation status
Gasteruption jaculator	Gasteruptiidae	Hymenoptera	common
Lasioglossum morio	Halictidae	Hymenoptera	common
Amblyteles armatorius	Ichneumonidae	Hymenoptera	common
Pimpla rufipes	Ichneumonidae	Hymenoptera	common
Vulgichneumon saturatorius	Ichneumonidae	Hymenoptera	common
Macropis europaea	Melittidae	Hymenoptera	Na
Dipogon subintermedius	Pompilidae	Hymenoptera	common
Priocnemis fennica	Pompilidae	Hymenoptera	common
Aneugmenus padi	Tenthredinidae	Hymenoptera	common
Caliroa annulipes	Tenthredinidae	Hymenoptera	common
Euura proxima	Tenthredinidae	Hymenoptera	common
Stromboceros delicatulus	Tenthredinidae	Hymenoptera	common
Vespa crabro	Vespidae	Hymenoptera	common
Vespula vulgaris	Vespidae	Hymenoptera	common
Asellus aquaticus	Asellidae	Isopoda	common
Oniscus asellus	Oniscidae	Isopoda	common
Philoscia muscorum	Philosciidae	Isopoda	common
Porcellio scaber	Porcellionidae	Isopoda	common
Trichoniscus pusillus	Trichoniscidae	Isopoda	common
Tachypodoiulus niger	Julidae	Julida	common
Blastobasis adustella	Blastobasidae	Lepidoptera	common
Bucculatrix thoracella	Bucculatricidae	Lepidoptera	common
Anthophila fabriciana	Choreutidae	Lepidoptera	common
Cosmopterix zieglerella	Cosmopterigidae	Lepidoptera	common
Acentria ephemerella	Crambidae	Lepidoptera	common
Agriphila geniculea	Crambidae	Lepidoptera	common
Agriphila straminella	Crambidae	Lepidoptera	common
Agriphila tristella	Crambidae	Lepidoptera	common
Chrysoteuchia culmella	Crambidae	Lepidoptera	common
Crambus lathoniellus	Crambidae	Lepidoptera	common
Crambus pascuella	Crambidae	Lepidoptera	common
Crambus perlella	Crambidae	Lepidoptera	common
Elophila nymphaeata	Crambidae	Lepidoptera	common
Eudonia mercurella	Crambidae	Lepidoptera	common
Nomophila noctuella	Crambidae	Lepidoptera	common
Pleuroptya ruralis	Crambidae	Lepidoptera	common
Scoparia ambigualis	Crambidae	Lepidoptera	common
Udea olivalis	Crambidae	Lepidoptera	common
Udea prunalis	Crambidae	Lepidoptera	common
Agonopterix arenella	Depressariidae	Lepidoptera	common
Agonopterix heracliana	Depressariidae	Lepidoptera	common

Species	Family	Order	Conservation status
Watsonalla binaria	Drepanidae	Lepidoptera	Section 41 Priority Species - research only;VU
Eilema lurideola	Erebidae	Lepidoptera	common
Lithosia quadra	Erebidae	Lepidoptera	common
Rivula sericealis	Erebidae	Lepidoptera	common
Tyria jacobaeae	Erebidae	Lepidoptera	LC (Global);Section 41 Priority Species - research only
Dyseriocrania subpurpurella	Eriocraniidae	Lepidoptera	common
Hemistola chrysoprasaria	Geometridae	Lepidoptera	common
Idaea aversata	Geometridae	Lepidoptera	common
Opisthograptis luteolata	Geometridae	Lepidoptera	common
Petrophora chlorosata	Geometridae	Lepidoptera	common
Caloptilia stigmatella	Gracillariidae	Lepidoptera	common
Cameraria ohridella	Gracillariidae	Lepidoptera	common
Phyllonorycter coryli	Gracillariidae	Lepidoptera	common
Phyllonorycter corylifoliella	Gracillariidae	Lepidoptera	common
Phyllonorycter messaniella	Gracillariidae	Lepidoptera	common
Phyllonorycter oxyacanthae	Gracillariidae	Lepidoptera	common
Phyllonorycter schreberella	Gracillariidae	Lepidoptera	common
Phyllonorycter tristrigella	Gracillariidae	Lepidoptera	common
Phyllonorycter viminiella	Gracillariidae	Lepidoptera	common
Ochlodes sylvanus	Hesperiidae	Lepidoptera	common
Thymelicus sylvestris	Hesperiidae	Lepidoptera	common
Incurvaria masculella	Incurvariidae	Lepidoptera	common
Celastrina argiolus	Lycaenidae	Lepidoptera	common
Leucoptera malifoliella	Lyonetiidae	Lepidoptera	common
Lyonetia clerkella	Lyonetiidae	Lepidoptera	common
Micropterix calthella	Micropterigidae	Lepidoptera	common
Stigmella aurella	Nepticulidae	Lepidoptera	common
Stigmella hybnerella	Nepticulidae	Lepidoptera	common
Stigmella lemniscella	Nepticulidae	Lepidoptera	common
Stigmella malella	Nepticulidae	Lepidoptera	common
Stigmella oxyacanthella	Nepticulidae	Lepidoptera	common
Stigmella perpygmaeella	Nepticulidae	Lepidoptera	common
Stigmella trimaculella	Nepticulidae	Lepidoptera	common
Stigmella ulmivora	Nepticulidae	Lepidoptera	common
Agrotis clavis	Noctuidae	Lepidoptera	common
Agrotis exclamationis	Noctuidae	Lepidoptera	common
Autographa gamma	Noctuidae	Lepidoptera	common
Nonagria typhae	Noctuidae	Lepidoptera	common
Orthosia cerasi	Noctuidae	Lepidoptera	common

Species	Family	Order	Conservation status
Aglais io	Nymphalidae	Lepidoptera	common
Aglais urticae	Nymphalidae	Lepidoptera	common
Maniola jurtina	Nymphalidae	Lepidoptera	common
Melanargia galathea	Nymphalidae	Lepidoptera	common
Pararge aegeria	Nymphalidae	Lepidoptera	common
Pyronia tithonus	Nymphalidae	Lepidoptera	common
Vanessa atalanta	Nymphalidae	Lepidoptera	common
Vanessa cardui	Nymphalidae	Lepidoptera	common
Hofmannophila pseudospretella	Oecophoridae	Lepidoptera	common
Carcina quercana	Peleopodidae	Lepidoptera	common
Gonepteryx rhamni	Pieridae	Lepidoptera	common
Pieris brassicae	Pieridae	Lepidoptera	common
Pieris napi	Pieridae	Lepidoptera	common
Pieris rapae	Pieridae	Lepidoptera	common
Anthocharis cardamines	Pieridae	Lepidoptera	common
Plutella xylostella	Plutellidae	Lepidoptera	common
Prays fraxinella	Praydidae	Lepidoptera	common
Acrobasis advenella	Pyralidae	Lepidoptera	common
Aphomia sociella	Pyralidae	Lepidoptera	common
Endotricha flammealis	Pyralidae	Lepidoptera	common
Hypsopygia glaucinalis	Pyralidae	Lepidoptera	common
Phycita roborella	Pyralidae	Lepidoptera	common
Phycitodes binaevella	Pyralidae	Lepidoptera	common
Acleris forsskaleana	Tortricidae	Lepidoptera	common
Agapeta hamana	Tortricidae	Lepidoptera	common
Aleimma loeflingiana	Tortricidae	Lepidoptera	common
Archips podana	Tortricidae	Lepidoptera	common
Celypha lacunana	Tortricidae	Lepidoptera	common
Celypha striana	Tortricidae	Lepidoptera	common
Cydia pomonella	Tortricidae	Lepidoptera	common
Ditula angustiorana	Tortricidae	Lepidoptera	common
Endothenia marginana	Tortricidae	Lepidoptera	common
Epiphyas postvittana	Tortricidae	Lepidoptera	common
Grapholita compositella	Tortricidae	Lepidoptera	common
Gypsonoma dealbana	Tortricidae	Lepidoptera	common
Hedya nubiferana	Tortricidae	Lepidoptera	common
Lozotaenia forsterana	Tortricidae	Lepidoptera	common
Notocelia uddmanniana	Tortricidae	Lepidoptera	common
Pandemis corylana	Tortricidae	Lepidoptera	common
Tortrix viridana	Tortricidae	Lepidoptera	common
Paraswammerdamia nebulella	Yponomeutidae	Lepidoptera	common
Lithobius forficatus	Lithobiidae	Lithobiomorpha	common

Species	Family	Order	Conservation status
Bithynia tentaculata	Bithyniidae	Littorinimorpha	common
Potamopyrgus antipodarum	Tateidae	Littorinimorpha	common
Panorpa communis	Panorpidae	Mecoptera	common
Chrysopa perla	Chrysopidae	Neuroptera	common
Aeshna cyanea	Aeshnidae	Odonata	common
Aeshna mixta	Aeshnidae	Odonata	common
Calopteryx splendens	Calopterygidae	Odonata	common
Ischnura elegans	Coenagrionidae	Odonata	common
Orthetrum cancellatum	Libellulidae	Odonata	common
Libellula depressa	Libellulidae	Odonata	common
Sympetrum striolatum	Libellulidae	Odonata	common
Dicranopalpus ramosus sensu lato	Phalangiidae	Opiliones	common
Leiobunum rotundum	Phalangiidae	Opiliones	common
Mitopus morio	Phalangiidae	Opiliones	common
Paroligolophus agrestis	Phalangiidae	Opiliones	common
Chorthippus brunneus	Acrididae	Orthoptera	common
Chorthippus parallelus	Acrididae	Orthoptera	common
Omocestus viridulus	Acrididae	Orthoptera	common
Conocephalus fuscus	Conocephalidae	Orthoptera	common
Meconema thalassinum	Meconematidae	Orthoptera	common
Leptophyes punctatissima	Phaneropteridae	Orthoptera	common
Tetrix subulata	Tetrigidae	Orthoptera	common
Pholidoptera griseoaptera	Tettigoniidae	Orthoptera	common
Roeseliana roeselii	Tettigoniidae	Orthoptera	common
Polyxenus lagurus	Polyxenidae	Polyxenida	common
Chernes cimicoides	Chernetidae	Pseudoscorpiones	common
Valenzuela flavidus	Caeciliusidae	Psocoptera	common
Ectopsocus briggsi	Ectopsocidae	Psocoptera	common
Graphopsocus cruciatus	Stenopsocidae	Psocoptera	common
Ampullaceana balthica	Lymnaeidae	Hygrophila	common
Planorbis planorbis	Planorbidae	Hygrophila	common
Arion ater agg.	Arionidae	Pulmonata	common
Arion subfuscus	Arionidae	Pulmonata	common
Cochlicopa cf. lubrica	Cochlicopidae	Pulmonata	common
Cepaea nemoralis	Helicidae	Pulmonata	common
Cornu aspersum	Helicidae	Pulmonata	common
Hygromia cinctella	Hygromiidae	Pulmonata	common
Monacha cantiana	Hygromiidae	Pulmonata	common
Limax maximus	Limacidae	Pulmonata	common
Tandonia budapestensis	Milacidae	Pulmonata	common
Oxyloma elegans	Succineidae	Pulmonata	common
Succinea putris	Succineidae	Pulmonata	common

Species	Family	Order	Conservation status
Arianta arbustorum	Helicidae	Pulmonata	local
Alboglossiphonia heteroclita	Glossiphoniidae	Rhynchobdellida	common
Glossiphonia complanata	Glossiphoniidae	Rhynchobdellida	common
Helobdella stagnalis	Glossiphoniidae	Rhynchobdellida	common
Goera pilosa	Goeridae	Trichoptera	common
Hydropsyche contubernalis	Hydropsychidae	Trichoptera	common
Mystacides azurea	Leptoceridae	Trichoptera	common
Mystacides longicornis	Leptoceridae	Trichoptera	common
Triaenodes bicolor	Leptoceridae	Trichoptera	common
Glyphotaelius pellucidus	Limnephilidae	Trichoptera	common
Limnephilus lunatus	Limnephilidae	Trichoptera	common
Molanna angustata	Molannidae	Trichoptera	common
Cyrnus trimaculatus	Polycentropodidae	Trichoptera	common
Neureclipsis bimaculata	Polycentropodidae	Trichoptera	common
Polycentropus irroratus	Polycentropodidae	Trichoptera	common
Aceria campestricola	Eriophyidae	Trombidiformes	common
Eriophyes crataegi	Eriophyidae	Trombidiformes	common
Eriophyes inangulis	Eriophyidae	Trombidiformes	common
Eriophyes laevis	Eriophyidae	Trombidiformes	common
Eriophyes tiliae	Eriophyidae	Trombidiformes	common
Sphaerium corneum	Sphaeriidae	Veneroida	common
Valvata piscinalis	Valvatidae		common

Annex 2

Status Categories for Rare and Notable Species

Red Data Book Category 1 (RDB 1) – Endangered

Definition.
Taxa in danger of extinction in Great Britain and whose survival is unlikely if the causal factors continue operating.

Included are those taxa whose numbers have been reduced to a critical level or whose habitats have been so dramatically reduced that they are deemed to be in immediate danger of extinction. Also included are some taxa that are possibly extinct.

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

Species which only occur in habitats known to be especially vulnerable.

Species which have shown a rapid or continuous decline over the last twenty years and are now estimated to exist in five or fewer 10 km squares.

Species which are possibly extinct but have been recorded this century and if rediscovered would need protection.

Red Data Book Category 2 (RDB 2) – Vulnerable

Definition.
Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating.

Included are taxa of which most or all of the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range.

Criteria.
Species declining throughout their range.

Species in vulnerable habitats.

Red Data Book Category 3 (RDB 3) – Rare

Definition.
Taxa with small populations in Great Britain that are not at present endangered or vulnerable, but are at risk.

These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range.

Criterion.
Species which are estimated to exist in only fifteen or fewer 10 km squares. *This criterion may be relaxed where populations are likely to exist in over fifteen 10 km squares but occupy small areas of especially vulnerable habitat.*

Nationally Scarce Category A - Notable A (Na)

Definition.
Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in 30 or fewer 10 km squares of the National Grid or, for less well recorded groups, within seven or fewer vice-counties.

Nationally Scarce Category B - Notable B (Nb)

Definition.
Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in between 31 and 100 10 km squares of the National Grid or, for less well recorded groups, within eight and twenty vice-counties.

Nationally Scarce - Notable (N)

Definition.
Taxa which do not fall within RDB categories but which are none-the-less uncommon in Great Britain and are thought to occur in between 16 to 100 10 km squares of the National Grid. Species within this category are often too poorly known for their status to be more precisely estimated.

Summary of the IUCN categories and criteria.

REGIONALLY EXTINCT (RE)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. In this review the last date for a record is set at fifty years before publication.

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.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable.

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 (DD)
A taxon is Data Deficient 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. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

GB Rarity Status categories and criteria

Nationally Rare (NR)
Native species which have not been recorded from more than 15 British hectads since 31st December 1979 and where there is reasonable confidence that exhaustive recording would not find them in more than 15 hectads. This category includes species which are probably extinct.

Nationally Scarce (NS)
Native species which are not regarded as Nationally Rare AND which have not been recorded from more than 100 British hectads since 31st December 1979 and where there is reasonable confidence that exhaustive recording would not find them in more than 100 hectads.

Other species status terminology.

- Local. Species that are restricted in distribution either geographically or by habitat. Also used for species that are widespread but infrequently encountered, e.g. encountered in no more than 300 10km squares of the national Ordnance Survey grid since 1970. Or those species listed as such, based upon modern geographical data, by ISIS (2010) and/or relevant recording schemes.
- Widely Scattered. Generally distributed but at low densities.
- Southern. Mainly or completely confined to southern England and/or its westerly or easterly regions – as indicated.
- Common. Generally widespread throughout the UK.
- Unknown. Usually indicates a lack of available data for difficult taxa but may also imply recent taxonomic confusion.

Annex 3
Invertebrate Site Quality Guidance

SSSI Selection Criteria

The JNCC updated the Guidelines for the Selection of Biological SSSIs Chapter for terrestrial and freshwater invertebrates in 2019.

The old version focussed on selection criteria for sites which supported important populations of well-studies groups, such as butterflies and dragonflies.

The current version recognises the importance of invertebrates in general terms and considers all groups where there is sufficient data available. It also considers the value of assemblages of specialised habitats for invertebrates, habitat heterogeneity/mosaics and habitat associations as much as the individual species and groups.

It also considers how site selection should include representation of international sites features, Nationally threatened species, Nationally Rare/Scarce species, and Species of country conservation priority, i.e.:

- International site features - Species listed on Annex II of the Habitats Directive and Annex 1 of the Habitats Regulations (such as Stag Beetle).
- Nationally threatened species – All sites that support species assessed as IUCN species categories of CR-Critically Endangered, EN-Endangered and VU-Vulnerable should be considered for notification.
- NT-Near Threatened species near to qualifying may be selected.
- NR-Nationally Rare species, those occurring in 1-15 10km squares, should be selected.
- NS- Nationally scarce species, those occurring in 16-100 10km squares, should be selected if locally few, or otherwise included as part of an appropriate habitat-based invertebrate assemblage.
- Species of country conservation priority-Section 41 (England) Priority species.

Ideally, site selection for species and assemblages should be based on stable populations that have been resident for at least three years.

The guidelines go on to explain that the country agencies (e.g. Natural England) are keen to promote invertebrate conservation by selecting habitat-based assemblages as well as single species. The assemblages are based on ecological coherence, either as a macro-habitat scale (e.g. grassland, woodland) or at a micro-habitat scale (e.g. bare ground).

As a consequence, Pantheon, the online analytical tool for assessing invertebrate interest, has been developed (see below and **Section 2**). This is instrumental in identifying and assessing nationally important assemblages, both as the macro and micro-habitat scale.

It is the recommendation in the guidance that consideration of inclusion of sites should be discussed with the country (e.g. Natural England) invertebrate specialist.

Pantheon – An Overview

Pantheon is an on-line spreadsheet used to analyse invertebrate sample data and assess assemblage data for favourable versus unfavourable condition by SSSI standards. Hence, if an assemblage or suite of assemblages are found to be in favourable condition this would indicate that the site is likely to be of significant importance for invertebrates.

Users import lists of invertebrates (called “samples”) into Pantheon, which then matches the species to the preferred name in the *UK species inventory* (a list of species maintained by the Natural History Museum). Not all macro-invertebrate taxa are included in the database. To date over c13,000 species have been assessed, this being about a quarter of the total macro-invertebrate fauna (estimated at 37,000). It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, bugs and hoppers, moths, ants, bees, wasps, spiders and molluscs.

The method for defining species resources was broadly similar to that followed in Natural England Research Report 024 (Webb *et al.*, 2010).

> *‘For each species, a literature search was undertaken. All relevant ecological information was extracted and added to a spreadsheet. This included ‘structural elements of the habitats that the species is generally associated with (e.g. emergent vegetation, seed heads) and/or other environmental factors that it requires, host plant and/or animal species alongside ecological guild of larvae as well as adults where these differed, (e.g. herbivore, carnivore). Only those resources which were considered important to the species in completing its life cycle were included’.*

The assemblage types are labelled in terms that relate to their favoured habitats in order to make them accessible to non-specialists. However, they are actually defined by lists of characteristic species that are generally found together in nature. Three levels are recognised in the classification.

‘Broad Biotopes’ and ‘Habitats’ (which replace the original ‘Broad assemblage types (BATs))’. These are a comprehensive series of assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites.

Specific assemblage types (SATs) are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value.

Since 2008 there has also been a third category of assemblage types that cut across this classification. They are mainly defined by lists of species dependent on a particular environmental resource, such as flowers as a source of pollen and nectar, or carrion and dung. The assemblage type classification is given below.

Textual descriptions of each assemblage type and its habitats have been prepared for incorporation into a web-based database.

Pantheon Guidance on Scoring Systems

The Pantheon website explains the scoring system behind the database, a principal aim of which is to help assess sample quality for nature conservation purposes.

The scoring systems make use of species richness, threat status, rarity and characteristic species for each broad biotope, habitat and resource. The four current scoring systems are described below.

1. Count – the number of species within each category.

2. Conservation Status – threat and rarity status from published reviews.

Pantheon explains that:

"The conservation status of species is complicated by the fact that there are two different systems in place – an 'old' system, that combines both threat and rarity, and a 'new' system that separates these. New reviews replace the old conservation status. The conservation status is also used to generate Species Quality Indices (SQI).

Sample quality can simply be derived from the overall number of species with a conservation status, and the number of species within each type of status."

(N.B. Some statuses are reported in square brackets e.g. [RDB3]. This is to indicate that these are considered out of date and should be used with caution).

The 'new' system is a two-pronged approach that separates rarity from threat. Threat is calculated using internationally recognise post-2001 IUCN criteria (see above).

The spiders and micro-moths are marked with a p before the status to indicated these are provisional statuses.

Two groups of flies were assessed using post-1994 IUCN criteria. The abbreviations for these are in brackets.

Rarity is calculated using the Great Britain Rarity Status:

Nationally Rare - Those species which have been recorded from between 1-15 British hectads (10km x 10km squares) within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectads.

Nationally Scarce - Those species which have been recorded from between 16-100 British hectads within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectads.

Species can have a status in both the threat and rarity categories above (e.g. *Carabus intricatus* is both Near Threatened and Nationally Rare).

The 'old' system – species having been evaluated using the pre-1994 criteria:

Including RDB 1- Endangered etc Na – Notable A etc

3. % representation (Percentage Representation)

For any given broad biotope, habitat or resource, the % representation is calculated by:

- The number of species in that resource in the sample / the total number of species in that resource in the Pantheon database.

High scores suggest that the sample includes a high proportion of characteristic species, which can be an indicator quality. Scores of 10-20% may indicate good quality.

Caution should be applied where the number of species coded (assigned) to any given category is 10 or less.

4. SQI – Species Quality Indices

Quality indicators have been used elsewhere already (e.g. dead wood invertebrate assemblages). Each species recorded from the sample are given a Species Quality Score (SQS) based on their conservation status (see definitions in **Table A3.1** below). Where there is robust recent information to show that the official status is no longer appropriate, the SQS assigns a rare or scarce status using the most recent information (as referenced in the Source of Rarity column).

The SQI is equal to the sum of all SQSs in any given resource, divided by the number of species. The score is then multiplied by 100 to give a 3 figure value without decimal places.

Any SQI score derived from a small number of species (15 or less) should be treated with caution.

Table A3.1 Species Quality Scores and Definitions

SQS	Definition
0	Not native. Not all of these are listed as not native in the status review: some are given no score, but the text says that they are thought not to be native. It is not always possible to tell whether a species is native or whether the reviewer thought it is native.
1	Species that are not rare or scarce. Includes those that are New to Britain.
4	Scarce species that are not listed as threatened under post-1994 or post-2001 IUCN criteria. Rare species listed as RDB K or RDB I under pre-1994 criteria. Notable species (Na, Nb, and Notable).
8	Rare species that are not listed as threatened under post-1994 or post-2001 IUCN criteria. Rare or scarce species listed as Vulnerable under post-1994 or post-2001 criteria. Rare species listed as RDB 2 or RDB 3 under pre-1994 criteria.
16	Rare or scarce species listed as Endangered under post-1994 or post-2001 criteria. Rare species listed as RDB 1 under pre-1994 criteria.
32	Rare or scarce species listed as Critically Endangered, Critically Endangered (Possibly Extinct), Regionally Extinct, Extinct, or Extinct in the Wild under post-1994 or post-2001 criteria.

Further information on Pantheon is available here: http://www.brc.ac.uk/pantheon/about/pantheon

Annex 4

White-clawed Crayfish eDNA Results

SureScreen Scientifics

Folio No: E18939
Report No: 1
Purchase Order: 2342
Client: ECOLOGICAL PLANNING AND RESEARCH LTD
Contact: *** INFO (ALWAYS SEND HERE TOO PLEASE) ***

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA SAMPLES FOR THE DETECTION OF CRAYFISH SPECIES AND CRAYFISH PLAGUE

SUMMARY

All organisms continuously release small amounts of environmental DNA (eDNA) into their habitat. By collecting and analysing this eDNA from water samples from lakes, ponds or rivers we can detect the presence or absence of crayfish species including: the white-clawed crayfish (Austropotamobius pallipes), signal crayfish (*Pacifastacus leniusculus*), the marbled crayfish (*Procambarus virginalis*) and the crayfish plague (*Aphanomyces astaci*).

RESULTS

Date sample received at Laboratory: 20/07/2023
Date Reported: 01/08/2023
Matters Affecting Results: None

Lab Sample ID.	Site Name	O/S Reference	Species	Result	SIC	DC	IC	Positive Replicates
FK1319	Loddon Garden Village Sample C	SU 743 677	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
FK1320	Loddon Garden Village Sample E	SU 766 682	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
FK1321	Loddon Garden Village Sample A	SU 758 695	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
FK1322	Loddon	SU 759 693	*White-Clawed*	Negative	Pass	Pass	Pass	0

	Garden Village Sample D		*Crayfish*					
FK1323	Loddon Garden Village Sample B	SU 753 688	*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Lauryn Jewkes **Approved by:** Jennifer Higginbottom

METHODOLOGY

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species: white-clawed crayfish, signal crayfish and crayfish plague, ensuring no DNA from any other species present in the water is amplified.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security. These methods have been extensively tested since 2015 in a number of different environments, habitats, conditions and ecological situations in order to successfully enable the full application of eDNA for the detection of crayfish species and the crayfish plague.

RESULTS INTERPRETATION

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative species presence.
Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.
Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

Annex 5

Barkham Brook White-clawed Crayfish Habitat Suitability Sample Locations

East 1 - SU7660 6815

Upstream

Downstream

East 2 - SU7663 6821

Upstream

Downstream

East 3 - SU7664 6835

Upstream

Downstream

Middle 4 - SU7658 6843

Upstream

Downstream

Middle 5 - SU7643 6867

Upstream

Downstream

Middle 6 - SU7643 6867

Upstream

Downstream

North 7 - SU7606 6915

Upstream

Downstream

North 8 - SU7596 6925

Upstream

Downstream

North 9 - SU7606 6915

Upstream

Downstream