

## Copyright Notice

Staff and students of Anglia Ruskin University are reminded that copyright subsists in this extract and the work from which it was taken. This Digital Copy has been made under the terms of a CLA licence which allows you to:

- \* access and download a copy
- \* print out a copy

This Digital Copy and any digital or printed copy supplied to or made by you under the terms of this Licence are for use in connection with this Course of Study. You may retain such copies after the end of the course, but strictly for your own personal use.

All copies (including electronic copies) shall include this Copyright Notice and shall be destroyed and/or deleted if and when required by Anglia Ruskin University.

Except as provided for by copyright law, no further copying, storage or distribution (including by e-mail) is permitted without the consent of the copyright holder.

The author (which term includes artists and other visual creators) has moral rights in the work and neither staff nor students may cause, or permit, the distortion, mutilation or other modification of the work, or any other derogatory treatment of it, which would be prejudicial to the honour or reputation of the author.

Course of Study:

**(MOD002733) British Wildlife and Conservation**

Title:

**The conservation status of British invertebrates (British Wildlife)**

Name of Author:

**Jon Webb and Andy Brown**

Name of Publisher:

**Cambridge University Press**



# The conservation status of British invertebrates

Jon Webb and Andy Brown

**An overview of the current conservation status of 3,769 invertebrates, some 10% of the total number of terrestrial and freshwater invertebrate species found in Britain. A rolling programme of status reviews is recommended.**

A Green-eyed (Norfolk) Hawker *Aeshna isosceles* (EN) in flight. Although Endangered and much-threatened by saline incursion as a result of increased storminess and sea-level rise, the Green-eyed Hawker appears to be expanding its range away from its Norfolk and Suffolk Broadland heartlands to other wetlands in eastern England. Richard Revels

The first review of the conservation status of the British invertebrate fauna was published nearly 30 years ago in two 'British Red Data Book' volumes (Shirt 1987; Bratton 1991). It used a status classification which combined threat and distribution, which, while gaining widespread use within Britain, failed to be adopted elsewhere. Notwithstanding its broad scope, data availability at the time was such that it was unable to cover all the macro-invertebrate taxonomic groups found in Britain. Although subsequent publications updated some of the information and covered new groups (e.g. Wallace 1991 covered the caddisflies), none of these used the now internationally accepted and universally adopted International Union for the Conservation of Nature (IUCN) protocols. Since the review and its updates have been published,

there have been significant changes in the ranges and/or numbers of many species in recent years (Burns *et al.* 2013) as a result of factors including positive conservation action, losses to development, adverse land management and climate change. Many species have also been added to the British fauna as a result of apparently natural colonisation, or by deliberate or unintentional introduction (Parsons 2010).

As an up-to-date understanding of the conservation status of invertebrates is critical to the appropriate targeting of scarce conservation resources, a re-assessment of the status of the British invertebrate fauna has long been overdue. A modern review would form the essential baseline for the identification of species' conservation priorities in Britain, and, coupled with information

on the distribution of habitats and species, would indicate for which habitats and in which parts of the country priority conservation efforts are required. Status reviews also play a vital role in the strategic planning of built and other forms of development and are invaluable in identifying sites for protection as Sites of Special Scientific Interest (SSSIs) under domestic legislation and as Special Areas of Conservation (SACs) under the EU Habitats and Species Directive. They may also come to play a greater role when we assess the condition of these sites.

The purpose of this article is to alert readers to the existence of a significant new programme of invertebrate status reviews, to provide an overview for the taxa embraced by the programme so far, and to introduce the idea of using the results of repeat reviews to chart formally the changing risk of extinction faced by the British invertebrate fauna. The IUCN documents and the reviews themselves provide information on exactly how each review was conducted, and this is not repeated here.

## Methods

Natural England instigated its most recent Species Status project in 2012, working with Natural Resources Wales and the Joint Nature Conservation Committee (JNCC) to oversee production of a series of up-to-date status reviews. Both Natural England and Natural Resources Wales have resourced publication of the reviews, while an inter-agency working group (consisting of invertebrate specialists from Natural England, Natural Resources Wales and Scottish Natural Heritage) acts as a peer-review panel, with JNCC (the current IUCN-accredited GB authority) sanctioning the drafts.

The geographical region covered by each review is, by convention, Great Britain. Northern Ireland generally aligns with the Republic of Ireland in production of biogeographically more relevant status assessments, and the Channel Islands and Isle of Man are also excluded on political and/or biogeographical grounds. Each review involved

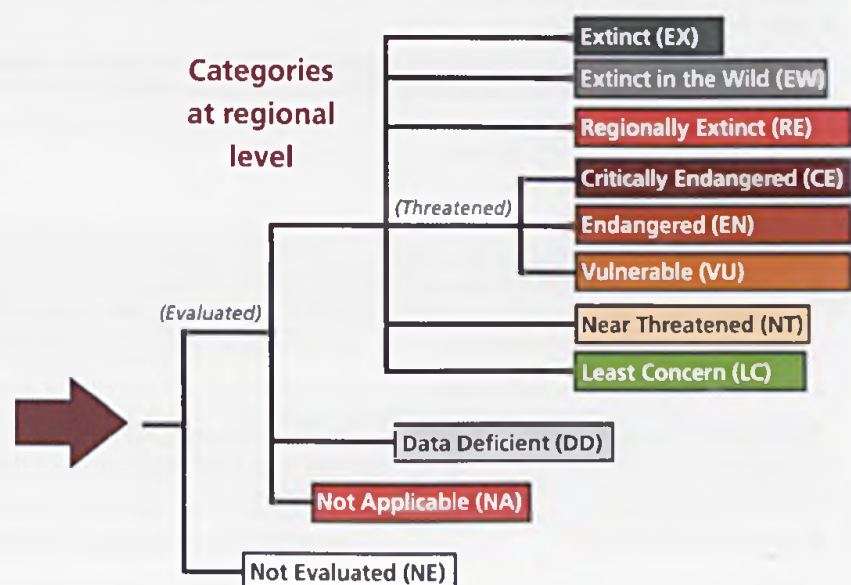
an assessment of each species' IUCN national threat status and an assessment of its national rarity/scarcity. These assessments are founded on numerical data collected and analysed as part of the status-review process.

## IUCN National Threat Status

An IUCN status assessment places each species within a particular taxonomic group into an appropriate threat category (Fig. 1 indicates the relationships between the threat categories): Extinct, Extinct in the Wild, Regionally Extinct (with Great Britain classed as the region), Critically Endangered, Endangered or Vulnerable. Species which are not assigned to a threat category are categorised as Near Threatened, Least Concern or Data Deficient. A minority of species in the group may be assessed as 'Not Evaluated', when they are, for example, non-native or of dubious taxonomic validity. For more information, the appropriate guidelines should be consulted (IUCN 2012a, 2012b, 2014).

The groups included in the first tranche of commissioned status reviews have been those with active Biological Records Centre ([www.brc.ac.uk](http://www.brc.ac.uk)) recording schemes, with the reviews conducted by experts in the relevant taxonomic groups (quite often the scheme administrator). Records for all species in the chosen taxonomic group (not just those assumed to have a conservation status) were collated. In general terms, the reviews sought to embrace as many verified records as possible (Box 1).

**Figure 1.** Hierarchical relationships of the categories (after IUCN 2014).





**Box 1. Sourcing records of the British mayflies (Ephemeroptera): an example of how records were sourced for the invertebrate reviews (after Macadam 2016)**

*'All 51 species included in the Fauna Europaea checklist of Ephemeroptera (Mayflies) of Britain (Macadam, 2012) are included in this review. The Ephemeroptera Recording Scheme has, since its formation in 2000, collated information about these species from the following data sources:*

- *Historic records as published in the national journals (and in some cases also local journals);*
- *Published county reviews;*
- *Voucher specimens available through national and local museums;*
- *Modern records, arising from the recording activity of the Statutory Environment Agencies and the freshwater invertebrate recording community.'*

Each review has used the internationally accepted IUCN Red List guidelines (IUCN 2012a, 2012b, 2014). While the IUCN process tests the available data for each species against each of the Criteria, data availability has a major influence on the degree to which each can be applied. An overview of the relative use made of each during the assessment of invertebrates is provided in Box 2.

### Great Britain Rarity Status

The identification of invertebrates as Nationally Rare and Nationally Scarce is a practice unique to Britain and has found limited application in other

taxonomic groups. The concept of national rarity/scarcity applied to native species has proved very useful for site notification and for determining the quality of survey locations. It should be noted that the term Nationally Rare is not to be confused with the older term 'Rare' (also called RDB3) that was used in earlier reviews.

- Nationally Rare species are defined as those which have been recorded from between 1 and 15 British hectads (10km × 10km squares) within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.
- Nationally Scarce species are those which have been recorded from between 16 and 100 hectads within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.

The date class used varies among taxa, reviewers choosing a date that is most applicable to their data, often a date that divides the available data set roughly in half. The years 2000, 1990 and 1980 have most frequently been used in the reviews.

## Results

### IUCN National Threat Status

Tables 1a and 1b divide the terrestrial, freshwater and brackish-water (but not marine) macro-invertebrate species into groups when current species data (a) do or (b) do not permit a status review at this time. This division is based not only on the availability of appropriate information, in particular biological records of a sufficient

**Box 2. Overview of the relative use made of each of the IUCN guidelines during assessments of the British invertebrate fauna**

IUCN Criterion	Application to the current published invertebrate assessments
A: Population reduction: direct measurements through observation, estimation and inference	Applied mostly in well-studied groups, such as butterflies and dragonflies
B: Geographical range: changes in range, fragmentation and numbers of occupied locations	Applied in most groups: data are usually available, especially for conspicuous species, species with restricted ranges, or those found at few locations where decline or fluctuation in range, habitat or locations occupied can readily be discerned
C: Small population size and decline	Infrequently used, except for some well-studied butterflies
D: Very small or restricted population	Applied in most groups: data are usually available to identify species with very restricted ranges or those found in a small number of locations
E: Quantitative analysis	Suitable data very rarely available

**Table 1a.** The 'better-known groups' of invertebrates in Britain listed by descending number of species

Common name	Taxa	No. of British species in group*	No. reviewed per IUCN protocol (April 2016)	Relative ease of review	Date of last review (non-IUCN unless specified)
True flies (better-known families)†	Diptera (in part)	4,000	648#	Difficult	1991 & 2005
Beetles (better-known families)‡	Coleoptera (in part)	3,100	1,337#	Difficult	1994
Micro-moths	Lepidoptera	1,700	0	Difficult	2012
Macro-moths	Lepidoptera	800	0#	Easy	2006
Spiders	Araneae	650	All	Easy	1991
Bees, wasps and ants	Hymenoptera (in part)	600	0	Easy	1991
Plant bugs and their allies	Hemiptera: Heteroptera	565	162#	Difficult	1992
Sawflies	Hymenoptera (in part)	500	0	Difficult	Never reviewed
Planthoppers	Hemiptera: Homoptera (in part)	394	0#	Difficult	1992
Freshwater and brackish-water molluscs	Mollusca (in part)	205	All	Easy	1991
Caddis flies	Trichoptera	194	All	Easy	1991
Centipedes and millipedes	Chilopoda and Diplopoda	114	All	Easy	1991
Lacewings and their allies	Neuroptera	69	0	Difficult	1991
Butterflies	Lepidoptera	62	All	Easy	1997 (IUCN)
Mayflies	Ephemeroptera	53	All	Easy	1990
Dragonflies and damselflies	Odonata	52	All	Easy	1987
Woodlice and their allies	Isopoda	45	All	Easy	1991
Stoneflies	Plecoptera	35	All	Easy	1990
Grasshoppers and crickets	Orthoptera	30	All	Easy	1987
Freshwater and brackish-water crustaceans	Amphipoda, Bathynellacea, Decapoda and Mycidacea	28	0	Difficult	Never reviewed
Pseudoscorpions	Pseudoscorpions	27	0	Difficult	Never reviewed
Harvestmen	Opiliones	25	0	Difficult	Never reviewed
Earwigs and cockroaches	Dermaptera & Dictyoptera	18	0	Difficult	1987
Scorpion flies and alder flies	Mecoptera, Megaloptera and Raphidioptera	15	0	Difficult	1991

\*Some figures have been rounded to the nearest 1,000, 100 or 1

†Poorly known and/or poorly recorded families include the Bibionidae, Cecidomyiidae, Ceratopogonidae, Chamaemyiidae, Drosophilidae, Hippoboscidae, Nycteribiidae, Oestridae, Phoridae, Platypezidae, Scatopsidae, Sciariidae, Simuliidae, Sphaeroceridae and Thaumaleidae.

‡Poorly known and/or poorly recorded families include the Clambidae, Corylophidae, Leioididae, Kateretidae, Nitidulidae (in part), Phalacridae, Ptiliidae, Scydmaenidae and Staphylinidae (in part).

#Further reviews are under way and in early-stage preparation.



**Table 1b.** The 'poorly known' groups of invertebrates in Britain listed by descending number of species

Common name	Taxa	No. of British species in group
Nematodes	Nematoda	10,000 (?)
Parasitic wasps	Hymenoptera (in part)	6,000
True flies (poorly known families)‡	Diptera (in part)	2,100
Mites	Acari	2,000
Beetles (poorly known families)†	Coleoptera (in part)	1,000
Aphids and allies	Sternorrhyncha	800
Rotifers	Rotifera	520
Biting lice	Mallophaga	500
Water fleas, flatworms, ostracods etc	Various freshwater groups	320
Booklice, stylops etc	Other insect groups	300
Springtails	Collembola	290
Leeches, earthworms, aquatic worms	Annelida	171
Water bears	Tardigrada	74
Ticks	Ixodoidea	22

For meanings of symbols, see Table 1a on p. 413.

Many sawflies, including this Figwort Sawfly *Tenthredo scrophulariae* (Not Assessed), are large, attractive and familiar species. Yet systematic recording of the distribution and numbers of this and many other invertebrates is in its infancy and the available data suggest that status assessments across all groups would be difficult.

Andy Brown



number, but also on how these data are stored and the specialist knowledge required to interpret this information. These tables suggest that, resources permitting, it should be possible to review the status of c. 13,900 species out of a total of c. 37,400 macro-invertebrates in Great Britain.

A total of 12 reviews covering a diversity of invertebrate taxa has now been published as part of the Species Status project, complementing existing recent reviews on water beetles (Foster 2010), dragonflies (Daguet *et al.* 2008), butterflies (Fox *et al.* 2010) and hoverflies (Ball & Morris 2014). Under the auspices of the Species Status project a further three reviews are in late-stage preparation (see Table 2).

To date, a total of 3,769 invertebrates has been recently

The driftline beetle *Eurynebria complanata* (EN). This predatory species is strongly associated with sandy beaches, and was last recorded in England in June 2002. It is now found in only seven locations along the Welsh coast, with an area of occupancy of some 48km<sup>2</sup>. Even here it appears to be declining rapidly, and shows such extreme fluctuations that national extinction is a strong possibility. John Walters



reviewed in accordance with the IUCN guidelines. This amounts to some 27% of the species in the 'better-known' groups listed in Table 1a. Essentially, these are groups that have readily available identification keys, active recorders and a history of recording. Of those reviewed, 48 (1.3%) are already regarded as Regionally Extinct. A further 400 (11%) species are threatened with extinction (classed as Critically Endangered, Endangered or Vulnerable). Over 10,000 species in the 'better-known' groups have

yet to be reviewed, including various families of true flies and beetles, the macro- and micro-moths and the bees, wasps and ants.

Table 2 provides summary data from the reviews, including the absolute numbers of species in each IUCN category. The '% Threatened' column expresses the summed values of CR, EN and VU as a percentage of the total number of species in the review. These values vary from 3% (isopods and myriapods) to 31% (butterflies).

**Table 2.** A summary of the recent threat status of British invertebrates in assessment-date order

Review Information				IUCN Status								
Common name of group reviewed	Date	Author	No. of species	% Threatened	CR	EN	VU	NT	DD	RE	LC	NE
Dragonflies	2008	Daguet, C., <i>et al.</i>	43	14	0	4	2	6	1	3	27	0
Butterflies	2010	Fox, R., <i>et al.</i>	62	31	2	8	9	11	0	4	28	0
Water beetles	2010	Foster, G.N.	391	11	5	8	22	36	1	5	234	80
Darkling beetles and their allies	2014	Alexander, K.N.A., <i>et al.</i>	180	11	0	0	19	1	6	9	111	34
Hoverflies	2014	Ball, S.G., & Morris, R.K.A.	282	5	4	3	6	10	8	0	249	2
Leaf beetles	2014	Hubble, D.	283	16	13	17	12	5	7	3	208	18
Molluscs	2014	Seddon, M.B., <i>et al.</i>	205	9	4	2	13	10	10	0	143	23
Soldier beetles and their allies	2014	Alexander, K.N.A.	114	7	1	3	4	5	0	5	79	17
Stoneflies	2015	Macadam, C.	34	6	1	0	1	0	4	1	27	0
Grasshoppers and crickets	2015	Sutton, P.G.	79	5	1	1	2	2	0	0	27	46
Myriapods and isopods	2015	Lee, P.	187	3	0	2	4	7	10	0	110	54
Water bugs	2015	Cook, A.	93	4	1	0	3	4	2	0	79	4
Shield bugs	2016	Bantock, T.	69	10	4	2	1	0	0	3	50	9
Ground beetles	2016	Telfer, M.	369	12	10	19	16	33	3	3	266	19
Caddis flies	2016	Wallace, I.	197	8	6	3	8	6	20	1	153	1
Mayflies	2016	Macadam, C.	53	9	0	3	2	0	6	2	38	0
Dance flies	in prep	Drake, M.D.	305	5	7	2	6	11	39	2	230	8
Soldierflies and their allies	in prep	Drake, M.D.	161	14	4	9	10	10	2	4	121	1
Spiders	in prep	Harvey, P., <i>et al.</i>	664	17	20	27	64	24	11	3	490	25
<b>TOTALS</b>	<b>19</b>		<b>3,769</b>	<b>11</b>	<b>83</b>	<b>113</b>	<b>204</b>	<b>181</b>	<b>130</b>	<b>48</b>	<b>2,670</b>	<b>340</b>



### Great Britain Rarity Status

Neither the dragonfly review nor the butterfly review provided information about GB Rarity Status; they focused purely on IUCN threat criteria. The water beetle and hoverfly reviews combined the IUCN threat status with the National Rarity/Scarce status, listing such species, along with others, as 'Near Threatened'. All of the other reviews (those under the auspices of the Species Status project) have kept the two classifications separate. Thus, while we are unable to present assessments for all taxa, GB Rarity Status assessments are available for a majority of species. A total of 611 taxa is classed as Nationally Rare and a further 904 as Nationally Scarce, together (1,515) some 40% of the total invertebrates reviewed.

### Discussion

The reviews described in this article provide an up-to-date, authoritative and transparent statement of the status of a significant fraction of our invertebrate fauna. The current number of species embraced by the programme is some 27% (3,769) of the total number of species in the 'better-known' terrestrial and freshwater invertebrate fauna. The completion of reviews under way for scarab beetles, rove beetles (in part), weevils, plant bugs, macro-moths, leafhoppers and more by 2017 will bring the total number embraced by the programme to about 6,900 species, equating to some 50% of the better-known macro-invertebrates in Britain.

For a number of reviews, a significant effort had to be made to collate appropriate data from a large number of sources. While this made the reviewing of these taxa a rather protracted business, it has had the enormous benefit of bringing together quantitative data on the distribution of these species for the first time ever. This is likely to benefit much other ecological research and conservation action, as the records have been validated and

assimilated into the relevant national databases. As an example, the national recording scheme data-holdings for scarab beetles increased from 16,000 to more than 40,000 records as a direct result of the preparatory work for the forthcoming review (Steve Lane pers. comm.).

Any extension of the programme beyond the groups already embraced is likely to be hindered not only by available finances and the want of a sound national monitoring scheme, but also by a lack of data or any attempt at a compilation of the existing data. Table 1 shows our assessment of the 'ease of review' for each major taxonomic group. This is a summary of the ability to undertake reviews based on the status of data-holdings, the amount of data, the availability of experts as assessors and the presence of an active national monitoring scheme.

The IUCN guidelines are intended for universal application across taxa and allow for categorisation based on a variety of data types. In essence, the criteria concern species' national range, population size, and changes in these two parameters. At the



**The Chequered Skipper butterfly *Carterocephalus palaemon* (EN) is currently found on open grassland in western Scotland. It was once more widespread, frequenting rides in native broadleaved woodlands in the East Midlands, but has not been reported in England since 1976.**

Andy Brown





**The New Forest Shieldbug *Eysarcoris aeneus* (EN).** This species has undergone a widespread decline and is now confined to wet heaths in the New Forest and the Isle of Wight. The small and discrete nature of colonies renders them at high risk of local extinction through habitat loss or changes in habitat condition and through all manner of chance events. Tristan Bantock

extremes, there are species for which we have negligible information concerning these attributes, while at the other are those for which we have an excellent idea of their total range, total numbers, and annual trends in these and sometimes even in their productivity. Across taxa, many fungal groups are to be found at one extreme, with birds at the other. The vast majority of invertebrate taxa are somewhere in between. With few exceptions, the data crucial to the categorising of invertebrates have related to their distribution and changes in this between two defined periods. Only very rarely have attributes directly concerning population size been available for use. We suspect that the available information leads us to underestimate the extinction risk faced by British invertebrates. In this regard, it is noteworthy that a comparatively high number of butterflies (31%) are regarded as Threatened, this being a data-rich group, with species often qualified against IUCN Criterion A (population reduction). Indeed, 12 species (19%) identified as Threatened by the Butterfly review were qualified only against Criterion A. In comparison, most of the species qualifying as Threatened in other taxa have done so against Criterion B (geographical range) and Criterion D2 (restricted number of locations/area of occupancy).

If more data were available to allow identification of trends in these other groups, it is highly likely that more species would qualify for a threatened category.

The preferred unit for IUCN status assessments is the tetrad (2km × 2km square). Yet many invertebrate data are collated and held at the hectad level (a legacy from the days of dot maps), hampering threat categorisation. This is because an assessment based on the number of occupied hectads will likely overstate a distribution which might have been described in terms of occupied tetrads or the species' real distribution. Some of the earlier reviews used hectads as the 'currency' of change for CR, EN, VU and NT species, although in reality these

are often references to single locations. The more recent reviews use tetrads and locations in different contexts, explicitly in order to avoid ambiguity. Many field recorders collect precise locational information and may even store this information at a very fine level (ten-figure grid references being not uncommon). We encourage all recorders to adopt fine-scale recording and schemes-managers to retain this fine-scale information, allowing separate assignment to tetrads, hectads or whatever unit size is appropriate to the analysis being conducted. The extra effort required is small in relation to the huge increase in precision gained and the consequent benefits for conservation action, should such become necessary.

A clear assessment of the impact of recording effort on the assignment process is a critical part of any review. This is because a paucity of records may erroneously lead to the inflation of both the IUCN Status and GB Rarity Status assignments. Broadly speaking, there needs to have been a concerted and up-to-date effort to find or document any species for it to be assigned to a threat category. A further safeguard is a check on data quality by the Inter-Agency Working Group (IAWG).

Rarity Status is a useful way of recognising species which are range-restricted and those likely



to be rare as a consequence. Some may be restricted to certain geographical areas, while others may be restricted by habitat. They may or may not also be threatened. The occurrence of Nationally Rare or Nationally Scarce species on sites (particularly when they are present in numbers and definable as an assemblage) is also an accepted way of defining site interest. Indeed, the SSSI guidelines (JNCC 1989) make particular reference to the representation of rare and scarce species, stating that these should be represented in the SSSI series and that they 'should generally be conserved as part of rich invertebrate faunal assemblages'.

### Using Status Reviews as indicators of change

The distribution and numbers of some species, notably many birds, butterflies and some plants and moths, are very well known, and surveillance schemes are in place which allow us to monitor and, often annually, report change in these parameters (e.g. the British Trust for Ornithology's Breeding Bird Survey: Harris *et al.* 2014). Whereas additional species are subject to periodic formal census (e.g. approximately ten-yearly gull and Peregrine surveys: Banks *et al.* 2009, 2010) or

**The Green Dock Beetle *Gastrophys viridula* (LC) is a widespread leaf beetle which, as its name suggests, feeds on the leaves of equally widespread docks. Found in 645 hectads since 1990, the species is categorised as of 'Least Concern'. Andy Brown**



receive more or less *ad hoc* recording effort (e.g. through UK biological recording schemes), we know comparatively little about changing numbers for the majority of our 50,000–100,000 species of all taxa.

While we may be unable to track change in numbers for a majority of species, the IUCN assessment process opens up the possibility of tracking the changing extinction risk which they face. This is because the national IUCN threat categories allow us to express threat to different species – both within and across taxonomic groups – in a common 'language' and, by the simple repetition of threat assessments over time, we become able to monitor and report changes in threat. We might simply chart the proportion of species in each threat category, but a more sophisticated approach might involve the production of a Red List Index (RLI), as first described by Butchart *et al.* (2004) and then improved to make it more widely applicable (Butchart *et al.* 2007). Butchart *et al.* (2004, 2005) have shown in a series of papers how the RLI is robust, temporally sensitive, representative and comprehensive and that it can be applied to a diversity of taxa, and Quayle *et al.* (2007) and Szabo *et al.* (2012) have successfully applied it at the national scale and below in Canada and Australia.

Although there are certain practicalities to be borne in mind in adopting such an approach, the necessity of having status assessments to work from is paramount among them. While we now have far more up-to-date assessments than has hitherto been the case, and a small number are in the pipeline, we need to lay the ground now to repeat these at regular intervals – say, every four to six years. The cost of conducting IUCN threat assessments varies with the number of species embraced by the task. Whole-group assessments may be expected to cost, very approximately, from £5,000 to £20,000. Across 20 major taxa, a broad estimate of costs would be some £100,000–£400,000 per cycle, in other words, some £20,000–£80,000 per annum across a programme staggered over a five-year cycle.

Neither the IUCN threat assessments nor the RLI, which uses the information derived from these assessments, is particularly good at capturing the deteriorating status of common





The Large Marsh Grasshopper *Stethophyma grossum* (NT) was once more widespread, found in lowland bogs, fens and valley mires from the Somerset Levels to the Norfolk Broads. Now Nationally Rare, following a huge reduction in range in recent years, it is confined to the New Forest and the Poole basin of Dorset. It is thus formally categorised as Near Threatened. Andy Brown

species that are declining slowly as a result of general environmental degradation. Indicators based on population trends are better suited for this, and show finer temporal resolution, and it will therefore be important to maintain current monitoring efforts for those well-studied groups, such as birds and butterflies, that are the subject of long-term monitoring schemes. Nevertheless, an increase in our ability to report on the status, and on status changes, of a much greater fraction of our biodiversity than is currently the case is

crucial (Burns *et al.* 2013), and we must find a means of closing the gap between the existing monitoring effort and that which is required to meet our needs. The use of threat assessments would provide us with:

- An unambiguous, quantitative, robust, temporally sensitive, easily understood and potentially all-embracing – and thus highly representative – ‘snapshot’ of the threats facing our wildlife.
- An ability to track change in numbers of species in the various threat categories and changes in the overall degree of threat faced by our wildlife.
- Much better information to use in identifying and updating our conservation priorities and informing the means by which we identify and agree them.
- A means of monitoring, reporting and celebrating the effectiveness of our conservation interventions, not least our efforts in relation to Biodiversity 2020 – the UK Government’s response to the United Nations Convention on Biological Diversity’s Aichi Targets (<https://www.cbd.int/sp/targets>).
- A means of comparing our progress and achievements with those elsewhere in

the world: our comparative efficiency and effectiveness.

- A means, potentially, of providing finer-scale trends for different habitats, ecosystems, taxonomic groups, political or biogeographical units, for species relevant to different international agreements or treaties, for species subject to different types of exploitation, and for those subject to different types of environmental pressure. We may anticipate eventual Europe-wide adoption, thus enabling nations to report



to Europe on progress with a number of international Directives and Conventions, not least as European status reviews already exist for saproxylic beetles (Nieto & Alexander 2010), dragonflies (Kalkman *et al.* 2010), non-marine molluscs (Cuttelod *et al.* 2011), and bees (Nieto *et al.* 2014) among a larger and increasing number for other taxa.

### Acknowledgements

Many thanks go to all the authors who took up the mantle of drafting a review through the Species Status programme and to the BRC for the assistance which they gave in enabling access to records. Thanks to Tristan Bantock and John Walters for the use of their images.

The resourcing of the project would not have happened had it not been for the support of senior staff within Natural England. We are grateful to Jon Curson, Richard Fox, David Heaver, Craig McAdam, Mark Parsons and Alan Stubbs, who commented on drafts, and to both Humphrey Crick (NE) and Mark Eaton (RSPB), who engaged

with us in helpful discussion about the production of a Red List Index.

### References

- Alexander, K. N. A. 2014. A review of the beetles of Great Britain: The Soldier Beetles and Their Allies. *Species Status* 16. Natural England Commissioned Reports, Number 134.
- Alexander, K. N. A., Dodd, S., & Denton, J. S. 2014. A review of the beetles of Great Britain: The Darkling Beetles and Their Allies. *Species Status* 18. Natural England Commissioned Reports, Number 148.
- Ball, S. G., & Morris, R. K. A. 2014. A review of the scarce and threatened flies of Great Britain. Part 6: Syrphidae. *Species Status* 9. Joint Nature Conservation Committee, Peterborough.
- Banks, A. N., Crick, H. Q. P., Coombes, R., Benn, S., Ratcliffe, D. A., & Humphreys, E. M. 2010. The breeding status of Peregrine Falcons *Falco peregrinus* in the UK and Isle of Man in 2002. *Bird Study* 57(4): 421–436.
- Bantock, T. 2016. A review of the Hemiptera of Great Britain: The Shield Bugs and their allies. *Species Status* 26. Natural England Commissioned Reports, Number 190.
- Bratton, J. H. (ed.) 1991. *British Red Data Book: Invertebrates Other Than Insects Book 3*. Joint Nature Conservation Committee, Peterborough.
- Burns, F., Eaton, M. A., Gregory, R. D., *et al.* 2013. *State of Nature report*. The State of Nature Partnership.
- Butchart, S. H. M., Stattersfield, A. J., Bennun, L. A., Shutes, S. M., Akçakaya, H. R., Baillie, J. E. M., Stuart, S. N. Hilton-Taylor, C., & Mace, G. M. 2004. Measuring global trends in the status of biodiversity: Red list indices for birds. *PLoS Biology* 2(12): 2294–2304. ([www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0020383](http://www.plosbiology.org/article/info:doi/10.1371/journal.pbio.0020383))

*Leistus montanus* (EN) is a montane species known from North Wales, the Lake District, the Cairngorms, and widely in western Scotland. Since 1980 there appear to have been only two British records. It is highly likely that climate change is the cause of its decline. John Walters





- Butchart, S. H. M., Stattersfield, A. J., Baillie, J. E. M., Bennun, L. A., Stuart, S. N., Akçakaya, H. R., Hilton-Taylor, C., & Mace, G. M. 2005. Using Red List Indices to measure progress towards the 2010 target and beyond. *Phil. Trans. R. Soc. B* 360: 255–268.
- Butchart, S. H., Resit Akçakaya, H., Chanson, J., Baillie, J. E., Collen, B., Quader, S., Turner, W. R., Amin, R., Stuart, S. N., & Hilton-Taylor, C. 2007. Improvements to the Red List Index. *PLoS ONE* 2(1): e140. doi:10.1371/journal.pone.0000140.
- Cook, A. 2015. A review of the Hemiptera of Great Britain: The Aquatic and Semi-aquatic Bugs Dipsocoromorpha, Gerromorpha, Leptopodomorpha & Nepomorpha. *Species Status* 24. Natural England Commissioned Reports, Number 188.
- Cuttelod, A., Seddon, M., & Neubert, E. 2011. *European Red List of Non-marine Molluscs*. Publications Office of the European Union, Luxembourg.
- Daguet, C., French, G., & Taylor, P. (eds) 2008. The Odonata Red Data List for Great Britain. *Species Status Assessment* 11. Joint Nature Conservation Committee, Peterborough.
- Drake, M. D. (in prep.) A review of the flies of Great Britain: the Larger Brachycera.
- Drake, M. D. (in prep.) A review of the flies of Great Britain: the Dance Flies (Dolichopodidae).
- Foster, G. N. 2010. A review of the scarce and threatened Coleoptera of Great Britain Part (3): Water beetles of Great Britain. *Species Status* 1. Joint Nature Conservation Committee, Peterborough.
- Fox, R., Warren, M. S., & Brereton, T. M. 2010. A new Red List of British Butterflies. *Species Status* 12. Joint Nature Conservation Committee, Peterborough.
- Harris, S. J., Risely, K., Massimino, D., Newson, S. E., Eaton, M. A., Musgrove, A. J., Noble, D. G., Procter, D., & Baillie, S. R. 2014. The Breeding Bird Survey 2013. *BTO Research Report* 658. British Trust for Ornithology, Thetford.
- Harvey, P. M., Davidson, I., Dawson, G., Hitchcock, P., Lee, P., Merrett, T., Russell-Smith, A., & Smith, H. (in prep.) A review of the scarce and threatened spiders (Araneae) of Great Britain.
- Hubble, D. 2014. A review of the scarce and threatened beetles of Great Britain: leaf beetles and their allies: Chrysomelidae, Megalopodidae and Orsodacnidae. *Species Status* 19. Natural England Commissioned Reports, Number 161.
- IUCN. 2012a. *IUCN Red List Categories and Criteria. Version 3.1*. 2nd Edition. IUCN Species Survival Commission. IUCN, Gland.
- IUCN. 2012b. *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels. Version 4.0*. IUCN Species Survival Commission. IUCN, Gland.
- IUCN. 2014. *Guidelines for Using the IUCN Red List Categories and Criteria. Version 11*. IUCN Species Survival Commission. IUCN, Gland.
- Joint Nature Conservation Committee. 1989. *Guidelines for selection of biological SSSIs*. Nature Conservancy Council, Peterborough.
- Kalkman, V. J., Boudot, J. P., Bernard, R., Conze, J. K., De Knijf, G., Dyatlova, E., Ferreira, S., Jović, M., Ott, J., Riservato, E., & Sahlen, G. 2010. *European Red List of Dragonflies*. Publications Office of the European Union, Luxembourg.
- Lee, P. 2015. A review of the millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda) of Great Britain. *Species Status* 23. Natural England Commissioned Reports, Number 186.
- Macadam, C. 2015. A review of the stoneflies (Plecoptera) of Great Britain. *Species Status* 20. Natural England Commissioned Reports, Number 174.
- Macadam, C. 2016. A review of the mayflies (Ephemeroptera) of Great Britain. *Species Status* 25. Natural England Commissioned Reports, Number 193.
- Nieto, A., & Alexander, K. N. A. 2010. *European Red List of Saproxyllic Beetles*. Publications Office of the European Union, Luxembourg.
- Nieto, A., Roberts, S. P. M., Kemp, J., Rasmont, P., Kuhlmann, M., García Criado, M., Biesmeijer, J. C., Bogusch, P., Dathe, H. H., De la Rúa, P., De Meulemeester, T., Dehon, M., Dewulf, A., Ortiz-Sánchez, F. J., Lhomme, P., Pauly, A., Potts, S. G., Praz, C., Quaranta, M., Radchenko, V. G., Scheuchl, E., Smit, J., Straka, J., Terzo, M., Tomozii, B., Window, J., & Michez, D. 2014. *European Red List of bees*. Publication Office of the European Union, Luxembourg.
- Parsons, M. 2010. The Changing Moth and Butterfly Fauna of Britain – The First Decade of the Twenty-First Century (2000–2009). *Entomologist's Rec. J. Var.* 122: 13–21.
- Quayle, J. F., Ramsey, L. R., & Fraser, D. F. 2007. Trend in the status of breeding bird fauna in British Columbia, Canada, based on the



***Cicindela maritima* (NT).** This spectacular carabid is a fore-dune specialist recently recorded from just 24 hectads in north-west Norfolk, east Kent and the coast between north Devon and Merionethshire. Its range has contracted in the past and these losses may be continuing. It is threatened by built development, coastal engineering works, recreational disturbance and potentially by sea-level rise and it is therefore formally categorised as 'Near Threatened'. Andy Brown

- IUCN Red List Index method. *Conservation Biology* 21: 1241–1247.
- Seddon, M. B., Killeen, I. J., & Fowles, A. P. 2014. A review of the Non-Marine Mollusca of Great Britain. *Species Status* 17. NRW Evidence Report No: 14. Natural Resources Wales, Bangor.
- Shirt, D. B. (ed.) 1987. *British Red Data Books: Insects Book 2*. Joint Nature Conservation Committee, Peterborough.
- Sutton, P. G. 2015. A review of the Orthoptera (grasshoppers and crickets) and allied species of Great Britain: Orthoptera, Dictyoptera, Dermaptera, Phasmida. *Species Status* 21. Natural England Commissioned Reports, Number 187.
- Szabo, J. K., Butchart, S. H. M., Possingham, H. P., & Garnett, S. T. 2012. Adapting global biodiversity indicators to the national scale: a Red List Index for Australian birds. *Biological Conservation* 148(1): 61–68. DOI: 10.1016/j.biocon.2012.01.062.
- Telfer, M. 2016. A review of the beetles of Great Britain: ground beetles (Carabidae). *Species Status* 26. Natural England Commissioned Reports, Number 189.
- Wallace, I. D. 1991. *A review of the Trichoptera of Great Britain*. Joint Nature Conservation Committee, Peterborough.
- Wallace, I. 2016. A review of the caddisflies (Trichoptera) of Great Britain. *Species Status* 27. Natural England Commissioned Reports, Number 191.

**Jon Webb** has worked at Natural England and its predecessor since 2002. Apart from a spell in a climate-change team, he has been employed as an invertebrate ecologist since that time.

**Andy Brown** has worked for Natural England and its predecessors since 1989. For most of this period he was Head of Ornithology, but currently is Principal Specialist for Species Conservation, with responsibilities which include advising on wildlife-conservation priorities.