Natural England Commissioned Report NECR187

A review of the Orthoptera (Grasshoppers and crickets) and allied species of Great Britain

Orthoptera, Dictyoptera, Dermaptera, Phasmida

Species Status No.21

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NATURAL ENGLAND

Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

Making good decisions to conserve species should primarily be based upon an objective process of determining the degree of threat to the survival of a species. The recognised international approach to undertaking this is by assigning the species to one of the IUCN threat categories.

This report was commissioned to update the threat status of grasshoppers, crickets and allied species from the named families from work originally undertaken in 1987, 1992 and 1994 respectively using the IUCN methodology for assessing threat.

It is expected that further invertebrate status reviews will follow.

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Further information
This report can be downloaded from the Natural England website: **www.gov.uk/government/organisations/natural-england**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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CONTENTS

1. Introduction to the Species Status project

1.1 The Species Status project

The Species Status project is a recent initiative, providing up-to-date assessments of the threat status of taxa using the internationally accepted Red List guidelines developed by the International Union for Conservation of Nature (IUCN) (IUCN, 2012a; 2012b; IUCN Standards and Petitions Subcommittee, 2013, 2014). It is the successor to the JNCC's Species Status Assessment project (http://jncc.defra.gov.uk/page-3352) which ended in 2008. This publication is one in a series of reviews to be produced under the auspices of the new project.

Under the Species Status project, the UK's statutory nature conservation agencies, specialist societies and NGOs will initiate, resource and publish Red Lists and other status reviews of selected taxonomic groups for Great Britain which will then be submitted to JNCC for accreditation (http://jncc.defra.gov.uk/page-1773). This means that the UK's statutory nature conservation agencies and JNCC will be able to publish red lists. All publications will explain the rationale for the assessments made. The approved threat statuses will be entered into the JNCC spreadsheet of species conservation designations (http://jncc.defra.gov.uk/page-3408).

1.2 The status assessments

This review adopts the procedures recommended for the regional application of the IUCN threat assessment guidelines which can be viewed at http://cmsdocs.s3.amazonaws.com/keydocuments/Reg_Guidelines_en_web%2Bcover%2Bbackcover.pdf. Section 3 and Appendix 1 provide further details. This is a two-step process, the first identifying the taxa threatened in the region of interest using information on the status of the taxa of interest in that region (IUCN, 2001), the second amending the assessments where necessary to take into account interaction with populations of the taxon in neighbouring regions (IUCN Standards and Petitions Subcommittee, 2013). In addition, but as a separate exercise, the standard GB system of assessing rarity, based solely on distribution, is used alongside the IUCN system.

1.3 Species status and conservation action

Sound decisions about the priority to attach to conservation action for any species should primarily be based upon objective assessments of the degree of threat to the survival of a species. This is conventionally done by assigning the species to one of the IUCN threat categories. However, the assessment of threats to survival should be separate and distinct from the subsequent process of deciding which species require action and what activities and resources should be allocated.

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2. Introduction to this review

The study of the Orthoptera and allied (orthopteroid) insects provides an opportunity to investigate both the ecological status of these species, and also the health of the environments that they live in, with some species being highly specialised in their habitat requirements and being lost through degradation and loss of such habitats.

A number of species from these groups, notably among the Tettigoniidae and Acrididae, have shown themselves to be sensitive indicators of climatic change. While more research is required to underpin and further validate these observations, it has become apparent that these species, along with notable examples from several other groups of insects, have responded dynamically to climatic amelioration. This is particularly relevant to the current work where some formerly rare and local species have become considerably more widespread and abundant, and conversely, where other species have started to disappear from formerly suitable habitats that have since become unfavourable.

2.1 Taxa considered in this review

The selection of taxa to be included in this review is based on the families which have been the subject of a national recording scheme, as coordinated by the Biological Records Centre (http://www.brc.ac.uk). The work of these schemes variously includes the collation of information 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 Orthoptera and allied insects recording community.

By focusing on the work of recording schemes it was possible to compare and contrast the modern data with the historic data in a way that has not been possible in the past. It was important to remain fully aware, however, of the variation in recorder effort – both regionally and in time. The taxa selected for this review are accordingly shown in Table 1.

Table 1. Insect taxa review in this study

Superfamily or order/ suborder (in brackets)	Family	Species	Name of Recording Scheme
Tettigonioidea	Rhaphidophoridae	2	Orthoptera and Allied Insects Recording Scheme
	Tettigoniidae	20	
Grylloidea	Gryllidae	7	
	Gryllotalpidae	1	
Acridoidea	Tetrigidae	3	
	Acrididae	17	
(suborder Blattodea)	Polyphagidae	1	
	Blaberidae	2	
	Blattidae	4	
	Blattellidae	6	
	Mantidae	2	
(order Dermaptera)	Anisolabididae	2	
	Labiidae	2	
	Forficulidae	3	
	Labiduridae	1	
(order Phasmida)	Phasmatidae	8	
		81	Total species covered by this review

The area covered in this review is Great Britain (i.e. England, Scotland and Wales only). While Northern Ireland forms part of the United Kingdom, the recent trend has been for that area to work with the Irish Republic to produce whole Ireland reviews. The Isle of Man and the Channel Islands are also not included, although species inhabiting these islands are identified, particularly where the species involved have formerly been recorded as occasional migrants.

The names of species covered by this review follow Haes and Harding (1997), although some more recent changes e.g. *Pseudomogoplistes vicentae*, are explained in the text. It should be borne in mind that earlier reviews will have used earlier checklists, and that nomenclature will therefore be somewhat different.

2.2 Previous reviews

2.2.1 A National review of Orthoptera: in the Invertebrate Site Register Report 46 (1983)

The first account of threatened British Orthoptera was in 1983, when Hadley included a review of British Orthoptera in the Invertebrate Site Register Report 46.

2.2.2 British Red Data Books: 2. Insects (1987)

Hadley (1982) was followed by, and updated in, the *British Red Data Books: 2. Insects* (Shirt, 1987), in which data sheets were given for each of the Category 1 (Endangered) and 2 (Vulnerable) species.

Table 2 analyses the species coverage by Category for the Superfamilies and families covered in the present volume, allowing for taxonomic changes which have occurred since 1987.

Table 2. Red List Categories (Shirt, 1987) for species covered in this review

Superfamily & Family	**Category 1 Endangered**	**Category 2 Vulnerable**	**Category 3 Rare**	**Category 5 Endemic**	**Appendix No post 1900 records**
Rhaphidophoridae					
Tettigoniidae		1			
Gryllidae	2				
Gryllotalpidae	1				
Tetrigidae					
Acrididae		1	1		
Polyphagidae					
Blaberidae					
Blattidae					
Blattellidae					
Mantidae					
Anisolabididae					
Labiidae					
Forficulidae					
Labiduridae					
Phasmatidae					

2.2.3 Atlas of grasshoppers, crickets and allied insects in Britain and Ireland (1997)

The *British Red Data Book* volume was followed by the publication of *Atlas of grasshoppers, crickets and allied insects in Britain and Ireland* (Haes and Harding, 1997). This atlas provided the most comprehensive overview of species distribution to date and, where appropriate, each 10km distribution map was annotated with the corresponding status of each species. This included designations for Nationally Notable species, divided into Lists A (species in Great Britain thought to occur between 15 and 30 10km squares) and B (between 31 and 100 10km squares) taken from Hadley (1983).

Table 3 analyses the species coverage by Category for the Superfamilies and families covered in the present volume, allowing for taxonomic changes which have occurred since 1997.

Table 3. Red Data Book and rarity categories (Haes and Harding, 1997) for species covered in this review

Superfamily & Family	Category 1 Endangered (RDB1)	Category 2 Vulnerable (RDB2)	Category 3 Rare (RDB3)	Category I Indeterminate (RDBI)	Category K Insufficiently Known (RDBK)	Extinct	Notable A	Notable B
Rhaphidophoridae								
Tettigoniidae		1					1	3
Gryllidae	2						1	
Gryllotalpidae	1							
Tetrigidae							1	
Acrididae		1	1					2
Polyphagidae								
Blaberidae								
Blattidae								
Blattellidae								3
Mantidae								
Anisolabididae								
Labiidae								
Forficulidae								2
Labiduridae						1?		
Phasmatidae								

2.2.4 The new review

There have been some major changes in the status of some orthoptera species since the last review in 1997, and the IUCN Guidelines have been revised (IUCN, 1994) and subsequently updated (IUCN, 2012a), making it necessary to revise the status of all orthopteroid species. It should be noted that the IUCN criteria for threat categories concentrate on imminent danger of extinction, whilst the older, non-IUCN criteria for Nationally Rare and Nationally Scarce relate to a small geographic distribution within Great Britain, without taking any account of trends, whether for increase or decline.

There has been nothing short of an extraordinary change in the fortunes of a significant number of species in this collective of orders since the first Red Data Book for insects was published in 1987. This includes the Field Cricket *Gryllus campestris*, which came so perilously close to extinction, and the Wart-biter *Decticus verrucivorus*, which has continued to decline on some sites and, with a lack of monitoring following apparently successful translocations; both species have benefitted in recent years from their respective Species Recovery Programmes. On the other hand, there is the appearance of three new species that have appeared as colonists, or potential colonists, on the back of northward European range expansions; and, of course, the spectacular range expansions of species like the Long-winged Cone-head *Conocephalus discolor* and Roesel's Bush-cricket *Metrioptera roeselii*. Indeed, some of the distribution maps provided in the 1997 atlas are almost unrecognizable for these

species. Therefore, in accordance with the revised threat status criteria, the following report provides a complete re-evaluation of the status of the insect Orders described in this review.

3. The IUCN threat categories and selection criteria as adapted for Invertebrates in Great Britain

3.1 Summary of the 2001 Threat Categories

A brief outline of the revised IUCN criteria and their application is given below. For a full explanation see Appendix 2 IUCN (2001; 2013) and the IUCN web site (http://www.iucnredlist.org/; www.iucn.org/). The definitions of the categories are given in Figure 1 and the hierarchical relationship of the categories in Figure 2. The categories *Extinct in the wild* and *Regionally Extinct* have not been applied in this review. All categories refer to the status in Great Britain (not globally).

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 (see Table 4).

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Table 4).

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Table 4).

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.

Figure 1. Definitions of IUCN threat categories (from IUCN 2001 with a more specific definition for regional extinction)

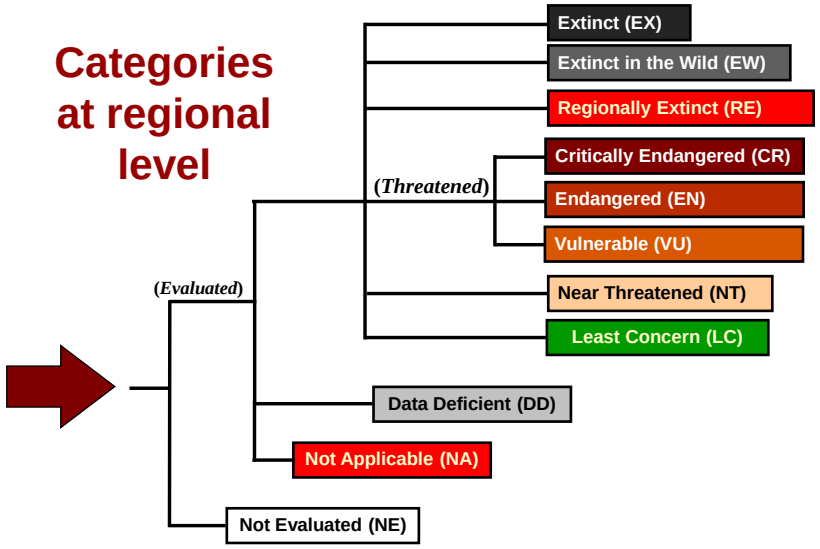

Figure adapted from IUCN (2001)

Figure 2. Hierarchical relationships of the categories

Taxa listed as *Critically Endangered*, *Endangered* or *Vulnerable* are defined as Threatened (Red List) species. For each of these threat categories there is a set of five main criteria A-E, with a number of sub-criteria within A, B and C (and an additional sub-criterion in D for the *Vulnerable* category), any one of which qualifies a taxon for listing at that level of threat. The qualifying thresholds within the criteria A-E are detailed in Appendix 2: Summary of IUCN Criteria.

In the main, the status evaluation procedure relies on an objective assessment of the available evidence. In certain cases, however, subjective assessments are acceptable as, for example, in predicting future trends and judging the quality of the habitat and methods involving estimation, inference and projection are acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can be reasonably supported. Suspected or inferred patterns in the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified as part of the documentation. Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible or nearly so (IUCN, 2001). Since the criteria have been designed for global application and for a wide range of organisms, it is hardly to be expected that each will be appropriate to every taxonomic group or taxon. Thus a taxon need not meet all the criteria A-E, but is allowed to qualify for a particular threat category on any single criterion.

The guidelines stipulate/advise that a precautionary approach should be adopted when assigning a taxon to a threat category and this should be the arbiter in borderline cases. The threat assessment should be made on the basis of reasonable judgment, and it should be particularly noted that it is not the worst-case scenario that will determine the threat category to which the taxon will be assigned.

The categorization process is only to be applied to wild populations inside their natural range (IUCN, 2001), with a long-term presence (since 1500 AD) in Britain. Taxa deemed to be ineligible for assessment at a regional level were placed in the category of '**Not Applicable (NA)'.** This category is typically used for introduced non-native species whether this results from accidental or deliberate importation. It may also be used for recent colonists (or attempted colonists) responding to the changing conditions available in Britain as a result of human activity and/or climate change.

3.2 Application of the Guidelines to Invertebrates

The criteria A, C, D1 and E are rarely appropriate for Orthoptera as population data have not been gathered and quantitative analysis has not been undertaken for this group.

In this Review, **Extent of occurrence** (EOO) is not applied to most species of Orthoptera as an agreed methodology for its measurement in relation to these species is not available. There are some instances where the known EOO can be measured but these are the exception. These tend to be species known to occur from one or a few sites and where their habitat resource is easily definable, in a restricted area and where intensive survey work has been undertaken to ascertain their distribution. Where EOO has been applied, the terms of this use has been defined within the status sheets on a species by species basis.

Area of occupancy (AOO) is another measure that is difficult to apply to invertebrate records and populations as defined by the IUCN guidelines (IUCN, 2012a; 2012b; 2013).

"Area of occupancy is defined as the area within its 'extent of occurrence' that is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data. To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa have different scale-area relationships." (IUCN, 2012a).

The IUCN have recommended a scale of 4km^2 (a tetrad) as the reference scale (IUCN, 2013). This needs to be applied with caution and there will be instances where a different scaling is more applicable, or where attempting to apply any scale is extremely difficult. For common and widespread species applying this rule will lead to under-estimation of their true AOO and a degree of interpretation is required. This highlights the importance of peer review and shared expert opinion for making decisions on scale. For rarer, more restricted, species the tetrad is more applicable, in particular those species which may occur on a few fragmented sites within the UK and/or whom are often restricted to certain, well-defined habitat types that are easily identified. In most instances, the reviewer (and his peers) is best placed to judge which these species are.

3.2.1 The two-stage process in relation to developing a Red List

The IUCN regional guidelines (IUCN, 2003) indicate that if a given taxon is known to migrate into or out of the region it should be assessed using a two-stage approach. Populations in the region under review should firstly be assessed as if they were isolated taxa. They should then be reassessed and can be assigned a higher or a lower category if their status within the region is likely to be affected by emigration or immigration. Although recruitment from abroad has clearly accounted for the establishment of some newcomers to the British fauna, migration within Britain and between Britain and the Continent of populations of Orthoptera under threat is not considered to be a significant factor.

3.2.2 The use of the Near Threatened category

The IUCN guidelines recognise a Near Threatened category to identify species that need to be kept under review to ensure that they have not become Threatened. This category is used for species where a potential threat, natural habitat dependency or range change demand frequent review of status.

This category would be best considered for those species that come close to qualifying as CR, EN or VU but not quite; i.e. meets many but not all of the criteria and sub-criteria. For those criteria that are not quite met, there should be sufficient evidence to show that the taxon is close to the relevant threatened thresholds. As such, it is up to the reviewers to provide evidence and methods for discerning this.

The Invertebrate Inter Agency Working Group and JNCC have defined the following for the use of B2bii which is commonly used in reviews. Continuing decline has to be demonstrated – and proven that it isn't an artefact of under-recording. If decline is demonstrated then the reviewer needs to consider whether or not B2a (and B2c if the data is present) is met:

- If 10 or less current localities then Critically Endangered, Endangered, Vulnerable is applicable.
- If 11 or 12 current localities then Near Threatened applies.
- If 13-15 and the taxon can be shown to be vulnerable to a specific and realistic threat, then Near Threatened applies.
- If more than 15 locations then Least Concern applies.

4. GB Rarity Status categories and criteria

At the national level, countries are permitted under the IUCN guidelines to refine the definitions for the non-threatened categories and to define additional ones of their own. The Nationally Rare and Nationally Scarce categories are unique to Britain. Broadly speaking, the Nationally Rare category is equivalent to the Red Data Book categories used by Bratton (1991), namely: Endangered (RDB1), Vulnerable (RDB2), Rare (RDB3), Insufficiently Known (RDBK) and Extinct. These are not used in this review. The Nationally Scarce category is directly equivalent to the combined Nationally Notable A (Na) and Nationally Notable B (Nb) categories used in the assessment of various taxonomic groups (e.g. by Hyman and Parsons (1992) in assessing the status of beetles) but never used in a published format to assess Orthoptera.

For the purposes of this review, the following definitions of Nationally Rare and Nationally Scarce have been applied:

Nationally Rare	Native species recorded from 15 or fewer hectads of the Ordnance Survey national grid in Great Britain since 31st December 1989 and where there is reasonable confidence that exhaustive recording would not find them in more than 15 hectads. This category includes species that are probably extinct.
Nationally Scarce	Native species which are not regarded as Nationally Rare AND which have not been recorded from more than 100 hectads of the Ordnance Survey national grid in Great Britain since 31st December 1989 and where there is reasonable confidence that exhaustive recording would not find them in more than 100 hectads.

This national set of definitions is referred to as the GB Rarity Status within this document. Importantly, Nationally Rare and Nationally Scarce are not categories of threat.

5. Methods and sources of information

5.1 Introduction

The most recent published list of scarce and threatened Orthoptera (Haes & Harding 1997) was based on the Red Data Book criteria used in the British Insects Red Data Book (Shirt, 1987) with the addition of the category RDB K (Insufficiently Known) after Wells, Pyle & Collins (1983). The original IUCN criteria for assigning threat status used in these publications had the categories Endangered, Vulnerable and Rare, which were defined rather loosely and without quantitative thresholds. The application of these categories was largely a matter of judgment, and it was not easy to apply them consistently within a taxonomic group or to make comparisons between groups of different organisms.This is the first review of the status of the UK orthoptera which uses these updated and standardised guidelines http://www.iucnredlist.org/technical-documents/red-list-documents

5.2 Data sources

The bulk of the data was derived from the Orthoptera Recording Scheme, supplemented with data held by Local Biological Record Centres from around the UK. Most of these records are now available through the NBN Gateway. The work of these schemes variously includes the collation of information 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 Orthoptera and allied insects recording community.

Altogether, a total of more than 60,000 records, from 2700 recorders, have been used in writing this review.

6. The assessments

6.1 The data table

The key outcome of this Review is the generation of a table which lists all of the taxa in the Orthoptera families covered. The full table has been produced as an excel spreadsheet which accompanies this text. Appendix 1 provides an extract of the key data. The columns completed in the full accompanying excel table are as follows:

Species name

Old BRC number

BRC concept

NBN taxon number

Presence in:

- England
- Scotland
- Wales

Area of occupancy:

- Total number of hectads occupied for period up to and including 1990
- Total number of hectads occupied from period from 1991-2013
- Total number of dual hectads where species have been recorded from within the hectad in date classes pre and post 1998

GB IUCN status (2013)

Qualifying criteria

Rationale

Global IUCN status (2010)

GB Rarity status (2013)

Status in Shirt (1987)

Status in Marshall and Haes (1988)

Status in Haes and Harding (1997)

Ecological account

Popular synonyms

6.2 Date classes

This Review uses 1998 as the **point of measurement** between old and recent date classes to assess decline as this was judged to be the date most applicable to the data concerned. The reason for this is that The *Atlas of grasshoppers, crickets and allied insects in Britain and Ireland* (Haes and Harding) was published in 1997 and this atlas provided the most comprehensive overview of species distribution to date.

6.3 Evidence of habitat declines

This can be used as a proxy for population declines for species that are strongly associated with specific habitat types (e.g. calcaereous grassland, heathland, lowland raised bogs. However, it should be acknowledged that quantitative data on a species' habitats are also rarely available.

7. Format of the species accounts

7.1 Information on the species accounts

Species accounts have been prepared for each of the CR, EN, VU and NT species, in line with the olther status reviews being produced. Previous reviews have also included species accounts for Nationally Rare and Nationally Scarce taxa.

Information on each species is given in a standard form. The data sheets are designed to be largely self-contained in order to enable site managers to compile species-related information on site files; this accounts for some repetition between the species accounts. This section provides context for nine items of information on each of the data sheets and includes a final section discussing taxa which have formerly had conservation status but which have been down-graded as part of this re-assessment process.

7.2 The species name

Nomenclature is intended to be as up to date as possible and is based on Harding and Haes (1997). Where the name differs from that used by Shirt (1987) the previous name is indicated, with citation of any relevant references. Information is also provided on any older names which have been used in the main identification literature.

7.3 Identification

The latest or most convenient work from which the identity of the species can be determined is stated; both adults and larvae are included wherever possible. The emphasis is on English language publications, and work in other languages is only referred to where no other options are available.

7.4 Distribution

Records held in the databases of the respective national species recording scheme form the basis for determining the distribution of each species.

Orthoptera Recording Scheme http://www.orthoptera.org.uk/ . In most cases these data can be accessed through the NBN Gateway (www.searchnbn.net) and therefore individual records have generally not been listed. The exceptions are those species known from only a relatively small number of sites and where site information is considered essential to understanding habitat, ecology, status, threats and conservation.

7.5 Habitat and ecology

This section aims to provide an overview of both the precise habitat requirements of each species.

Mobility is very important in understanding the use orthopterans make of habitat mosaics, but little is known about these aspects; many have functional wings but none of the British species can truly fly over long distances – though *Stethophyma grossum* can fly quite well over short distances. Climatic factors are an important influence and will vary across the country – in many orthopteran species active flight is associated with conditions of relatively

high temperatures, relatively high humidity, and little or no air movement. Mobility will naturally be higher under the more continental climatic conditions of southern and eastern Britain than in the cooler north and west. Species on the edge of their European range in Britain may be less mobile than their continental equivalents. This can change dramatically, as in the case of *Metrioptera roeselii* which has moved from exhibiting a coastal grassland distribution up until the 1970s and early 1980s, to being common and widespread across a large area of lowland England in a period of little more than a decade. *Conocephalus discolor* has undergone a similar range and population expansion over a similar timescale.

Considerable emphasis is placed in this review on the importance of relict sites in supporting rare species. This indicates that such species have poor dispersal capacity or that they require a special set of conditions provided only by such sites, or perhaps a combination of the two.

7.6 Status

Status is largely based on range size and both short and long term trends, but association of a species with particular habitats under threat is also taken into account. The IUCN guidelines (see Section 3) were then used to decide whether such species might also be considered under threat, and to assign a category. Detailed survey data is extremely rare but has been used where available. Counts of hectads known to be occupied since 1998 were used to establish whether or not a species might be considered scarce.

Only species which have been assessed as Critically Endangered, Endangered, Vulnerable or Near Threatened are provided with species accounts. The status of other species is summarised in Appendix 1.

The IUCN criteria are not rigid about the need for real data, but allow for expert opinion – ‘estimated, inferred, projected or suspected’ are acceptable reasons.

Assessments of status can only be based on current knowledge, which is very unlikely to be comprehensive in the majority of cases, being based on the experience of a limited number of active recorders in each generation. The likely national distribution of each species and trends in population size must, therefore, be extrapolated from the available information so as to arrive at the best estimate of the likely national status of each species.

7.7 Threats

It is those human activities that result in the loss of sites or that change the nature of habitats that are most likely to pose the greatest threats to invertebrate populations. Where specific threats might arise they are mentioned, otherwise the statements attempt to summarise in general terms those activities which are considered most likely to place populations of orthopteroid insects at risk.

Other threats, such as the impact of climate change, non-native species etc. are considered where such information is aviable.

7.8 Management and conservation

Special Areas of Conservation (SACs), designated under the European Habitats Directive, and Sites of Special Scientific Interest (SSSIs) plus National Nature Reserves (NNRs), designated under national legislation, all have the potential to provide protection for Orthoptera as long as the conservation interest associated with them is acknowledged, and as long as that interest is effectively translated into site conservation objectives and effective management.

Loss of suitable habitat continues in undesignated sites, as well as in some designated ones! Some rare species of orthoptera (notably the wart-biter *Decticus verrucivorus*) now occur largely on National Nature Reserves (NNRs) and the appropriate management of these is critical for their future survivial and spread.

The populations of many Orthoptera species with fragmented distributions are relicts of previously widespread populations, surviving in small patches of relatively undisturbed habitats following loss of the intervening habitats. For these species it is critical to maintain a chain of protected sites. Other species are more mobile and often rely on dynamic ecological processes operating over areas larger than those normally covered by individual designated sites. Some of these species have benefited from recent changes in the modern landscape, for example the tall herb pioneer community that colonises brownfield sites following abandonment of use.

7.9 Published sources

Literature references that refer to the previous conservation status of the species in Britain, or that have contributed information to the Data Sheet, are cited here.

7.10 Downgraded species

Downgrading of species should not necessarily be seen as evidence that species status is improving. In many cases the species were graded too highly in the 1997 Atlas through lack of availability of supporting data. The intervening period has seen a huge increase in recorder effort, targeting species with Nationally Scarce or RDB status – the publication of the Atlas acted as a focus or a ‘call to arms’, stimulating new recording – and the revised statuses presented here more accurately reflect the status of those species.

Some species have actually increased their abundances and/or ranges in the intervening 20 year period, as a result of a variety of factors. Other species appear truly to be declining, and the lack of records of these, following publication of the 1997 Atlas, is all the more significant in comparison.

The status of new arrivals in Britain is very difficult to ascertain. Where this results from a natural colonisation from the near continent, they may be expected to continue to expand and may exceed 100 hectads within the next few decades. Their natural range, or Extent of Occurrence under the IUCN Guidelines, expands with them, but they are not (yet) long-term residents in Britain and so are excluded from the IUCN categorisation for this reason. The precautionary principle suggests that they should not be afforded a regional conservation status unless the source population itself is threatened, which would seem unlikely in most

cases. Climate change may impose such a threat. In many cases there is a strong suspicion that their arrival in Britain is actually a chance importation and imported populations are not normally afforded conservation status.

8. Acknowledgements

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Bjorn Beckmann – BRC

Mike Edwards – *Gryllus* and *Decticus*

Oliver Cheesman – *Decticus*

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9. Species listed by IUCN status category

In this list the species are given in taxonomic order within status categories.

Regionally Extinct

Labiduridae	Giant Earwig *Labidura riparia* (Pallas, 1773)

Critically Endangered

Gryllotalpidae	Mole Cricket *Gryllotalpa gryllotalpa* (Linnaeus, 1758)

Endangered

Tettigoniidae	Wart-biter *Decticus verrucivorus* (Linnaeus, 1758)

Vulnerable

Gryllidae	Field Cricket *Gryllus campestris* (Linnaeus, 1758)
Gryllidae	Scaly Cricket *Pseudomogoplistes vicentae* (Gorochov, 1995)

Near Threatened

Acrididae	Large Marsh Grasshopper *Stethophyma grossum* (Linnaeus, 1758)
Acrididae	Heath Grasshopper *Chorthippus vagans* (Linnaeus, 1758)

10. Species listed by GB Rarity Status category

Nationally Rare

Tettigoniidae	Wart-biter *Decticus verrucivorus* (Linnaeus, 1758)
Gryllotalpidae	Mole Cricket *Gryllotalpa gryllotalpa* (Linnaeus, 1758)
Gryllidae	Field cricket *Gryllus campestris* Linnaeus, 1758
	Scaly Cricket *Pseudomogoplistes vicentae* (Gorochov, 1995)
Acrididae	Large Marsh Grasshopper *Stethophyma grossum* (Linnaeus, 1758)
	Heath Grasshopper *Chorthippus vagans* (Linnaeus, 1758)

Nationally Scarce

Tettigoniidae	Grey Bush-cricket *Platycleis albopunctata* (Goeze, 1778)
	Bog Bush-cricket *Metrioptera brachyptera* (Linnaeus, 1761)
Gryllidae	Wood Cricket *Nemobius sylvestris* (Bosc, 1792)
Tetrigidae	Cepero's Ground-hopper *Tetrix ceperoi* (Bolivar, 1887)
Acrididae	Woodland Grasshopper *Omocestus rufipes* (Zetterstedt, 1821)
	Rufous Grasshopper *Gomphocerippus rufus* (Linnaeus, 1758)
Blattellidae	Dusky Cockroach *Ectobius lapponicis* (Linnaeus, 1758)
	Tawny Cockroach *Ectobius pallidus* (Olivier, 1789)
	Lesser Cockroach *Ectobius panzeri* Stephens, 1835
Forficulidae	Short-winged Earwig *Apterygida media* (Hagenbach, 1822)
	Lesne's Earwig *Forficula lesnei* Finot, 1887

11. Taxonomic list of Conservation and Threat Statuses

Table 7. Taxonomic list of Conservation and Threat Statuses

Scientific name	**Shirt 1987**	**Haes and Harding 1997**	**This review (GB Rarity status)**	**This review (IUCN status)**
Tettigoniidae				
Decticus verrucivorus (Linnaeus, 1758)	RDB2	RDB2	NR	EN
Platycleis albopunctata (Goeze, 1778)	-	Nb	NS	LC
Metrioptera brachyptera (Linnaeus, 1761)	-	Nb	NS	LC
**Metrioptera roeselii* (Hagenbach, 1822)	-	Nb	-	LC
**Conocephalus discolor* (Thunberg, 1815)	-	Na	-	LC
Gryllotalpidae				
Gryllotalpa gryllotalpa (Linnaeus, 1758)	RDB1	RDB1	NR	CR
Gryllidae				
Gryllus campestris (Linnaeus, 1758)	RDB1	RDB1	NR	VU
Nemobius sylvestris (Bosc, 1792)	-	-	NS	LC
Pseudomogoplistes vicentae (Gorochov, 1995)	RDB1	RDB1	NR	VU
Tetrigidae				
Tetrix ceperoi (Bolivar, 1887)	-	Na	NS	LC
Acrididae				
Stethophyma grossum (Linnaeus, 1758)	RDB2	RDB2	NR	NT
Chorthippus vagans (Linnaeus, 1758)	RDB3	RDB3	NR	NT
Omocestus rufipes (Zetterstedt, 1821)	-	Nb	NS	LC
Gomphocerippus rufus (Linnaeus, 1758)	-	Nb	NS	LC
Blattellidae				
Ectobius lapponicis (Linnaeus, 1758)	-	Nb	NS	LC
Ectobius pallidus (Olivier, 1789)	-	Nb	NS	LC
Ectobius panzer (Stephens, 1835)	-	Nb	NS	LC
Forficulidae				
Apterygida media (Hagenbach, 1822)	-	-	Nb	LC
Forficula lesnei (Finot, 1887)	-	-	Nb	LC
Labiduridae				
Labidura riparia (Pallas, 1773)	-	-		RE

*Note: formerly classified as nationally scarce

12. Criteria used for assigning species to threatened categories (see Appendix 2 for criteria and categories)

Table 8. Criteria used for assigning species to threatened categories

Scientific name	**Status**	**Criteria used**
Tettigoniidae		
Decticus verrucivorus	Endangered	B2 a, b (ii, iii, iv), D2
Gryllotalpidae		
Gryllotalpa gryllotalpa	Critically Endangered	B2 a, c (iii, iv), D2
Gryllidae		
Gryllus campestris	Vulnerable	B2 a, c (iv)
Pseudomogoplistes vicentae	Vulnerable	D2

13. The data sheets

The data sheets are given in alphabetical order by scientific name within each family. Individual species can be found by looking up the generic or specific names (including synonyms used in Shirt (1987) and Marshall and Haes (1988) in the index.

13.1 Tettigoniidae

DECTICUS VERRUCIVORUS (Wart-biter)
ENDANGERED B2 a, b (ii, iii, iv)
Order ORTHOPTERA
Family TETTIGONIIDAE

Decticus verrucivorus (Linnaeus, 1758)

Despite some conservation successes since the 1980s, when the species was probably at its lowest ebb in this country, the last remnant heathland population (at Stoborough Heath in Dorset) has almost certainly been lost since the 1997 Atlas was published, *Decticus* not having been recorded there since 1998. Furthermore, one of the last three remnant grassland populations (at Kingston Escarpment in East Sussex) may have been lost through lack of suitable habitat management, with only a single adult recorded there in 2013 and none at all during an extensive search in 2014 (Cheesman 2014). Only one colony (the remnant population at Castle Hill in East Sussex) supports numbers of adults in the high hundreds in 'good' years. Even here, numbers have been known to fall dramatically in 'poor' years, which may have significantly reduced the genetic diversity of the population – for example it may have resulted in the loss of the striking purple and yellow form, as well as the grey form, of the species in the 1990s (Sutton 2009). The other remnant population (at Calstone Down in Wiltshire) has also been through a period of extreme population contraction, and currently supports numbers of adults in the low hundreds at best. The two (re)introduced populations (at Lydden in Kent and Mount Caburn in East Sussex) may also support numbers of adults in the low hundreds in 'good' years, but hold substantially fewer in 'poor' years. With two of the six populations that existed at the time of the last review (in 1997) probably lost (the Stoborough Heath population almost certainly so) and/or markedly fluctuating numbers on the other sites, this species qualifies as Endangered under Criterion B (small area of occupancy plus five severely fragmented populations, continuing decline of Area of Occupancy, populations/ quality of habitat). The species is now down to no more than five sites (and possibly now just four) and the Area of Occupancy is far less than 500 km², (actually estimated at less than 10 km²).

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012).

Distribution

In Britain, the species has always been confined to southern England, and is now restricted to just five (and possibly only four) populations, all on calcareous grassland. The Stoborough Heath population is assumed to be extinct as none have been seen there since 1998, despite many searches. It was the only heathland population known and was always very small. Three of these are remnant populations (two in East Sussex and one in Wiltshire), one is a re-introduction (in Kent) and one is an introduction (in East Sussex). One of the remnant populations in East Sussex has declined due to lack of appropriate habitat management to the point where it may now be on the verge of being lost.

Habitat and ecology

The wart-biter has very exacting habitat requirements in Britain (Cherrill & Brown 1990), which may relate to the species being on the edge of its range here (Cherrill & Brown 1992). Although it apparently occurred historically on some heathland sites, it is currently restricted to very high quality calcareous grassland, where it mainly occupies south-facing slopes due to its thermal requirements. It is omnivorous and requires a herb-rich sward which also contains a good variety of smaller invertebrates, including grasshoppers. It requires a small-scale habitat mosaic, with areas of bare ground, short, herb-rich turf, and taller, tussocky vegetation occurring in close proximity. The earlier instar nymphs favour short sward areas, where the warmer conditions enable more rapid development. Later instar nymphs and adults require tussocks for protection against predators, and adult males climb up tall grass stems to stridulate. Adult females return to areas of short sward and bare patches to lay their eggs. The eggs are laid in the soil and take at least two years to develop and hatch into nymphs, which can result in markedly biennial patterns in population size. All the English populations are subject to significant fluctuations, and the species can almost disappear from any given site in a 'poor' year.

Status

Endangered. It has always been considered rare due to its exacting habitat requirements and reliance on very high quality calcareous grassland. It has declined from 17 hectads prior to 1980 to just five since 1998 (with two of these being re-introductions that occurred in the early 1990s). **N.B.** 1980 is used as a cut off point here, as this species was already down to just a handful of sites by the early 1990s. Several populations were lost up to the 1980s due to loss or degradation of suitable habitat and the single heathland site was apparently lost in 1998. Since then it has persisted at just five sites – three supporting remnant populations and two where the species has been (re)introduced. Only one of the sites (Castle Hill) supports numbers of adults in the high hundreds, and these are only achieved during 'good' years. Numbers at the other four sites are much smaller, and the remnant population at Kingston Escarpment may already have been lost. Numbers at the Mount Caburn introduction site appear to have fluctuated particularly markedly in recent years, probably due to variable management. For example, no *Decticus* were seen there during 2013 surveys, when summer sheep grazing was an issue, although several adults were recorded the following year (Cheesman 2014). The species meets the criteria for Endangered as its AoO is <500km^2 and it occurs is 5 sites and has declined in the number of sites and quality of habitat. These five sites are all les than a hectad in area – the three Sussex sites at least do in fact total less than 1 km^2 in area.

Threats

Lack of appropriate management of its specialised chalk grassland habitat is the principal threat. This species is a small-scale habitat mosaic specialist and requires areas of bare ground, short turf and taller grass tussocks in close proximity. This mosaic is best produced by appropriate grazing by cattle or ponies. Unfortunately, this cannot be guaranteed on all sites in all years, and the species may already have been lost from one of its two remnant East Sussex colonies through lack of appropriate grazing. Some of the populations are so small (especially in 'poor' years) that they are highly vulnerable to stochastic events. The wart-biter is afforded protection under Schedule 5 of the Wildlife and Countryside Act (1981).

Management and Conservation

As discussed, wart-biters need very high quality calcareous grassland with suitable structural heterogeneity at an appropriate scale, and habitat can become unfavourable very quickly without continuous sympathetic management. The most appropriate management regime is winter grazing by cattle (and/ or Exmoor ponies – as has occurred on some of the Sussex sites recently), as this produces the sward structure that *Decticus* requires. Sheep tend to produce a more uniform sward, and summer grazing by sheep is particularly damaging. All five current sites are SSSIs and three of them are also NNRs. Even so, it is not always easy to maintain the most appropriate grazing regime. In recent years, suitable management has been re-established on at least three of the five sites, which is encouraging. However, the situation at Kingston Escarpment continues to give particular cause for concern; there appears to have been little or no grazing in recent years, *Brachypodium pinnatum* is becoming increasingly dominant, and the status of the wart-biter is perilous at best, with dedicated survey work locating only one adult in 2013 and none at all in 2014. Discussions are underway with Natural England staff to ensure that a suitable grazing regime is re-instated here.

Published sources

Benton, T. 2012, Cheesman, O.D. 2013, Cheesman, O.D. 2014,Cherrill, A.J. & Brown, V.K. 1990, Cherrill, A.J. & Brown, V.K. 1992, Marshall, J.A. & Haes, E.C.M. 1988, Sutton, P. 2009.

13.2 Gryllotalpidae

GRYLLOTALPA GRYLLOTALPA (Mole Cricket)
CRITICALLY ENDANGERED B2 a, (ii, iii, iv), D
Order ORTHOPTERA
Family GRYLLOTALPIDAE

Gryllotalpa gryllotalpa (Linnaeus, 1758)

With only one small colony currently known (and recently discovered) the species is Critically Endangered – under Criteria B (small range, single location and extreme fluctuations in number of populations and mature individuals), and D (very small population). Research is needed to determine the origin of this recently discovered population; some

records from elsewhere in recent decades have derived from horticultural imports, but this colony is from within the last known stronghold of this species.

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012)

Distribution

Historically (and before the extensive land drainage that occurred in the 17th and 18th centuries) mole-cricket was widespread in Britain. However, in recent decades it has become exceptionally rare and since 1960 the only colonies detected have been in the New Forest. There have been occasional records of single individuals elsewhere since 1960, but these have been mostly from urban or suburban areas and are assumed to be accidentally imported individuals. We have used 1960 as the cut-off date for this species (rather than 1998) as there have only been occasional reports (of presumed accidental imprts) away from the New Forest since that date). The possibity of accidental imports needs to be borne in mind when assessing future records.

Habitat and ecology

Mole-crickets are subterranean, spending most of their lives underground in excavated chambers, and occur on wet soils in water meadows and wet heathlands, occurring on both heavy and light soil types. Individuals recorded away from such habitat are most likely to be accidental imports. Males will come to their burrow entrances on warm early summer nights to give their distrinctive purring call and on warm nights both sexes may also partake in somewhat clumsy flights over short distances. Eggs are laid in underground nest chambers in batches of up to 300 and, once hatched, the nymphs take two or three years to complete their development underground. Being a creature of waterlogged habitats, late instar nymphs and adults can swim well.

Status

Critically Endangered. There were no recent records (this century) up to 2013 and the species was thought to be possibly extinct; however in 2014 a small population, numbering at least four calling males, was discovered in the New Forest. This will be carefully monitored in future years; the situation for this species appears to be critical, but at least there appear to be still a population in existence.

Threats

Modification of the habitat (through land drainage or perhaps natural drying out due to drought/ climate change) is the principal threat and extensive land drainage was the cause of the historic decline. With such a tiny (presumed remnant) population, accidental destruction of or damage to known and potential sites must also be a significant threat; therefore it is important to closely monitor the known current colony and to survey likely areas nearby in order to locate any other colonies, so they can be monitored and protected.

Management and Conservation

Currently there is only one, very recently discovered, colony known, so management will involve close monitoring and ensuring that the habitat is maintained. Other areas of suitable habitat should also be maintained and surveyed so that any other colonies can be detected and protected in a similar way.

Published sources

Benton, T., 2012, Marshall, J.A. & Haes, E.C.M. 1988.

13.3 Gryllidae

GRYLLUS CAMPESTRIS (Field Cricket)
VULNERABLE B2 a, c (iv)
Order ORTHOPTERA
Family GRYLLIDAE

Gryllus campestris Linnaeus, 1758

There is only one remnant native population, but there are now six re-introduced populations in four counties and so the species currently qualifies as Vulnerable under Criterion B (small area of occupancy plus no more than 10 populations and severe fluctuations). It may also qualify under Criterion D2 – it has a very small area of occupancy and lack of suitable management can cause very rapid declines. It does particularly badly in cool, wet springs, and on some of the re-introduction sites lack of adequate management has exacerbated the poor weather-related fluctuations to the point where it is lost from one, is almost lost from another and is struggling at a third. Thus these fluctuations, though natural, are quite extreme and could cause local extinctions; indeed they have apparently caused at least one colony to disappear already, with two others now struggling as a result of them. Where there is good management in place though it is either stable or increasing slightly. Several of these re-introductions are very recent and it is not yet known how sustainable they are in the long-term. However, the recovery programme is continuing and although some of these re-introduced popualtions still require bolstering by further translocations, it is doing well and spreading in at least two of them and there are a couple more re-introductions being planned.

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012).

Distribution

Field Cricket has never been common but has now become a very rare insect. Indeed at one stage it was down to a single colony (in West Sussex). Re-introductions, under Natural England's Species Recovery Programme, have improved the situation somewhat, and there are now six re-introduced colonies; mostly in West Sussex (with some in close proximity to each other to aid movement between colonies) plus single colonies in Hampshire, Surrey and the Isle of Wight. The IOW re-introduction (which took place in 1999, with further reinforcements added over the following few years) was thought to have failed but a few individuals were re-discovered in 2010, following a report of one heard in 2009.

Habitat and ecology

Field Crickets are restricted to short-turf grassland on light, well-drained, sandy or calcaereous soils, to allow adults to make their burrows and to allow the hibernating nymphs to withstand wet winters. Such grassland should not be a uniform short-sward turf and does

need to have some structure, with low tussocks and some bare ground (where the burrows are generally made). Eggs are laid singly in the ground in early summer; the nymphs hibernate in their penultimate instar and emerge the following spring (as soon as weather conditions are warm enough) to complete their development by late spring. They are on the edge of their climatic range in southern England and require warm, dry conditions in order to prosper, with suitable management of the sites to keep the vegetation short being key in this. Mature males call from their burrow entrances during warm weather in early summer. Mature females lay eggs during the summer months and adults have died off by late summer. It is thought that only eggs laid fairly early in the season (late May-early June) are robust enough to hibernate successfully. They are vegetarian, eating mainly grasses.

Status

Vulnerable. Although the situation has improved considerably from the one population that remained before the current recovery programme was started, there are still less than 10 locations and numbers are not yet confirmed as stabilized at a number of these as translocations only occurred a few years ago.

Threats

Lack of suitable habitat management is the main threat. Field crickets require open habitat with a short turf and some structural variation, and this is generally maintained by grazing (or sometimes mowing), with scrub management to prevent encroachment and succession. All populations are reliant on continuing management to maintain the habitat and moinitoring has shown that where suitable management is not maintained the population can decline very quickly.

Management and Conservation

See above; management is mainly to do with maintaining suitable habitat, and increasing the amount of suitable habitat where possible. The recovery programme is continuing and several of the re-introductions have had their numbers boosted in recent years, to increase genetic viability and increase the chances of sustainable populations at these sites.

Published sources

Benton, T., 2012, Edwards, M., 2012, 2014.

PSEUDOMOGOPLISTES VICENTAE (Scaly Cricket)
VULNERABLE D2
Order ORTHOPTERA
Family GRYLLIDAE

Pseudomogoplistes vicentae Gorochov, 1996

With only two coastal locations known in England and one in Wales this species qualifies as Vulnerable under criterion D2 (very small area of occupancy with a potential future threat). It is so elusive and rarely seen that virtually nothing is known about the size of any of the populations or whether they are declining, though the population at Chesil Beach is thought to be one of the largest known anywhere in the world and may number in the thousands. All

populations are in coastal locations and centred on the strandline of shingle beaches in exposed locations. The colony at Chesil is known to have suffered occasional flooding and it is likely that the others suffer occasional inundation as well. There are potential pollution issues associated with such inundations; when the Napoli was grounded near Branscombe, this resulted in an oil spill as well as all the debris washed ashore. As far as is known this oil spill did not affect the beach where the scaly crickets are, but it demonstrates that there is potential for oil spills to have a serious effect on a species with only three known coastal populations in the UK. On the other hand, its very elusiveness means that there may still be undiscovered populations somewhere on our coastline.

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012).

Distribution

In the UK it is currently known from only three coastal locations – Chesil Fleet in Dorset, Branscombe in south Devon, and Marloes Sands and the adjacent Dale Peninsula in Pembrokeshire. It is known from only a few locations abroad - it occurs on the coasts of Portugal and Morocco, and it has been recently found on the coast in northern France and in the Channel Islands. These French/ Channel Island findings provide a 'link' between the British populations and those further south and support the case for it being a relict native species (as opposed to an accidental introduction from ships as was previously thought by some).

Habitat and ecology

All British colonies are on areas of coastal shingle; two are on areas of shingle beach under cliffs and the largest colony at Chesil is on an extensive shingle bar. Very little is known of its ecology; it is nocturnal, hiding under pebbles during the day and emerging at dusk to feed – often on the detritus along the strandline of the upper beach. It is probably omnivorous, as captive animals eat both animal and vegetable matter. Nymphs have been found in April and adults are found from August to October. It has recently been discovered that it has a three year life cycle, with eggs laid in autumn and over-wintering, with the resulting nymphs over-wintering for a second year and reaching maturity the following summer - with adults possibly over-wintering successfully too (Sutton 1999). Pit-falling has been acknowledged as the best way to survey for this species since the work of Peter Kirby (Kirby 995); it has also recently been discovered (through two surveys carried out at Branscombe by National Trust and Natural England in 2014) that traps should be baited – and put out towards dusk and inspected as soon the following morning as possible to help prevent destruction by hungry gulls (J. Curson pers. comm.).

Status

Vulnerable. For a long time it was thought that there was just one colony – at Chesil Beach. It was not discovered here until the 1950s and since then the two other populations have been discovered. It is not often surveyed but the population at Chesil is thought to be quite large and recent monitoring at Branscombe and Marloes suggest that there are still viable populations at these locations following the storms of winter 2013/14.

Threats

The habitat itself is reasonably secure and not likey to suffer from human-induced degradation or destruction. There is a potential issue at Branscombe, where there are plans to introduce material to the base of the cliff in order to provide defences to the caravans on the clifftop; however it is not known whether there are any scaly crickets at this actual location, not whether such an activity would necessarily be detrimental (it might provide additional habitat over the medium-term). As all populations probably suffer occasional tidal inundation, there is a potential threat from marine pollution, mainly in the form of oil. In the long-term though, climate range and resulting sea level rise could pose the most significant threat to its survival, particularly at Branscombe and Marloes Sands where backing cliffs prevent 'migration' of the shingle beaches inland.

Management and Conservation

There is currently little need for active mangement of its isolated coastal habitat, but all populations should be monitored regularly, and it would be useful to establish a standardized monitoring protocol for this species.

Published sources

Benton, T., 2012, Jon Hudson Ecological Consultancy. 2007, Kirby, P. (1995), Marshall, J.A. & Haes, E.C.M. 1988, Sutton, P. 1999.

13.4 Acrididae

STETHOPHYMA GROSSUM (Large Marsh Grasshopper)
NEAR THREATENED B2 a b (i, ii)
Order ORTHOPTERA
Family ACRIDIDAE

Stethophyma grossum (Linnaeus, 1758)

This species could arguably persist at its current levels for the foreseeable future, subject to appropriate land management, and as such, does not fulfil the IUCN THREATENED criteria. It does qualify as near-threatened though as it has suffered on 85% reduction in range betrween 1985 and 2010 (see below under Status) and now only occurs in 13 hectads, and only within a small area of specialized wetland habitat within these. The majority, if not all, of the remaining colonies are on protected land.

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012).

Distribution

This species is restricted to southern England, where it currently occurs in just two restricted areas – in the Poole basin of Dorset and in the New Forest. It was formerly much more widespread, occurring in wetland areas across much of southern England. It was lost from the Thames Valley in the 19th century, and it was last recorded from the Norfolk Broads and the

Cambridgeshire Fens in the 1960s, from the Surrey Heaths in 1991, and from the Somerset Levels in 1995.

Dorset Poole Basin Colonies

The 2002 survey by Bryan Edwards showed that there were twelve colonies of *Stethophyma grossum* in Dorset, all of which were found in valley mire habitats within the Dorset Natural Heaths area (Edwards, 2002). Edwards concluded that there were no immediate threats to any of the colonies visited.

New Forest Colonies

The New Forest colonies appear to be similarly stable. The apparent appearance and disappearance of colonies between the different surveys may reflect recording conditions, or may genuinely reflect the dynamic nature of this large metapopulation.

Habitat and ecology

This is a wetland species and is currently restricted to acid bogs with tussocky grass on lowland heath, though it formerly occurred more widely in wetland habitats in southern England. Adults can fly quite well and this presumably enables movement between wetland areas in close proximity within the New Forest at least.

Status

This species qualifies as Near-threatened under Criteria A and B – it is estimated to have suffered an 85% reduction in its range in the 25 years between 1985 and 2010 (JNCC 2010). It is now restricted to two discrete areas and the populations within these are constrained due to the specialized wet mire habitat requirements in these lowland heath areas. Climate change or further loss of habitat through changes in water tables could potentially cause further declines, though the remaining populations are currently thought to be stable.

Threats

None of the populations in Dorset are thought to be under any immediate human-induced threats, but climate change could pose a longer-term threat to this species if its specialized wetland habitat dries out. In the New Forest, the populations appear to fluctuate quite dramatically, but it is not known whether this is due to recording inconsistencies or to the natural fluctuations in what apparently operates as a large meta-population in the New Forest area.

Management and Conservation

Management should focus on preventing any further human-induced loss or deterioration of the remaining wetland habitat in the two remaining areas occupied, but no specific management is required in these habitats.

Published sources

Edwards, B. (2002), JNCC (2010).

CHORTHIPPUS VAGANS (Heath Grasshopper)
NEAR THREATENED B2 a
Order ORTHOPTERA
Family ACRIDIDAE

Chorthippus vagans (Eversmann, 1848)

This species has suffered a large decline over recent decades due to extensive loss and degradation of its heathland habitat. Most if not all of the remaining colonies are on protected land and thus the remaining population is currently thought to be stable. As such it does not fulfill the IUCN threatened criteria, but it currently occurs in only 9 hectads and as it occupies a highly speciaslised early successional heathland habitat within this small area, and is still at some risk from fires, and other natural/ human-induced hazards in this habitat across its range, it is listed as Near Threatened.

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988), Benton (2012).

Distribution

Restricted to the New Forest and the Dorset heaths where its specialized habitat occurs. Despite searches it has not been found in similar habitat elsewhere in southern England.

Habitat and ecology

Occurs in dry open heathland with plenty of bare ground. It feeds on heather and dwarf gorse *Ulex minor* as well as grasses and herbs and so is frequently found in dry, open areas without any grass where other orthopterans cannot persist. It has recently been shown (Edwards 201) that this species shows a strong assocuaiation with dwarf gorse, which is now considered to be an important food source.

Status

This species qualifies as Near-threatened under Criterion B; it has a very restricted distribution and specialized habitat, but has always been restricted to these areas and populations, being on designated land, are currently thought to be stable. It has though, suffered a large decline over recent decades through losses of heathland to development, especially in Dorset.

Threats

Most populations are in protected/ designated areas and fires (natural or human-induced) are thought to be the main threat. Natural succession, causing loss of the early successional habiat with bare ground, is also a potential threat.

Management and Conservation

No particular management is required, except to ensure that the heaths on which it occurs continue to contain sufficient early sucession habitat and bare ground. This is likely to be maintaind largely through grazing pressure.

Published sources

Edwards, B. (2011), Marshall, J.A. & Haes, E.C.M. 1988.

13.5 Labiduridae

LABIDURA RIPARIA (Giant Earwig)
REGIONALLY EXTINCT
Order DERMAPTERA
Family LABIDURIDAE

Labidura riparia (Pallas, 1773)

Identification

Key, plus text and illustrations, is provided by Marshall and Haes (1988).

Distribution

This species has only ever been recorded at a handful of locations on the south coast of England and there is some doubt as to whether it is/ was a native species on the very edge of its climatic range, or a non-native species that formed temporary colonies following accidental introductions. It was first recorded near Christchurch, Dorset, in 1808, and occurred in a suburb of Bournemouth until the early 1930s. The only other locality where it has been recorded with certainty is at Folkestone in Kent (in the 19th century). There are unconfirmed records from Dorset and the Isle of Wight, but all prior to 1940. A specimen was possibly seen in the early 1980s on the south Devon coast, but was not confirmed. Whether or not it was ever truly a native species, it is now regarded as extinct.

Habitat and ecology

The few colonies found in southern England have all been coastal, in areas of white sand where its burrows were often found quite close to the high water mark.

Status

It is difficult to determine the true status of this earwig as there is doubt over whether it is a native species on the edge of its climatic range, or an occasional accidental import. If the former, it qualifies as Regionally Extinct. If the latter it would not be assessed.

Threats

There are currently no known populations and it is not known why previous populations have not persisted. As it occurred close to the high water mark, climate change and coastal flooding/ inundation, could be threats to any populations found in the future.

Management and Conservation

Its specialised habitat would not require any specific conservation measures, except to ensure that any future colonies were not subjected to excessive disturbance/ trampling from coastal tourism.

Published sources

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Appendix 1. A complete listing of all species reviewed, namely those in the families Rhaphidophoridae, Tettigoniidae, Gryllidae, Gryllotalpidae, Tetrigidae, Acrididae, Blaberidae, Blattidae, Blattellidae, Mantidae , Anisolabididae, Labiidae, Forficulidae, Labiduridae, Phasmatidae

Table A.

Species name	GB IUCN status (2013)	Qualifying criteria	Rationale	GB rarity status (2013)	Global IUCN status (2010)	Presence in England	Presence in Scotland	Presence in Wales	AoO (hectads) <1998	AoO (hectads) >1998	Dual hectads (pre and post 1998)
Tachycines asynamorus Greenhouse Camel Cricket	NA		Last known post-millennium colony (Derbyshire) now extinct	Non-native					15	2	0
Chopardina importata	NA			Non-native						0	0
Cosmoderus maculatus Prickly Bush-Cricket	NA			Non-native					2	0	0
Jamaicana subguttata Mottled- winged Bush-Cricket	NA			Non-native					1	0	0
Jamaicana flava	NA			Non-native						0	0

Mastophyllum scabricolle Brown-winged Bush-Cricket	NA			Non-native						0	0
Nesonotus tricornis	NA			Non-native						0	0
Meconema thalassinum Oak Bush-Cricket	LC					E		W	662	555	477
Meconema meridionale Southern Oak Bush-Cricket	NA		This species is an assisted introduction whose appearance was predicted, based on its apparent ability to hitch lifts on automotive transport. However, it is also know to have arrived in the UK with horticultural imports. The effective colonisation of several parts of the UK is in accordance with the northward spread of this species in e.g. France, Netherlands, and effectively represents a continued expansion of its range. So it is not assessed, in accordance with IUCN guidance.	Naturalised		E		W	0	35	0
Tettigonia viridissima Great Green Bush-Cricket	LC					E		W	292	220	
Ruspolia nitidula Large Cone-head	NA		Occasional introduction and probable migrant, (per Dorset and Isles of Scilly records); appears to have become temporarily established in Dorset for one year)			(E)			0	4	0

Decticus verrucivorus Wart-biter	EN	B2 a, b (iii, iv)	There are currently five known populations of this species, three native ones and two re-introductions. One population (the last remaining heathland one) has been lost since the last assessment of the orthoptera (the 1997Atlas) and one of the remaining native epopulatiojs appears to be on the verge of being lost (if it has not gone already) through lack of adequate management. Therefore it qualifiues as Endangered under Criterion B (small range, continuing decline of populations/ quality of habitat - and possibly also extreme fluctuations). All populations fluctuate, generally on a bi-annual basis with alternate 'good' and 'poor' years, and variable management on the sites with smaller populations may have exacerbated these natural fluctuations. Wart-biter has very exacting habitat requirement, and needs a small scale mosaic of bare ground, short turf and longer grass clumps within its chalk grassland habitat. Monitoroing of its known sites has demonstrated that lack of adequate management can cause rapid declines in the population.	NR		E			15	4	4
Pholidoptera griseoaptera Dark Bush-Cricket	LC					E	S	W	725	665	555
Platycleis albopunctata Grey Bush-cricket	LC		(Possibly climate assisted) broadening of ecological niche suggested	NS		E		W	98	77	57

Metrioptera brachyptera Bog Bush-cricket	LC		(Possibly climate assisted) broadening of ecological niche suggested, but remains vulnerable to habitat loss in certain parts of its range	NS		E	S	W	158	101	79
Metrioptera roeselii Roesel's Bush-cricket	LC		Massive range expansion across southern and midland UK counties			E		W	108	490	95
Conocephalus discolor Long-winged Conehead	LC		Massive range expansion across southern and midland UK counties			E		W	72	558	60
Conocephalus dorsalis Short-winged Conehead	LC		Significant range expansion, has colonised the north-west coast of England and now appears to have established its first colonies in Scotland			E	S	W	252	356	164
Phlugiolopsis henryi Tropical Bush Cricket	NA			Non-native						0	0
Phaneroptera falcata Sickle-bearing Bush-Cricket	NE		Occasional introduction and probable migrant. As the latter, it was recorded from Kent, Hampshire and East Sussex, becoming temporarily established in East Sussex for at least two years.	Non-native (potential colonist)		(E)			0	4	0
Phaneroptera nana Southern Sickle-bearing Bush-cricket	NA			Non-native					0	1	0
Leptophyes punctatissima Speckled Bush-cricket	LC		Evidence of northward range expansion			E	S	W	662	709	483
Acheta domesticus House Cricket	NA			Non-native					262	76	29

Gryllus campestris Field Cricket	VU	B2 a, c (iv)	This species is close to fulfilling the criteria for EN, but it categorically fulfills the VU criteria, and the Endangered criteria are only partly fulfilled.The sticking point has been whether or not the fluctuations in population can be categorised as 'extreme'. This species has been the recipient of Species Recovery Programme funding, and a considerable effort has been made to establish a successful breeding and re-introduction programme, with some success. There is some degree of stability regarding the persistence of the main colony at Coates, but other colonies have experienced considerable declines, and all colonies are at the mercy of poor spring and summer weather conditions. At the Parham re-introduction site, for example, where up to 200 males were heard calling in the early 1990's, the population subsequently crashed to the point of extinction and a further re-introduction of stock had to take place to establish the current population. The combination of variable weather and lack of management at tines results in strong fluctuations of many populations, and lack of suitable management in particular can cause rapid declines.	NR		E			19	6	4
Gryllus bimaculatus Southern Field Cricket	NA			Non-native					1	16	1

Gryllodes supplicans (=*sigillatus*) Tropical House Cricket	NA			Non-native					1	15	1
Nemobius sylvestris Wood Cricket	LC		UK colonies appear to be stable	NS		E			35	26	20
Pseudomogoplistes vicentae Scaly Cricket	VU	D2	This species qualifies as Vulnerable on account of the very small range - only three known populations, which could be threatened by marine pollution events, as well as by climate change/ sea level rise in the longer term. There is no evidence to suggest that there has been a decline in these populations, one of which (at Chesil Beach), indeed, may number many thousands and could be one of, or the, largest global population of this species. The Scaly Cricket is now regarded to be a genuinely native species, rather than an accidental introduction. and the UK colonies are important in a global context. The fragmented nature and position of the known colonies at Chesil Beach (Dorset), Branscombe (Devon) and Marloes/Dale Peninsula (Wales) means that they remain vulnerable to sea level rise and marine pollution events.	NR		E		W	1	5	2
Oecanthus pellucens Italian Cricket	NA		Recorded as an introduction from Kent, Jersey and elsewhere. This species has shown a significant northward range expansion in Europe and is a potential candidate for colonisation at a future date.	Non-native					0	2	0

Gryllotalpa gryllotalpa Mole Cricket	CR	B2 a, c (iii, iv), D	It currently qualifies as Critically Endangered under Criteria B (small range, single location and extreme fluctuations in number of populations and mature individuals), and D (very small population). As it is not yet known how viable this recently discovered population is, it may also qualify under Criterion E (>50% chance of extinction with 10 years/ three generations). Until 2014, all efforts to find a viable population of this insect had been unsuccessful, but in 2014 at least four males were recorded in suitable habitat in the New Forest. It is too early to determine whether these will persist, but it could represent a relict surviving population. The occasional report of an adult of this elusive insect being found in suitable habitat (e.g. Wareham, 1988; Macclesfield, 1996) means that the possibility of further colonies persisting in suitable wetland habitat (either in the New Forest or elsewhere) cannot be ruled out.	NR		E?	S?	W?	69	12	0
Tetrix ceperoi Cepero's Groundhopper	LC		Appears to be stable	NS		E		W	50	41	27
Tetrix subulata Slender Groundhopper	LC		Evidence of northward range expansion in UK			E		W	402	568	239
Tetrix undulata Common Groundhopper	LC					E	S	W	788	635	354
Anacridium aegyptium Egyptian Grasshopper	NA			Non-native					2	15	0
Schistocerca gregaria Desert Locust	NA			Non-native					0	4	0

Calliptamus italicus Italian locust	NA			Non-native						0	0
Oedipoda caerulescens Blue-winged Grasshopper	NA		Channel islands only - not assessed in the context of this report	CI only					6	5	3
Stethophyma grossum Large Marsh Grasshopper	NT		This species has undergone an 85% contraction in range over the last 25 years, yet does not currently fulfil any of the Threatened categories. This is because its 12 known colonies in Dorset and the apparent metapopulation that occupies the wettest parts of the mire system in the New Forest Hampshire are currently considered to be stable and are not under any immediate threat from habitat damaging activities.	NR		E			28	13	12
Locusta migratoria Migratory Locust	NA			Non-native					1	3	1
Stenobothrus lineatus Stripe-winged Grasshopper	LC		Evidence of significant range expansion in East Anglia			E			171	146	97
Stenobothrus stigmaticus Lesser Mottled Grasshopper	NE		Isle of Man only - not evaluated in the context of this report. However, evidence suggests that this may be a genuine relict population.	IOM only					1	1	1
Omocestus rufipes Woodland Grasshopper	LC		Evidence of range expansion in England	NS		E			146	106	65
Omocestus viridulus Common Green Grasshopper	LC		Anecdotal evidence of disappearance from some formerly occupied areas of the UK (e.g. west country counties) as the humid grassland habitats that it requires are becoming less so.			E	S	W	1367	997	650
Chorthippus brunneus Field Grasshopper	LC					E	S	W	1342	1055	807

Chorthippus vagans Heath Grasshopper	NT		Continued loss of heathland habitat to building projects e.g. housing estates, and associated problems e.g. deliberate arson, have continued to have an effect on this species. However, many colonies are present on protected heathland sites, offering stability to this rare orthopteran. It remains to be seen whether or not this species will respond positively to climatic amelioration and begin to colonise the wider range of habitats that it occupies on the continent.	NR		E			16	9	9
Chorthippus parallelus Meadow Grasshopper	LC					E	S	W	1298	1004	754
Chorthippus albomarginatus Lesser Marsh Grasshopper	LC		Significant range expansion observed for this species in England			E		W	355	480	245
Euchorthippus elegantulus (=*pulvinatus* ssp.*elegantulus*) Jersey Grasshopper	NE		Channel islands only - not evaluated in the context of this report	CI only					3	2	2
Gomphocerippus rufus Rufous Grasshopper	LC		However, more evidence required to assess the true nature of any changes observed for this species.	NS		E			79	38	26
Myrmeleotettix maculatus Mottled Grasshopper	LC					E	S	W	764	444	271
Pycnoscelus surinamensis Surinam Cockroach	NA			Non-native					6	4	1
Nauphoeta cinerea Cinerous Cockroach	NA			Non-native						0	0

Blatta orientalis Common or Oriental Cockroach	NA			Non-native					113	12	4
Periplaneta americana American or Ship Cockroach	NA			Non-native					31	5	1
Periplaneta australasiae Australian Cockroach	NA			Non-native					35	15	0
Periplaneta brunnea Brown Cockroach	NA			Non-native						0	0
Blattella germanica German Cockroach	NA			Non-native					38	7	0
Supella longipalpa Brown-banded Cockroach	NA			Non-native						0	0
Ectobius lapponicus Dusky Cockroach	LC			NS		E			86	46	26
Ectobius pallidus Tawny Cockroach	LC			NS		E		W	95	39	26
Ectobius panzeri Lesser Cockroach	LC			NS		E		W	98	66	44
Loboptera decipiens	NA			Non-native					0	1	0
Mantis religiosa Praying Mantid	NA			Non-native					0	1	0
Empusa fasciata	NA			Non-native					0	1	0
Euborellia annulipes Ring-legged Earwig	NA			Non-native					9	2	0
Labia minor Lesser Earwig	LC					E	S	W	139	194	20

Marava arachidis Bone-house Earwig	NA			Non-native					2	0	0
Apterygida media Short-winged Earwig	NA		Possibly spreading	NS		E			36	35	8
Forficula auricularia Common Earwig	LC					E	S	W	1319	1118	679
Forficula lesnei Lesne's Earwig	LC			NS		E		W	54	105	15
Labidura riparia Giant Earwig	NA? Or CR/RE?		There is some scepticism as to whether this was ever a truly native species. However, its former occupation of 'typical' habitat offers the suggestion that it may have been. Possible record from Devon in suitable habitat in 1980's. If introduced, it became established for over a century.	Non-native?					3	0	0
Acanthoxyla geisovii Prickly Stick-insect	NA			Non-native					9	16	9
Acanthoxyla inermis Unarmed Stick-insect	NA			Non-native					13	28	12
Clitarchus hookeri Smooth Stick-insect	NA			Non-native					1	2	1
Carausius morosus Laboratory or Indian Stick-insect	NA			Non-native					1	1	0
Bacillus rossius Corsican Stick-insect	NA			Non-native					1	3	1
Sipyloidea sipylus Pink-winged Stick-insect	NA			Non-native							
Clonopsis gallica French Stick-insect	NA			Non-native					0	1	1
Baculum thaii	NA								0	1	0

Appendix 2. Summary of IUCN Criteria

Table B. Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable)

Use any of the criteria A–E	**Critically Endangered**	**Endangered**	**Vulnerable**
A. Population reduction			
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following:

(a) direct observation

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality

(d) actual or potential levels of exploitation

(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.

A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.

A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²

AND at least 2 of the following:

(a) Severely fragmented, **OR**			
Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a i) Number of mature individuals in each subpopulation:	< 50	< 250	< 1,000
or			
(a ii) % individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals.			
D. Very small or restricted population			

Either:			
Number of mature individuals	< 50	< 250	**D1.** < 1,000
			AND/OR
VU D2. Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.			**D2.** typically: AOO < 20 km² or number of locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years

INDEX