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A review of the scarce and threatened Hemiptera of Great Britain

by

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INTRODUCTION

Purpose and scope of the review

The Nature Conservancy Council's Invertebrate Site Register was set up in 1980 with the aim of putting invertebrate conservation on a firmer footing. To this end, two lines of work were set in motion. A series of county reviews was to collate information on sites of importance for the conservation of invertebrates, and a series of national reviews of invertebrate groups was to summarise the biology and habitat requirements of the rarer species. The present work is one of the latter series, and covers the Hemiptera (Heteroptera and Auchenorrhyncha).

A review such as this has several uses. It can be a source of information for those wishing to know more about specific insects that may be recorded from a site in which they have an interest. Those involved in site management can use it in making management decisions. Entomologists may find in it guidelines for further recording and investigations of the biology of the rarer members of the group. Finally, it provides evidence of the sorts of changes in the countryside which have resulted in decline in the Hemiptera, and which continue to threaten the rarer species. Hemiptera occur in every major habitat in Britain and are very varied in their ecology and requirements. A study of the group leads to conclusions and recommendations of relevance to a wide range of invertebrate groups.

This review is essentially a compilation of existing information. It does, however, draw on a considerable amount of previously unpublished information, chiefly from contributors to the Invertebrate Site Register. It is not intended as a detailed compendium of records and observations. The original records on which the data sheets are based are held by the Invertebrate Site Register at the Nature Conservancy Council Great Britain Headquarters, Northminster House, Peterborough.

This review, like others of the series, combines detailed entomological information with consideration of habitats and conservation management. There is little doubt that the lack of such combined information has contributed greatly to the neglect of invertebrate interests in the assessment and management of conservation sites in the past. Entomological recording at a site has frequently resulted in a site manager being sent a list of scientific names, with little or no annotation. If he or she then seeks further information, recourse must usually be had to entomological texts which may be neither readily available nor readily comprehensible. If ecological information is included in such a text, it is all too often along the lines of "on hazel" or "under bark", statements which are at best unhelpful in formulating a management strategy, and at worst may lead a site manager into a false sense of security as to the ease with which such invertebrate interests can be accommodated.

It is hoped that this review will be understandable by both entomologists and non-entomologists, and that it presents information in a readily accessible way. It is intended as a reference text, rather than as a book to be read from cover to cover. Each data sheet has been written so that it will, hopefully, stand in its own right as a statement of the biology and conservation requirements of the subject species. This has been done not only for ease of reference but also in recognition of the fact that, in these days of photocopiers, copies of data sheets will inevitably find their way into site files well separated from explanatory and introductory material. For the same reason, a list of references used in the preparation of the data sheet is given for each species, despite the inevitable repetition of references to standard texts.

The rarity categories used in this review and their definitions are considered in detail later. It is worthwhile to note here, however, that the lower cut-off point for qualification for inclusion in the review is the occurrence of a species in no more than 100 ten-kilometre squares in Britain. This definition based on distribution is used for pragmatic reasons. The qualification or otherwise of a species for inclusion can be objectively assessed by reference to a recent distribution map. In the case of the Hemiptera, this advantage is largely a theoretical one, since none of the recording schemes would claim such thorough coverage as to be able to produce definitive maps, but the use of strict distributional criteria does provide an objective and comparative basis for status assessment.

The use of a distributional definition of rarity inevitable has its disadvantages as well as its advantages. From a conservation point of view, there are two main disadvantages. Firstly, the significance of a species from a conservation is not necessarily correlated with the restriction of its distribution. Secondly, because the statuses included in the review are national ones, there is no allowance for species which may be of great importance

or interest in only a part of their range. A single example will serve to illustrate both problems. The corixid *Sigara striata* is confined to a small area in the extreme south-east of England, mostly in Kent. Within its restricted British range, however, it is fairly frequent, and seemingly rather catholic in its taste in water bodies. It occurs in far less than 100 ten-kilometre squares, and is thus included in this review. Another corixid, *Glaencorisa propinqua*, is largely northern and western in distribution, but has a few scattered records from the south-east. It is a predator in open water, and is largely confined to clean oligotrophic or peaty pools, particularly where there is little fish predation. Though local, it has a very wide distribution over the northern half of Britain, and does not qualify for inclusion in the review. *G. propinqua* has never been recorded from Kent. If it were to be recorded, that record would of enormously greater interest and importance than a record of *S. striata*.

Since this review has been prepared primarily for conservation purposes, it is intended that it should include only established members of the British fauna. Vagrants, introductions, species which have established only transitory breeding populations, species occurring only in artificial situations, and recent arrivals are not, in general, included. This rule is, in practice, rather difficult to apply. There are a number of species with only a few very old records of which it is now impossible to say whether they were vagrants, formed temporarily established populations, or were long-established British natives which became extinct early in the history of recording. It is to some extent an academic point, since whatever their past status they are now apparently lost, and the status of any newly-discovered colony must be considered anew. The assigned status is less academic for recent additions to the British list which feed on native plants in natural conditions. In general, species have been included where there is any possibility that they may be previously overlooked natives. The decision is easier for species feeding on non-native plants. Species associated with rhododendron, or with Scots pine in the south of England, for example, are excluded. Exceptions from the general rules of exclusion are made for species which were included in Shirt 1987 (British Red Data Books 2. Insects). *Cimex columbarius* seems unlikely to be able to survive in a state of nature in Britain, and *Tuponia carayoni*, feeds on the introduced tamarisk *Tamarix* spp. It has rarely been necessary to address the question of how long a species must have been present to qualify as an established resident rather than as a recent arrival. The distinction between these two categories is widely made in conservation, at least implicitly, but attempts to define the borderline between the categories are few, and generally unsuccessful. All elements of the British fauna must have been recently arrived at one time, and there is no reason why a species which has been present for only a few decades should not be as informative and interesting a member of the fauna as one which has been present for a millenium. On pragmatic grounds, it is considered here that for conservation purposes a newly arrived species can only be considered an established part of the British fauna if it occurs in one or more of the suite of semi-natural habitats present in Britain, and that it is impractical to assign a status to a species which is sufficiently recently arrived for it not to have established a stable distribution. Recent colonisers are notoriously prone to dramatic changes in abundance and range, and it may take several decades before anything approaching stability is reached. *Deraeocoris olivaceus* is included in this review, despite there being strong evidence of it having colonised Britain only a few decades ago. It has remained largely confined to a small area of the home counties, with no evidence of dramatic changes in abundance or of rapid spread or decline, even on a very local basis, and it occupies a niche (large hawthorns) which occurs in semi-natural habitats.

All groups of the Hemiptera were initially considered for inclusion in the national review, but it was finally decided that only the Heteroptera and Auchenorrhyncha were suited for inclusion in a published volume. This is not to say that members of the other groups of Hemiptera are of no interest or importance in conservation terms. Some members of the Psylloidea and Aphidoidea are certainly of very local occurrence and specialised habitat requirements. However, it was felt that the overall knowledge of the distribution and statuses of the members of these groups was not sufficiently uniform or complete to enable statuses to be applied to them with any confidence.

History and current status of recording

1. Heteroptera.

The Heteroptera have a long history of recording, with a well-documented set of early records dating back to the middle of the nineteenth century. Some of the earliest records are rendered doubtful by taxonomic change and the uncertainties attached to identification in the earlier days of the subject. The production of the first major work on the British Heteroptera by Douglas and Scott in 1865 paved the way for more systematic recording. Various problems and uncertainties were resolved in the years following the production of this work, and with the appearance of Saunders' book (The Hemiptera-Heteroptera of the British Islands) in 1892 identification was

placed on a firm footing in most genera, and much distributional information summarised. Saunders' place as the leading expert on the Heteroptera in Britain was gradually taken by E.S. Butler in the early years of the twentieth century, and Butler's "Biology of the British Hemiptera-Heteroptera", published in 1932, is essentially a companion volume to Saunders' earlier taxonomic work, and gives an enormous amount of biological information, as well as updating Saunders' taxonomic treatment by the inclusion of additions to the known British fauna since 1892. Butler also included a table of distribution for all British species, by county for England and Wales, and merely by presence or absence in Scotland and Ireland. This recording system was continued by E.C. Bedwell, and a revised table of distribution based on his collated information was completed after his death by A.M. Masee and published in 1945. Masee published a further revision of this table in 1955. The table contains a number of errors, resulting in some measure from errors of transcription, but largely from uncritical acceptance of records. Nonetheless, it gives a good general picture of the distribution of the British species, and has proved a valuable starting point for the assessment of statuses for the present work.

In 1959, Southwood and Leston's "Land and water bugs of the British Isles" was published, which summarised the available information and gave keys to all the British species then recognised. This remains the standard work on the group, though taxonomic changes and recent additions to the British list mean that a number of additional papers are needed to update it. Many further papers on the British Heteroptera were published during the 1960s and early 1970s, particularly by A.M. Masee and G.E. Woodroffe, giving biological information and updating distributions. After the deaths of these two entomologists, the level of interest in the Heteroptera declined somewhat. Though quite a number of entomologists maintained an interest in the group, few claimed it as their chief or only interest, and relatively few publications were produced. The decline was less marked in the aquatic groups, which had long had a rather different following. Corixids in particular have lent themselves to comparative ecological and distributional work, and more detailed studies are available for them than for any terrestrial group. The availability of a separate key to the aquatic species (Macan 1965 now revised by Sarge 1989) published by the Freshwater Biological Association no doubt encouraged such separation.

The formation of the Heteroptera Study Group in 1983 resulted largely from the need to contact workers on the Heteroptera in connection with the preparation of the British Red Data Books volume on insects. As a result of the formation of this group, a number of workers who had previously been operating more or less in isolation were put in touch with a larger community of Heteropterists, and the stage set for a renewal of vigour in recording and study. National recording schemes for the aquatic and terrestrial Heteroptera were begun in 1983-1984.

2. Auchenorrhyncha.

The Auchenorrhyncha have historically been far less well recorded than the Heteroptera. Though taxonomic treatments of the group in Britain began at about the same time as those on Heteroptera, and a synopsis of the British species was published in 1896 by Edwards, they never achieved the same level of popularity as the Heteroptera. In part this was no doubt because of difficulties of identification. Whereas relatively few genera of the Heteroptera require study of the genitalia for accurate diagnosis of species, it is quite frequent for the Auchenorrhyncha to require such dissection and detailed examination. Early descriptions and diagnoses of species, using external characters, are both difficult to use and unreliable. For many years after the publication of Edwards' work, the Auchenorrhyncha had rather few devotees, and published information in the early years of the twentieth century is sparse. No further works in English dealt comprehensively with the British fauna until the appearance of the keys in the Royal Entomological Society's series of handbooks for the identification of the British fauna (Le Quesne 1960, 1965, 1969; Le Quesne & Payne 1981). The appearance of these keys, and the resolution of many of the taxonomic problems which had previously existed, has opened the field for entomologists, and there is now much greater interest in the group than ever before. A recording scheme was begun in 1979, and a regular newsletter is produced. The series of volumes in the Fauna Entomologica Scandinavica series covering the Auchenorrhyncha is now complete, and is in English. The fauna of the area covered by this work largely overlaps that of Britain.

Distribution of the Hemiptera in Britain

In common with most orders of insects, the Hemiptera are more numerous in both species and individuals in the south of Britain than in the north. The Heteroptera are a far more strongly southern group than the Auchenorrhyncha. Included in the assemblage of exclusively southern species is a number which are at the edge of their climatic tolerance in Britain, and which are therefore confined in this country to areas of particularly

favourable conditions. They are largely coastal. Examples are more numerous amongst the Heteroptera than amongst the Auchenorrhyncha. Scattered localities for various of these restricted species occur along the southern coasts, but there appear to be particular "hot spots": the Kent coast, particularly the area from Deal to Sandwich; the Dorset coast around Poole Harbour and Studland, and the extreme south-west, particularly The Lizard peninsula, the Land's End area, and the Scillies. It seems likely that the emphasis on these areas in the historical records results at least in part from habit. The discovery of rarities in these areas stimulated visits by entomologists, which in turn resulted in the discovery of more rarities, and sheer intensity of recording may have resulted in exaggeration of the importance of the classic sites.

Inland in southern counties, the rich Hemipterous fauna is particularly concentrated in areas of heath, wetland, chalk and limestone. Kent, Surrey, Sussex, Hampshire and Dorset are particularly rich. Further to the west, though coastal assemblages are rich, the inland Hemiptera seem far less diverse than in the south-eastern counties, but recording bias may have exaggerated this difference.

There is a gradual falling-off of interest in the Hemipterous fauna north of the Thames, now exaggerated in the south-east by the enormous destruction of habitat which has occurred in the London area in recent decades. The midlands counties, by virtue of their positions and their included habitats, are for the most part relatively poor in Hemiptera, and interesting assemblages of Hemiptera are for that reason all the more remarkable where they do occur. Interest is greater in the eastern counties. Areas of chalk and greensand in Hertfordshire, Bedfordshire and Cambridgeshire support good faunas, though extensive habitat destruction and neglect mean that these faunas are almost certainly a shadow of what was formerly present. The remaining fens of Huntingdonshire and Cambridgeshire hold an important fauna which is continued in the fens and broads of East Anglia. The heaths, brecks and coastlands of East Anglia are of great importance for the Hemiptera, and several species are confined in Britain to this region. Wetland species in East Anglia, in addition to a number of rarities confined to this area or of predominantly southern distribution, also include several species more characteristic of the north and west which have small outlying populations here.

The Wash marks a major divide in the coastal fauna: though the Hemiptera of coastal sites in Lincolnshire and further north are of considerable interest, they are decidedly depauperate compared with those to the south. The decline of interest is even more marked inland, but is now greatly exaggerated by the enormous scale of habitat destruction which has occurred in the interests of agricultural improvement.

The Hemipterous fauna of the western midland counties and Wales is less well known than that of the east. The limestone of Gloucestershire has received some attention, however, and is known to be of interest. Wetland sites, both in Wales and in the west midlands, have been surveyed in recent years, and it is increasingly apparent that the faunas, particularly of Auchenorrhyncha, are of great importance. The Welsh sites in particular contain a mix of characteristically northern and southern species, producing a richer assemblage, certainly in terms of the less common species, than either northern or southern sites.

Coastal habitats continue to be of great interest for the Heteroptera at least along the whole length of the Welsh coast. Few sites have been closely investigated, but the Pembrokeshire coast has produced several rarities, and the dunes at Newborough Warren, Anglesey, have been well-studied and have a rich fauna. The dune systems of the Gower Peninsula are likewise rich, and support a number of species at the edge of their range. Species with a basically southern distribution extend north for a considerable distance along the west coast, though they are often very sporadic in occurrence. *Chorosoma schillingi*, for example, a frequent species on dunes in the south-east of England, is scarcer in the south-west and has only a single known locality in Wales, but extends north to Cumbria.

A large area of northern England and southern Scotland is of very limited interest for the Heteroptera. There is a gradual decrease in diversity, and the limited number of generally frequent northern species appear, but Heteroptera assemblages of particular interest are few, and consist for the most part of sites which, by virtue of their position and aspect, support faunas of more southern make-up than is usual for the area. It is not until the highlands of Perthshire, Inverness-shire and Aberdeenshire are reached that rich assemblages of characteristically northern Heteroptera are reached, though several of their number occur at scattered localities further south. Even here, the number of characteristic species making up the fauna is relatively small. Caledonian pine forest is probably the richest habitat in the area, though most of the species associated with it can also be found in plantations of Scots pine, and some in more open habitats.

The Auchenorrhyncha are better represented in the north of Britain than are the Heteroptera, and there is a less marked tailing off of interest. The midlands area is essentially as uninteresting as for the Heteroptera, but good wetland and grassland faunas, with interesting northern elements included, occur in Yorkshire and Cumbria, and are probably present throughout northern England and Scotland where suitable habitats occur.

The habitats of the Hemiptera

Woodland

Woodland supports a rich hemipterous fauna, but rather few species in this fauna are particularly specialised or uncommon. There is a large assemblage of tree-feeding species, for example, the majority of which can occur on the host tree in whatever circumstances it grows, some apparently preferring the more open conditions outside woodland. Similarly, many of the species of the shrub layer of woodlands are as likely to occur in hedgerows, patches of scrub in more open habitats, or even in gardens. The specialised plants of the woodland floor in general support few Hemiptera. Those that do feed on these plants are largely generalists with a wide range of hosts. Woodland is an important habitat for Hemiptera, however, and several aspects and components of woodland may be singled out for particular consideration.

Dead wood and over-mature timber

None of the British species of Auchenorrhyncha are associated with dead wood, and only a few families of Heteroptera. The Aneuridae (flatbugs) and Aradidae (barkbugs) are flattened insects, typically living beneath bark. They feed on fungal hyphae. *Aneurus laevis*, *Aneurus avenius* and *Aradus depressus* are all widely distributed species and, in the south, not uncommon. *A. depressus* is chiefly a woodland species, occurring beneath thick bark on large logs and stumps. The species of *Aneurus* are less confined to woodland and may be found under the bark of smaller branches. *A. avenius* especially can breed successfully in piles of brushings, or even under the bark of fence posts. The other species of *Aradus* are less common. *A. cinnamomeus* is a recent arrival, and differs from all other British species by feeding on pine resin. *A. betulae* is confined to Scottish birch woods. *A. aterrimus* is known in Britain only from a small area of Kent and East Sussex, and its habitat requirements are far from clear. *A. corticalis* is an extreme rarity, but is associated with fungus-infested stumps and logs in the south of England.

Some members of the Cimicidae are found beneath bark of dead branches, trees and logs. *Xylocoris cursitans* seems to be largely a species of ancient woodland and parkland, though within such areas of ancient habitat it is quite catholic in its tastes, and will live beneath the bark of introduced conifers as readily as on native trees. *Dufouriellus ater* is frequently found beneath bark but is by no means confined to this habitat, requiring only the presence of small cracks in which to hide. It can occur as readily around buildings, and has been recorded from a wooden barrel used as a table in a pub beer garden. *Xylocoridea brevipennis* is a rarity which is as likely to be found under bark scales on living trees as beneath bark on dead ones, and is not particularly a woodland species.

More use is probably made of dead wood by hibernating Hemiptera than by those which rely on it for their livelihood in the breeding season. Many species which hibernate as adults beneath bark, or even within rotten wood, in the winter months. The tortoise bug *Eurygaster maura* migrates from grassland, where it breeds in the summer, to hibernate in woodland, either beneath bark or in leaf litter.

Trees and shrubs.

There is a rich fauna associated with the trees and shrubs of woodland, but few if any are specifically woodland species. The greater the structural diversity of woodland, the more species are likely to be accommodated. Species differ in their preferences for height, degree of shelter, age of tree, etc. of their host plants. Woods with only tall trees and little regeneration or open space are in general poorer than those from woods of more varied structure. There is no doubt that a sunny and sheltered growth of scrub along a ride margin or a wood edge, merging into grassland and herbs, supports a rich community of Hemiptera lacking in woods without such structural features, even if the community is generally of common and widely distributed species.

A number of predacious Heteroptera live on tree trunks, the most frequent prey being Psocoptera (bark lice). Chief amongst these Heteroptera are two species of *Loricula* (Microphysidae), three of *Temnostethus*

(Anthocoridae) and two of *Empicoris* (Reduviidae). Although there is an inevitable association between these insects and woodland, most are not particularly woodland species, and are equally at home on hedgerow and isolated trees. Some may occur on lichen-covered boulders far from trees, and *Loricula pselaphiformis* is quite frequently found on old scrub in open grassland. The assassin bug *Empicoris baerensprungi* may be a true woodland species, but records are few and populations outside woodland may exist. All these species seem to prefer sheltered and sunny situations, and are more likely to occur around clearings, along rides and at wood edges than within areas with a closed canopy.

A number of Auchenorrhyncha are regularly found on tree trunks, but use them only as resting places, feeding on the foliage. *Ledra aurita*, a local species usually associated with oak, is a specialist bark-dweller, associated particularly with the larger branches of trees. It is so coloured and contoured in all stages as to be very difficult to see against a bark with a covering of thin lichen or *Pleurococcus*.

Herb layer, litter and ground

Most of the characteristic plants of the ancient woodland ground flora support few if any Hemiptera. Those Hemiptera which do occur on these plants are for the most part generalists with a wide range of food plants. Wood spurge *Euphorbia amygdaloides* supports two uncommon species of Heteroptera, the spurge bug *Dicranocephalus medius* and the lacebug *Oncochila simplex*. Both these species require the host plant to be growing in open and sunny conditions, and perhaps have a particular preference for wood margins where the host plant spreads beyond the limit of the trees into open scrub and grassland. Both show evidence of decline in recent decades, probably associated with the loss of well-structured woodland margins and with neglect of formerly coppiced woodland. A similar decline is noticeable in the burrower bug *Sehirus biguttatus*, which feeds on common cow-wheat *Melampyrum pratense*. There are many old, but few recent, records of this species from woodland in southern England, and these are from open and sunny areas along woodland rides and in clearings. In recent years it has been more often recorded outside woodlands, particularly from roadside banks. Another *Melampyrum* feeder, *Charagochilus weberi*, seemingly prefers the host plant to be growing in light shade, and may be similarly susceptible to loss by excessive shading in the absence of woodland management.

A much larger spectrum of Hemiptera is supported by the habitats of rides and woodland edges than by the flora beneath the trees. Broad grassy rides will support an essentially grassland fauna. Only occasionally will rarer grassland Hemiptera be present. Dry rides will in general support a greater range of species than wet ones on a similar substrate, but there is a significant fauna associated with damper rides and with bordering drains and ditches. The plant bug *Capsodes flavomarginatus*, common on the continent on a wide range of leguminous species, is in Britain apparently confined to damp woodland rides, where it feeds on large bird's foot trefoil *Lotus uliginosus*. The groundbug *Acompus rufipes* can occur in woodland rides where there is a good growth of its foodplant valerian *Valeriana officinalis*. This, in common with other wetland species which may occur in damp rides, is more frequently found outside woodlands.

In woodlands on acid soils, particularly on sand, where a heathy flora develops along the rides, a good heathland Hemiptera fauna may be present. There must be a varied structure for such a fauna to be maintained, including areas of short vegetation and bare ground. Suitable conditions may be maintained by trampling by visitors alone. Though for the most part the fauna of such heathy rides and clearings is similar to that found on open heath, and becomes more similar the larger and sunnier the ride, a few species seem to prefer the presence of trees. The groundbug *Rhyparochromus pini*, in its south-eastern localities, is usually found amongst leaf litter near trees, and is recorded from a number of woodland localities. Though dry heathy vegetation may support a good community of Heteroptera, there are relatively few Auchenorrhyncha associated with such conditions. The diversity of Auchenorrhyncha is greater on wet heaths, but good examples of such habitat are infrequent within woodland.

A good heathland flora may also be maintained in secondary and plantation woodland where vegetation is regularly managed along access routes, beneath power lines, or as fire breaks.

Some species which are not woodland specialists are nonetheless largely confined to woodlands towards the edges of their ranges. The plant bug *Lygus wagneri* is a common species in the north and west in a wide range of habitats, but in the south-east of Britain it is largely confined to woodland rides and clearings. Equally, the sheltered conditions of woodland rides allow species of southern distribution to extend their distribution further north than would otherwise be possible. The green shield bug *Palomena prasina* is frequent in a range of habitats

in the extreme south of England but is decidedly local north of the Thames. In the north of its range it is largely confined to hazel in woodland rides. Woodlands may therefore support assemblages of Hemiptera of considerable local or regional interest, particularly where there are well-structured rides and clearings.

Rank vegetation at wood margins, of minimal botanical interest, may be of value for Hemiptera. Bramble, nettle, coarse grasses and cleavers in such situations can hold a considerable range of species. Most are common, but cleavers *Galium aparine* in such situations, for example, may support such local species as the plant bug *Halticus luteicollis* and, more often, *Polymerus nigrinus*.

Management for Hemiptera

Management of woodland.

The retention of dead wood, a major factor in general invertebrate conservation in woodland, is of relatively little importance in the conservation of Hemiptera. The few species specifically associated with dead wood are either fairly general in occurrence and apparently able to survive in quite intensively-managed woodland, or are so rare that management for them is relevant only in a very few sites or in restricted areas of Britain and special woodland types.

The most important factor in maintaining a good hemipterous fauna in a woodland is the maintenance of varied structure, and the most important way to maintain such diversity is the maintenance of a good set of rides. Rides should be broad, sheltered and sunny. They should have low vegetation at the centre, preferably with some bare ground and, in wetter woods, with small pools in ruts. Taller vegetation at the margins should grade into scrub which should intermingle with low tree branches. The maintenance of such rides requires active management, but such management should not be too intrusive. A number of species of Hemiptera require the flowering or fruiting parts of the plants, and a reasonable stock of such flowering plants must be present throughout the summer. Though most of the species of Hemiptera associated with woodland rides are reasonably mobile, some are less so, and it cannot be assumed that a population will survive in the long term if it is regularly required to colonise new areas of suitable vegetation structure. When cutting is needed to maintain good ride structure, therefore, it is important that only short stretches of a ride should be cut in any one year. It may be possible to cut along only one side of a ride in a season, but this will only be successful if the flora and microclimate are at least broadly similar on the two sides. The frequency with which cutting is needed will clearly vary very greatly from wood to wood, according to substrate, climate, and the effects of grazing by wild animals. If a wood supports a good population of rabbits, hares or deer, the need for ride management may be slightly reduced. Rabbits are particularly good at maintaining areas of close-cropped grass and bare ground on dry soils, and some of the best-structured of woodland rides on calcareous soils are partly maintained by rabbits.

The maintenance of very short vegetation with interspersed bare ground is not easy using any system of mowing or cutting. Along frequently used rides suitable conditions are likely to be maintained in the absence of active management, and regular use by deer or other grazing animals may maintain suitable conditions elsewhere. In the absence of such regular informal management, attempts to create open structure and bare ground may not be worth the effort, particularly on heavy soils. Driving a vehicle along a ride, perhaps annually, may be considered as a way of diversifying structure. The number of passes and size of vehicle needed to produce a significant structural change will clearly vary according to substrate type.

On lighter and drier soils, particularly on sand, chalk or limestone, short vegetation and bare ground are of far greater significance than on heavier clay soils, which in general support little of interest amongst the Hemiptera in the ground and litter zones. Where a wood has been long neglected and the ground vegetation has become long and coarse with a considerable litter layer, the most successful and practical way of opening up the vegetation may be by scraping it away or by cutting and rotovating. Such extreme measures should be undertaken only on a limited area at any one time, but may be very successful in creating small pockets of vegetation and bare soil.

The creation and maintenance of uniformly broad open rides may not always be the ideal, particularly if the ride is long and either straight or open-ended, so that its margins may be seriously exposed to winds from certain quarters. The creation of numerous rideside clearings separated by banks of scrub may be preferable in such circumstances. By providing subdivisions of the ride vegetation, they may also make the logistics of ride

management easier. Each clearing should be large enough to be divided into at least two compartments for management purposes, so that no more than half its area is managed in any one year.

Cuttings from rides should be removed. It may be practical to remove them from site completely, and in very small sites this may be the most desirable option. If land of low conservation interest is available close to the wood, the creation of a large litter pile is probably best, and this pile will support its own distinctive fauna. Otherwise, litter piles can be created within the wood itself. A pile along the margin of a ride where it receives considerable sun will provide a useful basking place and may develop a good fauna. A pile under dense canopy cover is less likely to support breeding populations of Hemiptera, but may be useful as a hibernation site. A few large piles are preferable to many small ones, and it is best if a pile is maintained in the same place from year to year. The exact positioning of such litter piles may require some thought, in order to avoid damage to areas which are of intrinsic interest.

Ride-side coppicing may be a valuable way of maintaining good ride structure with varied shrub growth. Such a coppice regime, if operated on, for example, a regular ten year rotation, gives adequate scope for the management of only a short stretch of ride in any given year. It is simpler and cheaper to arrange for such ride-side coppicing than for the instatement of a full coppice system into a wood and, so far as the Hemiptera fauna is concerned, is likely to be just as useful.

Traditional coppice management may have benefitted many species of Hemiptera. The shieldbug *Eurydema dominulus* feeds on crucifers, and in coppice woodlands in Kent has been observed to feed on lady's smock *Cardamine pratense* in recently coppiced compartments, the adults moving on to new compartments where coppice re-growth becomes dense enough to shade out the host plant. The bark bug *Aradus aterrimus*, in the same woods, bred in piles of chestnut chippings left after woodcutting operations. Coppicing maintains a varied structure of trees and shrubs, ensures good growth of foodplants for Hemiptera in the herb layer, and keeps open, sunny conditions. However, there is probably no British hemipteron which is dependent on coppicing for its survival at any given site. This is in contrast to some other insect groups, most notably the butterflies. Most species can maintain viable populations in fairly small areas of suitable habitat, and the maintenance of good ride structure, preferably combined with rideside coppicing, should normally be adequate.

Heathland

The most important features of heathland for the Hemiptera are that it is well-drained, is on a loose sandy substrate, and is open, possessing, in well-structured examples, short vegetation and bare ground. Heather *Calluna vulgaris*, though typically the dominant plant in such habitats, is not particularly important for Hemiptera. A number of species feed on it, but most of these are reasonably common and tolerate a wide range of conditions. Even some species normally found in close association with heather have also been found in situations without it. The damselbug *Nabis ericetorum* and the groundbug *Scolopostethus decoratus*, two common heathland species, have been recorded in dry grassland and ruderal habitats in the absence of heaths and heather. The rare groundbug *Nysius helveticus* and the local leafhopper *Zygina rubrovittata* are *Calluna* feeders, and the plant bug *Phytocoris insignis* also appears to be associated with heather.

The structural characteristics of heather may be more important than its direct or indirect value as food. A well-grown bush of heather provides shelter beneath the mat formed by its lower branches, and may be used both for shelter during periods of adverse weather and at times of the day normally occupied in resting, and for hibernation. Well-grown bushes of heather also provide shelter from the wind. Some of the best patches of ground for Hemiptera on heathland are small pockets of bare or nearly bare ground within areas of tall heather.

As with other habitats, the general rule applies that the greater the structural diversity of heathland, the greater the number of species of Hemiptera that can be supported. The importance of bare and partly bare ground cannot be over-stated. The dwarf shrubs of heathland should be represented by all stages from young growth to tall mature bushes, and the variation should be in as close a mosaic as possible. The presence of taller scrub is highly beneficial. Broom, gorse and birch are all important, in decreasing order of value for Hemiptera. Broom supports a rich Hemipterous fauna. For the full range of this fauna to be represented, it is important that a good age range of broom bushes should be present. The treehopper *Gargara genistae* and the leafhopper *Euscelis ohausi* may both prefer young, or at least low, growth of broom. The lacebug *Dictyonota fuliginosa* is almost always found on old well-grown broom with a profusion of flowers and seeds.

Gorse is important not only for the phytophagous species of Hemiptera which feed on it, but also as a hibernation site. Hibernating insects may overwinter amongst litter beneath the bush, within dense clusters of live or dead needles on the bush, or within old seed pods which remain attached over the winter. Accumulations of dead needles within the foliage of the bush can support large populations of Psocoptera (barklice), mites, etc., which in turn support predacious Heteroptera. The pale brown flower bug *Cardiastethus fasciiventris*, a local species, is found particularly in such conditions in gorse bushes on heathland and dry grassland, where microphysids of the genus *Myrmedobia* may also be frequent.

Birch *Betula* spp. also supports its own characteristic phytophagous Hemiptera fauna. The fauna may be quite rich, but the majority of species are more or less common and widely distributed, and none is confined to birch on heathland, though heathland birches probably support as good a community as anywhere. Birch is also valuable in providing shelter, particularly where it occurs in discrete patches of fairly open structure.

Most heathland has in the past suffered heavy long-term exploitation and extreme, usually small-scale, disturbance. Many of the rarer and more characteristic species associated with heathland are particularly associated with such disturbance, and have suffered greatly from the loss of traditional methods of heathland exploitation during the present century. For some of these species, the disturbance is more important than the heathland in which it occurs. Areas which, from a botanical and habitat point of view, might be regarded as seriously degraded, may be of great value for Hemiptera. Woodroffe (1959) examined the Heteroptera of an area of degraded heathland at Witley Common, Surrey, where buildings and roads had been constructed during the second World War and then demolished. His finds included *Odontoscelis lineola*, an uncommon species feeding on storksbill *Erodium* spp, for which this is the only recent inland locality outside the brecklands of East Anglia, and *Amblytulus delicatus*, a plant bug with only a handful of British records, which feeds on the common cudweed *Gnaphalium germanicum*.

It is important that areas of degraded heath, and areas of disturbed non- heath habitat within heathland are recognised for their intrinsic value. They should not be automatically dismissed either as of low conservation interest, or as areas necessarily suited to re-instatement of heathland. Disturbed or bare ground at the margins of car parks and tracks, alongside recently constructed roads, on the sites of old buildings and the like, should all be regarded as areas of interest, and effort should be made, if necessary, to maintain them by, for example, periodic disturbance. Severely degraded sites have the advantage from this point of view that, being of low overall habitat quality, it may be possible to undertake rather drastic experimental management without great risk or controversy.

There is no doubt that good heathland structure is best maintained by grazing. Rabbit grazing is well suited to providing a good structure, and kept many heathlands in excellent condition for many years prior to myxomatosis. By concentrating their grazing on certain areas and leaving others largely untouched, rabbits create a close mosaic of different vegetation heights and structures. Their scrapes create bare ground and create opportunity for the germination of annual plants and for the accumulation of leaf litter. Their burrows provide areas of bare loose ground enriched by droppings, which can support a further suite of plant species. Rabbit populations should be maintained or encouraged wherever possible, but there may inevitably be problems with neighbours, and the rabbit can never be relied upon as a management tool while myxomatosis is still rife.

A wide range of domestic stock has been in the past, and in some areas still is, grazed on heathland. Sheep are nowadays the likeliest stock to be suggested for re-instatement of grazing. They will certainly provide adequate management, and have done so for many years in some areas, for example on some breckland heaths. Cattle are probably to be preferred, however, since their greater weight provides some substrate disturbance, and they are much more patchy grazers. Their greater weight may also be effective in breaking up bracken rhizomes. Heaths in the New Forest are grazed predominantly by ponies to good effect.

In the absence of grazing heather will go through a cycle of growth and senescence which maintains structural diversity. As a heather plant ages, its branches fall outwards to the ground, and as the plant senesces and dies it provides a gradually increasing area of bare ground and dead twigs which can then re-colonise with regenerating heather and herbs. There is, however, an obvious danger of the build-up of a deep litter layer in circumstances where no material is removed from site, and it would be unwise to rely on the natural cycle to maintain sufficiently varied conditions over the whole of a site. It may be a valid option for small sites, however, for example small neglected spaces in woodland where any open-ground fauna is likely to be sparse, and also for parts of larger sites. It may, for example, be the best management option for the plant bug *Phytocoris*

insignis, which appears to prefer tall heather sheltered by trees. Scrub invasion is likely to be a major problem in sites which are neither cut nor grazed, particularly if there is surrounding woodland, and there may be a need for considerable management input in removing scrub and uprooting tree seedlings and saplings. Once a site has been got into condition, however, such management may be undertaken by very light but frequent management, and it may be quite feasible for a small site to be kept in order by a single person removing very young invading trees during regular visits. On very small sites, surrounded, for example, by forestry plantations, this may be the only practical management option.

Regular grazing of heathland will tend to maintain areas of open vegetation and bare ground in roughly the same positions from year to year. There will, of course, be some variation from year to year resulting from changes in grazing intensity and weather conditions, but overall structure should change only gradually. This continuity of position of areas of favoured structure may be important for some species of Hemiptera. Some species are known to be efficient dispersers and colonisers, but others are less certainly so. Some are usually short-winged and flightless, and colonisation of newly suitable areas over any but very short distances may be a rather chancy affair. Maintenance of suitable conditions in one place in the long term gives the best chance of maintaining suitable conditions for such insects.

The margins of tracks through heathland may also retain open conditions. In neglected heathland sites, track margins may be the last places to retain a good heathland Hemipterous fauna. The quality of the fauna will depend very much on the extent of trampling and the resultant vegetation structure. The best structure is a bare, hard-trodden central track several feet in width, bordered by a thin band of short vegetation maintained by infrequent trampling, which in turn should be overtopped by spreading heather and other dwarf shrubs. If the track is worn or compressed to a lower level than the surrounding heathland, so that low banks are formed, this is often better still. If usage of the track is sufficiently heavy to cause it either to develop into a gully with loose disturbed sand and sheer sides, or to spread laterally to form a broad area of heavily trampled vegetation, the Hemiptera community will be poorer. Where there is considerable public access to a heathland, a complex network of lightly used tracks is preferable to a single very heavily used route. The riding of horses along heathland tracks is in general very destructive. Their hooves churn the ground too much to create suitable conditions for Heteroptera. If access to heathland by horse-riders cannot be avoided, they should be confined as far as possible to a single track and attempts made at damage limitation along the route. On at least one heathland site used by horse riders, several alternative tracks are available for horses: horses are allowed to be ridden along one route until it becomes eroded, and are then re-routed to a different track until the first route has had time to recover. Such management simply results in the loss of Hemiptera interest on all tracks in a few years, and should be avoided.

Heavy trampling may provide informal management away from tracks. Hilltops, vantage points, monuments and even isolated trees will act as a focus which may draw people together. Whether the trampling which results is useful or destructive depends on its distribution and intensity. A large expanse of uniformly trampled ground-hugging vegetation or bare frequently disturbed ground is clearly bad, but a dense network of hard-trodden paths with clumps of taller vegetation may be good.

Where there is motor cycle scrambling on a heathland it is usually regarded as a problem. Certainly very heavy use of heathland in this way may result in great erosion and damage. However, light use by motor cycles may maintain open areas and bare ground without excessive damage, and may certainly be better than total neglect. The level of use and the effects on vegetation must clearly be monitored very carefully. Once again, regular usage of certain tracks provides the possibility of consistent maintenance of specific areas of open ground.

On most heathland sites, reliance on trackside habitats is unlikely to be adequate for the maintenance of low vegetation or open ground, though they may provide refuge for the less common elements of the Hemipterous fauna until management elsewhere on the site can be organised.

Two methods of management of large areas of open heathland in the absence of grazing are in frequent use: cutting, and burning. Each must be employed as a rotational management system. The site is divided into a number of plots, and only a fraction of the plots is managed in any one year. Heather is slow-growing and can be managed on a long cycle, up to twenty years or more, though as far as the Hemiptera are concerned there is probably little gain in a rotation period greater than about ten years. If space and management resources allow, it may be best to instigate both a long and a short rotation to run simultaneously. A small block of plots managed

on a rotation of, say, four years, within a block managed on a longer rotation of ten to fifteen years or more would provide good variation in structure, and would ensure the presence of sufficient areas of open ground and short vegetation. The plots used for such rotational management must be arranged so that each adjoins the plots managed immediately before and immediately after it, so as to facilitate colonisation after management. There are many possible arrangements of such plots, and the arrangement finally selected will clearly depend on the shape and size of the site. Narrow strips may be easier to manage than square plots, and may colonise more rapidly and effectively after management.

Burning removes above-ground vegetation and accumulated litter, and is therefore efficient in creating bare ground and early successional stages, but is destructive to the fauna already in the management plot. In a well controlled winter burn, high temperatures are experienced only superficially at ground level, and may leave many hibernating insects unscathed. Those species which overwinter as eggs on the aerial parts of plants, however, will be completely lost from a management plot during burning. The habitat will change so much as a result of the burn that those Hemiptera which survive it may ultimately fare little better. There is always a risk of a burn being hotter than anticipated, and killing all overwintering insects. It is better to regard burning as effectively wiping the slate clean in any area in which it is used, so that any Hemiptera must colonise from adjoining plots. Most or all may well be able to do this, but it cannot be guaranteed that they will be able to do so. Species tending to form small localised colonies may be particularly prone to localised extinction. In order to minimise such effects, plots used for burning should be as small as possible. The whole of a particularly interesting feature, such as a south-facing bank, should never be included in a single management plot.

Cutting is less thoroughly destructive than burning. Cut material must always be removed from site to avoid a build-up of litter and nutrients, so there is considerable loss of the aerial parts of plants. However dramatic the cut, though, the loss will not be complete. There is little danger of the complete loss of species hibernating in the litter and the superficial soil layers. The chief disadvantage, in comparison with burning, is that it does not remove accumulated litter or create areas of bare ground. The use of a vertical flail for cutting will provide ground disturbance, however, and once a heath is back into regular management, litter build-up may not be a major problem. If a vertical flail cannot be used, or if the disturbance created by it is not considered sufficient, cutting may be combined with substrate disturbance, for example by digging or rotovating a fraction of the managed plot.

Though cutting is not as destructive of the fauna as is burning, it is nonetheless a catastrophic management, involving sudden and dramatic change over a significant portion of a site. Hemiptera may respond well to catastrophe. The rich faunas associated with grossly disturbed or damaged areas of heathland are testimony to this. However, rotational management involves recurrent catastrophes every few years, and the efficiency with which Hemiptera can respond to such frequent changes is not known. Populations of many species might be expected to be less secure under such conditions of frequent change than if suitable conditions are present in the same place from year to year.

Accidental or vandalistic burning is a frequent problem on heathlands, and usually occurs in summer. From the point of view of the Hemiptera, such summer fires over a small area of heath may be little more damaging to the fauna within the burnt areas than are controlled winter burns for management purposes. The long term damage to the fauna of a site may be very much greater, however, if the area of burn is very large, or if regeneration following the burn is very poor. Though uncontrolled summer fires are best avoided, there are certainly some small and isolated heathland sites where small areas of burning, apparently through deliberate acts of vandalism, have been almost the only factors maintaining invertebrate interest against a background of neglect and scrub invasion. Where summer fires are likely to be a problem on large expanses of heathland, subdivision of the site by the creation of firebreaks may reduce the dangers and problems. The maintenance of bare or nearly-bare ground in such firebreaks may be of value for Hemiptera. If colonisation by small annuals and species of disturbed ground is allowed before re-clearance, a characteristic, if limited, fauna of Hemiptera will colonise.

Poor regeneration of heather and other characteristic heathland plants after an uncontrolled summer burn need not always be wholly deleterious to the Hemipterous fauna. The uncommon squashbug *Spathocera dahlmanni* occurs on sheep's sorrel *Rumex acetosella* and has been taken on a number of occasions on areas of heathland where sorrel has grown up after burning. Replacement of heather by grass-dominated vegetation may be harmful to the Hemiptera fauna if the area is large, but may enhance the interest, particularly amongst the Auchenorrhyncha, if it occurs only over a limited area.

Where a heathland supports areas of native species of shrubs or trees, it is rarely wise to completely remove them. Complete eradication of such aliens as rhododendron should always be attempted, though it is unlikely to be successful. Scots pine, a common invasive on many southern heathlands, supports an interesting fauna of Hemiptera, though of course none are native to the south of Britain. The extent to which invading pine is removed from heathland may depend on the speed and extent to which it is invading and the frequency and extent of possible management. Provided sufficient management time is available to deal with the consequences a few scattered pines or small groups of trees on a site may give some benefits to the fauna. In addition to the fauna on the pines themselves, the accumulated needles beneath the trees are used by a number of Heteroptera. The groundbug *Rhyparochromus pini*, in particular, is characteristically found amongst pine litter on heathland in the south-east of England. Young Scots pine have no particular Hemiptera interest, and there is no reason for retaining any number. The best trees to retain are small groups of fairly tall trees with a good litter layer beneath, and isolated short and rather spreading trees whose lower branches are in contact with the upper levels of the heather.

Scrub of birch, gorse and broom is best maintained in small discrete areas. Widely scattered scrub will hold less interest, is less easy to integrate into a management plan, and is less easy to monitor. It is best if scrub forms south-facing pockets around small areas of heath vegetation. Such pockets may occur naturally, but it may be possible to create them during scrub clearance operations.

There is no advantage to the Hemiptera of a site in having a broad area of scrub rather than a narrow one. A band of scrub one or two bushes wide is likely to support as many species as a dense block. Where large dense blocks occur, the best management is usually to remove sufficient to increase the length of the edge by creating pockets and corridors which will have sheltered edges.

The areas of densest and oldest scrub will often be at the margins of a site, and it may be administratively convenient to retain a scrub boundary while bringing the central area of a site into management as open heathland. There may be other advantages in having a dense scrub boundary. It may provide some control over access, and it will form a valuable screen on sites surrounded by arable or other intensively farmed land. It will also prove valuable shelter on exposed sites. However, a continuous scrub screen may cut off heathland from valuable heath-edge habitat, such as any transition to flowery grassland, or bare or disturbed ground along road verges. Such transition to edge habitats should be preserved wherever possible. Administrative convenience should never be used as an excuse for the removal of well-structured and valuable areas of scrub from any part of a site.

In addition to their direct value for invertebrates, areas of scrub may hold rabbit burrows. Disturbance to scrub containing warrens should be minimised.

Within areas of scrub or trees which are to be maintained, management should aim to retain a full representation of growth stages, from young regenerating growth to old mature bushes or trees. All the characteristic native tree and shrub species of heathland regenerate well from cut stumps. The easiest way to maintain a full set of growth stages, and a good structure, is therefore periodically to cut down some bushes and trees at the edge of a clump and allow re-growth. The opening up of the leading edge of the scrub will also allow germination of seeds and the production of new plants to act as replacements for any of the older ones which may be lost. If an entire scrub clump shows signs of senescence, and regeneration from seeds is poor, disturbance of the ground around the clump will encourage seed germination.

If an area of dry heathland has been so long neglected as to lose all open ground, to suffer serious scrub invasion, and to build up a deep litter layer, then re-instatement may require drastic treatment. In such a site, most heathland species of Hemiptera will probably already have been lost. Whatever management is adopted, the fauna must in large measure re-colonise from scratch. From this point of view, it makes little difference how dramatic the treatment is. It may therefore be simplest to remove all surface vegetation and litter from the site, scraping down to the surface layers of the bare sand or soil, and allowing regeneration of heathland on the bare ground. Obviously only a fraction of a site should be treated in this way at any one time.

This account has dealt chiefly with the instatement of planned long-term management over the whole of a conservation site. On many sites, however, resources may not be available for the considerable management input required. In such cases, management must be piecemeal, and must be regarded as a holding exercise attempting

to maintain pockets of interest until such time as increased resources become available. The two major aims of such holding management should be to ensure that no large areas of open heathland are completely lost to scrub, by keeping open islands of low vegetation, and to maintain areas of low vegetation and bare ground. Small open areas can be created by the cutting or pulling of heather to form patches of bare ground a few feet in diameter. Once made, it is relatively easy to maintain a series of such pockets, for example along trackways. The clearance of scrub in a broad swathe along tracks may enable the retention of a good proportion of the Hemipterous fauna of a site., at least in the short term. Because many Hemiptera are able to survive as viable populations in small areas of suitable habitat, very small remnants of heathland vegetation may be worth attention. On afforested heathland, surprisingly good assemblages of Hemiptera may be found in the broad swathes of low vegetation maintained beneath power lines, particularly where regularly used tracks cover more or less the same route.

Grasslands

Grasses and other grassland plants support a good range of phytophagous Hemiptera. The rarer grassland plants usually have few if any associated Hemiptera. The best grasslands tend to be those with good populations of local plants, which are able to support good populations of host-specific Hemiptera.

To support a reasonably full range of possible Hemiptera, as wide as possible a range of plant species should be present in as wide as possible a range of growth forms and stages. A good flowering population of the host plant may be important. *Oncotylus viridiflavus* feeds on hardheads *Centaurea nigra*. All stages feed on the flowers and developing fruits, and eggs are laid in the stems just below the flowerheads. To maintain a population of the bug, a good population of flowering plants must be present, and a good proportion of the seedheads must remain upright throughout the winter. In contrast, the negro bug *Thyreocoris scarabaeoides* is a largely ground-dwelling insect, which can burrow into sandy or fine-crumbed substrates. It is associated with violets *Viola* spp, and possibly with other plants. It is a warmth loving species and requires bare ground, or at least very sparse vegetation, in order to maintain its temperature and to provide opportunities for burrowing in adverse weather conditions. In consequence it is most often to be found where violets grow on disturbed ground, for example that created by trampling on slopes, or where rabbit grazing has reduced the plants to tight clumps amongst very low sparse vegetation.

The ground bugs, Lygaeidae, are mostly seed feeders, and may combine the need for bare or sparsely vegetated ground with that for a good population of flowering or seeding plants. Many of the rarer members of the family are warmth loving and need the microclimate associated with areas of open sunny ground. A close mosaic of tall and short vegetation may be important for some of these species, not only so that there is a good supply of food, but also so that there is tall, preferably tussocky, vegetation in the vicinity to provide hibernation sites.

A preference for open ground is not universal amongst the rarer groundbugs. The less common members of the genus *Drymus* are associated with taller vegetation, and particularly with thick moss layers. It may be that the moss acts as a seed trap and provides a good supply of food, as well as maintaining relatively constant environmental conditions and shelter. Taller mossy grassland at the margins of scrub is particularly favoured.

Many of the plant feeding Heteroptera feed on the reproductive parts of plants. The Auchenorrhyncha in general do not, but feed on xylem or phloem fluids or on the contents of mesophyll cells on the vegetative parts of the plants. Many of the grassland Auchenorrhyncha feed on grasses. Some of these Auchenorrhyncha may well be fairly catholic in their tastes, and feed on a broad range of species, but it is becoming increasingly clear that many are very host-specific, often confined to one or a few species.

It is not surprising to discover that many of the rarer members of the Auchenorrhyncha are associated with the finer and less competitive grass species which are readily lost or greatly reduced in quantity when grassland is neglected. Because many Auchenorrhyncha feed, and spend most of their lives, on the aerial parts of their host plants, they may be less affected by details of sward structure than are Heteroptera, and a good Auchenorrhynchous fauna may survive in a uniformly tall sward provided that plant species diversity remains high.

Calcareous grasslands are the richest for Hemiptera. This stems in part from the diversity of plant species they support, in part from the nature of the substrate, which is usually well drained with thin soils forming a crumbly structure suitable for burrowing, and in part because of the structure of the vegetation which, traditionally at least, has usually been fairly open and maintained by grazing. Trampling by stock causes disturbance and local

erosion of the thin soils, particularly on slopes, increasing the habitat diversity. An ideal calcareous grassland should have both level and sloping grassland, the latter with a variety of aspects, with at least one sizeable slope south-facing. There should be a good range of sward heights, from short sparse grassland to tall rank grassland with tall herbs and invading scrub. A species-rich sward of moderate height should predominate. Areas of disturbance and bare ground should be widely scattered across the site. Most should be small, and should be in close proximity to areas of taller grassland. Larger areas with extensive disturbance, for example created by old quarries or by land tumbling back from arable, are also valuable. There should be small discrete areas of scrub, at least some of which should be bordered by tall rank vegetation providing a transition to the managed grassland. On small sites, or sites subdivided into smaller fields, the scrub components of the grassland may be provided by boundary hedges. Tall boundary hedges are a beneficial feature of any grassland site. At least part of their length should show a transition through tall herbs to open grassland.

Moderate grazing is the best management for calcareous grasslands. The intensity of grazing must be carefully adjusted to provide suitable variation in structure. On sites with varied topography variation will be easier to maintain than on more level sites. The choice of grazing animal will depend on the nature of the site and of the stock available in the area. Sheep are the likeliest stock to be employed on calcareous grassland, and have certainly been successful in maintaining many such grasslands for a considerable time. However, on many sites cattle may well produce a better overall structure: being heavier they create more disturbance, and on sloping ground they are particularly effective at creating small pockets of open ground and loose soil amongst overhanging vegetation.

Rabbits are very good at creating a varied vegetation structure. Feeding areas develop a short fine turf, less frequented areas develop coarser and often tussocky vegetation. Scrapes provide small areas of disturbance suitable for the germination of annual herbs, and may also accumulate leaf litter which is valuable for shelter and hibernation. Larger areas of disturbance are provided by burrowing, and the large amounts of loose soil produced by such activity is suitable for the growth of tall herbs such as ragwort *Senecio jacobaeae* and viper's bugloss *Echium vulgare*. The ground bug *Graptopeltus lynceus*, which feeds on *Echium*, was widely recorded on downland prior to the decimation of the British rabbit population by myxomatosis, but is rarely recorded from this habitat now.

If grazing is not possible on a calcareous grassland site, and if rabbits are not sufficient to produce and maintain short vegetation and open conditions, as will usually be the case, some other management will be required. If areas of low vegetation and bare ground are being maintained by, for example, rabbits or by public recreation, it may be adequate, to maintain the remainder of the grassland as a tall closed sward. This can be achieved simply by the control of invading scrub. It is greatly preferable that this should be done by frequent clearance of young scrub growth, rather than by major "scrub-bashing" exercises at long intervals. An established scrub-grassland interface develops an interesting fauna of its own. There is also the additional advantage that the underlying flora will suffer less from shading and from the build-up of leaf litter and from consequent enrichment.

Management by scrub clearance only is more likely to be satisfactory on sites with steep slopes, where inherent instability, trampling by visitors, and disturbance resulting from management operations are more likely to maintain open ground. Management by cutting may be difficult or impossible on very steep slopes. On sites with gentle topography, it is likely that it will be necessary to instate a mowing or cutting regime if grazing cannot be introduced in the long term, simply in order to maintain floristic diversity. Any such cutting regime should be applied on a rotational basis, with only a fraction of the site cut in any one year. The proportion of the site cut in any given year will depend on the length of rotation which the site will support. A rotation length of three to four years is likely to be the longest that is consistent with maintaining full floristic diversity, particularly amongst low herbaceous species. A longer rotation, perhaps up to ten years, may be possible on some parts of the site, and will allow a greater range of vegetation structure to be maintained. Such longer rotations may be maintained in areas of the site with relatively low conservation interest, particularly where long neglect has led to dominance by coarse grasses or, perhaps preferably, they may be maintained around the margins of a site.

There are two problems associated with such a rotational cutting regime: cutting alone is inefficient at maintaining open ground, and cutting is a catastrophic event for the fauna of a compartment in which it occurs. The first of these problems may be addressed by introducing deliberate mechanical disturbance of the substrate in a part of the site (by ploughing, rotovating or digging, depending on its size). There may, however, be good reasons for not undertaking such disturbance. If the site is of very ancient grassland on undisturbed soils, there

may be an understandable reluctance to change them. Though many plants of calcareous grassland may re-colonise well on disturbed ground, and some uncommon calcicoles may be confined to such conditions, others cannot cope with such disturbance. If such plants are present on a site great care must be taken in instigating any programme of disturbance. Disturbance should be undertaken on the areas of relatively young turf, or those of least conservation interest and should not be allowed to compromise other conservation interests. The effects of disturbance on such soils are long lived and, depending on circumstances, further disturbance may not be needed for a decade or more.

The second problem, that of the catastrophic nature of management by cutting, cannot be avoided. If cutting is to be undertaken on a site, this must be tolerated. Species which spend all or a major part of their lives on the aerial parts of plants will clearly be decimated or entirely wiped out from a compartment during such operations. The assumption behind rotational management is that after such decimation any species disadvantaged will re-colonise from adjacent compartments in the following years. Many may well be able to do so, particularly since the distances involved are always small, but it cannot be guaranteed that all species will be able to re-colonise successfully in the repeated pattern necessary. Species which are poor at dispersing (for example, those which are habitually short-winged) and which form small and localised colonies within a site, perhaps because of specialisation to a rare niche or an uncommon plant, may be particularly prone to local loss and ultimate extinction under such management. The danger is not confined to species associated with the aerial parts of plants. Those associated with low-growing vegetation may be able to live in a compartment only during the first one or two years after cutting. They too will be required to regularly re-colonise compartments after they have been cut. Such low-living species may be even more prone to localised extinction, since they are more often flightless, and more liable to form small localised colonies.

Rotational grazing is a half-way house between the ideal of moderate grazing over an entire site to maintain varied structure in a more or less stable configuration, and the catastrophic management associated with cutting. A site is divided into management compartments, as for rotational cutting. Each compartment is hard-grazed for a year, and then allowed to recover for two or more years before grazing is re-introduced. The problems associated with catastrophic management remain, but substrate disturbance is maintained at a reasonable level. Grazing alone cannot easily be used for maintaining a very long rotation, however, where very coarse vegetation and scrub may dominate a compartment at the end of a management period.

Calcareous grassland is usually quite resilient to trampling and other activities resulting from pedestrian access, except on steep slopes where erosion may be severe even with relatively low visitor numbers. On neglected grasslands, track margins and areas of disturbance resulting from human activities may be the only remaining areas of low or sparse vegetation and bare ground. Under such circumstances, recreational access is definitely beneficial. Even when a grassland is under management, tracks continue to provide useful habitat features, especially when management is by cutting, which does not in itself provide bare ground. Activities which result in great disturbance, such as motor cycle scrambling, are clearly not to be tolerated on established grasslands, but may be more appropriate to recent or incipient grasslands on disturbed ground.

Whatever the management regime selected for a calcareous grassland, it should not entail the complete removal of scrub from the site. If there is currently no scrub on the grassland then it would usually be unwise to encourage its development on turf which is of any great conservation value. Under such circumstances, it is better to make use of a boundary hedge. If no such hedge exists, there may be a case for planting one. It will provide shelter, and may serve to protect the site from damage if, for example, it borders arable land. Where scrub already exists on a site, some should be retained, ideally in fairly discrete small patches. It is particularly beneficial if the scrub forms small sheltered pockets around areas of low vegetation. If areas of species-rich calcicole scrub are present on a site, it is likely that a significant quantity will be preserved irrespective of invertebrate requirements, and a good fauna of Hemiptera and other invertebrates will be supported. The importance of juniper on lowland calcareous grassland does not need to be stressed, but it is worthwhile to point out that it is of interest for the Hemiptera, as for other insect groups, and the decline of juniper in the south of England in recent decades has resulted in a corresponding decline in the Hemipterous fauna. Of four British species of Heteroptera associated with juniper, two are believed extinct, and one is decidedly uncommon, though not under threat. Only one species has done well: the shieldbug *Elasmotethus tristriatus* has spread to garden conifers, and is now well established and spreading in many suburban areas, particularly on *Chamaecyparis* and *Cupressus*.

Hawthorn is the commonest scrub species on calcareous grassland. The fauna of this plant is richer than that of the less common, and more intrinsically interesting, calcicole shrub species. In addition to the species found on the shrubs themselves, they and the litter beneath them provide hibernation sites and shelter from wind, and at least one species of Hemiptera, the groundbug *Eremocoris podagricus*, occurs throughout its life in the leaf litter. Hawthorn is also particularly favoured by rabbits as shelter for burrows. Rabbits are extremely valuable in managing grassland, and areas of scrub regularly used by them should be retained.

When a site has been neglected for a considerable time it may be difficult to bring the grassland back into good condition. Where there is a great deal of scattered scrub, or a broadly invading scrub front, conditions may be unsuitable for the introduction of sheep or cattle. It may be worthwhile, however, to attempt the introduction of goat grazing, which can be very effective in knocking back scrub growth. The use of tethered goats may provide a very effective fine-tuned method of management, in that they can be retained in an area until precisely the correct conditions have been achieved, and then moved on. Where scrub has become so dense as to destroy all trace of the original calcareous grassland vegetation and to build up a nutrient-rich herb layer, the re-creation of a calcareous grassland sward may be difficult if the scrub is merely cleared. Under such extreme conditions, the best results from the point of view of the Hemiptera may well be to remove the scrub and to scrape off the accumulated litter down to the underlying soil or subsoil, and to allow natural re-colonisation. The cleared area should be reasonably close to a source of suitable seed.

The foregoing account has dealt entirely with calcareous grassland. The same principles in general apply to other grassland types. Neutral grassland is perhaps the least interesting of grassland types for Hemiptera. The number of individuals in midsummer may be prodigious, but most are of relatively common species found in a wide range of grassy habitats, and many are also found on calcareous or acidic grassland. Neutral grassland is in general lush, on more level ground and on heavier soils than either calcareous or acid grasslands. All these factors militate against a rich fauna of ground and near-ground dwelling species, the rarer of which, particularly, usually find conditions too sheltered and shaded. Interest increases if the grassland is somewhat calcareous or wet. Even more than on other grassland types, the transition to marginal hedgerows may be important.

Acid grasslands have a rather restricted fauna, but it can include some quite specialised and interesting species, particularly amongst the Auchenorrhyncha. The best faunas are to be found where acid grassland abuts onto some other habitat type, particularly heathland or acid wetland.

Since hedges to be managed for conservation are so often associated with grassland, it may be appropriate to include a few words about hedgerows here. A good hedgerow can support a very large and diverse fauna of Hemiptera. This includes a considerable number of phytophagous species which feed on the shrub and tree species in the hedge itself. Few bushes and trees support no Hemiptera, but of particular value are oak, hawthorn, willows and sallows, ash and elm.

Where a hedge abuts onto grassland, there may be a tangled mass of vegetation. Depending on the substrate and the extent of enrichment by the hedge itself, this may include tall herbs such as nettle *Urtica dioica*, cleavers *Galium aparine*, hedge bedstraw *Galium mollugo*, and hedge woundwort *Stachys silvatica*. All these support Hemiptera, and the overall assemblage associated with such conditions may be considerable. The plant bug *Halticus luteicollis* is one species which seems to favour such hedgerow conditions. It is a *Galium* feeder, and eats both *G. aparine* and *G. mollugo*, as well as other species. It is often found on tall straggling *Galium* scrambling up hedges.

To support a good hemipterous fauna a hedge should be tall, spreading and unkempt, with a good number of trees along it, and should have a broad and gradual transition to the bordering habitat. Such hedges should be managed as little as possible. In extreme cases, such hedges may form a belt of scrub, perhaps ten feet wide and ten or more feet tall. Such a hedge may be more or less stable in the long term with no management at all, provided the management of the bordering land is sufficient to confine it and to prevent further scrub encroachment. The development of such broad tall hedges should be encouraged whenever possible. Where it is desired or essential to maintain a lower and narrower hedge, the rule of not managing too frequently still applies. In general, there should be no need to manage a hedge more often than once every ten years. Hedges within a site, or parts of a single hedge, should be managed in rotation, so that there is always a mature hedgerow present on the site. Laying is the best way of maintaining and rejuvenating a stock-proof hedge. If a hedge is very neglected and woody, and no longer needs to be stockproof, rejuvenation may also be achieved by coppicing the large trunks. Only a fraction of the bushes should be treated in this way in any given year.

Open waters and wetlands

Only the Heteroptera include fully aquatic species. Though there are some 60 species in Britain which live beneath or on the surface of the water, there are rather few rarities. Upland, and particularly oligotrophic, pools have particularly characteristic faunas, which can include such local species as the open-water predator *Glaencorisa propinqua*. In the lowlands, most open water bodies have a fauna composed chiefly of common and widely distributed insects. The lower the nutrient status of the water, the more specialised and local the associated species are, as a general rule. Dystrophic pools in lowland heaths can be particularly interesting. Brackish water supports a distinctive community: the corixids *Sigara stagnalis* and *S. selecta*, the former universal, the latter more local, the backswimmer *Notonecta marmorea*, the pondskater *Gerris thoracicus*. Various of the Hemiptera of lowland eutrophic waters, though not nationally uncommon, are nonetheless of restricted distribution, and may be of considerable interest in part of their range. The water stick insect *Ranatra linearis*, for example, is a frequent species in more southern counties, particularly the south-east, but has a rather sudden cut-off point and though, for example, quite common over much of Cambridgeshire barely, if at all, reaches Lincolnshire.

The rarest of the aquatic species are, for the most part, associated with the later stages of the hydrosere. Thus, the genus *Microvelia* (pygmy water crickets) contains three British species. The commonest, *M. reticulata*, is widespread and common in the south in a wide range of water bodies, generally close to the margins or amongst emergent vegetation. A rarer species, *M. pygmaea*, is typically found amongst rather dense emergent vegetation or where there is considerable shelter and shade. The rarest, *M. umbricola*, is so far known in Britain only from the fens of eastern England, where it occurs in conditions of dense shade, typically beneath overhanging tussocks of sedge over shallow water. The fauna of wetlands is much richer than that of open water. Though the Heteroptera of wetland habitats are of interest, it is the Auchenorrhyncha which tend to dominate. There is a rich fauna of these insects associated with the various grasses, sedges and rushes found in such places. The common reed *Phragmites australis*, for example, supports at least eight species of Auchenorrhyncha in Britain.

The richest of Heteropterous wetland faunas occur in fenland. Tall fen communities, in addition to a broad spectrum of more or less common wetland species, may also support such species as *Adelphocoris ticinensis* on large bird's foot trefoil *Lotus uliginosus* and other tall legumes, *Polymerus palustris* on *Galium palustre*, and such rarities as *Capsus wagneri*. The Auchenorrhyncha of fens are likewise rich, and again tall mixed fen vegetation is the richest of fenland habitats. The fens of East Anglia support several species not yet recorded elsewhere in Britain.

There is some overlap between the fauna of fenland and that of acid bogs. To some extent this probably reflects the occasional occurrence of acid conditions in fenland. There do seem to be some species, however, which are genuine peatland species, and are seemingly indifferent to the base status of the water. The groundbug *Pachybrachius fracticollis* is one such species. It is characteristic of acid bogs in large areas of the south and west, where it is apparently associated particularly with cotton grass *Eriophorum angustifolium*. It also occurs regularly in East Anglian fens, where it is associated with sedges *Carex* spp.

There are rather few Heteroptera associated specifically with bogs, but a large proportion of them are local or rare. The shore bugs (Saldidae) include several species which are strongly associated with such acid wetlands. *Chartoscirta cocksi* is widely distributed; the rarer *C. elegantula* appears to be rather southern in distribution; the larger *Salda muelleri* and *S. morio* are predominantly northern and western, with scattered outliers further to the south and east. All are of obscure habits and easily overlooked, a feature shared with a number of other characteristic elements of the bog fauna. Two species of *Hebrus* (Hebridae) and one of *Pachycoleus* (Dipsocoridae) are found within *Sphagnum*, for example. Several species of planthopper (Delphacidae) occurring in bogs seem also to be difficult to find: a large proportion of recent records come from pitfall traps. It seems likely that they habitually dwell low down amongst the vegetation, possibly often in the litter or in the surface layers of a *Sphagnum* mat.

Several of the characteristic Auchenorrhyncha of acid wetlands, including some uncommon species, are associated particularly with purple moor grass *Molinia caerulea*. This plant is a problem species on many wetland sites, particularly those which are degraded or neglected. The fauna associated with this plant is probably less in need of active conservation measures than are most elements of the acid wetland fauna, but it is of interest to point out that a plant generally held in low regard has some interest for Hemiptera. The insects associated are clearly much more local than the plant itself, though the reasons are far from obvious.

Coastlands

A large proportion of the rarer British Hemiptera, and particularly of Heteroptera, is largely or entirely coastal in distribution. The coastal rarities include species at the edge of their range, which are able to survive in Britain only in the favourable climate of coastal sites. Many coastal habitats support an excellent assemblage of dry grassland species. Wet dune slacks may support a very interesting fauna, though with rather few specialist Hemiptera. Brackish ditches and pools, and the emergent vegetation at their margins, can also support important assemblages of Hemiptera. The Hemipterous fauna of saltmarshes, though composed of a quite small number of species, includes a large proportion which are local or rare.

Saltmarshes

Few species of Hemiptera occur in the lower levels of saltmarshes, and those that do so are by and large species which are also found higher in the saltmarsh and occur more rarely, or as transitory summer residents, on the lower levels. The shorebugs, Saldidae, a group of ground-dwelling predators, are usually numerous on saltmarshes, and over half the British members of the family are confined to that habitat. Most live, or at least hunt, on bare mud, but *Salda littoralis* lives amongst quite dense vegetation. *Chartoscirta elegantula*, which occurs in a wide range of wetland habitats, is usually found beneath sea purslane *Halimione portaculoides* in sheltered areas when it occurs in saltmarshes.

A large proportion of the Hemiptera of saltmarshes occur in the grassier areas, and most of the species involved are probably feeding at least in part on saltmarsh grass *Puccinellia maritima*. Two local species of plant bug of the genus *Conostethus* are certainly associated with *Puccinellia*, as is the leafhopper *Macrosteles sordidipennis*. Two leafhoppers of the genus *Aphrodes*, *A. aestuarinus* and *A. limicola*, are generally found in areas with *Puccinellia*, though their foodplants are not certainly known. The planthopper *Oliarus leporinus* has subterranean root-feeding nymphs, and appear to be associated with grasses.

Sea wormwood *Artemisia maritima* supports the uncommon leafhopper *Chlorita viridula*, in saltmarshes in Essex and Kent. There are also more widely distributed species associated with this plant, including the plant bug *Plagiognathus albipennis*, polyphagous on *Artemisia* spp and with different forms on different host species, and the leafhopper *Eupteryx artemisiae*. It also supports two uncommon species of jumping plant louse (Psylloidea) of the genus *Craspedolepta*.

Sea purslane *Halimione portaculoides* is the foodplant of the rather local plant bug *Orthotylus moncreaffi*, two species of *Piesma* which though chiefly coastal are also found inland on other members of the Chenopodiaceae, and of the rare groundbug *Henestaris halophilus*, currently only known from marshes in north Kent.

Beds of rushes *Juncus* spp and sea club-rush *Scirpus maritimus* support a fauna which overlaps very broadly with that of freshwater marshes. It includes the small predacious plant bugs *Tythus pygmaeus* and *Fieberocapsus flaveolus* which are found low on stems and in tussocks, grassbugs of the genus *Teratocoris*, and leafhoppers such as *Conosanus obsoletus* and *Macustus grisescens*. The predacious damsel bug *Nabis lineatus* is rather characteristic of such habitats: it also occurs in inland marshes, but much more rarely.

The majority of saltmarsh plants support no specialist species of Hemiptera: those Hemiptera feeding on these plants are generally widespread and common species, which often establish only temporary populations in saltmarshes in the summer. The polyphagous plantbug *Calocoris norvegicus* may often be common on sea aster *Aster tripolium* for example.

A complete transition from saltmarsh to non-saline habitats at any site should be given high priority for conservation. Not only is the mix of species occurring across such a habitat transition particularly rich, there is also the possibility of the occurrence of some particularly specialised species. The plant bug *Orthotylus rubidus* feeds on glasswort *Salicornia* spp, but does not occur in true saltmarsh. It is confined to saline areas which are rarely inundated by the sea. Such sites can occur behind protective shingle banks, or in low-lying patches of grassland inland from saltmarshes, where seepage or occasional saline inundation keep the salt concentration high and prevent colonisation by more competitive plant species. Good transitions from saltmarsh to other habitats are now rare, the uppermost levels of saltmarshes having been lost to reclamation, sea defences and development.

Saltmarsh is an entirely natural habitat, and requires no management for its maintenance in suitable condition for a good invertebrate fauna. In practice, considerable areas of saltmarsh have long been used for grazing. Where grazing is sufficiently intense to form a uniformly short sward, little may survive other than the more tolerant shorebugs. Such close-grazed marshes need not be entirely without interest: the uncommon shorebug *Chartoscirta elegantula* has been recorded from one such marsh in Scotland. The Hemiptera of an ungrazed saltmarsh, however, will be much richer in species.

Grazing on saltmarshes encourages the growth of grasses, particularly *Puccinellia maritima*. Since this is an important foodplant for saltmarsh Hemiptera, the effects of grazing sufficiently light to maintain areas of tall flowering grasses and other plants may not be entirely harmful. It is unlikely, however, that grazing is essential to the maintenance of any species of saltmarsh Hemiptera at any site, and grazing at any level should not be introduced onto a site which has previously been ungrazed.

If grazing is suddenly removed from a saltmarsh grasses, encouraged by past management but kept down by constant grazing, may form dense stands over extensive areas of marsh. Such dense grass cover may support large populations of some species, but the very closed structure may result in the loss of others, and overall such dramatic change is likely to be deleterious to the Hemiptera. In the short-term, conditions for Hemiptera are best maintained by retaining grazing, but reducing its intensity if a short sward is being produced.

Sand dunes

An extensive system of calcareous dunes provides ideal conditions for many of the southern elements of the British Hemiptera. Sand dunes have a particularly rich Heteroptera fauna. A species list from such a site will not be as long as, say, a list from ancient woodland, but will be very much richer in rare, local, and specialised species. Several factors are responsible: a high diversity of flowering plants; a benign coastal climate; a loose sandy substrate suitable for burrowing; bare ground; low sandhills with a full range of aspect giving a diversity of microclimates; varied vegetation structure from ground sparsely vegetated by small annuals to dense and tussocky grassland; dune slacks supporting wetland vegetation; regular disturbance by wind and animals providing small-scale structural diversity.

The more landward section of a dune system supports the least specialised and least exclusively coastal Hemiptera, and the fauna of established dune grassland is broadly similar to that of inland dry grassland. It is, however, a very good example of dry grassland, and has certain elements which are entirely or largely coastal, such as the rhopalid bug *Chorosoma schillingi* and the plant bug *Miridius quadrivirgatus* to add distinction.

The fauna of the shifting fore dunes is the most specialised, though also the most limited, of the faunas associated with dunes. At the extreme upper limit of the beach, the thin band of vegetation, usually dominated by Chenopodiaceae, may support a few species: the Heteroptera *Piesma* spp and *Orthotylus flavosparsus* may be present on the Chenopodiaceae, and groundbugs, particularly *Scolopostethus affinis*, may occur amongst the accumulated litter.

Above this zone, patches of windswept sand couch *Elymus farctus* may hold populations of the plant bug *Trigonotylus psammaecolor*, largely confined to this extreme habitat and often the only member of the Hemiptera to be found in such circumstances. The fauna of the sparse vegetation leading up to established marram clumps is somewhat richer. The leafhopper *Psammotettix sabulicola*, for example, is a species characteristically found in such places, often resting on bare sand.

Marram clumps on the fore dunes offer a relatively sheltered environment, which affords protection from the harsher conditions of the bare ground between, and is used both for shelter and hibernation. The fauna of such clumps can be a surprising mixture. Some species are characteristic dune specialists: the planthopper *Paraliburnia boldi* is specifically associated with marram and other dune grasses, for example. Others, such as the predacious damselbug *Anaptus major*, are generalists of dry places. The small bug *Myrmedobia inconspicua* is an example of a generalist coastal species which, though almost never occurring inland, can be found on dunes, shingle, cliffs, or coastal grassland. Most surprising is the occurrence of some species more usually associated with wetlands. Two predacious plantbugs, *Tytthus pygmaeus* and *Fieberocapsus flaveolus*, are quite frequent on coastal dunes in marram clumps but are otherwise chiefly associated with clumps of rushes *Juncus* spp in marshes. The grassbug *Teratocoris saundersi*, usually associated with sedges and rushes in marshes and swamps, occurs in marram on dunes in the north.

By far the richest assemblage of Hemiptera is associated with partly stabilised dunes. Here the flora is richer, and the vegetation structure more diverse, than in either the fore-dunes or the stabilised dune grassland. All stages of development, from bare sand through to dense tussocky grass, are of interest for Hemiptera. However, perhaps the most interesting type of area is a fairly stable sand surface held by a thin carpet of lichen and moss, with sparse grasses and annuals maintained by rabbit grazing, on a south-facing slope, surrounded by taller grassy vegetation. Such an area provides open ground which can be used for sunning, as a hunting area for visual predators, or as a breeding site. The surrounding taller grassy vegetation, in addition to supporting its own assemblage of species, may be used for shelter during adverse weather conditions and as a hibernation site, and will provide shelter from wind for the nearby open areas. Such close mosaics of structure are important in all habitats, but sand dunes show great variation in structure over very short distances. There is great local variation in topography which is rare elsewhere in undisturbed sites, and the ease with which the surface is eroded leads to localised areas of bare ground and disturbance.

Though any type of disturbance to the dune surface will provide open conditions suitable for colonisation by a suite of animal and plant species, disturbance by grazing animals is preferable, and disturbance by rabbits is the best. The disturbance created by rabbits is on a small scale, and the resultant low vegetation and fine grasses which appear in the early stages of colonisation may well be maintained by grazing in the newly open area, so that early successional stages are retained in an area of fairly stable sand than would otherwise be the case. Grazing by rabbits also increases diversity by producing areas of considerable disturbance, by burrowing, in areas of otherwise stable and established vegetation, and by providing localised enrichment. The mix of species on disturbed ground created by grazing animals is in general much more suitable for the maintenance of a rich Hemiptera assemblage than other types of disturbed ground. Plants such as storksbill *Erodium cicutarium* and viper's bugloss *Echium vulgare*, for example, thrive in grazed areas, but are relatively infrequent in ungrazed dunes.

Stock grazing was traditional on many dune systems, but is now much less frequent. Rabbit grazing was an important factor in maintaining open conditions on many dune systems for a long period: indeed, rabbit grazing and disturbance may have been excessive on some sites prior to myxomatosis. Rabbit grazing has declined greatly both in intensity and in consistency since the advent of myxomatosis, but is still sufficient on many dune systems to provide good habitat variation and disturbance. Larger sites, however, are better if grazing stock can be introduced. The stocking levels should be low, and it is better to err on the side of understocking initially. Though even in the absence of grazing some bare sand and areas of sparse vegetation will still be present, they may be very restricted in distribution.

Public access to dunes can be either advantageous or deleterious, depending on its extent and nature. In the aftermath of myxomatosis, trampling and disturbance by visitors and the maintenance of open tracks may have been the only factors maintaining open conditions over significant areas of some dune systems. On most dunes, some degree of public access is probably to be regarded as a positive management feature. Problems arise only when pressure becomes so great as to cause significant erosion. A simple control measure such as the provision of boardwalks over the most frequently used areas should then be used.

The wet conditions provided by dune slacks support a very different and characteristic fauna. Some elements of this are general wetland species, and most of those to be found in dune slacks are more or less common species, though occasional populations of less common ones can occur. Probably the most important factor of such slacks for Hemiptera is the creeping willow *Salix repens*. This is the chief host plant for plant bugs of the genus *Monosynamma*. One species, *M. sabulicola*, is a characteristic species of slacks in dune systems of any size in the west, north to Ainsdale. It is more local in the east. The plant bugs *Globiceps cruciatus* and *Pilophorus clavatus*, and the leafhopper *Macropsis impura* are also characteristic species associated with *S. repens* in dune slacks, though all can also occur in other habitats.

Calcareous dunes are generally the richest for Hemiptera, but acid dunes may also be important. This is certainly true if they support heathland vegetation, they can be particularly important: Studland Heath is a good example of such a dune type, though it has the additional advantage of being in one of the richest areas of the country for Hemiptera anyway. On acid dunes where the flora is grassy there may be fewer Hemiptera. The flora is less diverse, so the fauna of phytophages is inevitably depauperate compared to calcareous dunes. However, there is a large common element between the faunas of the two substrate types, and many species are simply much less common on acid than on calcareous dunes, and thus tend often to go unrecorded.

Cliffs

The habitats offered by cliffs, and the fauna which colonises them, are very varied. Critical factors in deciding the fauna are composition, aspect, and rate of erosion.

The richest faunas are held by calcareous cliffs which are eroding at a moderate rate. Chalk cliffs along the south coast hold very good assemblages. Much of this fauna, however, is found on the upper parts of the cliffs, and is essentially similar to that found on calcareous grassland. From the point of view of the Hemiptera, such cliffs are best treated as steeply-sloping calcareous grassland with much bare soil and broken ground, which have the advantage of needing no management for their maintenance.

Very rapidly eroding soft-rock cliffs, especially of earth or sand, support a very specialised insect fauna, but Hemiptera are poorly represented. The very early stages of colonisation by ruderal plants support a few common generalist species, but nothing of great note. More slowly eroding cliffs, particularly where erosion is by occasional slumping of areas of the cliff face, as is frequent on clay or chalk for example, are more interesting. Seepages on such cliffs in the south-west may support the rare shorebug *Saldula arenicola*, largely confined to recent areas of slumping, and replaced by the common *S. saltatoria* in more stable areas. The mixture of bare ground and vegetation in varying stages of growth in such areas of slumping may produce a very good mix of Hemiptera, and may support a rich fauna. These include a number of local and uncommon species of coastal distribution, but few could be regarded as strictly cliff species.

Cliffs which are only gently eroding are likely to support more characteristic coastal and cliff faunas, even though the faunas involved may be far fewer in species than those found on more rapidly eroding cliffs. The squashbug *Enoplops scapha* is an example of a bug of slowly eroding cliffs. It feeds on mayweed *Matricaria* and possibly other related plants on cliffs, and relies on there being a good population of the plant in a given area in each year. It overwinters as an adult, probably near the host plant. There is one generation per year, and the reproductive rate is not particularly high. Some degree of erosion will encourage the growth of its host plants, but high rates will destroy colonies faster than it is able to make up its losses.

The preference for at least moderate stability is shown also by other Hemiptera. The ground bug *Henestaris laticeps* is a characteristic species of cliff tops and ledges in the southwest of Britain, where it feeds on buck's horn plantain *Plantago coronopus*. It is associated particularly with small poorly-grown plants in the extreme conditions of windswept, often grazed or trampled areas of fairly hard rock on cliff edges. On softer and more rapidly eroding cliffs the host plants may form large and healthy clumps, but the bug is almost never found on them.

On cliffs with low erosion rates, the plants of ledges and slopes may often be regarded as forming a rather sparse grassland with much bare ground, and it is not surprising that in such circumstances there is a considerable overlap between the fauna recorded for cliffs and that of grasslands on similar substrates. The grass feeding species, and particularly the Auchenorrhyncha, tend to be rather fewer, but those species of Hemiptera associated with bare ground and sparse vegetation are more frequent. Cliff habitats, maintained by extreme climate and erosion, are more stable from the viewpoint of the fauna than are grasslands which rely on grazing or other management for their maintenance. Open ground with fine bare rubble suitable for burrowing may remain on a cliff ledge for many years before being colonised by vegetation or overwhelmed by a catastrophic fall. Plants are generally slow to establish, grow or spread slowly under the extreme conditions of cliffs, and so the habitat changes only very slowly. As with grasslands, the extent of interest in cliffs varies with the substrate.

Cliffs are an excellent example of an entirely natural habitat which require no management for their maintenance. However, the cliff-top fauna may be critically dependent on the management of the area of land behind the cliff edge. In the south-west, for example, areas of land which were previously grazed either now receive no management, and in consequence suffer from extensive invasion by bracken and scrub, or have been ploughed or improved to very close to the cliff edge. The cliff-top communities, which once formed quite broad bands behind the cliff edge, are now often confined to a very thin line along the very edge of the cliffs. Wherever possible, a broad band of grazed vegetation stretching inland to unimproved grassland should be maintained above cliffs.

Shingle

Shingle is a difficult substrate for both plants and animals. There is only a single coastal shingle specialist among the British Hemiptera, and this is the leafhopper *Aphrodes duffieldi*, which is, so far as is known, endemic to Dungeness. The other species of Hemiptera which occur on shingle, though numerous, are also to be found in other habitats. The grassy areas of stabilised shingle support a coastal dry grassland fauna similar to that of sheltered dune grassland or cliff-top grassland. On less well-vegetated shingle, the fauna has much in common with that of sand dunes, though it lacks many species characteristic of that habitat. Mixed with these, however, are species not frequently found in dunes. The plant hopper *Cixius remotus*, for example, is otherwise more frequently found on coastal cliffs. The larvae feed on plant roots, and it may be that the spaces between shingle stones, or amongst loose and broken rock on cliffs, are important in enabling the adults to penetrate below ground to deposit their eggs.

Uplands

The Hemiptera of the uplands are far less well known than those of lowland habitats. This stems in part from the fact that the upland fauna is far poorer in species than that of the lowlands, and partly from the fact that those Hemiptera which do occur in the uplands are generally rather difficult to find, so that it has been difficult to get an accurate idea of either their habitat requirements or their status.

The Heteroptera are a chiefly southern group, and the fauna of most upland areas is decidedly poor. In many upland sites on grassland and moorland only a few species are present, and these are generally very tolerant and widely distributed species which also occur in the lowlands. Some of these widely distributed species are most numerous in upland situations. The shorebugs *Salda muelleri* and *Salda morio* frequent fairly thick vegetation on wet peat. They occur in lowland sites such as the fens and broads of East Anglia, but the greatest area of suitable habitat is on upland moorland and blanket bog. They are very inconspicuous members of the fauna, but results from pitfall trap studies demonstrate that populations can be very large. The shorebug *Teloleuca pellucens* occurs on patches of bare peat amongst heather in upland sites, and less often on fine shingle near streams. It occurs only rarely in the lowlands. The grassbug *Teratocoris viridis*, associated chiefly with cotton grass *Eriophorum*, is a frequent upland species, but rarely occurs at low altitude, even where *Eriophorum* is abundant. In the Scottish highlands, two members of the plant bug genus *Globiceps*, *G. woodroffeii* and *G. cruciatus*, have been found under bearberry *Arctostaphylos uva-ursi* on mountain sides. These two species are, in lowland Britain, chiefly associated with scrubby heathland and with dune slacks respectively, and their presence on different plants in a quite different habitat is interesting. In the eastern Scottish Highlands the two groundbugs *Eremocoris abietis* and *E. plebejus* may occur amongst montane vegetation. Neither is confined to upland habitats, however. *E. plebejus* has been recorded from a range of habitats in England, Scotland and Wales. *E. abietis* is best regarded as a Caledonian pine forest species which can also occur in other habitats. Members of the plantbug genus *Chlamydatus* are found in short or sparse grassland throughout Britain. In northern and upland situations, *C. wilkinsoni* is often the only species, replacing the commoner *C. pullus* and *C. saltitans* which occur in lowland habitats.

The Auchenorrhyncha as a group are far less strongly associated with southern lowland habitats than are the Heteroptera, but nevertheless the recorded upland faunas are generally rather poor. The richest assemblages of species are found in wetter areas. As with the Heteroptera, a large proportion of the species occurring on blanket bog and mires in the uplands also occur on wet peatlands in the lowlands. Included amongst such insects are the local planthopper *Tyrphodelphax distinctus*, and the nationally uncommon *Struebingianella litoralis*. A number of wetland species of Auchenorrhyncha, though of strongly northern distribution, seem in general to avoid upland habitats: *Oncodelphax pullula* and *Sorhoanus xanthoneurus* are examples. Drier areas of upland moorland generally support rather few Auchenorrhyncha, and these are in general widely distributed and common species also found in lowland habitats. Upland grassland supports a small but very characteristic set of species. Of particular note are *Dicranotropis divergens*, *Diplocolenus bensoni*, *Ebarrius cognatus*, *Psammotettix frigidus*, *Macrosteles alpinus* and *Cixius cambricus*. On most recorded sites, only one or two of these species occur amongst a number of common generalists. The status of such upland species is very uncertain. There remain large areas of habitat which may be suitable for them, only a fraction of which has been adequately surveyed. They can be very difficult to capture by conventional methods. Pitfall trapping has demonstrated that, for example, *Diplocolenus bensoni* may be much more frequent than has generally been supposed. The exact foodplants and habitat requirements of these species are uncertain.

Some species of upland habitats are more obviously restricted. *Chlorita dumosa*, currently only known from upland and northern habitats in Britain, is believed to be associated with thyme *Thymus drucei*; the leafhopper *Emelyanoviana contraria* feeds on rockrose, and is confined to calcareous upland areas.

In general, open areas with bare ground or sparse vegetation are of relatively little interest for Hemiptera in upland habitats, notwithstanding their importance in the lowlands. The shorebug *Teloleuca pellucens*, largely confined to patches of bare peat amongst heather, has already been mentioned. Some groundbugs are particularly found where clumps of heather or other plants overhang bare ground or rock, but are not confined to such situations. In general, the species and groups of Hemiptera associated particularly with bare ground and sparse vegetation do not extend very far north or to great altitude. Slopes of particularly favoured aspect in localised areas of mild climate, with plants in clumps over bare ground or rock may, however, support good assemblages of species at the edges of their ranges.

The Hemiptera of standing and running water in the uplands have been mentioned in an earlier section. It is worth re-iterating here that oligotrophic and dystrophic upland pools support an interesting and distinctive fauna of water bugs. Shingle beside streams regularly supports two shorebugs, *Saldula scotica* and *S. c-album*, and also the interstitial bug *Cryptostemma alienum*.

Artificial habitats

In view of the association of many species of Heteroptera, and to a lesser extent of Auchenorrhyncha, with early successional stages and bare ground, it is not surprising that interesting assemblages of Hemiptera may develop in the disturbed ground of artificial sites such as quarries, road and railway cuttings, spoil heaps, and derelict industrial land.

The fauna which colonises any given site of this nature will depend on the substrate type, the composition and structure of the flora, the geographical position of the site, and its proximity to possible sources of colonisation. Sites in the south of Britain will generally support better faunas than those in the north. The best artificial sites are those created within areas of semi-natural habitat which can act as a source of colonists. Quarries in chalk downland and sandpits in heathland are examples of artificial conditions which have long been recognised as important for various species of Hemiptera. The groundbug *Heterogaster artemisiae* is an example of a species which, though it may occur in calcareous grassland, is more likely to be found in quarries within it. It feeds on wild thyme *Thymus drucei*, and prefers large bushy plants growing over bare ground or rubble. Suitable plants can occur on slopes or at the margins of paths within a grassland, but are more frequent on loose broken rock.

Quarry sites within grassland or heathland may preserve some species after their disappearance from the rest of a site, caused by, for example, loss of open ground through scrub invasion. More importantly still, they may preserve sizeable assemblages of species after the site of which they were formerly a part has been largely or entirely lost. Old chalk or limestone quarries in much of England are of great importance for this reason. Such quarries were frequently started at a time when there were still extensive areas of semi-natural habitat in the area, and a good proportion of the fauna from such habitats may have colonised the disused areas. Subsequent loss of this semi-natural habitat, and particularly of calcareous grassland, has led to the loss of the original fauna over quite large areas, except insofar as it survives in quarries and other sites which do not so readily succumb to agricultural improvement.

Though chalk quarries in downland and sand pits in heathland are the most interesting of artificial sites for Hemiptera, any area of disturbed ground of even moderate size on any substrate may develop some interest. Worked-out clay pits, because they provide a rather harsh substrate for plant colonisation, and also an impermeable floor suitable for the formation of both temporary and permanent pools, may develop an interesting mix of species. Road and rail cuttings, and broad road verges of recent origin, may develop interesting faunas if on sandy or calcareous substrates, provided they are not top-soiled and seeded. Derelict land in cities and towns, whether on derelict industrial sites, neglected demolition sites, or old railway land, can build up very interesting assemblages. Derelict land within Greater London can support such uncommon species as the groundbugs *Raglius alboacuminatus* and *Drymus latus* and the squashbug *Bathysolen nubilus*. All are species which feed on common and widely distributed plants, but are of restricted distribution and require or thrive in early successional stages.

Many artificial sites are under considerable threat at present, as the value of land increases. Quarries, sand and clay pits are used as landfill sites, or for building, and derelict land in towns and cities is increasingly under pressure for development. Where such sites are not being actively destroyed by human intervention, they are being lost by neglect, leading ultimately to scrub invasion. It is true that new sites are being created, but in many cases the modern methods used for digging pits and quarries, for example, does not produce such interesting and varied habitats as the older, less automated methods, and in any case many such pits and quarries are only dug after plans have already been made for infilling and after use once extraction is over.

Quarries and pits which remain in good condition for Hemiptera may do so because the harshness of conditions means that colonisation by plants is slow. Steep slopes of bare rock or subsoil, for example, particularly if either very permeable or very impermeable, may lead to critical water shortage in mid-summer, will be slow to colonise, and may remain varied and interesting for many years in the absence of management.

On some sites, rabbit populations may be sufficient to maintain a varied vegetation structure and to hold back scrub invasion. Quarries with large heaps of overburden and fine spoil can provide ideal opportunities for burrowing, and sizeable warrens can build up. Management by rabbits on such sites is generally very effective. There is always a risk that the rabbits will be decimated by myxomatosis, but if succession on the site is sufficiently slow rabbit populations may build up again before scrub becomes a serious problem.

Informal recreational pressures on disused mineral workings and derelict land can be high. The results can be either deleterious or beneficial, depending on the nature and intensity of use. Motor cycle scrambling is quite frequent in such situations, and is certainly the activity with the greatest effect on habitat structure. At low to moderate levels, such scrambling is often a positive management tool, particularly if there are few or no rabbits to provide grazing. Compaction of some areas, disturbance of others, the multiplicity of tracks formed, and the fact that they tend to be specifically aimed towards interesting topographical features, are all points in favour of such management. On the other hand, over-intensive use may lead to excessive damage and disturbance to the substrate. Use by motor cycles tends to be concentrated on relatively regularly-used tracks, and in the absence of other management the consequence in the long term can be the development of dense scrub in patches, with relatively narrow bands of low or sparse vegetation. This condition is preferable to a complete cover of dense scrub, however.

Other forms of recreation normally have less dramatic effects than motor cycle scrambling, but nonetheless can be important. Simple trampling and scrambling by children, for example, can have a prodigious effect in areas of high population density, either over an entire site or over certain areas particularly favoured for play.

When neither rabbits nor informal recreation provide management suitable for the retention of varied structure and the maintenance of early successional stages, fairly dramatic management may be needed to retain habitat interest for Hemiptera. One of the simplest ways of achieving this is to continue the process which created the habitat in the first place, but on a smaller scale. Thus periodic scraping, digging or quarrying of limited areas of the site and allowing recolonisation may be successful. The process will obviously be easier in quarries or pits in sand or clay than on substrates of hard rock, but whatever the substrate such management can only be undertaken on a significant scale if the necessary machinery is available and can be got on and off the site with reasonable ease. Where large scale management is not possible, or where the site is too small for it to be necessary, small scale disturbance by digging, rotovating or other means may be used. Whatever the method of management, only a fraction of the site should be treated in any given year. If scrub is present it should not be entirely cleared, and it may be advantageous to allow scrub to develop over part of any site. Willow, hawthorn, birch, gorse and broom are amongst the most frequent scrub types which may develop, and all support interesting Hemiptera. Sycamore invasion should be avoided at all cost. Scrub of such plants as buddleia and Scots pine may be tolerated. Scots pine supports an interesting assemblage of Hemiptera, but buddleia supports no specific Hemiptera in Britain.

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THREAT CATEGORY DEFINITIONS AND CRITERIA

The species and subspecies have been assigned to threat categories now widely used for British Invertebrates. These are the Red Data Book categories used in Shirt (1987) and the Nationally Notable category established by the NCC. These definitions are defined below. However, this document is not a Red Data Book and the threat categories designated here should be considered provisional until they are published in a Red Data Book. It is hoped that by producing this review, entomologists and freshwater biologists will provide further information and a sound basis for a future Red Data Book.

Extinct

Taxa which formerly had breeding populations in Great Britain but are now believed to have completely died out.

Endangered (RDB 1)

Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Taxa whose numbers have been reduced to a critical level or whose habitats have been dramatically reduced that they are deemed to be in immediate danger of extinction. Included are taxa which are known only as a single population in only one 10 km square, taxa which only occur in habitats known to be especially vulnerable, or taxa which have shown a continuous decline over the last twenty years and now exist in five or fewer 10 km squares.

Vulnerable (RDB 2)

Taxa believed likely to move into the endangered category in the near future. Included are taxa of which most or all of the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that may be abundant but are under threat from serious adverse factors throughout their range.

Rare (RDB 3)

Taxa with small populations which are not at present Endangered or Vulnerable, but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. Usually, such taxa are not likely to exist in more than fifteen 10 km squares of National Grid. This criterion may be relaxed where populations are likely to exist over fifteen 10 km squares but occupy small areas of especially vulnerable habitat.

Out of danger (RDB 4)

Taxa formerly meeting the criteria of one of the above categories but which are now considered relatively secure owing to effective conservation measures or the removal of the previous threat to their existence. [No taxa in this report fall within this category, but it is nevertheless available for future use.]

Endemic (RDB 5)

Taxa which are thought not to occur naturally outside the British Isles. Taxa within this category may also be in any other threat category or not be threatened at all.

Insufficiently Known (RDB K)

Taxa suspected to fall within the Red Data Book categories but with too little information to allow confident assignment to any of the previous categories.

Nationally Notable [= Nationally Scarce]

Taxa which do not fall within RDB categories 1-3 but which are none-the-less uncommon in Great Britain and thought to occur in fewer than a hundred 10 km squares of National Grid.

Selection and assignment

Auchenorhyncha

Lists of species for possible inclusion in the review were drawn up by myself and Drs W.J. Le Quesne and A.J.A Stewart. Dr Le Quesne kindly prepared draft distribution maps of the candidate species, and used to refine the list. The provisional list was then sent to all recipients of the newsletter of the Auchenorhyncha recording scheme, together with a request for information on the included species. A print-out of the recording scheme records supplied by Dr Le Quesne was supplemented by collation of recent data supplied by recorders and by literature search. Several species have been removed from the list because recent recording has shown them to be more frequent or more widespread than was formerly suspected, but the list has remained substantially unchanged. Draft distribution maps were also used as the basis for the assessment of statuses.

The availability of distribution maps, based on literature records, museum specimens, and a decade of active operation of the recording scheme, provides a consistent basis for selection and assessment. However, recording of the group is still very far from complete, and much extrapolation is necessary. Some species are obviously more likely to be overlooked than others, and there is also a decided southern bias to the records available. This results not only from the greater concentration of recording effort in the south, but also from the fact that weather conditions in the north (and west) tend to result in a lower return per unit of recording effort. An attempt has been made to iron out these inconsistencies, but some problems are certain to remain. Several northern and western grassland and wetland species with few records are particularly liable to prove more widespread than current information suggests. They are retained on the list of Notable species for the moment in the absence of convincing evidence that they are not commoner, but some demotions may be needed in the future. It has seemed better to take current evidence at face value rather than mistakenly ignore genuine rarities because of faulty interpretation and extrapolation.

There are several very poorly known Auchenorhyncha whose status is in some doubt at present, including some known from only a single specimen. These have generally been assigned Notable status. Such a status is clearly

unsatisfactory, but at least ensures their inclusion in this review and their consideration when they appear on species lists.

Heteroptera

The heteroptera recording scheme is not as old as that for Auchenorrhynch, and no provisional maps are available. There is therefore a less consistent and objective basis for assessment. On the other hand, there is much historical information. Though this is inevitably subject to geographical bias, it provides a good picture of the broad distribution of many species. An initial list of candidate species was prepared using the county distribution tables in Masee (1955), from Southwood and Leston (1959) and Shirt (1987), and from records, data and opinions gathered for NCC by B.C. Eversham during the preparation of the Red Data Book for insects. A copy of the provisional list was sent to every member of the Heteroptera Study Group. Data received direct from recorders, abstracted from the recording schemes, and gained from literature search was collated and used to refine further the list and to assign statuses. This process led to the removal of a number of species from the list of Notable species.

The selection of species and the assignment of statuses has inevitably involved some difficult decisions. It is unlikely that every one of those decisions will prove to have been correct. It is likely, however, that future changes to the statuses of the Heteroptera will be more even handed than those to the Auchenorrhyncha. Some cryptic species may be included under false pretences; on the other hand, the relative abundance of historical information on the Heteroptera may have led to underestimate of the extent of decline and current low status of some species.

The rarest of the Heteroptera have already been listed in the Red Data Book (Shirt 1987). That list was based largely on records available to the end of 1984. Additional records since that time, and critical re-examination of older data, have made re-consideration of some of the statuses necessary. A number of recommendations for changes are made in this review. For convenience, proposed changes to the Red Data Book species are summarised below.

species	Status in Shirt (1987)	Revised recommended Status
<i>Adelphocoris seticornis</i>	RDB3	N
<i>Amblytylus delicatus</i>	-	RDB3
<i>Aradus betulae</i>	RDB3	N
<i>Capsus wagneri</i>	RDB3	N
<i>Chlamydatus pulicarius</i>	RDB3	N
<i>Cimex columbarius</i>	RDB3	Synanthropic
<i>Cymus obliquus</i>	RDB3	N
<i>Drymus pumilio</i>	RDB3	N
<i>Eremocoris abietis</i>	RDB3	N
<i>Eremocoris plebejus</i>	RDB3	N
<i>Eysarcoris aenius</i>	RDB2	RDB3
<i>Halticus macrocephalus</i>	RDB1	RDB2
<i>Hydrometra gracilentia</i>	RDB1	RDB3
<i>Lasiacantha capiucina</i>	RDB2	RDB3
<i>Macroplox preysleri</i>	RDB1	RDB3
<i>Megalonotus sabulicola</i>	RDB3	N
<i>Nabis pseudoferus</i>	RDB3	N
<i>Nysius graminicola</i>	RDB3	Retained but ? vagrant
<i>Odontoscelis fuliginosa</i>	RDB3	N
<i>Orthotylus rubidus</i>	-	RDB3
<i>Orthotylus virens</i>	RDB3	N
<i>Placochilus seladonicus</i>	RDB1	RDBK
<i>Pterometus staphyliniformis</i>	RDB3	RDB2

<i>Pygolampis bidentata</i>	RDB3	RDBK
<i>Rhopalus rufus</i>	-	RDB3
<i>Saldula arenicola</i>	-	RDB3
<i>Saldula fucicola</i>	RDB3	N
<i>Saldula opacula</i>	RDB3	N
<i>Saldula setulosa</i>	RDB2	RDB1
<i>Sigara striata</i>	RDB3	N
<i>Tuponia carayoni</i>	RDB2	Introduced

Nomenclature

So far as possible, the nomenclature employed in this review is the same as that used on the record cards for the national recording schemes for the groups. Arrangement into families follows that of Kloet and Hinks (1964) for Heteroptera and of Le Quesne and Payne (1981) for Auchenorrhyncha. Though this may seem old-fashioned to some, it does at least make for easy cross reference and consistency. The only changes which it has been necessary to make in the Auchenorrhyncha result from the addition of further species to the British list since the publication of a checklist. Amongst the Heteroptera, several name changes have been necessary, since it is known that the names employed on the recording card and in Kloet and Hinks (1964) have been wrongly applied to British insects which in fact belong to quite other species. Thus the insects long known in Britain as *Cymus obliquus*, *Dichroscytus valesianus*, and *Odontoscelis dorsalis* should in fact be called *C. aurescens*, *D. gustavi* and *O. lineola*.

THE DATA SHEETS

ARADUS ATERRIMUS

RARE

Order HEMIPTERA

Family ARADIDAE

Aradus aterrimus Fieber

Identification Southwood & Leston (1959).

Distribution Confined to the south-east of England; so far recorded only from Kent and West Sussex. The species is widespread over much of Europe, from Finland in the north to Spain in the south, and east to Siberia. It is sporadic and local through much of its range, but apparently relatively common in Siberia.

Habitat and ecology Recorded only from woodland. The majority of records are from piles of chippings left after wood cutting operations, and most are from chestnut chippings in woods in Kent. The first British record of the species was from chips on the stump of a felled oak. Adults have also been recorded in heaps of hedge cuttings. A nymph has been recorded from corrugated cardboard bound around the trunk of an apple tree, and a breeding colony has been found in decaying sacking in a wood. Heliovaara & Vaisanen report *A. aterrimus* as occurring in burned forests in northern Europe. An association with burnt wood has not yet been reported in Britain, but could go some way to explaining both the rarity of the bug and its dark coloration. The bugs are believed to feed on fungi. They are quite mobile, and move from one part of a wood to another as suitable conditions occur. Adults and nymphs are found all year round. Nymphs kept in captivity showed a very slow rate of growth: five nymphs collected in November 1933 remained in the last instar for ten months before reaching maturity. It is not clear whether such slow growth is typical of the species in the wild.

Status This has apparently always been a rare species. It was first recorded as British on the basis of a single specimen found in Darenth Wood, Kent, in 1861. It was not re-discovered in Britain until 1933, when it was found in numbers at East Malling, Kent, by A.M.Massee. He was eventually able to record the species from at least seven localities in Kent. The Sussex record is based on a single specimen swept in Rewell Wood in 1977. The species is certainly rare and of very restricted distribution, but barkbugs can readily be overlooked, and it is possible that it is of rather wider distribution than currently recognised. The fact that Massee, once familiar with the species, was able to record it from so many sites is itself suggestive. The last of Massee's published records of the species date from the 1950s, and its current status in Kent is unclear.

Threats In view of the association with chestnut chippings, it may be that neglect of woodlands, particularly coppice woodlands, might pose a threat, and might already have reduced the species in at least parts of its range. However, the extent to which the species is dependent on such chippings is not clear. Clearance and coniferisation of woodland are more definite threats; the bug has never been recorded in association with conifers in this country. If the species regularly breeds outside chippings, suitable habitat features could include decaying wood, accumulations of twigs and branches, etc., in a sufficiently damp condition to maintain fungal growth. Clearance of dead wood and branches and removal of dead or dying trees should therefore be viewed as potential threats.

Conservation The fact that the bulk of records come from piles of wood chippings might suggest that active woodland management is essential for the survival of the species. However, habitat features of this type must be rare in a state of nature, and there are records of individuals, including nymphs, found in other situations. It seems likely that it occurs in low population densities in the absence of wood-chip piles, but is most readily recorded from such piles because of higher density and/or easier accessibility. Nonetheless, in the absence of more solid evidence, it seems as well to recommend some degree of regular cutting of chestnut at known or likely sites for the bug. Chipping piles should certainly be left in situ on and around stumps. It is not possible to recommend a particular frequency of cutting, since it is not clear for how long chipping piles are able to support breeding colonies.

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ARADUS BETULAE**NOTABLE**

Order HEMIPTERA

Family ARADIDAE

Aradus betulae (Linnaeus)**Identification** Southwood & Leston (1959).**Distribution** In Britain, confined to Scotland; recorded from Perthshire, Inverness-shire and Stirlingshire. It is very widely distributed in Europe, and extends east to Siberia and Japan.**Habitat and ecology** Associated chiefly with birch. It has been found under bark on dead birches, both standing trees and fallen logs, and has also been found on fungi (*Fomes*) growing on birch; one record is of approximately 100 adults and nymphs on a single fruiting body. There is a single record of a dead adult found under the bark of a dead standing alder. On the continent it has been recorded from a much wider range of tree species, including conifers. It is believed to feed on fungi. Adults have been recorded in May, June and July, and nymphs in June. In other species of the genus in Britain, adults and nymphs of all ages occur all year round, and this may well also be the case with *A. betulae*. Most precisely located records are from large birch or birch-pine woods.**Status** Shirt (1987) includes this species in Red Data Book Category 3 (Rare). It is certainly a very local species, and of restricted distribution. Records are quite widely scattered in the Highlands, however, and it can be confidently predicted that a number of additional localities remain to be recorded. Barkbugs can easily be overlooked. A reduction in status to Notable more accurately reflects current knowledge of its distribution and status.**Threats** Clearance of birch and birch-pine woods; clearance of dead standing and fallen timber; replanting of birch or mixed woods with conifers; loss of regeneration of woodland through grazing either by stock or by deer. One recorded site is known to have suffered at least potential damage from spruce planting.**Conservation** Forest regeneration is being encouraged at a number of conservation sites in Scotland. It is important to maintain birch and birch-pine woods of as large an area as possible and with as wide as possible an age range of birch trees, to ensure a continuous supply of dead and fungus-infected wood. All standing and fallen dead wood should be left *in situ*. Sites where regeneration is known to be poor or in decline should be protected from grazing where possible.**References** Butler, E.A. (1923a), Crowson, R.A. (1975), Harwood, P. (1921), Heliövaara, K. & Vaisanen, R. (1983), MacNulty, B.J. (1971), Masee, A.M. (1955a), Masee, A.M. (1962c), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), White, I. (1983), White, I.M. (1983).

ARADUS CORTICALIS**RARE**

Order HEMIPTERA

Family ARADIDAE

Aradus corticalis (Linnaeus)**Identification** Southwood & Leston (1959).**Distribution** Southern England; recorded from Kent (West Wickham), Surrey (Oxshott Heath; Esher Common), Hampshire (New Forest) and Dorset (Parley Heath). The records from Kent and Dorset are both of single occurrences, and date from the 19th century. It is widely distributed in western Europe from Finland in the north to France and Italy in the south, and extends east to South Russia.**Habitat and ecology** The first British record, from West Wickham, Kent, is given by Douglas & Scott as "under bark of firs". Most recorded British specimens seem to be from broadleaved trees, either beneath the bark or in fungus on stumps. It has been found among fungus on beech stumps, and Douglas (1842) states that it "inhabits

dead boleti, in which I found them on stumps of trees and on palings in the New Forest". Elsewhere in Europe, it has been recorded from a wide range of broadleaved and coniferous trees. It is believed to feed on fungi. Adults have been recorded in summer and autumn, but it is likely that all stages can be found throughout the year.

Status A very rare species, though possibly somewhat under-recorded because of its obscure habits. The only area in which it has been repeatedly found is the New Forest, where it has been recorded by a number of collectors. Most of the New Forest records appear to have come from a single small area, but others are not precisely localised. The only other recent records are from Esher and Oxshott Commons, Surrey, in 1951. The status and habitat of the species in Surrey are uncertain.

Threats Clearance or re-planting of woodland in known areas for the species; removal of dead standing and fallen wood and stumps. These comments apply particularly to the New Forest, which may still hold the major British population. The greater part of Parley Heath has been lost to housing and to the development of Bournemouth airport.

Conservation The remaining area of Parley Heath is an SSSI, as are the New Forest and Esher and Oxshott Heath. All dead fallen and standing wood should be left in situ. Recorded sites for the species should be re-investigated to determine whether the species still survives and, if so, its habitat requirements and population strength.

References Blatch, W.G. (1883b), Butler, E.A. (1923a), Dale, C.W. (1886), Douglas, J.W. & Scott, J. (1865), Douglas, J.W. (1842), Groves, E.W. (1964), Groves, E.W. (1986), Heliovaara, K. & Vaisanen, R. (1983), Massee, A.M. (1955a), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1908a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1933).

ELASMUCHA FERRUGATA

EXTINCT

Order HEMIPTERA

Family ACANTHOSOMATIDAE

Elasmucha ferrugata (Fabricius)

Identification Southwood & Leston (1959).

Distribution Recorded only from Caernarvonshire, Derbyshire and Yorkshire in Britain. The Yorkshire record, from near Bradford in 1899, may not be valid. It is given by Butler (1923) but China (1950) was unable to locate any other reference to the capture.

Habitat and ecology *E. ferrugata* probably feeds on berries. On the continent, it has been recorded from a wide range of shrubby plants, which include hawthorn *Crataegus*, redcurrant *Ribes rubrum*, gooseberry *Ribes grossularia*, mountain currant *Ribes alpinum*, blackberry *Rubus fruticosus* and raspberry *Rubus idaeus*, dog rose *Rosa canina*, fly honeysuckle *Lonicera xylosteum*, bilberry *Vaccinium myrtillus* and blackthorn *Prunus spinosa*. The British captures are too few and too widely scattered to suggest its ecology here. The only reference to it being found in a natural situation is that from Caernarvon, where it was taken by sweeping low vegetation in a wooded valley. *Vaccinium* is perhaps the likeliest host in this case. The Derby specimen was taken on cultivated raspberries. In mainland Europe, adults overwinter, and oviposit from May onwards. The female guards the eggs and young until the second instar. In Britain, adults have been taken in June and July, and had presumably overwintered.

Status There are only four British records of the species, all of single individuals. Apart from the doubtful Yorkshire record already referred to, these are: Ogwen Valley, near Bangor, Caernarvon, 1899; in a garden on the outskirts of Derby, 1903, and in the kitchen of a house in Glossop, Derbyshire, 1950. This might suggest a non-established alien, except that the distribution of records is not what one would expect for a vagrant, and the Caernarvonshire record was sufficiently far from habitation to make importation unlikely. Suitable habitat and host plants were present at or near all the sites. There are many possible localities for the bug in areas that are poorly worked, and the existence of undiscovered populations cannot be ruled out.

Threats None known.

Conservation Little can be said in the absence of detailed observations of the species in Britain. If a colony is found, its habitat preferences should be carefully noted. Extrapolation from the known ecology of the species on the continent would suggest that any established colonies which may be found are likely to be dependent on *Vaccinium* or other berry-bearing hosts in open woodland. If this is the case, maintaining suitable vegetation structure may be of critical importance.

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GEOTOMUS PUNCTULATUS

ENDANGERED

Order HEMIPTERA

Family CYDNIDAE

Geotomus punctulatus

Identification Southwood & Leston (1959).

Distribution This species has only ever been recorded from two localities in Britain. An old record from Cowbridge, Glamorgan, is based on two specimens taken in the nineteenth century. The other locality is Whitesand Bay (Sennen Cove), Cornwall, where it has been known for over a century. The species is on the edge of its range in Britain, but is widely distributed and often common in southern Europe and the Channel Isles. It also occurs in North Africa and extends east to Japan.

Habitat and ecology A ground-dwelling insect of sand dunes, found on or just below the surface. It is phytophagous. The food plants are not known with certainty, but the bug is often found in the vicinity of *Galium verum*. It tends to occur in small colonies of fairly limited extent. The areas in which it is found are generally fairly sparsely vegetated, with plants of no more than a few inches in height growing in sand which, at least on the surface, is fairly loose.

Status The population at the single known extant British site remains healthy. Woodroffe recorded the species as present "in considerable numbers" in 1962, and between 1982 and 1987 it has been seen in numbers by several entomologists. It is possible that it may occur in other sites, perhaps at lower density, but it is not so inconspicuous as to readily escape notice, and such sites, if they exist, must be few.

Threats Whitesand Bay has a beach which is popular for bathing and recreation. There is currently very little development at the site, but there is considerable trampling which has led to erosion problems on the fore-dunes. This does not as yet pose a major problem to *G.punctulatus*, whose population is chiefly further back in less eroded areas.

Conservation The species is listed by the Joint Committee for the Conservation of British Insects (1974) as a species to be collected only with restraint. The condition of the dunes at Whitesand Bay should be monitored, and attempts made to rectify any erosion or deterioration as quickly as possible. Steps are already being taken to reinstate eroded foredunes.

References Anon, (1971), Butler, E.A. (1923a), Douglas, J.W. & Scott, J. (1868a), Hallett, H.M. (1936), Joint Committee for the Conservation of British Insects. (1974), Masee, A.M. (1953a), Saunders, E. (1871), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1933).

LEGNOTUS PICIPES

NOTABLE

Order HEMIPTERA

Family CYDNIDAE

Legnotus picipes (Fallen)**Identification** Southwood & Leston (1959).**Distribution** Predominantly south-eastern, with records from Lincolnshire, Norfolk, Bedfordshire, Oxfordshire, Essex, Kent, Surrey, Sussex, Berkshire, Hampshire, the Isle of Wight, Middlesex and Yorkshire (modern Humberside).**Habitat and ecology** Associated with bedstraws *Galium* spp. It has been recorded from *G. saxatile* and *G. verum*, but may feed on other species. It usually occurs on dry and well-drained sandy substrates. The majority of the records are from coastal dunes, but it has also been found on coastal shingle, and inland in the brecks and at the margins of heaths. In less dry habitats and on heavier soils it is replaced by the commoner *Legnotus limbosus*. It is largely a ground insect, and can burrow effectively in sand. The adults overwinter, ovipositing in the spring. Adults of the new generation appear from late July onwards.**Status** Apparently always a very local species, but easily overlooked. It is a ground-dwelling species, active only in warm weather, and often present at low densities, since it has rarely been found in numbers. There is some evidence of decline at inland sites. There are a number of old records for Surrey, for example, but none recent, though it remains a fairly well-worked county.**Threats** There is seemingly a preference for fairly sparse vegetation with exposed sand. Lack of disturbance, particularly on inland sites, and the resultant growth of tall coarse vegetation giving complete ground cover, is potentially damaging. The decline in rabbit populations through myxomatosis has almost certainly had a severe adverse effect at inland sites, though coastal populations are less likely to have been affected. Loss of suitable heath and breckland sites to agriculture, forestry and development has also greatly diminished the area of suitable habitat. At coastal sites, development and damage to dunes by recreational pressures are locally damaging.**Conservation** Coastal sites in general may need no active conservation measures beyond site protection. On larger dune systems particularly, introduction of light stock grazing may be advantageous in providing structural diversity and localised disturbance. Inland sites require more active management. Breckland and heath sites should be grazed if possible. Rabbit grazing is particularly effective in producing a varied vegetation structure with localised disturbance, and rabbit populations should be maintained or encouraged wherever possible. Where grazing is not possible, cutting of vegetation on a rotational regime will prevent scrub invasion and dominance by coarse grasses, but some degree of substrate disturbance is likely to be necessary to maintain conditions sufficiently open for the bug.**References** Anon, (1966), Butler, E.A. (1923a), China, W.E. (1939a), Edwards, J. (1884), Edwards, J. (1889), Edwards, J. (1899), Edwards, J. (1901), Foster, A.P. (1987a), Groves, E.W. (1964), Groves, E.W. (1986), Hincks, W.D. (Ed) (1951), Masee, A.M. (1950c), Masee, A.M. (1955a), Masee, A.M. (1962d), Masee, A.M. (1965b), Morley, C. (1933), Prior, G. (1969), Saunders, E. (1875), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1908a), Scudder, G.G.E. (1957b), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1894), Walker, J.J. (1933), Woodroffe, G.E. (1953a), Woodroffe, G.E. (1954).

SEHIRUS BIGUTTATUS

NOTABLE

Order HEMIPTERA

Family CYDNIDAE

Sehirus biguttatus (Linnaeus)**Identification** Southwood & Leston (1959).

Distribution Recorded from much of southern England and south Wales, up to Suffolk and Worcestershire. Records are lacking for most northern counties, except for Caernarvon, Cumbria and Perthshire. It is widely distributed in Europe, from Finland to the Mediterranean, and extends to North Africa and east to China.

Habitat and ecology The known food-plant is common cow-wheat *Melampyrum pratense*, though other *Melampyrum* spp. may also be used. One Kent population is believed to have been associated with yellow rattle *Rhinanthus minor*. The bulk of records for southern England are from woodland rides and clearings, but it has also been recorded from hedgerows and amongst heather. Though the habitats may be sheltered, it would seem that they must generally be open and sunny, and that plants growing in shade are unsuitable. It has been found on a range of soils, and is probably no more restricted in this respect than its host plant. There is one generation per year, the adults overwinter in moss or amongst dead leaves under or near the host plants. Eggs are probably laid in shallow scrapes in the ground, and the female may guard them until they hatch, in common with other *Sehirus* spp. Adults of the new generation probably mostly mature in August.

Status Very local, and apparently greatly declined. In the last century it would appear to have been of quite frequent occurrence in the south-east of England. In the account of Heteroptera in the Victoria County History for Suffolk (1911) Morley describes it as "widely distributed" and certainly regarded it as too common to list specific localities. Butler, in 1882, described it as "by far the commonest of the genus in East Sussex". There appear to be no recent records for either of these counties. The Scottish and Welsh records are likewise all old, as are those from several of the more southern counties. By 1959, Woodroffe regarded it as rare, and made a special trip to a known site (Pamber Forest, Hants.) in order to collect it (Woodroffe 1960). There was still a good number of scattered records through the 1950s, but in more recent years records appear to have been even more sparse.

Threats The reasons for the decline of this species are not wholly clear, but it seems likely that neglect of woodland management has been a major factor in the south-east of England at least. The bug requires its host-plant to grow in fairly open sunny situations, either because it is itself intolerant of cool and shady conditions, or because it feeds chiefly on the flowers and seeds of its host and requires the profuse flowering and seeding which occurs in more open conditions. Cessation of coppicing and lack of ride management have led to a dramatic decline of such conditions. It is noticeable that some of the better-known more recent localities for the species (e.g. Blean Woods, Kent; Pamber Forest, Hants) are woods which retained good rides or coppice management. In the north and west common cow-wheat is less confined to woodland, and a decline is less easy to explain. It may be that the bug was always rare in these areas, for climatic reasons, and has declined further due to climatic change, or it may simply have been overlooked in this part of its range in recent years.

Conservation In known or likely sites for the bug, ride management should aim to maintain open, sunny and sheltered conditions, particularly in areas where cow-wheat grows. Reinstatement or continuation of a coppice rotation may further increase the area of habitat available to the bug, but is unlikely in general to be necessary for its survival. The maintenance of populations of the host plant in continually suitable condition is likely to be preferable to requiring frequent re-colonisation of different areas of woodland as they become suitable. Coniferisation of woodland, though clearly disadvantageous, need not be disastrous for this species if rides are sympathetically managed. In areas where the host plant grows outside woodland, management should aim to retain good populations of the plant in flowering and seeding condition.

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Sehirus dubius (Scopoli)

Identification Southwood & Leston (1959).

Distribution Recorded only from the southern counties of England. It has been most frequently recorded from Surrey, and has been repeatedly found at some sites. There are also recent records from Sussex, Wiltshire, Oxfordshire, Gloucestershire, Dorset, and Hampshire (including the Isle of Wight) and older ones from Kent, Berkshire, Dorset, Hampshire, and Cambridgeshire. It is widely distributed in southern Europe, to as far north as Sweden, and the distribution extends to North Africa and east to Iran, Turkestan and Siberia.

Habitat and ecology The food plant is bastard toadflax *Thesium humifusum*, a calcicole plant of short turf in the south of England. The distribution of the plant reaches Lincolnshire, and thus extends somewhat further north than the known historical distribution of the bug. It has been suggested that there may be alternative hosts (marjoram *Origanum vulgare*, has been particularly favoured), but there is no convincing evidence of this, and the suggestion may have arisen simply because of the difficulty of finding and recognising *Thesium* during much of the year. All the known records for the bug are from calcareous grassland. The vegetation must be short, and ideally associated with some disturbance or bare ground, perhaps to provide suitable oviposition sites or areas for sun-bathing. There is one generation per year. The adults overwinter, and are gregarious during hibernation. They have most commonly been found under dry leaves, particularly where these have accumulated in rabbit scrapes, but have also been found in moss under juniper bushes. The adults of one colony have been reported as moving some fifteen metres from their breeding ground on *Thesium* to hibernate amongst beech leaves under a yew bush. They emerge from hibernation in late April or early May, the flowering period of their host plant. Eggs are probably laid in groups in shallow scrapes in the ground, and may be guarded by the female, as is the case with other members of the genus. Nymphs occur until the end of July. Adults are long-lived, and those of succeeding generations overlap.

Status *Thesium humifusum* is itself very local, and the bug is certainly rarer than the plant. It is more restricted in range, and probably requires sites on which good-sized stands of the foodplant have been continuously present for a long period. Though regularly recorded from certain Surrey sites, and seemingly well-established in some parts of Wiltshire, it has not been seen in Kent (a well-worked county) for many years, and the only record for Cambridgeshire dates from the first half of the nineteenth century. There is thus good evidence of a contraction of range over the last century. Against this must be weighed the fact that the bug, like its host, may occupy colonies of very restricted size, and may therefore be overlooked quite readily. This problem is exacerbated by its ground-dwelling habits and the very inconspicuous appearance of its host.

Threats Loss of calcareous grassland through improvement or conversion to arable is clearly threatening. A more insidious threat is loss of grazing and consequent domination by coarse grasses and scrub. *Thesium* is intolerant of such conditions, and *S. dubius*, with its requirement for warm open conditions and a reasonable population of the host plant is likely to be even more sensitive to changes. Loss of stock grazing on many sites no doubt had its effects, but reduction of rabbit populations through myxomatosis has probably been more serious, since rabbit grazing is ideal for producing small open areas with some disturbance in close proximity to taller vegetation which provides shelter and hibernation sites.

Conservation The first requirement for the maintenance of the bug is the retention of good populations of *Thesium*, and site management should be geared towards this. Management should aim to maintain a mix of vegetation heights, including some low or sparse vegetation and bare ground. Light grazing is probably the ideal management to achieve such a structure. Rabbit grazing is particularly effective in maintaining a small-scale mosaic of long and short vegetation and disturbed ground. Rabbit populations should be maintained or encouraged where possible, for example by the maintenance of areas of scrub used for shelter and burrowing. Light stock grazing will also produce a suitable structure. It is probably best if stock is excluded in the summer months, but this is unlikely to be critical if stocking levels are very low. Rotational grazing may be a viable alternative. The disadvantage is that in order to be successful the insect must be able to colonise newly available areas of suitable ground. It may well be able to do so, since the distances involved are small, but this cannot be guaranteed, particularly since the host plant may be very localised within a site. If grazing is not feasible,

rotational cutting may be tried as an alternative. Conditions will be further improved if there is localised rabbit grazing. The maintenance of scrub or trees with leaf litter beneath for hibernation, in reasonably close proximity to stands of the host plant, may be of critical importance, and it is important that such habitat features are retained on known or likely sites for the bug.

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EURYGASTER AUSTRIACA

EXTINCT

Order HEMIPTERA

Family SCUTELLERIDAE

Eurygaster austriaca (Schrank)

Identification Southwood & Leston (1959).

Distribution Reliably recorded in Britain only from the Kent coast between Folkestone and Margate, with most records from the dunes of Sandwich Bay. A record of an immature specimen from Birkdale, Lancashire, is almost certainly an error. It is widely distributed across southern Europe and into Asia and North Africa.

Habitat and ecology Where any note has been taken of the habitat of the species in Britain, it has been found close to or on the ground on coastal dunes. However, the locations of some of the records suggest that it might occur in other dry coastal habitats (as, for instance, at Folkestone). Abroad, it is not particularly a ground-dwelling species, and can occur in a wide range of grassy habitats; in parts of its range it is a crop pest of cereals. Its ground-dwelling habits in Britain probably reflect the need for a warm microclimate. The bug is probably polyphagous on grasses in Britain, as elsewhere. The life cycle abroad involves a single generation per year, with the adults overwintering. Eggs are laid in batches of about 14 on the undersides of grass leaves, each female laying up to 5 batches. Development takes up to 10 weeks, the nymphs feeding at first on the green parts and later on the seeds of the hosts. It is known to migrate for some distance between wintering and breeding habitats abroad, hibernation often taking place in woods and thickets, but the hibernation sites in Britain are not known.

Status Believed extinct in Britain. It was always a rarity, probably maintaining only a rather precarious foothold here at the edge of its range. Nonetheless, though records are few, it seems to have been firmly established, and was recorded on a number of occasions between the mid-nineteenth century and 1885. There is no reason to suppose that it had not been established for a considerable time before records commenced. A.M.Masee failed to find the species in the course of several decades of work on the Kent Heteroptera from the 1930s on, and specific search by E.G.Philp in recent years has also proved negative.

Threats None known. The bug was probably always limited by climatic factors in this country, and climatic changes may well have been the deciding factor in its extinction. The development of the dunes of Sandwich Bay for golfing may have been damaging. Other rarities of the site have continued to be recorded into recent years, but *E. austriaca* may have been more dependent on large areas of tall seeding grasses, and hence more sensitive to golf course management.

Conservation Sandwich Bay is an SSSI. It seems unlikely that a population has persisted in the old sites for the species on the Kent coast. It is possible, though unlikely, that a viable population might be found elsewhere, or that the species might re-establish from migrants. If a population is discovered, the first priority should be to establish the exact habitat requirements and ecology of the species in Britain. Until such time as this is done, any management of the site should aim as far as possible at maintaining the status quo.

References Butler, E.A. (1923a), Douglas, J.W. & Scott, J. (1865), Douglas, J.W. (1873), Hall, C.G. (1890), Masee, A.M. (1955a), Masee, A.M. (1962d), Saunders, E. (1908a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1900), Walker, J.J. (1933), Whittaker, O. (1907).

EURYGASTER MAURA

NOTABLE

Order HEMIPTERA

Family SCUTELLERIDAE

Eurygaster maura (Linnaeus)

Identification Southwood & Leston (1959).

Distribution There are confirmed records only from Kent, Surrey and Hampshire. The species has been confused with the much more common and widely distributed *E. testudinaria*, which was not recognised in Britain until 1927. It would seem likely that most of these records refer to *testudinaria*, but *maura* may yet prove more widely distributed. It is widely distributed in Europe, and occurs in North Africa.

Habitat and ecology The Kent and Surrey records are chiefly from chalk grassland, but there are records from dunes and other dry grassy places, and it has been recorded from a heathy area in the New Forest. It is polyphagous on grasses, and can be a pest of cereals in some parts of the continent. Adults have been seen to feed on a wide range of other plants, particularly on hardheads *Centaurea nigra*. There is a single generation per year, the adults overwintering. Eggs are laid in groups of about fourteen on grasses. The new generation probably matures chiefly in August. On the continent, the bugs are known to migrate some distance between wintering and breeding sites, and in Britain it is believed that it may move to woods and thickets for hibernation.

Status Though restricted in range and decidedly local, *E. maura* is frequent in parts of Kent and Surrey, and may be common where it occurs.

Threats Loss of dry grassland, particularly chalk grassland, through development, improvement, or conversion to arable is clearly a threat. Recent changes in downland sites resulting from loss of grazing caused by stock removal and myxomatosis have probably affected this species less than many other downland species, since it feeds on tall seeding grasses which may do well for a short while after cessation of grazing. Long-term neglect and absence of grazing lead to dominance of coarse grasses and to scrub invasion, and absence of grazing is a long-term threat. Equally, however, close grazing to maintain a short turf will be deleterious.

Conservation Management should aim to maintain grassland with a range of heights, including some which is allowed to grow quite tall and to develop to seeding without grazing or cutting, but sufficiently open to ensure high insolation and a warm microclimate close to the ground. Light grazing is probably the best way to achieve such a structure. Rabbit grazing is particularly effective in maintaining a small-scale mosaic of long and short vegetation. Rabbit populations should be maintained or encouraged where possible, for example by the retention of areas of scrub used for shelter and burrowing. Moderate stock grazing will also provide suitable structure. It may be best if stock is excluded in the summer months, but this is unlikely to be critical if stocking density is very low. Rotational grazing or cutting are likely to be suitable alternatives.

References China, W.E. (1927b), Groves, E.W. (1964), Groves, E.W. (1986), Haynes, R.F. (1952), Masee, A.M. (1955a), Masee, A.M. (1962d), Masee, A.M. (1966f), Masee, A.M. (1967), Rumsey, F.M. (1951), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Wakely, S. (1952), Woodroffe, G.E. (1956b).

Odontoscelis fuliginosa (Linnaeus)

Identification Southwood & Leston (1959).

Distribution There are records from Cheshire, Norfolk, Suffolk, Kent, Hampshire, Cornwall and Pembrokeshire. It is widely distributed in Europe north to Norway and Sweden, and also occurs in north Africa and extends east to Mongolia and China.

Habitat and ecology The usual habitat is coastal sand dunes. There are old records for inland sites in the sandier areas of the East Anglian breckland, but some are now known to refer to *O. lineola*. Though believed to be phytophagous, the food plant is unknown. It has been found under storksbill *Erodium* together with *O. lineola*. It is found particularly in fairly open areas. A.M. Masee considered it to be associated especially with stony areas on the dunes in Kent, and found it most frequently under flat stones partly embedded in sand. It is a ground-dwelling insect, and an efficient burrower. It will burrow when disturbed and also remains buried in poor weather. There is one generation per year. Nymphs overwinter in the third or fourth instar, and have been found in moss in sheltered areas of dunes. Adults occur from early June to late July or early August. Eggs are laid in July. The bugs have occasionally been found in numbers, but usually it seems that populations are fairly small and the bugs sparsely distributed.

Status Rare and possibly declined. It is possible that its apparent rarity is partly a consequence of it being difficult to find, since it has no definitely identified foodplant, burrows efficiently, usually occurs as scattered individuals, and is active on the surface only in very fine weather. It is, however, a large and distinctive insect once found, occurs in habitats which are well-worked by hemipterists, and is unlikely to be grossly under-recorded. Many of the records are old, and the current distribution may be more restricted than the old records suggest. The evidence of the species in Cheshire rests on a single specimen taken before 1907, and there appear to have been no records for several decades from the coasts of Norfolk, Suffolk, Hampshire, and Cornwall. Sandwich Bay, Kent, is the only site with a history of regular recording of the species.

Threats Coastal developments may have destroyed some colonies, and continue to be a threat where they impinge on known, or possible, sites for the bug. Increasing recreational use and development for recreational purposes may also be damaging, particularly through excessive disturbance of open ground. The bug has survived extensive conversion of dune areas at Sandwich Bay to golf courses, but populations may have been reduced. The chief damaging factor on many sites has probably been the loss of suitable habitat structure through loss of grazing, particularly as a result of decreased rabbit populations after myxomatosis. The ideal conditions for *O. fuliginosa* are probably provided by sparse low vegetation on more or less stable sandy ground, with occasional small-scale disturbance, perhaps with a preference for areas with small stones on the surface. Intense rabbit grazing and digging are ideal for providing such situations.

Conservation Site management should aim to provide areas of suitable open structure without excessive frequent disturbance. Suitable conditions may often occur without the need for active management. Where such conditions are, or may in the future be, maintained by rabbit grazing, rabbit populations should be encouraged as far as possible. On larger dune-systems the introduction or maintenance of stock grazing may improve conditions.

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Odontoscelis lineola Rambur

Identification Southwood & Leston (1959).

Distribution A southern species, recorded from the coasts of Norfolk, Kent, Sussex, Hampshire (including the Isle of Wight), Devon and Cornwall, and inland in Suffolk and Surrey. It is widely distributed in Europe.

Habitat and ecology Associated with storks-bill *Erodium cicutarium* and probably also sea storks-bill *E. maritimum* on sandy substrates. Most records are from coastal dunes, but it has been recorded from a number of inland sites in the Suffolk breckland, and from sandy areas with sparse vegetation in degraded heath at Witley Common, Surrey. There is one generation per year. Nymphs hibernate in the third or fourth instar in moss or buried in sand near the host plants. They mature in June. Eggs are laid in July, and adults may be found until the end of the month. There seems to be a preference for rather small plants of storks-bill growing in fairly firm and stable sand, often with a sparse growth of moss. Adults and nymphs can burrow effectively, and may be difficult to find in cold weather.

Status A very local species with a rather scattered distribution, appears to be genuinely absent from many apparently suitable sites. It seems well-established at a number of sites in the brecks, and probably has quite large populations in some southern dune-systems. It is difficult to gauge population sizes, because of the extreme localisation of colonies. There are likely to be further localities yet to be discovered, particularly in the west.

Threats The bug, like its host-plant, requires sparse vegetation with some disturbance. In recent historical times, such conditions were probably chiefly provided by rabbit grazing and digging. Reduction of rabbit populations through myxomatosis has probably been the greatest single adverse factor the species has faced in recent years. The populations in the brecks, particularly, though seemingly still stable, must be a very small fraction of what was there prior to myxomatosis. Loss of stock grazing, particularly in inland sites, will also have been damaging. Considerable areas of breckland and southern heathland have also been lost to afforestation and to agriculture in recent decades. Heavy public pressure leading to erosion is damaging at some coastal sites. Developments on coastal dunes, particularly recreational developments such as golf courses and caravan parks, threaten a number of known and potential sites.

Conservation Management should aim to maintain areas of short sparse vegetation with good growth of storks-bill. These are likely to be easier to maintain in coastal sites, where often no specific management will be needed. The ideal habitat seems to be areas which, though having suffered disturbance and being maintained at an early successional stage through slight disturbance and close grazing, are nonetheless on more or less firm and stable sand. Excessive disturbance, and particularly excessive human trampling, may leave conditions perfectly suitable for the host-plant (which, in such conditions, on loose sand, may grow very large) but unsuitable for the bug. Heavy visitor pressure should therefore be avoided in dune slacks, particularly in those areas where sparse vegetation is associated with a thin layer of moss/lichen. In areas of the brecks, where prolonged absence of grazing has led to loss of suitable habitat over large areas, occasional mechanical disturbance may be advantageous in providing the disturbed conditions necessary for the growth of the host plants. In all cases, rabbit grazing is the ideal management to maintain suitable conditions, and rabbit populations should be encouraged wherever possible.

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Chlorochroa juniperina (Linnaeus)

Identification Southwood & Leston (1959).

Distribution There are records from Northumberland, Lancashire, Derbyshire, Nottinghamshire, Leicestershire, Kent, Surrey, and Hampshire, though not all have been confirmed. Records from Surrey, Lancashire and Derbyshire are known to be correct. A published record for Wiltshire is now known to be incorrect. Abroad, the distribution includes much of northern Europe, extending from Finland to the Mediterranean, and east to Turkey and Siberia.

Habitat and ecology The host-plant is juniper *Juniperus communis*, though the bug may be partly predacious. There is one generation per year, the adults overwintering on the juniper bushes or amongst moss or leaf litter around their bases. Eggs are laid on the host plant in the spring, and adults of the new generation begin to mature in August. The bulk of the records of the species in Britain are from chalk downland in the south of England, but scattered northern records demonstrate that it need not be confined to this habitat. On the continent it can occur on junipers in any habitat in which they are able to grow.

Status Believed extinct. The bug was recorded from a number of sites on the downs in Surrey in the 19th century, and was also known, though rarely, from the chalk in Kent. Outside this downland area, the records are so sparse and scattered that it is difficult to determine what the status of the species ever was. The last published record was for Derbyshire in 1902, though somewhat surprisingly it came from Millers Dale, a locality which even then supported no juniper. A specimen in Manchester Museum was collected by a Mr Hilton from South Heywood, Lancashire, in 1925 (S. Judd pers. comm.). On the available evidence, it would seem likely that the species was precariously established on juniper in the north of England. There is no evidence of a continuing viable population. Such a large and conspicuous insect is unlikely to have been widely overlooked, but it is conceivable that it may survive in the north. *C. juniperina* is listed in Shirt (1987) as a Red Data Book Appendix species, indicating the absence of post-1900 records.

Threats The decline of juniper on chalk downland has probably been a major cause for the loss of the species in southern England. This may not be the whole story, however, since the bug disappeared at a time when juniper was still relatively common. This may imply a requirement for large actively regenerating stands of the host-plant, but it is equally possible that climatic or other factors may have contributed to the decline. The reasons for the extreme localisation and rarity of the species on northern juniper are not known. It would seem most likely that climatic factors are responsible in this case, the summers perhaps being too cool and wet. The severity of the winter is unlikely to be a factor, since the bug occurs at high latitudes on the continent. No current threats can be identified, in the absence of known viable populations.

Conservation It is unlikely that any populations of the species remain undetected in southern England, in view of the current poor state of juniper there, the conspicuous nature of the insect, and the fact that many of the remaining juniper populations have been quite well-studied. Efforts are currently being made to conserve and encourage the regeneration of juniper at a number of sites, and this should also benefit the insect if it were to reappear. There is perhaps a greater chance of a population surviving in the north, where juniper remains relatively frequent, and where there has been less attention from entomologists. If any such population were discovered, the ecology and habitat requirements of the species should be investigated, to facilitate accurate survey of the status of the species and to determine management requirements.

References Butler, E.A. (1923a), Carr, J.W. (1916), Douglas, J.W. (1865b), Groves, E.W. (1964), Masee, A.M. (1955a), Masee, A.M. (1962d), Saunders, E. (1892a), Scott, J. (1873), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Stokes, H.G. (1947), Taylor, J.K. (1905).

Eurydema dominulus (Scopoli)

Identification Southwood & Leston (1959).

Distribution A southern species. There are a number of records from Kent and Sussex, and it has also been reported from Norfolk, Middlesex, Northamptonshire, Sussex, Hampshire, Devon and Glamorgan. It is widely distributed in Europe, and extends east into Asia.

Habitat and ecology The host plants are crucifers, particularly lady's smock *Cardamine pratensis*. It has also been recorded from lesser swine-cress *Coronopus didymus*, flixweed *Descurainia sophia*, garden arabis *Arabis caucasica*, and other crucifers. In woodlands in Kent, it has been particularly found in recently coppiced areas, colonising the *Cardamine pratensis* which grows up after clearance, and moving to new areas as the new coppice growth becomes more dense. Some of the recorded localities, however, suggest that it is not confined to woodland rides and clearings. There is one generation per year, adults overwintering in moss, debris or beneath bark of fallen logs. Adults emerge from hibernation in late April or early May and may visit flowers, including umbellifers and hawthorn blossom. Eggs are laid in batches of about a dozen, probably from May onwards. In captivity, eggs were laid on the cage roof or on pieces of string rather than on the host plant. Eggs in captivity hatched in 8 to 9 days, and the minimum period for development was 52 days. The nymphs feed on all parts of the plant, but particularly on the developing fruits.

Status Very local and possibly declined. There have been regular records only from Kent and Sussex, and even in these counties they have been more sporadic in recent years. It is known from the other counties only from single records, none of them recent.

Threats Changes in woodland management have probably represented the chief threat to the species in recent years. Neglect of coppice woodlands must in many cases have greatly reduced the area suitable for growth of the host plant, even in woods where the rides have remained sufficiently open to support it. Conversion to conifers, or to uniform plantations of broadleaved trees, is also likely to be deleterious. The extent to which viable colonies have occurred outside woods in recent years is not clear. However, where such colonies do occur, drainage and improvement of low-lying marshy pasture and conversion to arable are particularly threatening.

Conservation Good populations of the host-plants, particularly *Cardamine pratensis*, should be retained in known or likely sites. Where a coppice woodland has been neglected, the re-introduction of a coppice cycle may encourage the re-growth of the plant in cleared areas. However, coppicing is unlikely to be essential for the bug's survival, and appropriate ride management should be adequate to maintain a sufficient food supply. Rides should be open, broad and sunny, and the introduction of rideside coppicing and the creation of small rideside clearings may be particularly helpful. Damp open areas supporting *Cardamine pratensis* and other crucifers should be retained and left unplanted.

References Butler, E.A. (1881a), Butler, E.A. (1881h), Butler, E.A. (1905), Butler, E.A. (1923a), Chitty, A.J. (1896), Douglas, J.W. & Scott, J. (1865), Groves, E.W. (1964), Groves, E.W. (1986), Hallett, H.M. (1936), Masee, A.M. (1940), Masee, A.M. (1941a), Masee, A.M. (1943), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Saunders, E. (1892a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1900), Woodroffe, G.E. (1959k).

Eysarcoris aeneus (Scopoli)

Identification Southwood & Leston (1959).

Distribution Recorded from Kent (Faversham), Hampshire (New Forest), Sussex (Ashdown Forest), Surrey (Woking and Brookwood), Bedfordshire (Baker's Wood), Cornwall (Bellowell, near Penzance) and Cardigan (Aberystwyth district). Butler (1909) and Jones (1928) give a record from Parkhurst Forest, Isle of Wight, but this is not included in Butler's later works. It is widely distributed in Europe, extends east to Siberia and Turkey, and also occurs in North Africa.

Habitat and ecology The only confirmed food-plant in Britain is slender St. John's wort *Hypericum pulchrum*. It is possible that there are alternative hosts, but in captivity adults have refused the related perforate St. John's wort *Hypericum perforatum*. The food-plant occurs in a wide range of usually non-calcareous habitats. In Britain, the bug has been found on damp heathland, in woodland rides and clearings, and in damp grassland. There is one generation per year, the adults overwintering in soil or moss. Egg-laying probably begins in late June, and nymphs can be found until late August, and possibly later. They feed preferentially on the developing fruits. The bug usually seems to occur in small colonies.

Status *E. aeneus* is included in Red Data Book category 2 (Vulnerable) in Shirt (1987), but this may over-state the threat to the species. The only locality with a continuous history of recording is the New Forest, where it has been known for well over a century. In all other localities it has been recorded on only one occasion, and in several cases is known from only a single specimen. In all cases where the habitat is known, however, it seems perfectly suitable for the insect, and there is no reason to doubt that they are from established populations. This points to the occurrence of very small isolated colonies of the insect, which may readily be overlooked. Further examination of potentially suitable sites, particularly in south-west England and in Wales, may well reveal further localities for the species. A reduction of status to Red Data Book category 3 (Rare) more accurately reflects the likely overall status of the species.

Threats Lack of woodland management, or inappropriate woodland management, leading to shading of rides and clearings and the creation of conditions unsuitable for the host plant; drainage or improvement of damp heaths and wet grassland, and the lowering of water tables as a result of water abstraction and drainage on surrounding land. In the New Forest, grazing levels may be of critical importance. Both overgrazing, leading to loss of flowering plants, and undergrazing, leading to swamping out of the host plants by coarse vegetation, may be harmful. The small size and localisation of many colonies of the species make it particularly susceptible to local extinction through relatively small-scale developments.

Conservation Woodland rides and clearings in known or likely sites for the species should be kept broad, open and sunny; this may be helped by rideside coppicing or the creation of rideside clearings. Any damp areas supporting stands of the host plant should be retained. If cutting of ride vegetation is necessary it should ideally be done early or late in the year to avoid the insect's breeding season, and only a fraction of the area supporting the host plant should be cut in any one year. The maintenance of suitable conditions for the bug on damp heaths and grassland is best achieved by light to moderate grazing. On heathland sites, burning should be avoided on wetter areas supporting the host plant.

References Anon. (1907), Bannister, R.T. (1976), Bedwell, E.C. (1935), Butler, E.A. (1909a), Butler, E.A. (1923a), Champion, G.C. (1870), Coulson, F.J. (1932), Groves, E.W. (1964), Jones, H.P. (1928), Masee, A.M. (1955a), Masee, A.M. (1962d), Nau, B.S. (1972), Saunders, E. (1892a), Saunders, E. (1900a), Scudder, G.C.E. (1956), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Southwood, T.R.E. (1951), Stichel, W. (1955), Turner, H.J. (1908).

HOLCOSTETHUS VERNALIS**RARE**

Order HEMIPTERA

Family PENTATOMIDAE

Holcostethus vernalis (Wolff)**Identification** Southwood & Leston (1959).**Distribution** There are records from Cumbria, Suffolk, Middlesex, Kent, Sussex, Somerset, Devon and Carmarthen. It is widely distributed in Europe, and extends east to Iran.**Habitat and ecology** Where habitat details have been recorded, British records appear to have come chiefly from bushes, young trees or herbage in woodland rides. The most recent specimen (from Carmarthen) was taken in a Rothamsted light trap. Nothing is known of the biology of the species in Britain. It seems almost equally obscure on the continent, where it has been recorded from a wide range of shrub and tree species, and also from a number of low-growing plants. It may be at least partly predacious. There is one generation per year in mainland Europe. Adults overwinter, and the adults of the new generation mature in August. In Britain adults have been taken in April, May, June, August, September and October.**Status** There is no proof that this is an established breeding species. The records are widely scattered both in space and time. North Kent is the only area from which the species has been recorded on more than one occasion. It is possible, therefore, that it is an occasional migrant which may sometimes temporarily establish itself. If a true British native, it is certainly both extremely local and rare.**Threats** In the current state of ignorance as to the ecology and status of the species in Britain, threats are difficult to determine. If it is a British native, it would appear to be a woodland ride insect, in which case clearance of woodland, conversion of broadleaved woodland to conifers, and lack of, or inappropriate ride management leading to excessive shading are the likeliest threats.**Conservation** If any further captures are made, the site should be thoroughly investigated to determine whether there is an established population, and if so its ecology and habitat requirements should be studied. In the lack of such knowledge, the likeliest management to retain the species is the maintenance of broad open sunny rides with a good mix of heights of woody species along its margins.**References** Blathwayt, L. (1906), Butler, E.A. (1923a), Chitty, A.J. (1904), Edmonds, T. (1915), Eversham, B.C.E. (ed.) (1984), Groves, E.W. (1964), Masee, A.M. (1950c), Masee, A.M. (1955a), Masee, A.M. (1962d), Morley, C. (1905), Morley, C. (1911), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

JALLA DUMOSA**EXTINCT**

Order HEMIPTERA

Family PENTATOMIDAE

Jalla dumosa (Linnaeus)**Identification** Southwood & Leston (1959).**Distribution** In Britain recorded only from the Kent coast at Deal (Sandwich Bay). It is widely distributed in Europe, particularly in the south, and also occurs east to Iran and in North Africa.**Habitat and ecology** Observations on the continent show this to be a chiefly ground-dwelling predacious bug, found amongst low and often sparse vegetation in dry, sunny places. The British records are from coastal dunes. The bug can occasionally be found on taller vegetation; one of the British specimens is known to have been beaten from sea buckthorn *Hippophae rhamnoides*.

Status Presumed extinct. There are very few specimens of the species known from Britain, and all come from a quite short period of the last century. Were it not that a single nymph was also taken on one occasion, this might suggest an occasional immigrant. It remains possible that it is a vagrant species which had only a transitory breeding population in Britain. However, the Sandwich Bay area is known to support a number of species of Heteroptera at the edge of their range in Britain, and the habitat is entirely suitable for *J. dumosa*, so it may equally be that it was a true British native, now lost.

Threats None known at present. The reasons for the loss of the species from its only British site must remain speculative.

Conservation None, in the absence of a viable population.

References Butler, E.A. (1923a), Douglas, J.W. & Scott, J. (1865), Masee, A.M. (1962d), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1900).

SCIOCORIS CURSITANS

NOTABLE

Order HEMIPTERA

Family PENTATOMIDAE

Sciocoris cursitans (Fabricius)

Identification Southwood & Leston (1959).

Distribution Confined to the south of England. Recorded from Kent, Surrey, Essex, Dorset, Hampshire, Somerset, Devon and Cornwall. It is widely distributed in Europe, particularly in the south, and occurs as far east as Turkey and Siberia.

Habitat and ecology In open, dry, sunny localities, often on chalk or sand but also on other substrates provided they are well-drained. There are records from coastal dunes, chalk downland, disused chalk pits, cliff-tops and dry earth banks. It is found amongst fairly low vegetation which may be quite sparse and with much bare ground. There is one generation per year, the adults hibernating. They have been recorded in moss in the winter. Eggs are laid in May and June, and adults of the new generation are found from early August onwards. It is chiefly a ground insect, though it will climb plants in warm weather. It is believed to be phytophagous, but the host-plants are uncertain. It has been found in association with wood sage *Teucrium scorodonium*, buckshorn plantain *Plantago coronopus* and storksbill *Erodium cicutarium* in Britain, but occurs in sites lacking all these plants. Eggs have been reported as being laid in flower-heads of mouse-ear hawkweed *Pilosella officinarum* and stems of cinquefoil *Potentilla*.

Status Local, but perhaps more frequent than in the past. For many years after its first discovery it was known only from the sandhills of the Kent coast at Sandwich Bay. It was recorded at Boxhill, Surrey, around the turn of the century, and has since been found there and elsewhere on the downs in Surrey on many occasions. By 1954, A.M.Masee regarded it as common in Kent. It has been recorded only once from Essex, from Purfleet, just to the north of the Thames. More westerly records are rather scattered. Colonies of the bug may be of rather limited extent, but where found it is often abundant.

Threats Commercial, residential and agricultural developments may be threatening to individual sites, particularly where the species occurs in marginal areas with no designation as sites of conservation interest. The limited size of some colonies makes them more susceptible to damage. It appears to be less exacting in its habitat requirements than some other species of such strongly southern distribution, living on a range of substrates and in a range of vegetation types, as long as they are warm, dry, sunny and with some bare ground. Lack of grazing, on chalk grasslands in particular, with consequent thickening of vegetation, dominance by coarse grasses, and scrub invasion, is deleterious. Elsewhere, in chalk-pits, quarries and waste ground, similar changes may come about through natural succession except in areas where rabbit grazing or disturbance are sufficient to prevent it.

Conservation Calcareous grasslands should be managed so as to provide a small-scale mosaic of different vegetation heights in close proximity, providing areas suitable for breeding and for hibernation, including some

sparse turf and bare ground. This structure is best achieved by moderate grazing. On both calcareous and other substrates the species may form colonies of limited extent centred on particularly favourable features of the site, such as south-facing banks and slopes with loose and crumbling substrate and incomplete vegetation cover. Such features should be noted and retained through any management programme. In sites such as quarries and other areas supporting ruderal or early successional plant associations, effort should be made to retain as full a set as possible of early successional stages, by clearance of invading scrub and by periodic disturbance where necessary. Rabbit grazing is particularly effective in maintaining suitable conditions at most of the types of site in which the bug may occur, and rabbit populations should be maintained or encouraged wherever possible. Heavy public pressure and erosion are damaging, but recreational use of a site sufficient to give occasional substrate disturbance and to maintain structural diversity of vegetation should be viewed as a positive management tool.

References Anon, (1952), Blathwayt, L. (1906), Butler, E.A. (1923a), Cropper, R.S. (1980), Douglas, J.W. & Scott, J. (1865), Foster, A.P. (1987b), Groves, E.W. (1964), Groves, E.W. (1986), Hall, C.G. (1890), Jennings, F.B. (1898), Jennings, F.B. (1902), Jones, H.P. (1928), Leston, D. (1954a), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Saunders, E. (1892a), Southgate, B.J. (1955), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Thomas, D.C. (1943), Vallins, F.T. (1954), Walker, J.J. (1900), Woodroffe, G.E. (1965a).

ARENOCORIS WALTLI

VULNERABLE

Order HEMIPTERA

Family COREIDAE

Arenocoris waltli (Herrich-Schaeffer)

Identification Southwood & Leston (1959).

Distribution This species appears to be mainly confined to the breckland area of Suffolk and Norfolk. A single record for Deal, Kent, may be erroneous. The locality of the first British record was given by Thouless (1902) as West Walton, Norfolk. The only West Walton in Norfolk, however, is in the north of the county, on the edge of the fens, and seems a surprising place both for *A. waltli* and for the other Heteroptera recorded with it. Single specimens have been taken at Fritton, near the Norfolk/Suffolk border east of the brecks, in 1919, and from a sand-pit at Framlingham in 1922. All the remaining British specimens have come from a small area of the Suffolk breckland around Mildenhall, Worlington and Freckenham.

Habitat and ecology Found in open sandy areas with low or sparse vegetation. The host plant is not known with certainty, but the bug has been found in mixed populations with the commoner *A. falleni* under storksbill *Erodium cicutarium* on at least two occasions. Some recorded localities have few habitat details, but it has been taken from a roadside verge and from a sandpit. Adults have been found in May, August and September, and probably overwinter.

Status Extinct or extremely rare: apparently unrecorded since 1935.

Threats Loss of open breckland to agriculture and afforestation has greatly reduced the area of suitable habitat. On remaining areas of open breck, cessation or reduction of grazing, particularly by the loss of rabbits through myxomatosis, has probably been the greatest threat. It has led to growth of tall vegetation and reduction of disturbance, rendering the habitat less suitable both for the bug and for *Erodium*, the probable host. Damage to roadside verges through road widening and improvements may also have been damaging.

Conservation Open breckland habitats with short sparse vegetation including *Erodium* should be maintained wherever possible. Rabbit grazing is the best management tool to achieve the desired structure, and rabbits should be encouraged as far as feasible on all sites. Where rabbit grazing is insufficient, stock grazing may provide a substitute, though it is less efficient at providing the small-scale disturbance and very intense localised grazing pressures which are ideally needed. In areas where grazing is not feasible, or where it alone is not adequate to provide open areas, periodical mechanical disturbance by ploughing or rotovation may be needed.

References Bedwell, E.C. (1923), Bedwell, E.C. (1935), Butler, E.A. (1923a), Daltry, H.W. (1932a), Edwards, J. (1904), Massee, A.M. (1955a), Massee, A.M. (1962d), Morley, C. (1920), Morley, C. (1923), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Thouless, H.J. (1902).

BATHYSOLEN NUBILUS

NOTABLE

Order HEMIPTERA

Family COREIDAE

Bathysolen nubilus (Fallen)

Identification Southwood & Leston (1959).

Distribution South-eastern England. There are records from Norfolk, Suffolk, Essex, Kent, and Buckinghamshire. Essex and Kent records include sites within Greater London. It is widely distributed in southern Europe, as far north as Sweden, and extends to Egypt and to Turkestan.

Habitat and ecology Associated with medicks (*Medicago* spp.) and perhaps with other species of Leguminosae. It has been found particularly in association with black medick *M. lupulina* and tall melilot *M. altissima* in Britain. It occurs on coastal shingle, in disused chalk pits and gravel pits, and on waste ground. There appears to be no particular preference as to soil type, provided it is well-drained. Most sites have rather sparse vegetation cover, and areas occupied by the bug may appear rather inhospitable, and be inhabited by few other species of Heteroptera. *B. nubilus* appears to be tolerant of disturbance, since it has been found beneath stunted plants of black medick growing on a path. There is one generation per year, the adults overwintering. They may survive until late June. Adults of the new generation mature in late July or early August. It is a ground-dwelling insect, and is found mainly beneath the host-plants, beneath stones and debris in their vicinity, or partly buried in soil.

Status Local. The species may have increased in the present century. For many years its only known site in Kent was at Deal, but since its re-discovery in 1945 it has been found at many sites in the county. It remains much more local in other counties in its range, however. There appear to be only three Norfolk records (two of these 19th century), one for Suffolk, and one for Buckinghamshire. The Essex records are from the extreme south of the county. It was first found in chalk pits at Purfleet in 1943, and was still present in the chalk pits at Grays in 1986. It also occurs amongst ruderal vegetation on waste ground in north-east London.

Threats On coastal sites, the chief dangers are probably from development and from heavy public pressure leading to erosion of shingle vegetation. On inland sites, the major threats are probably uncontrolled natural succession, destruction of sites for industrial or residential development, and the infilling of disused mineral workings. The bug requires sites at an early successional stage. These are always threatened by successional processes except in areas with regular disturbance. The character of the areas it prefers mean that they are unlikely to be accorded any great conservation value, even where they fall within a site of known interest, and in many cases there is likely to be relatively little opposition to development, landscaping, or planting on such sites. This is particularly a problem with sites in the east London area, where the increasing value of land is leading to extensive destruction of urban wasteland sites.

Conservation Areas of land exhibiting early successional stages with medicks should be retained wherever possible. Regular disturbance is needed to maintain early successional stages. This may be partly achieved by public use on some sites (by walking, playing by children, motor-cycle scrambling, etc.). Such recreational use on parts of a site should be viewed as a positive management tool, provided it is not so severe as to cause wholesale destruction of vegetation. In the absence of such informal management, periodic mechanical disturbance may be necessary to maintain suitable conditions. Coastal sites, particularly on shingle, are unlikely to require active management.

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GONOCERUS ACUTEANGULATUS**ENDANGERED**

Order HEMIPTERA

Family COREIDAE

Gonocerus acuteangulatus (Goeze)**Identification** Southwood & Leston (1959).**Distribution** Until recently known only from Boxhill, Surrey; recently recorded from additional sites in Surrey and probably spreading. The distribution extends east to Iran.**Habitat and ecology** Most British records are for box *Buxus sempervirens*. This has long been regarded as the only British foodplant. However, there is an old record of a nymph being found on yew, and recent records away from Box Hill certainly involve the use of other foodplants. Nymphs have been recorded on hawthorn *Crataegus monogyna*. This wider range of foodplants is in keeping with its known biology elsewhere in Europe, where it is polyphagous on a wide range of woody plants. Adults occur on other plants, particularly at ivy blossom, in the autumn. There is one generation per year, with overwintering adults. They mate in June or July, and eggs are laid in batches of about fifteen on twigs and leaves of the host. Adults of the new generation begin to mature in mid-August, and can be found until late October. Adults fly readily in warm weather.**Status** Listed as endangered in Shirt (1987), on the grounds of its restriction to a single site. As this species has now been found at additional localities, it seems likely that this status will need to be revised downwards in the future. However, the spread seems to be very recent, and it is impossible to predict whether it will be sustained or how far it will go. It does not seem appropriate to recommend a change in status at present.**Threats** Any threat to Boxhill, and in particular to the box population there, must be regarded as a threat to this species. The bug has been found principally on box bushes with good exposure to the sun, and so could potentially be threatened by either dense growth of box scrub going unchecked, or clearance of isolated box bushes from open grassland areas. On other sites, the juxtaposition of bushes with open grassland may be of critical importance in providing warm sheltered places on woody plants. Management of grassland sites should maintain a proportion of scrub.**Conservation** *G. acuteangulatus* is listed by the Joint Committee for the Conservation of British Insects (1974) as a species to be collected only with restraint. Boxhill is a SSSI and a property of the National Trust. The box population here should be retained and protected, ensuring that some areas retain an open sunny aspect; some box bushes should be retained in open grassland.**References** Bedwell, E.C. (1929), Butler, E.A. (1923a), Douglas, J.W. (1865b), Groves, E.W. (1964), Groves, E.W. (1986), Joint Committee for the Conservation of British Insects. (1974), Leston, D. (1954a), Massee, A.M. (1955a), McNulty, B.J. (1965), Pickard-Cambridge, A.W. (1946), Rumsey, F.M. (1951), Saunders, E. (1892a), Saunders, E. (1902a), Saunders, E. (1912), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Spreadbury, W.H. (1954), Stichel, W. (1955), Wakely, S. (1951), Walker, J.J. (1933).

SPATHOCERA DAHLMANNI**NOTABLE**

Order HEMIPTERA

Family COREIDAE

Spathocera dahlmanni (Schilling)**Identification** Southwood & Leston (1959).**Distribution** Chiefly south-eastern. Recorded from Suffolk, Essex, Kent, Sussex, Middlesex, Surrey, Berkshire, Hampshire and Dorset, and with a single isolated record for Staffordshire. It is widely distributed in Europe.**Habitat and ecology** The foodplant is sheep's sorrel *Rumex acetosella*. The bug prefers small stunted plants growing in otherwise almost bare ground. Bedwell (1943) described it as occurring in "places where the sorrel

has died, or is reduced to bare stems amongst broken pieces of grass-stems, pine needles and similar debris." It has occurred on sites which have been recently cleared or burnt and are only just re-developing vegetation cover. The host is typically a plant of acid soils. Burnt, cleared or degraded heathland provides the habitat for many of the records. G.E. Woodroffe found a colony on the site of an abandoned piggery at Arne Heath, Dorset. It has also been recorded from coastal dunes at Sandwich Bay, Kent. The Suffolk record is from the breckland. Though the bug has often been seen in only small numbers, this may partly be a consequence of it being inconspicuous and slow-moving. It has occasionally been seen in quantity, though even then the bugs seem to have been thinly spread over an area of suitable ground. There is one generation per year, the adults overwintering amongst leaf litter or in grass tussocks. Mating takes place in May and June, and eggs are laid singly or in small groups on stems of the food-plant. The eggs hatch in three to four weeks, and nymphal development takes seven to eight weeks. Adults mature from mid-August onwards. There may be a second generation in some years. The nymphs have been seen to feed on the stems of the host, while adults feed on the seeds.

Status Extremely sparse and local. Surrey is the county from which it has most frequently been recorded. It is known only from old records from single sites in Kent, Staffordshire and Suffolk, and the Middlesex record rests on specimens taken in the 1950s on Hounslow Heath. There are only single records from Essex, Berkshire and Sussex. This suggests that the heathland regions of the southern counties from Surrey to Dorset now comprise the main area of distribution for the species in Britain. Records, however, particularly modern records, are very sparse even here. It is difficult to be sure of the likely extent of under-recording.

Threats Afforestation; destruction of heath for conversion to arable land; loss of grazing through cessation of stock grazing and loss of rabbits to myxomatosis, leading to growth of coarse vegetation and scrub invasion. Factors which would normally be regarded as threatening to heathland through habitat degradation, such as uncontrolled fires and intensive public pressure and trampling, may be actually advantageous to this species. An additional threat is imposed by the fact that its preferred habitats are likely to be regarded as of relatively low interest by conservationists; they are therefore the most likely areas to be permitted to be used for development, and if retained may be subject to active measures to re-instate a more typical heathland flora.

Conservation Rabbit populations on heathland and breckland should be maintained or encouraged where possible, and stock grazing maintained or introduced. The value of areas of very sparse vegetation including sorrels, even if on very degraded land, should be recognised, and areas of this habitat should be conserved if possible. If seriously degraded land is incorporated into a site to be managed for conservation, thought should be given to maintaining some part of it in relatively extreme condition for such species as this, rather than attempting to re-create a more semi-natural vegetation. On sites where the species is known to occur, some areas of suitable vegetation should certainly be retained. This may necessitate periodic burning or, preferably, mechanical disturbance.

References Appleton, D. (1984a), Bedwell, E.C. (1943a), Butler, E.A. (1923a), Dicker, G.H.L. (1945), Douglas, J.W. & Scott, J. (1865), Forster, H.W. (1952), Groves, E.W. (1964), Groves, E.W. (1986), Massee, A.M. (1955a), Morley, C. (1905), Morley, C. (1911), Saunders, E. (1892a), Saunders, E. (1902a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1933), Woodroffe, G.E. (1953a), Woodroffe, G.E. (1954), Woodroffe, G.E. (1959g).

RHOPALUS MACULATUS

NOTABLE

Order HEMIPTERA

Family RHOPALIDAE

Rhopalus maculatus (Fieber)

Identification Southwood & Leston (1959).

Distribution A predominantly southern species, recorded from Cheshire, Suffolk, Oxfordshire, Kent, Surrey, Sussex, Berkshire, Hampshire, Dorset, Wiltshire, Norfolk, and Cardiganshire. The records currently available suggest centres of distribution in the East Anglian fens and the damper heaths of the southern counties from Surrey and Sussex to Dorset, with rather few scattered records outside these areas. It is widely distributed in Europe, and extends east to Japan.

Habitat and ecology Typically a wetland species, recorded from fens, the wetter parts of heaths, and marshy grassland. It may be polyphagous. Marsh cinquefoil *Potentilla palustris* and marsh thistle *Cirsium palustre* are regarded as hosts. A nymph has also been reared to maturity on slender St. John's wort *Hypericum pulchrum*, and was observed to feed on the green seed pods. The association with *Potentilla* is further confirmed by an anomalous finding of nymphs and adults on a dry heathy slope in association with tormentil *Potentilla erecta*. There is one generation per year, the adults overwintering in grass tussocks or moss. Eggs are laid between late May and late June. Adults of the new generation generally mature in August.

Status Local. Under-recording is possible, particularly in south-west England and South Wales.

Threats Drainage of fens, marshes, damp grassland and wet heaths; grassland improvement; conversion of marginal land to agricultural use; lowering of water tables through water abstraction and drainage in surrounding land. In fenland sites particularly, scrub invasion and growth of rank vegetation resulting from lack of management may also pose a threat.

Conservation The water tables of wetland sites should be maintained at a high level. In fenland sites, regular cutting may be necessary to maintain a diverse plant community free from excessive scrub invasion and growth of tall rank-growing species such as *Phragmites*. Any cutting regime should be rotational, with only a fraction of the site cut in any one year. On heathland, burning should be avoided on wet areas. Light grazing may be beneficial in maintaining structural and species diversity. Intense grazing should be avoided.

References Anon. (1907), Appleton, D. (1984b), Butler, E.A. (1882b), Butler, E.A. (1905), Butler, E.A. (1923a), Coulson, F.J. (1936), Dale, C.W. (1886), Douglas, J.W. & Scott, J. (1865), Fowler, W.W. (1906), Groves, E.W. (1964), Groves, E.W. (1986), Haines, F.H. (1926), Masee, A.M. (1955a), Masee, A.M. (1962d), Saunders, E. (1892a), Saunders, E. (1899b), Saunders, E. (1900a), Saunders, E. (1900b), Saunders, E. (1902a), Saunders, E. (1908a), Scudder, G.C.E. (1956), Southwood, T.R.E. & Leston, D. (1959), Southwood, T.R.E. (1951), Stroyan, H.L.G. (1941), Whittaker, O. (1907), Woodroffe, G.E. (1959k).

RHOPALUS RUFUS

RARE

Order HEMIPTERA

Family RHOPALIDAE

Rhopalus rufus Schilling

Identification Southwood & Leston (1959); Gollner-Scheiding (1978). This species is very similar to *R. parumpunctatus*. There have been misidentifications in the past, and records should be carefully checked.

Distribution Southern England and Wales. It has been reported from Suffolk, Surrey, Buckinghamshire, Hampshire, Wiltshire, Glamorgan and Pembrokeshire. Some records may be erroneous, however, resulting from confusion with *R. parumpunctatus*.

Habitat and ecology A species of dry sandy places, recorded from heaths and stable dunes. The food-plants appear to be unknown. There is one generation per year. Adults overwinter, and have been recorded in April, May, June, August, September and November.

Status Rare and very local. Its chief area of distribution appears to have been the Surrey heaths, and there are a number of records from various heathland sites up to the early 1950s. Since that time, it has been recorded only from Hampshire and Dorset. Outside the Surrey heaths, it seems always to have been rare, and most counties for which it has been recorded have only single, often quite old, records. Because of confusion with *R. parumpunctatus* it is quite likely that the species has been over-, rather than under-recorded in the past.

Threats It seems likely that lack of intense rabbit grazing on heathland following myxomatosis has led to loss of the preferred habitat of the bug, which is presumably low or sparse vegetation, perhaps with bare ground. Other threats to the species are loss of heathland to development, road building, agriculture and afforestation, and uncontrolled fires, particularly in summer, destroying large areas of vegetation and its associated insects.

Conservation Heathland sites should be managed so as to maintain a mosaic of different ages of vegetation; particularly important is the presence of areas of sparse vegetation including grasses and low herbs. Rabbit grazing is the ideal management tool to create a good structure, and where rabbits are present on a heath they should be encouraged as far as practicable. Light stock grazing should be introduced where possible. If grazing is impossible, rotational use of cutting or burning may be attempted to maintain structural and age diversity in the vegetation. Mechanical disturbance of some areas to re-start the succession, and particularly to encourage the growth of plants other than heather, may be valuable on some neglected sites. Stable dunes are less likely to require active management to maintain some areas in suitable condition, particularly if a rabbit population is present. Introduction of light stock grazing may be beneficial in preventing the build up of coarse growth.

References Appleton, D. (1984a), Butler, E.A. (1923a), Fordham, W.J. (1926), Gollner-Scheiding, U. (1978), Groves, E.W. (1964), Groves, E.W. (1986), Hallett, H.M. (1936), Le Quesne, W.J. (1954b), Masee, A.M. (1955a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Stokes, H.G. (1952b).

STICTOPLEURUS ABUTILON

EXTINCT

Order HEMIPTERA

Family RHOPALIDAE

Stictopleurus abutilon (Rossi)

Identification Dolling (1978); Gollner-Scheiding (1978).

Distribution There are confirmed British records for Kent (Deal), Surrey (Ashstead), Hampshire (Bournemouth) and Dorset (Hurn). It is widely distributed in Europe, but absent from the extreme north.

Habitat and ecology Elsewhere in north-western Europe, this is a species of dry, open and sunny localities. Precise details of British captures are not known, but they are from coastal or heathland localities. The species overwinters as an adult. Confirmed British captures were made in August, September and October.

Status There is no strong evidence that this was ever an established species in Britain. The existence of three specimens from Bournemouth (two of them undated) suggests the possibility of a population at least temporarily established, but all other records appear to be of singletons, and all may have been vagrants. There is only a single record from the present century, from Ashstead, Surrey, by A.M.Masee in 1948.

Threats None known. If this species was a true British native, it seems that it must have been at the limit of its possible range, and vagaries of climate may have been the chief factors determining its status.

Conservation No recommendations can be given in the absence of a known established population. If a population is found, it is likely that the maintenance of open sunny conditions, ideally with a varied vegetation structure which includes tall and short vegetation and bare ground, will be important, but management decisions should preferably be taken after the ecology and habitat requirements of the species at the site have been studied.

References Dolling, W.R. (1978), Gollner-Scheiding, U. (1975), Stichel, W. (1955).

STICTOPLEURUS PUNCTATONERVOSUS

EXTINCT

Order HEMIPTERA

Family RHOPALIDAE

Stictopleurus punctatonervosus (Goeze)

Identification Dolling (1978); Gollner-Scheiding (1978).

Distribution There are confirmed records of this species only from Surrey (Charlwood) and Sussex (Holm Bush). A record for Kent listed by Masee (1955) probably in fact refers to *S. abutilon*, and a record for Essex in the same paper is unconfirmed (Dolling 1979). It is widely distributed in Europe, but absent from the extreme north.

Habitat and ecology Elsewhere in north-western Europe, this is a species of dry, open, sunny habitats. British records are few, and lack habitat details. Saunders (1892) records the capture of *Stictopleurus* "by sweeping in dry places", but this could refer to either or both of the two known British species, and is too vague to be particularly informative. Dunes, open heaths and chalk grassland are the habitats most likely to be occupied by a species such as this, at the edge of its European range. The species overwinters as an adult, and confirmed British specimens have been taken in May and September.

Status Probably extinct. There are no confirmed British records later than 1870. It seems to have been certainly established at the Charlwood locality, since it was taken there by E. Saunders in 1860, 1869, and 1870.

Threats None known, in the absence of a known established population. The rarity of the species even in the last century, and its apparent disappearance at a time well before widespread major habitat loss in Britain suggests a species at the limit of its climatic tolerance whose extinction is likely to have been the consequence of climatic change.

Conservation No specific recommendations can be made in the absence of a known colony of the species. If a colony were to be discovered, it is likely that the maintenance of dry, open and sunny conditions would be important, preferably with both long and short vegetation and some bare ground, but management at any site should follow careful study of the ecology of the insect there to determine its requirements.

References Dolling, W.R. (1978), Gollner-Scheiding, U. (1975), Saunders, E. (1892a), Stichel, W. (1955).

PYRRHOCORIS APTERUS

ENDANGERED

Order HEMIPTERA

Family PYRRHOCORIDAE

Pyrrhocoris apterus (Linnaeus)

Identification Southwood & Leston (1959).

Distribution The only confirmed breeding colony in Britain is on the Oarstone (or Ore Stone) Rock, a small islet off Torquay, South Devon. However, the bug has also been reported from Yorkshire, Suffolk, Dorset, Camarvon, Merioneth, Glamorgan, and Salop/Flintshire. Some of these records may be erroneous, and most are very old. In no case is there proof of an established viable colony.

Habitat and ecology On the Oarstone Rock, the host plant is tree mallow *Lavatera arborea*, one of the few plants growing on the islet. It may also be partly predacious on occasion. On the continent it is polyphagous, feeding mostly on mallows and limes. There is one generation per year, the adults overwintering. They mate during late April and May, and mature by early August. All stages are warningly coloured and gregarious, but have nonetheless been recorded as being predated by a number of birds and amphibians. The bugs are normally short-winged and flightless. No completely fully-winged individual has been reported from Britain, though they occur elsewhere in Europe.

Status Considered to be endangered, because of its confinement to a single site. *P. apterus* has been known from the Oarstone Rock since at least 1865. The rock has received sporadic visits by people seeking the bug in the years since, and seemingly none has failed to find it. The most recent published record is for 1961. There would seem to be considerable variation in the population size on the rock. A.M.Massee, visiting the rock in August 1953, found the bug to be very abundant on low ledges, with several hundred attached to each plant. G.E.Woodroffe, in April 1961, found the bug rather sparse, and confined to the north-east summit ridge. Woodroffe suggested that this might represent a regular seasonal decimation, with only a small part of the islet suitable for successful overwintering, and the bug spreading out in the succeeding season. It may equally be that the population is prone to fairly dramatic changes of size from year to year. Though there is currently no convincing evidence of a permanently established population of the species on the mainland, it is by no means impossible that one might exist. Many of the records may be misidentifications, vagrants or introductions. However, there is an old Suffolk record of many brachypters found by Curtis at Beccles, and in 1979 two specimens were taken from "a number" on the cliff-tops at Kimmeridge, suggesting at least temporarily established populations.

Threats The chief threat to the Oarstone Rock population is probably the weather. There is evidence for either seasonal decimation of the population by severe winter weather or dramatic swings in the population size, for which weather conditions are again the most likely explanation. Such changes could prove disastrous to the population in the long run, but the long history of the species at the site suggests that it may be well able to cope with the dangers.

Conservation The Oarstone Rock should be maintained in roughly its present state, without excessive disturbance or interference. Any further records of the species from the mainland should be investigated to see whether they represent established populations, and their ecology studied.

References Anon. (1962), Bignell, G.C. (1898), Bignell, G.C. (1906), Brown, S.C.S. (1982), Butler, E.A. (1923a), Douglas, J.W. & Scott, J. (1865), Hallett, H.M. (1936), Masee, A.M. (1954a), Masee, A.M. (1955a), Morley, C. (1905), Morley, C. (1911), Parfitt, E. (1844), Rye, E.C. (1876), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1961a).

DICRANOCEPHALUS AGILIS

NOTABLE

Order HEMIPTERA

Family STENOCEPHALIDAE

Dicranocephalus agilis (Scopoli)

Identification Southwood & Leston (1959).

Distribution Strictly coastal, and predominantly south-western. There are confirmed records for most coastal counties from Kent to Pembrokeshire. Older records must be regarded as doubtful without re-examination of the specimens, because of past confusion with *D. medius*. Inland records almost certainly refer to the latter species. An old record for Lancashire (Liverpool) is more likely to refer to *D. agilis*, since this species extends further north than *D. medius*, and suitable habitat is available nearby. A record for Scotland listed by Bedwell (1945) is unconfirmed, but possible. It is widely distributed in southern and central Europe.

Habitat and ecology Portland spurge *Euphorbia portlandica*, appears to be the preferred foodplant, but sea spurge *Euphorbia paralias*, is frequently used, and the bug has also been recorded from cypress spurge *Euphorbia cyparissias*. It can occur almost wherever suitable stands of the host plants grow in coastal situations, on dunes, shingle and cliffs, though perhaps less frequent in the latter situation. Adults overwinter, mating in May and early June. Development takes about two months, and adults of the new generation can be found by mid-August. It is possible that in some years, in the south-west at least, there may be two generations per year: Woodroffe (1958) reported that in 1957 in Cornwall the bugs were just completing their first generation in early July, and copulation has been observed in August. All stages are found chiefly on the ground beneath and near the host plants, usually more or less hidden under litter. They will climb the plants on occasion, however, and adults will take to the wing in warm weather.

Status Frequent, though somewhat local, in the south-west of England. It can be abundant in places on the coasts of Devon and Cornwall. It is decidedly local from Dorset eastwards. The few records from Sussex and Kent are mostly old. It has been found in a number of localities in Wales, and may well still be rather under-recorded.

Threats Coastal developments, and heavy pressure from visitors leading to erosion of vegetation.

Conservation On many sites, no active conservation measures are needed beyond site protection. The introduction of grazing stock onto coastal sites may prove beneficial in some cases, provided the grazing pressure is light, since the host-plants are resistant to grazing and may be able to spread at the expense of more palatable species. Heavy trampling and erosion of dunes should be avoided, but some disturbance may be beneficial.

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Scudder, G.C.E. (1956), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Stokes, H.G. (1952a), Thomas, D.C. (1955a), Whittaker, O. (1909), Woodroffe, G.E. (1957c), Woodroffe, G.E. (1958a), Woodroffe, G.E. (1966d).

DICRANOCEPHALUS MEDIUS

NOTABLE

Order HEMIPTERA

Family STENOCEPHALIDAE

Dicranocephalus medius (Mulsant & Rey)

Identification Southwood & Leston (1959).

Distribution Southern England and Wales. There are records from Worcestershire, Gloucestershire, Oxfordshire, Buckinghamshire, Kent, Sussex, Berkshire, Hampshire, Wiltshire, Devon, Cornwall and Herefordshire. Some older records of *D. agilis* may also refer to this species, and could extend the distribution a little further. It is widely distributed in southern Europe.

Habitat and ecology The usual foodplant is wood spurge *Euphorbia amygdaloides*, but this bug has also been recorded from the introduced leafy spurge *Euphorbia esula*, and there is a single record from portland spurge *Euphorbia portlandica* on the Dorset coast. Preferred situations for the bug are open sheltered sunny areas supporting good populations of spurge in woodland rides, clearings and margins. It never occurs where the host plant grows in shade. It has been found both amongst pure stands of spurge, and in places where the plant grows amongst grasses and brambles. There is one generation per year, the adults overwintering beneath bark or in leaf litter. Eggs are laid singly or in pairs at the bases of stems of the foodplants. Adults of the new generation mature in August. Adults and nymphs have been seen to feed on the flowerheads and developing fruits. During the day, all stages are usually found on the ground near or beneath the foodplants, often more or less hidden amongst dead leaves, but are more active in warm sunny weather and can then be found climbing the stems. Adults will fly in sunshine.

Status Very local, and probably declined. Though never a generally common insect, *D. medius* appears to have been at least locally frequent in the past. Dicker (1945) was able to describe it as "generally distributed in the wooded areas of mid-Kent", and there are multiple localities for several other counties which might suggest a similar situation. It now seems to be rather rarely recorded and much more local, though there is no strong evidence of a contraction of range.

Threats The chief reason for the decline in the bug has probably been the decline in traditional woodland management practices in the central area of its British range. Coppicing and active ride management would have maintained the open sunny conditions required by the bug. It appears to require very open and sunny conditions to thrive, and such conditions would be rapidly lost on cessation of management. Other threats include destruction of woodland for development or agriculture; conversion of mixed-age broadleaved woodland to uniform plantations of conifers or broadleaves, and intensification of agriculture on land bordering woodland, leading to loss of well-structured woodland edges.

Conservation Woodland rides should be broad, open and sunny, particularly where extensive growth of wood spurge occurs on south-facing edges. Rideside coppicing and the creation of small rideside clearings will also be beneficial. Where possible, sheltered, and particularly south-facing, woodland margins should be structured to give opportunity for scrub and herb growth grading into surrounding low vegetation. Introduction or maintenance of a coppice cycle in at least part of a woodland will further increase the area of suitable habitat available for the bug, but is unlikely to be necessary for its survival in most sites, provided rides are managed sympathetically.

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ACOMPUS PALLIPES**RARE**

Order HEMIPTERA

Family LYGAEIDAE

Acompus pallipes (Herrich-Schaeffer)**Identification** Southwood & Leston (1959).**Distribution** There are confirmed British records only from an unknown site in Essex, probably near Colchester, from Cothill, Berkshire (modern Oxfordshire) and near Streatley, Berkshire.**Habitat and ecology** Thought to feed on cornsalads *Valerianella* spp. and valerians (*Valeriana*?) in dry situations, but the ecology of the species is virtually unknown in Britain. It overwinters as an adult (one specimen has been taken by shaking grass roots in January). It appears never to have been taken in any numbers.**Status** Very rare. There have apparently been no records since 1950. This bug may deserve higher status than it is currently afforded, but so little is currently known of it that it seems wise to retain it in Red Data Book category 3 for the time being.**Threats** The drier areas at Cothill, the only currently identifiable site for the species, have suffered considerably from scrub invasion and from coarsening of the vegetation in recent years, and it is not known whether the bug has been able to survive these changes. Successional changes of this sort, resulting particularly from cessation of stock grazing and from loss of rabbit populations through myxomatosis, may well threaten other populations which may exist.**Conservation** Cothill Fen is a National Nature Reserve. Management here, and at other sites for the species, should aim to maintain varied vegetation structure in the drier areas, including some short vegetation and bare ground where *Valerianella* spp. may grow. Rabbit populations should be encouraged where possible, since the combination of localised grazing and small-scale disturbance may provide particularly good conditions for the species. Stock grazing should be introduced where feasible. Cutting alone is less likely to maintain suitable conditions. Periodic localised substrate disturbance may be advantageous in maintaining early successional stages.**References** Campbell, J.M. (1987), China, W.E. (1935), Le Quesne, W.J. (1951b), Masee, A.M. (1955a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

APHANUS ROLANDRI**NOTABLE**

Order HEMIPTERA

Family LYGAEIDAE

Aphanus rolandri (Linnaeus)**Identification** Southwood & Leston (1959).**Distribution** A species of strongly southern distribution. There are records from Essex, Kent, Sussex, Dorset, Devon and Cornwall, and a rather surprising recent record from Warwickshire; although an isolated individual, there is nothing to indicate that this was a vagrant or an introduction. An old record for Northumberland must be regarded as doubtful. Elsewhere it occurs in southern and central Europe and North Africa, and extends east into Soviet Asia, Iran and Afghanistan.**Habitat and ecology** The bug has been found in a range of circumstances. It has occurred on a number of occasions on arable, or neglected arable, land. It was reported as not uncommon under pea haulms in fields in South Essex in the 1930s, and Douglas and Scott also recorded it from "under refuse in a pea-field" in Kent in the last century. A.M. Masee collected numerous specimens from sheltered corners of arable fields in Kent, and was able to trap them by placing old sacking or corrugated cardboard in likely places. It has also been recorded from a weedy arable field and from amongst weeds growing in a derelict *Brassica* seed-bed in Devon. It remains a frequent species of weedy arable and derelict fields elsewhere in western Europe. However, it has also been

found amongst dry leaf litter in chalk pits, and amongst grass and dry leaf litter on a cliff ledge beneath a thicket of sloe, bramble and gorse in Cornwall. At Dungeness it has occurred amongst leaf litter beneath bushes of prostrate broom. The localities have in common that they are sunny, sheltered and well-drained, and have a covering of dry leaf litter. The bug is probably chiefly phytophagous, but has been seen to predate the eggs of the leaf beetle *Gastrophysa polygoni*. There is one generation per year. The adults overwinter, and on occasion at least do so gregariously in moss or litter, or beneath bark in woods. Overwintered adults mate in May, and die shortly afterwards. The new generation mostly matures in August. All stages are largely ground-dwelling, but the adults will fly in the spring.

Status Extremely local, and probably declined. There appear to be no recent records for cultivated field sites, and very few for more natural habitats. It may be under-recorded in the south-west, where its cliff habitats can be relatively inaccessible. It is less likely to be so in the east. It is a large and distinctive species. However, if it regularly occurs amongst leaf litter beneath dense shrub growth, it may be easily overlooked.

Threats Intensification of agriculture, and particularly the widespread use of pesticides, has almost certainly been the major threat imposed on the species in recent decades, and is the probable reason for its disappearance from cultivated field sites. Sites in chalk pits of other disused workings may be threatened by infilling, development, or natural succession leading to dominance by scrub and rank vegetation and the loss of bare ground with high insolation.

Conservation Disused mineral workings known or thought likely to contain the bug should be managed where necessary to maintain sheltered sunny areas with sparse vegetation and light litter cover, particularly in the vicinity of light scrub of such species as gorse and broom. Periodic scrub clearance may be all that is required, but in some cases mechanical disturbance of the ground may be necessary to maintain early successional stages. Coastal sites should for the most part require no active conservation measures beyond site protection.

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DRYMUS LATUS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Drymus latus Douglas & Scott

Identification Southwood & Leston (1959).

Distribution South-east England. There are records from Northamptonshire, Huntingdonshire, Cambridgeshire, Suffolk, Gloucestershire, Oxfordshire, Buckinghamshire, Hertfordshire, Essex, Kent, Surrey, Sussex, Berkshire, Dorset and Wiltshire. There has been some taxonomic confusion in this genus, and it is possible that some of the older records are incorrect.

Habitat and ecology The habitat requirements of this species are unclear. It has been found in grassland at the edge of a marsh; tall calcareous grassland; on derelict arable land on chalk; amongst dense moss at the margins of scrub on chalk; at the base of fallen chalk cliffs; amongst rather sparse grassland on mildly acid soil; amongst ruderal vegetation on waste ground in the London suburbs, and in a wood. Two distinct micro-habitats seem to be involved: moss growing amongst dense grassland or leaves in fairly open situations, and bare ground amongst sparse vegetation on well-drained soils. The bugs are probably seed-feeders, this being the usual food of members of the subfamily, but no definite plant associations have been established. It has been found under black horehound *Ballota nigra* on derelict land, but no nymphs were seen, and the plant may have been used merely for shelter. Late nymphs have been found under ground ivy *Glechoma hederacea*. It has rarely been found in any numbers, and populations seem generally rather sparse. So far as is known, there is one generation per year, the adults overwintering. It is largely a ground insect, but adults will climb vegetation at times and have been recorded by sweep-netting, particularly in the evening.

Status Local. The bug is almost certainly considerably under-recorded. It apparently occurs at low density and has rather ill-defined habitat requirements. Dense grass with moss, one of its most frequent habitats, is also not easy to search thoroughly. However, it is certainly a great deal less common than are apparently suitable sites: it has been found on very few waste ground sites, for example, despite considerable attention given to such areas by Heteropterists.

Threats Threats are difficult to define for a species of such uncertain ecology. Destruction or improvement of semi-natural grasslands, particularly calcareous grasslands, is likely to be one such. Neglect of grasslands leading to dominance by coarse grasses and scrub invasion, is probably of less significance for this species than for many other ground-dwelling grassland Heteroptera, since it is apparently at home even in a rather dense thick sward. Overgrazing and excessive scrub clearance may pose greater threats through the loss of dense moss and tall vegetation. Loss of waste ground sites to development is likely to threaten some populations. Other waste ground sites may be damaged by natural succession leading to extensive scrub invasion and loss of bare ground to rank vegetation.

Conservation Grassland management should aim to maintain a mosaic of vegetation heights, including long grassland with a good moss layer. This is best maintained by light to moderate grazing. If scrub and adjoining tall vegetation is present, a reasonable quantity should be retained. Any scrub clearance exercise should aim to leave at least a third of the scrub-grassland interface undisturbed. Rotational grazing or cutting may also be used, and either should be satisfactory. Sites with ruderal vegetation should hold a reasonable representation of early successional stages. This may require scrub clearance, and possibly periodic mechanical disturbance of selected areas. Grazing and disturbance by rabbits may supply suitable conditions on some sites without the need for further management, as may disturbance and trampling by informal recreation.

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DRYMUS PILICORNIS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Drymus pilicornis (Mulsant)

Identification Southwood & Leston (1959).

Distribution South-east England. There are records for Derbyshire, Northamptonshire, Cambridgeshire, Oxfordshire, Buckinghamshire, Kent, Berkshire, Surrey, Sussex, Dorset, and Gloucestershire.

Habitat and ecology Confirmed captures have chiefly been from moss amongst grass on calcareous grassland, but it is possible that it may also occur in similar circumstances on other substrates. It would seem to be particularly associated with dense moss at the margins of scrub. There is one generation per year. The adults overwinter and mate in late May or June. The new generation matures in August. The bug is probably a seed-feeder, since this is the usual feeding habit of the subfamily, but no specific plant associations appear to have been recorded.

Status Apparently very local. Populations appear usually to be rather sparse, and given that the species needs to be carefully searched for, it may be rather under-recorded.

Threats Improvement of calcareous grasslands, and their destruction for development or conversion to arable; neglect of chalk grassland, particularly absence of grazing, leading to dominance of scrub and rank vegetation. *D. pilicornis* may be more tolerant of such changes than many other ground-dwelling grassland species, since it seems able to survive in (and may prefer) tall grassland, but eventually the vegetation structure will become unsuitable. Overgrazing and excessive scrub clearance may be equally dangerous, in bringing about loss of taller grassland with its accompanying moss layer.

Conservation Calcareous grasslands should be managed so as to provide a mosaic of different vegetation heights in close proximity. Moderate grazing is probably the best way of achieving this. Rabbit grazing is particularly effective in maintaining a small-scale mosaic of long and short vegetation and disturbed ground. Rabbit populations should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter and burrowing. Stock grazing will also provide a suitable structure. It may be best if stock is excluded in the summer months, but this is unlikely to be critical if stocking levels are low. Rotational grazing, whereby individual plots within a site are hard-grazed and then left ungrazed for several years, may be a viable alternative. Where grazing is not possible a cutting cycle may be used instead. If a site supports scrub, a reasonable amount should always be retained. Any scrub clearance which is undertaken should leave a reasonable proportion of the scrub-grassland interface untouched in any one year.

References Anon. (1905), Bedwell, E.C. (1938), Butler, E.A. (1923a), Champion, G.C. (1886), China, W.E. (1939a), Collins, J. (1911), Fowler, W.W. (1906), Groves, E.W. (1965), Groves, E.W. (1986), Massee, A.M. (1955a), Massee, A.M. (1962d), Morris, M.G. (1975b), Morris, M.G. (1979), Ratcliffe, D.A. (Ed) (1977), Saunders, E. (1892a), Saunders, E. (1902a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Tottenham, H.R. (1908).

DRYMUS PILIPES

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Drymus pilipes Fieber

Identification Southwood & Leston (1959).

Distribution Southern England, chiefly south-eastern. There are records from Oxfordshire, Kent, Surrey, Berkshire, Dorset and Devon. It is otherwise a chiefly southern European species.

Habitat and ecology The commonest recorded habitat is chalk downland, where it is found in moss growing amongst grass or stones. It has also been recorded from a heath, and there is a record of it from a relatively wet area at the margin of a bog. Though always found amongst low vegetation, it seems tolerant of a wide range of vegetation structures, having been found amongst fairly sparse vegetation on a disused arable field and in thick moss amongst coarse grasses. It would seem to be particularly associated with thick moss at the margins of scrub. It overwinters as an adult. Most records have been made in August or September. It is probably a seed-feeder, since this is the usual feeding habit of the subfamily, but no specific plant associations have been identified.

Status Rare. It has been more frequently recorded from Surrey than from any other county, but there appears to be no record from here since 1920. It was last recorded in Oxfordshire in 1963. There are recent records for Kent. It is difficult to know to what extent the species is likely to be under-recorded. It appears to be rather sparsely distributed even at known sites, and has only rather ill-defined habitat requirements. It may therefore require much careful searching and be readily overlooked.

Threats Loss of chalk grassland by improvement or by destruction for development or conversion to arable; lack of management of chalk grassland leading to dominance by coarse grasses and scrub invasion. The bug may be more tolerant of such changes than many other ground-dwelling grassland species, since it occurs in (and may prefer) thick moss in coarse grass, but if left unchecked the habitat would eventually become unsuitable. Overgrazing and excessive scrub clearance may also be threatening, resulting in the loss of taller grassland with a good moss layer. Damage to, and destruction of, heathland may be less important given the infrequency with which the bug is recorded from this habitat.

Conservation Grassland should be managed to maintain a varied structure, including some tall grassland with a good moss layer and short sparse vegetation with bare ground, preferably in close proximity. Moderate grazing is the best management to achieve such a structure. Rabbit grazing is particularly effective in maintaining a small-scale mosaic of long and short vegetation and disturbed ground. Rabbit populations should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter and burrowing. Stock grazing will also produce a suitable structure. It may be best if stock is excluded in the summer

months, but this is unlikely to be critical if stocking densities are low. Rotational grazing, whereby individual plots within a site are hard-grazed and then left ungrazed for several years, may be a viable alternative. The disadvantage is that in order for such management to be successful, the insect must be able to colonise the newly available areas of suitable habitat. It may well be able to do so, particularly as the distances involved are likely to be small, but the mobility of *D. pilipes* is not known, and lack of colonising ability may be one reason for its rarity. Where grazing is not feasible, a cycle of cutting may be used as an alternative. If scrub is present, a reasonable amount should be retained. If scrub clearance is undertaken, a proportion of the scrub-grassland interface should be left undisturbed.

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DRYMUS PUMILIO

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Drymus pumilio Puton

Identification Southwood & Leston (1959).

Distribution Southern England and Wales. There are records from Huntingdonshire, Oxfordshire, Buckinghamshire, Kent, Sussex, Hampshire (including the Isle of Wight), Dorset and Monmouthshire. It is apparently uncommon elsewhere in Europe, with scattered records from countries in the west.

Habitat and ecology Most commonly found on calcareous substrates, particularly chalk, but also recorded from sites on sand. Where the microhabitat has been noted, it seems usually to be fairly thick moss, growing amongst grasses and other vegetation. On at least two occasions it has been found in areas with a large amount of perforate St. John's wort *Hypericum perforatum*, but this may be no more than coincidence. Several records come from areas close to trees and scrub, perhaps because partial shade in such situations encourages the growth of a good moss layer. The bug appears not to occur in very shady conditions, however. Colonies seem usually to occupy only a small area, though the bugs may be quite frequent within a limited radius. Woodroffe, in 1959, located a colony occupying only "a couple of square yards" in a large area of apparently uniform habitat. The biology of the species is poorly known. It overwinters as an adult, and has been recorded from a grass tussock in March. Adults have been recorded in the spring, and from August onwards. Nymphs have been found in mid-August. The bugs are probably seed-feeders, since this is the usual food of members of the subfamily.

Status Very local, but almost certainly under-recorded. The extreme localisation of the colonies of the bug, and the absence of any visual clues as to their likely whereabouts in an area of uniform habitat, coupled with the time taken to thoroughly search an extensive area of fairly thick moss and other vegetation, make it liable to be overlooked. The recorded localities are widely scattered, and rather varied in character. *D. pumilio* is included in Red Data Book category 3 (Rare) in Shirt (1987), but a reduction in status to Notable would better reflect what is known of the distribution and ecology of the species.

Threats Loss of areas of calcareous vegetation through improvement, destruction for development or conversion to arable; lack of management of chalk grassland leading to excessive scrub invasion and dominance by coarse grasses; overgrazing; excessive clearance of scrub. In view of this bug's tolerance of, or preference for, mossy vegetation with some shade, neglect of calcareous grassland may be a less serious threat in the short term than for many other species of this habitat. In the long term uncontrolled succession will render sites unsuitable. Overgrazing may be as damaging as undergrazing, and its effects are likely to be more rapidly felt.

Conservation Chalk grassland should be managed to maintain a mosaic of vegetation height and structure, which should include deep mossy vegetation and some scrub. Light grazing is probably the best way to achieve this, and will create a particularly suitable structure if part or all of the grazing is undertaken by rabbits. Rabbit populations should be encouraged where possible, though excessive populations are likely to be destructive of more mossy areas. Where stock is grazed, it may be advantageous to exclude it from the site during the summer

months, unless the stocking density is very low. Where there are areas of partial scrub cover sheltering relatively damp and mossy vegetation, such as may occur particularly towards the bottom of slopes, some at least should be retained; dense scrub cover giving rise to very shady conditions, even when moss continues to grow beneath the bushes, is unlikely to be suitable. It is best if such partly sheltered areas are more or less stable in position, and if grazing or other processes are not sufficient to hold the situation stable, periodic clearance of invading scrub may be necessary. Much the same remarks apply to woodland margins where these abut onto calcareous grassland; partial shade may be beneficial, but extensive invasion of woody species should be avoided. Tree planting to extend woodland into such marginal areas should be avoided. Conditions suitable for the bug may be particularly likely to occur after clearance of partly shaded sites (for example, by scrub clearance or localised woodland clearance). Where temporary open conditions are created and tend to a tall herb and moss community in later years, this should be viewed as a positive feature of the site, and thought should be given to maintaining such conditions. The requirements of the species on non-calcareous sites are too poorly known to make specific recommendations possible.

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EMBLETHIS VERBASCI

RARE

Order HEMIPTERA

Family LYGAEIDAE

Emblethis verbasci (Fabricius)

Identification Southwood & Leston (1959).

Distribution Generally distributed in the Isles of Scilly (recorded from St Mary's, Tresco, Samson, St Agnes, St Martin's, Bryher and Tean); otherwise confined in Britain to Whitesand Bay (Sennen Cove), Cornwall, and Sandwich Bay, Kent. It is widely distributed in Europe, extends into Asia as far as Mongolia and Tibet, and also occurs in North Africa.

Habitat and ecology Coastal dunes and other sandy habitats near the coast. Its habitats usually have both moderate vegetation and bare ground, but it does not otherwise seem particularly restricted in its requirements. It has been found amongst marram on relatively unstable sand, amongst mixed shore vegetation including storksbill *Erodium* and spurge *Euphorbia*, in sparse grassland on fairly stable sand, and amongst *Erodium* in bulb fields in the Scillies. There is one generation per year. Overwintered adults die by mid-July, and the new generation matures from mid-August onwards. All stages are ground-dwelling and run actively in warm weather, particularly when disturbed. They are seed-feeders, but the plant species normally utilised in Britain are not known.

Status Well-established in the Isles of Scilly, where populations are probably stable. It is scarcer at its two mainland sites, but this seems always to have been the case, and there is no evidence of decline. The mainland populations must be considered vulnerable given their isolation and small size.

Threats On the mainland, recreational pressures and developments associated with recreation. The dunes at Sandwich Bay have been extensively developed for golfing, but the bug has so far survived these changes. There is considerable public pressure at Sandwich and to a lesser extent at Whitesand Bay, leading to erosion of dune vegetation. On the Scillies, recreational pressures may be considered a potential threat, but are a relatively minor consideration at present because of lower visitor pressure than on the mainland and the widespread distribution of the bug. Increasing use of herbicides in bulb fields threatens populations in cultivated fields, but these may always have been transitory. Absence of stock from previously grazed parts of the islands may be encouraging the growth of coarse vegetation at the expense of sparser vegetation on sandy ground suitable for the bug.

Conservation Sandwich Bay is an SSSI. Areas of erosion at Sennen Cove have been fenced for re-instatement. On the Isles of Scilly there is control over visitor numbers, and it is important that this is maintained. Significant increase in coastal scrub, bramble, or dense bracken should be prevented where possible.

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EREMOCORIS ABIETIS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Eremocoris abietis (Linnaeus)

Identification Woodroffe (1962).

Distribution Most records are from the eastern Highlands of Scotland. There are Scottish records from Ross-shire, Aberdeenshire, Inverness-shire, Perthshire and Sutherland. There are also two surprising records from Blue Bell Hill and Boxley, Kent. The species is very widely distributed in the Palearctic region.

Habitat and ecology In Scotland, recorded from several rather different habitats. It has been found in moss and litter beneath Scots pine *Pinus sylvestris*; in moss (including *Hypnum cupressiforme*) beneath juniper *Juniperus communis*; on juniper in Caledonian pine forest; on and under patches of bearberry *Arctostaphylos uva-ursi* on sandy heather-heath; amongst the moss *Rhacomitrium* on boulder scree, and in association with crowberry *Empetrum nigrum* on heathland on coastal blown sand. It seems clear that there are several alternative hosts, but it is interesting that at any one site it seems to be reasonably. The Kent records are from chalk downland. So far as is known, there is one generation per year, with the adults overwintering. Adults have been recorded between May and August, and nymphs in July and August.

Status This species is listed by Shirt (1987) in Red Data Book category 3 (Rare). However, since it can occur in quite a wide range of habitats, and is known to occur outside the eastern Highlands, it would seem likely that this is an overestimate of its rarity, and that its status should be reduced to Notable. It is reputed to be not uncommon in parts of the Highlands, but records are still rather few and the exact status and distribution of the species is not certain. There are no recent records from Kent, despite specific search. The isolation of these records, and the extremely atypical habitat, give cause for doubt that there was ever an established population here.

Threats Afforestation may be the chief threat in most of the species' British range. It has been recorded in commercial plantations of Scots pine, but it is unlikely to survive in dense, shaded and uniform plantations of alien conifers. Development and recreational pressures may be a danger to some populations, but are not known to be threatening overall. Lack of regeneration of Caledonian pine forest as a result of grazing by deer may also be damaging to forest populations, but given the bug's tolerance of open and treeless conditions elsewhere, this may not be a serious problem.

Conservation The species has been recorded from five National Nature Reserves in Scotland, and is also known from the recently acquired RSPB reserve at Abermethy. Regeneration of pine forest is being encouraged at several sites, and may prove beneficial to the insect. However, given wide range of habitats in which the bug has been found and the lack of detailed knowledge of factors controlling its distribution, detailed management prescriptions are not possible.

References Coulianos, C.-C. & Kugelberg, O. (1973), Dolling, W.R. (1983), Groves, E.W. (1965), Masee, A.M. (1952a), Philp, E.G. (1981), Shirt, D.B., ed. (1987), Stichel, W. (1955), Woodroffe, G.E. (1962d), Woodroffe, G.E. (1965c), Woodroffe, G.E. (1972b), Woodroffe, G.E. (1974).

EREMOCORIS FENESTRATUS**ENDANGERED**

Order HEMIPTERA

Family LYGAEIDAE

Eremocoris fenestratus (Herrich-Schaeffer)**Identification** Woodroffe (1962b).

Distribution Only certainly recorded from Surrey and Buckinghamshire. Old records from Scotland have been shown to refer to *E. abietis*, as do more recent records from Kent. There are also old records of *E. fenestratus* from Norfolk and Devon, but the specimens have not been traced. It is a southern European species, on the edge of its range in Britain.

Habitat and ecology Specifically associated with juniper *Juniperus communis* in Britain, the few known records being of specimens found in the litter beneath juniper bushes growing on chalk downs. It has been suggested that the bug requires large stands of juniper with deep litter. Adults overwinter, probably in litter beneath juniper bushes. It has been suggested that there may be two generations per year. All stages occur chiefly on the ground beneath and around juniper, but adults have occasionally been beaten from the bushes. It has been found in association with other conifers elsewhere in Europe.

Status Possibly extinct. The species appears never to have been common; Woodroffe, when reviewing the genus in Britain, was able to trace only 5 specimens in collections. The most recent finding was by Woodroffe at Coombe Hill, Buckinghamshire, in 1962. More recent surveys of the site have failed to re-locate the species. Juniper has declined considerably at the site, as elsewhere in southern Britain, and *E. fenestratus* may now have been lost.

Threats The chief threat in recent decades must have been the decline of juniper in the south of England: it is doubtful whether any site in the known British range of the bug now has a sufficient population of juniper to support it. An additional factor has been the loss of chalk downland through improvement, conversion to arable, or development.

Conservation Coombe Hill is an SSSI and a property of the National Trust; active management is under way to encourage the regeneration of juniper both here and at other sites in the south of England. No other specific conservation measures can be suggested in the absence of a known viable colony of the species.

References Bedwell, E.C. (1930), Butler, E.A. (1923a), Edwards, J. (1901), Groves, E.W. (1965), Masee, A.M. (1952a), Masee, A.M. (1955a), Saunders, E. (1892a), Saunders, E. (1908a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1962b), Woodroffe, G.E. (1962d).

EREMOCORIS PLEBEJUS**NOTABLE**

Order HEMIPTERA

Family LYGAEIDAE

Eremocoris plebejus (Fallen)**Identification** Woodroffe (1962).

Distribution This is chiefly a Scottish insect. There are records from Aberdeenshire, Inverness-shire, Kirkcudbrightshire, Morayshire and Perthshire, with the bulk of these records coming from the eastern Highlands. There are also records from Cambridgeshire, Kent, Hampshire and Glamorgan. The identity of the Kent and Cambridgeshire specimens was confirmed by Woodroffe (1962). The distribution abroad extends from northern Scandinavia to Spain, southern Russia and Turkey.

Habitat and ecology In the Scottish Highlands, *E. plebejus* is found in pine litter in Caledonian pine forest, and under stones among moorland plants. It has been most frequently recorded from woodland habitats, and here it occurs in moss (*Hypnum cupressiforme* has been recorded) and amongst masses of dry needles intermixed with

stems of heather or other plants. The habitat preferences of the southern specimens are less obvious; the Kent specimens were taken "in moss under tall fir trees . . . one mile from the coast"; the Cambridgeshire record is from Wicken Fen. Adults have been recorded in Britain in all months from April to October, and both large and small nymphs have been found in August. It is probably usual for the adult to overwinter, but a partial second generation has been recorded on the continent, overwintering as nymphs and maturing in the following spring.

Status Shirt (1987) lists this species in Red Data Book category 3 (Rare). However, as there appear to be at least scattered records outside the eastern Highlands, and it has been recorded from open habitats as well as from Caledonian pine forest, this probably overestimates its rarity. It is perhaps not uncommon in some parts of the eastern Scottish Highlands; records are still relatively few, however, and it is difficult to be sure of its exact status and distribution in Scotland. In southern England, it has seemingly always been extremely rare and local, and it is now some years since it has been recorded.

Threats Loss of Caledonian pine forest through active destruction and lack of regeneration is probably the chief threat. In more open habitats afforestation and perhaps also heavy recreational use and developments associated with recreation may prove threatening, but the status of the bug itself in such habitats at present remains far from clear. There are records of the species from commercial plantations of Scots pine, *Pinus sylvestris*, but other conifer species are not likely to be suitable, and very dense plantings will almost certainly be too densely shaded. No threats to the southern populations can be identified in the absence of more definite information on the ecology of the species; the Kent population appears to have been lost, but the reasons are not known.

Conservation The species occurs in the National Nature Reserves of Glen Tanar, Cairngorms, Kirkconnell Flow, and probably also Craigellachie, and in the RSPB reserve at Abernethy, which is also a SSSI. Regeneration of pine forest is being encouraged at several of these sites, and at others in the Highlands, which should benefit the bug. The status of the species in more open habitats needs to be clarified, and further work is also needed to establish the status of the species in the southern parts of its range.

References Butler, E.A. (1923a), Coulianos, C.-C. & Kugelberg, O. (1973), Hallett, H.M. (1936), Kenward, H.K. (1970), Kenward, H.K. (1972), Masee, A.M. (1953c), Masee, A.M. (1955a), Masee, A.M. (1962d), Norman, G. (1880), Pickard-Cambridge, A.W. (1920), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1962d), Woodroffe, G.E. (1968b), Woodroffe, G.E. (1972c).

GRAPTOPELTUS LYNCEUS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Graptopeltus lynceus (Fabricius)

Identification Southwood & Leston (1959).

Distribution Southern England, particularly the south-east. There are records from Norfolk, Suffolk, Oxfordshire, Buckinghamshire, Essex, Kent, Surrey, Sussex, Berkshire, Hampshire (including the Isle of Wight), Dorset, Somerset, Devon, Cornwall and Glamorgan. It is widely distributed in Europe, and also occurs in North Africa.

Habitat and ecology Associated with Boraginaceae, particularly viper's bugloss, *Echium vulgare*, but also recorded from forget-me-nots, *Myosotis* spp. There is a record of nymphs and adults being found on hound's-tongue, *Cynoglossum vulgare*. It is found in dry, open, sunny situations, most often on sand, less frequently on chalk. Habitats include coastal dunes, the East Anglian breckland, disused sand-pits, chalk-pits and clay-pits, rocky hillsides and stable shingle. The host plants tend to thrive best where there has been disturbance and where there is open ground, and the bug is likewise generally found in such circumstances. It can occur in numbers among quite sparse vegetation and on stunted host plants, but is unlikely to be found where there is continuous plant cover, even if large healthy host plants are present. Adults overwinter, and have been found in grass tussocks early in the year. They mate in May, and the new generation may mature in early July. There may be a second generation, at least in the south-west in some years, but observations in East Anglia suggest that a single generation with adults mostly maturing in August is probably usual. All stages are chiefly ground-dwelling, often hidden amongst the basal leaves of their hosts, but can be very active when disturbed,

and also in particularly warm weather. Both adults and nymphs climb the plants, probably to feed on flowers and developing seeds.

Status Local, and perhaps declined. It never seems to have been particularly common, but recent records appear to be lacking for several counties in which a number of localities were recorded in the past, and there is no county with more than a handful of recent sites.

Threats Loss of calcareous grassland through improvement or destruction for development or conversion to arable; lack of management, particularly grazing, on chalk grassland and in the breckland leading to loss of open conditions and bare ground and to scrub invasion and dominance by coarse grasses; loss of open conditions in chalk-pits and other artificial sites through natural succession; infilling of disused mineral workings, and their loss to development. Boraginaceae are generally resistant to rabbit grazing, and *Echium* particularly is often associated with areas of rabbit disturbance. The loss of rabbits in many sites as a result of myxomatosis may have been a major influence on the abundance and distribution of the species since the 1950s.

Conservation Calcareous grasslands, breckland, and disused mineral workings should be managed so as to leave at least part of their area in an early successional state, with bare, ideally occasionally disturbed ground supporting the host plants. Taller tussocky vegetation may be necessary for hibernation. The best management tool for creating a mosaic of different vegetation heights including bare and disturbed ground is rabbit-grazing, and rabbit populations should be encouraged wherever feasible, so long as populations do not become sufficiently large to remove all taller vegetation. In the absence of intense rabbit-grazing, stock grazing will assist in maintaining suitable conditions, but will be less efficient in the creation of bare and partly bare ground. Mowing and cutting of grassland is unlikely to be sufficient to create suitable conditions, unless coupled with periodic ground disturbance. Management of chalk-pits and other disused mineral workings may necessitate scrub clearance and mechanical disturbance of the ground in the absence of high rabbit populations. Grazing may be of critical importance on coastal dunes. Rabbit grazing may be sufficient, but stock grazing should be introduced or maintained where possible.

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HENESTARIS HALOPHILUS

VULNERABLE

Order HEMIPTERA

Family LYGAEIDAE

Henestaris halophilus (Burmeister)

Identification Southwood & Leston (1959).

Distribution Most records are from the north Kent coast between Gravesend and Herne Bay, including the Isle of Sheppey. It has also been taken at St Osyth, Essex. There is a single old record from Whitesand Bay in East Cornwall, near Plymouth, which requires confirmation. Elsewhere it is known from southern Europe to the southern USSR and Turkestan, and from North Africa.

Habitat and ecology Associated with sea purslane, *Halimione portaculoides*, on saltmarshes. It seemingly prefers the upper levels of the marshes, especially where somewhat overgrown. Populations may often be rather small, and the bug may be difficult to find, but it has occasionally been found in abundance. There is one generation per year, the adults overwintering; the hibernation site does not appear to have been recorded. Eggs are laid on plant stems, and nymphs have been found in July and August. Nymphs are submerged at some high tides, but the adults are intolerant of submergence, and climb plant stems to remain above water level, or even float freely

on the water surface. Otherwise, adults and nymphs are usually ground-dwelling, and are cryptically coloured against sandy mud.

Status Extremely local, perhaps much declined, and confined to small areas of vulnerable habitat. It seems to have occurred only in small numbers, and to have been rather difficult to find, in recent years. There are past records of it occurring in numbers; A.M.Massee took it commonly in the 1950s and 1960s. It seems able to survive on quite small relict sites, but the long-term viability of such colonies is uncertain. It is possible, given the difficulty often experienced in finding the bug even at known sites, that further colonies remain unrecognised.

Threats Natural erosion of saltmarshes, reclamation, construction of coastal defences, recreational pressures, and possibly pollution. The stretch of coast which comprises the known recent range of the species in Britain has been subject to considerable pressures for a number of years, and the area of saltmarsh available has declined considerably in the last century. The expansion of the north Kent coastal towns has led to direct destruction of coastal habitats through development close to the shore and the construction of sea defences, and increased recreational pressure is damaging remaining coastal habitats. The hibernation site of the bug does not appear to have been recorded. In view of the aversion of the adult to submersion in summer, it may be that it leaves the saltmarsh for the winter months to hibernate in grass tussocks or other terrestrial situation. If so, the presence of a gradation from saltmarsh into semi-natural terrestrial habitat may be important, and saltmarshes whose upper limits are abruptly defined by a sea wall or other inhospitable habitat may be unsuitable. Further investigation of this possibility is needed.

Conservation The bug occurs on the Swale NNR. All other recent sites fall within the Swale Estuary SSSI. Any saltmarsh within this area should be regarded as a potential site for the bug. It has been recorded from quite small remnant saltmarshes, and the absence of previous records or failure to locate the species in the course of a survey is no proof of its absence. The upper levels of saltmarsh should ideally grade into grassland or other semi-natural habitat, rather than ending abruptly, since such terrestrial habitats may be important for overwintering. Further searches for the species should be made elsewhere on southern coasts.

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HETEROGASTER ARTEMISIAE

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Heterogaster artemisiae Schilling

Identification Southwood & Leston (1959).

Distribution Chiefly southern England. Recorded from Oxfordshire, Surrey, Hampshire (including the Isle of Wight), Dorset, Somerset, Cornwall, Cumbria and Glamorgan. It is recorded from Ireland, and is otherwise chiefly a southern species in Europe, and also occurs in North Africa.

Habitat and ecology Associated with thyme *Thymus drucei*, on coastal dunes and on chalk. It has been taken on chalk downland and on cliff-tops, and seems to show a preference for areas with broken or partly bare ground or scree, or the edges of tracks, where there are large clumps of thyme over bare ground or stones. Thyme growing in turf seems to be unsuitable. There is one generation per year, the adults overwintering. Eggs are laid in clumps on the host plant in June, and are covered with a thick secretion. Overwintered adults survive until the end of June or early July, and new adults mature in late August or early September.

Status Very local, but possibly under-recorded. The recent discovery of the species in Cumbria raises the possibility of its occurrence elsewhere on the west coast. Colonies seem to be of small size and could be overlooked.

Threats Natural succession may lead to loss of open conditions, particularly in old quarry sites and other artificial habitats in chalk downland. Some degree of recreational pressure may be beneficial, since large thyme plants overhanging tracks can provide suitable conditions for the bug; however, pressure leading to extensive trampling of vegetation or great disturbance of partly vegetated ground and slopes will be damaging. Cessation of stock grazing and reduction in rabbit grazing as a result of myxomatosis may have been damaging through reduction of disturbance and loss of open conditions.

Conservation Partly bare, disturbed or unstable ground with clumps of thyme should be maintained. In some sites, particularly those in coastal situations, such conditions may occur without the need for active management. Inland sites are more likely to need management. In quarries and other artificial habitats, scrub clearance may be needed to maintain open conditions, and in very old and neglected sites substrate disturbance or turf stripping may be advisable. In such sites, and in grassland and established dunes, light recreational pressure leading to the formation of stable tracks with overhanging vegetation will be advantageous. Disturbance by rabbits is likely to be beneficial, and rabbit populations should be maintained or encouraged where feasible. Where grazing stock is introduced to a site, stocking density should be low enough to ensure survival of well-developed thyme clumps.

References Brown, J.M. (1931), Butler, E.A. (1905), Butler, E.A. (1923a), Edmonds, T. (1915), Groves, E.W. (1965), Groves, E.W. (1986), Jennings, F.B. (1908), Jones, H.P. (1928), Masee, A.M. (1955a), Parsons, M.S. (1987b), Saunders, E. (1892a), Saunders, E. (1902a), Scudder, G.G.E. (1955), Scudder, G.G.E. (1957c), Shaw, H.K.A. (1956), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Thomas, D.C. (1955b), Woodroffe, G.E. (1957c), Woodroffe, G.E. (1964b).

ISCHNODEMUS QUADRATUS

ENDANGERED

Order HEMIPTERA

Family LYGAEIDAE

Ischnodemus quadratus Fieber

Identification Southwood & Leston (1959).

Distribution In Britain, only known from Folkestone Warren, Kent. Sporadic records from here date back about a century, the most recent being a 1974 record from Shakespeare Cliff. It is otherwise largely confined to Mediterranean countries.

Habitat and ecology The habitat at Folkestone is short dry chalk grassland at the foot of cliffs. In France it has been associated particularly with dunes. The food is grasses. It is not clear whether there are any particular grass species are preferred. It has been found on marram *Ammophila arenaria* in France, but this cannot be the host at Folkestone. So far as is known, there is one generation per year, the adults overwintering. The related *I. sabuleti* hibernates in hollow stems, leaf sheaths and tussocks. Eggs are inserted into grass stems in small groups. In Britain, the bug probably remains close to the ground for much of the time, but has been taken by sweeping on very hot days. Both long-winged and short-winged forms occur, but the latter are much the more frequent.

Status Very rare: possibly extinct. The Folkestone colony was first recorded about a century ago, and there are sporadic records from succeeding decades, but the bug would seem to have declined at the site in recent decades. The colony was probably not given the attention it deserved for much of this time because the species was not recognised as fully distinct from the related *I. sabuleti* until the 1950s. The single record of the species at Shakespeare Cliff in 1974 points to the possibility of the continued survival of the bug along this stretch of coast, but the extent of any surviving colonies is probably small.

Threats Loss of suitable short sheltered grassland as a result of rabbit decline after myxomatosis may have adversely affected the bug. However, since it is a Mediterranean species which seems always to have had a rather precarious hold in Britain, it may be that its apparent decline has occurred at least partly for climatic reasons. The construction of the Channel Tunnel will have major effects on the south Kent coast, including Shakespeare Cliff, and the survival of any colonies of the bug which may occur in the affected areas must be in doubt.

Conservation Further survey is needed to determine the status and distribution of the species in Britain. Where a colony is found, short grassland with high insolation should be maintained. Scrub clearance should be undertaken if necessary. Rabbit grazing may be important in maintaining suitable conditions, and rabbit populations should be maintained or encouraged where possible.

References Scudder, G.G.E. (1957a), Southwood, T.R.E. & Leston, D. (1959), Stubbs, A.E. (1976).

LASIOSOMUS ENERVIS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Lasiosomus enervis (Herrich-Schaeffer)

Identification Southwood & Leston (1959).

Distribution Southern England. Recorded from Suffolk, Kent, Sussex, Surrey, Berkshire, Bedfordshire, Oxfordshire, Hampshire (including the Isle of Wight), Dorset, and Devon. It is known from Ireland, and is otherwise chiefly a species of central and southern Europe.

Habitat and ecology The ecology of this species is rather obscure. It has been found amongst leaf litter in fairly open woods, amongst dry rush litter bordering drains in a recent conifer plantation, on a new road embankment in an old coppice woodland area, amongst grass and moss on chalk downs and at the foot of chalk cliffs, in a grass tussock bordering a sand quarry, on a coastal dune, and from a heath. Insofar as it is possible to find common factors in this diversity of habitats, it would appear that they are usually on well-drained substrates in sheltered or sunny spots, but in a fairly moist microclimate. It is usually amongst dense litter, moss, or grass tussocks, and has also been found under the shelter of railway sleepers. There appears to be one generation per year, the adults overwintering. Hibernating adults have been found in grass tussocks in December. It can be active quite early in the year, and there are several records for March and April. Mating has been observed in August and September. It is a seed-feeder, and would appear to be polyphagous. Seeds of self-heal *Prunella vulgaris*, black medick *Medicago lupulina* and grasses have been recorded as food.

Status Very local. The often small number of individuals recorded from a site, and the rather uncertain habitat requirements of the species, probably mean that it is under-recorded.

Threats The presence of the bug on any given site may be dependent on the exact levels of shelter and shade and the nature and depth of the vegetation. Any major changes in such factors must therefore be regarded as threatening. In woodland sites such changes include replacement of varied broadleaved woodland by uniform shady plantations of conifers or broadleaves; the planting up or neglect of woodland clearings; lack of ride management, leading to closing of the canopy and the shading out of ride vegetation. It is possible that neglect of coppicing in woodland previously managed in that way may have been detrimental. There is no evidence of any strong association between *L. enervis* and coppice woodland, but a number of its sites have held coppice in the past, and its appearance in numbers in a Kent site shortly after the establishment of a plantation of conifers suggests that the species can take advantage of temporarily advantageous conditions. In non-woodland sites, threats are less easy to identify, beyond such large-scale changes as destruction of heaths and chalk grassland for agricultural improvement or development. Loss of varied structure, including some long vegetation with a good moss layer, though a rather vague threat, has probably otherwise been the most important. Such a change may be brought about by natural succession on sites of artificial origin and by neglect, particularly loss of grazing, on heathland and grassland sites resulting in scrub invasion and dominance by tall coarse vegetation.

Conservation Rides and clearings in woodlands should be kept broad, open and sunny. Rideside coppicing and/or the creation of small rideside clearings may be advantageous. Open-structured, well lit woodland should be maintained, particularly where there is a fairly dry litter layer or thick vegetation. On grassland sites, management should aim to maintain a mosaic of vegetation of varied heights, including some which is reasonably long and covers a good moss layer. This is best achieved by moderate grazing. Rotational grazing or cutting may be used as alternatives. Coastal sites are likely to need no active conservation measures beyond site protection.

References Anon. (1967), Billups, T.R. (1881), Butler, E.A. (1923a), Campbell, J.M. (1987), Champion, G.C. (1872), Chitty, A.J. (1902a), Collett, H.R.P. (1922), Douglas, J.W. & Scott, J. (1871a), Edmonds, T. (1915), Groves, E.W. (1965), Jones, H.P. (1928), Masee, A.M. (1950c), Masee, A.M. (1951a), Masee, A.M. (1955a), Masee, A.M. (1962d), Masee, A.M. (1966b), Masee, A.M. (1966d), Morley, C. (1905), Morley, C. (1911), Nau, B.S. (1985), Saunders, E. (1892a), Saunders, E. (1902a), Saunders, E. (1908a), Side, K.C. (1962a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1953b).

MACROPLAX PREYSSLERI

RARE

Order HEMIPTERA

Family LYGAEIDAE

Macroplox preyssleri (Fieber)

Identification Dolling (1969); Stichel (1955).

Distribution So far recorded from only four sites in Britain: Brean Down, Somerset; Dolebury Warren, Somerset (modern Avon); Rodborough Common and Daneway Banks, Gloucestershire, and Horton, Gower Peninsula, Glamorgan. It is widely distributed in Europe.

Habitat and ecology Associated with rockrose, *Helianthemum* spp. The first British record was made from white rockrose, *H. appeninum*, but the others have been from common rockrose, *H. chamaecistus*, which is presumably the more normal host in Britain. The records so far made are from calcareous cliffs and calcareous grassland on steep hillsides where the vegetation is short and where there is some bare ground. It seems likely that the bug will be confined to hot and dry places. The ecology and life history of the species in Britain is largely unknown at present. Adults have been found in the spring, suggesting that it overwinters in this state.

Status This species is included in Red Data Book category 1 (Endangered) in Shirt (1987), but this overstates the rarity and degree of threat. It was not reported in Britain until 1969, and there is still much scope for further recording of the species. The known localities are quite widely scattered, none are under immediate threat, and in two cases the insect occurs on cliffs and slopes which are both relatively inaccessible and need no active management for their maintenance. Clearly, however, it is a very local insect. The status RDB3 (Rare) better reflects current knowledge of its status.

Threats There is considerable public pressure at Brean Down and on parts of the south Gower coast, but the habitat of *M. preyssleri* at the sites, on cliff faces, does not appear to be under any immediate threat. Neither of the other two sites is at present directly threatened. On inland grassland sites in general, the chief threat to any further colonies is likely to be from lack of adequate management, particularly lack of grazing through cessation of stock grazing and loss of rabbits to myxomatosis. In view of the apparent requirement of the insect for high insolation and a warm microclimate, suitable conditions could be rapidly lost in the absence of suitable management. Very heavy grazing could prove equally damaging, however, by reducing the foodplant.

Conservation Any hot dry calcareous slopes supporting good populations of *Helianthemum* in the south-west England and South Wales should, in the present state of knowledge of the bug, be viewed as potential sites for the species. The vegetation on such sites should include some areas of short open-structured vegetation with bare ground. On coastal cliffs such conditions are likely to occur without the need for active management, and the same may be true of some very steep slopes elsewhere. Elsewhere, suitable conditions are best maintained by grazing. Rabbit grazing is effective in producing good vegetation structure. Rabbit populations should be maintained or encouraged wherever possible. In some cases rabbits alone may be able to maintain suitable conditions, but in general stock grazing will also be needed. The Gloucestershire sites are moderately grazed by cattle, creating a rough broken turf. Sheep grazing may create a less suitable closed sward. Rotational grazing or cutting is less likely to be satisfactory, and would be impractical on very steep slopes.

References Askew, R.R. (1985), Dolling, W.R. (1971), Shirt, D.B., ed. (1987), Stichel, W. (1955).

Megalonotus antennatus (Schilling)

Identification Southwood & Leston (1959).

Distribution A southern, and particularly south-eastern, species, recorded from Huntingdonshire, Northamptonshire, Buckinghamshire, Essex, Kent, Surrey, Sussex, Hampshire, Wiltshire, Dorset, Devon and Cornwall. It is widely distributed in Europe.

Habitat and ecology Recorded from woodland rides and clearings, from limestone quarries, disused clay workings, dry grassland near the coast and on earth banks. It can occur in moss, amongst grass or other low vegetation, and amongst stones or litter on partly bare ground. It is not easy to find common factors linking all these habitats, and different collectors seem to have had different conceptions of the ideal places to search for the species. It would seem to be fairly indifferent to substrate type. Southwood and Leston (1959) suggest a preference for sandy or clay soils, but although it is true that it is infrequent on the chalk in the south of England, there are records from downland, and in the north of its range it is recorded from limestone quarries. There are records from a number of coastal sites, but it is generally absent from dunes. There is one generation per year, the adults hibernating. They have been found in the winter in moss in woodland clearings and in grass tussocks. They mate in May and June. All or most of the new generation mature in August. The bug is ground-dwelling in all stages, but has occasionally been recorded by sweeping, so must climb vegetation at times. The food is unknown; members of the subfamily feed chiefly on seeds, but no specific plant associations have been suggested for *M. antennatus*. The wide range of habitats from which it has been recorded suggest that it is likely to be polyphagous. The bugs are usually short-winged and unable to fly, but occasional fully-winged individuals are recorded. Its occurrence in limestone quarries and clay pits might suggest a good colonising ability, but in all investigated cases the mineral workings in question are bordered by woodland from which the species may have colonised.

Status Local. The species is likely to be rather under-recorded. Its habitat requirements are rather vague, and it is hence a difficult animal for which to make specific search. It is unlikely, however, that it is very widely overlooked, and the infrequency with which it is recorded indicates a genuinely very local species.

Threats The habitat range is so great that threats must be correspondingly varied. In woodland, the principal threats are clearance, conversion of ancient broadleaved woodland to plantation of conifers, or of densely-planted uniformly-aged broadleaved species, and neglect of woodland rides and clearings, leading to loss of open conditions and the shading out of ride flora. In sites on disused mineral workings, the chief threats are likely infilling, and loss of open conditions through natural succession leading to scrub invasion and dominance by coarse vegetation. Heavy recreational use on some sites might also prove damaging, but there is at present no evidence of such a problem at any of the known recent sites for the bug. Coastal sites may be threatened by development, and by the construction of sea defences. Grassland sites may be threatened by agricultural improvement and by neglect, particularly the absence of grazing, leading to scrub invasion and dominance by coarse grasses.

Conservation Woodland rides and clearings should be open and sunny and with a good range of vegetation heights. Rides should be broad and sheltered, and their structure may be enhanced by rideside coppicing or the creation of small ride-side clearings. Where cutting of rides is necessary, this should be done only in sections, or along one side of the ride, in any given year. Quarry and clay-pit sites should be managed to retain or develop a good range of successional stages, from largely bare ground with sparse colonisation to the early stages of scrub invasion. Light recreational use in such sites may in some cases assist in maintaining a varied habitat structure. Grassland sites should have a mosaic of different sward heights, from low vegetation with partly bare ground to tall grassland with a good moss layer and small quantities of scrub. Such a structure is best achieved by moderate grazing. Rabbit grazing is particularly effective at maintaining a varied structure, and rabbit populations should be maintained or encouraged where possible, for example by the retention of areas of scrub used for shelter and burrowing. Stock grazing should be introduced or maintained where possible. It may be best if stock is excluded during the summer months, but this is not likely to be critical at very low stocking density.

General grazing over the whole site is the preferred management, but rotational grazing or cutting may prove suitable.

References Bignell, G.C. (1906), Butler, E.A. (1889), Butler, E.A. (1905), Butler, E.A. (1909a), Butler, E.A. (1923a), Clark, J. (1906), Groves, E.W. (1965), Groves, E.W. (1986), Le Quesne, W.J. (1951b), Masee, A.M. (1951a), Masee, A.M. (1955a), Masee, A.M. (1962d), Morris, M.G. (1969), Russell, W.E. (1969a), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1902a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1933).

MEGALONOTUS DILATATUS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Megalonotus dilatatus (Herrich-Schaeffer)

Identification Southwood & Leston (1959).

Distribution Southern Britain. There are records for Cheshire, Norfolk, Suffolk, Bedfordshire, Gloucestershire, Oxfordshire, Buckinghamshire, Middlesex, Essex, Kent, Surrey, Sussex, Berkshire, Hampshire, Dorset, Somerset, Devon, Cornwall, Radnorshire and Glamorgan. There is a single nineteenth century record for Perthshire. It is widely distributed in central and southern Europe.

Habitat and ecology This is a ground-dwelling bug found on dry and well-drained soils. The majority of records are from sandy places, particularly inland heaths and sandy grassland but also coastal dunes. However, it also occurs on other soils, particularly if they are loosely-structured, and has been recorded from coastal shingle. It can be found in quite small pockets of suitable habitat, and frequently occurs in such places as the margins of tracks where bare ground is exposed, or small slopes where the instability of the soil maintains open conditions. It is often associated with a light covering of leaf litter or a crumbly soil, into which the bugs can burrow. It has been suggested that it is mainly nocturnal. There is one generation per year. Adults overwinter, laying eggs in the following May or June. The new generation mostly matures in August.

Status Local. This is a widely distributed and probably under-recorded species. It has been recorded from a rather broad range of habitats, and is able to form small populations in quite small areas where conditions are suitable. It is generally inconspicuous, and is able to hide effectively by burrowing amongst soil or litter.

Threats The chief causes of loss of the open, dry, semi-natural habitats favoured by this species in recent decades have been destruction for development or farming, and loss of open conditions through neglect and reduction in grazing pressures leading to dominance of coarse vegetation and scrub invasion. These remain the most serious threats.

Conservation Management of suitable sites for the species should aim to maintain a varied vegetation structure, including areas of bare ground with partial cover by plants or leaf litter. In large areas of open habitat light grazing is the preferred management. The maintenance of minor habitat features such as tracks margins and dry banks may be particularly important, and any overall management plan for a site should aim to retain such features.

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Order HEMIPTERA

Family LYGAEIDAE

Megalonotus praetextatus (Herrich-Schaeffer)**Identification** Southwood & Leston (1959).

Distribution A southern species, found especially in the coastal counties. Recorded from Yorkshire, Norfolk, Suffolk, Cambridgeshire, Essex, Kent, Surrey, Sussex, Oxfordshire, Berkshire, Somerset, Dorset, Devon, Cornwall, Glamorgan, Pembrokeshire and Carmarthen. It is widely distributed in southern and central Europe.

Habitat and ecology A ground-dwelling bug found on dry and well-drained substrates. Records have been made from sand, chalk and slaty soils. It has been found in quarries, on coastal cliffs, sand dunes, and inland sandy grassland and heaths. There is often a partial covering of bare sand or small loose stones among which the bugs may burrow or hide when disturbed or in bad weather. Vegetation is always sparse or short, and where there is little bare ground the bug is usually to be found amongst moss. It is probably restricted to particularly warm, sheltered and sunny places in Britain. It is partial to south-facing slopes of cliffs, quarries, etc., and is mainly coastal in much of its British range. In East Anglia it appears to be largely restricted to the climatically favourable area of the breckland. The bug overwinters as an adult, mating and ovipositing in May or early June. Eggs are laid singly, attached to grass stems or to mosses. One generation per year is probably usual, but in the south-west there may be two generations, at least in favourable years, since adults of the new generation have been found maturing in early July. Adults and nymphs are probably seed-feeders, since this is believed to be the usual food of the sub-family. Numbers of the bug have been found in close association with storks-bill *Erodium cicutarium*, which is almost certainly a host-plant. The bug has been found in places without *Erodium* so it cannot be the only host.

Status Very local. It is probably most frequent in the south-west, where it occurs both on dunes and on cliffs, but even here seems usually to form rather small and localised colonies, presumably in areas of particularly favourable microclimate. It is less frequent further east and north; its occurrence in Yorkshire rests on three records from the extreme south of the county, the most recent in 1948.

Threats The bug is dependent on sheltered sites with sparse or short vegetation on well-drained substrates: any factor which might destroy or adversely affect such sites within the known range of the species should be viewed as a potential threat. Coastal developments may be destructive in places, and inland sites such as quarries and sandpits may be vulnerable to infilling. Excessive visitor pressure may be locally damaging at coastal sites, particularly on sloping sites with scree at the tops and bottoms of cliffs, where relatively light pressure may lead to extensive substrate disturbance and loss of vegetation. Changes in vegetation structure resulting from natural succession or to reduction of grazing pressure, particularly as a result of reduction in rabbit populations through myxomatosis, may also be damaging. Successional changes are likely to be particularly important in artificial habitats such as quarries. Loss of rabbit grazing is likely to be most severe in inland sites, perhaps particularly in the East Anglian breckland. Since it seems often to occur in rather small and localised colonies it may be particularly vulnerable to relatively small-scale changes leading to local extinction. It is not clear how mobile the species is, or to how great an extent it is able to take advantage of new areas of suitable vegetation structure. It has clearly been able to colonise some relatively old disused mineral workings, but is not a usual component of recently disturbed ground or ruderal communities, even in the part of its range where it is commonest.

Conservation Cliff ledges and the more stable screes will in general need no active management, but should be protected from excessive disturbance by visitors. Sites of artificial origin, such as quarries, should be managed to retain as wide as possible a range of successional states, from bare ground to well-established scrub, so as to give a mosaic of conditions and to provide sheltered corners. Unless there is fairly intense grazing by rabbits this is likely to require at least periodic scrub clearance, and may also necessitate cutting of grassland and herb vegetation unless grazing stock can be managed in the site. Periodic disturbance of the substrate may be needed in some sites to maintain early successional stages. On inland grass and heath sites, management should aim to maintain a mosaic of vegetation structure and height, including some short, and ideally rather sparse, vegetation with some bare ground. Such a structure is best achieved by grazing, and the best structure is produced by rabbit-grazing. Rabbit populations should be encouraged on such sites, and also on coastal dunes and in disused mineral workings. Where rabbit populations are not adequate to maintain suitable vegetation structure, stock

grazing should be introduced or maintained. It may be best if stock is excluded during the summer months, but this is unlikely to be critical if stocking levels are very low. Rotational grazing is less likely to be suitable, since to be successful it requires that the bug is able to colonise newly suitable areas of habitat: it may well be able to do so, but the mobility of the bug is not known, and such colonisation cannot be guaranteed. A rotational cutting regime would suffer the same problem. Management of a part of a site on a short rotation might be suitable if grazing is impossible, but some degree of substrate disturbance may be needed to maintain early successional stages.

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MEGALONOTUS SABULICOLA

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Megalonotus sabulicola (Thomson)

Identification Woodroffe (1963).

Distribution Southern England, particularly the south-east. There are records from Norfolk, Suffolk, Kent, Sussex, Hampshire, Dorset, Devon, Cornwall and Somerset. Elsewhere it is largely a species of southern and central Europe.

Habitat and ecology A species of dry and well-drained situations; most confirmed records are on sand. The majority of known sites are coastal, but it also occurs in the East Anglian brecks, and there are records for inland sites in Kent. It is a ground-dwelling insect found amongst moss or low plants in areas of short or sparse vegetation. So far as is known, its life history is similar to that of its commoner relative, *M. chiragra*, from which it was reliably separated in Britain only in 1963. Adults overwinter, probably in long moss or grass tussocks. Eggs are laid singly, attached to plants stems or moss, in all members of the genus so far examined. Captures of the adults have been concentrated in the spring and autumn months, so there is probably a single generation per year. The members of the subfamily to which *M. sabulicola* belongs are believed to be largely seed-feeders, but no association between this bug and any particular plant species has been established.

Status This species is listed in Red Data Book category 3 (Rare) in Shirt (1987). However, this would seem to over-estimate its rarity. Records are quite widely scattered in the south of England, and the insect does not seem to be unduly restricted in its habitat requirements. Since *M. sabulicola* has only been certainly recognised as a full species in Britain since 1963, it may still be under-recorded. However, a number of past authors have listed *sabulicola* separately, either as a full species or as a named variety, and the records of these authors make it clear that it has always been relatively sparse and local. It is likely to be particularly under-recorded in East Anglia and the south-west. Removal of the species to the Notable category would more accurately reflect its status as currently known.

Threats Any threat to open sandy habitats with short or sparse vegetation within the known range of the species should be viewed as a potential threat. Coastal developments and excessive public pressure may be threatening on some coastal sites. Threat of destruction to inland sites is more likely to result from conversion of marginal land to agriculture or to forestry; extensive areas of suitable habitat have been lost to conifer plantations in East Anglia. Loss of suitable short or sparse vegetation through natural succession or as a result of reduction in grazing pressure following myxomatosis and loss of stock-grazing are likely to be particularly serious in inland sites, especially in the brecks, but may also affect coastal dune to some extent.

Conservation Management of known or likely sites should aim to maintain a wide range of vegetation structure, including some very short or sparse vegetation with some bare ground. On coastal dunes such conditions may

occur without active management, particularly if there is a good rabbit population. Stock grazing may be advantageous on larger dune systems. On inland sites grazing is the ideal method of achieving suitable vegetation structure. Rabbit grazing will provide an ideal small-scale mosaic of short and tall vegetation, and rabbit populations should be encouraged wherever possible. Where rabbit populations are inadequate to maintain suitable vegetation structure, introduction of grazing stock is desirable. It is probably best to exclude stock in the summer months, unless grazing pressure is very light. Though short or sparse vegetation is needed, overgrazing to the extent of removing all tall and tussocky vegetation is undesirable, not only because it renders conditions unsuitable for a wide range of other invertebrate species, but also because it may remove suitable hibernation sites. Where there has been neglect over a considerable time, and scrub and coarse vegetation are extensively dominant, drastic management measures involving large-scale scrub clearance, cutting of coarse grasses, and mechanical disturbance of the substrate may be necessary in selected parts of the site. If grazing is impossible, cutting alone may be used for management of grassland and heathland sites, but is less likely to produce satisfactory results. Success may be greater if cutting is combined with localised substrate disturbance.

References Appleton, D. (1984a), Butler, E.A. (1884), Butler, E.A. (1923a), Champion, G.C. (1886), Collett, H.R.P. (1935), Douglas, J.W. (1875a), Edwards, J. (1889), Edwards, J. (1901), Ellis, E.A. (1939), Foster, A.P. (1987a), Groves, E.W. (1965), Hall, C.G. (1890), Massee, A.M. (1962d), Shirt, D.B., ed. (1987), Southwood, T.R.E. (1963).

NYSIUS GRAMINICOLA

RARE

Order HEMIPTERA

Family LYGAEIDAE

Nysius graminicola

Identification Dolling (1985); Stichel (1955).

Distribution Recorded in Britain only from Studland Bay, Dorset. It is recorded in southern Europe from southern Germany to the Mediterranean, in North Africa, and east to Turkestan and Iran.

Habitat and ecology The British record is from heath on coastal dunes. This is a ground dwelling insect characteristic of dry, often sandy, places elsewhere in western Europe. Related species feed on seeds and developing fruits of low plants. The favoured hosts of *N. graminicola* are not known. Adults overwinter in mainland Europe.

Status Only a single male has been recorded in Britain. It was recently discovered at the time of preparation of the Insect Red Data Book (Shirt 1987), and the species was assigned the status of RDB3 (Rare). No further specimens have apparently been taken since, and there is as yet no proof that it is an established species in Britain.

Threats None known. Studland Bay is subject to considerable public pressure, but there is no reason to think that at current levels this would be unduly damaging to any population of *N. graminicola* which might occur there.

Conservation Studland Bay is a National Nature Reserve. No practical conservation measures can be suggested in the absence of a confirmed population. Further survey should be made at the site to see if a viable population exists, and if so its ecology should be investigated.

References Allen, A.A. (1984b), Dolling, W.R. (1985a), Shirt, D.B., ed. (1987), Stichel, W. (1955).

Nysius helveticus (Herrich-Schaeffer)

Identification Dolling (); Southwood & Leston (1959).

Distribution Southern England. There is a nineteenth century record from Kent, but the site no longer exists. It is now confined to the Greensand heaths of Surrey, Hampshire and Dorset. It is widely distributed in Europe, and extends east to Turkestan and Siberia.

Habitat and ecology Found on dry heathland, particularly in sheltered areas or on south-facing slopes. It is tolerant of quite tall plant growth, but does not usually occur where growth is dense enough to produce a deep litter layer or moss growth; heather is usually underlain at least in part by bare sand. The foodplant is heather, *Calluna vulgaris*, and this bug is one of the few which occurs in areas of heathland consisting only or mainly of this species. Adults and nymphs are largely ground-living, but adults climb the vegetation on hot days in August and September. Eggs are laid in late summer or autumn on flowers or leaves of heather, and development begins immediately. The majority of individuals overwinter as nymphs, but there may also be occasional overwintered adults.

Status Rare: always of very local distribution, and probably declined in recent years. It is unlikely to be greatly under-recorded, since its distribution is centred on a well-known area of the country, it is relatively easily recorded, and lives in a habitat well-worked by entomologists.

Threats Destruction of heathland through development and road-building; heavy recreational pressure, such as horse-riding and motor-cycle scrambling, where this leads to extensive damage of vegetation; uncontrolled fires; afforestation, and loss of suitable structure through lack of management. Reduction of rabbit grazing as a result of myxomatosis has led to extensive invasion by birch and pine on many heaths, and to large areas being dominated by uniformly tall heather growth with a deep damp litter layer, and often considerable moss growth, unsuitable for *N. helveticus*. Uncontrolled summer fires may be very destructive, but the bug has been recorded from stands of pure heather regenerating within a few years of such a fire, so is presumably capable of re-colonising such areas, so long as a viable population remains on the site. The most westerly known site, at Warmwell heath, Dorset, is threatened by quarrying.

Conservation There are recent records from the NNR at Hartland Moor, and from SSSIs at Chobham Common, Ash Vale and the New Forest. On known sites, a varied age structure of heather should be maintained, including some fairly young growth with bare ground beneath. The desired structure is best maintained by grazing, particularly rabbit grazing. Rabbit populations should be encouraged where possible. In the absence of sufficient rabbit population to maintain the required structure, stock grazing should be employed whenever feasible. Where no grazing is possible, management by cutting may be suitable, providing the cuttings are removed. A good population of *N. helveticus* has been found in the strip of managed vegetation beneath a power line on the Surrey heaths, managed by cutting on a long cycle and including incipient scrub. Here trampling beside a track, and the mechanical disturbance caused by the machinery used for cutting, assisted in maintaining a varied structure. Management by burning should be successful, provided it is implemented with care. Burning should be rotational, with only a fraction of a site being burnt in any one year. A single management compartment should include the whole of, for example, an area of open vegetation on a south-facing slope, even if the area is small.

References Butler, E.A. (1923a), Coulianos, C.-C. & Kugelberg, O. (1973), Groves, E.W. (1965), Groves, E.W. (1986), Masee, A.M. (1950a), Masee, A.M. (1955a), Masee, A.M. (1962d), Ryle, G.B. (1952), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1902a), Saunders, E. (1908a), Stichel, W. (1955).

Ortholomus punctipennis (Herrich-Schaeffer)

Identification Southwood & Leston (1959).

Distribution Southern and Eastern England. Recorded from Risby Warren, North Lincolnshire (modern Humberside); Brancaster, Norfolk; Icklingham/Tuddenham Heath, Suffolk; Sandwich Bay, Kent; near Matley, New Forest, Hampshire, and Studland Bay, Dorset. It is widely distributed in Europe, extends east to Mongolia, and also occurs in North Africa.

Habitat and ecology All British captures have been on sand. The typical habitat is very sparse vegetation, including short moss and lichens, on very dry sand in a hot sheltered position. It has also been found amongst ruderal plants in plough ruts in recent conifer plantation. There are records from coastal dunes, from the East Anglian brecklands, and from the breck-like habitats of the Lincolnshire coversands. Plants which have been found in association with the bug include wall pepper *Sedum acre*, mouse-ear hawkweed *Pilosella officinarum*, and various fine grasses. Spring cinquefoil *Potentilla tabernaemontani* has been suggested as a host-plant, but it seems likely that the association was in this case purely fortuitous. The life-history is poorly known. In Germany, at least some individuals overwinter as adults, development takes a little over two months, and there may be two generations per year. In Britain adults have been taken in late July and August. Search for larvae in mid-August proved negative, which may suggest that in Britain there is only a single generation annually.

Status Rare and very local. It would seem that even in localities where it is well-established it occurs only in rather small colonies of limited extent. By virtue of this extreme localisation and because it generally occurs in company with superficially rather similar *Nysius* spp., it may be overlooked in a number of additional sites, but since it has been recorded from only 6 sites since its discovery in 1937 it seems that it is certainly a considerable rarity. In view of its habitat preferences a decline in recent years might be expected. In fact, the sparseness of the records mask any such decline; it has been found recently (1986/7) in three out of the six sites, two of these being new localities. Its recent discovery at Sandwich Bay, one of the best-worked localities for Heteroptera in Britain, is surprising, and may represent a recent immigration or a non-established vagrant.

Threats The type of very sparse vegetation with lichen and moss growth amongst which *O. punctipennis* is usually found is becoming increasingly rare in Britain, largely as a result of loss of rabbit grazing through myxomatosis. Large areas of potentially suitable habitat have been lost through this cause in the East Anglian brecks and on coastal dunes. Intense grazing of this type may be essential to the survival of the bug; two of the three sites from which the bug has been recently recorded were maintained in suitable condition only by intense rabbit grazing. Continued loss and instability of rabbit populations through myxomatosis is probably the chief threat faced by the species in its known current sites. Excessive public pressure has resulted in serious degradation of the dunes at Brancaster, and this, perhaps coupled with reduction in rabbit grazing, may have resulted in the loss of the species from the site. There is also heavy public pressure at Studland and at Sandwich Bay. Large areas of the Lincolnshire coversands and of the brecks have been lost to agriculture and forestry, greatly reducing the area of potential habitat for this species. No current sites are known to be threatened by these factors at present, but they must be regarded as potential threats to undiscovered populations in suitable habitats.

Conservation Studland Bay and Tuddenham Heath are National Nature Reserves, though the recent Suffolk records are outside the NNR boundary. Only a single record is not within an SSSI. The site at Brancaster is a property of the National Trust, and current management includes the re-instatement of dunes damaged by erosion. Management of known or likely sites should aim to maintain a range of vegetation structure including some areas of very short and sparse vegetation, ideally with a thin moss/lichen community. Such a structure is most effectively produced by intense rabbit grazing, and rabbit populations should be encouraged on such sites wherever possible. It is not clear to what extent suitable structure could be produced by stock grazing alone. Where rabbit populations are not sufficient to maintain suitable conditions, stock should be introduced where possible, but stocking levels should be carefully adjusted so that suitable conditions are maintained without excessive substrate disturbance. Where suitable areas of sparse vegetation have been largely lost from a site, mechanical disturbance of the substrate may be needed to re-create early successional stages.

References China, W.E. (1938a), Foster, A.P. (1987a), Masee, A.M. (1955a), Russell, W.E. (1969b), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

PACHYBRACHIUS LURIDUS

RARE

Order HEMIPTERA

Family LYGAEIDAE

Pachybrachius luridus (Hahn)

Identification Southwood & Leston (1959).

Distribution Recorded in Britain from Hothfield Bog, Kent; Chobham Common, Surrey; the New Forest, Hampshire; Wareham Forest, Dorset, and Ynys-hir, Cardiganshire. It is widely distributed in Europe.

Habitat and ecology Found in *Sphagnum* bogs in Britain. It is usually found on or near the ground, often amongst *Sphagnum*. Krogerus (1960) describes it as a characteristic species of poor sedge fen in Scandinavia. It overwinters as an adult, probably in grass tussocks. It may do so in grass tussocks in dry areas at bog margins, but adults have been recorded amongst soaking *Sphagnum* as late as November. It is likely that there is a single generation per year, with adults maturing in August. It is probably largely or entirely a seed-feeder, in common with related species. The food plants are not known but sedges *Carex* spp. have been suggested.

Status Clearly a rare species, but possibly somewhat under-recorded. The related *P. fracticollis* is relatively common, but can easily be overlooked even in sites where it is well-established unless the population level is very high or weather conditions particularly favourable. The same is likely to be true for *P. luridus*. There appear to be no recent records from Kent or Surrey.

Threats Drainage of bogs; lowering of water tables by water abstraction and drainage of surrounding land, and invasion of bogs and marshes by scrub and coarse vegetation either through changes in water regime or neglect of previous management practices. Hothfield Bog is much drier than in the past, and is also subject to considerable recreational pressure. Wet areas on Chobham Common have been subject to drainage and damage through the construction of tracks, road-building, and uncontrolled summer fires. At least one site in the New Forest is known to have declined in interest since the first finding of the species, as a result of increasing dominance of *Juncus* and *Molinia*. Other sites in the New Forest are subject to heavy recreational pressure and to changes resulting from alterations of grazing pressure, but the extent of likely or actual damage to populations of the bug from these causes is not known.

Conservation Only the Dorset site is not within a SSSI. Chobham Common is owned by Surrey County Council, and Hothfield Bog is a Local Nature Reserve. Management of known sites should aim to maintain a varied structure of vegetation, including both low *Sphagnum*-dominated areas and taller vegetation. Water tables should be kept high. In the New Forest, suitable vegetation structure is maintained by grazing, and light grazing is probably the ideal management on other sites.

References Champion, G.C. (1919), Felton, J.C. (1975), Green, B.H. & Townsend, N.D. (1986), Groves, E.W. (1965), Krogerus, R. (1960), Masee, A.M. (1955a), Masee, A.M. (1962d), Saunders, E. (1900a), Saunders, E. (1902a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

PERITRECHUS GRACILICORNIS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family LYGAEIDAE

Peritrechus gracilicornis Puton

Identification Southwood & Leston (1959).

Distribution There are records from Kent, Sussex, Surrey, Hampshire (including the Isle of Wight) and Dorset. Most of these may well be of isolated vagrants. It has been recorded on two well-separated occasions from

Sandwich Bay, Kent. Several were taken on sand dunes east of Studland, Dorset, in 1977, suggesting at least a temporarily established population. It is a largely southern species in Europe, and also occurs in North Africa and east to Iran and Turkestan.

Habitat and ecology Most British examples have been recorded from coastal localities. At Studland, the only locality where it has been found in numbers, the habitat was dune heath. There are other records from dunes, heathland and chalk scree. It is a ground-dwelling species in all stages, and probably shows a preference for warm, sheltered and sunny locations with low or sparse vegetation and some bare ground. The members of the sub-family to which it belongs are believed to be chiefly seed-feeders, but no specific plant associations appear to have been recorded for *P. gracilicornis*. It is believed to overwinter as an adult: there is probably one generation per year, with adults maturing around August.

Status Dubiously a British native. If one or more populations are truly established in Britain now, it may never be possible to determine whether they are long-established or the result of recent immigration. The only record of the species being found in numbers in Britain is at Studland Bay in May 1977 (Allen 1980), when several were taken at places about a mile apart. It is interesting that this record should follow the exceptional summer of 1976, but it is not known whether it results from the immigration and survival of an exceptional number of individuals from the continent, from the temporary establishment of a breeding population, or from an increase in the frequency of a usually very rare and overlooked insect. *P. gracilicornis* is listed in Red Data Book category 1 (Endangered) in Shirt (1987), but the scattered occurrence of the species in the past, its dubious status as a British species, and the recording of the species at an additional Dorset locality since the publication of the Red Data Book make this status inappropriate. It is suggested that the status be changed to RDBK (Unknown), until such time as more information is available on the status and ecology of the bug in Britain.

Threats No threats can be identified with certainty. Both Sandwich Bay and Studland Bay are subject to considerable recreational pressure, but it is not clear whether it is at a level to be damaging to the bug.

Conservation Studland Bay is an NNR, and Sandwich Bay an SSSI. Management at both sites should aim to retain a wide range of vegetation structure, including some bare and sparsely vegetated ground. Further investigation is needed of the status of the species in Britain, particularly at Studland Bay, to determine whether there is a viable population in Britain.

References Allen, A.A. (1980b), Butler, E.A. (1905), Butler, E.A. (1909a), Butler, E.A. (1923a), Douglas, J.W. (1879), Masee, A.M. (1955a), Saunders, E. (1892a), Shirt, D.B., ed. (1987).

PIONOSOMUS VARIUS

RARE

Order HEMIPTERA

Family LYGAEIDAE

Pionosomus varius (Wolff)

Identification Southwood & Leston (1959).

Distribution There are records from Kent (Sandwich Bay and Littlestone), Dorset (Swanage; a nineteenth century record unsupported by specimens), Glamorgan (Pennard, Llangenith and Whiteford Burrows, all on the Gower Peninsula), and Pembrokeshire (Broomhill Burrows, Barafundle Bay, Stackpole Warren and Broad Haven Dunes).

Habitat and ecology Confined to sand dunes in Britain. It has been reported as occurring in close association with little mouse-ear *Cerastium semidecandrum*, yellow stonecrop *Sedum acre* and storks-bill *Erodium cicutarium*. The closest recorded association is with *E. cicutarium*, but there is no proof that it, or any of the other plants named, is the host. Adults have been seen to feed on seeds of shepherd's purse *Capsella bursa-pastoris*. The bug is normally found in open areas with sparse vegetation and bare sand. Adults overwinter, and mate in May. In captivity, eggs are laid in loose sand. Nymphal development takes about eight weeks and the first adults of the new generation mature in late July. It is a ground-dwelling insect in all its stages. It may usually form rather small localised colonies which can easily be overlooked. There are gaps of many years between records even

at the well-worked site at Sandwich Bay, though most or all of the specimens seem to have come from a fairly restricted area of the dunes.

Status Very local. The distribution as currently known is oddly disjunct, and it may well be that the bug will prove to occur in other dune systems, particularly in south Wales and south-west England. Under-recording is particularly likely given the small size and extreme localisation of the colonies. There are recent records for Sandwich Bay and for sites in Glamorgan and Pembroke. It has not been recorded from Littlestone since the early 1960s, and the only Dorset record is from the last century.

Threats There are no recorded immediate threats to the species in its known sites. There is considerable recreational pressure at Sandwich Bay, and the area has undergone extensive change as a result of golf course development, but neither factor is known to be damaging at present. There is increasing recreational pressure on the Welsh dune systems. Loss of open ground through reduction in rabbit grazing in recent decades may have resulted in a reduction of the area of suitable habitat.

Conservation Sandwich Bay is an SSSI and a reserve of the Kent Trust for Nature Conservation; Whiteford Burrows is an NNR and a property of the National Trust; Pennard Burrows is in part a property of the National Trust; Broomhill Burrows is an SSSI and in part National Trust Property; Barafundle Bay, Stackpole Warren and Broad Haven dunes are all within the Stackpole NNR and National Trust property. At most sites, suitable conditions are likely to occur in the absence of active management, particularly if there is some rabbit grazing. Some grazing by stock may be advantageous.

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PTEROTMETUS STAPHYLINIFORMIS

RARE

Order HEMIPTERA

Family LYGAEIDAE

Pterotmetus staphyliniformis (Schilling)

Identification Woodroffe (1962).

Distribution Recorded in Britain only from the coast of west Cornwall between Sennen Cove and Cape Cornwall. It is widely distributed in Europe. It has been recorded from Finland to the Mediterranean, and extends to Syria, Turkestan and Siberia.

Habitat and ecology Found on cliff-tops, in company with the ant *Formica fusca*. It was found by G.E. Woodroffe in the 1960s in areas of sparse vegetation with thin grass, *Sedum* and prostrate *Trifolium* on rather bare stony ground. In recent years it has also been recorded running on boulders with a thin covering of lichens, mosses, and occasional other plants in areas of fairly dense scrubby growth of gorse and bramble. The association with the ant appears to be quite close, and the bug superficially resembles it when running rapidly. There is no evidence that the association is more than a mimetic one. Adults have been taken in May and in late August and September, and nymphs in early August; it would seem likely that there is a single generation per year, with adults overwintering. The food is not known. Members of the subfamily are believed to be mainly seed-feeders.

Status Apparently very restricted, and uncommon even where found. The species was not recognised in Britain until 1962, though the area from which it is recorded had been visited by a number of Heteropterists for a century or more previously. This suggests that it may be rather easily overlooked, and that it may eventually prove to occur elsewhere in cliff-top habitats in the south-west. Searches in some other superficially suitable localities have proved negative, however, and it may be that the species is at the extreme edge of its climatic tolerance in Britain, and that conditions are only suitable in this very limited area in the extreme south-west.

Threats Absence of grazing of cliff-top vegetation is probably the main threat at present. The cessation of traditional stock-grazing and the loss of rabbits through myxomatosis have led to an increase in the height of vegetation and to invasion by coarse grasses and scrub in such sites over a wide area of southern Britain. The Cornwall North Coastal Path runs close to the cliff edge for the whole length of the coast from which the bug has been recorded. This is leading to localised erosion of cliff-top vegetation. At current levels of use, such trampling may be beneficial overall, in maintaining strips of relatively short vegetation along the path margins, but increased levels of use could prove damaging. Woodroffe's description of the area in the 1960s suggests the presence of large areas of short vegetation and bare ground, presumably maintained through grazing. Such conditions are now rather scarce in the area, and chiefly confined to the extreme cliff edge. This may account for the recently observed association of the bug with boulders.

Conservation Management should aim to maintain or increase areas of low vegetation with bare ground. This may necessitate scrub clearance in places to create open conditions. Grazing should be introduced where possible. Where it is not feasible to introduce grazing stock, rabbit populations should be encouraged as far as possible, for example by retaining areas of scrub used for shelter or burrowing. Trampling and other recreational use, if at low level, may be advantageous in maintaining bare ground and low plants, but heavy trampling and erosion should be avoided.

References Shirt, D.B., ed. (1987), Stichel, W. (1955), Woodroffe, G.E. (1962c), Woodroffe, G.E. (1966d).

RAGLIUS ALBOACUMINATUS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Raglius alboacuminatus (Goeze)

Identification Southwood & Leston (1959).

Distribution Southern Britain, particularly the south-east. There are records from Norfolk, Suffolk, Essex, Kent, Middlesex, Berkshire, Surrey, the Isle of Wight, Dorset, Devon, Cornwall and Glamorgan. It is widely distributed in Europe, particularly in central and southern countries, and extends east to Iran and Iraq.

Habitat and ecology Recorded from a number of habitats: woodland clearings and edges, gardens, roadside verges, waste ground and a disused chalk pit are included. It is particularly associated with black horehound, *Ballota nigra*, but there may well be other hosts. The habitats seem to have in common the presence of quite densely tufted plants growing in ground partly bare or covered with thin leaf litter. There seems to be a preference for a fairly firm substrate; there are a number of records from clay and chalk, but it is rarely if ever found on sand. Adults overwinter, and have been found commonly under bark. They are active very early in the spring on warm days. Mating probably occurs in May, and the eggs are laid singly in the ground or in litter. The adults of the new generation mature from late July onwards, and there may be a second generation. It is probably a seed-feeder.

Status Local; perhaps somewhat declined in recent decades. There appear to be few recent records for counties in the north and west of its British range. It is, however, still well-established in the south-east, including the London area where it is locally common on waste ground.

Threats Loss of suitably structured habitat, chiefly through development, infilling, landscaping, and natural succession. Threats from development are particularly marked in the London area. Overall, however, the species is probably not under great threat in the central area of its range. It would seem to be a quite efficient coloniser of newly available habitat, to require only limited areas to support viable populations, and to be fairly catholic in its broad habitat requirements. Localised loss of populations, however, is quite possible, and may be more serious towards the edge of the range.

Conservation At present, the bug is probably able to survive successfully on the available habitat within the central area of its range. Sites which are known to support it should be managed in such a way as to retain as broad as possible a range of successional phases, from largely bare ground to scrub, and including patchy vegetation with tall plants of black horehound over bare soil or thin leaf litter. The habitats necessary for *R.*

alboacuminatus can probably be maintained quite adequately by rotational scrub clearance to maintain some open areas. Periodic mechanical disturbance of the substrate may be advantageous in encouraging early successional stages. Some degree of disturbance through informal recreational use is likely to be advantageous, and should be looked on as a positive management tool.

References Bignell, G.C. (1906), Butler, E.A. (1923a), Clemons, L. (1982), Edwards, J. (1884), Edwards, J. (1899), Edwards, J. (1901), Groves, E.W. (1965), Groves, E.W. (1986), Hallett, H.M. (1936), Harwood, W. (1903), Jennings, F.B. (1908), Masee, A.M. (1950b), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Moore, B.P. (1950), Saunders, E. (1892a), Saunders, E. (1902a), Side, K.C. (1977), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walker, J.J. (1933).

RHYPAROCHROMUS PINI

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Rhyparochromus pini (Linnaeus)

Identification Southwood & Leston (1959).

Distribution Southern England and Wales. It has been recorded from Shropshire, Warwickshire, Worcestershire, Norfolk, Gloucestershire, Oxfordshire, Essex, Middlesex, Kent, Surrey, Sussex, Berkshire, Hampshire, Dorset, Somerset, Devon, Cornwall, Glamorgan, and Pembrokeshire. It is widely distributed in the Palearctic.

Habitat and ecology In the south-east, the usual habitat is inland heathland sheltered by trees, where it is usually found running on bare ground or amongst light leaf litter. On the Surrey heaths, such areas are most often found near or beneath pine trees, but areas near broadleaved trees are equally suitable. Quite small dry heathy areas within woodland may be used. In the south-west, it seems to be chiefly a coastal species. It occurs on sand dunes and on sloping, usually sparsely vegetated ground on and behind cliffs in the complete absence of both trees and heather. It has also, though infrequently, been recorded from heathland in the west. It is a seed-feeder but the usual foodplants in Britain are not known. Nymphs have been found in close association with storksbill *Erodium cicutarium* in Pembrokeshire. In view of the varied habitats from which it has been recorded it is likely to be polyphagous. There is one generation per year. Adults hibernate amongst litter or beneath bark. Eggs are laid singly in the ground in late May and June. Adults of the new generation begin to mature in early August.

Status A local species, but with a widely scattered distribution across southern Britain. Despite being a quite large and active insect, it seems to be easily overlooked. In the west particularly, it seems often to occur at low density. It may also form colonies of rather limited extent.

Threats Heathland sites in the southeast are threatened by destruction, particularly for development, by uncontrolled fires, and by scrub invasion resulting from lack of management. The latter phenomenon may affect this species less rapidly than other heathland inhabitants, because of its preference for shaded localities. Colonies in heathy areas in or near woodland may be lost through lack of woodland management, leading to scrub invasion and shading of open areas. In the south-west, heavy public pressure on coastal sites may result in damage by erosion, or by developments associated with recreation, but the threats are probably less serious overall.

Conservation Coastal sites in the south-west in general may require no active conservation beyond site protection. Re-introduction of grazing to cliff-top vegetation may be of value. Heathland should be managed to maintain a varied structure. Particular attention should be paid to areas adjoining or within woodland or trees. It is likely to be impossible to manage such areas by burning. Light grazing is the best way to ensure suitable structure. If the introduction of grazing animals is impossible, cutting may be attempted. Periodic scrub clearance alone may provide adequate management. Heathy areas within or adjoining woods should be kept open and sunny. Again, occasional scrub clearance may be sufficient to maintain suitable conditions, but cutting may also be needed. Only a fraction of such an area should be cut in any one year.

References Bedwell, E.C. (1935), Butler, E.A. (1882b), Butler, E.A. (1905), Butler, E.A. (1923a), China, W.E. (1939a), Clark, J. (1906), Classey, E.W. (1951), Edmonds, T. (1915), Edwards, J. (1884), Edwards, J. (1901),

Felton, J.C. (1975), Foster, A.P. (1987b), Fowler, W.W. (1906), Groves, E.W. (1965), Hallett, H.M. (1936), Harwood, W. (1903), Masee, A.M. (1953a), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Nicholson, C. (1927), Ryle, G.B. (1950), Saunders, E. (1892a), Saunders, E. (1892d), Saunders, E. (1900a), Saunders, E. (1902a), Saunders, E. (1908a), Scudder, G.G.E. (1957b), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Swale, H. (1893), Walker, J.J. (1933), Woodroffe, G.E. (1957c), Woodroffe, G.E. (1959a), Woodroffe, G.E. (1964a).

SCOLOPOSTETHUS PICTUS

NOTABLE

Order HEMIPTERA

Family LYGAEIDAE

Scolopostethus pictus (Schilling)

Identification Southwood & Leston (1959).

Distribution In the past this has been largely a south-eastern species. There are records from Norfolk, Cambridgeshire, Oxfordshire, Hertfordshire, Essex, Kent, Surrey, Sussex, Buckinghamshire, Berkshire, Hampshire, Dorset, Devon and Gloucestershire. There are recent records from the coast of Kirkcudbrightshire and from the margin of the river Conway in north Wales.

Habitat and ecology The most commonly recorded habitat in the past has been stacks of dried plant material, particularly cornstacks, and probably also stacks of fen litter. It seems to have been particularly frequent in chalk areas. The Scottish colony was found under tide wrack, composed chiefly of straw, resting on shingle. A recent Welsh record is from flood refuse along a river margin. It is recorded from similar habitats both on the sea-shore and at the margins of lakes and rivers elsewhere in Europe, and this is no doubt the natural habitat of the species. It has been suggested that it feeds in part on small fungi, but it is probably largely a seed-feeder, in common with related species. In corn-stack populations there seems to be no clear pattern to the life history: adults and nymphs may overwinter, and mating has been observed between mid-May and August. It would appear that there is one, or possibly two, generations per year, but that the timing is not strictly correlated with the seasons, at least under these relatively artificial circumstances.

Status Always local, and apparently much declined. Though it formerly had a wide distribution in southern counties and it seems to have been fairly regularly recorded before the Second World War, the most recent record appears to be from Kent in 1967. The Scottish population was first recorded in 1973, and was still present in 1986. Since it has always been a species of rather sporadic distribution, most frequently recorded from largely artificial situations, there is always the possibility of under-recording. The extent of possible under-recording of the species in its more natural habitat is difficult to determine. This species may prove to qualify for a higher status in Britain than it is here afforded, but it would be premature to judge this at present.

Threats The main cause of decline in the south-east has probably been the changing and intensification of farming practices, which has meant that the stacks of dry plant material which form its principal habitat are less frequent, and less often kept in the sort of conditions which would be likely to support populations of the bug. Neither of the known coastal sites is known to be under threat, but the specialised habitat is of limited occurrence and extent, and colonies may be vulnerable to localised coastal development.

Conservation Where wetland and grassland sites are managed by cutting, litter piles created on site may provide suitable habitat for this species. It is probably best if small numbers of fairly large piles are created, and if their positions are kept more or less constant from year to year. The frequency of occurrence of the species in more natural situations such as that at Auchencairn Bay needs to be investigated. Such sites should need no active conservation measures other than site protection.

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Taphropeltus hamulatus (Thomson)

Identification Woodroffe (1959a)

Distribution Southern England, predominantly the south-east. There are records from Oxfordshire, Kent, Surrey, Gloucestershire, and Cornwall.

Habitat and ecology Most of the south-eastern records are from sites on chalk. The Cornish records are on serpentine or schist, and it has been recorded away from the chalk in Kent. It would seem to be particularly frequent amongst moss in areas where there are loose chalk fragments and flints. It has been found in such circumstances in a disused chalk pit and on a neglected arable field in chalk downland. It has also occurred in moss amongst tall grass and other vegetation in undisturbed downland, but in such circumstances does not seem to develop such large populations. It overwinters as an adult, but the life history is otherwise poorly known. Members of its subfamily are mainly seed-feeders, but no specific plant association has been claimed for *T. hamulatus*.

Status Very local. Records are few and rather scattered, but this may in part be the result of taxonomic confusion in the past, since various authors have differed in their opinions as to whether it is truly distinct from the common *T. contractus*. Some older records require confirmation. *T. hamulatus* is listed in Red Data Book category 3 (Rare) in Shirt (1987), but in view of its wide distribution in southern England and its tolerance of a range of substrates this seems likely to over-estimate its true rarity.

Threats Destruction of chalk downland through improvement, ploughing and development; neglect of chalk grassland leading to scrub invasion and dominance by coarse grasses; overgrazing or over-enthusiastic scrub clearance leading to loss of tall vegetation and thick moss layers. On disturbed ground and disused quarries, natural succession leading to a closing over of vegetation cover over mossy stones, and eventually to domination by coarse vegetation and scrub, is likely to be the main danger. Little is known of its habitat in the south-west, and threats cannot easily be specified. The area of the Lizard from which the bug is so far known is subject to considerable public pressure, which has led to extensive erosion of vegetation in places.

Conservation Chalk grassland should be managed to maintain a good range of vegetation structures and heights, including some tall grassland with a thick moss layer. This is best achieved by grazing. Rabbit grazing is effective in producing a small-scale mosaic of varied vegetation structure, and rabbit populations should be encouraged where possible. In the absence of a rabbit population sufficient to produce the desired structure, introduction of stock grazing is desirable. Moderate grazing throughout the site is probably ideal. It may be advisable to exclude stock in the summer months, but this is unlikely to be essential if stocking levels are low. Rotational grazing may be less effective, since it is not certain how mobile the bug is, or how efficiently it would be able to colonise and build up populations in areas of habitat which retain suitable structure for only a short time, but may prove suitable. Where grazing is impossible, rotational cutting may be used, but this is the least desirable management option. In disturbed ground and quarry sites, management should aim to retain a good range of successional stages, including early successional stages with bare ground and stones. Periodic mechanical disturbance may be needed to ensure the continuity of such varied structure.

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Taphropeltus limbatus (Fieber)

Identification Southwood & Leston (1959).

Distribution South Britain, particularly the south-west. The species was first recorded in Britain from Southsea, Hampshire, in 1870, and has since been found in Bewdley Forest, Worcestershire, in 1879; Bowes Park, Middlesex, around the turn of the century; Windsor Forest, Berkshire, in 1933; at least five localities in Dorset, the most recent in 1981; the New Forest, Hampshire, a number of records over several decades to the late 1950s, and two localities in Devon, the Meavy Valley in 1909, and near Dunsford in the 1950s. It appears to be an uncommon south-western species elsewhere in Europe, and is recorded from Spain, Portugal, France and Germany.

Habitat and ecology This species is associated with ants, but the exact nature of the relationship is not clear. Continental workers have linked it with several types of ants, including species as far removed in taxonomy and nest structure as *Myrmica scabrinodis* and *Formica rufa*. Ants leave the bug unmolested, though they attack other species of Heteroptera placed near their nests. If the bugs spend much time within the nests, this might in part explain the rather sporadic and irregular records of the species in Britain, and the apparent lack of consistent habitat preferences. It has been found in wet moss beside a stream, in *Sphagnum*, amongst thick vegetation on chalk downland, beneath a stone on a chalk cliff, amongst sparse vegetation in a derelict garden in a wood, on a dry hedgebank, and "in a sandy place". The food is unknown; members of the subfamily are generally believed to be seed-feeders. It appears to overwinter as an adult. Mating has been observed in May, and oviposition in June. Nymphs in the last instar have been found in early to mid-August, so there is probably one generation per year, maturing in mid- to late August.

Status Very local, but exact status unclear. Records are few, scattered, from a rather wide range of habitats, and usually of only one or two individuals. This would suggest that the species is usually present in small numbers and may easily be overlooked, particularly in the south-west, which is not a well-worked area for Heteroptera.

Threats Uncertain. In the current state of knowledge of the biology of the species it is difficult to determine what factors might be damaging to it. The only common factor linking the recorded habitats seems to be that they are open and unshaded. Loss of such open conditions, particularly as a result of neglect of previously managed sites, may be significant. The Middlesex site was destroyed by urban development many years ago.

Conservation Four records fall certainly or probably within SSSIs: Windsor Forest, Berkshire; New Forest, Hampshire, and the Purbeck Ridge, Dorset. It is difficult to suggest positive conservation measures for the species in the current state of knowledge. More information on the biology and ecology of the species is needed. If it is genuinely a species of sporadic occurrence, associated with a number of ant species, and otherwise with no strong habitat preferences, it may be impossible to suggest overall conservation measures. Management at known sites should aim to retain open conditions: on most sites this may be best achieved by light grazing.

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TRAPEZONOTUS ULLRICH**RARE**

Order HEMIPTERA

Family LYGAEIDAE

Trapezonotus ullrichi (Fieber)**Identification** Southwood & Leston (1959).**Distribution** Recorded in Britain only from Devon, Cornwall and Pembrokeshire. It was first recorded from the north Cornwall coast near Boscastle or Tintagel in 1891, and was subsequently discovered on the south coast near Craffhole, Whitesand Bay, near Plymouth, in 1953. It was found at Babbacombe Bay, near Torquay, South Devon, in 1979. It is a principally southern species in Europe, and also occurs in North Africa, and east to Turkestan.**Habitat and ecology** All British records are from cliff-tops. The habitats of the Cornish captures have not been recorded in detail, but the Whitesand Bay specimens were taken at the roots of dry grass. In the Devon locality, it was found amongst quite dense grassland of moderate length, with occasional sparse or bare areas, on irregular ground. Little is known of the biology of the species. It probably overwinters as an adult; nymphs have been recorded in August. Members of the sub-family are generally believed to be seed-feeders, but no specific plant associations have been claimed for *T. ullrichi*.**Status** Clearly a rarity, but the extent of under-recording is difficult to estimate. The few scattered records suggest that it may form very localised populations in areas of suitable habitat, and there are no known special habitat features with which it is associated. Given the considerable extent of cliff-top vegetation in Devon and Cornwall, there may be a number of unrecorded populations.**Threats** The loss of low grassy vegetation on cliffs as a result of lack of grazing leading to scrub invasion and dominance of coarse tall plants is probably the major threat. Where there is heavy public pressure, as there is on the cliffs at Boscastle, erosion of cliff-top vegetation may be damaging.**Conservation** Cliff-top grassland should have a varied structure, including tall grassland and areas of shorter vegetation with bare ground. Grazing is the best management for producing such structure. Grazing, particularly by rabbits, may be sufficient to maintain suitable structure in the absence of active management. Grazing stock should be introduced where possible, but stocking levels should be low. Some trampling may be advantageous in maintaining areas of low vegetation and low ground, but heavy trampling should be avoided.**References** Butler, E.A. (1923a), Clark, J. (1906), Masee, A.M. (1954b), Masee, A.M. (1955a), Parsons, M.S. (1987a), Saunders, E. (1892a), Saunders, E. (1892b), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

TROPISTETHUS HOLOSERICEUS**NOTABLE**

Order HEMIPTERA

Family LYGAEIDAE

Tropistethus holosericeus (Scholtz)**Identification** Southwood & Leston (1959).**Distribution** Southern England. There are records from Oxfordshire, Buckinghamshire, Berkshire, Hertfordshire, Kent, Sussex, Surrey, Hampshire, Wiltshire, Dorset, Devon and Cornwall. It is widely distributed in Europe, and also occurs in North Africa.**Habitat and ecology** Found in dry, well-drained, open and sunny situations, amongst short and often sparse vegetation. It has been taken on chalk downland, in disused chalk pits, amongst stones in a gravel pit, under stones in a derelict arable field on chalk, in moss and grass on consolidated coastal shingle, amongst very short moss on a cliff, and amongst dead leaves in woodland. Chalk downland and disturbed areas on chalk claim the

bulk of the records. It is a ground-dwelling insect, and all stages are generally well-hidden, at least during the day, beneath stones, amongst moss or at plant roots. There is one generation per year. Adults overwinter, and have been found early in the year in moss under the shelter of bushes. Mating does not take place until June, and adults mature in late August or September. The food is not known. Members of the subfamily are chiefly seed-feeders, but no specific plant associations have been demonstrated for *T. holosericeus*.

Status Local. A small and rather cryptic species, and no doubt under-recorded as a consequence.

Threats Loss of chalk downland through improvement, conversion to arable or development; loss of suitable vegetation structure on downland as a result of lack of grazing leading to scrub invasion and dominance by coarse grasses; infilling and natural succession in old mineral workings; loss of coastal shingle to development and gravel extraction.

Conservation Chalk downland should be managed to retain a wide range of vegetation structure, including some areas with short vegetation and ideally with bare ground. Such a structure is best maintained by grazing. Rabbit grazing is effective, and rabbit populations should be encouraged where possible. Stock grazing should be introduced or maintained where possible. Moderate grazing over the whole of a site is to be preferred. It may be advantageous to exclude stock in the summer months, but this is unlikely to be essential if stocking levels are low. Rotational grazing may prove suitable. Where stock grazing is not possible, rotational cutting may be used, but this is the least desirable management option. If scrub clearance is undertaken, some areas of scrub should be left to provide shelter and possible hibernation sites. Disturbed ground and sites in disused mineral workings should be managed so as to retain a good range of successional stages. Disturbance of the substrate may be necessary to achieve this, unless rabbit populations are high.

References Anon, (1884), Bignell, G.C. (1906), Butler, E.A. (1923a), China, W.E. (1939a), Donisthorpe, H. St J.K. (1927), Douglas, J.W. (1875b), Duffield, C.A.W. (1926a), Felton, J.C. (1975), Fowler, W.W. (1905), Fowler, W.W. (1906), Goddard, W.H. (1936), Groves, E.W. (1965), Groves, E.W. (1986), Henderson, K.L. & Henderson, A.C.B. (1984), Leston, D. (1954a), Masee, A.M. (1955a), Masee, A.M. (1962d), Saunders, E. (1892a), Saunders, E. (1899a), Saunders, E. (1900a), Saunders, E. (1902a), Scudder, G.G.E. (1957c), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Stokes, H.G. (1952b), Woodroffe, G.E. (1959j).

BERYTINUS HIRTICORNIS

NOTABLE

Order HEMIPTERA

Family BERYTINIDAE

Berytinus hirticornis (Brulle)

Identification Pericart (1984); Southwood & Leston (1959).

Distribution There are records from Essex, Kent, Sussex, the Isle of Wight, Dorset, Devon and Cornwall. It is widely distributed in Europe north to the Baltic, and also occurs in North Africa and Asia.

Habitat and ecology This is typically a species of dry or sparse grassland, with most records from neutral or calcareous soils. There are records from habitats as diverse as sand dunes, vegetated shingle, slippage areas on soft-rock cliffs, rank grassy vegetation on disturbed ground, disused chalk pits, roadside verges, and sea banks. Sites for the bug typically have fairly tall flowering grasses, but are sufficiently thinly or patchily vegetated for bare ground to be visible. In areas of suitable habitat, populations may be very large. Different authors have associated it with a range of plants. It will certainly feed on grasses. Cocksfoot *Dactylis glomerata* is a known foodplant. False oat-grass *Arrhenatherum elatius* and common couch *Elymus repens* have been suggested as hosts in Devon. It has been regularly found in association with grass vetchling *Lathyrus nissolia* in south-east England. Elsewhere in Europe it has been found on field wormwood *Artemisia campestris*, various Leguminosae, heather *Calluna vulgaris*, and mullein *Verbascum* sp. It has been found on millet *Panicum* sp in North Africa. Some of these may be casual associations. Both adults and nymphs have been seen to feed on the stems and leaves of *Dactylis*. There are observations of the insect attacking aphids and feeding on dead individuals of larger insects. There is one generation per year. Adults overwinter, and mate in the spring. Eggs are laid singly on leaves. They hatch in about twelve days, and development takes six to eight weeks. Adults of the new generation mature from about mid-July.

Status This species was not recognised in Britain until 1943, and for some time was known only from a small area of Devon. It was taken in Cornwall in 1960, in Dorset in 1968 and on the Isle of Wight in 1971. Since the late 1970s it has been found in Sussex, Kent and Essex, and in the latter two counties it has undergone dramatic increase. It is now generally distributed and fairly frequent in north Kent and south Essex. It has been recorded almost to the Essex-Suffolk border. Despite its increase in the south-east, *B. hirticornis* apparently remains extremely local further west. The inclusion of this species in the Notable category is easily justified on the basis of the known current distribution of the species, but as it still appears to be spreading in south-east England this status may be only temporary.

Threats Possible threats to individual populations of this species include natural succession on unmanaged grassland and artificial sites leading to dominance by dense coarse vegetation and to scrub invasion; over-grazing of tall grassland; intensive management of verges and amenity grassland; improvement or ploughing of grassland for agricultural purposes; development; re-profiling of sea banks. Such threats may be of greater significance in the west of the species' British range, where populations appear to be rather localised and scattered. In the east, where the range appears still to be increasing, there is no overall threat.

Conservation Management of dry grassland sites should aim to maintain a varied structure, including both tall flowering grasses and thinly vegetated or bare ground. In coastal sites on sand or shingle such vegetation structure may require no active management for its maintenance. Elsewhere, management by moderate or rotational grazing, or by a programme of cutting, is desirable. Periodic substrate disturbance to maintain early successional stages may be an appropriate management technique on some sites, particularly those of artificial origin.

References Anon, (1985), China, W.E. (1943), Clemons, L. (1985), Dolling, W.R. (1982), Masee, A.M. (1961c), Parsons, M. (1986), Pericart, J. (1984), Philp, E.G. (1984), Ryle, G.B. (1969), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

CYMUS AURESCENS

NOTABLE

Order HEMIPTERA

Family BERYTINIDAE

Cymus aurescens Distant.

Identification Southwood & Leston (1959) (as *C. obliquus*).

Distribution South-eastern England. Recorded from Surrey, Sussex, Berkshire, and Kent. It is a central and southern species in Europe.

Habitat and ecology The foodplant is wood club-rush, *Scirpus sylvaticus*. The host-plant is itself a very local wetland species of wet woods, meadows and streamsides. The bug seems to prefer open situations, and most records are from stream margins, open marshy pasture and wood edges. Elsewhere in Europe, adults have been recorded from common club-rush *Schoenoplectus lacustris* and from grey club-rush *Schoenoplectus tabernaemontani*, but there is no proof of the insect having bred on either plant. There is believed to be one generation per year, adults overwintering and ovipositing in spring and early summer in the flower-heads of the hosts. Adults of the new generation begin to mature in July. All stages are associated with the flower and seed-heads of the host, and it is likely that the chief foods are the buds, flowers and developing seeds.

Status Very local, though often abundant where found. This species is listed in Red Data Book category 3 (Rare) in Shirt (1987). However, though it is clearly a very local species, new colonies continue to be discovered, and the very localised distribution of its host makes it likely that the bug remains rather under-recorded. *Scirpus sylvaticus* is recorded much more widely than *C. aurescens* has been to date, though it is most frequent within the known distribution of the bug. Reduction of the status of the species to Notable would more accurately reflect current knowledge of the distribution and status of the species.

Threats Drainage and improvement of wet meadows; drainage of woodland rides; clearance of woodland ditches; lack of management in wet woodland leading to excessive shading of rides and clearings and rendering

conditions unsuitable for the host-plant and the bug; clearance of stream margins leading to loss of stands of the host-plant. One of the two recorded Kent colonies has almost certainly been destroyed by gravel extraction work.

Conservation Wet meadows containing the host-plant should be managed so as to ensure that the plant is able to flower and set seed in all years. This is probably best achieved by light grazing. If cutting is to be used as an alternative to grazing, it should be rotational, with only a fraction of the area occupied by *Scirpus sylvaticus* cut in any one year. Wet woodland rides with *Scirpus sylvaticus* should not be drained and should be protected from heavy trampling. Wet woodland rides and clearings should be kept open, broad and sunny. Rideside coppicing and the creation of small rideside clearings may assist. The cutting of rides should be done in small sections or along only one side of the ride in any given year, and it is important that a good proportion of the *Scirpus sylvaticus* is allowed to flower and set seed in each year. Clearance of the margins of streams and drainage ditches, where it cannot be avoided, should be performed along only one side, or along only short stretches in any given year, and a good proportion of the *Scirpus sylvaticus* should be left undisturbed in any one session of clearance.

References Bailey, P. & Bailey, V. (1966), Butler, E.A. (1909b), Eversham, B.C.E. (ed.) (1985), Groves, E.W. (1965), Ledvinka, J. (1970), Masee, A.M. (1955a), Masee, A.M. (1961f), Masee, A.M. (1962d), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1965b).

PIESMA QUADRATUM SPERGULARIAE

RARE ENDEMIC

Order HEMIPTERA

Family PIESMATIDAE

Piesma quadratum spergulariae Woodroffe

Identification Woodroffe (1966c).

Distribution Confined to the Isles of Scilly: so far recorded from St Mary's, St Martin's, St Agnes', Bryher and Samson. So far as is known, this subspecies is endemic to the Isles of Scilly.

Habitat and ecology The foodplant is *Spergularia rupicola*, which is widespread and common on the Scillies on walls and cliffs. The bug seems to be confined to places where the plants grow on cliffs and headlands close to the sea. The life history is not known in detail, but is probably fairly similar to that of *P. quadratum quadratum*, a common insect on Chenopodiaceae in Britain. In that subspecies, adults overwinter, ovipositing in May on stems, sticks, stones or the soil; adults of the new generation begin to appear in July, and there is at least a partial second generation.

Status First described by Woodroffe as a new species in 1966 from material taken in 1965 on St Mary's, but since reduced to a subspecies of *P. quadratum*. The host-plant is frequent only in the south-west of Britain. It is possible that the bug occurs on the mainland in this region, but it is unlikely to be very widely distributed. It seems to be rather local within the Scillies, but many suitable stands of the host-plant are inaccessible. It is certainly well-established, and probably occurs on most or all of the islands.

Threats There seems to be no major threat to the subspecies in the Scillies at present. Stands of host-plant at the tops and bottoms of cliffs may be subject to damage by trampling by visitors, but the plant is sufficiently widespread, visitor pressure sufficiently low, and sites sufficiently inaccessible, for this to pose no great threat. More damage is probably done by natural erosion.

Conservation In general, no particular conservation measures are needed. It may be desirable to restrict visitor access at sites where trampling and erosion seriously affect the vegetation.

References Shirt, D.B., ed. (1987), Woodroffe, G.E. (1966a), Woodroffe, G.E. (1966d), Woodroffe, G.E. (1967c).

ACALYPTA PLATYCHEILA**NOTABLE**

Order HEMIPTERA

Family TINGIDAE

Acalypta platycheila (Fieber)**Identification** Pericart (1983); Southwood & Leston (1959).**Distribution** Southern and eastern England. Recorded from Staffordshire, Suffolk (in numbers at Mildenhall), Oxfordshire, Kent, Surrey, Sussex and Dorset. It is widely distributed in central and western Europe, extending east to Siberia and north to 60 or 62 degrees latitude in Scandinavia.**Habitat and ecology** In moss, usually in moist or shaded places, particularly around stumps and logs and under the shade of trees. There may be a preference for sandy substrates. Masee (1954) associated it particularly with moss at the base of hawthorn trees in rough fields. In the Ukraine it has been recorded in fields and meadows on the moss *Pleurozium schreberi*. The life history is not fully known. Most records of the adult have been early in the year, between April and June, but it has also been recorded amongst moss in a copse in September. It seems likely, therefore, that there is a single generation per year, with adults overwintering. Pairing has been observed in May.**Status** Local. This is a small and inconspicuous species of obscure habits, which generally seems to occur in small numbers even where found, so it is likely that it is rather under-recorded.**Threats** Improvement of grassland and the clearance of trees and old scrub.**Conservation** Where trees, logs and old scrub are present in grassland sites, they should be retained, at least in part. If trees need to be felled and replaced, the old stumps should be left in place for some time to allow for the maintenance of populations, and should be left until the moss at the foot of replacement trees has built up sufficiently to support the bug. Where scrub clearance is undertaken, it should not be so thorough as to remove all bushes; retention of a few more or less isolated tall bushes with surrounding moss is likely to prove particularly valuable. On all sites where the species is recorded, some areas should be maintained in a condition where a good thick moss layer is retained.**References** Bedwell, E.C. (1934), Butler, E.A. (1917), Butler, E.A. (1923a), Campbell, J.M. (1987), China, W.E. (1939a), Groves, E.W. (1986), Jones, H.P. (1928), Masee, A.M. (1955a), Masee, A.M. (1962d), Pericart, J. (1983), Southwood, T.R.E. & Leston, D. (1959).

CATOPLATUS FABRICII**NOTABLE**

Order HEMIPTERA

Family TINGIDAE

Catoplatus fabricii (Stal)**Identification** Pericart (1983); Southwood & Leston (1959).**Distribution** Southern England and Wales. Recorded from Staffordshire, Cambridgeshire, Worcestershire, Gloucestershire, Oxfordshire, Buckinghamshire, Hertfordshire, Kent, Surrey, Sussex, Berkshire, Hampshire, Dorset, Somerset, Devon, Glamorgan, Wiltshire and Middlesex. A widely distributed species in central and western Europe, but largely absent from Mediterranean regions. It occurs north to 63 degrees in Scandinavia, and east to the Ural mountains.**Habitat and ecology** Associated exclusively with ox-eye daisy *Leucanthemum vulgare* in Britain. Abroad, it has been found in association with other composites. Occasional records of the species from non-Composites are probably casual associations. It is usually found in warm, dry, well-drained and sunny sites. Low chalk grassland on a south-facing slope would provide a typical site. Where the detailed nature of the vegetation has been recorded, it would seem that the ox-eye daisy has been surrounded by short or sparse vegetation. A large

proportion of the records are from chalk and limestone grassland, but it has also been found on sand and other substrates, so long as they are well-drained. There are occasional records from clay pits, cuttings and quarries, but it is not a regular inhabitant of such artificial sites. Adults hibernate in moss, and emerge very early in the year in suitable weather. There seems to be a single generation in a year. Adults are long-lived, and may be found in all months. They will climb the host-plants, but both adults and nymphs are more usually found on the ground and amongst moss around the base of the host.

Status Local. It can be a rather obscure species, and may be somewhat under-recorded.

Threats Destruction of dry, and particularly calcareous, grassland through improvement or conversion to arable; loss of short and sparse vegetation in grassland through lack of management, particularly lack of grazing; loss of suitably structured vegetation in disturbed and artificial sites through natural succession leading to dominance by tall coarse vegetation and scrub.

Conservation Dry grassland sites supporting ox-eye daisy should be managed so as to retain a good range of vegetation structure, including some areas of short or incomplete vegetation structure, and areas with a good moss layer to provide hibernation sites in the near vicinity. Grazing is the best management to achieve this. Rabbit grazing is effective at producing a small-scale mosaic of different vegetation structures, and rabbit populations should be maintained or encouraged where possible, for example by the maintenance of areas of scrub used for shelter or burrowing. Grazing stock should be introduced where possible. Moderate grazing over the entire site is the preferred management. It may be best if stock is excluded during the summer months, unless stocking density is very low. Rotational grazing may also be suitable. Rotational cutting is less likely to produce satisfactory results, but the effects may be enhanced if there is localised grazing and disturbance by rabbits, or if occasional localised substrate disturbance is used to maintain bare ground and early successional stages. In disturbed and artificial habitats, management should aim to preserve as wide as possible a range of successional stages, including early succession with some bare ground.

References Anon, (1986), Bedwell, E.C. (1938), Butler, E.A. (1923a), China, W.E. (1939a), Fowler, W.W. (1906), Groves, E.W. (1966), Groves, E.W. (1986), Haines, F.H. (1926), Hallett, H.M. (1936), Hodge, P. (1989), Massee, A.M. (1955a), Parsons, M. (1986), Pericart, J. (1983), Ratcliffe, D.A. (Ed) (1977), Saunders, E. (1892a), Scudder, G.G.E. (1957c), Southwood, T.R.E. & Leston, D. (1959), Thomas, D.C. (1938), Woodroffe, G.E. (1959a), Woodroffe, G.E. (1959j).

LASIACANTHA CAPUCINA

RARE

Order HEMIPTERA

Family TINGIDAE

Lasiacantha capucina Germar

Identification Pericart (1983); Southwood & Leston (1959).

Distribution In Britain, recorded only from Cornwall. The classic locality for the species is Kynance Cove, where it has been known for many years and where it still occurs. It has now been recorded from at least eight sites from Sennen Cove in the west to Nare's Head in the east, and has also been taken on the north Cornwall coast at Capel Porth, St Agnes; it is almost certainly present at other coastal sites within this area. It is widely distributed across southern Europe north to Poland, but is seemingly absent or very rare in the extreme south (much of Spain, Italy and Greece). It extends into Asia (Mongolia, Kazakhstan, Altai, Amur, eastern Siberia.)

Habitat and ecology The foodplant in Britain is thyme *Thymus drucei*. Elsewhere in Europe it feeds on a range of *Thymus* spp. in different parts of its range, and has also been reported from a number of other plants. The ecology has been studied in the Ukraine. Adults overwinter, mating and ovipositing from early May. Eggs are laid in groups of two or three in stems of thyme. They hatch in June, and adults of the new generation mature in late July or August. Adults and larvae occur on flower-heads and leaves of the host, but are also frequently found on the ground around the base of the plants. Population densities are rarely high. There may be two generations per year in favourable conditions.

Status Apparently very local even within its restricted distribution. It is, however, a small insect, and may easily be overlooked. *L. capucina* is listed in Red Data Book category 2 (Vulnerable) in Shirt (1987). Since the publication of that work a number of new localities have been discovered. In the present state of knowledge, a status higher than Red Data Book category 3 (Rare) cannot be justified.

Threats Both Kynance Cove and Sennen Cove are subject to considerable visitor pressure, as are other parts of the coast of south Cornwall. Erosion of vegetation is particularly a problem at Kynance Cove. Loss of grazing by both rabbits and stock in recent times from areas of cliff-top grassland may have reduced the areas of suitable vegetation as a result of growth of tall and coarse vegetation.

Conservation All recorded sites receive some degree of statutory protection. Of eight recent sites, six are SSSIs, six are properties of the National Trust, and one is a National Nature Reserve. There have been studies over a number of years at Kynance Cove on the effects of erosion and on possible methods of re-habilitation of damaged areas. Where cliff-top vegetation is known to be becoming more tall and coarse, management to maintain low and open structure may be needed. Grazing should provide ideal management if it is feasible to introduce or encourage it.

References Anon, (1971), Butler, E.A. (1919b), Butler, E.A. (1923a), Masee, A.M. (1953a), Masee, A.M. (1955a), Pericart, J. (1983), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Thomas, D.C. (1956).

ONCHOCILA SIMPLEX

NOTABLE

Order HEMIPTERA

Family TINGIDAE

Onchocila simplex (Herrich-Schaeffer)

Identification Pericart (1983); Southwood & Leston (1959).

Distribution Southern England: recorded from Buckinghamshire, Oxfordshire, Kent, Sussex, Surrey, Berkshire, Hampshire, Devon and Gloucestershire. It is widely distributed in central Europe to 54 degrees north, and also found in much of southern Europe with the exception of the Iberian and Italian peninsulas. The distribution extends east to much of Soviet Asia.

Habitat and ecology Almost entirely confined to wood spurge, *Euphorbia amygdaloides*, in Britain, but with a single record from sea spurge, *Euphorbia paralias* at Folkestone Warren, Kent. In mainland Europe its most frequent host is *Euphorbia cyparissias*, but though this plant is widely naturalised in England, the bug does not appear to have been recorded from it here. The majority of records appear to be from large stands of spurge growing in sheltered sunny positions in woodland clearings, rides and edges. Two of the most recent records have been from spurge in calcareous grassland adjoining woodland. Adults hibernate in leaf litter beneath the host plants; it is possible that larger nymphs may also hibernate. Nymphs are typically found on the ground beneath or near the host-plant, not on the aerial parts of the plants themselves. Adults, in contrast, are frequently found on the foliage, and have been seen to feed from the leaves. Third, fourth and fifth instar larvae have been found at the beginning of June.

Status Very local, and seemingly declined.

Threats The principal cause of the apparent decline in this species has probably been lack of woodland management at many sites in recent decades, and particularly the neglect of coppice woodlands. This has led to shaded conditions unsuitable for the bug, and perhaps unsuitable for the growth of extensive colonies of the host-plant. Other threats include the improvement and ploughing of grassland close to woodland edges, leaving no opportunity for the spread of wood spurge into unshaded areas; clearance of ancient broad-leaved woodland; conversion of broad-leaved woodland of varied structure to uniform plantations without broad rides.

Conservation Rides and clearings in woodland should be maintained broad, open and sunny. Rideside coppicing and the creation of small rideside clearings may assist. Where a coppice cycle is established, it should be retained. Re-introduction of coppice management to neglected coppice woodlands may further increase the extent

of available habitat for the species, but is unlikely to be necessary for the maintenance of the species in a wood provided ride management is sympathetic. Grassland, particularly calcareous grassland, adjoining woodland should be managed so as to produce a graded woodland edge of trees through scrub to low vegetation, giving opportunity for woodland flora to spread into more open situations.

References Bedwell, E.C. (1935), Butler, E.A. (1923a), Campbell, J.M. (1987), Collins, J. (1923), Dicker, G.H.L. (1941), Groves, E.W. (1966), Masee, A.M. (1955a), Pericart, J. (1983), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1902a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959).

PHYSATOCHEILA HARWOODI

ENDANGERED

Order HEMIPTERA

Family TINGIDAE

Physatocheila harwoodi China

Identification Pericart (1983); Southwood & Leston (1959).

Distribution In Britain recorded only from a single lichen-covered maple tree at Witchampton, Dorset. In mainland Europe it has been found only in France, Germany and northern Italy, and there is an additional unconfirmed record from Poland.

Habitat and ecology The British examples were all taken from the bark of a lichen-covered field maple *Acer campestre*. On the continent, adults have been found beneath flaking bark other *Acer* species, including sycamore *Acer pseudoplatanus*. Adults overwinter beneath flaking bark on the host trees, and can probably be found in all months of the year.

Status First recorded from Britain in 1936, and taken again from the same tree twenty years later. It seems unlikely that it can have always been so restricted in its distribution, but it is not possible at present to determine whether the bug is present on other trees in the area but has gone unrecorded, or whether the Witchampton tree was the last (or almost last) site for a species which had been in decline for some time. The possibility of an inadvertent introduction cannot be entirely ruled out, but given the apparent rarity of the species in Europe would seem improbable.

Threats By 1960, the only known British site had been planted with spruce, the maple tree was dying, and *P. harwoodi* could not be found. If the species is still present elsewhere in the area, felling of old maples or shading them by the planting of other trees are potential threats. It is not clear how close the association with lichen is; if the bug is dependent on good lichen cover, atmospheric pollution and acid rain may prove to be threatening. If it occurs elsewhere in Britain, it is likely that the bug will be found particularly on trees in fairly open situations such as parkland and woodland edges, and threats to trees in such situations may therefore be particularly serious.

Conservation Further survey of *Acer* spp. in the Witchampton area, and possibly elsewhere in the south and south-west, is needed to determine whether the species still occurs in Britain, and if so what its current status may be. In the absence of such information, any old specimens of *Acer*, especially if lichen-covered, should be regarded as potential sites for the bug, and should be protected where they occur within sites whose management can be influenced. The possibility should be borne in mind that it may colonise sycamore, *Acer pseudoplatanus*, and where well-grown trees of this species occur they should ideally be investigated for the presence of the bug before they are included in any clearance or thinning programme.

References China, W.E. (1936), Pericart, J. (1983), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959).

PHYSATOCHEILA SMRECZYNSKII

NOTABLE

Order HEMIPTERA

Family TINGIDAE

Physatocheila smreczynskii China

Identification Pericart (1983); Southwood & Leston (1959).

Distribution Southern England: recorded from Gloucestershire, Surrey, Kent, Sussex, Hampshire, Dorset, Somerset, Devon, Cornwall and Berkshire. Elsewhere it is recorded from central and northern Europe, extending east to Amur, Mongolia and north-east China.

Habitat and ecology Associated with trees of the family Rosaceae. In Britain it has been found chiefly on lichen-covered apple trees. It is recorded both from crab apple *Malus sylvestris* in broad-leaved woodland and from cultivated apple trees in old orchards. In mainland Europe it has rarely been recorded from apple, but has been found on members of the genera *Sorbus*, *Pyrus*, *Crataegus* and *Prunus*. It hibernates as an adult, emerging in early spring. Mating and oviposition begin in May, the eggs being laid along the leaf-veins. Nymphs have been found in July and August. Adults of the new generation occur from mid-July onwards.

Status Very local, and possibly declined, particularly in eastern England. The bug was always local, but there are old records from a number of sites in Kent and Surrey in which it has not been recently seen. It is a fairly small and cryptic species, so may be somewhat under-recorded.

Threats Destruction of old orchards, and perhaps more generally the replacement of old apple trees with newer and smaller varieties; use of pesticides on apple trees grown for fruit; clearance of ancient woodland, or re-planting with conifers or uniform plantations of broadleaved species; neglect of previously managed woodland, leading to shading of rides and clearings and consequent creation of conditions unsuitable for growth of crab-apple. The importance of lichen to the bug is not clear; if it is important or essential, loss of lichens through atmospheric pollution may be a major contributory factor to decline, particularly in the east.

Conservation In woodland sites, rides, clearings and edges should be maintained open and sunny to encourage growth of crab-apple. Existing trees, particularly if lichen-covered, should be retained through any management programmes. Old apple trees on non-woodland sites should be retained, and replacements planted or sown where none currently exist to provide the next generation of trees.

References Anon, (1884), Anon, (1971), Butler, E.A. (1889), Butler, E.A. (1905), Butler, E.A. (1923a), Dale, C.W. (1886), Douglas, J.W. (1871), Groves, E.W. (1966), Jones, H.P. (1928), Jourdain, F.C.R. (1908), Masee, A.M. (1955a), Masee, A.M. (1955b), Masee, A.M. (1962d), Pericart, J. (1983), Ryles, W.E. (1900), Saunders, E. (1892a), Saunders, E. (1900a), Saunders, E. (1902a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959).

TINGIS ANGUSTATA

RARE

Order HEMIPTERA

Family TINGIDAE

Tingis angustata (Herrich-Schaeffer)

Identification Pericart (1983); Southwood & Leston (1959).

Distribution South-eastern England. Recorded from Sussex, Hertfordshire, Essex and Kent. Abroad, it occurs across much of southern and central Europe from the Mediterranean north to Poland, and extends east to Turkey, Iraq, Iran, and Kazakhstan, but is seemingly rare or absent from much of the western parts of Spain and France.

Habitat and ecology In Britain *T. angustata* has been recorded from "thistles". It is certainly associated with members of the Compositae. In Bulgaria nymphs and adults have been recorded in numbers on *Anthemis thracica*, and it has been associated with *Cnicus arvensis* and *Onopordon acanthium* in the Ukraine. However,

the adults have most frequently been taken in small numbers by sweeping low vegetation, and it has not often been possible to associate them with a host-plant. Little is known of the preferred habitat in Britain. One has been taken from the side of a footpath near woodland, and another was found hibernating in sacking in an apple plantation. Adults overwinter: on the continent they can apparently be found in all months of the year; in Britain they have been found in May, June and September.

Status Extremely local and rare. A superficial resemblance to the common *Tingis cardui* may lead to it being overlooked to some extent, but the records are so few and so scattered in time that it must certainly be a genuine rarity of the south-east. There appears to have been no record since 1937.

Threats No threats can be certainly recognised in the absence of further knowledge of the ecology and habitat preferences of the species.

Conservation No practical conservation measures can be suggested at present. If the species is re-discovered, an attempt should be made to find the host-plant, and to investigate the habitat preferences and ecology of the species.

References Beaumont, A. (1903), Butler, E.A. (1905), Butler, E.A. (1923a), Masee, A.M. (1942), Masee, A.M. (1955a), Pericart, J. (1983), Saunders, E. (1888b), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959).

TINGIS RETICULATA

NOTABLE

Order HEMIPTERA

Family TINGIDAE

Tingis reticulata Herrich-Schaeffer

Identification Pericart (1983); Southwood & Leston (1959).

Distribution A predominantly southern species; recorded from Yorkshire, Cambridgeshire, Huntingdonshire, Leicestershire, Northamptonshire, Suffolk, Gloucestershire, Oxfordshire, Essex, Kent, Surrey, Sussex, Berkshire, Hampshire, Dorset, Somerset, Devon, and Herefordshire. Widely distributed in southern Europe as far north as Poland and Denmark, and extending east to Turkey, Transcaucasus and Kazakhstan.

Habitat and ecology The foodplant is bugle, *Ajuga reptans*, growing in woodland rides and grassland, usually on calcareous soils. It may require sunny situations. It is rarely recorded from shaded woodland rides, even though the foodplant may be common. It has also been found on a number of other plants, particularly mullein, *Verbascum* spp., but there is no evidence that the bug is able to breed on such plants. It hibernates as an adult in moss, litter, and at the base of plants. It is active early in the spring, and mating occurs from early May. Eggs are laid in small groups in young flowering stems of the host. They begin to hatch in mid-May, and the first of the new generation of adults appears at the end of June. Later individuals may not mature until August. Adults begin to disperse to hibernation sites towards the end of August, but in favourable years some individuals may be found as late as October. It is frequently found on the ground beneath the foodplant, at least during the day. Populations usually seem to be fairly small, but there are occasional records of it occurring in large numbers.

Status Local. Though widely distributed, it appears to be genuinely absent from many sites where the host-plant grows profusely.

Threats In woodland sites, the main threat is probably lack of recent management, leading to dense shading in former coppice, and the loss of open sunny rides and clearings. Clearance of woodland and its replacement with uniform plantations of conifers or single-aged broadleaved trees will also lead to loss of suitable habitat, though this may to some extent be offset by active ride maintenance. In grassland the main threats are improvement or conversion to arable, and neglect of previously managed sites, particularly through loss of grazing, leading to scrub invasion and dominance by coarse grasses.

Conservation In woodland sites, rides and clearings should be kept broad, open and sunny. Rideside coppicing and the creation of small rideside clearings may help. Ride vegetation should be in part sufficiently low for good

growth of bugle; where cutting is necessary to achieve this it should be performed only along one side of the ride or on short sections of the ride in any one year. Where a woodland is under traditional coppice management, this should continue. Re-introduction of coppicing to neglected coppice may further increase the area of habitat available to the bug, but is unlikely to be necessary for the maintenance of the species, provided there is sympathetic ride management. In grassland, management should aim to retain as wide as possible a range of vegetation structure, ideally as a small-scale habitat mosaic. Rabbit grazing is effective in providing such a structure, and rabbit populations should be maintained or encouraged wherever possible. Stock grazing should be introduced or maintained where possible. The ideal is to have moderate grazing over an entire site. A rotational grazing regime may also produce satisfactory results, but is less desirable because of the possible need for the bug to move around the site to colonise newly available areas of suitable habitat every few years; the mobility of the insect is not known. Rotational cutting may provide a reasonable alternative where grazing is impossible.

References Allen, A.A. (1959), Anon, (1952), Bedwell, E.C. (1938), Brown, J.M. (1930), Butler, E.A. (1905), Butler, E.A. (1923a), Campbell, J.M. (1987), China, W.E. (1939a), Dale, C.W. (1886), Groves, E.W. (1966), Harwood, W. (1903), Jennings, F.B. (1903), Le Quesne, W.J. (1954a), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Morley, C. (1911), Morris, M.G. (1968), Pericart, J. (1983), Russell, W.E. (1969a), Saunders, E. (1899b), Saunders, E. (1908a), Scudder, G.G.E. (1957b), Southwood, T.R.E. & Leston, D. (1959), Walker, J.J. (1933).

EMPICORIS BAERENSPRUNGI

NOTABLE

Order HEMIPTERA

Family REDUVIIDAE

Empicoris baerensprungi (Dohrn)

Identification Southwood & Leston (1959).

Distribution Southern England: there are records from Huntingdonshire, Oxfordshire, Surrey, Berkshire and Hampshire. It seems otherwise to be a largely central European species.

Habitat and ecology A cryptic predator, found on trunks and branches of trees. It has been found low down on the trunks of large oaks in Hampshire and Huntingdonshire. Dicker (1941), in the Reading district, found it particularly on jagged stumps where dead branches had broken off oaks. It has also been found on lichen-covered blackthorn and on a stack of cut pine branches. It has been found on trees in sheltered sunny positions adjoining rides and clearings, but it is not known whether it is confined to such situations. Adults have been found in June, July and August. There is believed to be one generation per year, the adults overwintering. It has been observed to feed on Psocoptera and other small insects.

Status *E. baerensprungi* is listed in Red Data Book category 3 (Rare) in Shirt (1987). It is clearly a very local species. However, members of the genus are all slow-moving and cryptically-coloured, and even the two common British species are probably grossly under-recorded. A recent record of the species from Monks Wood, Huntingdonshire, considerably extends the known British range of the species, and the fact that it was not known from such a well-recorded site until 1984 highlights the ease with which it may be overlooked. Reduction of the status of the species to Notable more accurately reflects current knowledge of the distribution and status of the bug.

Threats Loss of broadleaved woodland through clearance or replanting with conifers or with uniform plantations of broadleaved trees. The exact ecological requirements of the species are not known. It may be sensitive to the levels of shade or exposure, and thus be affected by the details of woodland management. Neglect of previously managed woodland, leading to increased shade, may be deleterious. Large-scale removal of mature trees, perhaps particularly oaks, must certainly be damaging.

Conservation Management of known or likely sites for the species should aim to retain a good number of well-grown broadleaved trees, including mature and overmature oaks, in as wide as possible a range of conditions of shade and exposure.

References Butler, E.A. (1923a), Chalmers-Hunt, J.M. (1969), China, W.E. (1939a), Dicker, G.H.L. (1941), Groves, E.W. (1966), Masee, A.M. (1955a), Saunders, E. (1902a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

PYGOLAMPIS BIDENTATA

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family REDUVIIDAE

Pygolampis bidentata (Goeze)

Identification Southwood & Leston (1959).

Distribution Known in Britain from only three sites: Quatford, near Bridgnorth, Shropshire (around the 1830s); between Brockenhurst and Beaulieu Road Station, New Forest, Hampshire (1914) and near Totnes, Devon (before 1920). Abroad, it occurs widely but sporadically across much of Europe and Asia.

Habitat and ecology This species is very poorly known. It lives on, and perhaps usually beneath, the ground, amongst stones and the roots of grasses. It has been taken in May in Britain; on the continent nymphs, together with an adult, have been found in August, and both adults and nymphs are known to overwinter. The New Forest specimen was taken by sweeping on a railway bank, and the Totnes specimen by sweeping in "a damp place", so the insect clearly leaves ground level on occasion. Members of the family are all predacious, but the exact food of *P. bidentata* is unknown.

Status *P. bidentata* is clearly a rarity, but the exact status is impossible to estimate. It is found only rarely throughout its range, and it seems likely that this is at least partly the result of its subterranean habits.

Threats Uncertain. The current state of knowledge of the habitat requirements of the bug means that even potential threats to the species are impossible to estimate.

Conservation The New Forest is an SSSI. In the current state of knowledge of the status, ecology and distribution of the species, no positive conservation measures can be suggested. In the case of re-discovery of the bug, effort should be made to investigate its ecology, and if possible to estimate population size and habitat requirements.

References Butler, E.A. (1914), Butler, E.A. (1923a), Masee, A.M. (1955a), Saunders, E. (1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

NABIS BREVIS

RARE

Order HEMIPTERA

Family NABIDAE

Nabis brevis Scholtz

Identification Pericart (1987). Southwood & Leston (1959) key this species, but use a coloration character which is not always reliable.

Distribution Scattered, but chiefly southern. *N. brevis* has been reported from Yorkshire, Staffordshire, Norfolk, Kent, Surrey, Sussex, Dorset and Somerset. However, there have been numerous misidentifications within the genus *Nabis* in the past, and some records may be erroneous.

Habitat and ecology Most British records are from wet heaths and bogs. Little is known of the biology or exact habitat requirements of the species in Britain. It has been found in a much wider range of habitats elsewhere in Europe. There is one generation per year. Adults overwinter, and ovipositing in grass stems in the spring and early summer. Adults begin to mature at the end of July. The members of the family are all predacious, but nothing is known of the prey taken by *N. brevis*.

Status Very local. The exact status must remain uncertain at present, since the levels of under-recording and of misidentification are unknown.

Threats Drainage of wet heaths and bogs; lowering of water tables on wetland sites as a result of water abstraction in surrounding land; scrub invasion and growth of coarse vegetation on wetland sites as a result of lack of management and reduced water levels.

Conservation Water levels in wetland sites should be maintained; where there is evidence of vegetation change and scrub invasion, management should aim to keep scrub down to a reasonable level. Any management of low-growing vegetation which may be necessary should ideally be achieved through light to moderate grazing over the whole site; rotational cutting may provide a substitute on some sites. Little is known of the vegetation structure preferred by the bug; management should aim to maintain variety. More information is needed on the habitat requirements of this species.

References Butler, E.A. (1923a), Collett, H.R.P. (1927), Groves, E.W. (1966), Masee, A.M. (1955a), Masee, A.M. (1962d), Pericart, J. (1987), Saunders, E. (1892a), Saunders, E. (1900c), Saunders, E. (1902b), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959).

NABIS PSEUDOFERUS

NOTABLE

Order HEMIPTERA

Family NABIDAE

Nabis pseudoferus Remane

Identification Pericart (1987); Southwood & Leston (1959).

Distribution Southern and largely coastal. Recorded from Kent, Devon, Suffolk, Norfolk, Hampshire, Dorset, and Pembrokeshire. Elsewhere it is largely a species of southern and central Europe, and also occurs in North Africa.

Habitat and ecology *N. pseudoferus* is usually found in dry sandy places. Most records are from coastal dunes, but it also occurs on sandy heathland and dry grassland in Kent, the New Forest, and the East Anglian breckland. It occurs amongst both short sparse and relatively long grass and other vegetation, but always in dry, open and sunny locations. There is probably a single generation per year in Britain, though two or more generations are possible in southern Europe. Adults overwinter. Members of the family are all predacious, but the usual prey of *N. pseudoferus* is not known. All stages seem to be largely ground-dwelling, but adults are known to climb vegetation on occasion, and have been taken by sweeping; all stages may be active higher in the vegetation at night.

Status Very local. Though listed in Red Data Book category 3 (Rare) in Shirt (1987) it seems likely that this over-estimates the rarity of the species. It was first recognised in Britain in 1956, from specimens taken in 1954, and is superficially similar to the common *N. ferus*, so may have been quite widely overlooked. It may be quite frequent in western dune systems. A reduction in status to Notable more accurately reflects current knowledge of the distribution and rarity of the bug.

Threats Coastal developments and excessive public pressure leading to erosion may be threatening on some coastal sites, but otherwise most dune sites are probably not under any immediate threat; the habitat requirements of the bug do not seem to be so exacting as to be threatened by details of management. The East Anglian breckland has suffered considerably from coniferisation, conversion to permanent agriculture, and from loss of rabbit grazing through myxomatosis leading to scrub invasion and dominance by coarse vegetation. This must already have considerably reduced the area of habitat available to the species, and continues to threaten remaining areas.

Conservation Coastal sites in general require no active conservation measures beyond site protection. Introduction, or re-introduction, of grazing onto dune grassland may be beneficial in dunes with extensive growth of coarse grasses. In inland grassland and heath sites, management should aim to maintain an open structure of vegetation, ideally with areas of short vegetation and bare ground. Grazing is the best way of maintaining

suitable conditions, and rabbit grazing produces the best structure. Rabbit populations should be retained and encouraged wherever possible. Where rabbit grazing is inadequate to maintain suitable vegetation structure, stock grazing should be introduced, ideally as moderate grazing over the entire site. A rotational regime of grazing or cutting may provide a viable alternative, but is less desirable.

References Allen, A.A. (1958a), Allen, A.A. (1959), Clements, H.A.B. & Evans, I.M. (1973), Felton, J.C. (1964), Felton, J.C. (1975), Foster, A.P. (1987c), Masee, A.M. (1958b), Masee, A.M. (1962d), Pericart, J. (1987), Ryle, G.B. (1961), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Southwood, T.R.E. & Remane, R. (1956), Woodroffe, G.E. (1959c), Woodroffe, G.E. (1964a).

PROSTEMMA GUTTULA

EXTINCT

Order HEMIPTERA

Family NABIDAE

Prostemma guttula (Fabricius)

Identification Pericart (1987); Southwood & Leston (1959).

Distribution There are only four British records, all from the last century: from Charlton and from Sandwich Bay, Kent; from Llandudno, Caernarvon, and from Lancashire. It is widespread in central and southern Europe, and also occurs in North Africa, extending to the Middle East and Transcaucasus.

Habitat and ecology Found in dry sandy areas; the British specimens, where the habitat was recorded, were from coastal dunes. In Europe, there is one generation per year, with adults overwintering. Oviposition is in May and June, and adults of the new generation mature between August and mid-October. All stages are ground-dwelling, and the general preference would seem to be for fairly short vegetation with some bare sand. All members of the family are predacious.

Status Believed extinct. This is a large and conspicuous insect, which is unlikely to have been overlooked for such a long period. So few records might suggest a casual immigrant, but the distribution of records argues against this, and the bug is usually short-winged and unable to fly; its occurrence at four localities in the past would at least imply regular immigration and the establishment of temporary populations. This seems less likely than that it was formerly a true British native. If any populations do remain in Britain, they are most likely to occur in the relatively poorly worked dune systems of the west, particularly in Wales.

Threats At present, none known.

Conservation In the absence of a known established population, no positive conservation measures can be suggested. If a viable population is discovered, an attempt should be made to ascertain its population size, ecology and habitat requirements, and its protection should be afforded a high priority.

References Butler, E.A. (1923a), Groves, E.W. (1966), Masee, A.M. (1955a), Pericart, J. (1987), Saunders, E. (1892a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Walker, J.J. (1900).

ANTHOCORIS AMPLICOLLIS

RARE

Order HEMIPTERA

Family CIMICIDAE

Anthocoris amplifollis

Identification Crossley (1981); Jessop (1983); Pericart (1972).

Distribution So far known in Britain only from North-east Yorkshire, with records from Ashberry, Lowna (near Kirkby Moorside) and Riccal Dale (near Helmsley). All the sites are at the southern edge of the North Yorkshire Moors. On the continent it is a species of central and western lowland countries, extending north to Denmark and south Sweden, and east to Yugoslavia and Lithuania.

Habitat and ecology All the British specimens were taken from ash trees. On the continent the bug is known to be predacious on aphids of the genus *Prociphilus*, but these are very rare in Britain, and none could be found at one of the *A. amplicollis* sites despite specific search. The biology of the species is poorly known, but it is believed to overwinter as an adult.

Status Uncertain. The species was first reported in Britain in 1982, from specimens taken between 1978 and 1980. It was still present in the area of the original records in 1989. The genus *Anthocoris* contains a number of closely allied insects, and it is possible that the species may previously have been overlooked. However, examination of material in collections indicates that the species has not been widely missed, and it has not so far been found in the south of England, despite specific search by a number of workers. The extent of potentially suitable habitat in the north, however, is considerable, and it is likely to be some years before it will have been sufficiently worked to enable a definitive statement of the status of the species to be made.

Threats No significant threats are known at present. Complete removal of ash trees from known or likely sites would clearly be damaging to particular populations, but the bug is not known to be particularly exacting in its habitat requirements beyond the simple presence of ash trees, so there is no reason for this to prove a major threat overall.

Conservation On known and likely sites, continuity of ash trees should be ensured. Further survey of ash elsewhere in the country is needed to establish the British status of the species.

References Crossley, R. (1981), Crossley, R. (1982), Jessop, L. (1983), Pericart, J. (1972).

ANTHOCORIS MINKI

RARE

Order HEMIPTERA

Family CIMICIDAE

Anthocoris minki Dohrn

Identification Jessop (1983); Pericart (1972).

Distribution So far recorded in Britain only from the towpath by the Thames at Kew, Surrey, and from Three Locks, Soulbury, Buckinghamshire.

Habitat and ecology At the known British sites *A. minki* occurs on Lombardy poplar *Populus nigra* var. *italica*. The immature stages are passed in galls caused by aphids. At Kew, they occur in spiral galls of *Pemphigus spirothecae*. In mainland Europe it has also been recorded from black poplar *Populus nigra*, white poplar *Populus alba* and *Populus pyramidalis*, and in association with the aphids *Pemphigus bursarius*, *P. filaginis* and *Chaitophorus leucomelas*. The infestation rate of galls at the Kew site is roughly two per cent. So far as is known, there is one generation per year, with adults overwintering. Adults are believed to hibernate.

Status Uncertain. This species was not reported from Britain until 1983. Older records bearing this name refer to *A. simulans*. It will be some years before the true status of the species in Britain can be assessed. Search for the species at a number of other sites has proved negative, but there would seem no reason why it should not occur elsewhere in the south-east of England; suitable hosts are abundant, and the known sites do not appear to show any particularly outstanding features which might explain why the bug should be restricted to them. It is possible that the bug has been overlooked elsewhere, since its habits mean that it must usually be specifically searched for, and it is probably usually uncommon even on the trees on which it occurs. Lombardy poplar is not a native British plant, and the bug may well be an introduction or recent arrival.

Threats The only identifiable threat at present is the loss of poplars from known sites for the species. There is no known ecological requirement beyond the presence of host trees with a good population of galls.

Conservation Continuity of poplars at the known sites should be ensured by the planting of replacement trees for any which are lost. The species should be looked for elsewhere, and the status of the species in Britain elucidated.

References Jessop, L. (1983), Pericart, J. (1972).

ANTHOCORIS VISCI

NOTABLE

Order HEMIPTERA

Family CIMICIDAE

Anthocoris visci Douglas

Identification Jessop (1983); Pericart (1972); Southwood & Leston (1959).

Distribution Most records are from southern England, but there are also records from Wales. It has been recorded from Norfolk, Worcestershire, Herefordshire, Kent, Dorset, Somerset, Bedfordshire, Monmouthshire and Denbighshire. It is otherwise recorded from France, Holland, Spain, Germany, Yugoslavia and southern Russia, and is seemingly local throughout its European range.

Habitat and ecology *A. visci* occurs on mistletoe, *Viscum album*, where it is a predator of the mistletoe psyllid *Psylla visci*. Adults have most often been recorded between August and October, and nymphs have been found in July. Adults overwinter, probably beneath bark on the host tree of the mistletoe. Eggs are laid in the spring, singly or in groups of two or three, beneath the epidermis of young mistletoe leaves. There may be two generations per year.

Status Very local. The host-plant itself is rather scarce over much of its British range, and *A. visci* appears to be absent from many sites in which its host occurs. It is probably under-recorded, because of the inaccessibility of mistletoe clumps on many sites.

Threats Destruction of old and neglected orchards with extensive growth of mistletoe; removal of accessible mistletoe for Christmas decoration or for other reasons; coniferisation of woodland; replacement of open-structured broadleaved woodland by plantations of by uniform plantations, leading to conditions too shady to support good growth of mistletoe.

Conservation Trees supporting mistletoe should be retained wherever possible. Where the mistletoe population on a site is low, continuity of supply should be ensured by the introduction of the plant to further trees.

References Butler, E.A. (1923a), Douglas, J.W. (1889), Foster, A.P. (1987c), Ing, B. (1979), Jessop, L. (1983), Masee, A.M. (1941b), Masee, A.M. (1963b), Nau, B.S. (1980a), Pericart, J. (1972), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959).

CIMEX COLUMBARIUS

RARE

Order HEMIPTERA

Family CIMICIDAE

Cimex columbarius Jenyns

Identification Pericart (1972); Southwood & Leston (1959).

Distribution This species has been widely recorded in England, but separation from the common bed-bug, *C. lectularius*, which can occur in similar situations, is not easy, and some records may be erroneous. There are reliable records from Shropshire, Northamptonshire, Cambridgeshire and Northamptonshire, and it is quite likely that the species was more widespread. It probably occurs throughout north-west Europe.

Habitat and ecology *C. columbarius* is a parasite of pigeons. Most authenticated records come from pigeon cotes, with the domestic pigeon, *Columba palumbus*, being the host. It has been suggested that only wooden dove-cotes, in which birds are crowded and temperatures may be high, are suitable for the bug, and that it does not occur in roosts in and around buildings. There appears to be no record of a natural reservoir for the species in Britain. It is very closely related to the human bed-bug, *Cimex lectularius*, and has frequently been treated as a sub-species. The two will hybridise readily in the laboratory. The ecology and life-history of *C. columbarius*

has not been studied in detail in the wild, but cultures have been maintained under laboratory conditions. The bugs are nocturnal, spending the day hidden in cracks and crevices, emerging at night to feed, when they will take two or more times their own weight in blood. At least one feed is necessary in each instar, and females must feed before oviposition. Starved bugs can live for a considerable time; in the related *C. lectularius* a starved adult in captivity can live for about a year, a nymph for about three months. Breeding can occur throughout the year if temperatures are high enough. In *C. lectularius* development ceases if the temperature falls below 13 degrees Celsius for any length of time. If such a low temperature is maintained for a long period (for example, the whole of the winter months) eggs and larvae fail to survive and a large proportion of females fail to oviposit after a rise in temperature. If the same is true of *C. columbarius* it may be unable to survive in Britain outside artificially warm or crowded conditions. Eggs are attached to hard surfaces, and a single female may lay several hundred over a period of six months or more, the number and frequency of eggs depending on the number and size of blood meals. Developmental time is very variable, depending on both temperature and the availability of blood meals.

Status Rare, declined, and possibly extinct. There is no convincing evidence of the species ever having occurred in Britain outside the artificial conditions of dove-cotes, and such biological information as exists would suggest that it is probably unlikely to do so. It is unlikely that it was ever a true British native.

Threats The chief causes of decline in Britain have probably been the decrease in the use of wooden dove-cotes, and increasing standards of hygiene where domestic pigeons are kept.

Conservation It would seem likely that suitable conditions for the bug still exist in some pigeon lofts and dove-cotes in the country, and possibly also in some feral pigeon nesting sites and roosts, particularly in towns where they may be kept artificially warm. Populations of *C. columbarius* may therefore still exist, or be established by introduction on birds from mainland Europe. If it is re-discovered under any circumstances it is inappropriate to suggest active conservation measures.

References Johnson, C.G. (1940), Pericart, J. (1972), Southwood, T.R.E. & Leston, D. (1959), Usinger, R.L. (1966).

TEMNOSTETHUS TIBIALIS

RARE

Order HEMIPTERA

Family CIMICIDAE

Temnostethus tibialis Reuter

Identification Pericart (1972); Woodroffe (1971).

Distribution So far known in Britain from only three sites: Pamber Forest, Hampshire; Silwood Park, Berkshire, and Oxleas Wood, Kent. It is otherwise known from Jersey, Czechoslovakia, Rumania, Turkey and Crete.

Habitat and ecology On trunks and branches of trees. The British specimens were taken from the trunk of a fallen oak and beaten from a living oak. Its life history is probably similar to those of the other two British members of the genus: one generation per year, adults maturing in late July or August, and overwintering in cracks and beneath flaking bark on the host tree. All stages are predacious, probably on Psocoptera and other small insects.

Status Apparently rare and extremely local. The species was first reported in Britain in 1972, and there appear to have been no additional specimens recorded since then. It may have been overlooked in the past as one of the more common species, particularly if occurring in mixed populations, but the absence of recent records suggests that it is a genuine rarity. It would appear to be rare throughout its European range.

Threats It is likely that, in common with the other *Temnostethus* species, *T. tibialis* has a preference for trees growing in warm sunny, sheltered conditions, for example at a woodland or ride edge, on standards in an area of coppice, or on rows of trees on sheltered roadsides or hedgerows. If so, threats may include neglect of woodland management, leading to the development of densely shaded conditions unsuitable for the species; clearance of broadleaved woodland or its replacement with plantations of conifers or close-set plantations of

broadleaved trees; removal of roadside and hedgerow trees, or failure to replace trees in such situations which are lost. Oxleas Wood is threatened by road construction.

Conservation Woodland rides and clearings should be managed so as to be broad, open and sunny. Rideside coppicing and the creation of small rideside clearings may assist in this. Management of woodland as coppice-with-standards may also benefit the species; though re-introduction of coppicing to a neglected coppice woodland may increase the amount of available habitat, it is unlikely to be essential to maintain the bug. Hedgerow and roadside trees should be retained wherever possible, and a continuity of such trees ensured by planting or encouraging saplings to supply the next generation.

References Pericart, J. (1972), Woodroffe, G.E. (1972a).

XYLOCORIDEA BREVIPENNIS

NOTABLE

Order HEMIPTERA

Family CIMICIDAE

Xylocoridea brevipennis Rcuter

Identification Pericart (1972); Southwood & Leston (1959).

Distribution Southern England: recorded from Kent, Surrey, Dorset, Somerset, and Berkshire. Records from Suffolk and Glamorgan are apparently erroneous. It is otherwise known from central and southern Europe and North Africa, but the records are rather few and scattered.

Habitat and ecology A sub-cortical species, recorded from beneath bark of apple, hawthorn, alder, lime, sycamore and larch. Little is known of its ecology. Adults can probably be found throughout the year, and nymphs have been recorded in February and April, suggesting that it may not have a strictly seasonal life-cycle. Members of the family are predacious, but the food of *X. brevipennis* does not seem to have been recorded. The exact habitat requirements of the species are not obvious; it is clearly very much rarer and more local than the apparent abundance of suitable habitat might lead one to expect.

Status Rare and very local. A small and inconspicuous species of such obscure habits is clearly liable to be under-recorded, and it may well be both commoner and more widely distributed than the records currently available suggest.

Threats Uncertain. There is no clear indication of the exact habitat requirements of the species. Extensive loss of shrubs and trees from known sites would clearly be damaging.

Conservation No positive management recommendations can be given at present.

References Anderson, N.H. (1959), Butler, E.A. (1923a), Daltry, H.W. (1932b), Groves, E.W. (1967), Hallett, H.M. (1930), Hallett, H.M. (1936), Light, S.S. (1925), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Morley, C. (1905), Pericart, J. (1972), Saunders, E. (1898), Saunders, E. (1902a), Southwood, T.R.E. & Leston, D. (1959).

XYLOCORIS FORMICETORUM**NOTABLE**

Order HEMIPTERA

Family CIMICIDAE

Xylocoris formicetorum (Boheman)**Identification** Pericart (1972); Southwood & Leston (1959).**Distribution** Found at Westerham, Kent, in 1921-22, but otherwise recorded only from the Eastern Highlands of Scotland; known from Rannoch, Braemar, the Cairngorms NNR (Rothiemurchus, Inshriach, and near Loch an Eilean), Nethy Bridge, Meggernie Wood, and Bridge of Gairn.**Habitat and ecology** *X. formicetorum* occurs in nests of the wood ants. It has occurred with *Formica rufa* and *Formica lugubris*(?) in Britain. Elsewhere in Europe, it has occurred with *Formica sanguinea*, *F. truncicola*, *F. exsecta* and *Lasius flavus*. Adults have been found between March and October, and nymphs in April, June and August. Some nymphs, at least, reach maturity in September. There may be a single prolonged generation in each year. Members of the family are predacious, but the exact food of *X. formicetorum* does not seem to have been recorded.**Status** *X. formicetorum* has not been seen in Kent since 1922, and in all probability is now extinct there. It is seemingly extremely local in the Eastern Highlands of Scotland. It is difficult to estimate the likely extent of under-recording of this species. It is not easily recorded, and may yet prove to be rather more frequent and widely distributed than is currently known.**Threats** The main danger in the Highlands is loss of well-structured pine forest either through lack of regeneration resulting from grazing, or by afforestation with even-aged conifer plantations, which may be too shady for the survival of wood ant nests.**Conservation** Several recorded localities fall within the Cairngorms NNR. Here, and at a number of other Highland sites, the regeneration of pine forest is being encouraged.**References** Anon. (1907), Butler, E.A. (1923a), Donisthorpe, H. St J.K. (1907), Donisthorpe, H. St J.K. (1927), Douglas, J.W. & Scott, J. (1875), Groves, E.W. (1967), Masee, A.M. (1955a), Masee, A.M. (1962d), Pericart, J. (1972), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959), Woodroffe, G.E. (1970a).

MYRMEDOBIA COLEOPTRATA**NOTABLE**

Order HEMIPTERA

Family MICROPHYSIDAE

Myrmedobia coleoptrata (Fallen)**Identification** Pericart (1972); Southwood & Leston (1959).**Distribution** Widely distributed in England, but apparently largely southern. There are records from Westmorland, Lincolnshire, Huntingdonshire, Cambridgeshire, Buckinghamshire, Hertfordshire, Middlesex, Essex, Kent, Surrey, Berkshire, Hampshire and Cornwall.**Habitat and ecology** The ecology of this species is poorly known. It has been recorded beneath tree bark, in moss around tree trunks, amongst dead leaves beneath a hedge, and in ants' nests. There are several records from lichen-covered conifers. The association with ants is apparently indirect, the bugs feeding in part on small aphids tended by the ants, as well as on other small insects. It seems clear that they can occur in a variety of situations, and are probably associated with a particular microhabitat or particular microclimatic conditions in places where there is a good and consistent supply of prey. Most records are from woodland or from sites with considerable numbers of trees. There is great sexual dimorphism, the females being flightless and superficially similar to some small beetles, while the males are able to fly actively. Males mature and fly in June or early July, and are quite

short-lived. Females mature a little later than the males, and may climb plant stems and trunks to mate. Females are found until late August.

Status Uncertain, but apparently very local. It is a small species of inconspicuous appearance, cryptic habits and unpredictable occurrence, so there is great scope for under-recording. Even in sites where it is known to occur findings are few and unpredictable; G.E. Woodroffe took the species on three occasions in Windsor Forest in twelve years of collecting.

Threats No threats can be clearly identified in the present state of knowledge of the ecology and biology of the species.

Conservation No positive conservation measures can be suggested at present. Research into the habitat requirements and ecology at a known site would be of assistance.

References Butler, E.A. (1923a), Donisthorpe, H. St J.K. (1927), Douglas, J.W. (1874b), Groves, E.W. (1967), Massee, A.M. (1955a), Morris, M.G. (1970), Pericart, J. (1972), Russell, W.E. (1969a), Saunders, E. (1892a), Southgate, B.J. & Woodroffe, G.E. (1951), Southwood, T.R.E. & Leston, D. (1959), Woodroffe, G.E. (1963).

MYRMEDOBIA INCONSPICUA

NOTABLE

Order HEMIPTERA

Family MICROPHYSIDAE

Myrmedobia inconspicua (Douglas & Scott)

Identification Pericart (1972); Southwood & Leston (1959).

Distribution Southern and eastern coasts of England: recorded from Yorkshire, Suffolk, Sussex, Hampshire, Dorset, Devon, and Cornwall. It is otherwise known from Ireland, the Channel Isles, France and Italy.

Habitat and ecology This is a coastal species, which has been found at the roots of marram and other plants on dunes, on lichen-covered boulders, and amongst grassy vegetation immediately above rocky shores. Adults have been recorded between June and September, and nymphs have been found in June, but the life history is otherwise little known. There is great sexual dimorphism, the females being short-winged and flightless, the males fully winged and flying actively in sunshine. Members of the family are predacious, but no specific records of the prey of *M. inconspicua* appear to have been made.

Status Uncertain, but apparently very local. It is a small and inconspicuous species of rather cryptic habits, and hence liable to be under-recorded.

Threats It is difficult to identify specific threats to the species in the current state of knowledge of its biology and habitat requirements. Any generalised threat to dry coastal sites, such as coastal developments and erosion through public pressure, are potential threats.

Conservation In general, no active conservation measures should be needed beyond site protection.

References Brown, J.M. (1950), Butler, E.A. (1905), Butler, E.A. (1909a), Butler, E.A. (1923a), Champion, G.C. (1897), Champion, G.C. (1908b), Dale, C.W. (1886), Douglas, J.W. & Scott, J. (1871b), Massee, A.M. (1955a), Morley, C. (1905), Morley, C. (1911), Pericart, J. (1972), Saunders, E. (1889), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959), Walker, J.J. (1933), Woodroffe, G.E. (1966d).

Adelphocoris seticornis (Fabricius)

Identification Southwood & Leston (1959).

Distribution *A. seticornis* has a wide but scattered distribution in Britain. There are records from Yorkshire, Norfolk, Kent, Surrey, Hampshire, Dorset, Devon, Somerset, Pembrokeshire and Perthshire. It is widely distributed in Europe and northern Asia.

Habitat and ecology The food-plants are members of the Leguminosae: bird's-foot trefoil *Lotus corniculatus*, large bird's-foot trefoil *Lotus uliginosus*, meadow vetchling *Lathyrus pratensis* and tufted vetch *Vicia cracca* have been recorded, and bird's-foot *Ornithopus perpusillus* has been suggested as the host for one south coast colony. It is chiefly associated with tall vegetation in damp places, such as the margins of ditches in grazing levels, or in water meadows, but it has also been taken from *Lotus corniculatus* growing in shorter vegetation in a disused chalk-pit, so is clearly not especially restricted in its habitat requirements. There is one generation per year. The eggs, which overwinter, are laid in the upper parts of the stems of the food plants. Adults occur from early July until late September. Adults and nymphs feed especially on the unripe fruits of their hosts.

Status *A. seticornis* is listed in Red Data Book category 3 (Rare) in Shirt (1987). However, given the very wide distribution of the species and the range of habitats and hosts from which it has been recorded, this would seem to overestimate the rarity of the species. A reduction to Notable more accurately reflects the likely true status of the species. It is, however, clearly extremely local. It is not easy to see why a species which feeds on a number of generally common plants, has a range which includes much of Britain, and apparently does not have unduly restrictive habitat requirements, should be so local. Small and very localised colonies may be overlooked, but it is a large and conspicuous insect so should not be widely overlooked, at least in the entomologically better-worked areas of Britain.

Threats Improvement and drainage of wet grasslands, and the clearance and intensive management of drains and ditches are probably the most serious threats overall. Since the bug forms rather small and localised colonies, and all life stages are spent in the upper and flowering parts of the plant, it is likely to be very sensitive to the effects of vegetation management. Cutting or heavy grazing of the whole of an area of grassland containing a colony of the bug in even a single year may well result in its extinction, as may clearance of any considerable length of ditch or drain margins in a single season. In drier sites lack of management leading to dominance by tall coarse grasses and to scrub invasion may be threatening, particularly on sites such as disused chalk-pits.

Conservation The tendency of *A. seticornis* to form small and very localised colonies presents the main problem in managing sites supporting the bug. It is important that a part of the area of foodplant used by the bug remains uncut and ungrazed, so that the upper and flowering portions of the plant remain untouched throughout the year. In damp grassland and along the margins of drains and ditches where these abut onto grassland the ideal management is light to moderate grazing, at a level sufficient to maintain floristic diversity and varied vegetation structure without complete grazing of the whole area. Rotational regimes of grazing or cutting are likely to be less satisfactory: their success will depend on the ease with which the bug disperses to newly available patches of suitable habitat in the vicinity, and at present this is not known. On dry grassland, cutting and grazing are less likely to damage the flowering parts, and the exact method of management is less likely to be critical. Once again, however, consistent low-level management over the whole of the site is likely to be preferable to rotational regimes. In sites on old mineral workings, management is likely to be needed in the long term to prevent excessive scrub invasion and dominance by coarse vegetation, unless there is a considerable rabbit population, or unless grazing can be introduced. Periodic scrub clearance is the minimum management which is likely to be necessary, but cutting of the vegetation or periodic disturbance of areas of ground may also be needed. Any such management should be undertaken in small blocks, and care should be taken not to include the whole of a colony of the bug in any one management block.

References Butler, E.A. (1909a), Butler, E.A. (1923a), Cropper, R.S. (1982), Edmonds, T. (1915), Foster, A.P. (1987c), Hill, A.R. (1946), Massee, A.M. (1955a), Massee, A.M. (1961b), Massee, A.M. (1962b), Saunders, E.

(1892a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1959i).

ADELPHOCORIS TICINENSIS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Adelphocoris ticinensis (Meyer-Dur)

Identification Southwood & Leston (1959).

Distribution Southern England, particularly the south-east. There are records from Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, Surrey, Sussex, Hampshire, Dorset, Somerset and Devon. It occurs throughout Europe, and the distribution extends to China, Japan and Siberia.

Habitat and ecology The foodplants are large bird's-foot trefoil *Lotus uliginosus*, and marsh pea *Lathyrus palustris*, growing in fens and marshes. There are records from other plants, but these are probably casual, and do not represent true hosts. In East Anglia it would seem to be chiefly a fenland species, but in the south of England is rather more widely distributed in marshy places such as the edges of pools and the margins of wet heaths. Some colonies appear to be rather small and localised, and the species does not seem to require a large area of suitable habitat. It is nonetheless very local in occurrence, and may be a relatively immobile species which is a poor coloniser. The eggs overwinter, and are inserted into the tissues of the host-plant. Adults occur from late July or early August, and some may survive until early October. Nymphs in captivity have fed on both large bird's-foot trefoil and on aphids taken from that and allied plants.

Status Very local. This is a large and easily recognised species which is relatively easy to find, and is probably not greatly under-recorded.

Threats Drainage of wetlands; lowering of water tables at wetland sites through drainage or water abstraction in surrounding land; neglect of wetland sites leading to scrub invasion and to dominance by coarse vegetation.

Conservation Water tables on wetland sites should be maintained at a level close to the soil surface. Management of vegetation should aim to retain diversity of both species and structure. This is probably best achieved by grazing, at a level which will maintain vegetation structure and composition but will leave some areas of the host plant ungrazed throughout the year. On sites which are too small, wet, or isolated for grazing, or which have been traditionally managed by cutting and on which it is felt that such management should continue, a rotational cutting regime provides a suitable alternative. It is essential that only a small proportion of the site is cut in any one year. If it is necessary to clear or cut ditch or pond margins at which the bug occurs, only a fraction of the margin should be managed in any one year. The bug is present on or in the plant at all times of the year, so any extensive destruction to the host in any season will be damaging.

References Appleton, D. (1984b), Bedwell, E.C. (1938), Butler, E.A. (1882b), Butler, E.A. (1909a), Butler, E.A. (1923a), Collett, E.P. (1928), Collett, H.R.P. (1927), Collins, J. (1929), Edwards, J. (1889), Edwards, J. (1894), Edwards, J. (1914), Ellis, E.A. (1939), Groves, E.W. (1975), Masee, A.M. (1955a), Morris, M.G. & Dolling, W. (1969), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959), Tottenham, H.R. (1908), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1955b).

Agnocoris reclairei (Wagner)

Identification Southwood & Leston (1959).

Distribution The distribution is centred on a limited area in Cambridgeshire, Huntingdonshire and Bedfordshire. It has occurred in West Suffolk near the Cambridgeshire border, but it appears not to have been recorded there for some time. There is a recent record from the Northamptonshire side of the river Nene in Peterborough. There are also two isolated recent records from Kent and Warwickshire.

Habitat and ecology *A. reclairei* usually occurs on large trees of white willow *Salix alba* in river valleys. It has also been recorded from other *Salix* species, but such occurrences are relatively infrequent and it is not clear whether breeding occurs other than on *S. alba* in Britain. The feeding habits are not known, but it is likely that it is at least partly phytophagous. Adults occur in August and September and hibernate under bark, in moss and leaf litter, and in conifers. They return to the host tree in the spring, and oviposit on the trees in May and early June. The distribution of the species up to the 1960s was very much a fenland one, though the insect occurred not only within fens, but also on willows beside rivers and broad ditches. In recent years it has been more widely recorded, particularly on large *Salix alba* trees around flooded gravel workings.

Status Within the central area of its distribution, *A. reclairei* is a quite frequent species, and occurs on a large proportion of sites supporting populations of mature white willows. The bug was not recognised in Britain until 1913, and was considered a great rarity for many years subsequently. Since it is easily captured and of distinctive appearance it should not have been widely overlooked. The Huntingdonshire and Cambridgeshire fens have long been well frequented by entomologists. *A. reclairei* may have undergone genuine spread and increase. The Kent and Warwickshire records, both of which are of breeding populations, may indicate that the spread is continuing.

Threats The only likely threat to the species is the loss of old *Salix alba* beside water or wetland. Possible causes are the drainage of wetland, the removal of riverside trees during river 'improvement' operations and clearance of trees along pools and drains and in hedgerows in the interests of agricultural intensification or changes in land use. A more insidious loss can occur through neglect; *Salix alba* ages quickly unless pollarded, and the removal of dangerous or broken trees, neglect of pollarding, and failure to replace lost trees can quickly deplete *S. alba* populations. Gravel pit populations are chiefly threatened through re-instatement and infilling of pits, and to a lesser extent by recreational use, which may be incompatible with the maintenance of populations of large willows.

Conservation Populations of *Salix alba*, including mature trees, should be maintained at sites where the bug occurs, and management should aim to ensure continuity of suitable hosts by planting or pollarding when necessary. Any sizable stand of large *Salix alba* within the known range of the bug should be regarded as a potential site for the species. *S. alba* elsewhere in the country should be examined for populations of the bug in order to determine its true status, and to monitor any spread which may be occurring.

References Butler, E.A. (1923a), Lane, S.A. (1989), Masee, A.M. (1953b), Masee, A.M. (1955a), Morris, M.G. (1972), Nau, B.S. (1977), Nau, B.S. (1985), Southwood, T.R.E. & Leston, D. (1959), Stroyan, H.L.G. (1941).

AMBLYTYLUS BREVICOLLIS**NOTABLE**

Order HEMIPTERA

Family MIRIDAE

Amblytylus brevicollis Fieber**Identification** Southwood & Leston (1959).

Distribution This species has been recorded from Dumfriesshire, Perthshire, Forfar, Yorkshire, Cumbria, Lancashire, Derbyshire, Norfolk, Buckinghamshire, Hertfordshire, Middlesex, Oxfordshire, Surrey, Sussex, and Hampshire. There is also a Scottish record from an unknown locality. However, it has been frequently confused with the related *Amblytylus nasutus*, and many records may be erroneous. Southwood & Leston (1959) suggest that all southern records may be incorrect, but there is a reliable recent record from Oxfordshire.

Habitat and ecology The typical habitat is dry grassland. The hair-grass *Aira divaricata* has been suggested as a host on the continent. This plant does not occur in Britain, but related fine grasses may be the hosts. Hill (1952) reports this species from raspberry plantations in Scotland. There is one generation per year, the eggs overwinter, probably in the stems of grasses. Adults occur from late June to mid-August.

Status *A. brevicollis* is certainly very local, but its exact status is uncertain owing to the unreliability of many records. The extreme scarcity of recent material certainly identified as this species justify placing it in the Notable category, but further recording and checking of specimens is needed before its status can be definitively assessed.

Threats Improvement or ploughing of dry grassland; neglect of grassland leading to scrub invasion and dominance by coarse vegetation; bracken invasion may be a particular problem in some sites.

Conservation Dry grassland on sites known or suspected to contain the bug should be so managed as to maintain a varied structure, including some which is fairly short and open. This is probably best achieved by moderate grazing. It may be preferable for stock to be excluded in the summer months unless stocking density is very low. Management regimes of rotational grazing or rotational cutting may be suitable, but the ecology of the bug is too poorly known at present to be sure of their effects.

References Butler, E.A. (1923a), Campbell, J.M. (1987), Crossley, R. (1981), Groves, E.W. (1968), Hill, A.R. (1952), Leston, D. (1953a), Masee, A.M. (1955a), Masee, A.M. (1962d), Murray, J. (1940), Saunders, E. (1890), Saunders, E. (1892d), Saunders, E. (1902a), Saunders, E. (1908a), Sharp, W.E. (1906), Southwood, T.R.E. & Leston, D. (1959), Thomas, D.C. (1938), Wagner, E. & Weber, H.H. (1964).

AMBLYTYLUS DELICATUS**RARE**

Order HEMIPTERA

Family MIRIDAE

Amblytylus delicatus (Perris)**Identification** Southwood & Leston (1959).

Distribution Recorded from Woking and Witley, Surrey, in 1888 and 1958 respectively, and from Cranborne, Dorset, in 1937. Masee (1955) also lists Suffolk in the distribution for the species. A record for Bedfordshire is now known to be erroneous. It is otherwise recorded only from Germany and France.

Habitat and ecology The foodplant is common cudweed *Filago germanica*, which grows on dry, thinly-vegetated places, particularly on sandy and rather acid substrates. There are continental records of the species from other species of *Filago* and from *Micropus erectus*. The first record of the species was from recently disturbed ground on a roadside, and the second Surrey record was from degraded heathland. All the confirmed British records are from heathy areas, and it seems likely that the bug forms very small and localised colonies on suitable stands of the host plant, and that it is able to colonise suitable new patches when they

appear. The exact factors determining the suitability or otherwise of a given stand of the plant are not clear, however. The host-plant is certainly not uncommon, and large stands of it can occur without the bug being present. It is possible that it sometimes escapes detection as a result of occurring at low density. Saunders recorded only "a few after many hours search". There is one generation per year, overwintering in the egg. Nymphs have been recorded in late June, and adults from the second week in July until mid-August. Nymphs have been reared in captivity on common cudweed.

Status Rare and very local. The long gaps between records make it clear that the species can be easily overlooked, and must be rather under-recorded, but it is certainly a rarity even in those areas where it has been recorded in the past.

Threats Loss of open and disturbed areas on heaths and dry grassland through lack of management and loss of rabbit grazing, leading to dominance by coarse vegetation and to scrub invasion; destruction of open heathland, sparse grassland and waste ground by development and conversion to agriculture. Though there are no records of the bug from arable land, common cudweed can grow as an arable weed, and modern use of herbicides and pesticides may have affected some populations.

Conservation Heaths and dry grasslands within the known range of the species should be managed so as to retain a good range of vegetation structure, including some sparsely vegetated ground with low plants, including common cudweed. Such management is probably best provided by grazing. Rabbit grazing is probably best, but rabbit populations are likely to be inadequate to maintain suitable conditions in most sites. Grazing by stock may provide a suitable alternative where this is feasible. Management by cutting alone is unlikely to provide suitable conditions, since it does not produce close-cropping and ground disturbance. A regime of management which combines rotational cutting with periodic ground disturbance to encourage a ruderal flora may be more suitable. Burning is probably the least suitable of management techniques. It seems likely that all stages of the bug are found in or on above-ground parts of the host-plant, and are thus liable to be destroyed by burning in whatever season the management is undertaken. Where there are areas of waste ground supporting ruderals in the vicinity of heathland, the ruderal communities should be retained, at least in part. Management in such places is likely to require periodic ground disturbance, for example by rotovating. In some sites disturbance may be provided by the activities of rabbits, and rabbit populations should be maintained or encouraged wherever possible.

References Butler, E.A. (1923a), Groves, E.W. (1968), Harwood, P. (1937a), Leston, D. (1961a), Masee, A.M. (1955a), Nau, B.S. (1972), Saunders, E. (1888b), Saunders, E. (1892a), Saunders, E. (1902a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1959a).

CAPSODES FLAVOMARGINATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Capsodes flavomarginatus (Donovan)

Identification Southwood & Leston (1959).

Distribution A southern species, recorded from Staffordshire, Suffolk, Essex, Kent, Berkshire, Sussex, Hampshire, Devon and Cornwall. It is widely distributed in Europe.

Habitat and ecology *C. flavomarginatus* is usually found on large bird's-foot trefoil *Lotus uliginosus* in damp woodland rides. A number of workers have associated it with common cow-wheat *Melampyrum pratense*, but there is no evidence that this is a host plant. Nymphs have been successfully reared on large bird's-foot trefoil. It is recorded from a much wider range of plants elsewhere in Europe, and may not be restricted to *lotus* in Britain. There is a record of two specimens being found on broom in Kent. The exact habitat requirements of the species are not entirely clear, since it very much more local than are apparently suitable habitats, even within its restricted southern range. It seems likely that it is either restricted to areas of particularly favourable climate, or is a relatively immobile species confined to sites with a long history of suitable conditions. There is a record of the species from "waste ground" and several others which are from areas not heavily wooded. It may well be less tied to woodland in the south west of Britain than in the south east. There is one generation per year.

The eggs overwinter, and are probably laid in the stems of the host-plant. Adults are found from early June until early August. Though largely phytophagous, both adults and nymphs will also eat aphids in captivity.

Status Very local, and probably declined at least in the south east. It is possibly under recorded in the south western counties.

Threats The chief cause of decline, and the chief current threat, is probably from changes in woodland management. Neglect of woodlands, particularly those formerly under coppice management, leads to shading of rides and clearings and the development of cool dark conditions unsuitable for the bug, and even for its host plant. Conversion of mixed broadleaved woodland to plantations of either broadleaves or conifers will also often be destructive, at least in the long term, unless particular care is taken in ride maintenance.

Conservation Rides and clearings in woodlands should be kept broad and sunny by regular management. Rideside coppicing and the creation of small rideside clearings may be useful. Where cutting is necessary, only a part of any given ride should be cut in any given year. Rideside drains should be cleared only when absolutely essential, and only a small proportion of the marginal vegetation should be cleared in any one year.

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CAPSODES SULCATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Capsodes sulcatus (Fieber)

Identification Southwood & Leston (1959).

Distribution South-western England. Recorded from Sussex, Hampshire (including the Isle of Wight), Dorset, Somerset, Devon and Cornwall. There is also an isolated, and surprising, record from Cheshire, which may be an error. It is otherwise a chiefly Mediterranean species, recorded from France, Spain, Portugal and Sardinia.

Habitat and ecology In Britain, *C. sulcatus* is chiefly associated with members of the Leguminosae. Nymphs have been recorded from common vetch *Vicia sativa*, bird's-foot trefoil *Lotus corniculatus*, clover *Trifolium* sp., black medick *Medicago lupulina*, and meadow vetchling *Lathyrus pratensis*, and have been reared on the last-named. It is, however, probably polyphagous. Nymphs and adults have been found on heath bedstraw *Galium saxatile* in Dorset and adults have been found in numbers on stinking iris *Iris foetidissima* on the Isle of Wight. The only legume in the vicinity being gorse *Ulex europaeus*. The bug has been recorded from a wider range of hosts on the continent. Almost all the records are coastal, but there is an isolated inland record from the New Forest. It is found in open sunny places, but the vegetation can vary from quite sparse clumps of plants in otherwise bare ground to moderately tall grassland. It can be a local insect, colonies occurring over a comparatively short stretch of coast when further, apparently suitable, habitat is available over a greater distance. A need for a particular local climate is probably implied; sites are often south-facing and rather sheltered. There is one generation per year. The eggs overwinter, and are probably laid in the stems of the host plants. Adults are found from June to early August.

Status Local. Colonies may be relatively frequent on the south coasts of Devon and Cornwall, but go unrecorded because they are of limited size and extent. It would seem certainly to be very local further east and north, however. The only Somerset record dates from the last century.

Threats Coastal developments; heavy public pressure leading to erosion of vegetation. Woodroffe (1969) records one site in Hampshire which was largely destroyed by trampling between 1955 and 1967. Loss of rabbit-grazing as a result of myxomatosis has had a significant effect on coastal vegetation in parts of the south-west. It is not

known to what extent such changes may have adversely affected *C. sulcatus*, which usually occurs in fairly tall vegetation, but such changes are certainly a potential threat.

Conservation Coastal sites should be managed to retain as wide as possible a range of structure, which should ideally include both low vegetation and taller grassland with legumes. Such conditions may be largely self-maintaining on many sites. Where there is evidence of considerable vegetation change resulting from reduction in grazing pressures, efforts should be made to introduce stock grazing. Sites should not be over-grazed, however: all life stages of the bug are found on exposed parts of the host-plant, and tight grazing may destroy the population. For the same reason, where cutting is contemplated as a management tool, only a part of a site should be cut in any one year.

References Appleton, D. (1984a), Bignell, G.C. (1889), Bignell, G.C. (1906), Blathwayt, L. (1906), Butler, E.A. (1905), Butler, E.A. (1909a), Butler, E.A. (1923a), Clark, J. (1906), Ehanno, B. (1980), Francis, H. (1888), Jones, H.P. (1929), Masee, A.M. (1955a), Parsons, M.S. (1987a), Saunders, E. (1876), Saunders, E. (1892a), Saunders, E. (1900a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1956c), Woodroffe, G.E. (1958d), Woodroffe, G.E. (1970b).

CAPSUS WAGNERI

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Capsus wagneri Remane

Identification Southwood & Leston (1959); Wagner & Weber (1964). Misidentifications have resulted in the past from reliance on the proportions of the second antennal segment, which can be misjudged. Examination of the male genitalia is desirable for confirmation.

Distribution There are confirmed records from Somerset (Shapwick); Cambridgeshire (Wicken Fen; Peterborough, Ferry Meadows); Norfolk (Catfield Fen); Northamptonshire (margin of the river Nene near Castor); Huntingdonshire (Woodwalton Fen); Lincolnshire (Baston Fen); Yorkshire (Askham Bog, Melbourne Marshes, Ellerton Ings, Aughton Ings, Ulleskelf Mires and Hatfield Moor), and Sussex (Bury, Coldwaltham and Pulborough). Butler (1923) describes a specimen of *Capsus* from Amberley, Sussex, which may well be var. *rufescens* of *C. wagneri*. Woodroffe (1962) recorded the species from Rhum, Inner Hebrides, and referred to the existence of other, unpublished, Scottish records. *C. wagneri* does not appear on later published lists from Rhum, and may have been in error. There are also two unconfirmed Leicestershire records.

Habitat and ecology *C. wagneri* is a wetland species. It has been associated with purple smallreed *Calamagrostis canescens*, in its fenland localities, but has also been taken at sites where no *Calamagrostis* grows. It has been found on reed canary-grass *Phalaris arundinacea*, and may feed on a number of grass species. It has been found in fens, marshes and wet grassland. Though it does not seem unduly restricted in its habitat requirements, all confirmed records are from sites with a long history of wetland conditions. Some unconfirmed records are largely from relatively undistinguished marshy sites. Adults have mostly been recorded in the second half of June and in July. There is one generation per year, presumably overwintering in the egg.

Status Apparently very local and rare, but possibly under-recorded. The bug is superficially similar to the common and widely distributed *Capsus ater*, and may therefore be overlooked in the field. The known distribution is sufficiently wide to give reason to expect further records. However, specific searches in apparently suitable habitats within the known range of the species has proved negative, so it unlikely that it is very widely overlooked.

Threats Drainage of fens and marshes; lowering of the water table on wetland sites as a result of water abstraction and drainage in surrounding land; neglect of formerly managed fens, marshes, and marshy grassland leading to scrub invasion and dominance by coarse vegetation. Hatfield Moor has been almost entirely destroyed by peat extraction and gravel digging.

Conservation Woodwalton Fen and the Isle of Rhum are National Nature Reserves. Wicken Fen is an SSSI and a property of the National Trust. Baston Fen is an SSSI and a reserve of the Lincolnshire and South Humberside Trust for Nature Conservation. Askham Bog is a reserve of the Yorkshire Wildlife Trust and an SSSI. Hatfield Moor is an SSSI. Melbourne Marshes are within the Melbourne and Thornton Ings SSSI, and Ellerton and Aughton Ings are within the Derwent Ings SSSI. The Somerset record is from an SSSI. Management of sites should aim to maintain sizeable areas of tall flowering grasses. The ideal management is probably light to moderate grazing. Management by cutting is likely to be traditional on some sites, and may be the only practicable management technique in some cases. A rotational programme of cutting should be used, whereby only a limited area is cut in any one year. Water levels must be kept high to maintain good wetland vegetation, but there is no evidence that *C. wagneri* is very restricted in its requirements within its sites, and exact water levels may be less critical than for many other wetland species.

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CHARAGOCHILUS WEBERI

RARE

Order HEMIPTERA

Family MIRIDAE

Charagochilus weberi (Wagner)

Identification Wagner & Weber (1964); Woodroffe (1965).

Distribution *C. weberi* was first recognised in Britain from specimens taken in Pamber Forest, Hampshire, in 1959. It was subsequently recorded from Blean Woods, Kent, in 1964. There are old records of "macropterous" specimens of the common *C. gyllenhali*, which are believed in fact to refer to *C. weberi*. Butler (1923) reported having taken two specimens of this form, though without giving a locality, and also gave a record from Perthshire. Douglas (1880) reports a single male "*Charagochilus gyllenhali* macropter" from Darenth Wood, Kent. On the continent, it is recorded from Germany, Austria, Spain, France, Italy and Sicily.

Habitat and ecology In Britain *C. weberi* has been found on common cow-wheat *Melampyrum pratense*, and has been seen feeding on that plant. On the continent it has also been associated with *Odontites lutea*; this plant is not found in Britain, but it is possible that there are other British host-plants. The habitat in Pamber Forest was in woodland with light shade cast by standard oaks and light bracken cover. Dense stands of *Melampyrum* in more open conditions did not support the bug. It is possible that if the bug occurs further to the north and west it may be less demanding of such conditions. So far as is known, the life history is similar to that of the commoner *C. gyllenhali*, with adults overwintering in moss, litter or conifers, ovipositing in the stems and/or leaves of the host-plant in May or June, and nymphs maturing in late July or August. In Pamber Forest, adults of *C. weberi* were recorded in September and later, and again in the spring.

Status Very local. The absence of recent records, despite a fairly long adult season, known habitat and host-plant, and a period of over 25 years since its recognition in Britain, would seem to imply genuine rarity. It seems quite likely, however, that further localities exist, particularly in the north and west.

Threats The paucity of records of the species makes specific threats difficult to identify. The recorded habitat in Britain suggests that in the south-east it is a species of coppice woodland and of woodland rides, and that the degree of shading is critical. The major threats in recent decades are therefore likely to have been woodland clearance, conversion of former coppice woodland to uniform plantations, either of conifers or broadleaves, and the neglect of previously managed woodland, leading to loss of coppice structure and the shading of rides.

Conservation Pamber Forest is an LNR; Blean Woods is an SSSI, and in part an NNR and an RSPB reserve. The habitat of known colonies of the species should be maintained in a suitable state of light shading: this will be best determined by examining the conditions at an established colony, and maintaining them. Where suitable conditions are present only over a very limited area, increasing the extent of suitable habitat, particularly by thinning of trees, or re-coppicing neglected stools, may be advisable. In possible or likely sites from which the

species has not been recorded, the maintenance of a range of degrees of shading, by appropriate thinning, by coppicing, or by careful ride management, so as to include some areas of lightly shaded *Melampyrum*, is desirable. Rides should be broad, open and sunny, and where possible good-sized stands of *Melampyrum* should be kept partly in shade and partly in the open. The re-introduction of coppicing into neglected coppice woodlands should benefit the species, but it is not likely that this will be necessary for the maintenance of the species in any given site, provided careful attention is given to the management of rides. Any necessary woodland management is probably best carried out in the winter months, but thought should be given to the needs of the hibernating adults: extensive clearance and widespread damage to the vegetation and litter of the woodland floor may destroy a large proportion of the population. The management requirements of the species may be different in different parts of its range, and note should be taken of the ecology of the species in any site away from the south-east.

References Brough, P. (1984), Butler, E.A. (1923a), Douglas, J.W. (1880), Masee, A.M. (1965e), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1966c).

CHLAMYDATUS EVANESCENS

RARE

Order HEMIPTERA

Family MIRIDAE

Chlamydatus evanescens (Boheman)

Identification Southwood & Leston (1959).

Distribution Recorded from Colwyn Bay, Denbighshire (1890); near Conway, Caernarvonshire (1924); and from the Staffordshire side of Dovedale (1930, 1936). Masee (1955) lists the species from Cheshire, possibly in error. Conway and Colwyn Bay, though in different counties, are quite close, and these records may well represent a single limited area of distribution, perhaps centred on the Great Orme's Head.

Habitat and ecology The foodplants are stonecrops *Sedum* spp. In Britain it has been found on wall pepper, *Sedum acre*. On the continent, it has been found in association with other *Sedum* spp., including white stonecrop *S. album* and a cultivar of *Sedum boloniense*. There is seemingly a preference for stonecrops with small elliptical leaves, but the bug has been reared in captivity of the broad-leaved *Sedum sempervivum*. The Staffordshire site is on a steep south-facing hillside with exposed rock and scree. At the Conway site, the *Sedum* was growing "in the shelter of heath and gorse". The bug apparently requires open ground with good growth of *Sedum* in sunny, usually south-facing, situations. British records are from limestone, but it has been recorded from sandy substrates elsewhere in Europe. There are two generations per year. Adults overwinter, laying eggs in the leaves of the host plant in May. The first generation becomes adult in June or early July, and the second generation in late August, September, or October. In the Netherlands, adults have been observed to be active, and to mate, in sunny weather in February when the temperature was only just above zero. In cool wet weather in summer, however, the bugs are inactive.

Status *C. evanescens* is clearly extremely local. Though it is a small and obscure insect which could be overlooked, its foodplant is well-known and easy to examine, and the bug has a long season. It is unlikely to have been widely overlooked in southern counties, but further populations may be present on, for example, coastal cliffs and inland scree, which may be difficult to search. Outside Britain, it is widespread in northern and central Europe. There is some evidence of a spread in recent decades.

Threats Threats are difficult to specify, since no populations are currently known. The host-plant is dependent on dry, open, sunny conditions. The likeliest threat to such conditions is scrub invasion or growth of coarse vegetation leading to shading, particularly as a result of cessation of grazing on marginal land or loss of rabbit grazing through myxomatosis. In the North Wales sites, development of coastal sites and erosion of vegetation through heavy public pressure may both be problems. The Colwyn Bay site is known to have been destroyed by development by the early years of the century.

Conservation The Dovedale site is still grazed by sheep, and is sufficiently unstable that open ground is in part self-sustaining. The area in which the bug was captured is in private ownership, but much of the dale is a property of the National Trust, and the bug may occur elsewhere. The site is a SSSI. No other precise localities

are known. More information is needed on the status and distribution of the bug before exact conservation recommendations can be made. The areas in which the species was found in the past should be re-surveyed to establish whether it is still present, and apparently suitable habitats elsewhere, particularly in North Wales and the limestone dales of the north midlands and northern England, should also be examined. On known sites, management should aim to maintain open, sunny, and perhaps sheltered conditions suitable for the growth of good stands of *Sedum*. There is every reason to suppose that if the host-plant is encouraged, the bug will be able to thrive.

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CHLAMYDATUS PULICARIUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Chlamydatus pulicarius (Fallen)

Identification Southwood & Leston (1959); Wagner & Weber (1964).

Distribution *C. pulicarius* is widely distributed in Britain. It has been recorded from Inverness-shire (Glen Affric area, several sites in the Cairngorms NNR and on Speyside), South Yorkshire (Town Moor, Doncaster), Oxfordshire (Wychwood Forest), and Suffolk (Barton Mills, Wangford Warren and Icklingham). It is widely distributed in northern Europe, and extends east to Siberia.

Habitat and ecology The biology and ecology of the species are poorly known. It has been recorded from a grassy riverside terrace, from fine grass and bedstraws in a woodland ride, and from dry breckland. All recorded habitats are well-drained, open, and grassy with fairly short vegetation. Adults have been recorded in June, July and August, and adults were found to be maturing at the end of June in the Cairngorms NNR. It seems likely that, as with the related *C. pullus*, eggs overwinter and there are two generations per year. *C. pulicarius* is believed to be phytophagous, but the host-plants in Britain are not known. Observations elsewhere in Europe suggest that it is polyphagous. It is a largely ground-dwelling species, but has also been taken by sweeping grasses, so clearly climbs vegetation on occasion.

Status *C. pulicarius* was included in Red Data Book category 3 (Rare) in Shirt (1987). It seems that this is an overestimate of its rarity. It has a wide distribution and its habitat requirements are apparently not unduly restrictive. It was only recognised in Britain in 1959, and is superficially similar to the common *C. pullus*, with which it can occur. There is a strong likelihood of under-recording. Reduction of the status of the species to Notable better reflects current knowledge.

Threats In known sites, any factors leading to the loss of open grassy conditions and short or sparse vegetation are likely to be threatening to the bug. Chief among such factors is succession leading to dominance by coarse grasses and to scrub invasion, particularly as a result of cessation of stock grazing or loss of rabbit grazing through myxomatosis. In woodland sites, lack of management leading to shading and scrubbing over of rides and clearings may pose a particular threat.

Conservation Areas of grassland known to support the species should be managed so as to maintain short or sparse grassy vegetation. The best management to achieve this is grazing. In breckland sites, and perhaps also in other areas, rabbit grazing has provided suitable conditions for some time, and probably produces the best vegetation structure overall. Rabbit grazing should be maintained or encouraged wherever possible. Stock should ideally be grazed at low density over the entire site. Rotational grazing or cutting may be used if uniform grazing is not possible, but the tolerance of the bug to such management is not known. Where grassland is cut, occasional localised substrate disturbance may be helpful in maintaining open conditions.

References Campbell, J.I. (1959), Campbell, J.M. (1987), Foster, A.P. (1987a), Foster, S. (1986), Lansbury, I. (1961), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1965c), Woodroffe, G.E. (1968a).

DERAEOCORIS OLIVACEUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Deraeocoris olivaceus (Fabricius)**Identification** Southwood & Leston (1959).**Distribution** South-eastern England. Recorded from Surrey, Berkshire, Middlesex, Buckinghamshire, Essex and Sussex. It is widely distributed in central and southern Europe.**Habitat and ecology** The usual host-plant is hawthorn *Crataegus monogyna*, and there is a preference for large heavily-fruited hawthorns in rough grassland or other open situations. On the continent it has also been recorded from *Pyrus* and *Prunus*. Nymphs reared in captivity have fed on both hawthorn berries and aphids. There is one generation per year. Eggs, laid in the host plant, overwinter; nymphs occur in May and early June, and adults are found in June and July.**Status** *D. olivaceus* was first discovered in Britain in 1951, and may well be a recent arrival. It is a large insect unlikely to be confused with any other British species, and its distribution is centred on one of the entomologically better-known areas of Britain. It is unlikely that it would have been overlooked for so long if it were a true native. On the other hand, it is still very local, is usually found in small numbers, and is frequently high on the bushes. It remains possible that it is a true British native which was formerly sufficiently rare to have escaped notice. Even allowing for the recent apparent spread, it remains a very local species.**Threats** Loss of large fruited hawthorns in grassland and other open habitats. This may occur through clearance of land for development or agricultural intensification; through death of old hawthorns in pasture (as, for example, where they are the remnants of old and neglected hedgerows); the bringing back into management of old and neglected pastures, hedgerows and areas of scrub, and perhaps also increase in density of scrub on sites where it was previously relatively scattered and open. The latter circumstance may occur where grazing or cutting ceases on previously managed grassland, but it is not clear exactly how damaging it might be. Most records of *D. olivaceus* come from fairly isolated bushes, but this may simply be a reflection that the bug is more easily found on such bushes. Populations in the canopy of tall dense scrub would be very difficult to sample.**Conservation** Management of sites containing large fruited hawthorns within the known range of the species should include the retention of at least a few large bushes, and ensuring that a younger generation of bushes is allowed to grow to provide replacements for any older specimens which may be lost through age, disease or accident. The best arrangement is probably a loose grouping of bushes, with a few feet separating individuals. In this way, competition is minimised so that each bush gives good growth and a good fruit crop, while at the same time the bushes provide mutual shelter.**References** Groves, E.W. (1968), Groves, E.W. (1986), Masee, A.M. (1955a), Sands, W.A. (1954), Southwood, T.R.E. & Leston, D. (1959), Tomlinson, R. (1971), Verdcourt, B. (1981), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1954), Woodroffe, G.E. (1956b), Woodroffe, G.E. (1959a), Woodroffe, G.E. (1963).

DICHROOSCYTUS GUSTAVI

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Dichrooscytus gustavi Josifov**Identification** Southwood & Leston (1959) (as *D. valesianus*).**Distribution** Southern England. There are records from Oxfordshire, Buckinghamshire, Berkshire, Kent, Surrey, Sussex, Wiltshire, and Worcestershire. It is otherwise largely a species of central and western Europe.

Habitat and ecology *D. gustavi* usually occurs on juniper *Juniperus communis*, on chalk downland. There are two records from introduced juniper species away from downland: from Bedgebury Pinetum, Kent (*Juniperus chinensis*), and from Broadway, Worcestershire (a sizeable colony on a large old *J. chinensis* "Pfitzerana" and two nymphs on *J. sabina* "Tamariscifolia"). There is one generation per year. Eggs are laid in the host plant and overwinter. Nymphs have been recorded from early May to mid-August, and adults from mid-June to mid-August.

Status Very local. The bug has presumably declined, since both its host plant and its habitat have become much rarer in southern England over the last century. The records, however, mask this: it has always been regarded as a rarity, probably because of its short season, but a survey of remaining juniper sites in southern England in 1968/9 (Ward & Lakhani 1977) showed the bug to be present at a number of sites where good stands of juniper still occurred. The distribution is perhaps as well-known as that of any British bug, but still includes only about 20 recent sites. It is possible that the species may become more widespread on cultivated junipers, but there is no suggestion at present that it regularly occurs under such circumstances. If, as observation to date suggest, it occurs chiefly or entirely on older or larger bushes of cultivated species, this may impose a limit on its spread.

Threats The destruction of chalk downland through improvement, conversion to arable, and development; loss of juniper from remaining chalk downland sites in southern England. Juniper has declined very greatly in southern England over the last century, and this must have enormously reduced the area of useful habitat for the bug. The cultivated juniper which supported the Worcestershire colony has been destroyed.

Conservation The conservation of the bug is entirely dependent on the maintenance of good stands of juniper at remaining sites for the plant in southern England. Work is already in hand at a number of conservation sites to encourage the survival and regeneration of the plant.

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GLOBICEPS CRUCIATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Globiceps cruciatus (Reuter)

Identification Southwood & Leston (1959); Woodroffe (1959).

Distribution Widely distributed in Britain, but very scattered in the south and east, largely coastal in the west, and absent from large areas of the midlands and north. There are records from Northumberland, Durham, Yorkshire, Lancashire, Cheshire, Derbyshire, Nottinghamshire, Lincolnshire, Middlesex, Kent, Surrey, Sussex, Devon, Anglesey, Carmarthen, Glamorgan, Merioneth, Aberdeenshire, Inverness-shire, and Morayshire. Some records may be erroneous, resulting from taxonomic changes and confusion in the genus. *G. cruciatus* is widely distributed in Europe and extends into Soviet Asia.

Habitat and ecology *G. cruciatus* is usually associated with low-growing willows *Salix* spp., particularly creeping willow *Salix repens*. Most records are from dune slacks or wet heaths, but there are occasional records from other habitats. It has been recorded from beneath bearberry *Arctostaphylos uva-ursi* and under trailing strands of cranberry *Vaccinium oxycoccus* in the eastern Highlands of Scotland. All the major recorded habitats have in common that they are fairly open, and wet for at least part of the year. There is one generation per year. Eggs overwinter. When creeping willow is the host they are laid in wounds and cracks in the bark. Adults are found from July to early September. Adults and nymphs are largely predacious, but have also been seen to feed on several plants, including creeping willow and bilberry *Vaccinium myrtillus*. Though all stages will climb the host plants, they are largely ground-dwelling.

Status *G. cruciatus* is local, and has probably declined, at least in the south. Most of the records from eastern England are old ones, and it would seem that the strongholds for the species are now in the dune slacks of the

west coasts. In these habitats, it may still be rather under-recorded. There are a number of extensive dune systems with creeping willow from which it is not yet known. Its status in Scotland is not yet clear, but it is certainly far from generally distributed.

Threats Destruction of heathland for development, afforestation or agricultural exploitation; drainage of wet heathland; lowering of water tables as a result of drainage or water abstraction on surrounding land; lack of management on wet heathland leading to extensive development of tall carr or birch scrub with consequent shading; development of coastal sites; heavy public pressure on dune systems leading to erosion of dune slack vegetation. In Scottish sites, afforestation is probably the most likely threat, but the status and ecology of the species in the north is too poorly known to enable the extent of the threat to be determined.

Conservation On heathland sites, the water table should be maintained at a high level in the wetter areas, and vegetation should, if necessary, be managed to avoid extensive invasion or shading by tall scrub. In some sites, light stock grazing may be adequate to achieve this, but elsewhere occasional scrub clearance may be necessary. In dune systems, water levels in dune slacks should be maintained. Vegetation in dune slacks should be low and open, ideally with some bare ground in the drier areas. Grazing will assist in maintaining this. Rabbit grazing alone may be sufficient to keep a suitable structure, but stock grazing may be beneficial. Further survey is needed to establish the status and requirements of the species in Scotland; it is likely that in many sites no active conservation measures will be needed beyond habitat protection.

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GLOBICEPS FLAVOMACULATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Globiceps flavomaculatus (Fabricius)

Identification Southwood & Leston (1959); Woodroffe (1959).

Distribution Old records cover a wide area of southern Britain. There are records from Durham, Yorkshire, Lancashire, Cheshire, Shropshire, Staffordshire, Leicestershire, Hertfordshire, Norfolk, Suffolk, Cambridgeshire, Herefordshire, Oxfordshire, Essex, Kent, Surrey, Sussex, Hampshire, Wiltshire, Somerset, Devon, Cornwall, Flintshire, Caernarvon and Glamorgan. Some of these records, however, may be erroneous, resulting particularly from confusion with *G. woodroffeii*, not recognised in Britain until 1959. There are confirmed post-1970 records from Herefordshire, Kent and Oxfordshire.

Habitat and ecology Chiefly associated with damp places and wetland edges, particularly where there is luxuriant vegetation growth and where there are low shrubs. Typical habitats include the margins of damp woodlands, around shrubs in wet pasture, and at the margins of marshes, bogs and wet heaths. There is one generation per year. Eggs overwinter, and are laid in cracks in the older wood of trees and shrubs. Adults occur from June until September. Adults and nymphs are chiefly predacious, but have also been seen to feed on various plants, particularly members of the Leguminosae, and utilise flowers and unripe fruits. They live mostly low down amongst vegetation and on the ground, not infrequently beneath the shelter of the lower branches of bushes. There is no evidence of strong preferences in the woody species used for oviposition, and the bug has been found in association with broom, sallow and blackthorn.

Status Very local, and seemingly much declined. Though the species was probably always local, there is a disproportionately large number of old records, and there are few or no recent records from many counties, including relatively well-worked areas in the south. The situation is complicated, however, by possible past confusion with *G. woodroffeii*.

Threats Populations of the bug may be particularly prone to damage because of their dependence on the juxtaposition of mature woody and low herbaceous vegetation. Threats to this transitional feature include the drainage of wet pasture; improvement of grassland and the conversion of grassland to arable; neglect of grassland or other sites leading to extensive scrub invasion and the loss of scrub-herb interface; scrub clearance, including that for conservation purposes, which removes mature woody growth used for oviposition; intensive hedge management; drainage of wet heaths, bogs and marshes; lowering of water tables as a result of drainage or other operations in surrounding land, and the loss of unimproved land to development.

Conservation Management at sites where the species is known or suspected to occur should aim to maintain a good range of vegetation structure, and should maintain areas where mature woody shrubs with extensive low bushy growth abut onto areas of lower herbaceous vegetation. Particular care must be taken in any scrub clearance programme. The eggs overwinter in the bark of the more mature scrub, and any large-scale clearance of scrub runs the risk of decimating or eliminating the egg population. Scrub clearance in known sites should be done piecemeal; only a small proportion of the area to be cleared should be treated in any given year, and where feasible some scattered scrub should be left, particularly along the former scrub-herb transition. As far as possible, suitable conditions should be continually maintained in a specific area, rather than relying on long-term rotation, resulting in areas of suitable habitat changing their position from year to year. The female of *G. flavomaculatus* is normally short-winged and flightless, and the mobility of the species, even over quite short distances within a site, is not known. The ideal management for the maintenance of suitable vegetation structure in the long term is probably moderate grazing. If cutting is to be used for management of, for example, a grassland site bordered by scrub, the cutting should be done as late in the season as possible. It may be beneficial if the vegetation close to the scrub edge is cut rather higher than the remainder: much of the life of *G. flavomaculatus* is spent in the lower few inches of the vegetation, or beneath the shelter of the lower branches of the scrub, and the population may be able to survive such treatment fairly intact. Hedges should be managed as little as is consistent with their continued function. Annual cutting, particularly if by mechanical flail, is likely to be harmful to the bug. It is unlikely that management of any particular stretch of hedgerow will be needed at intervals of less than five or six years, and may be left considerably longer. Only a fraction of the hedges on any given site should be managed in any one year.

References Aubrook, E.W. (1969), Bedwell, E.C. (1938), Bignell, G.C. (1906), Billups, T.R. (1891), Blathwayt, L. (1906), Bouskell, F. (1907), Brown, J.M. (1933), Brown, J.M. (1950), Butler, E.A. (1882a), Butler, E.A. (1905), Butler, E.A. (1923a), Campbell, J.M. (1987), China, W.E. (1939a), Collett, H.R.P. (1938), Daltry, H.W. (1932b), Edwards, J. (1901), Flint, J.H. (1963), Flint, J.H. (1969), Groves, E.W. (1969), Hall, C.G. (1890), Hallett, H.M. (1936), Massee, A.M. (1955a), Massee, A.M. (1962d), Morley, C. (1905), Morley, C. (1911), Rumsey, F.M. (1951), Saunders, E. (1892a), Saunders, E. (1902a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Southwood, T.R.E. (1954), Wagner, E. & Weber, H.H. (1964), Walker, J.J. (1933), Whittaker, O. (1907), Wingate, W.J. & Robson, J.E. (1905), Woodroffe, G.E. (1959b).

GLOBICEPS JUNIPERI

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Globiceps juniperi Reuter, formerly known as *G. woodroffei* Wagner.

Identification Southwood & Leston (1959); Woodroffe (1959a): in both cases as *G. salicicola*.

Distribution There are records from Ross-shire, Inverness-shire, Northumberland, Westmorland, Yorkshire, Lincolnshire, Derbyshire, Shropshire, Surrey, Sussex and Camarthenshire. It is otherwise a species of northern and central Europe.

Habitat and ecology In England, *G. juniperi* is a heathland species, found particularly where fairly tall heather *Calluna vulgaris* and heath (*Erica* spp.) grow amongst light scrub of birches or pines. In Scotland, it has been found associated with bearberry *Arctostaphylos uva-ursi*. There appears to be a single generation per year, with eggs overwintering. Nymphs have been recorded in June, and adults probably mature in late June or July. Adults have been most often recorded in July or August, but some survive until September. Nymphs and adults are chiefly or entirely predacious. In captivity nymphs have been reared on aphids, but are also strongly cannibalistic.

Other members of the genus lay eggs in crevices in woody stems. This may also be true of *G. juniperi*, and may account for the frequent association of the species with areas of scrub.

Status Though this clearly a very local species, its status in much of Britain, particularly the north, is not adequately known. The species was first recorded in Britain from specimens taken in 1956, but it is superficially similar to two other British *Globiceps* species, and some older records of *G. flavomaculatus* and *G. cruciatus* may refer to *G. juniperi*.

Threats In southern Britain, the apparent preference of the species for lightly scrubbed heathland means that it may be vulnerable both to further scrub and tree invasion resulting from lack of management, and to loss of scrub resulting from active heathland management. Heathland fires are likely to prove destructive at all times of year, since so far as is known all stages of the life history are spent on the aerial parts of plants. The destruction of heathland for development or agricultural or forestry pose further threats. The status and requirements of the species in Scotland are still too poorly known for threats to be certainly identified: loss of low vegetation in open places through afforestation may be the greatest danger.

Conservation On southern heathland sites, management should aim to maintain a broad spectrum of vegetation structure, including some areas with light scrub, ideally of birch, over well-grown heather and heath. Such conditions could be maintained by a long rotational management with periodic cutting or burning, but it is preferable if suitable conditions are continuously maintained in a single area. This might best be done along the transition to a fringing border of scrub or woodland, with the appropriate density of scrub maintained by periodic thinning of the older material. Any management involving cutting or burning is likely to be deleterious to populations of the bug, since all stages of the life history are probably concentrated in the aerial parts of the plants and are therefore vulnerable to damage. The females are almost invariably short-winged and flightless, so that colonisation of newly-available areas of suitable habitat, even if in the near vicinity, may be difficult. In Scottish sites, the habitat requirements of the species are too poorly-known for any specific management recommendations to be made: in most cases, probably no measures are needed beyond habitat protection.

References Groves, E.W. (1969), Skidmore, P., Limbert, M. & Eversham, B.C. (1987), Southwood, T.R.E. & Leston, D. (1959), Woodroffe, G.E. (1959a), Woodroffe, G.E. (1959b), Woodroffe, G.E. (1965c), Woodroffe, G.E. (1968b), Woodroffe, G.E. (1972b).

HADRODEMUS M-FLAVUM

EXTINCT

Order HEMIPTERA

Family MIRIDAE

Hadrodemus m-flavum (Goeze)

Identification Southwood & Leston (1959).

Distribution The only recorded locality is Charing, Kent. It is a southern European species and would be at the edge of its range in Britain.

Habitat and ecology The host-plants are meadow clary, *Salvia pratensis* and wild clary, *Salvia horminoides*. On the continent, there is one generation per year. Eggs overwinter, and adults are found from mid-June to early August. The host-plants are found particularly in chalk downland in the south-east.

Status Apparently extinct, and possibly never an established British species. Only four British specimens are known. All were taken in the 19th century and three are without data.

Threats None known.

Conservation No specific recommendations can be made in the absence of a known established colony. It is a conspicuous and unmistakable bug, and is unlikely to have been overlooked, but survey of the host-plants in suitable localities on or near the south coast may be worthwhile.

References Masee, A.M. (1962d), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964).

HALLODAPUS MONTANDONI

RARE

Order HEMIPTERA

Family MIRIDAE

Hallodapus montandoni (Reuter)

Identification Southwood & Leston (1959).

Distribution Southern England. There are records from at least five sites in Kent, from Colesbourne and Rodborough Common in Gloucestershire, and from single sites in Dorset, Cornwall, Somerset and Oxfordshire. It is otherwise largely a central European species.

Habitat and ecology *H. montandoni* is associated with ants, particularly *Myrmica scabrinodis*, and is found in areas of sparse vegetation on dry substrates, particularly chalk or sand. Most records are from calcareous grassland or its vicinity, but it has also been found on coastal dunes. It is clearly able to colonise suitable habitats fairly quickly; at least two records are from disused chalk pits, one is from a derelict arable field, and another from an uncultivated corner of a barley field. There is one generation per year. Nymphs have been recorded in June and July, and adults between June and early September. Eggs overwinter. Adults have been seen to feed on dead *Myrmica scabrinodis*. The bug is normally found running on bare ground together with the ant, but has occasionally been found within the nests.

Status Very local, but possibly under-recorded. The bug clearly forms very localised colonies, and may therefore be overlooked. The records are widely scattered in southern England, and there is considerable scope for the discovery of new sites. The status of this species may require re-consideration in time.

Threats Agricultural intensification leading to loss of neglected and uncultivated land and the spraying out of sparsely vegetated marginal areas; loss of unimproved grassland on chalky and sandy soils to development or agriculture; growth of coarse vegetation and scrub in grassland and dune habitats as a result of cessation of stock grazing and loss of rabbit grazing through myxomatosis; natural succession on artificial sites leading to loss of low vegetation and bare ground; infilling of chalk-pits and other artificial sites.

Conservation Sites where the bug is known or believed to occur should be managed so as to maintain a good range of vegetation structure, including short sparse vegetation with bare ground. In grassland sites this is best achieved by grazing. Rabbits are particularly effective in producing a small-scale mosaic of vegetation structure, and rabbit populations should be maintained or encouraged where possible. Moderate stock grazing should ideally take place over the entire site. Rotational grazing or cutting may provide suitable alternatives, but it is not known to what extent the bug is able to move to newly available areas of suitable habitat. Though it is apparently able to colonise neglected arable fields and other artificial habitats, this may be rather a hit and miss affair, since the females are almost invariably short-winged and flightless. The infrequency with which fully-winged forms capable of colonising new areas are produced may be a major factor in determining the rarity of the species. It is better if, so far as possible, areas of suitable habitat are maintained in fixed positions in the long term, rather than relying on the bug to colonise successive areas of suitable habitat created in different places in successive years. Where cutting is employed, occasional substrate disturbance may be helpful in maintaining open ground and early successional stages. Such disturbance may also be useful on artificial sites, where management should aim to retain as wide as possible a range of successional stages. Dune sites may usually require no active management, but the introduction of grazing may be beneficial.

References Butler, E.A. (1923b), Campbell, J.M. (1987), Groves, E.W. (1969), Leston, D. (1954b), Masee, A.M. (1955a), Masee, A.M. (1961a), Masee, A.M. (1961e), Masee, A.M. (1962d), Masee, A.M. (1963a), Masee, A.M. (1966f), Masee, A.M. (1967), Morris, M.G. (1975a), Shirt, D.B., ed. (1987), Side, K.C. (1960), Southgate, B.J. (1955), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1960b).

HALTICUS MACROCEPHALUS**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family MIRIDAE

Halticus macrocephalus Fieber**Identification** Southwood & Leston (1959).**Distribution** In Britain known only from north Cornwall, where it has been taken at Rock, near Padstow (1956 and 1957) and Porth Kidney Sands, near St. Ives (1968). It is otherwise a largely Mediterranean species, though also recorded from Germany.**Habitat and ecology** *G. macrocephalus* is recorded in Britain from lady's bedstraw, *Galium verum*, on sand dunes. In captivity, nymphs have been reared on *G. verum* and on cleavers, *Galium aparine*. They cause extensive feeding damage to the leaves, in the form of large white patches. The bug apparently forms very localised colonies. One such colony found by G.E. Woodroffe in 1957 occupied less than a square yard, despite being in an extensive area of apparently suitable habitat with abundant *G. verum*. Elsewhere in Europe, the bug has been recorded from *Clematis* and from the composite *Carduncellus mitissimus*. So far as is known, there is one generation per year, overwintering in the egg, as in other *Halticus* spp. Nymphs have been found in mid-June. British captures of adults have been in July, but they are probably also to be found in August.**Status** *H. macrocephalus* is listed in Red Data Book category 1 (Endangered) in Shirt (1987). However, this may overstate the threat to the species. It is seemingly found only in small numbers even within its known sites, and is probably therefore easily overlooked. Woodroffe, in 1957, returning to a known locality for the species, had to undertake an "exhaustive search" before he was able to locate a colony. It is quite possible, therefore, that the bug also occurs in other dune systems in western Britain. Red Data Book category K (Unknown) is a more realistic status for the species in the current state of knowledge.**Threats** A species forming such small and localised colonies is very vulnerable to small-scale habitat changes. The first colony discovered, in 1956, had been destroyed by windblow a year later. Small and localised populations may therefore be threatened by natural processes of erosion and deposition within the dune system. Such changes are likely to be exacerbated by public access; there is some public pressure at both recorded sites, and at other suitable sites along the same stretch of coast. Both the recorded sites are in the immediate vicinity of golf links. Dune systems along the north Cornwall coast are under pressure from development, particularly from holiday camps, camping and caravan sites, and other developments associated with tourism. All these developments, and the increased public pressure associated with them, must be regarded as threatening.**Conservation** In general, suitable habitat for the bug should require no active conservation measures beyond site protection. More recording is needed to establish the distribution of the species in the south-west of Britain.**References** Bannister, R.T. (1969), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1957a), Woodroffe, G.E. (1957c), Woodroffe, G.E. (1958a).

HALTICUS SALTATOR**NOTABLE**

Order HEMIPTERA

Family MIRIDAE

Halticus saltator (Geoffroy in Fourcroy)**Identification** Southwood & Leston (1959).**Distribution** Masee (1955) lists seven counties for this species. Of these, however, a Leicestershire record appears to be the result of a transcription error, and records listed for Lancashire and Cheshire must be regarded as doubtful. The remaining counties are Cambridgeshire, Kent, Berkshire and Hampshire. It is otherwise known from central and southern Europe.

Habitat and ecology *H. saltator* appears to feed on a wide range of plant species. In Britain, it has been recorded from potato *Solanum tuberosum*, nettle *Urtica dioica*, garden *Phlox* and french beans. On the continent, it has been recorded as a pest of cucumber *Cucumis sativa* and of hollyhock *Althaea rosea*. Southwood and Leston (1959) state that it is usually to be found in relatively tall and damp vegetation, but it has also been reported from short dry grassland. British records are mostly from cultivated plants or from artificial habitats. The bug is seemingly of very sporadic occurrence. There are long gaps between records, but the insect is usually abundant when it is found. More information is needed on the ecology of this species in Britain, particularly away from cultivated sites. So far as is known, there is one generation per year. Adults have been recorded from July to September, and eggs overwinter.

Status Very local. Knowledge of this species in Britain is seemingly very incomplete. It may be significantly rarer than has generally been recognised, but at present the extent of under-recording is impossible to estimate.

Threats Uncertain in the current state of knowledge.

Conservation Knowledge of the ecology of this species in Britain is currently too incomplete to enable management recommendations to be made.

References Bedwell, E.C. (1938), Butler, E.A. (1923b), Butler, E.A. (1925), Hey, G.L. (1932), Jones, H.P. (1929), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Southwood, T.R.E. & Leston, D. (1959).

LYGUS PRATENSIS

RARE

Order HEMIPTERA

Family MIRIDAE

Lygus pratensis (Linnaeus)

Identification Woodroffe (1966). Records prior to this date are unreliable, particularly as the name *pratensis* has been used for other members of the genus in the past. The key in Southwood & Leston (1959) is unreliable, but has been used by some workers even after the publication of Woodroffe's paper on the group in Britain. All records should be carefully checked.

Distribution Southern Britain. There are confirmed records from Kent, Hampshire, Berkshire and Surrey. Published records from Yorkshire are now known to be incorrect. It is found throughout the Palearctic.

Habitat and ecology The biology and ecology of this species in Britain are poorly known. Most of the records are of single specimens, taken in rides in ancient forests. There are also records of the species being taken from low herbs in more open situations. At Witley Common, Surrey, it has been found in an area of gorse and heather. It is known to be polyphagous elsewhere in Europe. Adults have been taken between July and late May, and are known to overwinter. In mainland Europe there are two generations per year.

Status Uncertain, but apparently very local and rare. There has been much taxonomic confusion in this genus, and identification remains difficult. If the insect occurs at low density it may be overlooked amongst others of the genus.

Threats If the apparent preference of the species for woodland rides in southern England is real, the main threat may come from the widespread changes in management and neglect of ancient woodlands in recent decades. Clearance and conversion to plantations of conifers may be threatening in some areas; conversion to uniform plantations of broadleaved trees may be almost equally damaging unless particular care is taken with ride management and maintenance. Neglect of formerly managed woodland, particularly neglect of ride management, may reduce the area of available habitat through shading.

Conservation Woodland management should aim to retain rides and clearings broad, open and sunny. Rideside coppicing and the creation of small rideside clearings may assist in this. The re-introduction of coppicing to neglected coppice woodlands may further increase the extent of suitable habitat, but is unlikely to be necessary for the continued maintenance of the species at any given site, so long as adequate attention is given to ride

management. Where the cutting or mowing of rides is necessary, only short stretches of ride, or one side of a ride, should be cut in any one year. Where the species is recorded from any other habitat than woodland, careful record should be made of its habitat preferences, and management of the site should be modified to take them into account.

References Boness, M. (1963), Campbell, J.M. (1987), Ehanno, B. (1980), Groves, E.W. (1973), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1960c), Woodroffe, G.E. (1966b).

LYGUS PUNCTATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Lygus punctatus (Zetterstedt)

Identification Woodroffe (1966). Keys prior to this date are unreliable, and older records of *L. punctatus* should be viewed with caution. The more widely available key in Southwood and Leston (1959) has been used by some workers even after the publication of Woodroffe's key, and relatively modern records may be erroneous. Separation of the species remains difficult, and the validity of records should be carefully checked.

Distribution The distribution of *L. punctatus* is not adequately known. Taxonomic changes and frequent misidentifications in the past mean that there are relatively few reliable records. Until recently there were confirmed records only from the Scottish Highlands (Inverness-shire, Aberdeenshire, Morayshire, Sutherland). There is a recent reliable record from Yorkshire, and there are several unconfirmed recent records from Northumberland. It is a boreo-montane species elsewhere in Europe.

Habitat and ecology In Scotland *L. punctatus* has been recorded particularly on juniper *Juniperus communis*, though it has also been taken from young pines. It has been found both in Caledonian pine forest and in birch-juniper woodland. However, it has also been recorded from heathland well-removed from juniper, indicating that there must be other hosts in Britain. Adults have been recorded in June, July and September, and presumably overwinter, like other members of the genus. There is probably a single generation per year.

Status Uncertain. Though *L. punctatus* is apparently rather rare, it may well be under-recorded. Woodroffe (1966) considered it widespread on juniper in the eastern Highlands. The recent Yorkshire record suggests that it may be quite widely distributed, if rather local, in northern England and Scotland.

Threats The ecology and habitat requirements of this species are too poorly known to enable detailed assessment of threats. Over much of its range afforestation, particularly with alien conifers, is probably the greatest threat. Loss of open-structured Caledonian pine forest through prevention of regeneration by grazing may also pose a threat, at least in the eastern highlands, but in view of the occurrence of the bug in more open habitats it is difficult to assess the importance of this. Destruction of open heath and moorland for agriculture is probably the major additional threat to populations in more open habitats.

Conservation Regeneration of pine forest is being encouraged at a number of conservation sites in Scotland, and such work should benefit *L. punctatus*. The exact requirements if the species in more open habitats is not known. Detailed management recommendations are therefore impossible. The use of grazing to maintain a varied vegetation structure is likely to be suitable.

References Flint, J.H. (1968), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1965c), Woodroffe, G.E. (1966b), Woodroffe, G.E. (1968b).

MONOSYNAMMA BOHEMANI**RARE**

Order HEMIPTERA

Family MIRIDAE

Monosynamma bohemani (Fallen)**Identification** Woodroffe (1967).**Distribution** Reliably recorded in Britain from only a single site, at Virginia Water, Surrey. It occurs over much of Europe.**Habitat and ecology** The British specimens have been taken from creeping willow, *Salix repens*, in a disused sandpit lightly grazed by cattle. The life history is believed to be similar to that of the commoner *M. sabulicola*. In that species, there is one generation per year. Eggs, laid at the base of the leaf buds, overwinter. Published dates for *M. bohemani* in Britain are all for July, but in France the season extends from June to August.**Status** Uncertain. The identification of members of this genus is difficult. Until 1967, all British records of *Monosynamma* were assigned to *M. bohemani*. Any records other than from Virginia Water require checking; most will refer to *M. sabulicola*. Separation of the species is difficult, and any populations discovered should be carefully checked. The true *M. bohemani* does not appear to have been recorded from the Virginia Water locality since the 1960s, and it is not known whether any suitable habitat now exists in the area.**Threats** None known at present. If a viable population is rediscovered in its old site, or one of similar history and nature, the chief potential threats are likely to be agricultural improvement or other management changes (such as tree planting), or cessation of grazing and other management, leading to scrub invasion and loss of low vegetation with creeping willow.**Conservation** The old site and its surroundings should be checked to see whether the bug is still established in the area. If a viable colony is still present, management by grazing should ideally be continued or re-instated. The essential feature to aim for in management is well-developed clumps of creeping willow surrounded by short or even sparse vegetation.**References** Groves, E.W. (1969), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1962e), Woodroffe, G.E. (1967a).

MONOSYNAMMA MARITIMA**RARE**

Order HEMIPTERA

Family MIRIDAE

Monosynamma maritima Wagner**Identification** Woodroffe (1967).**Distribution** The only confirmed British records are from Sandwich Bay and Dungeness, Kent. It is seemingly one of the rarer members of the genus in western Europe.**Habitat and ecology** On creeping willow, *Salix repens*, on dunes or consolidated shingle. The life history is believed to be similar to that of the commoner *M. sabulicola*. In that species, there is one generation per year. Eggs overwinter, and are laid at the base of the leaf buds. Adults occur from late June to August. Like the commoner species, *M. maritima* probably prefers reasonably sized stands of creeping willow adjoining low or sparse vegetation.**Status** Uncertain. Prior to Woodroffe's 1967 revision of the genus in Britain, all British *Monosynamma* were assigned to *M. bohemani*. The identification of members of this genus remains difficult, and there are no doubt a number of *Monosynamma* populations which have not been critically examined. The species is seemingly uncommon at both of its Kent sites, and there have been long gaps in recording.

Threats Dungeness has been affected in the past by the construction of the nuclear power station and by gravel extraction, and further construction and extraction may occur in the future. Water abstraction has been responsible for a significant decline in the water table. The fall in the water table may adversely affect creeping willow populations. At Sandwich Bay, the dunes have been considerably modified for the creation of golf courses, but the bug has thus far survived these modifications. There is considerable public pressure on the dunes.

Conservation Dungeness and Sandwich Bay are both SSSIs. Management of known sites should aim to maintain good populations of creeping willow, preferably in close stands surrounded by short or sparse vegetation giving sunny sheltered edges. Such conditions are in general unlikely to need active conservation measures beyond site protection. Any *Monosynamma* populations discovered elsewhere, particularly in the south-east, should be carefully checked.

References Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1967a).

MONOSYNAMMA SABULICOLA

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Monosynamma sabulicola Wagner

Identification Woodroffe (1967).

Distribution This is a predominantly south-western coastal species, but scattered records extend over a wide area of southern Britain. There are records from Lancashire, Cheshire, Anglesey, Merionethshire, Glamorgan, Devon, Kent, Surrey, Middlesex, Bedfordshire and Derbyshire. Some of these records may need to be checked to ensure that they do not refer to other, rarer, species of the genus. It is widely distributed in Europe.

Habitat and ecology Most frequently found on creeping willow, *Salix repens*, in coastal dune slacks. Some older inland records may be from creeping willow on wet heaths. Recent inland records from Derbyshire, Bedfordshire and Oxfordshire are from the margins of gravel pits, where it has been recorded from white willow *Salix alba* and the hybrid *S. fragilis/S. viminalis*. In the inland sites, the bugs were found on low saplings or bushes growing amongst short or sparse vegetation on a sandy substrate. In all cases, the preferred habitat would appear to be fairly dense stands of the hostplant adjoining short vegetation or bare ground, giving sheltered and sunny edges. There is one generation per year. Eggs overwinter, and are laid at the base of the leaf buds. Adults usually occur from late June to early August, but have been found as late as early September.

Status Very local. It will probably ultimately prove to be present in all the major coastal dune systems in the west, between Lancashire and Devon, but this still does not give a large number of sites. It seems to be genuinely absent from most of the east coast. The occurrence of the species on willows other than creeping willow at inland sites seems to be a relatively new phenomenon; given the wide availability of suitable gravel pit habitats, it is possible that the bug may increase at inland localities. The status of this species may require re-assessment in the near future.

Threats At coastal sites, the loss of dunes to development, and in some sites erosion and damage by recreational pressures. In some sites where grazing by stock or rabbits has been greatly reduced there may be a problem from invasion by coarse vegetation and tall scrub, leading to shading of creeping willow. At gravel pit sites, the chief threats are likely to be destruction through restoration, natural succession leading to the loss of low vegetation and open ground, and development for recreational purposes.

Conservation Coastal sites are usually likely to need no active conservation measures beyond site protection. Management should aim to maintain a good population of creeping willow, preferably in the form of sizeable stands bordered by short or sparse vegetation. Grazing may assist in the maintenance of suitable vegetation structure; in many sites rabbit grazing may be sufficient, but introduction of stock grazing may be beneficial. At gravel pit sites, suitable habitat will tend to be lost quite rapidly through natural succession once active working ceases, and maintenance of suitable areas may depend on regular disturbance and scrub clearance;

grazing or trampling alongside areas of willow scrub may assist in maintenance of suitable vegetation structure, but otherwise there may be a need for fairly intensive management in the long term.

References Bignell, G.C. (1906), Butler, E.A. (1923a), Dallman, A.A. (1936), Eversham, B.C.E. (ed.) (1984), Groves, E.W. (1969), Hallett, H.M. (1936), Le Quesne, W.J. (1954a), Masee, A.M. (1955a), Masee, A.M. (1962d), Masee, A.M. (1964d), Nau, B.S. (1981), Nau, B.S. (1982), Saunders, E. (1882a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Walker, J.J. (1900), Whittaker, O. (1907), Woodroffe, G.E. (1967a).

MYRMECORIS GRACILIS

RARE

Order HEMIPTERA

Family MIRIDAE

Myrmecoris gracilis (Sahlberg)

Identification Southwood & Leston (1959).

Distribution Southern England: recorded from Surrey (Oxshott Heath, Chobham Common, Ash Vale), Hampshire (Brockenhurst, Fleet) and Dorset (Parley Heath). There is an unconfirmed record for Brownsea Island, Dorset. It is widely distributed in central and northern Europe, occurring to an altitude of 2300 metres in the Alps.

Habitat and ecology All recorded British sites for the species are on dry sandy soil on or near heathland. It is a ground-dwelling species, found amongst low sparse vegetation and on bare patches of sand. Recorded microhabitats are: open heath; amongst heather; bare patches of sandy ground beneath pine trees; amongst grass and *Medicago lupulina*; an area of short fine grasses with patches of *Erica* and *Calluna*; amongst black medick on recently disturbed ground on heathland. All stages mimic ants, with which the bug is usually closely associated. *Formica fusca* is the usual species, but it has also been found with *Lasius niger* and with *Formica rufa*. The bug has occasionally been found inside *Formica* nests. There is one generation per year. Eggs overwinter, and are laid in old but undecayed grass stems. Adults have been recorded from late June to late August. All stages are chiefly predacious, and have been seen to feed on grass aphids, the eggs of the grassbug *Notostira elongata*, and various small invertebrates, as well as on aphid honeydew. In captivity, they will feed on dead ants and on ant pupae, but not on live adult ants. Adults are usually short-winged and flightless: the fully-winged form, which occurs rarely on the continent, has not yet been recorded in Britain.

Status Rare and very local. Most of the records are of small numbers of individuals in limited areas, and suggest that the bug forms small localised colonies. Such small colonies of an ant-mimicking species might easily be overlooked. However, the number of suitable sites for the species in southern England is limited and declining.

Threats Loss of heathland to agriculture and development; uncontrolled fires on heathland sites; loss of low open heath and bare ground to tall vegetation and scrub invasion through loss of grazing, particularly through reduction of rabbit populations by myxomatosis. On disturbed areas of sparse vegetation, loss of open ground through natural succession may also be threatening to local populations, unless there are factors which ensure continued or repeated disturbance.

Conservation On heathland sites, management should aim to create or maintain a good range of vegetation structure, including some short or sparse grassy vegetation. Such a vegetation structure is best maintained by grazing. Rabbits produce the best vegetation structure, but in most sites rabbit populations are likely to be too low to maintain the habitat in suitable condition over more than a very limited area. Grazing by stock will provide a suitable alternative, particularly if complemented by some amount of rabbit grazing. Cutting and burning are less suitable management techniques, but could be used if grazing is not possible. Since all stages of the life history are spent above ground level burning, however carefully controlled, is likely to destroy most or all of the population of the bug in the burnt area. Since the bug is so localised, this may mean an entire population. Any programme of burning, therefore, should use small vegetation plots managed in rotation. Cutting is likely to be less directly destructive, but is unlikely to provide suitable conditions in the long term if used alone. If there is some rabbit grazing, a programme of rotational management by cutting may be adequate, but otherwise periodic localised substrate disturbance may be necessary to maintain early successional stages. If areas

of degraded heath or heath edge habitats with short or sparse vegetation are present on a site, they should be carefully surveyed to determine the extent of invertebrate interest; *M. gracilis* may have better populations here than on the heath itself, and such areas may be particularly suitable for more drastic management techniques such as extensive substrate disturbance.

References Butler, E.A. (1923a), Ehanno, B. (1980), Groves, E.W. (1973), Harwood, P. (1937b), Leston, D. (1953b), Masee, A.M. (1955a), Saunders, E. (1903), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1959k).

ORTHOTYLUS FUSCESCENS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Orthotylus fuscescens (Kirschbaum)

Identification Southwood & Leston (1959).

Distribution Northern Scotland. There are records from Inverness-shire, Morayshire, Perthshire and both East and West Ross. It is widely distributed in Europe.

Habitat and ecology On Scots pine, *Pinus sylvestris*. Most records are from Caledonian pine forest, but it has also been taken from commercial plantations and ornamental trees. There is one generation per year, overwintering in the egg. Adults are found from late June to August, with exceptional stragglers surviving into September. The food does not seem to have been recorded: some other members of the genus are partly predacious.

Status Very local. Perhaps rather more widespread than the current records suggest, but under-recorded. It may usually occur high in the trees and thus be easily missed.

Threats Loss of Caledonian pine forest, particularly through conversion to plantations of alien conifers, and lack of regeneration through overgrazing by deer.

Conservation Pine forest regeneration is being encouraged on a number of conservation sites in Scotland. There is no good evidence that the bug requires anything more than the presence of its host tree in the limited area of its British distribution.

References Butler, E.A. (1923a), Haines, F.H. (1936), Masee, A.M. (1955a), Saunders, E. (1892a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1968b).

ORTHOTYLUS RUBIDUS

RARE

Order HEMIPTERA

Family MIRIDAE

Orthotylus rubidus (Fieber in Puton)

Identification Southwood & Leston (1959).

Distribution South and south-east coasts of England. There are records from Norfolk, Suffolk, Essex, Kent, Sussex, Hampshire, Dorset and Devon. It is widely distributed in southern Europe.

Habitat and ecology Associated with glasswort, *Salicornia* spp. *Salicornia ramosissima* is certainly a host. The bug is not found on open saltmarshes, but occurs in areas which, though saline, are not regularly inundated by the sea. Sites where habitat details have been recorded include a strip of saltmarsh behind a shingle bank, kept wet and saline by seepage through shingle, and a dense community of *S. ramosissima* associated with a lagoon on the landward side of a shingle beach. Elsewhere in Europe, it has been recorded from saltwort *Salsola kali*, but it does not appear to have been found on this plant in Britain. There are probably two generations per year.

Eggs appear to overwinter, but the oviposition site does not seem to have been recorded. Adults of the first generation become adult in early July, and the second from mid-August onwards. Some mature as late as the end of September, and may survive until late October.

Status Very local, and probably declined. It appears to have very rarely been recorded in recent years, though it is known to be still present on the Norfolk coast. The related, and commoner, *Orthotylus moncreaffi* was for some time regarded as a variety of *O. rubidus*, and old records must therefore be treated with caution. The species appears always to have been decidedly local, presumably because of the very restricted nature of its preferred habitat. In view of its rarity and the specialised and vulnerable nature of its habitat, it is proposed that this species should be afforded the status of Red Data Book category 3 (Rare).

Threats The position of the bug's rather specialised habitat, at the landward edge of saline habitats, makes it particularly vulnerable to coastal developments and protection schemes, and to a lesser extent also to recreational and other activities occurring to landward. There must have been considerable loss of such habitats in the past along the south and east coasts, particularly through the expansion of resort towns and the building and maintenance of sea defences, and populations of *O. rubidus* must have suffered as a consequence. No established populations are known at present, the most recent records being from the 1950s, so no specific threats are known to identified sites. Natural changes in the distribution of shingle and sediments, and catastrophic events such as severe storm damage or exceptional flooding may also be destructive to individual populations, and could be highly deleterious in the long term to a species whose habitat is of such scattered distribution.

Conservation The bug's habitat is essentially a natural one. In general, no active conservation measures should be needed beyond site protection.

References Butler, E.A. (1923a), Edwards, J. (1884), Edwards, J. (1909), Groves, E.W. (1973), Masee, A.M. (1955a), Masee, A.M. (1962d), Southwood, T.R.E. & Leston, D. (1957), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1958c).

ORTHOTYLUS VIRENS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Orthotylus virens (Fallen)

Identification Southwood & Leston (1959).

Distribution Northern England: recorded from Cumberland, Westmorland, and Yorkshire. It otherwise occurs in northern and central Europe.

Habitat and ecology The foodplant is bay willow *Salix pentandra*. This plant grows in streamsides, marshes, fens and wet woods, and is widely distributed in northern England and Scotland, as well as being quite widely planted in other parts of Britain and in other habitats. The bug is clearly much more local than its host, but the factors which determine its occurrence are not clear. It may be confined to female trees. It has been recorded from other species of willow on the continent. The earliest British records are from peat mosses and marshes, but recent records show that it is not unduly restricted in its habitat requirements, and it may require nothing more than the presence of a reasonable population of the host tree. So far as is known, the entire life cycle of the bug is spent on the plant. There seems to be one generation per year, with eggs overwintering. Adults have been recorded from July to September.

Status *O. virens* is listed in Red Data Book category 3 (Rare) in Shirt (1987). It is clear, however, that the bug has been under-recorded in the past. A rapid survey by B.S. Nau and L. Lloyd-Evans in 1988 recorded several previously unknown sites, and it seems inevitable that more populations will ultimately be found in the north of England, and perhaps also in Scotland.

Threats At present, little can be said in detail of the threats to the species. The likeliest general threats are probably destruction of wetland sites through drainage or improvement for agriculture, and extensive growth of

scrub on neglected sites leading to shading of suitable bushes of the host plant. However, the bug seems to have no very restrictive habitat requirements, and in general is probably not much threatened.

Conservation In the present state of knowledge of the ecology of the insect, all that can be recommended is that at known or likely sites for the bug, bay willow stands should be maintained in roughly the condition shown at the time of recording.

References Butler, E.A. (1917), Butler, E.A. (1923a), Crossley, R. (1979), Crossley, R. (1981), Day, F.H. (1918), Day, F.H. (1928), Hutchinson, G.E. (1921a), Massee, A.M. (1955a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964).

PHYTOCORIS INSIGNIS

RARE

Order HEMIPTERA

Family MIRIDAE

Phytocoris insignis Reuter

Identification Southwood & Leston 1959.

Distribution South-eastern England: recorded from Kent (Orlestone Forest); Surrey (Ockham & Wisley Common, Oxshott Heath, Esher Common, Chobham Common, Ash Vale); Buckinghamshire (Cowcroft Wood, nr Chesham); West Sussex (Wigginholt Common). It is also known from Germany, Austria, France, Finland and the Caucasus.

Habitat and ecology Dry heathland. It is usually associated with areas dominated by heather, *Calluna vulgaris*. This may well be the food-plant, though there seem to be no direct observations to prove this. The related and similar *P. varipes*, which feeds on grasses and various herbs, tends to replace *insignis* in the grassier areas of heaths. *P. insignis* has been recorded from tall, old heather, but it is not clear whether such plants are preferred, or whether younger growth is equally suitable. Though it has been recorded from areas sheltered by trees, it seems intolerant of shading. Other members of the genus are partly or mainly predacious on a variety of small invertebrates, and this is also likely to be true of *P. insignis*. There appears to be one generation per year. Eggs overwinter, and are probably laid in heather stems. Adults have been recorded from late July to late September.

Status Very local, but possibly under-recorded. The species is superficially very similar to the common *P. varipes*, and its presence in Britain was not reported till 1957. The two species can occur on the same sites, and females cannot be separated with certainty, increasing the likelihood of under-recording. Sufficient populations have now been checked, however, to make it likely that this is a genuinely uncommon species confined to south-eastern heathlands.

Threats Destruction of heathland through development, improvement for agriculture, or afforestation; neglect of previously managed heathland; loss of rabbit grazing on heathland as a result of myxomatosis, leading to extensive scrub invasion and shading; suppression of heather growth and erosion of open heathland as a result of recreational pressures; uncontrolled fires on heathland.

Conservation Management of dry heathland should aim to maintain as wide as possible a range of vegetation heights, including some stands of tall woody heather. The best way to maintain a suitably varied structure is by light grazing, and grazing by rabbits produces the best small-scale mosaics of structure. Rabbit populations should be maintained or encouraged wherever possible. In the absence of sufficient rabbit populations (as will normally be the case) the introduction of grazing stock should be considered. If grazing is not feasible, management by rotational programmes of cutting or burning may be necessary, but both should be undertaken with great care. All stages of the life history of the bug, so far as is known, are spent on the aerial parts of heather. Any burning which is done will, therefore, decimate or eliminate the bug from the burnt area, irrespective of the time of year at which management is undertaken and the care taken in its control. *P. insignis* is fully winged, and is probably able to colonise new areas of suitable habitat within a site, but the rate of colonisation and of population build-up are not known, and neither are the exact limits of tolerance of age and height of heather stands. The problems associated with cutting are similar to those associated with burning. On small sites, where management on a long rotation is not feasible, the needs of the bug would be best served by

allowing the heather to age, senesce and regenerate in a natural cycle, and to maintain open conditions by scrub clearance, preferably by hand-pulling when young.

References Campbell, J.M. (1987), Groves, E.W. (1976), Masee, A.M. (1958c), Masee, A.M. (1962d), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stubbs, A.E. (1967), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1957b).

PILOPHORUS CONFUSUS

ENDANGERED

Order HEMIPTERA

Family MIRIDAE

Pilophorus confusus (Kirschbaum)

Identification Southwood & Leston (1959).

Distribution Recorded from only two localities in Britain: Virginia Water, Surrey (1955-1962) and Dungeness, Kent (1981). It is otherwise widely distributed in Europe.

Habitat and ecology Associated with creeping willow *Salix repens*. It is to a large extent a ground insect in Britain, though it will climb low plants, and has been found on sallows and young pines as well on creeping willow. On the continent, it has been recorded from various broadleaved trees, particularly willows, and appears to be less of a ground dwelling insect than in Britain. So far as is known, all *Pilophorus* are predacious, their chief prey being aphids of the subfamily Lachninae. These aphids are frequently ant-attended, and the bugs bear a superficial and probably mimetic resemblance to ants. Adults in Britain have been recorded from early July to early August. So far as is known, in common with other members of the genus, there is one generation per year, overwintering in the egg. It would seem that the bug forms rather small localised colonies: searching at the Virginia Water site in 1962 produced only one adult and half a dozen larvae (Woodroffe 1962).

Status Uncertain. There have been no records from Virginia Water since the 1960s. It has been recorded only once at Dungeness, where M. Newcombe found about four individuals amongst scrub sallows in 1981. The species was not discovered in Britain until 1955, and then made its appearance in a sandpit, rather than a more natural habitat. It is possible that it was an introduction to this site, given the shortage of records since, but if so the origin of the stock is obscure. The habitat represented at the site is essentially rather similar to that encountered in dune slacks, with creeping willow growing in patches amongst low or sparse vegetation on a sandy substrate. In view of this, and the isolated Dungeness record, it may be that the species should be searched for at coastal sites. The extreme localisation of colonies, low population densities, and ground-dwelling habits of the bug would make it quite easy to overlook.

Threats The current state of the Virginia Water site is not known. Considering the length of time since the site was found, the need for fairly intensive management to maintain the habitat, and the construction of a motorway immediately adjoining the site since the records were made, it is unlikely that it remains suitable. Natural succession leading to dominance by taller scrub or trees, and direct or indirect effects of road construction, are likely to have had a deleterious effect, irrespective of any other changes which may have been made to the site. Dungeness has been adversely affected by the construction of the nuclear power station and by gravel digging, and further construction and digging is possible. Water abstraction has been responsible for a significant drop in the water table, which may affect the creeping willow. At present, the ecology and status of the species in Britain are too poorly known for any general comments to be made on possible threats elsewhere.

Conservation Dungeness is an SSSI. The two sites from which the bug has already been recorded should be re-surveyed to establish whether viable populations still exist, and to determine their size and extent. At Virginia Water, in particular, survey should also extend to any other similar sites in the area. As there is a wider range of hosts and habitats on the continent, search might usefully be extended to such places as gravel pits and other habitats with low or sparse vegetation and shrubs. At any site where it is discovered, the ecology of the species should be carefully noted, and its habitat requirements investigated. If the recorded habitat at Virginia Water is indeed characteristic of its requirements in Britain, any inland sites for the bug are likely to require fairly intensive management, at least in the long term. Grazing is likely to prove the most effective way of maintaining habitat in suitable condition. Rabbit grazing may assist at some sites, or may exceptionally be adequate in itself.

The aim of management should be to maintain reasonable populations of creeping willow growing amongst short, ideally rather sparse, vegetation. Coastal sites are in general likely to need no active conservation measures beyond site protection.

References Groves, E.W. (1969), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1956a), Woodroffe, G.E. (1956d).

PLACOCHILUS SELADONICUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family MIRIDAE

Placochilus seladonicus

Identification Nau (1979a); Wagner & Weber (1964).

Distribution Recorded from only three sites in Britain: a disused railway near Leighton Buzzard, Bedfordshire; a quarry beside the railway between Dunstable and Luton, Bedfordshire (a single individual, only some 10 km from the Leighton Buzzard site, and possibly not representing an established population), near Wallington, Oxfordshire, and two sites in Sussex (Beachy Head; Beddingham, nr Lewes). It is widely distributed in Europe.

Habitat and ecology Associated with field scabious *Knautia arvensis*, a plant of calcareous soils. At all known British sites the host plant grows amongst tall grassy vegetation, but it is not known whether this is an essential feature of the habitat of the bug in Britain. The three British sites known to support breeding populations are a disused railway; an area of grassland beside a track through arable land, and species-rich ancient chalk grassland. Adults have been recorded between mid-July and mid-September in Britain. There would appear to be a single generation per year, probably overwintering in the egg. The oviposition site for the species does not seem to have been recorded, but is likely to be in the upper parts of the host-plant.

Status Uncertain. The species was not found in Britain until 1977. There have subsequently been repeated records only from the Leighton Buzzard site. It seems unlikely that the species can have been widely overlooked in southern Britain, and several workers have searched for it over quite a wide area since its first discovery without finding further populations. It is not easy to see why a bug with such a widespread and frequent host should be so rare, particularly as the recorded sites do not immediately suggest very restrictive habitat requirements. There must therefore be a suspicion that the bug is a recent arrival in Britain.

Threats The Leighton Buzzard site is increasingly encroached by commercial and industrial development, and there seems little hope of the continued integrity of the site. Even without such development, it would seem likely that natural succession would ultimately pose a threat to the site, unless active management were undertaken. If the bug is found to occur more widely, it will be in tall, mildly to strongly calcareous, grassland. Threats to this habitat in southern England include destruction for development or for conversion to arable; agricultural improvement; heavy grazing leading to loss of tall vegetation; neglect of previously managed grassland leading to scrub invasion and shading; regular cutting, particularly of roadside verges, leading to loss of flower and seed heads, where the entire life cycle of the bug is probably spent. Populations close to arable land will also be prone to damage or loss through spray drift.

Conservation Where management of a site containing the bug is possible, this should aim to maintain a good range of vegetation height and structure, including some areas of tall grassy vegetation with field scabious. The best way of maintaining a suitable mosaic of vegetation structure is by light to moderate grazing. Grazing by rabbits probably provides the best structure, and rabbit populations should be maintained or encouraged wherever possible. Stock grazing can provide a suitable alternative. It is probably best if stock is excluded in the summer months, unless stocking density is very low. Rotational grazing or cutting may provide satisfactory alternatives. It should be borne in mind, however, that all stages of the life cycle of the bug are spent in the upper parts of the host-plant, on or around the flowering heads. Cutting of the vegetation is therefore likely to destroy the entire population of the bug within the area cut, irrespective of the season of cutting.

References Campbell, J.M. (1987), Nau, B.S. (1978), Nau, B.S. (1979a), Nau, B.S. (1979b), Nau, B.S. (1980a), Nau, B.S. (1982), Nau, B.S. (1983), Shirt, D.B., ed. (1987), Wagner, E. & Weber, H.H. (1964).

POLYMERUS VULNERATUS**ENDANGERED**

Order HEMIPTERA

Family MIRIDAE

Polymerus vulneratus (Wolff)**Identification** Southwood & Leston (1959).**Distribution** Recorded in Britain only from Great Yarmouth, Norfolk. Abroad, it occurs over much of Europe, and the distribution extends to Siberia.**Habitat and ecology** The foodplant is lady's bedstraw *Galium verum*. The first capture of the species was on sand dunes. Later, it was found on an area of derelict ground a short distance from the sea, within the town of Great Yarmouth. At both sites, lady's bedstraw was growing amongst short grass. Adults have been recorded in Britain in mid-August and mid-September; in the latter case, most were rather worn, and it was probably towards the end of the season for the bug. In France, it has been recorded between June and early October. So far as is known, there is one generation per year, overwintering in the egg.**Status** Very rare, possibly extinct. The first finding of the bug was by H.J.Thouless in 1898 "on the sandhills at Yarmouth", when just over a dozen individuals were found. The site was visited by other entomologists in the years following. The last published record for the species in Britain 1954, when A.M. Masee visited Yarmouth to search for it. It would seem that the bug may be very localised, and may therefore have been overlooked elsewhere on the East Anglian coast. There remains a considerable length of coast which might hold suitable habitat, and much has not been extensively searched by Hemipterists.**Threats** At the time of Masee's visit in 1954, he described the remaining dunes at Yarmouth as "well-trodden", and with little lady's bedstraw remaining. The dunes at Yarmouth have suffered further from development and erosion since that date. However, though dunes in the immediate vicinity of the town have suffered, there are dunes of reasonable quality close by. It is unlikely that the derelict ground site discovered by Masee has escaped the attention of developers in the intervening years, and similar sites which may exist elsewhere in or on the outskirts of the town must be threatened, if not by development then by natural succession leading to dominance by coarse vegetation and scrub invasion. If the bug proves to occur elsewhere on the East Anglian coast, the most likely threats are development, particularly for recreation, and erosion by recreational pressure.**Conservation** No specific recommendations can be made in the absence of known established populations of the bug. Survey should be undertaken of suitable sites on the Norfolk coast, beginning in the vicinity of Yarmouth, to determine if any populations exist. Where the bug occurs on dunes, the habitat is likely to be largely self-maintaining, and the conservation of the bug will be assured simply by protection of the habitat. Much of the length of the Norfolk coast which might support the bug has SSSI status, and a significant proportion falls within nature reserves or National Trust ownership. If a population is within a protected site, damage by public pressure and erosion is likely to be the greatest danger, particularly if, as seems likely, the bug occurs in fairly small colonies. Access restriction to areas where colonies occur, or the control of access to dunes by the provisions of boardwalks etc., may be necessary where visitor pressure is high. If the species still occurs on derelict land sites management should aim to maintain early successional stages. Rabbit grazing will assist, and some degree of human trampling or other use may also be beneficial. Periodic scrub clearance may be necessary. A cutting regime for the low vegetation may assist in the maintenance of suitable vegetation structure, but in the long term it is likely that some amount of regular substrate disturbance will be needed to maintain suitable vegetation structure.**References** Edwards, J. (1899), Edwards, J. (1901), Masee, A.M. (1955a), Masee, A.M. (1955c), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Thouless, H.J. (1898), Turner, H.J. (1904), Wagner, E. & Weber, H.H. (1964).

PSALLUS ALBICINCTUS**NOTABLE**

Order HEMIPTERA

Family MIRIDAE

Psallus albicinctus (Kirschbaum)**Identification** Southwood & Leston (1959); Woodroffe (1957).**Distribution** There are British records from Northamptonshire, Bedfordshire, Berkshire, Buckinghamshire, Surrey, Essex, Dorset and Hampshire. An old Kent record is now regarded as doubtful.**Habitat and ecology** *P. albicinctus* feeds on oak. There are records from willow and grey poplar in Britain, and from other trees on the continent, but these may be of stray individuals. Most British records are of singletons or small numbers, but fogging of mature oak trees in Richmond Park, Surrey, in 1984, produced greater numbers, and it was found to be the ninth most abundant mirid out of thirty species collected from the trees. This may suggest that it is a canopy species liable to be overlooked by routine collecting. The records to date suggest a preference for open-structured woodland or parkland. Adults have been recorded in Britain from early June to mid-July. So far as is known, there is one generation per year, with eggs overwintering, probably laid in twigs of the host tree. Other members of the genus are known to be partly phytophagous and partly predacious on aphids and other small invertebrates, and the same is probably true of *P. albicinctus*.**Status** This is apparently a very local species, but is almost certainly under-recorded. Records are quite widely scattered through south-eastern England, and the species is not known to have any habitat requirements beyond the presence of mature oak trees. It is therefore not easy to see why it should not be more generally distributed. The results of the fogging experiments in Richmond Park may imply that it is an under-recorded canopy species, but Richmond Park is itself an exceptional site with a rich fauna and a long history as pasture woodland. Fogging work in a wider range of sites would be interesting.**Threats** Destruction of open broadleaved woodland in south-eastern England, for development, conversion to agricultural use, or planting with conifers; loss of mature hedgerow trees through age or felling, and failure to ensure a continuation by planting replacement trees to supply the next generation. It is possible that tree shape and woodland structure may play a part in determining the distribution of the bug, and may be affected by details of woodland management, but there is no evidence of this at present.**Conservation** In the present state of knowledge, nothing can be recommended beyond ensuring a continuity of mature oaks at known and likely sites.**References** Butler, E.A. (1923a), Campbell, J.M. (1987), Dolling, W.R. (1985b), Eversham, B.C.E. (ed.) (1984), Groves, E.W. (1968), Groves, E.W. (1986), Masee, A.M. (1955a), Masee, A.M. (1959b), Masee, A.M. (1962d), Nau, B.S. (1981), Saunders, E. (1892c), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1957d).

STRONGYLOCORIS LURIDUS**NOTABLE**

Order HEMIPTERA

Family MIRIDAE

Strongylocoris luridus (Fallen)**Identification** Southwood & Leston (1959).**Distribution** Chiefly south-western England. There are records from Cumberland, Caernarvonshire, Pembrokeshire, Gloucestershire, Surrey, Hampshire, Wiltshire, Dorset, Somerset, Devon, Cornwall, and Kent. It is found over much of Europe, but is absent from the extreme north.**Habitat and ecology** The food-plant is sheep's-bit scabious, *Jasione montana*. The plant grows in dry grassland and on cliffs, screes and other rocky places, including old stone walls. The bug appears to prefer plants growing

in more open-structured habitats, where there is much bare ground or rock, and may require fairly high levels of insolation. There is one generation per year. Eggs, laid on the food-plant, overwinter. Adults are found from June to August.

Status Local. It is well-established and quite frequent in suitable places in the south-west, particularly on cliffs and in other open rocky places near the sea. In the Isles of Scilly, for example, it is rather common on sheep's-bit on walls. It becomes progressively more local away from the extreme south-west. There is a single old record for Cumberland, and there appear to be no recent records for Surrey, Gloucestershire, Wiltshire or Somerset. In Kent it is only known to occur on the shingle at Dungeness.

Threats Most of the bug's habitats and localities are fairly inaccessible and are often unsuitable for development or agricultural intensification. Recreational pressure along coastal paths and other walking and access routes may cause local erosion leading to diminution of the area of habitat available for the species, but is in general unlikely to be a serious threat. Reduction in grazing at coastal sites, through cessation of traditional stock grazing and as a result of loss of rabbit populations through myxomatosis, has greatly reduced the area of suitable habitat along considerable stretches of south-western coasts. Coastal development, particularly around the larger towns in the south-west, may also be locally damaging. Other threats include clearance or improvement of dry grasslands and the cleaning or replacement of stone walls supporting good populations of sheep's bit. In the north and east of its range, populations of the bug are clearly much more isolated, and threats to individual sites more serious for the species on a local scale.

Conservation In many sites, no active conservation measures may be needed beyond site protection. Where grazing has been lost or reduced in intensity, the re-introduction or encouragement of grazing may be essential, though in some cases rabbit grazing alone may be sufficient to maintain suitable vegetation structure. Where recreational pressure is causing severe erosion, measures should be taken to reduce the effects by restricting access or providing alternative routes.

References Butler, E.A. (1923a), Day, F.H. (1928), Douglas, J.W. & Scott, J. (1868b), Groves, E.W. (1969), Massee, A.M. (1955a), Massee, A.M. (1966a), Massee, A.M. (1966c), Murray, J. (1922), Saunders, E. (1892a), Saunders, E. (1902a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1957c), Woodroffe, G.E. (1967c).

SYSTELLONOTUS TRIGUTTATUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Systellonotus triguttatus (Linnaeus)

Identification Southwood & Leston (1959).

Distribution Widely distributed in Britain, but chiefly southern. There are records from Lancashire, Lincolnshire, Norfolk, Suffolk, Cambridgeshire, Buckinghamshire, Middlesex, Kent, Surrey, Sussex, Hampshire (including the Isle of Wight), Dorset, Somerset, Carmarthen and Fife. It occurs throughout Europe.

Habitat and ecology *S. triguttatus* occurs in dry places with short sparse vegetation. The bulk of records come from the more open areas of sandy heaths or from coastal dunes. It has also been frequently recorded from habitats on chalk. Here it occurs chiefly in chalk pits with much bare ground and sparse colonisation by plants, or on patches of bare ground on open downland. It seems invariably to be found in company with ants, which the short-winged form of the bug quite closely resembles. *Lasius niger* is the most frequently recorded species, but *Formica fusca* has also been noted. All stages are partly phytophagous and partly predacious. Recorded foods include young buds, shoots and unripe fruits of heather, tormentil, creeping willow and sheep's fescue, and aphids. Ant pupae, honeydew and galls on creeping willow have also been seen to be attacked. They have been seen to feed on dead ants, but apparently do not attack live ones. The association appears to be chiefly mimetic, though it is possible that the aphids which form a large part of the diet are ant-attended. Eggs overwinter, and have been observed to be laid in cracks or scars in one- or two-year old wood of creeping willow, but woody plants do not seem always necessary as oviposition sites. Adults have been recorded from late May to early

August. So far as is known, there is one generation per year. The male is fully-winged, but the female is almost invariably short-winged and flightless.

Status Local, and perhaps declined. Colonies can be highly localised, which may result in its being overlooked. However, it has a long season, and the habitats and microhabitats in which it occurs are ones which are well-investigated by heteropterists. It would appear to be very much more frequent in south-east England than elsewhere, and may be entirely coastal in the north.

Threats Probably the main threat to the species in recent decades has been reduction in grazing and disturbance on heath, dune, and chalk grassland sites as a result of cessation of stock grazing on many sites and, particularly, the effects of myxomatosis on grazing rabbit populations. Other threats to coastal sites include coastal development, and heavy public pressure leading to erosion, particularly in areas where there is sparse low vegetation over otherwise more or less stable sand. On grassland and heathland sites, destruction for development, conversion to arable, and agricultural improvement, are additional hazards. On heathland, uncontrolled fires pose an additional threat, but in view of the preference of the species for open conditions, it is possible that such fires may on occasion be beneficial in the long term.

Conservation Management of calcareous grassland and heathland should aim to maintain as wide as possible a range of vegetation heights and structures, which should ideally include some areas of short sparse vegetation, or bare ground, including or adjoining low woody plants. Such varied conditions are best maintained by grazing. Rabbit grazing produces the best small-scale mosaic of structure. Rabbit populations should be maintained or encouraged wherever possible. Where rabbit populations alone are insufficient to maintain suitable vegetation structure, as will usually be the case, stock grazing should be implemented. Where grazing is not feasible, management by a rotational regime of cutting or mowing may be attempted. Where there is also local intense rabbit grazing and disturbance, this may be sufficient in itself to maintain suitable conditions, but where rabbit densities are low, cutting alone is unlikely to be satisfactory, unless supplemented by periodic localised substrate disturbance to maintain bare ground and early successional stages. Management of heathland by a rotational regime of burning may be attempted. The effects of this on the bug are not entirely clear. All stages of the life cycle seem to occur above ground, and colonies are small and localised. As a result, any burn is likely to destroy individual populations of the bug, irrespective of its timing and the care with which it is carried out. The insect is able to colonise newly available habitat, but the rate of such colonisation is unknown. The female is almost invariably short-winged and flightless, so colonisation might be expected to be slow and unpredictable. On quarries and other sites of artificial origin, unless rabbit populations are large, management is likely to be needed in the long term. Where scrub is invading relatively sparse growth of ruderals and calcicoles periodic scrub clearance may be sufficient. On coastal dunes management is less likely to be needed. Nonetheless, the best areas for *S. triguttatus* are those which receive some grazing. This will normally be from rabbits, and again rabbit populations should be maintained or encouraged where feasible. The addition of stock grazing, particularly in areas where rabbit populations are low, may further assist the maintenance of suitable habitat.

References Butler, E.A. (1884), Butler, E.A. (1905), Butler, E.A. (1909a), Butler, E.A. (1912), Butler, E.A. (1923a), Campbell, J.K. (1980), Clemons, L. (1982), Donisthorpe, H. St J.K. (1927), Douglas, J.W. (1865a), Edwards, J. (1889), Groves, E.W. (1969), Groves, E.W. (1986), Hall, C.G. (1890), Harwood, P. (1937b), Masee, A.M. (1955a), Masee, A.M. (1961e), Masee, A.M. (1962d), Masee, A.M. (1966f), Masee, A.M. (1967), Morley, C. (1909), Morley, C. (1911), Morris, M.G. (1975a), Saunders, E. (1892a), Saunders, E. (1892d), Saunders, E. (1902a), Saunders, E. (1908a), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Walker, J.J. (1933), Woodroffe, G.E. (1953d), Woodroffe, G.E. (1959a).

TERATOCORIS CARICIS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Teratocoris caricis Kwoł.

Identification Woodroffe (1967)

Distribution Scotland and north-western England. There are records from a number of sites in Inverness-shire (particularly in Speyside), and Perthshire, from Loch Davan, Aberdeenshire, and from Sunbiggin, Westmorland. It is also recorded from northern Europe and from North America.

Habitat and ecology Freshwater marshes. The bug has usually been recorded from mixed vegetation including sedges. It has been found on almost pure stands of slender tufted sedge *Carex acuta* and of *Carex rostrata*, and these are probably hosts, though not necessarily the only one. It can probably occur in any habitat where there is suitable tall marsh vegetation, and has been recorded from riverside and lochside marshes, as well as from wetland areas not associated with open water. There appears to be one generation per year, with eggs overwintering. They are probably laid in small rows in the leaf sheaths and leaves of the host plant, as they are in other members of the genus. Adult males begin to appear in the second week of June, and females survive well into September.

Status Very local. The bug was not recognised in Britain until 1967, though older records are now known. The other British *Teratocoris* species are broadly similar in appearance, and examination of the male genitalia is frequently necessary for certain identification. *T. caricis* often occurs with *T. saundersi* and *T. viridis*, and so may be overlooked. It may well ultimately prove to be rather more widespread in the north than current records indicate, but it is certainly much less common than the other two associated species.

Threats Drainage of marshes and other wetland sites for agricultural improvement; neglect of previously grazed marshes, leading to scrub invasion and carr development; overgrazing of tall marsh vegetation.

Conservation Water tables on wetland sites should be kept high. Many of the riverside and lochside marshes in which this species is likely to occur may need no active management for their maintenance. Where changes in grazing levels in areas containing marsh supporting this species are proposed, careful consideration should be given to the potential effects of the changed grazing levels on the vegetation. Light grazing pressure has probably been usual on most sites, and may usually be beneficial, but significant increase may reduce tall flowering sedges.

References Woodroffe, G.E. (1967b), Woodroffe, G.E. (1968c), Woodroffe, G.E. (1969).

TRIGONOTYLUS PSAMMAECOLOR

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Trigonotylus psammaecolor Reuter

Identification Lansbury (1963); Southwood & Leston (1959).

Distribution *T. psammaecolor* is widely distributed around British coasts. There are records from Cumberland, Lancashire, Cheshire, Yorkshire, Lincolnshire, Suffolk, Kent, Sussex, Hampshire, Glamorgan, Carmarthen, Cardiganshire, Caernarvonshire and Fifeshire. It is also known from the coasts of Sweden, Germany, the Netherlands and France.

Habitat and ecology The usual foodplant is sand couch *Elymus farctus* growing on the seaward edge of sand dunes. It has also been recorded from lyme grass *Leymus arenarius* in continental Europe. The typical habitat is of short, sparse, wind-swept grass only a few inches tall at the very edge of the vegetated area of the dunes. This rather inhospitable habitat is inhabited by few other species of Heteroptera, and the importance of this habitat for the species was not recognised until 1958. Older workers mostly gave marram, *Ammophila arenaria*, as the host. There is a record of two individuals from a *Molinia* bog in Cardiganshire, but the site is close to the coast, and the record must be presumed to be of vagrants. It is possible that other grasses are, indeed, used, but in general the older records probably refer to isolated wanderers from the main population. The bugs are extremely well-camouflaged against their usual host and are easily overlooked even when, as is frequently the case, population levels are high. There is one generation per year. The eggs, which overwinter, are laid in rows on the inner side of glumes of the foodplant. Adults mature in late June or early July, and survive until early August.

Status Local. The bug has rather a short season, and may have been widely overlooked in the past. It is likely to be somewhat under-recorded, particularly in the north of its range. Sites supporting extensive areas of its specialised habitat are themselves rather uncommon, however, and many of the sites which do exist appear genuinely to lack the bug.

Threats Natural processes of erosion and deposition of sand may be the major threats to many populations. This is particularly the case since many dune systems have become fragmented or isolated by coastal developments, reducing the chances of colonisation of newly available sites. Colonies of *T. psammaecolor* may occupy very limited areas of suitable habitat, and such sites could be destroyed by single storms. Other potential threats are coastal developments, coastal protection works, and erosion of dune vegetation by heavy public pressure. The latter is a hazard not only through the direct loss of suitable vegetation by erosion, but also because erosion along the dunes encourages the re-working of sand, and increases the chances of catastrophic deposition or erosion of sand on fore-dune habitats. Where public pressure is particularly heavy on the shore, populations of the bug may be directly damaged by flattening and trampling, since the sparsely vegetated fore-dune areas which they inhabit are also favoured sun-bathing and picnicking areas.

Conservation The bug's habitat is a natural one, and should need no positive management so long as the associated dune system retains its integrity. Large dune systems, and areas of coast supporting a number of dune systems in fairly close proximity, are likely to be particularly important in providing many areas of suitable habitat, and so maximising the chances of colonisation of newly-formed suitable fore-dunes, and minimising the chances of local extinction. Where there is heavy public pressure and dune erosion is occurring, public access to the dunes, including their seaward edge, should be limited, either by fencing, or by the provision of boardwalks to encourage visitors away from more sensitive areas.

References Butler, E.A. (1912), Butler, E.A. (1923a), Campbell, J.K. (1980), Collett, H.R.P. (1922), Collett, H.R.P. (1936), Day, F.H. (1928), Hallett, H.M. (1926), Hallett, H.M. (1936), Henderson, K.L. & Henderson, A.C.B. (1984), Jones, H.P. (1929), Lansbury, I. (1963), Masee, A.M. (1955a), Masee, A.M. (1962d), Scudder, G.C.E. (1956), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1958e).

TYTTHUS GEMINUS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Tytthus geminus (Flor)

Identification Southwood & Leston (1959).

Distribution Southern Britain. There are records from Lincolnshire, Cheshire, Staffordshire, Norfolk, Cambridgeshire, Bedfordshire, Hertfordshire, Middlesex, Kent, Glamorgan and Pembrokeshire. There is an unconfirmed record from Surrey.

Habitat and ecology *T. geminus* usually occurs amongst rushes, *Juncus* spp. or, less often, sedges *Carex* spp. in wet places. Like its commoner relative, *T. pygmaeus*, it is generally to be found amongst large clumps of rushes, and spends much of its time near the base of the stems, though it will occasionally climb. There appear to be no major limitations on the type of wetland in which it occurs. There are records from fenland, from vegetated borrow pits, from riverside marsh, from a valley mire, and from a small remnant marsh on derelict heathland. It may be, however, that all sites have a long history of the continuous presence of suitable wetland conditions. There appears to be one generation per year, probably overwintering in the egg. There are records of the adult from late June to October. The bulk of the records are for the later part of this season. All stages of the related *T. pygmaeus* are predacious on eggs, and possibly young nymphs, of leafhoppers. It is likely that *T. geminus* is likewise chiefly or wholly predacious, but the food does not appear to have been recorded.

Status Very local. There are few records of this bug, but it is difficult to estimate the extent of under-recording. It appears to have been as often recorded in recent years as at any time in the past, but only rarely has it been taken on more than a single occasion from any given site. It may therefore be a rather elusive species, perhaps particularly so if it occurs in mixed populations with the superficially similar *T. pygmaeus*.

Threats Drainage of wetland sites, particularly for agricultural improvement or conversion to arable; lowering of water tables on wetland sites as a result of water abstraction or drainage in surrounding land; lack of management on wetland sites leading to scrub invasion and dominance by tall shading vegetation; over-grazing or over-management on wet grassland and marsh sites, leading to loss of rush clumps and tall vegetation.

Conservation Management of wetland sites where the bug is known or thought likely to occur should aim to retain some areas of tall vegetation with rush clumps. Grazing is likely to be the best way to achieve this on many sites. Rotational cutting may be an alternative, but such management can lead in the long term to rather uniform vegetation structure and the loss of discrete clumps of plants. Some sites, such as river-side marshes, may be largely self-maintaining. Where lack of management or falling water tables have led to scrub invasion and shading of low herbaceous vegetation, some degree of scrub clearance may be necessary.

References Bedwell, E.C. (1938), Butler, E.A. (1910b), Butler, E.A. (1923a), Daltry, H.W. (1932b), Groves, E.W. (1968), Masee, A.M. (1952b), Masee, A.M. (1955a), Masee, A.M. (1958d), Masee, A.M. (1962d), Nau, B.S. (1977), Nau, B.S. (1981), Southwood, T.R.E. & Leston, D. (1959), Wagner, E. & Weber, H.H. (1964), Woodroffe, G.E. (1953a).

ZYGIMUS NIGRICEPS

NOTABLE

Order HEMIPTERA

Family MIRIDAE

Zygimus nigriceps (Fallen)

Identification Southwood & Leston (1959).

Distribution So far recorded in Britain only from a few sites in the eastern Highlands and Speyside (Inverness-shire and Morayshire). It otherwise occurs in northern Europe.

Habitat and ecology Found on juniper, *Juniperus communis*. There have been occasional records from Scots pine, *Pinus sylvestris*, but these are probably of individuals which have strayed from nearby juniper bushes. Junipers are known to be the hosts in the USSR and in Sweden. In a Botanic Garden in the latter country the bug has been found on *J. salina*, *J. chinensis* and *J. horizontalis*. There seems to be a preference for low bushes. There are records both from small stunted bushes and from low luxuriant growth, the bugs being found up to about five feet from the ground in some cases. British specimens are from, or near to, areas of remnant Caledonian pine forest. The bug has a strongly northern distribution in Europe, and it is probable that the area of the Eastern Highlands is the only area of Britain with a suitable climate. It is clearly much less common than its host in the highlands, and this may reflect the need for particular local and microclimatic conditions only locally met with. It has been recorded up to an altitude of 1300 feet. There appears to be one generation per year, probably overwintering as eggs laid within the tissues of the host plant. Records of adults in Britain are between late June and mid-August, and nymphs have been recorded earlier in June. This suggests a slightly later season than in Sweden, where adults are found between the first week in June and the last in July.

Status Very local, and seemingly of very restricted distribution. The bug was not recognised in Britain until 1958 (though the first specimens were collected in 1911), and for some time the host plant was thought to be Scots pine, which may have affected recording in subsequent years. It would appear that the bug can form rather localised colonies, perhaps of a very few individuals, and may thus be overlooked in suitable localities where juniper is abundant. Further recording of juniper fauna in the eastern Highlands and elsewhere in Scotland is needed before final judgement can be made of its overall status.

Threats Destruction of Caledonian pine forest, particularly by conversion to conifer plantation; loss of juniper in other sites through development, road-building, or other causes; overgrazing, both within and outside Caledonian forest, leading to lack of regeneration of juniper. The exact conditions required by the bug are not sufficiently well-known for the degree of threat posed by minor changes within sites to be assessed. The preference for low bushes and the very localised distribution of the bug imply that it may be sensitive to the

details of site condition and management. In the absence of more definite information, any significant change in the state of known sites for the species should be regarded as potentially threatening.

Conservation Regeneration of pine forest is being encouraged at a number of conservation sites in Scotland. It is likely that in most established sites suitable conditions for the bug will require no active management beyond site protection, provided they are secured from over-grazing.

References Masee, A.M. (1955a), Masee, A.M. (1961d), Masee, A.M. (1965d), Scudder, G.G.E. (1958b), Southwood, T.R.E. & Leston, D. (1959), Waterston, A.R. (1964), Woodroffe, G.E. (1965c), Woodroffe, G.E. (1972b).

PACHYCOLEUS WALTLI

NOTABLE

Order HEMIPTERA

Family DIPSOCORIDAE

Pachycoleus waltli Fieber

Identification Southwood & Leston (1959) (as *P. rufescens*).

Distribution Southern Britain: there are records from Berkshire, Surrey, Hampshire, Dorset, Devon, Norfolk, Pembrokeshire and Cardiganshire. It has also been recorded from south-western Ireland. It is widely distributed in Europe, but records are more frequent in the west.

Habitat and ecology *P. waltli* is found in permanently wet places, usually amongst moss. It occurs amongst *Sphagnum* in bogs and on wet heaths, and has also been found in *Hypnum* growing amongst marsh marigold *Caltha palustris*, and in moss beside a cliff seepage in Dorset. There is a record of a single individual found amongst damp sedge litter at Catfield Fen, Norfolk, but this may have been a stray individual from a population in nearby moss. All stages may occur together in the moss, and tend to form small colonies, even where there is a considerable area of apparently suitable habitat. The bugs appear to remain close to water level, and have been recorded from fully submerged *Sphagnum* in summer. They are very sensitive to desiccation, and will die rapidly in a dry tube. Adults have been found between February and June and between late July and November, suggesting a single generation per year, with adults overwintering, apparently within the moss. In Britain, nymphs have been recorded as late as August, but they have been found in early October in Germany. This suggests the possibility of a second generation. Alternatively, in the relatively sheltered and constant conditions within the moss, development and breeding may be unsynchronised, and perhaps dependent as much on food availability as on season. The bugs are believed to be predacious, but there appear to be no direct observations of feeding. Adults are normally short-winged and flightless. There is a fully-winged form, but this has so far been recorded in Britain only from a single site in the New Forest.

Status Very local. There is considerable scope for under-recording of this species. It is small, and can be mistaken, particularly in its younger stages, for a mite; it is of cryptic and obscure habits, and it occurs in small colonies which may easily be missed even within a site where it occurs. Nonetheless, there are sufficient negative records to be confident that it is not very widely overlooked.

Threats Because it forms small colonies, is apparently dependent on permanently wet conditions, and is usually flightless, this species is likely to be particularly prone to local extinctions, following which re-colonisation and recovery of populations would be at best very slow. Vagaries of the climate, or of local drainage, may therefore be threatening to some populations, particularly where suitable habitat occurs in small areas, or is greatly fragmented. Other threats include: drainage of wetland sites for development, agriculture or forestry; lowering of water tables on wetland sites as a result of drainage or water abstraction on surrounding land, or increased evapotranspiration from invading scrub and trees, or marginal plantations; succession on unmanaged sites leading to extensive scrub invasion and tree growth, particularly in areas where there is an abundant seed source from nearby pine plantations or birch scrub/woodland.

Conservation On sites known or thought likely to support the bug, water tables should be maintained at a high level, vegetation should be kept low in the vicinity of moss-dominated areas, and scrub invasion should be kept to a low level. Where afforestation takes place in the vicinity of a site, as wide a band as possible of unplanted land should be left around wetland areas to ease problems of scrub invasion. The best method of maintaining the vegetation in suitable condition on many sites where scrub invasion is a potential problem is grazing. Where grazing is not possible, and particularly where there is a ready source of seeds, periodic scrub clearance may be necessary. Because of the small size of individual colonies, small-scale management of the area immediately around known colonies may be possible to maintain populations, but this is clearly unsatisfactory except as a temporary measure until management of the whole site can be implemented.

References Bedwell, E.C. (1929), Bedwell, E.C. (1935), Brown, E.S. (1948b), Butler, E.A. (1923a), Champion, G.C. (1908a), Champion, G.C. (1913), Champion, G.C. (1919), Collins, J. (1926), Groves, E.W. (1982), Groves, E.W. (1986), Irwin, A.G. (1982), Keys, J.H. (1908), Leston, D. (1958b), Leston, D. (1961b), Massee, A.M. (1955a), Massee, A.M. (1959a), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

AEOPHILUS BONNAIREI

NOTABLE

Order HEMIPTERA

Family SALDIDAE

Aepophilus bonnairei Signoret

Identification Southwood & Leston (1959).

Distribution South-western coasts. There are records from Cornwall, Devon, Dorset, Hampshire (including the Isle of Wight), Glamorgan, Pembrokeshire, Caernarvonshire and Anglesey. It is also known from Ireland, the Isle of Man, the Channel Islands, and southwestern coasts of mainland Europe.

Habitat and ecology An intertidal species, which lives in rock crevices or beneath rocks on firm silt or gravel. It seems most often to occur well down the shore, in the *Fucus* zone, between low spring and low neap levels, but there are records from much of the shore, from the upper edge of the *Laminaria* zone to "just below high water mark". It has been found in small colonies, in which adults and nymphs can occur together, but there are also records of isolated individuals. The bugs are believed to be predacious, but their feeding habits are not fully known. Marine worms are one source of food. In captivity, an adult bug has been seen to probe a section of "chopped marine worm" with its proboscis, but was not proved to be feeding. It has been suggested that it will predate the springtail *Anurida maritima*. The life history is poorly known. Nymphs have been recorded between April and September, and adults in most months of the year. It is believed that the bugs mostly overwinter as adults, and mate and oviposit in the spring, but conditions are relatively constant in the bug's specialised microhabitat, and breeding may be more or less unsynchronised for much of the year. The female has a powerful serrated ovipositor, which it has been suggested may be used for inserting the eggs into seaweeds.

Status Local, but almost certainly under-recorded. The bug could possibly occur in any area of rocky shore of the south-west coast where there are suitable crevices. This gives a large potential distribution, and there must be many sites in south-west England and Wales which have not yet been adequately investigated. Besides being small and living in an inaccessible habitat, it is one of the rarer elements of the crevice fauna, and may be missed even when specifically searched for at a site. Nonetheless, there are sufficient negative results from specific search to suggest that it is considerably more local than its habitat.

Threats Disturbance of isolated rocks and stones may be damaging on shores with easy public access. It is noticeable that many of the older records are from beneath stones, whereas more recent ones are overwhelmingly from crevices. Populations within crevices are less likely to suffer from disturbance. The species is likely to be sensitive to oil pollution.

Conservation No active management measures are needed for this species. Relatively undisturbed shores are likely to prove better for the bug, but in most cases the effects of disturbance are probably not sufficient to justify any specific action.

References Bignell, G.C. (1895), Blair, K.G. (1939), Brown, E.S. (1948a), Butler, E.A. (1915), Butler, E.A. (1923a), Carpenter, G.H. (1897), Champion, G.C. (1894), China, W.E. (1927a), Clark, J. (1906), Glynne-Williams, J. & Hobart, J. (1952), Green, J. (1955), Green, J. (1956), Keys, J.H. (1888), Keys, J.H. (1890), Keys, J.H. (1895), Kilburne, W.R. (1890), King, P.E. & Copland, M.J. (1969), King, P.E. & Fordy, M.R. (1984), Marquand, E.D. (1887), Massee, A.M. (1955a), Morgan, M.J. (1969), Morton, J.E. (1954), Scudder, G.C.E. (1956), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Tomlin, J.R. le B. (1915), Waterfall, W.B. (1902), Waterhouse, C.O. (1881).

MICRACANTHIA MARGINALIS

NOTABLE

Order HEMIPTERA

Family SALDIDAE

Micracanthia marginalis (Fallen)

Identification Southwood & Leston (1959).

Distribution Southern England and Wales. There are records from Yorkshire (Thorne Moors), Norfolk (a single locality recorded in the nineteenth century), Dorset (Studland Heath; Holt Heath; Arne Heath, and old records for Lewell Heath and Alderney Heath), Surrey (Chobham Common; Esher Common; Elstead Common; Thursley Common), Hampshire (New Forest), Shropshire (Wem Moss), Denbighshire (Wixall Moss) and Cardiganshire (Cors Fochno). Elsewhere, it occurs in northern and central Europe and in North America.

Habitat and ecology *M. marginalis* is usually found on bare or sparsely vegetated ground in damp hollows and at the margins of small areas of standing water on heathland. Colonies are generally quite small, and a few square feet of suitable habitat is quite sufficient to support the insect. Large areas of bare ground seem usually to be avoided. The bug is clearly quite an efficient colonist over short distances, as might be expected of a species specialising in such an essentially transitory habitat. Established populations can be found within a few years of the creation of suitable areas as a result of fire, or pond or ditch clearance. The life cycle is not fully known. Nymphs have been found in the first half of June; adults occur chiefly from early June to mid-September, but there is a single record from April. G.E. Woodroffe considered it likely that there was a single generation per year, overwintering in the egg. The isolated April record suggests that some adults may overwinter. In America, a female has been recorded as laying a batch of eggs of which some developed immediately, while the remainder entered diapause. The members of the family are all predacious, but the normal food of *Micracanthia marginalis* in the wild appears to be unknown.

Status Very local, and seemingly of rather restricted distribution. The small size of the colonies, and the frequently transitory nature of the preferred habitat, mean that the species may be overlooked. However, the preferred habitat of the species is distinctive and easily searched: in view of this, the many negative records obtained by a number of recent workers indicate that it is genuinely absent from many sites, and from large areas of the country. It may still be under-recorded in the north and west of its range.

Threats The most northerly known British population, at Thorne Moors, is threatened by large-scale peat extraction. The first recorded British site, at Lewell Heath, has been lost to agriculture. The expansion of Bournemouth has largely overtaken semi-natural habitats in the Alderney Heath area, where the bug was recorded in the 1940s. There has been extensive destruction of heathland suitable for the insect in the south in recent decades, and destruction for development remains a particular threat to remaining areas. Because of the transitory nature of its habitats, the bug must have shifting populations which move from area to area within a site, and perhaps between adjacent sites, as patches of suitable habitat become available. The larger the site the more likely it is that suitable conditions will be present somewhere within it to maintain a viable population. Reduction in size and fragmentation of heathlands are therefore likely to be threatening. Lack of management of heathland, unless there is regular disturbance through recreational pressure or other causes, may result in continuous tall vegetation and the consequent shading out of suitable areas of habitat. Heath fires may often be advantageous to the bug in providing new areas of bare ground, but uncontrolled summer fires may be destructive to existing populations, and will be particularly damaging if they take place over extensive areas. Other threats include the destruction of heathland for development, afforestation or agriculture, and the lowering of water tables on wet heath as a result of drainage or water abstraction in surrounding land.

Conservation Studland Heath, Arne Heath, Thursley Common and Cors Fochno are NNRs, and Arne is additionally protected as an LNR and an RSPB reserve. Thorne Moors, Holt Heath, Chobham Common, Esher Common, the New Forest, Wem Moss and Wixall Moss are all SSSIs, and Chobham Common is owned by Surrey County Council. Heathland sites and complexes should be kept as large and as intact as possible. Management of sites should aim to maintain as wide as possible a range of vegetation structure, including bare or sparsely vegetated wet ground. Where there is active management on a wet heathland site, suitable conditions are likely to be created as a result of management operations, such as the clearing or maintenance of ponds, or rotational burning over areas with damp hollows. It is important, however, that suitable conditions are always present, and the need for the constant presence of bare wet ground should be borne in mind in management planning. The areas needed are small, and it may often be possible to create suitable patches by hand clearance. Vehicular access to sites, and other activities which damage or degrade surface cover, may be beneficial to this species provided they are infrequent occurrences. The grazing of stock on heathland sites is beneficial in maintaining open areas free of vegetation, particularly at the margins of pools and ditches used for drinking, but excessive disturbance should be avoided. Small-scale peat cutting may be a good way of maintaining suitable conditions on some sites.

References Brown, E.S. (1948a), Brown, E.S. (1948b), Butler, E.A. (1882b), Butler, E.A. (1923a), Crossley, R. (1976a), Crossley, R. (1980), Groves, E.W. (1982), Leston, D. (1958a), Masee, A.M. (1955a), Masee, A.M. (1962d), Polhemus, J.T. (1985), Saunders, E. (1892a), Saunders, E. (1912), Skidmore, P., Limbert, M. & Eversham, B.C. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Woodroffe, G.E. (1959k).

SALDULA ARENICOLA

NOTABLE

Order HEMIPTERA

Family SALDIDAE

Saldula arenicola (Scholtz)

Identification Cobben (1960); Southwood & Leston (1959).

Distribution Southern England. There are records from Kent, Hampshire (particularly the Isle of Wight), Dorset and Devon. Old records from other counties are believed to be erroneous. It is a widely distributed species in Europe, extends to North Africa and the Middle East, and also occurs in North America.

Habitat and ecology This species is found on more or less bare surfaces around seepages on soft-rock cliffs, and occasionally on bare ground by pools in landslips on such cliffs. It seems to be associated particularly with recent slippage areas. Where the substrate is more stable, it tends to be replaced by the common *S. saltatoria*. This is quite distinct from its usual ecology elsewhere in Europe, where it is associated with gravel and shingle beside still and flowing water. The single Kent record (Dungeness, 1972) is from shingle, and may stem from a relatively recent immigration from mainland Europe, but it is not known whether an established population is present. The life-cycle is not fully known, but it is believed that the bugs overwinter as adults. The members of the family are all predacious, but the exact food of *S. arenicola* does not seem to have been recorded.

Status Local, and of very restricted distribution. The bug seems to be a characteristic component of the seepage fauna of the soft rock cliffs along the south coast from Hampshire to Devon, but there is no proof of an established population elsewhere.

Threats Erection of sea defences and the stabilisation of eroding cliffs.

Conservation Suitable conditions will be naturally generated provided the habitat is safeguarded.

References Allen, A.A. (1958b), Brown, E.S. (1948a), Brown, E.S. (1948b), Butler, E.A. (1909a), Butler, E.A. (1923a), Cobben, R.H. (1960a), Douglas, J.W. & Scott, J. (1871a), Douglas, J.W. (1871), Jones, H.P. (1929), Masee, A.M. (1955a), Saunders, E. (1870), Saunders, E. (1892a), Saunders, E. (1900a), Southwood, T.R.E. & Leston, D. (1959), Walker, J.J. (1933).

SALDULA FUCICOLA**NOTABLE**

Order HEMIPTERA

Family SALDIDAE

Saldula fucicola (Sahlberg)

Identification Cobben (1960); Lindskog (1974); Southwood & Leston (1959). *S. vestita*, keyed as a separate species in Southwood & Leston, is now regarded as a form of *S. fucicola*.

Distribution Northern England and Scotland. Taxonomic changes and confusion with other species of the genus mean that some older records must be considered doubtful. There are confirmed or convincing records from Northumberland, Westmorland, Cumberland, Perthshire, Dumbartonshire, Fife, Orkney, and Shetland. Elsewhere, it occurs in northern and central Europe, and extends east to Siberia.

Habitat and ecology There are British records from gravel, shingle and sand beside lochs, rivers and streams. There seems to be a preference for lowland lochs and for larger rivers. In northern Europe Lindskog (1974) regarded the *vestita* form of this species as characteristic of bare sand or silt beside large lowland rivers, and the *fucicola* form as typically associated with bare sandy shorelines of upland streams, rivers and lakes. The life history is poorly known, but it is believed to overwinter as an adult. All members of the family are predacious, but the usual prey of *S. fucicola* is unknown.

Status *S. fucicola* is listed in Red Data Book category 3 (rare) in Shirt (1987). It is clearly a scarce species in comparison with other members of the northern shingle saldid fauna, *Saldula scotica* and *S. c-album*, but may well be considerably under-recorded. The records to date are quite widely scattered over Scotland and northern England, and there is an ample supply of potentially suitable habitat. Reduction of the status of the species to Notable more accurately reflects current knowledge of the status and distribution of the species.

Threats Eutrophication of lowland lochs, and perhaps also eutrophication and pollution of the lowland stretches of some rivers, may be damaging. Use of lochs as reservoirs should be regarded as threatening, since it is not known whether the bug can cope with the great variations in water level. Any re-alignment or alteration of streams or rivers may be locally threatening, as may the use of dams to control flooding, which will result in the stabilisation of shingle.

Conservation No active conservation management will usually be needed, provided sites are safeguarded.

References Butler, E.A. (1923a), Cobben, R.H. (1960a), Day, F.H. (1928), Dolling, W.R. (1983), Douglas, J.W. (1874a), Lindskog, P. (1974), M'Gregor, T.M. (1893), Masee, A.M. (1955a), Nelson, J.M. (1983), Newbery, F.A. (1902), Scudder, G.G.E. (1958a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959).

SALDULA OPACULA**NOTABLE**

Order HEMIPTERA

Family SALDIDAE

Saldula opacula (Zetterstedt)

Identification Cobben (1960); Southwood & Leston (1959).

Distribution Records are predominantly from Scotland and from the south-eastern coastal counties of England. It has been reported from East Sutherland, Morayshire, Easterness, Aberdeenshire, Dumfriesshire, Norfolk, Suffolk, Cambridgeshire and Kent. Several recent records from Essex require confirmation. Some records may be erroneous, since the species has been confused with others of the genus, but a number of records both from Scotland and from East Anglia are known to be correct. The known distribution in Britain is thus rather sharply discontinuous, but the extent of under-recording is impossible to estimate. *S. opacula* has been reported from Ireland, and is widely distributed in Europe, and also occurs in North America.

Habitat and ecology This species has been recorded from a wide range of wetland habitats. A number of records, predominantly old, are from east coast estuaries and saltmarshes. A recent Norfolk record is from a sheltered saline pool fed by seepage through shingle, and it has also been recorded from the margins of brackish ditches. It seems likely that in coastal situations *S. opacula* occurs particularly in the sheltered upper levels of saltmarsh and around pools and creeks further inland. It has also been recorded on a number of occasions from the margins of peat pools in moorland and grassland in Scotland, at altitudes up to about 1000 metres. In Mound Alderwood, Sutherland, it was found on mud in a dried-up marsh. There are also records from coastal dune slacks and from the fens of East Anglia and Cambridgeshire, but some need to be checked. Adults have been found between June and September, but otherwise little is known of its life history in Britain. All members of the family are predacious.

Status This species was listed in Red Data Book category 3 (Rare) in Shirt (1987). It is clearly very local. However, there is a wide scattering of records, particularly in Scotland, the insect does not seem unduly restricted in its habitat requirements, and there must be many suitable sites which have not yet been investigated. A reduction of status to Notable more accurately reflects the known status and distribution of the species.

Threats Saltmarsh sites may be damaged by reclamation and the construction of sea defences. Estuaries in particular may be particularly liable to threats from development. In upland habitats, afforestation is probably the chief threat.

Conservation Coastal sites should need no active conservation measures beyond site protection. The ecology of the species at inland sites is too poorly known to enable detailed management recommendations to be given.

References Butler, E.A. (1923a), Cobben, R.H. (1960a), Dolling, W.R. (1983), Douglas, J.W. (1874a), Drake, C.M. (1988), Drake, C.M. (1989a), Edwards, J. (1899), Edwards, J. (1901), Hadley, M. (1981), Horsfield, D. (1989), Lansbury, I. (1959), Masee, A.M. (1955a), Morley, C. (1905), Morley, C. (1911), Ridpath, M.G. (1953), Saunders, E. (1892a), Scudder, G.G.E. (1958a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Walton, G.A. (1966), Woodroffe, G.E. (1974).

SALDULA SETULOSA

VULNERABLE

Order HEMIPTERA

Family SALDIDAE

Saldula setulosa (Puton)

Identification Southwood & Leston (1959).

Distribution Recorded in Britain only from the margins of Poole Harbour, Dorset. There are precisely localised records from Arne and from Studland Heath. It is otherwise known from Mediterranean Europe and North Africa.

Habitat and ecology An intertidal species. It has been recorded from tide litter amongst cord-grass *Spartina* on the mud-flats, but appears to be chiefly confined to the extreme upper edge of the tidal zone, along a thin strip of sandy silt with little vegetation. Adults have been found in August and September, and nymphs between June and early August, but the life history is otherwise unknown. All members of the family are predacious, but there appear to be no specific observations of the food of *S. setulosa*.

Status *S. setulosa* is listed in Red Data Book category 2 (Vulnerable) in Shirt (1987). It is possible that this under-estimates the rarity and threat to the species. The size and number of colonies within the very limited area of distribution is not known, and survey to establish the current status of the bug would be of value.

Threats In the past, development around Poole Harbour may well have seriously reduced the area of suitable habitat. The known recent site at Arne could easily be damaged by pollution, a particular concern in view of exploration for oil in Poole Harbour. Public access to the area from the landward side is restricted to a nature trail, but landing from the sea is less open to control, and damage resulting from public access is a possible danger.

Conservation Studland Heath and Arne Heath are both NNRs, and Arne receives additional protection as an LNR and an RSPB reserve. Any area known to support the bug should be kept as free as possible from human disturbance and interference. Any development in or around Poole Harbour which might lead to an increase in pollution levels should be carefully considered. Development should in general be opposed, and where it occurs effort should be made to ensure that the chances of pollution incidents are minimised.

References Brown, E.S. (1948b), Butler, E.A. (1923a), Masee, A.M. (1955a), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

HEBRUS PUSILLUS

NOTABLE

Order HEMIPTERA

Family HEBRIDAE

Hebrus pusillus (Fallen)

Identification Savage (1989); Southwood & Leston (1959).

Distribution Southern England and Wales. There are records from Norfolk, Suffolk, Warwickshire, Gloucestershire, Hertfordshire, Middlesex, Essex, Kent, Surrey, Sussex, Hampshire (including the Isle of Wight), Dorset, Cornwall, and Caernarvon. It is widely distributed in Europe, from Finland to the Mediterranean, and extends east to Turkestan and South Russia. It also occurs in North Africa.

Habitat and ecology A wetland species, occurring amongst dense vegetation in shallow water or at water margins. It occurs amongst sphagnum in bogs and at the margins of acid pools on lowland heaths, where it is often found with its commoner and more widespread relative, *H. ruficeps*. It also occurs in marshes and at the margins of non-acid pools and ditches, where it has been found amongst duckweed, at the base of rushes, and in moss. These non-acid sites are particularly concentrated in large areas of ancient wetland: the East Anglian broads, the Thames marshes, and grazing marshes and levels in Essex, Kent and Sussex. Members of the family are probably entirely carnivorous, predated small invertebrates and feeding on the bodies of those which have drowned, but there appears to be no detailed information on the food of *H. pusillus*.

Status Very local, and probably declined. It is a species of rather obscure habits, and therefore prone to under-recording. It is, however, no more so than the related *H. ruficeps* which, despite a much greater habitat restriction (being always confined to *Sphagnum*), is very much more commonly and widely recorded. Given the habitats and distribution of the species, it might be expected to be rarer now than in the past. There is some evidence that this is the case: Edwards, in the Victoria County History for Norfolk, describes the species as common, which is certainly no longer true.

Threats Drainage and infilling of marshes; improvement of grazing levels, or conversion to arable, with consequent pollution and eutrophication of drainage ditches; unsympathetic management of drainage ditches by clearance of large lengths simultaneously, or by the creation of steep profiles unsuitable for the growth of sheltering marginal vegetation; destruction of lowland heath through improvement, afforestation or development; loss of open wet heathland and bog to invading scrub in areas where management has ceased or diminished in intensity; lowering of water tables on wetland sites through water abstraction and drainage in surrounding land. Eutrophication, pollution, and high intensity of boating activity on the Norfolk Broads, leading to loss and erosion of marginal and aquatic vegetation, may also be threatening, but it is not clear exactly which areas of habitat within the broads complex the species has occurred.

Conservation Water tables on lowland heaths should be maintained at a high level, and pools and bogs should be kept open and free from all but very light scrub invasion. Grazing will assist in the maintenance of open conditions, and the resultant hoofprints help to create small-scale habitat diversity which may be beneficial to the species, particularly by producing small sheltered hollows which will remain damp in times of drought. In non-acid wetland and ditches, water quality should be maintained by avoiding sources of pollution, and particularly by avoiding or minimising the use of fertilisers or pesticides on surrounding land. Management of ditches should be the minimum necessary to ensure their continued function; ideally, only short lengths should be cleared at any one time, and clearance should be on one side only. The slope at the margin should be gentle,

to allow the establishment of marginal and emergent vegetation. Heavy trampling by stock should be avoided on at least some ditch margins.

References Andersen, N.M. (1982), Bedwell, E.C. (1908), Blatch, W.G. (1883a), Brown, E.S. (1943b), Brown, E.S. (1948a), Brown, E.S. (1948b), Butler, E.A. (1905), Butler, E.A. (1923a), Champion, G.C. (1919), Edwards, J. (1901), Foster, A.P. (1987c), Groves, E.W. (1982), Harwood, W. (1903), Macan, T.T. (1965), Masee, A.M. (1955a), Masee, A.M. (1962d), Masee, A.M. (1965a), Masee, A.M. (1965f), Masee, A.M. (1965g), Morley, C. (1905), Morley, C. (1911), Nau, B.S. (1974), Saunders, E. (1892a), Saunders, E. (1908a), Savage, A.A. (1989), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955).

HYDROMETRA GRACILENTA

RARE The lesser water measurer

Order HEMIPTERA

Family HYDROMETRIDAE

Hydrometra gracilentata Horvath

Identification Savage (1989); Southwood & Leston (1959).

Distribution Recorded from only three localities in Britain: Barton Broad and Great Fen, East Norfolk; New Forest, Hampshire, and Pevensey Levels, East Sussex. It is widely distributed in western Europe, from Finland in the north to France and Italy, and east to Soviet Asia.

Habitat and ecology In Norfolk this species has been found amongst and beneath overhanging cyperus sedge *Carex pseudocyperus* and soft rush *Juncus effusus* growing on peaty banks at the margin of shallow water over deep mud. In Sussex, it was found amongst mixed marginal vegetation including sedges and rushes along a well-vegetated drainage ditch in grazing levels. The nature of the habitat in the New Forest locality is not known in detail. The life history in Britain is not fully known. Adults have been taken in June and August. Members of this and related families in temperate climates generally hibernate as adults, and this is likely also to be true of *H. gracilentata*. Members of the Hydrometridae are all, so far as is known, carnivorous. There appear to be no specific observations on the food of *H. gracilentata* but it is likely that, like the related and common *H. stagnorum*, it both predated small invertebrates, and feeds on those which have drowned.

Status Extremely local and rare. It was first recorded in Britain in 1938, from the Norfolk Broads, but has seemingly not been recorded from there or from the New Forest since the 1950s. The recent (1988) discovery of the species in Sussex makes it clear that the species may be overlooked, and it is possible that more populations remain to be discovered.

Threats The Norfolk Broads have suffered considerably from eutrophication in recent decades, and Barton Broad is in one of the most severely affected areas. In lowland drains in general, and in grazing levels in particular, the main threats are pollution and eutrophication resulting from intensification of land use and chemical application on surrounding land, and unsympathetic management of drainage ditches by the clearance of large stretches in a single operation, or the creation of steep profiles unsuitable for the establishment of marginal vegetation.

Conservation All recorded sites for this species in Britain are within SSSIs. Part of the Pevensey Levels is an NNR, and part a reserve of the Sussex Wildlife Trust, though the single record of *H. gracilentata* is not from either of these areas. Barton Broad is a reserve of the Norfolk Wildlife Trust. Effluent from a sewage works near Barton Broad is now treated to reduce phosphate levels. Where the bug occurs in drainage ditches, these should be isolated from pollution sources, the surrounding land should as far as possible be laid to pasture, and the use of chemical fertilisers and pesticides should be avoided as far as possible. The ditches themselves should be managed as little as is compatible with their continued function. Clearance should be carried out over short stretches at any one time, and should be undertaken from one side only, leaving the vegetation on the other side untouched. Ditch profiles should be shallow towards the water margins, for colonisation of marginal and emergent vegetation.

References Andersen, N.M. (1982), Brown, E.S. (1948b), Gardner, A.E. (1954a), Gardner, A.E. (1954b), Leston, D. (1952), Leston, D. (1954b), Macan, T.T. (1965), Masee, A.M. (1955a), Savage, A.A. (1989), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Walton, G.A. (1938).

MICROVELIA BUENOI UMBRICALA

RARE

Order HEMIPTERA

Family VELIIDAE

Microvelia buenoi umbricola

Identification Savage (1989); Southwood & Leston (1959) (as *M. umbricola*).

Distribution Recorded only from the fens and broads of Cambridgeshire (Wicken Fen) and Norfolk (Barton Broad, Bure Marshes NNR, Catfield Fen, Sutton Broad, Wheatfen Broad). It appears to be rather localised in mainland Europe, and is recorded from Denmark, Germany, Sweden and Poland. *M. buenoi* also occurs in North America, but the European form (*M. b. umbricola*) is regarded as subspecifically distinct.

Habitat and ecology This is a semi-aquatic bug, living on the water surface. It is confined to still, usually shallow, water where there is dense shading vegetation. It has been found in a floating bog of *Iris*, *Carex* and other plants, but is more usually recorded from the margins of ditches, where it is found close to the edge under overhanging clumps of cyperus sedge *Carex pseudocyperus* or other plants. Under such conditions it may be the commonest species of *Microvelia*. Adults have been recorded between May and September, and probably overwinter. Nymphs have been recorded from June to September. All species of *Microvelia* are predacious. They will attack submerged prey, such as small Crustacea and ciliate Protista, through the surface film, and will also take surface-dwelling prey, such as springtails. Adults are usually flightless, with extremely reduced wings, but fully-winged forms occur at low frequency.

Status Very local, and of restricted distribution. It appears to be fairly widespread in East Anglian fens, but there are no records outside this very limited area.

Threats Eutrophication is a major problem in the Norfolk Broads, but since *M. umbricola* generally occurs in smaller ditches away from the margins of the main broads, and is a surface-dwelling species in shallow water, it may be less affected by this than is much of the fauna. The lowering of water tables at fenland sites, particularly those away from the main broadland complex, as a result of drainage and water abstraction on surrounding land, is an increasing problem. Both lack of management, and unsympathetic management, of ditches and water margins may be threatening. In the absence of management, ditches may become choked with vegetation and lose their open water. Because of the dependence of *M. umbricola* on dense overhanging marginal vegetation, clearance of long stretches of ditch in a single operation may remove all suitable habitat for a population. The creation of steep marginal profiles will also be damaging, unless the water table is very near the surface, since it will make the establishment of marginal vegetation difficult. Lack of recent management on many fen sites has led to extensive scrub invasion. Where this is sufficiently dense to shade out the marginal vegetation of ditches and pools it is likely to be damaging.

Conservation All recorded sites for the bug are within SSSIs. The Bure Marshes is an NNR; Wicken Fen is a property of the National Trust; Barton Broad, Sutton Broad and Catfield Fen are reserves of the Norfolk Wildlife Trust. A trust has been formed to purchase and manage Wheatfen Broad. Sewage effluent from a treatment works near Barton Broad is now treated to reduce phosphate levels of the Norfolk Broads. In fen sites, water tables should be maintained at a high level, and the water sources isolated as far as possible from sources of pollution and enrichment. Clearance of ditches should be undertaken to the minimum extent compatible with their continued function. Where possible, only short lengths should be cleared at any one time, and marginal vegetation should be left untouched on at least one side. If re-profiling is necessary, the margin should be left gently shelving, to provide opportunity for re-colonisation by marginal and emergent vegetation. If the water table is consistently very close to the surface, a steeper profile may be acceptable. Continuous scrub cover at the margins of pools and ditches should be avoided, but the retention of small discrete areas of scrub close to the water margin may be beneficial.

References Allen, A.A. (1984a), Andersen, N.M. (1982), Bedwell, E.C. (1943b), Brown, E.S. (1948b), Brown, E.S. (1954), Macan, T.T. (1965), Masee, A.M. (1955a), Savage, A.A. (1989), Shirt, D.B., ed. (1987), Southwood, T.R.E. & Leston, D. (1959), Stichel, W. (1955), Usinger, R.L. & Brown, E.S. (1949), Walton, G.A. (1939).

MICROVELIA PYGMAEA

NOTABLE

Order HEMIPTERA

Family VELIIDAE

Microvelia pygmaea (Dufour)

Identification Savage (1989); Southwood & Leston (1959).

Distribution Southern England and Wales. There are records from Cambridgeshire, Hertfordshire, Essex, Kent, Surrey, Sussex, Hampshire, Dorset, Cornwall, Glamorgan and Monmouthshire. It is also recorded from Ireland. It is widely distributed in southern Europe, from France to South Russia, and extends east to Siberia and China. It is also found in North Africa. Prior to 1939, all British *Microvelia*, including the common *M. reticulata*, were regarded as belonging to this species. Older records are likely to be erroneous.

Habitat and ecology A semi-aquatic bug, living on the water surface. It is found in still or very slowly flowing water, usually where there is a thick growth of emergent vegetation such as reeds or sedges, or where there is extensive growth of overhanging marginal vegetation. Beyond the need for still and sheltered conditions, the species seems fairly catholic in its tastes. It has been found both in acid pools in heathland and in bogs, and in fairly calcareous water in ditches and river backwaters. It has also occurred in disused flooded clay pits and gravel workings, a spring-fed pool, and drainage ditches in grazing levels. There is a single record of the species from a garden pond, to which it may have been introduced with vegetation. The adult has been recorded in all months between March and November, and probably overwinters. Nymphs have been recorded as late as September. All species of *Microvelia* are predacious. They have been observed to attack small Crustacea and large ciliate Protista through the surface film, often raising them out of the water on the extended rostrum to feed. They also attack surface-dwelling animals such as springtails.

Status Very local, but perhaps increasing. *M. pygmaea* was listed in Red Data Book category 3 (Rare) in Shirt (1987), but recent records make it clear that this considerably overstates the rarity of the species, and that Notable is the highest justifiable status. There have been a number of recent records, which significantly extend the known distribution of the species. It is not clear, however, whether this is the result of an actual increase, or merely reflects past under-recording. The bug is small, often found amongst dense vegetation, and frequently occurs in mixed populations with the common *M. reticulata*. When this is the case, *M. pygmaea* is more restricted to dense vegetation, and is hence the more likely species to be missed if a small sample is taken for recording purposes.

Threats Destruction of wet heathland and bogs through development, afforestation and drainage; lowering of water tables on wetlands through drainage or water abstraction on surrounding land; excessive shading of pools on heathland through uncontrolled scrub invasion on unmanaged sites; loss of permanent standing water in drainage ditches and pools as a result of improved drainage; pollution and eutrophication of pools and drainage ditches, particularly as a result of use of pesticides, herbicides and fertilisers on surrounding land, and the conversion of grassland bordering such sites to arable; unsympathetic management of ditches and ponds. Because of the dependence of the bug on the shelter of emergent or overhanging marginal vegetation, populations could easily be wiped out by clearance of large lengths of water margin in a single operation, or by re-grading to give a steep profile at the water margin, giving conditions unsuitable for the growth of marginal and emergent vegetation.

Conservation Water tables on wet heaths and bogs should be kept high. Lowland drainage ditches and pools should be isolated as far as possible from sources of pollution and enrichment. Where there are extensive systems of drainage ditches, as in grazing levels, use of fertilisers, pesticides and herbicides in surrounding land should be avoided or minimised, and fields should be laid to pasture, rather than converted to arable. Clearance of drainage ditches should be carried out to the minimum extent compatible with their continued function. Clearance should be undertaken over short lengths in any single operation, and should take place along one side of the

drain only, leaving emergent and marginal vegetation untouched on the other bank. Profiles after clearance should be shallowly sloping, to allow colonisation by emergent and marginal vegetation. Continuous dense scrub along the margins of pools and ditches should be avoided, but if scrub is present the retention of discrete patches close to the water's edge may be beneficial.

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AQUARIUS PALUDUM

NOTABLE

Order HEMIPTERA

Family GERRIDAE

Aquarius paludum (Fabricius)

Identification Savage (1989); Southwood & Leston (1959).

Distribution Chiefly south-eastern. There are records from Cambridgeshire, Hertfordshire, Essex, Kent, Sussex, Middlesex, Surrey, Berkshire, Buckinghamshire, Oxfordshire, and Hampshire (including the Isle of Wight). There are a number of unconfirmed records outside this area, but all are suspected of being erroneous. It is widely distributed in central and southern Europe.

Habitat and ecology A large pondskater which occurs in colonies on the surface of large open water bodies such as lakes and reservoirs, and on flowing water in rivers and canals. Adults overwinter, and mate in the spring. Eggs are laid beneath the water, the female carrying the male beneath the surface with her. Oviposition extends over a considerable period, and nymphs continue to occur until late in the year. There may be at least a partial second generation. All stages are carnivorous, feeding largely or entirely on arthropods which have fallen or been blown into the water, and are trapped in the surface film. There is no detailed information on the food of *A. paludum*, but work on the related and commoner *A. najas* has shown it to have fairly catholic tastes, and the same is probably true of *A. paludum*. There are both short-winged (flightless) and long-winged forms, the latter often being the commoner.

Status Very local. *A. paludum* may be under-recorded. Although it is a large and conspicuous animal, it is also fast-moving, and frequently occurs well away from the bank of rivers and lakes, where it is inaccessible. At a distance, it cannot be distinguished from the commoner *A. najas*. There appear to be only a few, mostly old, records for Cambridgeshire, Essex, Bedfordshire, Hertfordshire, Middlesex and Oxfordshire.

Threats No certain threats are currently known. Pollution and eutrophication are possible threats, but there is no evidence of any direct effect on the species. Since it is confined to open water, it is possible that neglect of some canals and large lakes and pools, and consequent growth of extensive beds of emergent vegetation, may have been deleterious, but this is unlikely to have had more than a very local effect. The use of waterways, reservoirs and lakes for water sports might be expected to be damaging, since it is unlikely that the bugs could successfully feed and reproduce in water frequently disturbed by boat wash, but there is no direct evidence of such an effect. Loss of marginal cover from intensively managed water bodies may be damaging because of the absence of hibernation sites. The considerable recent increase in the area of open water in much of the species' range as a result of gravel extraction might be expected to benefit it, but as yet there seems to be no record of it colonising such a habitat. There seems no reason why it should not do so, since the fully-winged form, which is able to fly, is of frequent occurrence, and it is known to have colonised at least one artificial reservoir.

Conservation More observations on the constraints which limit this species in Britain would be welcome, since it seems so much more local than are apparently suitable habitats. In most sites where it occurs, no active conservation measures are likely to be needed, beyond ensuring the continuation of areas of open water. Extensive use of boats, or intensive use of a water body for water sports, are likely to be detrimental to local populations, and should be avoided as far as possible, at least in some defined areas of any given lake.

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CORIXA IBERICA

NOTABLE

Order HEMIPTERA

Family CORIXIDAE

Corixa iberica Anderson

Identification Jansson (1986); Savage (1989).

Distribution Northern and western Scotland, south to Arran. There are records from Argyll, Sutherland, the Inner and Outer Hebrides, the Shetlands and the Orkneys. Elsewhere it is known only from the north-west of Ireland, Spain, and Portugal.

Habitat and ecology The species has only recently been recognised, and its ecology and biology are as yet poorly known. Records are predominantly from small water bodies. *C. iberica* appears to be found in areas with an extreme oceanic climate and mild winters. Climatic factors are probably the chief factor affecting the status and distribution of the species in Britain.

Status Uncertain, but apparently local. The known British distribution is rather restricted, but the species has been so recently recognised that there is considerable scope for it to prove more widely distributed and frequent. On present evidence, this would seem to be the rarest of the European species represented in the British fauna; roughly half the known European records are from the British Isles.

Threats None known at present.

Conservation The ecological requirements of the species are too poorly known for any specific management recommendations to be made. There is a good chance that no specific conservation action need be taken at most sites, beyond site safeguard.

References Jansson, A. (1986), Savage, A.A. (1989).

MICRONECTA MINUTISSIMA

RARE

Order HEMIPTERA

Family CORIXIDAE

Micronecta minutissima (Linnaeus)

Identification Jansson (1986); Savage (1989); Southwood & Leston (1959).

Distribution There are confirmed records from south-eastern England: Colchester, Essex; River Lea, Hertfordshire; Longleat Park, Wiltshire, and the Oxford Canal, Somerton, Oxfordshire. A Nottinghamshire record is based on three specimens labelled "Babworth" in the British Museum (Natural History). It is widely distributed in north-west and central Europe, and has also been recorded from south-west Asia.

Habitat and ecology In Britain this bug seems to be most commonly associated with slow-flowing shallow water over a bottom of pebbles or mud with fairly sparse vegetation. It is extremely sporadic in occurrence, and appears to have been taken in only a single year at each of its known localities. In the cases of the River Lea and the Oxford Canal, this was in spite of there being large populations in the years in question, and despite specific search in subsequent years. This suggests a ready migrant, able to build up populations rapidly in a suitable area. Most individuals, however, are short-winged and flightless. There are two generations per year in

southern England. Nymphs overwinter when about half-grown, and mature in late spring. Adults of the summer generation mature and breed in late August. Eggs are laid on the edges of the leaves of aquatic plants. The bugs are probably generalised microphages, sifting bottom detritus and algae for food, but may also be actively predacious on bottom-dwelling organisms.

Status Apparently extremely local. A species as prone to the formation of transitory colonies as this is inevitably liable to be overlooked, particularly since it is superficially similar to two other British species, *M. poweri* and *M. scholtzi*, which may occur with it. However, the extreme scarcity of records, the most recent being in 1957, leave little doubt that it is genuinely rare.

Threats The chief threat to the species probably lies in the eutrophication and pollution of lowland rivers and canals. *Microneecta* species in general are intolerant of pollution and of high concentrations of organic matter in solution. Lack of management of, for example, disused canals may also be a threat at some sites; it seems unlikely that the bug could survive in a densely vegetated site. Unsympathetic management of rivers and canals, particularly through piling of the edges or the creation of steeply angled margins may also be damaging.

Conservation Specific recommendations for conservation and management for this species are difficult to give in the absence of known populations, and the probably transitory nature of any populations which might occur. If a population is found, the bed of the water body in which it occurs should be kept fairly sparsely vegetated, and the water should be isolated as far as possible from sources of pollution and enrichment. The population should be carefully monitored.

References Brown, E.S. & Scudder, G.G.E. (1958), Groves, E.W. (1983), Jansson, A. (1986), Nau, B.S. (1974), Savage, A.A. (1989), Southwood, T.R.E. & Leston, D. (1959), Walton, G.A. (1944).

SIGARA STRIATA

NOTABLE

Order HEMIPTERA

Family CORIXIDAE

Sigara striata (Linnaeus)

Identification Jansson (1986); Savage (1989).

Distribution Only certainly known in Britain from Kent and East Sussex, but with unconfirmed records from south Essex. Though restricted in distribution, it is found widely and often commonly within its range. It is common throughout most of Europe except for parts of the extreme west, and extends east into Asia.

Habitat and ecology A water boatman found in still or slow-flowing water, tolerant of a wide range of conditions. It can occur in open and almost weed-free water over mud, silt or gravel, or amongst quite dense weed. It is tolerant of moderate salinity, but is not generally found in sites where there is heavy pollution or great eutrophication. Overwintered adults mate in April or early May. There is a partial second generation, the summer generation maturing and mating in July and August. All stages are probably rather generalised feeders, in part general microphages on detritus, but probably in part also active predators of chironomids and other bottom-dwelling organisms. *S. striata* will readily mate with the common *S. dorsalis* in the laboratory to produce viable offspring, and hybrids are frequent in the wild.

Status *S. striata* was listed in Red Data Book category 3 (Rare) in Shirt (1987), but the records currently available clearly show that this overstates the rarity of the species, which cannot be assigned a status higher than Notable. It is a frequent species within its restricted distribution. It may have been spreading in recent years. There are certainly more widespread records, but the species was only added to the British list in 1956, and it is possible that it has been widely overlooked until recently.

Threats Threats to particular populations include: pollution and eutrophication, particularly as a result of intensification of farming in surrounding land; infilling and neglect of pools and minor ditches; culverting and infilling of drains; loss of permanent water in ditches and pools as a result of falling water tables brought about by water abstraction and improved drainage. The species is sufficiently widespread and tolerant within its range that these probably do not represent any overall threat in Britain.

Conservation The bug is sufficiently tolerant and widespread within its limited area of distribution that active conservation measures are probably superfluous. Where there is an opportunity to influence water quality, particularly over extensive areas with slow-flowing or still water such water should as far as possible be isolated from potential sources of pollution and eutrophication. Surrounding land should be grassland, rather than arable, and the use of pesticides and fertilisers should be minimised.

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CICADETTA MONTANA

ENDANGERED New Forest cicada

Order HEMIPTERA

Family CICADIDAE

Cicadetta montana (Scopoli, 1772)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Now known only from the New Forest, Hampshire. There are several old records from Surrey. Records from Frillinghurst Wood, "near Haslemere", and "near Chiddingfold", may all come from the same general area. There is also a record from near Woolmer. Morley (1941) refers to an additional old and unconfirmed record from Epping Forest, Essex, by Westwood, given in the Dale manuscripts at Oxford University. Morley says that this record "must be erroneous", but it is not immediately obvious why he considered that this must be so. It is certainly a very doubtful record, but Epping Forest in the early nineteenth century must have held plenty of suitable habitat. *C. montana* is widely distributed in Europe, and is also recorded from Siberia and Syria.

Habitat and ecology The nymphal stage, which is subterranean, probably lasts from five to eight years. The larvae feed suctorially on roots. A wide range of woody plants have been recorded as hosts, together with bracken and purple moor-grass *Molinia caerulea*. The latter is perhaps particularly important for early instars, but can be used by all nymphal instars. Adults occur from mid-May to late July, with mid-June as the peak period. They have a minimum temperature requirement of about 65°F for singing or flight. *C. montana* occurs in fairly open deciduous or mixed woodland, preferring southern fringes bordering on rough common, or broad rides, firebreaks or clearings. Clearings showing active regrowth of low vegetation, for instance a year or two after a fire, are favoured. As the growth matures, the *Cicadetta* colony tends to decline. A large colony has been recorded from an area of rabbit-cropped acid grassland with stunted bracken overhung by pine trees. *Cicadetta* seemingly prefers a heavy soil, and the largest New Forest colonies have been recorded from areas on clay. The largest recorded colonies have been on clay soils. The adults feed on a variety of broadleaved trees and shrubs. The eggs are laid inside the stems of woody plants. Oviposition has been recorded in bracken, silver birch, oak and beech, with bracken the most frequently used. The male sings to attract the female. Though the song has been described as loud by some workers, it is high pitched and is not audible to everyone. The preferred song perches of the male are beech, oak and lone Scots pine *Pinus sylvestris* at 15 to 40 feet. The eggs are laid in small batches inserted into stems not far from the ground using the powerful ovipositor. Each batch consists of about a dozen eggs. An individual female can produce over 600 eggs in total, but 200 to 300 is probably a more usual for a wild female in Britain. The nymphs apparently do not travel far after hatching. *C. montana* seems to occur chiefly in rather localised colonies. The history of records from the New Forest suggests that individual colonies have had limited lifespans of perhaps one to several decades before habitat changes have made the site unsuitable. However, there have been scattered records from a wide area of the Forest, and it would seem that, in the past at least, the insect has occurred at low density outside the more obvious colonies.

Status Extremely localised and rare. Even within the New Forest, there are few populations, and these are small and isolated. It is perhaps unlikely that colonies remain elsewhere in Britain, but the possibility cannot be entirely ruled out. The very localised occurrence of the species makes it easy to miss a colony. Though the males sing, and might be expected to be conspicuous as a result, many people are unable to hear the song, and for some time after its discovery in Britain doubt was expressed as to whether it sang at all. Singing males are usually

inaccessibly high in trees. Populations appear often to be quite small. Since several years are passed as an underground nymph, it is not even strictly necessary for adults to be present in every year.

Threats This species is probably at the limit of its climatic tolerance in Britain, and would seem always to have been extremely local. The occurrence of the species in small and isolated colonies may make it particularly sensitive to localised changes in vegetation structure. Such sensitivity to small-scale changes may be particularly important in relatively small and isolated sites, and the recent restriction of the species to the New Forest may be at least partly the result of the large area of semi-natural habitat available, which may have allowed localised losses to be compensated by colonisation of suitable habitat nearby. Changes in grazing pressure may be deleterious if they result in significant changes in vegetation structure.

Conservation The New Forest is an SSSI. The New Forest populations have been the subject of intense study since the late 1960s and the Forestry Commission is aware of the importance of the sites. It has proved possible to rear *Cicadetta* artificially, using domestic raspberry *Rubus idaeus* as the host plant. It would seem that vegetation structure is the critical factor in determining the suitability of a site for this species. Sheltered south-facing woodland margins and edges of rides and clearings should be kept open and sunny, and dense growth of scrub should be avoided. Though bracken is a beneficial or necessary feature for this species, it does not appear that it needs to be tall or dense. Chemical control of bracken should be avoided in areas where *C. montana* occurs. If mechanical control of bracken is to be undertaken, it should be done early in the year, before the hatching of adults and oviposition. In the New Forest, grazing is likely to be a critical factor in maintaining suitable vegetation structure, particularly since the reduction of rabbit populations by myxomatosis.

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APHROPHORA ALPINA

NOTABLE

Order HEMIPTERA

Family CERCOPIDAE

Aphrophora alpina Melichar

Identification Le Quesne (1965).

Distribution Widely distributed in southern Britain. There are records from Yorkshire, Cheshire, Staffordshire, Warwickshire, Shropshire, Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, Surrey, Hampshire and Glamorgan. It is also recorded from Ireland. In mainland Europe, it has been reported from Holland, France, Germany, Poland, Czechoslovakia, Switzerland, Austria, Italy, Yugoslavia, and Russia, and extends east to Japan.

Habitat and ecology *A. alpina* occurs on wet lowland heaths, bogs and fens. The most frequently recorded foodplant is bog myrtle *Myrica gale*. *A. alpina* has been found on sallow *Salix* sp. at Wicken Fen, Cambridgeshire. There are a number of records from sites where *Myrica* is rare or absent, suggesting that use of *Salix* may not be uncommon. When feeding on *Myrica*, there may be a preference for rather scattered plants growing amongst tall vegetation such as reeds *Phragmites australis*. In the Norfolk fens it is found regularly in such circumstances, but is often absent or rare in areas of dense *Myrica*. There is probably one generation per year. Nymphs, like those of other members of the genus, probably develop in masses of froth on the lower stems and roots of the host. There is probably one generation per year, overwintering in the egg. Adults have been found from August to October.

Status Very local. This is a large and conspicuous insect, and is probably more thoroughly recorded than many members of the group. However, it may well be under-recorded in some areas, particularly in the west. It has been more frequently recorded in recent years than previously, and may be increasing.

Threats Drainage of wetlands; lowering of water tables on wetlands as a result of water abstraction or drainage on surrounding land; neglect of previously managed wetlands, leading to scrub invasion, usually by willows *Salix* or birch *Betula*, and shading out of *Myrica* and other wetland vegetation; eutrophication of lowland sites,

particularly in the east, through nutrient inputs from water draining intensively farmed land and, in the Norfolk Broads particularly, from sewage input.

Conservation Water tables on wetland sites should be kept high. Management of any given site should aim to maintain tall vegetation with good *Myrica* growth. Large stands of pure *Myrica* are not necessary for this species, and may be less suitable than smaller and more scattered bushes growing amongst tall sheltering vegetation. Light grazing may be the best way to maintain suitable vegetation structure in most sites. *A. alpina* has been found in reed-beds managed by cutting. However, the cutting cycle should be as long as possible, and only a fraction of the area occupied by *Myrica* should be cut in any one year. Management by burning will ultimately destroy *Myrica*, and should not be attempted.

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NEOPHILAENUS LONGICEPS

NOTABLE

Order HEMIPTERA

Family CERCOPIDAE

Neophilaenus longiceps

Identification Le Quesne (1965).

Distribution So far recorded in Britain only from north Kent and Essex. The known distribution extends north to the Colne estuary in Essex, and east to Faversham in Kent. This distribution may be misleading, as the species is very similar to the common *N. lineatus*, and may be overlooked elsewhere. It is, however, very similar to the distribution of another saltmarsh Auchenorrhynchan, *Chlorita viridula*, as well as to several other species in other insect orders. *N. longiceps* is otherwise a largely mediterranean species, recorded from France, Portugal, Spain and North Africa.

Habitat and ecology Salt-marshes, particularly the grassier upper levels. Members of the genus *Neophilaenus* are in general grass-feeders, and *N. longiceps* presumably feeds on saltmarsh grasses. No specific hosts have been suggested. The species can be found in areas dominated by common saltmarsh grass *Puccinellia maritima*, but there is no proof of feeding by nymphs on this plant. The life history is probably similar to that of the very closely related *N. lineatus*, a common grassland species. In *N. lineatus*, the nymphs are xylem feeders, living in masses of froth low down on grasses. Adults of *N. longiceps* have been recorded from July to September.

Status Apparently local, and of very restricted distribution, but well-established in at least some of the known Essex localities. The extent of under-recording is difficult to estimate. The insect is very similar to the closely related *N. lineatus*, and may have been overlooked elsewhere in Britain. The East Anglian coasts other than those of south Essex have been rather poorly worked for Auchenorrhyncha in recent years, and the species may extend further north.

Threats The Essex saltmarshes are currently eroding, and it has been estimated that virtually all could have vanished within 50 years. The underlying causes are not known. If this process continues unchecked, most suitable habitat within the known distribution of the bug will be lost. Other threats include development, particularly along the Thames Estuary; saltmarsh reclamation, and loss of upper saltmarsh communities through construction or renovation of sea defences.

Conservation The species is known to occur in the Colne Estuary National Nature Reserve, and is likely to be present in other coastal reserves within its known range. A considerable proportion of the saltmarsh with habitat of reasonable quality for the insect is now afforded SSSI status. Research is in progress to determine the causes of erosion of Essex saltmarshes, and to investigate ways of preventing it. Saltmarsh communities need no active management to remain suitable for *N. longiceps*. Light grazing, which encourages the growth of grasses, may perhaps improve the quality of the habitat for the insect, but is certainly not necessary, and should not be introduced to marshes where it is not already present. Heavy grazing, producing a relatively short sward, is likely to be deleterious.

AGALLIA BRACHYPTERA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Agallia brachyptera (Boheman)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Predominantly eastern. There are records from Northumberland, Yorkshire, Lincolnshire, Derbyshire, Leicestershire, Northamptonshire, Huntingdonshire, Cambridgeshire, Suffolk, Bedfordshire, Oxfordshire, Wiltshire and Dorset. The absence of records from the extreme south-eastern counties is interesting. Under-recording may be partly responsible, but it may well be that the distribution is genuinely concentrated in the East Midlands and the north-east. Despite the eastern bias in the distribution, there are scattered older records from further west, including several from Ireland. Abroad, the distribution extends across much of Europe to Algeria.

Habitat and ecology Recorded from both dry and marshy places. It is recorded from Wicken, Woodwalton and Chippenham Fens, where it has been taken by sweeping marsh vegetation, and has occurred in a saltmarsh in Ireland. The majority of British records, however, are from dry localities, particularly from amongst low or sparse vegetation. There may be a preference for calcareous substrates. Habitats include chalk grassland and sparsely vegetated limestone quarries. Large populations have been observed on disturbed ground, and conditions of partial re-vegetation in such places may represent particularly good conditions for the species in Britain. On the continent, it has been found in dry and moist grassland, cultivated fields, and damp woods, and in sedge fens and bogs in Scandinavia. It is largely ground-dwelling, and probably requires fairly open conditions in all its sites. Eggs overwinter. On the continent, nymphs have been found under *Rumex acetosella*, *Trifolium repens*, and *Taraxacum* sp. in June and July, and have been seen to feed on all these plants, and also on *Achillea millefolium*. Adults have been found from June to early September in Britain, and in Sweden have occurred until early October. They are short-winged and flightless.

Status Local, but perhaps rather under-recorded because of its ground-dwelling habits.

Threats In wetland sites, drainage must be considered a threat, but the precise details of water regime are probably less critical for this species than for many others; loss of short vegetation and its replacement by tall grasses or scrub as a result of lack of active management and/or lowering of the water table may be a more serious problem in many sites. In calcareous grassland, loss of open structure, and perhaps also loss of bare ground, are likely to be detrimental, and cessation of grazing or disturbance particularly so; destruction or improvement of calcareous grasslands will also be threatening. On disturbed ground, the main danger, apart from the destruction caused by development or infilling, is likely to be natural succession leading to a closing over of the vegetation cover and to scrub invasion. The species is brachypterous, and so is likely to be a poor coloniser over all but very short distances. As a result, it may prove particularly sensitive to the loss of localised colonies.

Conservation Open conditions should be maintained in wetland sites by grazing or rotational cutting regimes. Calcareous grasslands should be grazed to maintain a mosaic of turf lengths, preferably with some bare ground. The exact timing and pattern of grazing may not be critical for this ground-dwelling species. Mowing is a less satisfactory way of maintaining vegetation structure, since it is less likely to provide areas of bare ground or disturbance. In long-neglected grassland, relatively large-scale disturbance of the ground may well prove beneficial for the species. In ruderal sites, active management is likely to be necessary in the long term to maintain areas of open vegetation and bare ground, unless there is very intense grazing or disturbance by rabbits.

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Order HEMIPTERA

Family CICADELLIDAE

Aphrodes aestuarinus (Edwards)**Identification** Le Quesne (1965) (as a form of *A. makarovi*).**Distribution** Southern coasts of Britain. There are records from South Lincolnshire, Norfolk, Suffolk, Essex, Sussex, Hampshire, Dorset, Cardiganshire, Pembrokeshire, Anglesey and Lancashire. In mainland Europe, there are records from Germany and Poland, and an unconfirmed report from Italy.**Habitat and ecology** *A. aestuarinus* is a saltmarsh species. It has been recorded from shrubby seablite *Suaeda fruticosa* and on one occasion from annual seablite *S. maritima*, but these may not be foodplants. The records from Wales and Lancashire are beyond the range of *S. fruticosa*, and in eastern England it has been taken in numbers on marshes where *S. fruticosa* does not occur. In Essex it occurs most frequently in the upper levels of the saltmarsh where there is dense growth of saltmarsh grass *Puccinellia maritima* and sea purslane *Halimione portaculoides*. *Puccinellia* may be the foodplant under these circumstances, since some other members of the genus are known to be grass-feeders. All stages are largely ground-dwelling, but adults more often climb vegetation and can sometimes be captured in numbers using a sweep net. They will also climb vegetation to avoid inundation by the tide. Nymphs appear to remain at ground level. Adults have been recorded between July and September. It is likely that, in common with other related members of the genus, there is one generation per year, overwintering in the egg.**Status** Widespread but local in southern saltmarshes. *A. aestuarinus* is no doubt still under-recorded, perhaps particularly in the south-west. Its taxonomic status is uncertain. It has often been regarded as a form of the common *A. makarovi*, which may have exacerbated under-recording.**Threats** The upper levels of saltmarsh are particularly prone to damage through the construction or renovation of sea banks and other protective measures. Suitable available habitat for the species has been reduced in many sites through the construction and maintenance of such defences, and in some places has been entirely lost. The extensive saltmarshes of the Essex coast are currently being lost at a considerable rate through erosion, though the underlying cause is not certainly known. Reclamation of saltmarsh for agricultural use remains a threat in some areas. Coastal development, particularly along major estuaries and near ports, threatens a number of saltmarsh sites. Pollution is a potential threat to many sites, those near ports and along major estuaries again being the most susceptible. Estuarine saltmarshes may also be threatened by barrage schemes. Intense grazing of saltmarsh, leading to a close-grazed sward, is likely to be damaging to *A. aestuarinus*, which appears normally to live amongst vegetation of moderate height.**Conservation** Research is in progress to attempt to find ways of preventing the continued loss of saltmarsh on the Essex coast. Most sites for the species need no active management to maintain them in suitable condition for this species, and site protection should adequately ensure its continued survival. Where there is light grazing on a marsh, this may not disadvantage *A. aestuarinus*. Heavy grazing should be avoided, unless it has been practised for a long period and there are other valid conservation reasons for its continuation.**References** Edwards, J. (1908), Edwards, J. (1909), Harmsworth, G.C. & Long, S.P. (1986), Le Quesne, W.J. (1965b), Morley, C. (1933), Nast, J. (1972), Tittley, I. (1982).

Aphrodes albiger (Germar)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Widely distributed in England, but not yet recorded from Scotland or Wales. There are records from Westmoreland, Yorkshire, Derbyshire, Norfolk, Essex, Kent, Surrey, Berkshire, Sussex, Hampshire and Somerset. It has been recorded from Jersey and from France, and is widespread in central Europe, east to Latvia, Estonia and the Ukraine. It also occurs in North America.

Habitat and ecology *A. albiger* occurs in a wide range of marshy places, and has been recorded from habitats as diverse as saltmarshes, disused flooded chalk pits, and ditches in grazing levels. It may be associated particularly with water margins and with areas which are regularly flooded. It is probably a grass-feeder, since this seems the most usual food of members of the genus. Both adults and nymphs usually remain on or close to the ground, at least during the day. Adults have been recorded from July to September, and there is probably one generation per year. It overwinters in the egg.

Status Very local. A largely ground-dwelling species such as this can be difficult to record, particularly in view of its seemingly sporadic distribution in a wide range of wetland habitats. It is therefore likely to be somewhat under-recorded.

Threats Saltmarsh populations may be threatened by the construction and renovation of sea defences, which may damage or remove the upper levels of the saltmarsh which the species inhabits; by reclamation for agriculture; by development, and probably also by the introduction of grazing onto previously ungrazed saltmarshes. On inland sites, generalised threats include the drainage and improvement of wet grassland; the lowering of water tables on wetland sites as a result of drainage and water abstraction in surrounding land; pollution and eutrophication of water bodies, particularly by run-off from intensively used farmland; cessation of management on sites leading to loss of open wetland conditions.

Conservation Water tables should be maintained at a high level. Water bodies should be isolated as far as possible from sources of eutrophication and pollution. Land close to drainage ditches should be used as non-intensively as possible; grazing on unimproved grassland is ideal. Ditches and other water bodies should not be cleared more often than is necessary. When clearance is undertaken, only a fraction of the length of margin, or only one side of a drainage ditch, should be cleared in any one operation. Open conditions with diverse vegetation structure should be maintained on wetland sites. Light grazing is probably the most generally suitable management for maintaining such structure, but a rotational programme of cutting may also be suitable, particularly on sites where this has been the traditional management practice. Light scrub invasion is unlikely to be damaging to *A. albiger*, and may be desirable for other elements of the invertebrate fauna. Dense scrub should be avoided, and some scrub clearance may be necessary on neglected sites. Saltmarsh sites require no active conservation measures beyond site protection. Grazing should not be introduced onto previously ungrazed saltmarshes. If sea banks are to be constructed or renovated, they should be positioned as far inland as possible, and construction material should be excavated as far as possible from areas of low conservation interest to the landward side of the bank.

References Duffield, C.A.W. (1960b), Le Quesne, W.J. (1965c), Nast, J. (1972), Ossiannilsson, F. (1981).

APHRODES DUFFIELDI**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family CICAPELLIDAE

Aphrodes duffieldi Le Quesne**Identification** Le Quesne (1965).**Distribution** Recorded only from Dungeness, Kent. This is a possible endemic. There are no definite records of this species outside Britain, but it is possible that it is conspecific with *A. alpinus* from the Alps.**Habitat and ecology** Vegetated coastal shingle. The foodplants are believed to be grasses, but there is no information on which species are utilised. It is chiefly a ground-dwelling species, at least during the day, and may spend much of its time buried in the shingle. Recent records of the species have come from pitfall traps, which have collected it in moderate numbers in areas where hand searching and vacuum sampling have failed to find it. Almost all the individuals captured by this method are males. This bias in sex ratio is general amongst *Aphrodes* captured in pitfalls, and suggests that the females remain relatively immobile. Adults have been captured from June to September. It is likely that, in common with other members of the genus, it overwinters as the egg.**Status** C.A.W. Duffield took this species at Dungeness in 1919, 1926, 1928, 1955, and 1957. It was not recorded again until 1988, when systematic pitfall trapping at Dungeness showed it to be widely distributed at the site, though not necessarily in large numbers. In view of the retiring nature of the species it is possible that it occurs elsewhere in Britain. Any extensive area of well-vegetated shingle in southern Britain is worth searching, but such sites are themselves rare.**Threats** *A. duffieldi* may be sufficiently widespread at Dungeness for localised changes and developments not to present any threat to the population as a whole. However, loss of suitable habitat has already occurred through the construction of the power station, gravel extraction, and the development of Lydd airport, and further extension of any of these will inevitably further diminish the population. Threats to other coastal shingle sites which might support the bug come chiefly from development, gravel extraction, and recreational use leading to disturbance and erosion of vegetation. The most likely of other possible sites for the insect, the Crumbles, East Sussex, has recently been largely destroyed for the development of a marina.**Conservation** The habitat of *A. duffieldi* at Dungeness, and probably at other sites at which it may occur, needs no management in order to maintain suitable conditions. Site protection is all that is required.**References** Duffield, C.A.W. (1960a), Duffield, C.A.W. (1960b), Le Quesne, W.J. (1965c).

APHRODES LIMICOLA**NOTABLE**

Order HEMIPTERA

Family CICAPELLIDAE

Aphrodes limicola (Edwards)**Identification** Le Quesne (1965); Ossiannilsson (1981).**Distribution** Southern British coasts. There are records from Lancashire, South Yorkshire, Lincolnshire, Norfolk, Essex, Kent, Hampshire, Dorset, Cornwall, Somerset, Gloucestershire, Cardiganshire Pembrokeshire and Anglesey. *A. limicola* also occurs in Ireland. It has been reported from Sweden, Holland, Germany, Greece and Italy, but some records need confirmation.**Habitat and ecology** This is a saltmarsh species, found particularly in the upper levels of the marsh amongst saltmarsh grass *Puccinellia maritima*, a probable foodplant. It is normally found amongst vegetation of at least several inches in height, often where *Puccinellia* grows mixed with sea purslane *Halimione portaculoides*. Adults and nymphs are largely ground dwelling, but may climb plant stems to avoid inundation during high tides. Adults

have been recorded from July to September. It is likely that, in common with other members of the genus in Britain, it overwinters as the egg.

Status Widely distributed but local. It is likely to be under-recorded, since it is of rather cryptic habits.

Threats The construction and renovation of sea defences are likely to be damaging through the destruction of the upper levels of saltmarshes where *A. limicola* occurs. Large areas of habitat have been lost through such defences along considerable stretches of the coast, and in places all suitable habitat has been lost. The extensive areas of saltmarsh in Essex, which are known to support the insect, are currently eroding, though the underlying reasons for this loss are not known. Reclamation for agricultural purposes continues to be a problem in some areas. Coastal development, particularly along estuaries and in the vicinity of ports and holiday resorts, is a threat along a number of sections of coast. Pollution is a potential threat, and is again most likely to be in estuaries and near ports. Coastal barrage schemes may threaten extensive areas of saltmarsh along several stretches of the coast. Heavy grazing of saltmarshes, leading to a close-cropped sward, is probably unsuitable for the species, and increases in grazing pressure on any saltmarsh should be viewed as potentially damaging.

Conservation Research is in progress on ways of preventing continuing loss of Essex saltmarsh through erosion. The habitat of the species in almost all cases needs no active management to maintain it in suitable condition, and the conservation of the species is chiefly dependent on site protection. Where sea banks or other protective devices are to be constructed, they should be as far to landward as possible to minimise the destruction of the upper levels of the saltmarsh. Where strengthening or enlarging existing defences requires the extraction of soil, this should be taken as far as possible from areas of low conservation interest to the landward side of the defences, rather than digging material from the marsh itself. It is possible that light grazing on saltmarshes may be compatible with the needs of *A. limicola*. However, under no circumstances should grazing be introduced to a previously ungrazed saltmarsh.

References Brown, J.M. (1923), Duffield, C.A.W. (1960a), Duffield, C.A.W. (1960b), Edwards, J. (1908), Edwards, J. (1909), Le Quesne, W.J. (1965c), Little, C., Payne, R.M., Aaldhous, P. & Scott, P. (1988), Nast, J. (1972), Ossiannilsson, F. (1981), Renouf, L.P.W. (1934).

APHRODES TRIFASCIATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Aphrodes trifasciatus (Geoffroy in Fourc.)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Chiefly northern. There are records from Shropshire, Worcestershire, Staffordshire, Derbyshire, Nottinghamshire, Yorkshire, Lancashire, Westmoreland, Kirkcudbrightshire, Perthshire and Dumfriesshire. It is widely distributed in Europe, but seemingly more frequent in the north.

Habitat and ecology On damp heaths and moors. Members of the genus are usually grass-feeders, and this is probably true of *A. trifasciatus*, which seems to be particularly associated with purple moor-grass *Molinia caerulea* in Britain. It has been recorded from a wider range of habitats in mainland Europe, including dry grassland. There is one generation per year in northern Europe. Eggs overwinter. Adults have been recorded from July to September. Adults and nymphs are largely ground-dwelling, at least during the day.

Status Local. Since this is a largely ground-dwelling insect, and hence rather difficult to find, it is likely to be rather under-recorded. It is clearly widely distributed in the north.

Threats Ploughing and improvement of heathland for agricultural purposes; drainage of wet heathland; lowering of water tables on wet heathland through water abstraction or drainage in surrounding land; overgrazing in upland areas leading to replacement of heather moor by *Nardus* grassland; neglect of previously managed sites, leading to scrub invasion and shading; afforestation. Uncontrolled summer fires may also be damaging, but since they may encourage *Molinia*, the likely foodplant, they may in the long term be less harmful to this species than to many others in the same habitat.

Conservation Management of heathland and moorland sites should aim to maintain a wide range of habitat structure and vegetation type as possible, including areas with *Molinia* tussocks. Water tables on wet heathland sites should be kept high. Suitable structure is probably best maintained by light grazing. Overgrazing, leading either to loss of structural diversity or to loss of heather and its replacement by coarse grasses, should be avoided. The effect of burning of wet heathland on this species is not known, but burning is in general inadvisable because of the adverse effects on other elements of the flora and fauna. Management by a rotational programme of cutting may be possible on some sites. Management units should be as small as possible, and the rotation as long as possible.

References Brown, J.M. (1926), Coulson, J.C. & Butterfield, J.E.L. (1979), Crossley, R. (1981), Daltry, H.W. (1932b), Edwards, J. (1915), Flint, J.H. (1966), Fordham, W.J. (1922), Le Quesne, W.J. (1965c), Murray, J. (1935), Nast, J. (1972), Ossiannilsson, F. (1981).

AUSTROGALLIA SINUATA

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Austroagallia sinuata (Mulsant & Rey)

Identification Le Quesne (1965).

Distribution There is a single British record from the Lizard district, Cornwall, in the last century. It occurs in the Channel Isles. It is widespread in Mediterranean Europe, and extends north to Switzerland and east to Turkestan.

Habitat and ecology The single British record is from pellitory-of-the-wall *Parietaria diffusa*, but this was almost certainly a casual association. *A. sinuata* is a largely ground-dwelling species. In the Channel Isles it is found on sand dunes, often under moss. If it is established in mainland Britain the true habitat is likely to be in low or sparse vegetation on well-drained substrate.

Status Uncertain. It is not clear whether this is a true British native. Only a single specimen has been recorded, and this may have been a vagrant. However, if the species is established in Britain, the Lizard, and the south-west peninsula in general, is one of the most likely areas in which it might occur. This part of Britain is not well-recorded for Auchenorrhyncha, and established populations of such a cryptic species may well have escaped notice.

Threats Uncertain. The Lizard heaths have been subject to piecemeal improvement, and any continuation of this process may be damaging to *A. sinuata* if there is an established population there.

Conservation Part of the Lizard heaths are now a National Nature Reserve, and more extensive areas in the region are SSSIs. This area, and other sites in the extreme south-west, should be checked for the species, and its ecological requirements studied if a population is found.

References Edwards, J. (1896), Le Quesne, W.J. (1965c), Nast, J. (1972), Ribaut, H. (1952).

AUSTROASCA VITTATA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Austroasca vittata (Lethierry)**Identification** Le Quesne & Payne (1981).**Distribution** In Britain this species has been recorded only from Osterley Park, Middlesex. It is widespread in central and southern Europe.**Habitat and ecology** The foodplant in mainland Europe is wormwood *Artemisia absinthum*. This plant is widespread and frequent on derelict and disturbed land in southern England, and if established populations are found, they are likely to be in such habitats.**Status** Uncertain. It is not known whether *A. vittata* is a true British native. Only a single British specimen is known, taken in the 1950s, and this may have been an introduction or vagrant. On the other hand, there seems no reason, from its continental distribution, why the species should not occur in Britain.**Threats** No threats can be certainly identified at present. Given the preference of the host plant for derelict and disturbed ground, it is likely that any populations of the insect which may be established may be locally threatened by development, natural succession, or attempts at weed control. Such habitats, however, tend to be transitory, and unless the species proves to be extremely localised it is not likely to be threatened overall by such changes.**Conservation** No active conservation measures can be suggested in the absence of a known established population of the species in Britain. If viable populations are discovered, maintenance of derelict and disturbed land in the area will be important. The discouragement of unnecessary tidying and weeding should be a priority. Where derelict or disturbed ground supporting the insect is to be managed for conservation, periodic substrate disturbance on some part of the site may be necessary in order to maintain good populations of the host plant.**References** Le Quesne, W.J. (1961b), Le Quesne, W.J. (1965c), Nast, J. (1972).

CHLORITA DUMOSA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Chlorita dumosa Ribaut**Identification** Ossiannilsson (1981).**Distribution** Currently known from only two British localities: Harris, Rhum, Inner Hebrides (1969) and Scout Scar, Westmorland (modern Cumbria) (1987). It is almost certainly present at further sites, and may prove to be quite widespread in the north of England and Scotland in suitable habitats.**Habitat and ecology** The Rhum specimens were taken on a hillside covered with grass, rushes and heather. The Cumbrian specimens were taken from limestone grassland. In mainland Europe, it has been taken from dry grassland, and is thought to be associated with thyme *Thymus* sp. It is probably premature to comment in detail on the ecology of the species in Britain, but it seems clear that it will prove to be a northern species. Further survey of upland habitats, particularly those supporting thyme, is needed to clarify its requirements. The British specimens were taken in late June and late August. In mainland Europe there are two generations per year, and the winter is spent in the egg.**Status** Uncertain. This species is clearly very local, but more recording is needed. It is currently known from only four specimens. Though the first two were taken in 1969, both were female, and it was not until the taking of a pair in 1987 that the species was recognised as British. There has clearly been little time as yet for the

species to be searched for more widely, and several years at least must elapse before the status of the species in Britain can be assessed.

Threats In the current state of knowledge of the species, threats are difficult to determine. Grassland habitats in the north are subject to improvement, less often to ploughing. Sites on limestone in particular may be vulnerable to quarrying. Grazing levels are likely to be critical in maintaining suitable vegetation structure. Either neglect or overgrazing may be damaging.

Conservation Rhum is a National Nature Reserve. Scout Scar is a SSSI. Management of sites containing the species should aim to maintain open conditions with a mosaic of vegetation structure, including some fairly short grassland supporting thyme. Light grazing is the preferred method for achieving this. It is important that grazing levels should be adjusted to keep vegetation structure suitable. A tightly grazed sward is unlikely to be able to support the insect.

References Nast, J. (1972), Ossiannilsson, F. (1981), Stewart, A.J.A. (1987).

CHLORITA VIRIDULA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Chlorita viridula (Fallen)

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution In Britain, recorded only from the coasts of north Kent and south Essex. Most records are from the Thames estuary, extending north to the Crouch in Essex, and east to Whitstable Bay in Kent. It is widely distributed in Europe, and has been reported from Soviet Asia and North Africa.

Habitat and ecology In Britain recorded only from sea wormwood *Artemisia maritima*, growing in the upper levels of saltmarshes and on sea walls. In mainland Europe it has been found on a wider range of aromatic composites: mugwort *Artemisia vulgaris*; wormwood *Artemisia absinthum*; tansy *Tanacetum vulgare*, and santolina *Santolina chamaecyparissus*. There are two generations per year in southern Sweden, and adults are found from June to October. Captures of adults in Britain have been from July to September. It probably overwinters in the egg.

Status Well-established within the limited area of its distribution, with a large proportion of the good-sized stands of the host plant supporting populations of the insect.

Threats The Essex saltmarshes are eroding, and it has been estimated that almost total loss could occur within 50 years. Throughout the British range of the insect, the construction and renovation of sea defences may seriously damage the upper levels of saltmarshes, though this may to some extent be compensated by the ability of the species to colonise sea wormwood growing on sea walls. The first recorded site for the species in Britain, at Seasalter, Kent, was destroyed by the construction of sea defences. Reclamation and development may be seriously damaging in some parts of the range, particularly along the inner stretches of the Thames estuary, and must already have destroyed or seriously affected a large proportion of the habitat historically available. Pollution is a further potential threat, again most serious within the Thames Estuary, and near major towns.

Conservation The habitats for the species usually require no active management: site safeguard is all that is likely to be required in most cases. Heavy grazing is inimical to the growth of suitable stands of host-plant. Grazing should not be introduced to any ungrazed saltmarsh. Where construction or renovation of sea banks or other defences is essential, material for the construction should be taken from areas of low conservation interest on the landward side of the bank, and the construction should be as far to the landward side of the saltmarsh as possible.

References Badmin, J. (1983), Badmin, J.S. (1984), Duffield, C.A.W. (1957), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981).

CICADELLA LASIOCARPAE

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Cicadella lasiocarpae Ossiannilsson**Identification** Le Quesne (1987); Ossiannilsson (1981).**Distribution** So far recorded in Britain only from three Welsh sites: Cors Erddreinniog and Cors Bordeilio, Anglesey, and Cors Geirch, Caernarvonshire. The host plant has a scattered distribution throughout Britain. It is most frequent in the north and west, but there are local concentrations of records in, for example, East Anglia, the New Forest, and parts of Wales. *C. lasiocarpae* is also recorded from Ireland (Co. Kerry, Co. Clare, Co. Mayo and Co. Galway), Finland, Sweden and Denmark.**Habitat and ecology** British records to date are from a calcareous valley mire, from flushes dominated by black bog rush *Schoenus nigricans* in acidophilous mire, and from fen with saw sedge *Cladium mariscus* and thin reed *Phragmites australis*. The only known food plant is slender sedge *Carex lasiocarpa*. This is a plant of "mesotrophic to eutrophic mires and reed swamps, on substrates ranging from sedge peats to sandy soils of exposed lake shores" (Jermy, Chater & David 1984). Females in captivity have been seen to feed on *C. lasiocarpa*, and one has been seen to oviposit; eggs were laid in groups of two to three in soft tissue about four centimetres above the shoot base. The British specimens were taken in August. Adults have been taken from July to September.**Status** Uncertain. The species was described as new to science in 1981, and was first recognised in Britain in 1985. No other British specimens have so far been found in museum collections. The species is clearly very local, but it is premature to estimate the British status beyond this.**Threats** Generalised threats to the habitats in which the species is likely to occur are drainage and improvement, lowering of the water table on wetland sites through drainage or water abstraction in surrounding land, and afforestation. Overgrazing may also be a problem locally.**Conservation** Cors Erddreinniog is a National Nature Reserve. Water tables on wetland sites should be kept high. Vegetation structure should be varied, and include both low, moss-dominated vegetation and clumps of sedges and other taller plants. Light grazing is the preferred management for long-term maintenance of suitably varied conditions, but grazing levels should be carefully monitored to ensure overgrazing and consequent loss of structure does not occur. In some sites, scrub clearance may be necessary if neglect of formerly managed sites has led to extensive scrub invasion. If cutting is necessary to maintain open conditions on any site, then only a fraction of the site should be cut in any one year, and the periods between cuts should be as long as possible.**References** Jermy, A.C., Chater, A.O. & David, R.W. (1982), Le Quesne, W.J. (1987b), Ossiannilsson, F. (1981).

CICADULA FLORI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Cicadula flori (J.Sahlberg)**Identification** Le Quesne (1969); Ossiannilsson (1989).**Distribution** In Britain, known from only five sites: Walthamstow Marshes (1979, 1984); Ingrebourne Marshes (1984); Rainham (1984), all in South Essex, East Walton Common, Norfolk (1989), and Fenstanton, Huntingdonshire (1990). It is widely distributed in northern and central Europe, extending east to Mongolia, and has also been recorded from Israel.**Habitat and ecology** There are three British records from freshwater marshes near the River Thames, and one

from a Norfolk pingo system. In mainland Europe, it has been recorded from wet grassland and from the upper levels of coastal marshes. The foodplants are not known, but may well include sedges *Carex* spp. The life history in Britain is poorly known. On the continent adults are found from July to September in the north. In central Europe there are two generations per year. Eggs probably overwinter.

Status Extremely local. The Essex records come from a very limited area, which is under considerable pressure. The species was only recognised in Britain in 1982. It is superficially similar to other *Cicadula* species, so might be overlooked in other areas. The recent finding of the species at a Norfolk site suggests that *C. flori* may occur more widely in East Anglia, which has not been well-worked for Auchenorrhyncha in recent years.

Threats The north Thames marshes were formerly an extensive wetland area. Only very small, and generally degraded, remnants remain. The small size and isolation of many actual or potential sites for the species may itself be a threat to the long-term viability of the populations. Walthamstow Marshes are isolated amongst urban development. They remain of reasonable quality, but have been drying out for some time. They have been threatened with draining and development in the past, and may be so again in the future. Planned road-building and development in the Rainham area may affect both the Rainham and Ingrebourne Marshes sites, either directly or indirectly. Increasing urbanisation and development in the Rainham area are likely to affect the sites in some way, either by changed drainage patterns, or increasing pollution of the incoming water. All marshes in the area were previously managed, either by cutting or grazing, but have been neglected in recent decades. Increasing growth of coarse vegetation and scrub invasion may prove threatening in the future. East Walton Common is under no immediate threat, but lack of management in wetland sites on pingo systems in East Anglia has led to considerable decline in quality in many cases. There is little prospect of re-instating management on most sites, and this must be regarded as a threat both at East Walton Common and at other sites where *C. flori* may prove to occur.

Conservation Management should aim to retain a diverse marsh vegetation with at least some beds of tall vegetation including sedges. The most intractable management problem in the Essex sites is likely to be in maintaining water tables at a high level, and with maintaining water quality. In the long term, it is likely to be necessary to re-introduce management to these marshes. Traditional management of Walthamstow Marshes, and probably other sites, was by cutting for hay. If cutting is to be re-introduced, it should be on a rotational basis: only a fraction of the area of habitat should be cut in any one year, and the period between cuts should be as long as is compatible with the maintenance of suitable vegetation structure. Light grazing is probably a better method of management, in that suitable structure may be maintained indefinitely throughout the site, rather than undergoing catastrophic change at regular intervals. However, grazing is likely to be difficult to introduce or maintain on sites in the area. If it is used, grazing levels should be very carefully monitored to ensure that no over-grazing takes place.

References Le Quesne, W.J. (1983b), Nast, J. (1972), Ossiannilsson, F. (1983).

CICADULA ORNATA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

C. ornata was common on a tall sedge, as yet unidentified. It is reported as feeding on sedges *Carex* spp elsewhere in Europe, and in Scandinavia has been found in wet peaty meadows. The British specimens were taken in early September. In mainland Europe, adults have been recorded from July to September.

Status Uncertain, but almost certainly very local. There are a number of *Cicadula* species in Britain, and it is possible that *C. ornata* has been overlooked in the past. It is, however, a large and distinctive member of the genus, and should not have been widely overlooked. Further recording will be needed before the status of the species in Britain can be adequately assessed. It is afforded the status Notable B in this review. It is very unlikely that this overstates the rarity of the insect.

Threats It is not yet clear whether the single known British site represents the only, or even the typical, habitat for *C. ornata* in Britain, nor can it be guessed how widespread the insect will eventually prove to be. Estimates of threats must therefore be rather tentative. Unimproved and wetland sites in river floodplains have been widely destroyed through drainage, improvement and conversion to arable. Such changes continue to threaten remaining

sites. The low water quality of many lowland rivers, particularly as a result of fertiliser and pesticide run-off from agricultural land, may pose a further threat. Lowland wetland sites are frequently threatened by water abstraction, leading to lowering of water tables. River engineering, and particularly flood prevention works, may lead to serious changes in the extent and frequency of flooding of riverside habitats. Neglect of remaining wetland sites, leading to dominance by coarse vegetation and invasion by scrub and carr, may damage populations of the insect both directly by shading and loss of foodplant, and indirectly by increased evapotranspiration leading to drying of the site. Unsympathetic management of drainage ditches, by the clearance of large stretches in a single operation or by the creation of steep edges which emergent vegetation cannot easily colonise, may also be damaging.

Conservation The Derwent Ings is an SSSI, and part is protected as an NNR. Several areas of similar habitat in the area are also SSSIs. The key factors in maintaining the habitat in suitable condition for *C. ornata* are likely to be the maintenance of a high water table and suitable vegetation structure. Suitable vegetation structure is probably best maintained by grazing, and should include both tall flowering sedges and grasses and areas of lower grazed vegetation. If a site has been traditionally cut for hay, then no harm can come from continuing this management. The marginal vegetation of drainage ditches may be of particular importance, particularly if grasslands have been drained, improved or mis-managed in any way. Great care should be taken in the management of drains. They should be managed only as often as strictly necessary, and only over the minimum length needed in any one operation. Management should be carried out from one side only, and the marginal vegetation of the other bank left untouched. The ditches should be left with a gently shelving margin to encourage the establishment of marginal vegetation. Where it is inevitable that a ditch must be frequently cleared, it is probably best if it is cleared often, but gently. The removal of small amounts of depositing silt and growing vegetation several times a year may be less damaging than a more traumatic single annual clearance.

References Flint, J.R. (1990), Ossiannilsson, F. (1983), Stewart, A.J.A. (1989).

CICADULA QUINQUENOTATA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Cicadula quinquenotata (Boheman)

Identification Le Quesne (1969); Ossiannilsson (1983). *C. intermedia* is easily confused with two other, commoner, members of the genus, *C. aurantipes* and *C. persimilis*. Older records, particularly, need to be carefully checked.

Distribution A predominantly northern and western species. There are confirmed records from Aberdeenshire, Morayshire, Roxburghshire, Yorkshire, Cheshire (three old records), Brecknock, Montgomery, Merioneth and Cardiganshire. There are unconfirmed records from a number of other English and Welsh counties.

Habitat and ecology *C. quinquenotata* is predominantly a peatland species, with records from lowland and upland bogs and the margins of acid pools. There are occasional records from wet acid grassland. It has been recorded from poor and rich fens in Scandinavia. The foodplant is not certainly known, but it has been collected from sedges *Carex* sp(p) and from cotton grass *Eriophorum* sp. In Britain, adults have been recorded from August to early October, but the life history is otherwise unknown. It probably overwinters as an egg, in common with other members of the genus.

Status Local. Confusion with *C. aurantipes* or *C. persimilis* may have led to over recording in the past, particularly in the south. It is seemingly quite widely distributed in the north, and may also be so in Wales, which is relatively poorly recorded.

Threats Drainage and improvement of moorland and acid grassland for farming purposes; afforestation of uplands; large scale peat extraction; lowering of water tables on lowland wetland sites through drainage and water abstraction in surrounding land; scrub invasion and dominance by coarse vegetation on neglected sites which were formerly managed; overgrazing leading to loss of plant diversity and tall vegetation; burning, particularly if uncontrolled and occurring during the summer months.

Conservation Water tables on peatland sites should be kept high. Management should aim to maintain a diverse plant community, including areas of tall sedge and cotton grass. Such communities may be maintained with little or no management in the extreme north. Further south and at lower altitudes active management is needed to maintain suitable structure in the long term. Traditional management which has maintained suitable habitat structure in the past is likely to have been grazing, small scale peat cutting, or both. Either would be acceptable for continued management. Grazing levels must be carefully monitored to ensure that there is no overgrazing. Where none of these management techniques is feasible, cutting may be possible on some sites. If it is to be introduced, only a fraction of the total habitat area should be cut in any one year, and the interval between cuts should be as long as is compatible with the maintenance of suitable vegetation structure. Where a site has traditionally been managed by burning, continuation of the practice is unlikely to do much harm in most cases. It is, however, the least desirable of management options, and should be phased out if possible. If it is to be continued, it should be done on a rotational basis, with only a fraction of the site burnt in any one year.

References Brown, J.M. (1923), Edwards, J. (1915), Fordham, W.J. (1922), Krogerus, R. (1960), Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983), Roche, P.J.L. (1944), Salmon, M.A. (1954), Skidmore, P., Limbert, M. & Eversham, B.C. (1987), Whalley, P.E.S. (1955).

COSMOTETTIX CAUDATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Cosmotettix caudatus

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution There are only five British records: Shardloes Pond, Amersham, Buckinghamshire (1956); Millwater private nature reserve, Crewkerne, Somerset (1979); Haskayne Cutting, Lancashire (1979), Castor Hanglands, Northamptonshire (1984) and Sonning Eye Gravel Pits, Oxfordshire (1988). It is widely distributed, though apparently usually rather uncommon, in Europe from Finland in the north to France in the south, and extends east to Kazakhstan.

Habitat and ecology The British records are all from marshy or grassy vegetation, sometimes near standing water, the substrate varying from slightly acid to somewhat alkaline. All are rather small areas of wetland at pool margins or on seepages. On the continent, it has also been recorded from wet meadows and from bogs. The widely scattered British records give little hint as to likely limiting factors. It seems clear that it is rather secretive and difficult to record. Adults have been found in July and August, but the life history is otherwise unknown. The foodplant is unknown, but it has been taken from sedges *Carex* spp.

Status Clearly very local, but otherwise uncertain. The very scattered distribution, coupled with the apparently rather unspecialised habitat requirements make it seem likely that more localities remain to be discovered, but the extent of under-recording is impossible to estimate.

Threats Shardloes Pond dried out some years after the recording of *C. caudatus*. It has since re-filled, but the insect may not have survived. The Millwater reserve has been recently threatened by plans for conversion into a playing field by the local authority. General threats to its habitat as currently known are: infilling of small ponds, for agricultural purposes or by dumping; drainage and improvement of wet grassland; falling water tables on wetland and pool sites as a result of water abstraction or drainage in the surrounding land; neglect of ponds and small wetland areas leading to scrub encroachment, dominance by tall coarse vegetation and loss of open conditions; pollution and eutrophication of lowland pools and small areas of wetland, particularly as a result of run-off from surrounding arable land.

Conservation Castor Hanglands is a National Nature Reserve. Haskayne Cutting is a reserve of the Lancashire Trust for Nature Conservation. Millwater N.R. is a private nature reserve and an SSSI. Wet grassland and pool margins should be kept open and unshaded, and with a good range of vegetation type and structure, including areas of tall grassy vegetation. Light grazing is probably the best way of maintaining suitable conditions on larger sites where there is ample room for stock, but may be impractical, particularly on small sites. Periodic cutting is a viable alternative technique, and wet grassland at Castor Hanglands NNR has been managed in this way for

some years. Only a fraction of the total area of habitat should be cut in any given year, and the period between cuts should be as long as is consistent with the maintenance of suitable vegetation structure. Scrub clearance may be necessary if there is heavy and worsening invasion, but light scrubbing may be acceptable. Where pools are cleared out, this should be done with the minimum of disturbance to the marginal vegetation: if clearance of marginal vegetation is necessary, only a fraction should be treated in any given year.

References Krogerus, R. (1960), Le Quesne, W.J. (1960b), Le Quesne, W.J. (1985), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Payne, K. (1981).

COSMOTETTIX COSTALIS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Cosmotettix costalis (Fallen)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution *C. costalis* is so far known in Britain only from Norfolk. It was first recorded at Ranworth in the nineteenth century, but has not been recorded there since. It was found at Sea Mere in 1988. In Europe as a whole it is a northern species, found from Finland in the north to Germany in the south, and extending east to Mongolia.

Habitat and ecology The Ranworth record is from "amongst low plants in marshes" (Edwards 1896). Given the locality, this probably refers to the fenland bordering the Broads. The recent record is also from a fen locality, but is of only a single male taken in a trap: the exact habitat occupied by the species therefore remains uncertain. On the continent it has been recorded from fens and from wet grassland. Adults occur from June to August in mainland Europe, but the life history is otherwise unknown, as are the foodplants.

Status Uncertain, though clearly extremely local. Though habitat quality in the Norfolk Broads has declined since the first record, much good fenland remains in the immediate area of the old record, and other rarities of the Broads survive. Norfolk has been relatively poorly recorded for Auchenorrhyncha in recent years, and there are a number of Broadland localities which might repay investigation.

Threats The Norfolk Broads have declined greatly in habitat quality since this insect was first recorded, largely through decline in water quality resulting from enrichment by sewage effluent and run-off from agricultural land. Heavy boat traffic and the resultant erosion have hastened the deterioration. The fenland habitats occupied by *C. costalis* are likely to have been less affected by these changes than the purely aquatic habitats, however. Some areas of previously managed fen have been neglected in recent decades, and have turned to carr. The resultant shaded conditions are unlikely to be suitable for *C. costalis*. Other potential sites for the species in eastern England have suffered from drainage and reclamation for agriculture, from falling water tables resulting from water abstraction and drainage on surrounding land, from neglect, and from pollution and eutrophication.

Conservation Ranworth Broad and marshes now fall within the Bure Marshes National Nature Reserve. Other parts of the Norfolk Broads and Fens are within SSSIs or reserves of the voluntary conservation bodies. Considerable effort is being put into improving the condition of the broads, though the results to date have not been wholly satisfactory. So little is known of the ecology of *C. costalis* that it is impossible to be precise about management requirements. Maintenance of, or return to, traditional management techniques in any area in which the insect is rediscovered is probably the safest option in the short term. This is most likely to involve periodic cutting. It is best if this is done over only a small proportion of the site in any given year, and if the period between cuts is as long as is compatible with the maintenance of suitable vegetation composition and structure.

References Edwards, J. (1889), Edwards, J. (1896), Krogerus, R. (1960), Le Quesne, W.J. (1965c), Ossiannilsson, F. (1983).

COSMOTETTIX PANZERI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Cosmotettix panzeri (Flor)

Distribution *C. panzeri* is chiefly a northern species. There are records from Arran, the Inner Hebrides, Kirkcudbrightshire, Lanarkshire, Inverness-shire, Ross-shire, Sutherland, Aberdeenshire, Yorkshire, Cheshire, Norfolk, Surrey, Radnor, Glamorgan, Cardiganshire and Caernarvonshire. It is otherwise known from northern and central Europe and also occurs in Ireland.

Habitat and ecology This is a peatland species. It is chiefly found in the acid uplands, but there are a few records from southern and lowland bogs and wet heaths. It has been found in sedge *Carex* bogs, and an association with cotton-grass *Eriophorum* has been suggested. Adults have been collected in July and August in Britain. In mainland Europe, there is one generation per year, overwintering in the egg.

Status Local. Woodroffe (1973) suggested that this species might be widely distributed and not uncommon in suitable habitats in Scotland, and the records to date certainly do not refute this. It is clearly much more local in the south. There is only a single Yorkshire record, despite a good history of recording in the county. There is a recent record for Dersingham, Norfolk, an area which is an outpost for a number of species of predominantly northern distribution. The only other English records, from Newchurch Common, Cheshire, and Chobham, Surrey, are old.

Threats The wet areas of Chobham Common are drier than in the past, and have been affected by developments and road construction at the margins, by scrub invasion resulting from lack of management, and from uncontrolled summer fires. Similar problems are likely to affect other possible lowland sites for the species. Other threats are drainage and improvement for farming purposes, afforestation and, in places, overgrazing.

Conservation Water levels on wetland sites should be maintained. Management should aim to maintain a good range of species and structural diversity in the vegetation. In the extreme north and at higher altitudes, such habitat may be more or less stable in the long term, but will need more active management in the lowlands. Light grazing is the best management to achieve the desired structure. It is important that a site is not overgrazed. On neglected lowland sites, scrub clearance may be necessary to maintain open conditions. If grazing is not possible, scrub clearance may have to be repeated at regular intervals, or the area cut periodically. The latter alternative is unlikely to be suitable at many sites, which may be too permanently wet to allow cutting without great damage. If cutting is used on drier sites, only a small portion of the site should be cut in any one year, and the intervals between cutting should be as long as is compatible with maintenance of suitable vegetation structure.

References Foster, S. (1986), Le Quesne, W.J. (1965c), Nast, J. (1972), Ossiannilsson, F. (1983), Woodroffe, G.E. (1972b), Woodroffe, G.E. (1974).

DORATURA IMPUDICA

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Doratura impudica

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Known in Britain only from the north Norfolk coast. There are records from Holkham and Hunstanton (both old records) and from Scott Head Island (1971). It is widely distributed in central and southern Europe, extending east to Kazakhstan, Uzbekistan and Kirghizia.

Habitat and ecology Coastal sand dunes. In mainland Europe, it also occurs inland, but always in dry grassland. The foodplants are probably grasses. Adults have been taken in July and August, but the life history is otherwise unknown.

Status Rare and of very restricted distribution. The East Anglian coast is not exceptionally well recorded for *Auchenorhyncha*, so *D. impudica* may prove to be somewhat more widely distributed.

Threats Development has destroyed parts of the dunes of the Norfolk coast in the past, and continues to be threatening locally. Recreational use of dunes has increased in recent decades, and in places has caused considerable damage through erosion.

Conservation Scolt Head Island and Holkham are National Nature Reserves. A large area of the dunes at Holkham is a reserve of the Norfolk Wildlife Trust. Other sections of the North Norfolk coast are National Nature Reserves, National Trust properties, or reserves of the RSPB. Most of the remaining area of dunes of high quality falls within SSSIs. The known habitats require no active management, so far as is known, and should remain stable provided sites are safeguarded. Where necessary to prevent erosion, public access should be controlled or directed via boardwalks and signs so as to avoid excessive erosion.

References Edwards, J. (1899), Edwards, J. (1908), Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983).

EBARRIUS COGNATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Ebarrius cognatus (Fieber)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Northern England and Scotland. There are records from Inverness-shire (Aviemore; Nethy Bridge; Loch an Eilein, Cairngorm NNR), Lanarkshire (Broomhill, Glasgow), Morayshire (Nethy Bridge, Aviemore), Aberdeenshire (Glen Derry, Braemar, Cairngorms NNR; Crathie Wood, Braemar) and Westmorland (Moor House NNR). It is widely distributed in northern and central Europe east to Armenia and Georgia, and has a more scattered distribution in southern Europe, including Italy and Albania.

Habitat and ecology On grasses. There is no very clear indication of its exact habitat requirements and preferences in Britain. It has been taken from open high altitude grassland and from fine grasses in a wood. The most detailed habitat description is by Woodroffe (1971) who found it on *Festuca vivipara* growing as scattered plants on an otherwise bare riverside bank of mixed sand and shingle. In mainland Europe, it has been taken in dry grassland, at wood edges, on dry hill slopes and moors, and on arable land. It has been found up to an altitude of 1150 metres. It would seem likely that the insect prefers open, sunny, and perhaps well-drained, conditions with short grasses. Adults have been taken in Britain in June, July and September.

Status Very local. The apparent preference for open dry and sunny habitats coupled with a strongly northern distribution may greatly restrict the number of potential localities. However, such sites may be of very local and scattered distribution, and it is possible that most populations are small and strongly localised, in areas of particularly favourable aspect and climate. Some degree of under-recording is inevitable.

Threats Improvement of upland grassland, afforestation, and perhaps also overgrazing are potential threats. However, the majority of British records seem to do not from areas of open grassland, but from small patches of suitable habitat with no readily predictable threats. The apparent occurrence of the species in small and rather isolated populations may make it particularly liable to local extinction as a result of small-scale habitat changes.

Conservation Some sites for the species, particularly those in the north of its range and at high altitude, may need no active management to maintain them in suitable condition for the insect. On grassland areas, management should aim to retain a good range of sward heights and vegetation structure. This is best achieved by moderate grazing. Grazing levels should be monitored to avoid overgrazing.

References Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983), Woodroffe, G.E. (1972b).

EDWARDSIANA ALNICOLA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Edwardsiana alnicola (Edwards)

Identification Le Quesne & Payne (1981).

Distribution Recorded from Glamorgan (Coed-y-Bedw; Fforest Gannol; Roath Park), Gloucestershire (Colesborne), Hampshire (Beaulieu), Buckinghamshire (Chenies; Latimer) Cambridgeshire (Sawston Hall Meadows), Huntingdonshire (Holme Fen) and Yorkshire (Drax). It is also known from Finland, Austria, Germany, Poland, Rumania and Sweden.

Habitat and ecology The only proven British food plant is alder *Alnus glutinosa*, from which it has been reared (Claridge & Wilson 1981). In mainland Europe, it has also been recorded from *Alnus incana*. Reports of the species from field maple *Acer campestre* are probably of stray individuals. From the available records, there are no other common features between the localities which might indicate other habitat requirements, though the extreme localisation of the species strongly suggests that such factors exist. Adults have been taken in late June, July and August in Britain.

Status Local, but apparently quite widely distributed in at least southern Britain, and probably under-recorded. The status may eventually need revising.

Threats No specific threats are known, beyond the obvious point that destruction of alders in a locality for the species will be damaging. Such losses may be particularly prone to occur where rivers are re-graded, straightened or embanked.

Conservation Where work is to be undertaken on rivers or other water bodies with marginal alders, disturbance to the trees should be minimised. It is not known whether *E. alnicola* has a preference for alders of a particular age, size or structure. If it has, it may be desirable to undertake specific management work on the alders at some sites, for example to ensure a continuous supply of young growth. Further information on the status and requirements of the species is needed.

References Claridge, M.F. & Wilson, M.R. (1981), Duffield, C.A.W. (1960b), Edwards, J. (1924), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981).

EDWARDSIANA ISHIDAI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Edwardsiana ishidai (Matsumura)

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution Predominantly south-eastern England. There are records from Bedfordshire, Hertfordshire, Surrey, Essex, and Kent. A single isolated record from the Derbyshire Dales (Lathkill Dale, 1988) may indicate that the insect is rather more widely distributed than current records would suggest. It is widely distributed in Europe, and extends east to Siberia and Japan.

Habitat and ecology The host-plants are elms. Most English records are from members of the *Ulmus procera* group, but a Derbyshire record probably originated from wych elm *Ulmus glabra*, from which it has been recorded in mainland Europe. It has also been taken from hazel, but it is not known whether the insect is able to breed on that plant. A number of the records are known to come from young re-growth of suckering elm after all large trees in the vicinity had been killed by elm disease. It has been found in such circumstances in

hedgerows, at wood margins, and in neglected grassland with invading elm scrub. Adults have been recorded from July to October.

Status Local. The taxonomy of the group of *Edwardsiana* species to which *ishidai* belongs has been somewhat confused in the past, and there has consequently been less scope for recording of the species than for many others. The earliest reliable record currently known is 1969. It would seem to be well-established in south-west Essex, an area traditionally rich in elm, from which there are several localities. Its frequency in this area, and the isolated Derbyshire record, suggest that it may be under-recorded to a considerable extent. It is perhaps only a borderline notable.

Threats Elm disease may have affected this insect to some extent. It is clearly not in general a threat, however, since *E. ishidai* is well-established in south-west Essex, where the disease has killed all large elm trees. Greater threats are the grubbing out of hedgerows and areas of suckering elm growth, and over-intensive management of hedges. The worst type of hedge management is the cutting of a hedge to only three or four feet in height, and annual cutting by flail. Such management removes sheltered conditions, and destroys both feeding areas and oviposition sites, which may well be towards the terminal parts of young growth. Other threats are the use of chemical pesticides on farmland where this adjoins hedges or wood margins containing elm.

Conservation Where elms have been killed by elm disease, growth from suckers should be allowed to continue, and encouraged where necessary. The extent of growth of such suckers will probably be limited by the re-occurrence of elm disease, and the plants are unlikely to reach great size. Hedges should be allowed to grow as large as possible, and management should be kept to a minimum. Annual management is to be avoided at all costs, and even on hedges which must be kept relatively low, it is unlikely that management more than once every five or six years could be justified. When cutting is undertaken, only a fraction of the elm-supporting hedges should be cut or laid in any one year. On non-intensively managed grassland, as for example in country parks and some nature reserves, a degree of invasion by suckering elm may be tolerated, but extensive invasion and the formation of dense shaded stands should be prevented.

References Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981).

EDWARDSIANA LANTERNAE

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Edwardsiana lanternae (Wagner)

Identification Le Quesne & Payne (1981).

Distribution There are confirmed records from Hampshire (New Forest) and Glamorgan (Coed-y-Bedw; Fforest Gannol). This might suggest a predominantly western distribution, but the records are so few that it would be premature to judge this.

Habitat and ecology The only proven British foodplant is alder *Alnus glutinosa*, on which it has been reared (Claridge & Wilson 1981). It has also been recorded from rowan *Sorbus aucuparia*, but it is not certain that the insect is able to breed on this tree. Records to date do not have any obvious common features which might suggest other limiting habitat requirements, but the very local distribution suggests that such limiting factors exist. Adults have been recorded in July and October.

Status Apparently rare and local. This species is likely to be under-recorded, particularly since it is superficially similar to a number of others, some of which also feed on alder, and requires dissection for identification. There are, however, many negative records resulting from specific search of alder, and the insect is a great deal less frequent than its host. It could be overlooked if it occurs at low density among other *Edwardsiana* species, or if it regularly lives high in the trees.

Threats So little is known of the ecology and habitat requirements of the species that threats cannot easily be identified, beyond the obvious one of destruction of alder in a locality where the insect occurs. Such destruction is perhaps most likely where rivers are to be re-graded, diverted, or otherwise managed.

Conservation Where management is to be undertaken of rivers or other water bodies with marginal alders, disturbance to the trees should be minimised. It is not known whether *E. lanternae* requires alders of a particular size, age or structure. If it does, it may be desirable on some sites to manage the alders in such a way as to encourage suitable growth. Further work should be undertaken on the ecology of the species.

References Claridge, M.F. & Wilson, M.R. (1981), Duffield, C.A.W. (1960b), Le Quesne, W.J. & Payne, K.R. (1981).

EDWARDSIANA ROSAESUGANS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Edwardsiana rosaesugans

Identification Le Quesne & Payne (1981).

Distribution So far recorded in Britain from only a single site: the Cwm Glas (Glais Valley) nature reserve, on the Taf Fechan near Merthyr Tydfil, Glamorgan (vice-county 42, Breconshire). It is recorded elsewhere from Switzerland and north Italy.

Habitat and ecology The foodplant is rose *Rosa* sp., and the insect has been reared on this plant. Adults have been recorded in July, but the life history and ecology are otherwise unknown.

Status Uncertain. Certainly very local; possibly extinct. The insect was only ever recorded from a single rose bush at its British site. It is apparently no longer present on this bush. It seems likely that the species occurs elsewhere in Britain. However, it is clearly very local, even within a site. Since the factors responsible for its extreme localisation are unknown, the extent of possible under-recording cannot be estimated.

Threats None known at present.

Conservation The only British site is a reserve of the Glamorgan Wildlife Trust. It is impractical to give general recommendations for the conservation of a species of such extreme rarity which occurs on such a common plant. On sites where *E. rosaesugans* is recorded, particular attention should clearly be given to the maintenance of a population of rose bushes. The needs of the insect may need to be borne particularly in mind if, for example, a programme of scrub clearance is to be undertaken.

References Claridge, M.F. & Wilson, M.R. (1978), Claridge, M.F. & Wilson, M.R. (1981), Le Quesne, W.J. & Payne, K.R. (1981).

EDWARDSIANA TERSA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Edwardsiana tersa (Edwards)

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution There are confirmed British records from Birkdale Salting and Freshfield, Lancashire; from Arthrington, Sprotborough and Rossington Bridge, Yorkshire; Stoneleigh, Warwickshire; Brampton Pasture, Huntingdonshire; Sawston Hall Meadows, Cambridgeshire. It is widely distributed in Europe, and extends east to Turkey and Siberia.

Habitat and ecology The foodplants are willows *Salix* spp. The species has been recorded from large willows such as white willow *Salix alba* and crack willow *Salix fragilis*. In mainland Europe the insect has been recorded from eared willow *S. aurita*, osier *S. viminalis* and from *S. lapponum*. Adults have been taken from mid-June to mid-September in Britain.

Status Apparently very local, but probably under-recorded. The known records are all from northern England, but there seems otherwise to be no linking factor which might account for the scarcity of records, and it might be expected to be found more widely. It may eventually be necessary to revise the status.

Threats The ecology and requirements of the species are too poorly known for threats to be certainly identified.

Conservation There would seem no reason why this insect should not occur on a variety of willow species in a variety of habitats in Britain. In the present state of knowledge of the habitat requirements of the species, there seems little point in attempting to list all conservation measures of value for all willows in all situations. Where the insect occurs, management should aim to retain good willow growth in a range of ages and sizes.

References Claridge, M.F. & Wilson, M.R. (1981), Flint, J.H. (1960), Le Quesne, W.J. & Payne, K.R. (1981), Ossiannilsson, F. (1981).

EMELYANOVIANA CONTRARIA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Emelyanoviana contraria (Ribaut)

Identification Le Quesne & Payne (1981).

Distribution There are only two British records: Morrone Birkwood, Aberdeenshire (1971) and South House Pavement, Ingleborough, Yorkshire (1976). It is otherwise known only from France and Austria, where it is apparently very local.

Habitat and ecology *E. contraria* has been found on upland limestone turf in Scotland and on limestone pavement in Yorkshire. The foodplant is rockrose *Helianthemum* sp. Both British records are from altitudes in excess of 1000 feet. At the Yorkshire site, it occurred in numbers on rockrose on limestone pavement at 1150 feet, but could not be found at lower altitudes despite specific search. It is similarly confined to high altitudes in mainland Europe. Adults have been recorded in July, but the life history is otherwise unknown.

Status Extremely local. It would seem likely that the species is present in additional localities, particularly in view of the wide separation of the two known sites. However, the restriction to open limestone habitats at high altitude severely limits the number of possible sites.

Threats The exact requirements and tolerances of the insect for vegetation height and grazing levels are not known, but both neglect of limestone grassland and overgrazing are likely to be damaging. Overgrazing is the more likely threat at Morrone Birkwood at present. However, *E. contraria* is likely to be a mesophyll feeder, so even complete failure of rockrose to flower as a result of heavy grazing need not necessarily be damaging to the populations of the insect. Improvement of upland limestone grassland for farming purposes is a widespread threat, but does not apply to either of the known sites. Quarrying is a potential threat to many sites on limestone. Limestone pavement sites may be threatened by destruction through removal for rockery stone.

Conservation Morrone Birkwood is a National Nature Reserve; South House Pavement is a reserve of the Yorkshire Wildlife Trust. Both are SSSIs. Management should aim to maintain a diverse flora, including rockrose, and reasonable variation in vegetation height and structure, including some relatively tall vegetation and areas of short sward. Management should be by grazing, and it is likely that most suitable upland sites will already be under grazing management. Grazing levels should be carefully monitored to ensure that overgrazing does not occur: a uniform very short turf is less likely to provide suitable conditions for the insect than one of more varied structure.

References Flint, J.H. (1977b), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ribaut, H. (1936), Woodroffe, G.E. (1972b).

ERYTHRIA AUREOLA**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family CICADELLIDAE

Erythria aureola (Fallen)**Identification** Le Quesne & Payne (1981); Ossiannilsson (1981).**Distribution** There is apparently only a single nineteenth century record of the species: Findhorn, near Forres, Morayshire. It is widely distributed in Europe.**Habitat and ecology** In mainland Europe, this species is associated with heather *Calluna vulgaris*, particularly at higher altitudes. The single British record is from a marsh on the Scottish coast. The only ecological information attached to the original record was "on *Carices*". The likeliest origin for the specimens is heather growing inland from the site of capture. The Findhorn area is one of relatively favourable climate compared to much of Scotland, with relatively low rainfall and moderate winter temperatures. Climate may therefore be the limiting factor in determining the British distribution. It has been recorded in July and August in northern Europe.**Status** Very rare, possibly extinct. There are many other localities which could be searched for the insect, and there is no good reason to suppose that it may not still be present in Scotland. However, sufficient work has been done on the Auchenorrhyncha, particularly by G.E. Woodroffe in the 1960s and 1970s, to indicate that it is probably not widely overlooked.**Threats** There have been a number of changes to habitats in the Forres area. There has been extensive afforestation on the Culbin Sands area to the north-west, and Kinloss Aerodrome and associated expansion of the village of Kinloss have led to development to the north-east. The exact location of the *E. aureola* record, and the area occupied by the species in the past, are not known, so it is not known whether any of these changes have affected it.**Conservation** Findhorn Bay itself, parts of the surrounding dunes and marsh, and the very large area of the now afforested Culbin Sands form a single SSSI, but it is not clear whether the original *E. aureola* site is included. Specific conservation measures for the species cannot easily be recommended in the absence of further information on the ecology of the species in Britain.**References** Edwards, J. (1896), Le Quesne, W.J. & Payne, K.R. (1981), Ribaut, H. (1936).

EURHADINA KIRSCHBAUMI**NOTABLE**

Order HEMIPTERA

Family CICADELLIDAE

Eurhadina kirschbaumi Wagner**Identification** Le Quesne & Payne (1981); Ossiannilsson (1981).**Distribution** So far recorded from five localities in Glamorgan (Blackmill; Pentrebach; Trehafod; Coed-y-Bedw, and South Cardiff) and from a single locality in Kent (East Malling). The concentration of records in Glamorgan may be simply the result of concentrated collecting effort in this area, and the insect may prove more widely distributed in western sessile oakwoods. The isolated Kent record may imply that the insect also has a scattered and very local distribution in the south-east. It is widely distributed in Europe.**Habitat and ecology** The only proven native British foodplant is sessile oak *Quercus petraea*, from which it has been reared (Claridge & Wilson 1981). However, it has also been reared on the introduced southern beech *Nothofagus obliqua/procera*, and adults have been found on turkey oak *Quercus cerris*. It will probably also feed on pedunculate oak *Quercus robur*, since in mainland Europe it has been recorded from at least one site where

this is the only oak species present. There is one generation per year in northern Europe. It has been recorded in July and August in Britain, with peak numbers in middle to late August.

Status Uncertain. The insect may be genuinely very local and confined to small areas of the country, or may prove quite widespread in the west, and local only in the east. It seems likely that it will prove to have been under-recorded thus far, particularly since it is superficially similar to commoner members of the genus.

Threats The scale and nature of possible threats are difficult to assess in the present state of knowledge of the ecology of the species. Loss of, or damage to, western sessile oakwoods must inevitably be damaging: clearance for agriculture and conversion to plantation of conifer or broadleaved species are the likeliest causes. It is possible that loss of oaks in farmland or hedgerows may also be damaging. Many woods in hill country in the north and west have suffered from stock grazing for many years, with resultant loss of regeneration and gradual disappearance of the woodland. This gradual erosion continues in many areas, and loss of suitable habitat for the insect is an inevitable consequence.

Conservation So far as is known, this is a canopy species, which is found on, even if not necessarily confined to, well-grown trees. There is no reason to suppose that it is sensitive to subtle changes in woodland management, and probably no specific conservation measures are needed in enclosed woods, other than site protection. Where possible, grazing stock should be excluded from woods.

References Claridge, M.F. & Wilson, M.R. (1978), Claridge, M.F. & Wilson, M.R. (1981), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981), Woodroffe, G.E. (1971b).

EURHADINA RIBAUTI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Eurhadina ribauti

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution There are records from Yorkshire (Shaw Wood & Cantley Common Plantation), Berkshire (Silwood Park), Buckinghamshire (Burnham Beeches; Chenies), Hampshire (Hurn) and Glamorgan (Cathays Park; Roath Park). It is widely distributed in northern and central Europe, and is also recorded from Cyprus.

Habitat and ecology Pedunculate oak *Quercus robur* and sessile oak *Quercus petraea* are both hosts, and the insect has been reared from both (Claridge & Wilson 1981). Adults have also been taken from elm *Ulmus* sp and from alder *Alnus glutinosa*, but these may have been casual associations, and there is no proof that the species is able to breed on these hosts. Adults have been taken in July in Britain, and from July to September in mainland Europe. There is one generation per year. There is no obvious linking factor between the recorded sites to indicate why the insect should be so localised. It is possible that the bulk of the population lives high in the canopy, and thus escapes detection.

Status Local. The broad scattering of records across southern Britain suggests that it may still be widely under-recorded.

Threats In the present state of knowledge it is not easy to be specific about the scale or nature of threats to the species. Any large-scale destruction of woodland containing oak in known areas of distribution are potentially threatening. The likeliest causes of such destruction are the grubbing out of woodland for agriculture, development or road-building, and the conversion of woodland to plantation of either conifers or broadleaved trees; agricultural intensification leading to loss of oaks in fields or hedgerows, or in exposing them to chemical pesticides. In hill areas in the west, there may also be damage through grazing of woods by stock, leading to prevention of regeneration and the gradual disappearance of the wood.

Conservation So far as is known, *E. ribauti* is not restricted to any particular height of foliage. If populations occur in the canopy, then it is probably more or less indifferent to the details of woodland management, and will

require no conservation measures beyond site protection. Grazing stock should be excluded from woods where possible. In non-woodland areas, measure should be taken to ensure a continuity of mature trees.

References Claridge, M.F. & Wilson, M.R. (1978), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981), Ribaut, H. (1936).

EUSCELIDIUS SCHENCKII

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Euscelidius schenckii (Kirschbaum)**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** The only recorded British locality is a garden in the Norwich district, Norfolk. Elsewhere, the species is widely distributed in Europe, and extends east to Iraq, Kazakhstan, the Altai mountains and west Siberia. It is also known from Tunisia, the Canary Islands, and occurs in the Nearctic.**Habitat and ecology** The British records were from amongst long grass in a badly kept garden. Elsewhere in Europe it has been reported from meadows, from dry grassland on hillsides, and from cultivated fields.**Status** There is no convincing evidence that this was ever a truly established British native. It was only taken in 1884 and 1885, and has never been found in a natural or semi-natural habitat in Britain, and its wide distribution and occurrence on cultivated land in mainland Europe means that both accidental introduction and the temporary establishment of a population from vagrants might occur relatively easily. On the other hand, if it were ever established, East Anglia, with its relatively continental climate, would be a logical place for a species with a preference for sunny and well-drained habitats to occur. It may be a species which in the past had a precarious toehold in Britain, at the edge of its climatic tolerance. If so, it would appear to have been rare even in the last century, and now to be possibly extinct.**Threats** None known.**Conservation** Too little is known of the ecology and habitat requirements of the species in this country for any recommendations to be made as to positive conservation measures were a viable population to be discovered. In view of the period since the last record, priority should be given to determining whether any such population is truly native or the progeny of recent vagrants which might form only a transitory breeding population.**References** Edwards, J. (1896), Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983).

EUSCELIDIUS VARIEGATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Euscelidius variegatus (Kirschbaum)**Identification** Le Quesne (1969).**Distribution** *E. variegatus* is chiefly a species of south-eastern coastal counties in Britain. It is recorded from Yorkshire, Norfolk, Suffolk, Kent and Cornwall. It is a southern European species, whose distribution in this country is presumably limited by climate. It is possible that the isolated Cornish record implies that colonies remain to be found in the intervening south coastal counties, but a true disjunct distribution including only the extreme south-east and extreme south-west would not be unique. It is widely distributed in southern Europe north to the Netherlands and Germany, and extends east to the Ukraine and Yugoslavia.**Habitat and ecology** This would seem to be a species of dry grasslands in Britain. The records suggest that it may be relatively indifferent to soil type, so long as it is well-drained. There are records from coastal and inland

sites, including sand dunes, acid grassland, breckland, and chalk downland. In mainland Europe it has likewise been recorded from grassland, but may also occur in cultivated areas. In Italy it is often found in vineyards. It is apparently associated with either grasses or clovers, but the actual foodplant is not known. Adults have been recorded from August to November.

Status Very local. It may have declined somewhat, since there is a disproportionate number of older records, when compared with most of the less common Auchenorrhyncha. In part, however, this may simply reflect the relative lack of recent recording of the group in East Anglia.

Threats Dry grassland in the East Anglian breckland has declined considerably both in quantity and quality over recent decades, as a result of afforestation, ploughing and improvement for agriculture, and most recently through loss of grazing, particularly loss of the previously large rabbit population through myxomatosis. This has led to extensive loss of short grassland and bare ground, and extensive domination by tall grasses and scrub. Loss of grazing and consequent domination by coarse vegetation and scrub is probably the chief threat facing other inland grasslands. Additional threats are improvement and ploughing for farming purposes, and destruction for development. Over-grazing may also pose a threat locally. The tolerances of *E. variegatus* for different vegetation lengths is not known, but it is unlikely that it would tolerate a uniformly short sward.

Conservation Management of grassland site where the insect occurs should aim to maintain open conditions with good variety of vegetation structure, from short sparse vegetation with bare ground to tall dense flowering grasses, to ensure representation of suitable conditions. Such varied structure is best achieved by grazing. Rabbit grazing probably produces the best structure, since it tends to result in a mosaic of vegetation structure on a fairly small scale. Rabbit populations should be maintained and encouraged wherever possible. The ideal pattern for stock grazing is moderate grazing over the whole of a site. A rotational programme of grazing may well be suitable for this species, however. If grazing is not possible, a rotational regime of cutting may be attempted as an alternative.

References Edwards, J. (1896), Le Quesne, W.J. (1969), Nast, J. (1972), Ribaut, H. (1952).

EUSCELIS OHAUSI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Euscelis ohausi Wagner

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Widely distributed in Britain, with records from Inverness-shire, Kent, Surrey, Hampshire, Worcestershire, and Cardiganshire. This is a rather strangely scattered distribution, perhaps implying under-recording in some of the currently blank areas. It appears to have a rather restricted distribution in western Europe, and has been reported from France, Belgium, Germany, Denmark, Portugal, Germany, and The Netherlands.

Habitat and ecology The chief food plant is broom *Sarothamnus scoparius*. An association with petty whin *Genista anglica* has also been suggested. *E. ohausi* is clearly much more local than its foodplant, but the factors restricting its distribution are not obvious. On Jersey, W.J. Le Quesne finds it to be particularly associated with young broom plants. At Dungeness, Kent, it is found in considerable numbers on and beneath prostrate broom growing on the shingle. Adults have been recorded from August to October.

Status Very local. The extent of under-recording is difficult to estimate. The distribution as currently known initially suggests under-recording. However, the insect is not difficult to capture and is fairly distinctive in the field. Broom is frequented by a considerable number of insect species, including other Hemiptera, and so is unlikely to have been neglected by recorders.

Threats Extensive areas of habitat in which stands of broom with a long history have been present have been destroyed in recent decades, through development, afforestation, and destruction for agriculture. Broom itself is a common plant, and large areas of active regeneration can be found, for example, along recent road cuttings

and on derelict land, but the absence of records of *E. ohausi* from any such sites may indicate that the insect is a poor coloniser. The chief threat to coastal sites supporting such stands of broom is probably development. Dungeness, where the insect is well established, has been subjected to gravel extraction and power station construction in recent decades, and there are plans for further development on the site.

Conservation Sites supporting populations of prostrate broom should require no active management to retain the plants in suitable condition, and require no conservation measures beyond site protection. Where the insect occurs on broom on inland sites, management should aim to maintain a good range of age and structure of broom bushes at all times. This may require active management by cutting part of the broom population every year or two to encourage regeneration. A rotational management programme of cutting should be suited to maintaining stands in suitable condition. It should be noted that old and senescent broom bushes support a fauna of some interest, however, so it is important that not all the available broom on a site is brought into the rotation, and that a continuity of senescent bushes is also maintained.

References Duffield, C.A.W. (1960b), Le Quesne, W.J. (1960b), Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983).

EUSCELIS VENOSUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Euscelis venosus (Kirschbaum)

Identification Le Quesne (1969).

Distribution There are only two recorded British localities: Aston Rowant, Oxfordshire (1967, 1969), and Headley Warren, Surrey (1968). It also occurs in central and southern Europe, north to Germany, Switzerland and Poland.

Habitat and ecology In Britain, *E. venosus* has been found amongst tall vegetation on chalk downland. It is likewise found in grasslands, including pastures, in mainland Europe. Adults have been recorded in August and September.

Status Very local. The existence of colonies as far apart as the North Downs and the Oxfordshire Chilterns suggests that it may also occur at other chalk grassland sites in southern England. However, there has been considerable recording work on many such sites, so it is unlikely to be widely under-recorded.

Threats Improvement or ploughing of chalk grassland for farming purposes; loss of unimproved calcareous grassland to development; neglect of previously grazed chalk grassland, and resultant domination by coarse grasses and scrub invasion. Cessation of stock grazing on many southern chalk grasslands in recent decades has been exacerbated since the 1950s by the reduction in rabbit populations brought about by myxomatosis. Since *E. venosus* has been found amongst fairly rank vegetation, neglect may not be as serious a problem as for many other downland species. Where chalk grassland is still managed, overgrazing may be an equally serious threat, since it is unlikely that a uniformly short sward would be suitable for the insect.

Conservation Management of chalk grassland should aim to retain as wide as possible a range of vegetation structure, including both areas of short turf and areas of tall grassland. Moderate grazing is the best management to achieve such a structure. Rabbit grazing is particularly suited to the production of a good small-scale mosaic of vegetation structure. It is unlikely that rabbit grazing alone will be adequate on most sites to maintain suitable structure, but limited rabbit grazing will enhance the effects of stock grazing, and may improve the conditions created by other management techniques. A rotational regime of grazing, whereby a given area of grassland is close-grazed for a period, and then left ungrazed, may be suitable. The mobility of *E. venosus* is not known, however, and the management plots should be arranged so as to facilitate colonisation of newly-suitable areas of vegetation. Where grazing is not possible, a cutting regime may provide a reasonable, though less satisfactory, alternative. Cutting should be undertaken on a rotational programme, with only a fraction of the area of grassland cut in any one year.

References Le Quesne, W.J. (1969), Nast, J. (1972), Ribaut, H. (1952), Woodroffe, G.E. (1968d).

HEPHATHUS NANUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Hephathus nanus (Herrich-Schaeffer)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Chiefly recorded from south-eastern England, with records from Bedfordshire (Barton Hills), Kent (Hillside), Sussex (Seaford), Surrey (Boxhill; Shere; Aldbury), Berkshire (Silwood Park), Wiltshire (Savernake Forest), Hampshire (Freshwater, Isle of Wight). There is an isolated record from Risby Warren, North Lincolnshire. It is widely distributed in central and southern Europe, but is absent or rare in the north.

Habitat and ecology Dry grassland, apparently with a preference for short vegetation. It is seemingly fairly indifferent to substrate, providing it is well-drained: it has been recorded chiefly from calcareous grassland but occasionally from grassland on acid sands. Adults and nymphs are probably generally to be found low down amongst the vegetation, but adults at least climb sufficiently to be taken by sweep-netting on occasion. Adults have been recorded in July and August, but the life history is otherwise unknown.

Status Local. This is a species of relatively obscure habits, rarely found in numbers, which may easily be overlooked. It may therefore prove to be rather under-recorded. The type of dry grasslands which it frequents, however, have received sufficient attention from hemipterists over the years to make it clear that it is a genuinely uncommon insect.

Threats Improvement and ploughing of dry grasslands for farming purposes; neglect of previously grazed grassland leading to dominance by coarse grasses and to scrub invasion. The effects of cessation of grazing by stock have been exacerbated by loss or dramatic reduction of rabbit populations as a result of myxomatosis. On acid grassland and heathland sites, afforestation may be an additional threat. Development may threaten sites in the south-east particularly. By far the greater part of the Lincolnshire coversands have been lost to afforestation and agriculture. The tolerance of *H. nanus* to different grazing levels is not clear, but a uniform short sward is unlikely to be suitable.

Conservation Management of sites on which *H. nanus* occurs should aim to maintain a wide range of sward height and vegetation structure. This is best achieved by light grazing. Rabbits are the best grazing animals for the maintenance of a small-scale mosaic of short and long vegetation. Rabbit populations may sometimes be sufficient in themselves to maintain open conditions in at least the short term. Where rabbit populations are insufficient in themselves to maintain suitable structure, they will still enhance structure created by other management, and rabbit populations should be maintained or encouraged wherever possible. Stock grazing should be introduced wherever possible, but stocking levels should be carefully regulated to ensure that a diversity of vegetation height and structure is maintained. Such diversity may be created by a rotational regime of grazing or cutting. Such a pattern of management relies on the ability of the fauna associated with any given vegetation structure to colonise newly available areas. The colonising ability of *H. nanus* is not known. There seems no reason to believe it incapable of the necessary colonisation, but it is nonetheless better, if possible, to err on the side of caution and to maintain uniform grazing conditions over the whole site, and to retain diversity of structure through a low stocking density.

References Brown, J.M. (1924), Butler, E.A. (1909a), Le Quesne, W.J. (1965c), Nast, J. (1972).

IASSUS SCUTELLARIS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

*Iassus scutellaris***Identification** Wilson (1981).**Distribution** So far recorded only from south-eastern England: Middlesex, Surrey, Kent and Essex. It is widely distributed in southern Europe, as far north as Germany and Poland, and east to Greece and the Ukraine.**Habitat and ecology** The foodplant is elm. All British record to date are from English elm *Ulmus procera*. Recent records come from low elm bushes or suckering growth in areas where most or all mature elm trees have died as a result of elm disease, but the limits of tolerance and preference for age, height and structure of host elms is not otherwise known. Elms are characteristically hedgerow rather than woodland trees, and the records reflect this in coming from hedgerows and woodland edges. Adults have been recorded in July and August.**Status** Uncertain, but apparently local. The species was not recognised in Britain until 1978, when it was taken at Mitcham Common, Surrey. To date there are only eight records, all in a restricted area within and close to London. It may be genuinely restricted in its distribution to this area, but the nature of the localities at which it has so far been found give every reason to expect it to appear in further localities in the London area. It is superficially similar to the common oak-feeding *Iassus lanio*, and may have gone unnoticed in the past.**Threats** It might be expected that the devastating effects of elm disease would have affected the populations of this elm-feeding species. In practice, it is clear that the insect is able to survive on suckering re-growth after the death of all mature trees. A greater threat than the death of elms by disease may well be misguided attempts to control the disease by indiscriminate clearance of elms from diseased areas, and the removal of elm hedges and areas of suckering elm scrub because of their continued susceptibility to disease. In the farmed countryside, additional threats are posed by the grubbing out of hedges in general, unsympathetic management of hedges by too-frequent cutting and by trimming to a low height, and the effects of pesticide drift from sprays applied to arable fields.**Conservation** Where elm trees are dead or dying as a result of elm disease, any suckering growth should be left. If the trees are felled before they are completely dead, they should be cut so as to give the stool a chance to coppice, and should not be completely grubbed out. Bushes and suckers in hedges should likewise be left. They will be prone to periodic attack by elm disease as branches reach a critical size, but in general regeneration will keep pace with the course of the disease in the long term. Hedges containing elm should be managed as infrequently as possible consistent with their continued function. Annual management, particularly by flailing, will almost certainly destroy any populations of the insect. There should usually be no need for management on any particular stretch of hedge to be undertaken more frequently than once every five or six years, and in areas of non-intensive land use much longer periods between successive management events may be possible. Only a fraction of the hedges on any given site should be managed in any one year.**References** Badmin, J. (1985); Badmin, J. (1990), Hollier, J.A. (1984), Nast, J. (1972), Ribaut, H. (1952), Wilson, M.R. (1981).

IDIOCERUS FULGIDUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Idiocerus fulgidus (Fabricius)**Identification** Le Quesne (1965).**Distribution** The only British record is from Costessey, Norfolk. It is a western European species, otherwise recorded from France, Germany, Austria, Hungary, Italy and Spain.

Habitat and ecology The single British specimen was taken from Lombardy poplar *Populus nigra* var. *italica*. The species also feeds on poplars in mainland Europe. There the female overwinters in heather, ivy and conifers, and oviposits in the spring.

Status There is no strong evidence that this is a true British native. It is known only from a single male taken in the last century, taken on Lombardy poplar, which is itself not a British native. However, there is no good obvious reason why it should not occur in Britain. The area of East Anglia from which it is recorded has a very continental type of climate, and is one of the strongholds for the native black poplar, *Populus nigra*, which might be an alternative foodplant. The region is relatively poorly recorded for Auchenorrhyncha, and further survey of native black poplars in the area might help to decide its status.

Threats No threats are certainly known. If it is a true native on black poplar, then the steady decline of this tree over several centuries must have seriously affected it, and the lack of interest in the tree by most landowners, coupled with its failure to set seed in this country, must be considered a continued threat to any populations which might still exist.

Conservation Specific search of native black poplars in East Anglia is needed to see whether populations of the insect still exist, and to help determine whether or not it is a true British native. If it is still present, its conservation is likely to depend simply on the maintenance of good populations of black poplar.

References Allen, A.A. (1964), China, W.E. (1929), Edwards, J. (1884), Le Quesne, W.J. (1965c), Nast, J. (1972), Ribaut, H. (1952).

KYBOASCA BIPUNCTATA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Kyboasca bipunctata (Oshanin)

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution So far recorded from only two British sites in the south-east of England: Mitcham Common, Surrey and Twitton, near Otford, Kent. It may ultimately prove more widespread in the south-east. It is widely distributed in Europe, extends east to Manchuria, Mongolia and Russia, and has been introduced to North America.

Habitat and ecology British specimens have been taken from English elm *Ulmus procera*. Elsewhere in Europe it has been recorded from other elm species (*U. pumila*, *U. laevis*, *U. campestris*). There is also a record from hemp *Cannabis sativa*, and in the east of its range it has been reported as a cotton pest. Adults have been recorded in July. There are few detailed observations of the life history. Nymphs have been reared on English elm. Adults and nymphs are mesophyll feeders. There is probably one generation per year, with eggs overwintering, laid in the tissues of the host plant. The tolerances and preferences of the species for different ages, structures and heights of elms is not known. If the species is a true British native, it would seem that some other limiting factor must be sought to explain its apparent rarity in the south-east of England, where elm has historically been common. It is possible that it is particularly a high canopy species, which would have escaped notice at the time when there was a profusion of tall elms, but there is no evidence of this.

Status Apparently rare, and certainly very local. The species was first reported in Britain in 1979, from specimens collected in 1978. It is a fairly distinctive species, and the failure of earlier collectors to record it in the relatively well-worked areas of the south-east imply that it must either have been always very local, or inaccessible. It is possible that it is a recent arrival to this country, which may still be actively spreading.

Threats It is unlikely that elm disease has been without effect on this species, but in both its known British localities it was recorded after devastation of mature elms by the disease, so such events are clearly not disastrous. As a mesophyll feeder, there is no *a priori* reason why suckering and coppicing growth should not be adequate to support populations of the insect, as they are known to be in other elm-feeding Auchenorrhyncha. The disease may, however, have dramatically reduced populations in places. More serious in the long run may

be the widespread removal of elm from diseased areas, by the grubbing out of tree roots, elm hedges, and areas of elm suckers which may be considered unsightly because of the dead branches caused by continued recurrence of the disease. Even where suckering and coppicing growth of young elm is allowed, other tree species have often been planted as replacements, and these may ultimately shade the elm and either kill it or make it unsuitable for the support of *K. bipunctata*. The grubbing out of hedges containing elm, particularly in areas of countryside dominated by arable land, continues to be a problem in south-east England. Further threats to any hedgerow populations which exist are the frequent over-management of hedges, with annual flailing for example, which renders the structure unsuitable for many insects, and may well also destroy a large proportion of the population of eggs.

Conservation Elm should be retained wherever possible. Where elms affected by disease are cut down before completely dead the stumps should be left in place to coppice. Suckering growth should be left wherever possible. Where elm grows in hedges these should be managed as little as is compatible with their continued function. Even in relatively intensively farmed areas it is unlikely to be necessary to undertake any management more often than every five or six years, and in conservation sites, or other sites with less intensive usage, much less frequent management may well be possible. Only a fraction of a hedge, or a fraction of the hedges on any given site, should be cut in any one year. Suckering and coppicing elm will be subject to recurrence of elm disease as the branches reach a critical size, but elm should be well able to hold its own against the disease in most sites.

References Claridge, M.F. & Wilson, M.R. (1981), Dolling, W.R. (1980), Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972), Ossiannilsson, F. (1981), Wilson, M.R. (1979).

KYBOS CALYCVLUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Kybos calyculus (Cerutti)

Identification Le Quesne & Payne (1981).

Distribution Recorded in Britain only from Yorkshire (Barnby Dun 1978), Buckinghamshire (Burnham Beeches 1972, 1983; Cholesbury 1984) and Surrey (Box Hill 1971-1980). It would seem to be rare in mainland Europe, and is recorded only from Switzerland and Poland.

Habitat and ecology The foodplant is birch *Betula* spp. It is not known whether there is a preference for either of the British species. Adults have been taken in July and August. The life history and biology are otherwise unknown, but other members of the genus in Britain are mesophyll feeders, with two generations per year, overwintering in the egg. The reason for the very localised distribution of this species in Britain is not clear, since its foodplant is very widely distributed and common and the insect. It is possible that it usually feeds higher in the canopy than other members of the genus, and is consequently under-recorded, but it seems unlikely that this is a full explanation.

Status Uncertain, but apparently rare. It seems unlikely that the known distribution accurately reflects the true status of the species in Britain, and further recording is needed to elucidate the situation. It is, however, clearly a very local species.

Threats Threats are uncertain in the present state of knowledge of the ecology and habitat requirements of the species in Britain. The removal of large stands of birch from sites in which the insect is known to occur would obviously be damaging. The preferences and tolerances of the species for different heights, structures and ages of birch are not known: if it is restricted in its requirements, details of management may be important. Loss of any age class of birch should be viewed as potentially damaging.

Conservation More work on the ecology and habitat requirements of the species in Britain is needed. In the absence of more detailed information, management should aim to retain as wide as possible a range of age, structure and heights of birch trees and bushes. This requirement should be borne in mind in any scrub clearance

operations which may be undertaken. The presence of the species on a site should not, however, inhibit the clearance of invading birch from otherwise open habitat which it may be damaging.

References Le Quesne, W.J. & Payne, K.R. (1981), Nast, J. (1972).

LIMOTETTIX ATRICAPILLUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Limotettix atricapillus

Identification Le Quesne (1969; Ossiannilsson (1983).

Distribution There are British records only from Cheshire (Newchurch Common and Delamere Forest) and from Hampshire (New Forest). It appears to be a rather scarce species in northern Europe, recorded from Sweden, Norway, East Fennoscandia, Germany, Poland, Estonia and Lithuania.

Habitat and ecology Bogs and wet heaths. The few records from Britain do not permit detailed consideration of requirements in this country. In mainland Europe it has also been recorded from fens. It may prove to be a species of poor fens and base-enriched bogs. The foodplants are not certainly known. Sedges *Carex* spp are consistent associates. The commonest sedges at the recent New Forest site are star sedge *C. echinatus*, common sedge *C. nigra* and carnation sedge *C. panicea*. Adults have been recorded from August to October in Britain, but have been found as early as June elsewhere in northern Europe.

Status Very rare. Enough work has now been undertaken on lowland bogs and other wetlands to make it quite certain that this species is at most a very infrequent constituent of the fauna. The Cheshire records are old ones, and the only recent locality is from the New Forest (1985). The fact that it has been overlooked in the New Forest for so long indicates that further records are possible.

Threats General threats to the preferred habitat are drainage and improvement of bogs and wet heaths; afforestation; lowering of water tables on wetland sites, particularly where rather small and isolated, as a result of drainage and water abstraction on surrounding land; neglect of open wetland sites, leading to scrub invasion, particularly where there is nearby pine plantation, birch scrub or other seed source of invasive woody species. The tolerance to grazing is not known, but heavy grazing is likely to produce unsuitable structure. This may limit the species in the New Forest to some extent, but is unlikely to be threatening overall. Delamere Forest and the nearby heaths and bogs have suffered greatly during the present century from draining, afforestation, conversion to arable land, fragmentation and neglect. conversion to farmland; now with heavy visitor pressure in places; some wetland areas now rather isolated and prone to further decline.

Conservation The only recent site for the species is within the New Forest SSSI. Despite the widespread decline and fragmentation of habitats in the Delamere Forest area, some areas of high quality remain, and several SSSIs are included. Management of wetland sites where the species is known or suspected to occur should aim to maintain open conditions with a good range of plant species and a varied vegetation structure, which should include some tall sedges. Light grazing is the best way to maintain suitable conditions. The New Forest site is grazed, and the maintenance of reasonable grazing levels is likely to be essential to the continued viability of the colony. If the species is found on a site where grazing is not possible, there may be no need for urgent action provided the water table is kept high, limiting possible scrub invasion. If active invasion is occurring, occasional scrub clearance may be the only essential management, at least in the short term. Cutting may be an alternative on some sites where grazing is not feasible. Such cutting should be undertaken on a rotational programme, with as long as possible a period between cuts.

References Edwards, J. (1915), Krogerus, R. (1960), Le Quesne, W.J. (1969), Nast, J. (1972), Ossiannilsson, F. (1983).

MACROPSIS GLANDACEA

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

*Macropsis glandacea***Identification** Le Quesne (1965).**Distribution** Recorded in Britain only from Lee and Lewisham, Kent. It is chiefly a central European species.**Habitat and ecology** The foodplant is elm. The British records are probably from English elm *Ulmus procera*. The British records are so few and so old that little more can be said of the ecology of the species in this country. Probably it was always a species at the edge of its climatic tolerance here. Adults have been recorded in August.**Status** Only two authentic specimens of *M. glandacea* are known from British collections, both from the last century. There are a number of other old records, but when checked they have proved to refer to the commoner *M. mendax*.**Threats** The areas from which the species was recorded in the last century have long since been overwhelmed by housing and other development. If the insect was genuinely a species of the London area, the same fate may have overtaken many other possible sites. The insect seemingly disappeared long before the recent outbreak of elm disease, but if any populations remained the spread of the disease may have had deleterious effects. Other elm feeding Auchenorrhyncha have survived the disease, however, so remaining populations of *M. mendax* may also still exist. More serious threats to any remaining populations may be the removal of elm from diseased areas, by the grubbing out of tree roots, elm hedges and areas of elm suckers which may be considered unsightly because of the dead branches caused by recurrence of the disease. Even where suckering and coppicing growth of young elm is allowed, other tree species have often been planted as replacement for the lost elms, and these may ultimately shade the elm and either kill it or render it unsuitable for *M. glandacea*. The grubbing out of hedges containing elm, particularly in areas of countryside dominated by arable land, continues to be a problem in south-east England. Further threats to any hedgerow populations which may exist are the frequent over management of hedges, for example by annual flailing, which renders the structure of the hedge unsuitable for many insects, and may well also destroy a large proportion of the eggs.**Conservation** Further recording work in the London area is necessary to determine whether the species still exists in Britain. Elm should be retained wherever possible. Where elms affected by disease are cut down before completely dead the stumps should be left in situ to coppice. Suckering growth should be left wherever possible. Where elm grows in hedgerows these should be managed as little as is compatible with their continued function. Even in relatively intensively farmed areas it is unlikely to be necessary to undertake management more often than once every five or six years, and on conservation sites, or sites with other non-intensive use, less frequent management may be possible. Only a fraction of the length of hedge on any given site should be managed in any one year. Suckering and coppicing elm will be subject to recurrence of elm disease as the branches reach a critical size, but elm should be well able to hold its own against the disease in most sites.**References** Le Quesne, W.J. (1965c), Nast, J. (1972).

MACROPSIS MENDAX

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macropsis mendax (Fieber)**Identification** Le Quesne (1965).**Distribution** Southern England, particularly the south-east. There are records from Warwickshire, Huntingdonshire, Cheshire, Oxfordshire, Buckinghamshire, Berkshire, Hertfordshire, Essex, Kent, Sussex, Surrey,

Middlesex, Hampshire, Dorset and Somerset. It is otherwise found in central and southern Europe, east to middle Russia and the Ukraine.

Habitat and ecology The known British foodplant is English elm *Ulmus procera*. This is a tree primarily of hedges and open countryside rather than woods, and this is reflected in the distribution of records. The preferences and tolerances of the insect for different ages, heights and structures of elm are not known, but some of the recent records are from tall suckering elm in areas where all mature trees have been lost to elm disease. Adults have been recorded from July to October. Eggs probably overwinter, and are likely to be laid in the tissues of the host plant.

Status Apparently locally common in the past, but declined in recent years, perhaps as a result of elm disease. It may prove to be present at low density in a wider range of sites.

Threats The apparent decline in recent years may well be the result of elm disease. However, the insect is known to be able to survive on tall suckering elms, so the disease is threatening only where other factors prevent the formation of tall suckers. A more serious threat than the disease itself may be the removal of elm from diseased areas, by the grubbing out of tree roots, elm hedges, and areas of elm suckers which may be considered unsightly or undesirable because of the dead branches caused by the continued recurrence of elm disease. Even where suckering and coppicing of young elm is allowed, other tree species have often been planted as replacements, and these may ultimately shade the elm and either kill it or render it unsuitable for the support of *M. mendax*. The grubbing out of hedges containing elm, particularly in areas of countryside dominated by arable land, continues to be a problem in south-east England. Further threats to any hedgerow populations which may exist are the frequent over-management of hedges, for example by annual flailing, which renders the structure unsuitable for many insects, and may well also destroy a large proportion of the eggs.

Conservation Elm should be retained wherever possible. Where elms affected by disease are cut down before completely dead the stumps should be left to give them an opportunity to coppice. Suckering growth should be left wherever possible. Where elm grows in hedges these should be managed as little as is compatible with their continued function. Even in areas of relatively intensive land use such management is unlikely to be necessary more than once every five or six years. On conservation sites, and others with less intensive use, less frequent management may well be possible. Mechanical flailing should not be used. Suckering and coppicing elm will be subject to recurrence of elm disease as the branches reach a critical size, but elm should be well able to hold its own against the disease in most sites.

References Le Quesne, W.J. (1961c), Le Quesne, W.J. (1965c), Morley, C. (1905), Morris, M.G. (1972), Nast, J. (1972), Ribaut, H. (1952).

MACROSTELLES ALPINUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles alpinus (Zett.)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Northern England and Scotland: probably widely distributed. There are records from the Inner Hebrides (Rhum), Perthshire, Dumfriesshire, Aberdeenshire, Westmorland and Durham. It is widely distributed in northern and central Europe, and extends east to Mongolia.

Habitat and ecology *M. alpinus* has been found in open areas with grasses or rushes, but the precise habitat requirements are unclear. Woodroffe (1971) was of the opinion that it occurred particularly on areas of basic rock; for example, on limestone on the Scottish mainland, and on basalt on Rhum. The majority of British records do seem to be from sites with at least some basic rocks, but others are undoubtedly from acid grassland, and even from blanket bog. Most are from moderate to high altitude. In mainland Europe, it has been found in damp meadows, fens, bogs, and in fields. Host plant associations are uncertain, but heath rush *Juncus squarrosus* has been suggested as a host. Adults have been recorded in July and August. The life history is otherwise unknown, but it probably overwinters in the egg, in common with others of the genus.

Status Local, but possibly greatly under-recorded. Woodroffe (1971) regarded it as widespread at high altitudes in the hills around Glen Derry. Coulson and Butterfield (1979) recorded it at 5 sites in northern England by the use of pitfalls, which suggests that it may be overlooked by casual sampling.

Threats Drainage and improvement of grassland may be a threat in some areas, particularly at lower altitudes. Afforestation is a potential or actual threat in much of the range of the species. Except at very high altitudes and in very exposed situations, the habitat is in general maintained by grazing. Changes in grazing will affect the structure and species composition of these habitats. In some areas, increased grazing pressure in recent years has led to increase of grasses at the expense of heather and other plants in upland areas. However, the requirements and tolerances of *M. alpinus* are too poorly known for it to be possible to estimate the extent to which such changes constitute a threat.

Conservation Management should aim to maintain open conditions with good growth of grasses and rushes. Such conditions will normally be maintained by grazing, and grazing should be continued or re-introduced wherever possible. Grazing should be adjusted so as to maintain diversity of plant species and structure. All recorded sites are very open. Light scrub invasion may be acceptable but dense scrub should be avoided.

References Coulson, J.C. & Butterfield, J.E.L. (1979), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Prior, R.N.B. (1967), Whittaker, J.B. (1964), Woodroffe, G.E. (1971a), Woodroffe, G.E. (1972b).

MACROSTELLES CRISTATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles cristatus (Ribaut)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution There are British records only from Hertfordshire (Ware), Kent (Cranbrook & East Malling), Berkshire (Silwood Park), Bedfordshire (Upper Sundon Chalk Pit), Oxfordshire (Wychwood) and South Yorkshire (Blue Man's Bower; Conisburgh). It is probably widely distributed at least in south-eastern England. It is very widely distributed in Europe, extending east to Mongolia, and also occurs in the Nearctic.

Habitat and ecology This is particularly a species of disturbed ground and ruderal communities. It can occur both in small areas of disturbance in sites supporting semi-natural vegetation, and in completely artificial situations such as arable fields. On experimental sites at Silwood Park it occurs on disturbed sites in the first and second year, sometimes in abundance, but declines thereafter (J.A.Hollier pers. comm.). On the continent it appears to be particularly associated with arable fields. The foodplants certainly include grasses, and it is a cereal virus vector in some parts of Europe. However, it has also been found in fields of clover *Trifolium*, lucerne *Medicago sativa* and potato *Solanum tuberosum*. An association has also been suggested with knotweeds *Polygonum* and with flaxes *Linum*. The evidence suggests a mobile species which is an efficient coloniser forming transient populations which may survive for only a few generations. The winter is spent in the egg.

Status Apparently very local, but probably widely overlooked. The transient nature of the preferred habitat, and the fact that such ruderal and arable sites tend not to be thoroughly investigated by recorders, would encourage under-recording. It may also escape notice amongst populations of other *Macrosteles* spp., particularly *M. sexnotatus* and *M. laevis*, which it superficially resembles.

Threats The increasingly intensive use of arable land and the widespread use of herbicide must have had a great effect on the area of land suitable for the species in recent decades. Otherwise, there are probably few very general threats: the temporary nature of the sites and populations may mean that destruction of individual sites is not necessarily a major problem, provided that further ruderal sites are created in the area. On sites with semi-natural vegetation, where the insect may form colonies in local areas of disturbance, the widespread loss of grazing and the decimation of rabbit populations by myxomatosis may be expected to have had a deleterious effect, but there is no evidence of this.

Conservation There is probably little point in undertaking active conservation measures for this species. Where a site supporting ruderal vegetation or disturbed ground is to be managed for conservation, the survival of the species on the site will probably be assured by periodic local substrate disturbance to maintain the ruderal communities.

References Crossley, R. (1981), Le Quesne, W.J. (1985), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Payne, K. (1981), Prior, R.N.B. (1967), Woodroffe, G.E. (1971a).

MACROSTELES CYANE

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles cyane (Boheman)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution There are only four British records, from Surrey (Fifield, Holmwood), Sussex (Dallington Forest) and Essex (Epping Forest). It is widely distributed in northern and central Europe, but apparently rather scattered and uncommon. It extends east to Japan.

Habitat and ecology Found on floating leaves of broad-leaved pondweed *Potamogeton natans* and water lilies (in mainland Europe both yellow water-lily *Nuphar luteum* and white water lilies *Nymphaea* spp.) in ponds. All the British records apparently come from fairly small water bodies but precise localities are unknown. Adults have been taken from July to October. The life history is otherwise unknown. Members of the genus generally overwinter in the egg. If this is true of *M. cyane*, its unusual host plant association must place a restriction on its habits. The floating leaves of the hosts die and rot in the winter, so are unlikely to provide suitable oviposition sites, and there is no evidence that the insect climbs down the plants to oviposit on submerged parts. The likeliest oviposition sites are probably the stems of emergent and marginal plants. If this is the case, it implies the need for young nymphs to make their way out from the margins to beds of floating leaves. If this is true, suitable ponds will probably have large and dense beds of vegetation close to the bank.

Status Very rare, possibly extinct. Apparently always very local, there are no recent records.

Threats The reasons for the apparent decline are not clearly known. Water quality and site quality have greatly declined in many parts of southern England over the present century, but enough apparently suitable habitat remains in the general area of the old records to support viable populations. Not enough is known of the specific pools from which the Surrey and Sussex records were made to assess the potential influence of local habitat change. In Epping Forest, there has been a general decline in the quality and wildlife value of the ponds. Excessive erosion through recreational use, and the provision of angling facilities, have led to the almost total destruction of marginal vegetation and to serious eutrophication of some ponds. Where such recreational pressures are less, lack of management, and particularly the failure to maintain open conditions around the pools, has led to shading and heavy leaf input. In general terms, the chief threats to suitable pools in the south-east are dumping and infilling; pollution and eutrophication as a result of runoff from farmland, roads and areas of development; long-term neglect, leading to choking of the water by growth of weeds and emergent vegetation, or excessive shading by the unchecked growth of marginal shrubs and trees; lowering of water tables as a result of water abstraction and drainage in surrounding land, and over-management involving the wholesale clearance of aquatic and/or marginal vegetation.

Conservation Management of small pools in which the species is known or thought likely to occur should aim to maintain good growth of both marginal and aquatic vegetation, including beds of vegetation with floating leaves within close reach of the water margins. Water tables should be maintained at a reasonable level, and pools should be isolated as far as possible from potential sources of pollution and enrichment. Clearance of aquatic and marginal vegetation should be undertaken only when absolutely essential, and should be done piecemeal, with only a fraction of the area cleared in any one year. At least a part of the pool should be kept open and sunny, and shrubs and trees should be cut or trimmed where necessary to achieve this. Some shelter from trees and bushes around part of the pond or in its immediate vicinity may be beneficial.

MACROSTELLES FIEBERI

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles fieberi (Edwards)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution The known distribution of *M. fieberi* is wide but scattered through England and Scotland and with a single record from Wales. There are records from Inverness-shire, Ross-shire, Perthshire, Morayshire, Sutherland, Yorkshire, Cheshire, Norfolk, Suffolk, Hertfordshire and Merionethshire. It also occurs in Ireland, and is widely distributed in northern and central Europe. It extends east to Mongolia and Iran, and also occurs in the Nearctic.

Habitat and ecology This is a wetland species, whose biology and habitat requirements are rather obscure. It has been found in marshy areas close to the sea, and an association with club-rush *Scirpus* has been suggested. Morley (1933) specifies its occurrence in a salt marsh. Other records, however, come from acid bogs and inland non-acid marshes. With such a wide habitat range, it seems likely that the insect is polyphagous. It is interesting that a species of such wide distribution and apparently wide habitat range should be so localised. The limiting factors which determine this are not obvious. Adults have been recorded from July to September. In mainland Europe, there are two generations per year, and eggs overwinter.

Status Local. The wide range of known habitats and wide distribution make the extent of under-recording difficult to estimate. It may be quite widespread in the north, where there has been less active recording. Like other uncommon *Macrosteles* species, it may be overlooked amongst common, and superficially similar, members of the same genus.

Threats The ecology of the species is so little known that likely threats and their relative magnitude are difficult to estimate. As a wetland species, it is likely to be threatened, at least locally, by such general changes as drainage of wetlands; lowering of water tables at wetland sites as a result of water abstraction and drainage in surrounding land; pollution and eutrophication of water sources by runoff from farmland, and from developed areas and roads. Lowland sites in particular may be threatened by neglect and lack of management, leading to loss of open conditions through scrub invasion or dominance by coarse vegetation. Coastal populations may additionally be threatened by the construction and renovation of sea defences, which may involve the destruction of brackish water communities, particularly through excavation of material for the construction of the bank. In upland sites, the chief threat at present is probably afforestation.

Conservation Water tables on wetland sites should be kept high. Management should aim to maintain open vegetation, with good growth of tall vegetation such as rushes, sedges, and wetland grasses. In the extreme north and at high altitudes, such conditions may need no management for their maintenance. Elsewhere, light grazing is probably the commonest form of management for such habitats, and should be maintained. Some sites in the south may have been traditionally managed by cutting. Such management should continue or be re-instated, though its replacement by a grazing regime may be quite acceptable.

References Brown, J.M. (1923), Edwards, J. (1889), Edwards, J. (1891), Edwards, J. (1896), Fordham, W.J. (1922), Le Quesne, W.J. (1969), Morley, C. (1933), Ossiannilsson, F. (1983), Payne, K. (1979a), Ribaut, H. (1952), Salmon, M.A. (1954).

MACROSTELES FRONTALIS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles frontalis (Scott)**Identification** Le Quesne (1969).**Distribution** The known distribution of *M. frontalis* in Britain is very scattered. There are a number of records from northern England and Scotland (Inverness-shire, Morayshire, Yorkshire), two Oxfordshire sites, two sites in the New Forest area of Hampshire, and single records from Staffordshire, Worcestershire and Bedfordshire.**Habitat and ecology** This is a wetland species in Britain. It is typically found on horsetails *Equisetum* spp., though an association with reed *Phragmites australis* has also been suggested. There is no strong evidence of very restrictive habitat requirements, and there are records from a wide range of wetland conditions. In mainland Europe it has also been recorded from *Equisetum* growing in dry places, but seems not to have been found under such circumstances in Britain as yet. Adults have been found from June to September, which suggests that there are two generations per year. The life history is otherwise unknown, but the winter is likely to be spent in the egg, as in commoner *Macrosteles* species.**Status** *M. frontalis* is certainly very local, but is possibly under-recorded. The distribution as currently known is unusual, and it may well be that the species is widely overlooked. This may in part result from confusion with other superficially similar *Macrosteles* species.**Threats** Drainage of wetland sites; lowering of water tables as a result of drainage or water abstraction on surrounding land; neglect of wetland sites leading to dominance by coarse vegetation and scrub invasion; afforestation, both when it destroys the wetland itself, and when tree-planting occurs close to the margin of the wetland increasing the dangers of scrub invasion.**Conservation** Water tables should be kept high. Management should aim to maintain open conditions with good growth of *Equisetum*. This is probably best maintained by light grazing. Where grazing is impossible, or has not been a traditional management, cutting may be a possible alternative. The cutting should be undertaken on a rotational regime, with only a fraction of the area being cut in any one year. Heavy shading should be avoided, and scrub and shading trees should be removed or trimmed, particularly if there is any evidence of stands of *Equisetum* suffering from shading.**References** Crossley, R. (1976b), Edwards, J. (1896), Flint, J.H. (1966), Fordham, W.J. (1922), Le Quesne, W.J. (1985), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Ribaut, H. (1952).

MACROSTELES LIVIDUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles lividus (Edwards)**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** Recorded in Britain only from Norfolk (Weybourne), Hampshire (New Forest), and Dorset (West Parley; Gussage). It also occurs in northern and central Europe, and extends east to the Ukraine and Middle Russia.**Habitat and ecology** This is a wetland species, but there is otherwise little in common between the known British localities. The Norfolk site was a "swampy marsh by the sea"; the New Forest record is most likely to be from an acid bog or wet heath, but other habitats are possible; West Parley is in a heathland area, but adjoins the River Stour, so the locality could equally be a riverine site; Gussage is in a chalk area, and the most likely wetlands there are riverine, alongside the River Allen or its tributaries. In mainland Europe it has been found

in coastal sites. The host plants are not known. Adults have been found in June, August and October. The life history is otherwise unknown, but it is likely that eggs overwinter, as in other *Macrosteles* species.

Status Apparently very local and rare. The uncertain ecology of the species in this country makes it difficult to estimate the likely extent of under-recording. Like other rarer members of the genus, it may be overlooked amongst commoner, but superficially similar *Macrosteles* species occurring in the same sites.

Threats Threats are difficult to identify precisely in the current state of knowledge of the species. Coastal sites may be particularly prone to damage by the construction or renovation of sea defences, which may damage the upper levels of saltmarshes both by blocking the free flow of water over the upper marsh and by the digging of material for bank construction. Riverine marshes may be damaged by pollution, by large-scale dredging and by improvement works. Straightening or diversion of the channel will limit the number of backwaters and areas of slow flow and inhibit the development of marsh. Wetland sites in southern England in general face threats from drainage, from falling water tables resulting from drainage or water abstraction in surrounding land, from scrub invasion and dominance by coarse vegetation where neglected, and in places from afforestation. Development may pose a serious threat in some areas. Much of Parley Heath has already been destroyed through the expansion of Bournemouth and the development of Hum Airport, and there is considerable pressure on other sites in the area.

Conservation Much of the North Norfolk coast now falls within SSSIs and a large proportion of the better quality habitat is within NNRs, reserves of the local Naturalist's Trust or the RSPB, or are properties of the National Trust. Weybourne itself is at the eastern edge of the areas of particular interest. The New Forest is an SSSI, as is the remaining area of Parley Heath. Coastal sites for the species probably need no active management for their maintenance in suitable condition. On other sites, too little is known of the habitat requirements of the insect to make detailed management prescriptions possible. The maintenance of high water tables and open conditions is likely to be critical. On riverine sites, any management work which must be undertaken should involve clearance of only short stretches or, if this is not practicable, only one bank at a time, and re-profiling should leave gently sloping margins to facilitate colonisation by emergent vegetation.

References Edwards, J. (1889), Edwards, J. (1891), Edwards, J. (1896), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983).

MACROSTELES OSHANINI

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles oshanini Razvyaskina

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution In Britain, recorded only from Ranworth and from Sutton Broad, Norfolk. It is otherwise known from central and north-western Europe.

Habitat and ecology The single British record is from the Norfolk Broads, and is likely to originate from one of the fenland areas. Elsewhere in Europe, though it has been recorded from fenland, it appears to show a preference for woodland clearings and other shaded places. The British adults were collected in June. The life history is otherwise unknown, but it is likely that it overwinters in the egg, in common with other *Macrosteles* species.

Status Apparently very rare. There is a single 19th century record from Ranworth, and a single recent (1988) record from Sutton Broad. It may have been overlooked elsewhere. There has been rather little recent recording of *Auchenorrhyncha* in the Norfolk Broads.

Threats Water quality in the Norfolk Broads has declined considerably in recent decades as a result of increasing nutrient load from water draining from farmland and sewage treatment works. This has profoundly affected communities in the open broads particularly. Considerable areas of fen vegetation remain in good condition at present. Neglect of previously managed areas of fen and reed-bed in the broads has led to extensive scrub

invasion and dominance by coarse vegetation. The extent to which such changes are threatening to *M. oshanini*, however, is not known.

Conservation Much of the remaining wetland in the area of the Ranworth record now falls within the Bure Marshes NNR. Sutton Broad is within the Ant Marshes SSSI. Various other parts of the Norfolk Broads are reserves of the Norfolk Naturalists Trust or RSPB, and most remaining areas of good habitat quality are within SSSIs. All fall within the Norfolk Broads Environmentally Sensitive Area. Much work has been done in recent years to improve water quality in the broads and to reduce nutrient input, but success has so far been limited. Various of the fens, including some within the Bure Marshes NNR, are now being brought back into traditional management, but the extent to which this will benefit the insect is uncertain in the present state of knowledge of its ecology. Until the foodplants and habitat requirements are more fully known, management for the species should aim to maintain as wide as possible a range of wetland conditions within any given site in the Broads, from very open regularly managed sites to carr with a well-shaded ground flora.

References Edwards, J. (1891), Edwards, J. (1894), Edwards, J. (1896), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983).

MACROSTELAS QUADRIPUNCTULATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles quadripunctulatus (Kirschbaum)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Southern England. There are records from Devon (Braunton Burrows), Surrey (Frensham Vale; Kew), Berkshire (Silwood Park), Oxfordshire (Aston Rowant NNR), Essex (St Osyth) and Kent (Murston). It is widely distributed in Europe and extends east to Iran and Iraq.

Habitat and ecology British records come from sand dunes, dry coastal grassland, inland acid grassland, chalk downland, and disturbed ground supporting ruderal vegetation. These habitats have in common that they support short, open, and often quite sparse vegetation on very well-drained substrates. The association with dry and well-drained habitats applies also to most records from mainland Europe. Host plants are not certainly known. It has been found in association with bristle-grasses *Setaria* and millets *Panicum* on the continent, but both these genera occur only as casuals in Britain, so there must be other hosts. Elsewhere in Europe, there are two generations per year, the eggs overwintering.

Status Very local. The wide range of habitats, the ability to colonise ruderal sites, and the wide but scattered distribution suggest that this species may be under-recorded. It may form temporary populations in localised areas of disturbance, and may therefore be easily missed. It is possible that it is overlooked in mixed populations with other, superficially similar, members of the genus, but the commoner *Macrosteles* are generally rather infrequent in the dry habitats preferred by *M. quadripunctulatus*.

Threats Threats are rather difficult to identify precisely in the present state of knowledge of the ecology and habitat requirements of the species. In grassland sites the major threats are likely to be destruction by ploughing, improvement or development, and the loss of open conditions, particularly disturbed and thinly vegetated ground, as a result of the widespread cessation of stock grazing on unimproved grassland in recent decades and the decimation of rabbit populations by myxomatosis. Sites on waste ground may be threatened by development, and may also be lost through uncontrolled natural succession. On coastal dunes, development may be locally threatening, and erosion through heavy public pressure may also be damaging.

Conservation There are records from two National Nature Reserves, at Braunton Burrows and at Aston Rowant, though the latter record was of a single individual which it was thought might be a chance vagrant. Sites on coastal dunes may need no active management to maintain suitable conditions. However, rabbit grazing probably helps in maintaining open conditions, and the addition of moderate stock grazing could be beneficial. On grassland sites, management should aim to maintain as wide as possible a range of vegetation structure, including some areas of short or sparse vegetation. Grazing is the best way to produce such conditions. Rabbit grazing

produces a close mosaic of short and long vegetation. Rabbit grazing should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter. Grazing by stock should be introduced or maintained wherever possible, but stocking levels should be carefully monitored to ensure that varied vegetation is maintained. Where grazing is not possible, cutting may be the only alternative. Cutting alone may not be satisfactory in maintaining suitable conditions for *M. quadripunctulatus*, but if assisted by local rabbit grazing, or localised substrate disturbance, better conditions may be produced. The insect is known to be able to colonise ruderal sites, so a rotational regime of management, by either grazing or cutting, may be acceptable. On waste ground and similar sites as wide as possible a range of successional stages should be maintained. Periodic scrub clearance may help, but the best long-term answer is probably periodic mechanical disturbance of the substrate over part of the site to ensure that early successional stages are always represented.

References Jones-Walters, L. (1988), Le Quesne, W.J. (1960b), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983).

MACROSTELLES SORDIDIPENNIS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Macrosteles sordidipennis (Stal)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Widely but locally distributed around British coasts, with records from Dumfries-shire, Durham, Cumbria, Cheshire, Lancashire, Yorkshire, Lincolnshire, Essex, Kent, Sussex, and Hampshire.

Habitat and ecology Coastal saltmarshes, particularly the upper levels. A single inland record from Durham requires confirmation. Badmin (1986) recorded this species from a grass sward consisting almost entirely of the stiff saltmarsh grass *Puccinellia rupestris*. Elsewhere it is probably associated with other *Puccinellia* species. It is frequent around the Wash where there is good growth of the common saltmarsh grass *Puccinellia maritima*. It has been recorded from *Puccinellia* on the continent also. It has been taken from saltmarsh rush *Juncus gerardii*, but this may have been a casual association. Adults have been taken from June to September in Britain. In mainland Europe, there are two generations per year. Eggs probably overwinter.

Status Local, but clearly well-established around some parts of the coast. It is likely to prove under-recorded in at least parts of its range: the virtual absence of records from East Anglia is unlikely to reflect the true situation, and the south-western saltmarshes are under-recorded for Auchenorrhyncha in general. Its status in Scotland is far from clear.

Threats Reclamation of saltmarshes; development, particularly along major estuaries such as the Mersey, Thames and Humber; tidal barrage schemes; construction and maintenance of coastal defences, which may be damaging both by cutting off the upper levels of the saltmarsh and through digging of construction materials from the saltmarsh itself. Heavy grazing of saltmarshes will be deleterious if it reduces the flora to a short and uniform sward. However, grazing encourages the growth of grasses such as *Puccinellia*, and light grazing, which maintains reasonable structural diversity, may not be harmful.

Conservation The insect is known to be represented in at least three National Nature Reserves and a number of other coastal reserves and SSSIs. For the most part, no active management is needed to maintain the habitat in suitable condition for the species. Heavy grazing should be avoided. Light grazing which maintains reasonable diversity of structure is acceptable, but grazing should not be introduced to previously ungrazed saltmarshes. Cessation of grazing on previously grazed saltmarsh may lead to rapid dominance by coarse *Puccinellia* growth. Such conditions appear quite acceptable to *M. sordidipennis*, which may even benefit, but the change may be less desirable for other elements of the saltmarsh fauna. Where a seabank is to be constructed, this should be as far back from the sea as possible, so as to leave the maximum possible tidal range over the saltmarsh. Material for construction or renovation of seabanks should be taken from the landward side wherever possible.

References Badmin, J. (1986), Badmin, J.S. (1981), Britten, H. (1939), China, W.E. (1938b), Le Quesne, W.J. (1974), Le Quesne, W.J. (1986), Le Quesne, W.J. (1969).

METALIMNUS FORMOSUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Metalimnus formosus (Boheman)**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** Recorded in Britain only from Brandon, Suffolk. It is widely distributed in northern and central Europe, and extends east to Mongolia and Manchuria.**Habitat and ecology** A wetland species. The single British record is from an osier carr on the River Little Ouse close to the border between ancient fenland and breckland. The insect was found on large bitter cress *Cardamine amara*, but the association was probably casual. Elsewhere in Europe it has been recorded from a very wide range of wetland habitats, from wet meadows and base-rich marshes to acid bogs. The foodplants are unknown, though sedges *Carex*, reed-grass *Glyceria* and yellow flag *Iris pseudacorus* have been suggested. Of these suggestions, polyphagy on *Carex* spp. seems the likeliest, in view of the wide habitat range. The British specimens were taken in August. Adults have been taken from July to October in mainland Europe.**Status** Very rare, possibly extinct. The single British record dates from 1906. The area in which it was taken has not been well-worked in recent years, and the likelihood of the insect being rediscovered is impossible to estimate, particularly in view of its wide habitat range on the continent.**Threats** Threats are difficult to identify and quantify in the absence of more detailed information on the habitat of the species in Britain and the absence of a known population. Wetland sites in the area have come under threat from drainage, from falling water tables resulting from water abstraction and drainage in surrounding land, and from decline in water quality, as a result of runoff from farmland and of sewage effluent. Many of the remaining wetland sites have also suffered in recent decades from lack of management, leading to loss of open structure and to scrub invasion.**Conservation** Though the habitat requirements of the species in Britain are not fully known, it seems likely from records elsewhere in Europe that it will need open and unshaded conditions with good growth of tall vegetation such as sedges. Management should aim to retain such structure. Either light grazing or a cutting regime should be suitable for maintenance of such conditions, and the choice will be dependent on past management practices at the site and the feasibility of the different management options. Grazing should be adjusted to give good variety of structure, including both low vegetation and clumps of tall plants. Cutting should be arranged on a rotational basis, with only a fraction of the site cut in any one year, and the periods between cuts as long as possible.**References** Edwards, J. (1908), Le Quesne, W.J. (1969), Morley, C. (1933), Ossiannilsson, F. (1983).

MOCUELLUS COLLINUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Mocuellus collinus (Boheman)**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** In Britain recorded only from St Helen's, Isle of Wight. It is widespread in Europe, and extends east to Mongolia.**Habitat and ecology** The single British record is from a dry coastal area on sandy soil. It is likewise a species of dry places elsewhere in Europe, with records from sand dunes, grassland on sandy soils, calcareous grassland,

and areas on saline soils. An association with common couch *Elymus repens* has been suggested. The British record was made in July, and elsewhere in Europe it has been found from June to September. In central Europe there are two generations per year, and it hibernates in the egg.

Status Uncertain. There is only a single 19th century record of the species. It is possible that it was of a non-established vagrant or from a temporary colony established by such vagrants. If it is a true native species, the absence of other south coast records suggests a rarity on the extreme edge of its range, but it may have gone unrecorded elsewhere.

Threats Uncertain, in the face of the limited knowledge of the habitat requirements of the species in Britain, and the lack of any known established population. The chief threats to likely habitats are probably the improvement of dry grassland, development, particularly in the area of coastal resorts, and perhaps also stabilisation of soft rock cliffs, which on the Isle of Wight might provide suitable areas of dry sparse grassland of sunny aspect.

Conservation If an established population is found, management should aim to maintain open grassy habitat, perhaps ideally sparse or patchy. Some coastal sites, such as on dunes or cliffs, may need no active management to maintain such conditions. On more stable inland sites grazing will be required to maintain optimum conditions. Rabbit grazing is probably the best, and creates a small-scale mosaic of different turf lengths with areas of disturbance. Grazing by stock will produce better results if there are rabbits to supplement their effects.

References Edwards, J. (1896), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Ribaut, H. (1952).

PARALIMNUS PHRAGMITIS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Paralimnus phragmitis (Boheman)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Southern Britain. There are records from Carmarthen, Glamorgan, Norfolk, Suffolk, Huntingdonshire, Cambridgeshire, Kent, Surrey and Hampshire. It is widely distributed in Europe, particularly in northern and central regions, and extends east to Iran and Siberia.

Habitat and ecology Most records are from either East Anglian fens and broads, or from estuarine or other brackish sites near the coast. There is an old record from Haslemere, Surrey, which clearly comes from neither of these habitats, so other inland habitat types can clearly also be suitable. The most frequent foodplant is common reed *Phragmites australis*, but it has also been taken from pure stands of sea club-rush *Scirpus maritimus*, and there may also be other host plants. When associated with reed it can occur both in pure beds of the host or in stands where it is mixed with other plants. Adults have been recorded from late May to September, but the life history is otherwise unknown.

Status Local. It is clearly well-established in some parts of East Anglia, and is probably under-recorded there, since it is not a particularly well-worked area for the Auchenorrhyncha.

Threats On fenland sites the chief threats are drainage; lowering of water tables as a result of improved drainage and increased water abstraction on surrounding land, and neglect leading to scrub invasion and loss of reeds and other grassy vegetation. Eutrophication and pollution are also widely threatening to fenland sites in East Anglia, but these may be less damaging to *P. phragmitis* than to many elements of the fauna, since *Phragmites* can grow at high nutrient levels and in spite of moderate pollution. In coastal sites, pollution caused by runoff from farmland and other sources may adversely affect smaller brackish ditches in particular. The loss of upper coastal and estuarine habitats to development may be a problem in some areas, for example around Southampton Water, where there are a number of records. The construction and maintenance of coastal defences may be damaging both by cutting off the upper levels of the saltmarsh and by damage caused by excavation of construction material from the marsh itself.

Conservation Most coastal sites probably need no active management to maintain suitable conditions for *P. phragmitis*. Where sea banks or walls are to be constructed, they should be positioned as far to landward as possible, to preserve the maximum extent of saltmarsh habitat. Material for construction should be excavated from areas of low conservation interest on the landward side wherever possible. On fenland sites, water levels should be kept high, and management should aim to maintain open vegetation, including good growth of *Phragmites*. Such conditions may be maintained by cutting or light grazing. A strict cutting regime is probably not necessary, and in sites with mixed vegetation the insect may benefit from a modicum of neglect, which may encourage the growth of reed and other coarse grasses at the expense of lower vegetation. Only a fraction of a site should be cut in any one year, and the period between cuts should be as long as possible. Ditches and drains supporting reeds should be managed only when strictly necessary for their continued function. If clearance work is undertaken, it should be done piecemeal, with only a small proportion of the drains in any given site being managed in any given year, and only short stretches, or a single side, of any drain being treated at any one time.

References Badmin, J. (1984), Collins, J. (1929), Edwards, J. (1894), Edwards, J. (1896), Edwards, J. (1909), Krogerus, R. (1960), Le Quesne, W.J. (1969), Morley, C. (1933), Ossiannilsson, F. (1983).

PEDIOPSIS TILIAE

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Pediopsis tiliae (Germar)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution Widely distributed in southern Britain, north to Yorkshire. There are records from South Yorkshire, Buckinghamshire, Berkshire, Bedfordshire, Hertfordshire, Kent, Hampshire, Dorset, Gloucestershire and Glamorgan.

Habitat and ecology The foodplants are limes *Tilia* spp. The usual foodplant is believed to be the small-leaved lime *Tilia cordata*, but it is not restricted to that species. Adults are recorded from June to September. So far as is known, the entire life history is spent on the tree. Details of the habitat are lacking for many records, but it is clear that the insect is not confined to natural populations of limes or limes growing in semi-natural habitats. Indeed, the insect is so far unrecorded from some of the best-known areas for native small-leaved lime in Britain. This may stem partly from under-recording. It is possible that in woodland the population is concentrated high in the canopy where it may escape notice, for example. However, the species does seem more localised than its known biology and ecology would suggest it should be, and the factors which determine its distribution are not obvious.

Status Local, but perhaps widely under-recorded.

Threats Uncertain, beyond the destruction of lime trees. Nothing is known of the preferences of the species for different ages, structures and heights of tree, so it is not clear whether the details of management are critical to the insect.

Conservation Where lime, particularly small-leaved lime, is present on a site, management should aim to preserve the species in as wide a range of ages and growth forms as possible.

References Duffield, C.A.W. (1960b), Le Quesne, W.J. (1965c), Ossiannilsson, F. (1981).

PLATYMETOPIUS UNDATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Platymetopius undatus (Degeer)**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** Old records are widely scattered over southern England. There are records from Suffolk, Hertfordshire, Kent, Surrey, Sussex, Berkshire, Wiltshire, Dorset and Devon. It is widespread in Europe, and extends east to Mongolia, Siberia, and the Korean Peninsula.**Habitat and ecology** Recorded in Britain from various trees and from low vegetation, apparently from a variety of habitats. It has perhaps been most frequently reported from woodland margins and clearings. It has been taken from bracken *Pteridium aquilinum*, sallow *Salix* sp., and oak *Quercus* sp. in Britain. Elsewhere in Europe it has been reported from a number of other shrubs and trees, and from rockrose *Helianthemum* sp. In mainland Europe, it overwinters in the egg, and has one generation per year. Adults have been recorded from June to September.**Status** Possibly extinct. There have been no records for some 40 years. Since it is an unmistakable insect which can be captured readily by standard entomological techniques, and its former distribution covers some of the entomologically best-known areas of Britain, it is clear that the species has considerably declined, even if it is still extant in Britain.**Threats** The reasons for the decline of this species are unknown. It would seem to have no unduly restrictive habitat requirements, and the decline occurred prior to the major habitat changes resulting from intensification of agriculture and other changes in the countryside in recent decades. Climatic changes are perhaps the most likely explanation for the loss of the insect, but there is no convincing evidence of this. .**Conservation** No positive conservation measures can be suggested in the absence of a known established population of the insect. Even if a population is discovered, it is not obvious what habitat features are critical to its survival. In the case of discovery of a population, the ecology of the species should be studied and, until more evidence of the requirements of the species are obtained, management should aim to maintain the habitat in roughly the condition at the time of recording of the insect.**References** Butler, E.A. (1889), Duffield, C.A.W. (1960b), Edwards, J. (1896), Le Quesne, W.J. (1969), Morley, C. (1933), Ossiannilsson, F. (1983), Piffard, A. (1890b), Scott, J. (1882).

PSAMMOTETTIX ALBOMARGINATUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Psammotettix albomarginatus Wagner**Identification** Le Quesne (1969); Ossiannilsson (1983).**Distribution** Southern England and Wales. There are records from Norfolk, Suffolk, Isle of Wight, Devon, Glamorgan, Merioneth and Anglesey, and additional unconfirmed records from Oxfordshire and Yorkshire. It has also been recorded from Ireland, and on the European mainland has been recorded from Scandinavia, The Netherlands, Germany and Poland.**Habitat and ecology** *P. albomarginatus* is chiefly recorded from sandy soils on the south coast and in the East Anglian breckland and heaths. There are also some records for chalk grassland inland. Occasional records from other habitats require checking, but it is possible that it also occurs in other well-drained habitats inland. Grey hair-grass *Corynephorus canescens* has been suggested as the foodplant in mainland Europe. This association may hold true in parts of East Anglia, but *C. canescens* is absent from the rest of the insect's range. An

association with *Agrostis*, also suggested by some continental authors, is more likely. Adults have been recorded from late June to September in Britain, and there is an unconfirmed record for October. It has been found from May to October in central Europe, where there are two generations per year and the winter is passed in the egg.

Status Very local, though possibly under-recorded because of superficial similarity to other *Psammotettix* species in the field. East Anglia, which would seem to be one of its strongholds, has not been well recorded in recent years.

Threats The chief threats to inland dry grassland are improvement, destruction by ploughing or for development, and neglect leading to scrub invasion and to dominance by coarse vegetation. The remaining areas of the East Anglian brecks and heaths also face these problems, and additionally large areas have been destroyed by afforestation. Loss of traditional grazing, coupled with the decimation of the rabbit population by myxomatosis, has led to extensive loss of open conditions. Dunes are in general probably less directly and immediately threatened. Destruction by development and erosion by recreational pressures are the most likely threats. Reduction of rabbit grazing because of myxomatosis, and perhaps also loss of traditional stock grazing on dune grasslands, may have reduced the area of suitable vegetation on some sites.

Conservation On dune sites, probably no active conservation measures are needed to maintain suitable conditions. The addition of very light grazing to extensive dune sites may be advantageous. Grazing and disturbance by rabbits is almost certainly beneficial, and rabbit populations should be maintained or encouraged where possible. On inland sites, management should aim to maintain open conditions with varied vegetation structure, including short grasses and some bare ground. Such conditions are best maintained by grazing. Rabbit grazing produces a particularly good small-scale mosaic of structure, and rabbit populations should be maintained or encouraged where possible, for example by the maintenance of areas of scrub used for shelter and burrowing. Stock grazing is likely to produce the best structure if accompanied by some rabbit activity. Where grazing is not possible, rotational cutting may be attempted. Again, the management is more likely to be successful if there is localised rabbit grazing. Periodic localised mechanical disturbance of the substrate may be valuable in maintaining open conditions and may be used either alone or in conjunction with cutting to maintain early successional stages and sparse grassland.

References Le Quesne, W.J. (1960b), Le Quesne, W.J. (1969), Morris, M.G. (1974), Ossiannilsson, F. (1983).

PSAMMOTETTIX FRIGIDUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Psammotettix frigidus (Boheman)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution A northern species, so far recorded in Britain only from Scotland. There are records from Perthshire (Ben Lawers), Morayshire (Lynwilg Wood, Aviemore), Aberdeenshire (Glen Coich; Glen Derry; Morrone), and East Ross (Beinn Dearg). Elsewhere, it is known only from Norway, Finland, Latvia and north Russia.

Habitat and ecology A northern and upland species. Recorded from mountain-sides and hillsides, both on acid substrates and on limestone. It certainly occurs at altitudes in excess of 600m, and most records appear to be from above 300m, though some, with altitude unspecified, could be from below this height. All British records appear to come from open, usually grassy, localities. Records from mainland Europe are from dry meadows, woodland and moraine, and also from bogs. The limited available evidence suggests that it is reasonably catholic in its habitat tastes in Britain as well. The foodplants are not known, but they are likely to be grasses of some sort, in common with other *Psammotettix* species. Adults have been recorded in July and August in Britain, but as late as September in mainland Europe. The life history is otherwise unknown, but it is likely that the species overwinters in the egg, in common with its near relatives.

Status Local, but probably under-recorded. There is a considerable area of apparently suitable habitat in northern Britain which has not yet been surveyed for Auchenorrhyncha. The success of survey in these areas is in any case strongly influenced by the weather, and any species of open country is more likely to be overlooked than

in more southern localities. Additionally, *P. frigidus* closely resembles other members of the genus, and may be overlooked amongst them. It is known to occur in mixed populations with the common *P. nodosus*.

Threats The chief threat to the species is probably afforestation, which may totally destroy suitable habitat over extensive areas. Changes in management such as alterations in grazing pressure and patterns of burning may also influence the species, but too little is known of the effects of such changes and of the habitat preferences and tolerances of the insect to be sure of the extent to which they represent a threat. If the insect occurs at lower altitudes, improvement of grassland and moorland may also be a threat.

Conservation Too little is known of the requirements of the species to enable detailed management prescriptions to be made. Management should aim to maintain open conditions with good growth of grass, ideally with a range of structure from short turf to tussocks and tall swards. Throughout its known range such conditions will have been maintained in the past largely through grazing, and moderate grazing should continue. At very high altitudes, it is unlikely that active management will be needed to maintain suitable conditions for the insect.

References Le Quesne, W.J. (1969), Ossiannilsson, F. (1983), Woodroffe, G.E. (1972b).

PSAMMOTETTIX MARITIMUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CICADELLIDAE

Psammotettix maritimus (Perris)

Identification Ribaut (1952).

Distribution So far recorded in Britain only from Dawlish Warren, Devon. It is a largely southern European species, and is known from the Netherlands, Belgium, Germany, France and Portugal.

Habitat and ecology The single British record is from amongst sparse grassy vegetation with much bare sand at the seaward edge of Dawlish Warren. In mainland Europe, also, it is a species of dunes and other sandy locations by the sea. The foodplants are not certainly known, but an association with marram *Ammophila arenaria* has been suggested.

Status The species was not recorded in Britain until 1980, and is still known from only a single record. It is a fairly distinctive species amongst *Psammotettix*, and it seems unlikely that it is very widely overlooked. As a species likely to be at the edge of its range in southern England, further sandy coastal localities in the south-west are the most likely localities to produce further records. This is not a particularly well-worked area for Auchenorrhyncha, and further recording work in the area will be needed before the status of *P. maritimus* can be fully assessed.

Threats Dawlish Warren is an SSSI and a Local Nature Reserve. It suffers considerable recreational pressure, with consequent erosion of vegetation. There is, however, no reason at present to suppose that this poses an immediate threat. Recreational pressures and development associated with recreation are likely to be the major threats to other coastal sites which may be discovered.

Conservation The habitat from which this species has been recorded in Britain is essentially a natural one, and should require no active conservation measures beyond site protection.

References Payne, K. (1981), Ribaut, H. (1952).

PSAMMOTETTIX STRIATUS**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family CICADELLIDAE

Psammotettix striatus (Linnaeus)**Identification** Le Quesne (1969).**Distribution** Recorded in Britain only from Freckenham, Suffolk. Records are widespread in Europe, but taxonomic confusion means that some may be erroneous. Records for Scandinavia have proved to be erroneous, and the insect may be more strongly southern than once thought.**Habitat and ecology** The only British record is from the East Anglian breckland. In mainland Europe it occurs on grasses in pastures and meadows, and also in neglected fields, at a wide range of altitudes. This wide range of continental habitats and its known distribution in Britain suggests a species at the edge of its range, confined to areas of continental climate with areas of low or sparse vegetation which can warm up rapidly. Little is known of the biology and life history in Britain. It is likely to feed on grasses and probably overwinters in the egg, in common with other members of the genus.**Status** Very rare and local. There is only a single old (pre-1930) record of the species in Britain, but East Anglia is not a particularly well-worked area for the Auchenorrhyncha and, since this is a relatively undistinguished species in appearance, which might be overlooked amongst superficially similar common members of the genus, it may still occur. However, the brecks have not gone entirely unsurveyed, and sufficient work has been done in remaining sites of high quality to indicate that it is a rarity.**Threats** Large areas of the East Anglian breckland have been lost to afforestation in the present century. A considerable area has also been lost to agriculture. The remaining areas have suffered first from loss of sheep grazing and subsequently, and most seriously, from the decimation of the formerly large rabbit population by myxomatosis. As a result, a large proportion of the remaining breckland is becoming dominated by tall coarse vegetation and is suffering from invasion by scrub, and by pines from adjoining forestry plantations.**Conservation** A number of the better areas of the remaining breckland are now under protection as National Nature Reserves or reserves of the Norfolk Wildlife Trust. Much larger areas receive statutory protection as SSSIs. Grazing continues in parts of the Norfolk breckland under the control of the M.o.D. and on some reserves. Management should aim to maintain open conditions with low grassy vegetation, with some bare ground. Grazing is the best way to achieve this, and it is best if at least part of this grazing is done by rabbits, which produce a good fine-grained mosaic of short and long vegetation with areas of disturbance. Cutting does not provide a wholly adequate substitute, but is better than nothing if grazing proves impossible. It will be more successful in maintaining suitable conditions if combined with periodic mechanical substrate disturbance, to maintain open conditions and bare ground. Both cutting and disturbance should be undertaken on only a fraction of a site in any one year.**References** China, W.E. (1939c), Le Quesne, W.J. (1969).

SAGATUS PUNCTIFRONS**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family CICADELLIDAE

Sagatus punctifrons (Fallen)**Identification** Le Quesne & Payne (1981); Ossiannilsson (1981).**Distribution** Recorded in Britain only from Surrey (Woking) and from Somerset (Stoke St Gregory). It is widely distributed in Europe, particularly in northern and central regions, and extends east to the Altai mountains and Siberia. It also occurs in the Nearctic.

Habitat and ecology The foodplants are willows *Salix* spp. The Somerset record is from the edge of West Sedgemoor in the Somerset Levels. The Surrey record is from 'dwarf willows', probably creeping willow *Salix repens*. The most likely habitat for this record is wet heathland, but there is no written evidence for this. It has also been found on *Salix repens* on sandy soils elsewhere in Europe, but is also recorded from a number of other willow species (*S. triandra*, *S. fragilis*, *S. incana*, *S. purpurea*). There seems no good reason why *S. punctifrons* should not occur in other habitats in Britain: dune slacks supporting *S. repens* are perhaps the likeliest. Adults have been recorded in July in Britain, and from July to September in mainland Europe. The life history is otherwise unknown, but it is likely that all stages are spent on the host-plant, with eggs inserted into the plant tissues and overwintering.

Status Certainly very rare and local. There are no recent records. It is a small species which could be under-recorded, but it lives on plants which are relatively easy to sample and which support a good fauna, and which are therefore far from neglected by entomologists. It is therefore unlikely to be widely overlooked. The Somerset Levels and other areas in the south west are relatively under-recorded, and are perhaps the most likely areas for further investigation.

Threats Uncertain. The exact nature of the habitats in which it has been recorded in Britain are not known, so threats are difficult to identify. The Surrey heaths have undergone very great changes since the record there was made, and wet heathland and bog supporting *Salix repens* has declined through destruction for development, through falling water tables resulting from increased drainage and water abstraction in surrounding land, and through neglect of previously grazed sites leading to scrub invasion. Extensive areas of the Somerset levels have been improved, ploughed, or dug for peat. The exact impact of these changes on *S. punctifrons* are difficult to estimate, but they are likely to have been deleterious.

Conservation In the absence of a known population of the insect, and in the absence of more detailed information as to the habitat requirements of the species in this country, detailed management prescriptions are impossible. Further investigation of suitable sites in the west of Britain is needed. It seems likely that low growth of willows in fairly open situations is what is needed, and management of sites known or thought to contain the species should aim to maintain such features.

References Edwards, J. (1891), Edwards, J. (1896), Le Quesne, W.J. (1969), Ossiannilsson, F. (1983).

SCLERORACUS DECUMANUS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Scleroracus decumanus (Kontkanen)

Identification Le Quesne (1969); Ossiannilsson (1983).

Distribution Apparently widely distributed in Britain. There are scattered records from a wide area of southern England and Wales and an isolated record from the Isle of Arran, Scotland. Southern counties from which it has been recorded are Yorkshire, Huntingdonshire, Suffolk, Berkshire, Buckinghamshire, Hampshire, Dorset, Carmarthen and Anglesey. It is widely distributed in northern and central Europe, and extends east to Mongolia and Kamchatka.

Habitat and ecology Dry grassy heathland and acid grassland would seem to be the preferred habitats in Britain. It has been found on coastal dunes in Wales; in the East Anglian breckland on sites supporting grassy heath; at Risby Warren, Lincolnshire, on dry grassy breck-like habitat with scattered heather. At Holme Fen, Huntingdonshire, it has been found commonly amongst regenerating vegetation on dry peat after clearance of dense birch woodland. Other sites support dry heath on sand, or chalk heath. Some localities, for which no habitat details are currently available, are in chalk or limestone areas. It is not clear whether in these localities the insect occurred on chalk heath or on chalk grassland. In mainland Europe it has been found in dry meadows and in open pine woodland. It has been frequently found in association with heather *Calluna vulgaris*, but this may be a spurious correlation. Elsewhere in Europe it has been found amongst bilberry *Vaccinium myrtillus*, a plant with which there seems to be no particular association in Britain. At the Holme Fen site, the only common plants were sheep's sorrel *Rumex acetosella*, rosebay willowherb *Epilobium angustifolium* and creeping

soft grass *Holcus mollis*. The latter would seem the most likely host in this case. Adults have been recorded from June to September. The life history is otherwise unknown, but related species in general overwinter in the egg.

Status Apparently very local. The wide but scattered distribution suggests that the insect may be under-recorded in at least some areas. It seems likely, for example, that records will ultimately be forthcoming for the west country and for further areas of Wales.

Threats The species gives the impression of forming colonies of rather limited extent. This may be an erroneous impression, but if true means that the species could be particularly vulnerable to local extinction resulting from habitat change over limited areas. Chalk heath is now an extremely rare habitat in Britain, most having been lost to improvement and ploughing. Dry heathland and acid grassland have likewise been greatly reduced in area by agricultural intensification and by afforestation. Remaining areas have tended to suffer from loss of grazing in recent decades, first as a result of removal of grazing stock, and secondly because of the decimation of rabbit populations by myxomatosis. These changes have led to scrub invasion and to dominance by coarse vegetation. Southern heathlands in particular have been greatly reduced by development, and have also suffered increasingly from uncontrolled summer fires. Western dune systems have been less heavily under threat than other recorded habitats, but caravan and camping sites and other recreational developments have eaten into a number of areas, and increased recreational pressures have led to erosion of vegetation in some areas.

Conservation Management on all habitat types from which the species has been recorded should aim to maintain open vegetation with varied structure, from low or sparse vegetation with at least some bare ground to taller and denser swards. On sand dunes such structure may continue without management, though light to moderate grazing, either by rabbits or by grazing stock, could enhance structure. Invasion by scrub should be kept under strict control, though limited areas may do no harm. On grassland and heathland sites, structure is best maintained by grazing. Rabbits are particularly good at producing good vegetation structure, by providing a small-scale mosaic of disturbed ground, low grazed turf, and taller vegetation. Rabbit grazing should be maintained or encouraged wherever possible, for example by maintaining areas of scrub used for sheltering or burrowing. In most cases, it is unlikely that rabbit grazing alone will produce suitable structure, and grazing by stock should be maintained or introduced. If grazing is impossible, management by cutting is better than neglect. Only part of a site should be cut in any given year, and cuttings should be removed. On dry heathland, the use of a vertical flail for cutting will provide substrate disturbance as well, and assist in maintaining open conditions. Burning is the least desirable management option, but may be needed on heathland if no other option is available. Burning should be practised on a rotational basis, with only a fraction of the site being burnt in any one year.

References Le Quesne. W.J. (1969), Ossiannilsson, F. (1983).

STROGGYLOCEPHALUS LIVENS

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Stroggylocephalus livens (Zetterstedt)

Identification Le Quesne (1965); Ossiannilsson (1981).

Distribution *S. livens* has a wide but scattered distribution through much of Britain. There are records from Perthshire, Kirkcudbrightshire, Westmorland, Northumberland, Radnor, Carmarthen, Glamorgan, Cambridgeshire, Norfolk, Suffolk, Hampshire, Cardiganshire, Montgomeryshire, Merionethshire, Denbighshire and Caernarvonshire.

Habitat and ecology A wetland species, recorded both from fens and from bogs and acid mires. It is typically found in very wet areas, though Edwards (1896) refers to its capture in 'damp grassy places'. All stages probably stay close to the ground for much of the time, and the species may therefore be easily overlooked. The foodplants are unknown. Adults have been recorded from March to October. It is known to overwinter as an adult in mainland Europe, and has been found in moss in the winter.

Status Very local. The largely ground-dwelling habits of the species combined with the wet conditions in which it occurs probably result in it being overlooked. However, it has not so far turned up widely even in surveys of wetland sites making widespread use of pitfall traps, which catch the related *S. agrestis* in numbers. It would seem from present records to be largely confined to wetland areas of high conservation status and long standing.

Threats In the north of its range, the main threat is probably afforestation. Afforestation may also threaten some sites in the south, particularly those on wet heathland. Drainage for agricultural purposes and for development threatens many wetland sites in the south. The lowering of water tables, particularly on smaller and more isolated sites, as a result of increased drainage and water abstraction in surrounding farmland, is a serious problem in some areas, particularly in the south-east. Eutrophication and pollution of incoming water, particularly as a result of runoff from farmland and sewage input to rivers, is a major problem in some areas. The East Anglian fens and broads suffer greatly from eutrophication, and the broads have been very seriously affected. Neglect of previously managed wetland sites may lead to scrub invasion and to dominance by coarse vegetation.

Conservation Water tables should be kept high. The water supply to wetland sites should be isolated as far as possible from sources of enrichment and pollution: if the use of enriched water is inevitable, it should, if possible, be filtered through vegetation which will extract nutrients, such as a bed of reed *Phragmites australis*. Management of the wetland should aim to maintain open conditions with varied vegetation structure and with good growth of a range of wetland species. Such conditions may be maintained either by light grazing or by cutting. Grazing is probably the best management on most sites, but cutting is likely to have been the traditional management on many fenland sites in eastern England.

References Coulson, J.C. & Butterfield, J.E.L. (1979), Edwards, J. (1889), Edwards, J. (1896), Eyre, M.D. & Forrester, G. (1984), Le Quesne, W.J. (1965c), Morley, C. (1933), Nelson, M. (1986), Norman, G. (1880), Ossiannilsson, F. (1981).

ULOPA TRIVIA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Ulopa trivialis Germar

Identification Le Quesne (1965).

Distribution Southern England. There are records from Cambridgeshire, Bedfordshire, Oxfordshire, Essex, Kent, Sussex, Surrey, Isle of Wight, Dorset, Wiltshire, Somerset, Devon, and Cornwall. It is widely distributed in central and southern Europe.

Habitat and ecology This is primarily a species of chalk and limestone grassland, but is also found regularly on calcareous dunes. It occurs also on the vegetated shingle at Dungeness, Kent, and there is an isolated record away from the chalk in Essex. The foodplants are uncertain. Viper's bugloss *Echium vulgare* and lady's bedstraw *Galium verum* have been suggested. Nymphs have been found under or at the roots of ribwort plantain *Plantago lanceolata*. Adults have been found in numbers in apparently close association with borseshoe vetch *Hippocrepis comosa*. At Dungeness, adults have been taken in numbers in pitfalls in an area where the only recorded higher plants were sheep's sorrel *Rumex acetosella* and sweet vernal grass *Anthoxanthum odoratum*. It seems to be tolerant of a wide range of vegetation structure, and has been recorded both from very short or sparse turf and from tall grassland. It is not normally found in very rank or overgrown sites, however. Most recorded sites are on south-facing slopes, but it has been recorded from almost level ground and from slopes of other aspect. All stages are largely ground-dwelling. Adults are normally short-winged and flightless, but very rarely fully-winged individuals occur. Adults have been recorded from early July to November. Nymphs have been found in May, July and August. There is probably one generation per year, females overwintering and laying eggs in the spring.

Status Local, but apparently well-established in some areas in the south and a rather characteristic species of southern downland.

Threats Improvement and ploughing of calcareous grassland; loss of grazing on calcareous grassland, by removal of grazing stock and as a result of the decimation of rabbit populations by myxomatosis, leading to

dominance by tall coarse vegetation and to scrub invasion. Coastal populations may be threatened locally by development, particularly that associated with recreational activities such as camping and caravan sites, and by erosion caused by increased public pressure. The shingle at Dungeness has been damaged in the past by gravel extraction and by the construction of the power station, and further construction and extraction are threatened in the future.

Conservation Management of calcareous grassland should aim to maintain a varied vegetation structure, with some areas of short or sparse turf. Such structure is best maintained by grazing, and grazing stock should be maintained or introduced whenever possible. Rabbits are particularly good at producing a small-scale mosaic of disturbed ground, short turf and longer vegetation. Rabbits alone are unlikely to be able to maintain suitable conditions on the majority of sites, but rabbit populations should be encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter or burrowing. Rotational grazing may be suitable for the species, but it would seem likely to be a rather poor coloniser. It is preferable to maintain suitable conditions permanently in one area. Where grazing is not possible, rotational cutting may be a successful alternative. Coastal sites may require no active management in order to maintain them in suitable condition for the species. Grazing is probably beneficial in maintaining reasonable areas of open habitat with short vegetation.

References Butler, E.A. (1907b), Dale, C.W. (1886), Douglas, J.W. (1875c), Duffield, C.A.W. (1926a), Duffield, C.A.W. (1960b), Edwards, J. (1896), Hutchinson, G.E. (1921b), Jones-Walters, L. (1988), Le Quesne, Dr W.J. (1965c), Morris, M.G. (1971), Scott, J. (1871b).

ZYGINA RUBROVITTATA

NOTABLE

Order HEMIPTERA

Family CICADELLIDAE

Zygina rubrovittata (Lethierry)

Identification Le Quesne & Payne (1981); Ossiannilsson (1981).

Distribution South-eastern England. There are records from Middlesex, Berkshire, Surrey, Hampshire and Dorset. The bulk of records are from the Surrey heaths and the New Forest area. It is a widely distributed European species.

Habitat and ecology The foodplant is heather *Calluna vulgaris*. The usual habitat is dry heath, but it has been found on cultivated heather in London. Adults have been recorded from July to September. It probably overwinters in the egg, in common with related species.

Status Very local, but probably somewhat under-recorded. It is a very small and easily overlooked species. However, its known distribution is so strongly concentrated on the heaths of Surrey and the Hampshire basin that it seems quite probable that it is a species of genuinely restricted distribution.

Threats Destruction of heathland for farming purposes, for afforestation, or for development. Development is particularly a problem in the remaining heaths of the Poole basin. Neglect of previously managed or grazed heathland, especially since the decimation of the rabbit populations of such sites by myxomatosis, has led to widespread scrub invasion, particularly by birch, and by pine from adjoining forestry plantations, which further diminishes the area of open heath left on remaining sites. Uncontrolled summer fires are also threatening, and are increasingly likely as the amount of old woody vegetation increases on neglected heath.

Conservation Management of southern heathlands should aim to maintain a full range of ages of heather, and to keep the extent of scrub invasion down to a reasonable level, so that extensive areas of open heath remain. Grazing is the preferred method of achieving this, and grazing stock should be introduced or maintained wherever possible. Rabbits are particularly good at maintaining a small-scale mosaic of disturbed ground, close-grazed plants, and taller vegetation. Rabbit populations should be encouraged wherever possible, but only exceptionally will they be able to keep a site in good condition without active management help. Where grazing is not possible, cutting may be employed. The use of a vertical flail ensures substrate disturbance and thereby helps to maintain open conditions and regeneration. Cut material should be removed from site. Only a fraction of a site should be cut in any one year. Burning is, in general, the least desirable management option for

heathland areas, but for *Z. rubrovittata* it is likely to be entirely suitable, provided that a rotational management regime is adopted and only a fraction of a site is burned in any one year. The insect is a very mobile one which readily takes to the wing, and it should have no difficulty in colonising areas of regrowth in other parts of a site.

References Anon, (1986), Le Quesne, W.J. & Payne, K.R. (1981), Ossiannilsson, F. (1981), Stubbs, A.E. (1967).

CIXIUS CALEDONICUS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family CIXIIDAE

Cixius caledonicus

Identification Le Quesne (1960).

Distribution There are only two British records, both from Midlothian: Heriot Water (1937); Edinburgh (before 1960). The species has not so far been recorded outside Britain.

Habitat and ecology Effectively unknown. The only note of ecology is that a specimen was found under a stone set in grass by Heriot Water. Though a northern species, there is no evidence of it being associated with high altitudes or with characteristically northern habitat types. Heriot Water is at an altitude of approximately 240-300 metres, and the Edinburgh record is likely to be from an altitude of 200 metres or less. The nymphs, in common with those of other *Cixius* spp., are likely to be subterranean, living in wax-lined cells and feeding on plant roots. Adults have been recorded in July and August.

Status Uncertain, but apparently extremely local and rare; possibly endemic. It is impossible to estimate the likely extent of under-recording until more is known of the ecology of the species.

Threats None known.

Conservation The ecological requirements of the species are completely unknown, and there are no certainly known viable colonies. Conservation and management requirements are therefore completely unknown. If the species is discovered at its old sites or elsewhere, the ecology should be carefully studied.

References China, W.E. (1942), Le Quesne, W.J. (1960c), Nast, J. (1972).

CIXIUS CAMBRICUS

NOTABLE

Order HEMIPTERA

Family CIXIIDAE

Cixius cambricus China

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution A northern and western species, with records from the Sutherland, Inner Hebrides (Rhum), Wester Ross, Morayshire, Aberdeenshire, Yorkshire, Caernarvonshire and Brecknockshire. It is widely distributed in Europe, from Finland in the north to Italy in the south, and extends east to the Ukraine and South Russia.

Habitat and ecology Most records are from quite high altitudes, but it is also found at lower altitudes in upland areas. From present records, it does seem that occurrence at lower altitudes is strongly linked to latitude. It has been taken at 2000 feet in the Hebrides, but at low altitudes in Yorkshire and on Bardsey Island. It has been taken from both acid and calcareous grassland. Adults seem usually to be found on low vegetation in more or less exposed situations. Adults have also been found under stones, and may be largely ground-dwelling and therefore easily missed. Nymphs have been found at 2000 feet on Rhum, on wet sandy terraces. They occurred in colonies beneath stones, living in small wax-lined cells around the roots of sedges, on which they were feeding. Adults have been found between June and August. In mainland Europe the nymphs hibernate.

Status Local, but probably under-recorded. The rather secretive nature of the adults may make the species quite difficult to record, and there are many apparently suitable upland areas which have not yet been searched.

Threats At lower altitudes particularly, drainage and improvement of grassland may be damaging. Afforestation may be the major threat in large parts of the uplands. Erosion resulting from heavy public use of sites may be a problem locally, particularly near hill summits. The effects of overgrazing and neglect are not clear. Overgrazing, and the production of a short sward, may be damaging, but since the nymphs are subterranean root-feeders, and the adults more or less ground-dwelling, this may not be a serious threat. Neglect of previously managed sites and consequent scrub invasion is likely to be damaging, since all records of the insect are from open sites with low herbage, but the exact tolerances of the species are not known.

Conservation At high altitudes and latitudes, and in otherwise very exposed sites, the habitats of the insect are perfectly stable without management, and need no conservation measures other than site protection. At lower altitudes and further south, the normal management on most sites is likely to be grazing, and this should be continued. The limits of tolerance of the insect are not known, but it is probably best if management is aimed at maintaining a fairly varied structure, with both short and relatively tall areas of sward.

References China, W.E. (1939b), Crossley, R. (1981), Ely, W.A. (1988), Horsfield, D. (1980), Le Quesne, W.J. (1960c), Nast, J. (1972), Ossiannilsson, F. (1978), Rees, J. (1983), Steel, W.O. & Woodroffe, G.E. (1969), Woodroffe, G.E. (1961b), Woodroffe, G.E. (1972b).

CIXIUS REMOTUS

NOTABLE

Order HEMIPTERA

Family CIXIIDAE

Cixius remotus Edwards

Identification Le Quesne (1960).

Distribution Southern coasts of Britain. There are records from Suffolk, Essex, Kent, Hampshire, Dorset, West Cornwall and Monmouthshire. There are also unconfirmed records from Yorkshire and Northumberland. It has also been recorded from Belgium, France, Yugoslavia and Bulgaria.

Habitat and ecology All confirmed records are from coastal sites. Most appear to be from coastal shingle or cliffs, though *C. remotus* has also been taken on coastal dunes, and the exact habitat for many records is not recorded. It is well-established at Dungeness, Kent, and recent survey using pitfall traps has shown the species to be sufficiently widespread to leave little doubt that it is breeding on the vegetated shingle. The known cliff sites are predominantly soft-rock cliffs in the south-west, which provide an abundance of bare and partly vegetated ground, loose scree and rubble. In common with other members of the genus, the nymphs are probably subterranean, feeding on roots. The host plants are unknown. Adults may be found on the ground, on low vegetation, and on bushes. Adults have been found from early June to October, but the life history is otherwise unknown.

Status Local.

Threats Coastal developments; gravel digging; excessive disturbance of vegetated shingle leading to erosion of vegetation cover; stabilisation of soft-rock cliffs for coastal protection.

Conservation The known habitats of the species need no conservation measures beyond site protection. No active management will usually be needed to keep them in suitable condition, so far as is known.

References Duffield, C.A.W. (1960b), Edwards, J. (1896), Eyre, M.D. & Forrester, G. (1984), Le Quesne, W.J. (1960c), Nast, J. (1972), Sheppard, D.A. & Eyre, M.D. (1983).

OLIARUS PANZERI**NOTABLE**

Order HEMIPTERA

Family CIXIIDAE

Oliarus panzeri Low**Identification** Le Quesne (1960).**Distribution** South-eastern England. There are records from Oxfordshire, Berkshire, Essex, Kent, Sussex, Hampshire and the Isle of Wight. It is widely distributed in central and southern Europe, and also occurs in north Africa.**Habitat and ecology** The ecology of this species is somewhat obscure. It has been found on a number of occasions in areas which are periodically waterlogged, but which dry out and crack in the summer. Duffield (1960) records that it was present in one such field in Kent until an unspecified change caused the cracks to cease to form, whereupon the insect vanished from the site. He was of the opinion that the cracks gave the insect the opportunity for ovipositing below ground level. This may be the case: the nymphs, like those of other Cixiids, are believed to be root feeders. Adults can be found both on low vegetation and on bushes, and have been taken from May to August. The foodplants are unknown, but a colony has been found in a semi-improved pasture where little else grew but a small number of grass species, dominated by perennial rye *Lolium perenne*.**Status** Very local.**Threats** Improvement of grassland is likely to destroy colonies of the bug, but it has been recorded in semi-improved grassland, so can either survive such treatment or re-colonise. Improved drainage of seasonally or irregularly flooded grassland may be a more serious threat in at least some areas. Destruction of grassland for development, or conversion to arable, are also threatening. Development pressures are very great in Kent, from where almost half the British records originate.**Conservation** *O. panzeri* would seem to be dependant on minor habitat features, and its retention at a site is will require the maintenance of such features through any management programme. The optimal sites for the insect are probably poorly drained corners of pastures close to the hedges utilised by the adult insects, and perhaps also reasonably near to paths or gates where there is some poaching. Any such areas which dry and crack in summer should be regarded as potentially interesting habitat features, though they may appear rather uninspiring from the viewpoint of general conservation. The exact management of the grassland is probably relatively unimportant, since the nymph is subterranean and the adult fairly mobile. Very heavy grazing and poaching is to be avoided, but otherwise stocking levels can probably be fairly flexible. There seems no reason why cutting should not be an acceptable alternative management.**References** Butler, E.A. (1907b), Butler, E.A. (1909a), Duffield, C.A.W. (1960b), Edwards, J. (1896), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1974), Saunders, E. (1888a), Stewart, A.J.A. (1988), Turner, H.J. (1900).

OLIARUS LEPORINUS**NOTABLE**

Order HEMIPTERA

Family CIXIIDAE

*Oliarus leporinus***Identification** Le Quesne (1960); Ossiannilsson (1978).**Distribution** Chiefly the southern coasts of England and Wales. There are records from Suffolk, Essex, Hampshire and the Isle of Wight, Dorset, Devon, Somerset, Gloucestershire, Monmouthshire, Pembrokeshire and Carmarthenshire.

Habitat and ecology This is usually a saltmarsh species in Britain, found in grassy areas in the upper marsh. It can extend some distance along estuaries, and Curtis recorded it from coarse grasses at the side of the Avon at Clifton, Bristol (Edwards 1896). It has been recorded on a number of occasions from bogs in the New Forest. It is apparently not particularly associated with saltmarshes elsewhere in Europe, where it occurs in a range of wetland habitats, and has also been found in dry areas. The single Irish record is an inland one, from an area of coarse grass and sweet gale *Myrica gale* on high ground. The foodplants are not known, though it has been found in association with reed *Phragmites australis* and other wetland grasses. The nymphs are probably root-feeders, in common with other Cixiidae. Adults have been found from May to August. They may be common when found, but tend to be very local. A colony may be confined to a hundred metres or so of saltmarsh, when apparently similar habitat stretches for a considerable distance in each direction.

Status Very local, but perhaps under-recorded in the south-west. The rather localised distribution within areas of apparently suitable habitat may exacerbate the effects of low recorder pressure in some parts of its range.

Threats Reclamation of saltmarshes; destruction of the upper levels of saltmarshes by the construction or renovation of coastal defences; development, particularly along major estuaries and near ports and coastal resorts; in some areas perhaps also tidal barrage schemes. The Essex saltmarshes are undergoing rapid erosion at present, to the extent that it has been estimated that the entire area may be lost within 50 years. The reasons for this erosion are not fully understood. Heavy grazing of saltmarshes is deleterious, and the introduction of grazing to any previously ungrazed should be regarded as threatening.

Conservation Research is in progress to determine the causes of saltmarsh erosion in Essex, and to investigate ways of preventing it. New sea banks should be constructed as far inland as feasible, leaving the maximum possible range of saltmarsh communities. Material for construction or renovation of such banks should be excavated from areas of low conservation interest to the landward side of the bank wherever feasible. Saltmarsh communities need no active management in order to maintain suitable conditions for the insect. Light grazing may do no harm, and should not be stopped if there has been a long history of grazing at a site. Grazing should not be introduced onto any previously ungrazed marsh.

References Butler, E.A. (1907a), Butler, E.A. (1909a), Dale, C.W. (1886), Edwards, J. (1896), Giddens, C., Bristow, H. & Allen, N. (1988), Harmsworth, G.C. & Long, S.P. (1986), Le Quesne, W.J. (1960c), Little, C., Payne, R.M., Aaldhous, P. & Scott, P. (1988), Marshall, T.A. (1866c), Morley, C. (1919), Ossiannilsson, F. (1978), Stewart, A.J.A. (1988), Turner, H.J. (1904), Walker, J.J. (1917).

TRIGONOCRANUS EMMEAE

NOTABLE

Order HEMIPTERA

Family CIXIIDAE

Trigonocranus emmeae

Identification Le Quesne (1964).

Distribution There are only six widely scattered British records: Gait Barrows, Lancashire; Burdale Quarry, Yorkshire; Leatherhead, Surrey; Brook, Dungeness and Woolwich Common, Kent. Records from elsewhere in Europe are also scattered and sparse. It is known from Czechoslovakia, France, Switzerland and Austria.

Habitat and ecology This is a very poorly known species. The British records are predominantly from chalk or limestone areas. The insect has been found under rocks on occasion. It would seem to be a very secretive species, probably largely ground-dwelling or partly subterranean, and perhaps crepuscular or nocturnal in habits. It seems generally to be found as single individuals. The foodplants and life history are unknown. The nymphs of Cixiids in general are subterranean, feeding on plant roots. Adults have been taken from June to August.

Status Uncertain, though apparently very local. The present distribution makes little obvious sense, and probably correlates better with the better-worked areas of Britain for Auchenorrhyncha than with the true distribution of the insect. The records are so scattered both in space and time (1925-1981) that it seems certain that there must be considerable under-recording.

Threats Uncertain. The ecology of the species is too little known to make any estimate of its habitat preferences and tolerance possible, much less to reliably identify likely threats.

Conservation Gait Barrows is a National Nature Reserve. *T. emmae* would seem to prefer low open vegetation, and bare ground and exposed rocks are often present. Management should aim to maintain such conditions. On most sites, grazing is probably the best management to achieve suitable structure. Cutting may provide at least a partial substitute where grazing is impossible, but it is far from certain whether cutting alone can maintain suitable conditions. On some sites, particularly those of artificial origin, periodic localised substrate disturbance may be valuable in maintaining open conditions and early successional stages.

References Allen, A.A. (1982), Le Quesne, W.J. (1964), Le Quesne, W.J. (1985), Payne, K. (1979b).

ASIRACA CLAVICORNIS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Asiraca clavicornis (Fabricius)

Identification Le Quesne (1960).

Distribution Historically recorded from a wide area of southern England, south of a line from the Wash to the Bristol Channel. There are records from Norfolk, Suffolk, Cambridgeshire, Essex, Kent, Surrey, Hampshire (Isle of Wight), Dorset and Devon. Particular concentrations of records come from Norfolk and Suffolk, from Kent and from Surrey. Recent records, however, are confined to the area of the Thames Estuary, largely from the London area. Abroad, the distribution extends over much of central and southern Europe to central Asia and North Africa.

Habitat and ecology *A. clavicornis* is usually found low down amongst grasses. It can occur both in areas of rather sparse vegetation and in dense tussocks, but always in open, dry and sunny situations. The distribution of the records reflects this, and includes coastal sites on sand, chalk grassland, and the East Anglian brecklands. However, it is a ready coloniser, and a large proportion of the recent records come from ruderal habitats, particularly from amongst tussocky grass in areas partly bare of vegetation. Adults overwinter, and have been found in grass tussocks in December.

Status Local, but well-established in its recent sites in the London area. The records suggest that it has undergone a considerable reduction in range in recent years, but this may in part result from the lack of recording in some areas.

Threats The loss of the species from many of its old sites, if true, may reflect recent changes in vegetation. Brecks, beaths and calcareous grassland have all suffered from lack of management, particularly lack of grazing, in recent decades, and this has been exacerbated by reduction of rabbit populations through myxomatosis. *Asiraca* is on the edge of its range in Britain, and such changes in vegetation structure may be sufficient to wipe out populations in marginal areas. The greatest threat to remaining grassland populations, other than the straightforward destruction of habitats through improvement, ploughing or development, is probably lack of management (and of rabbit grazing) leading to dominance by coarse vegetation or scrub. Overgrazing is also a potential threat, however, since the species seems to prefer tussocky vegetation. On ruderal sites, the main threat is probably loss of sites to development: this is particularly the case in wasteland sites in the London area. Natural succession poses a further threat, since *Asiraca* is unlikely to survive extensive scrub invasion.

Conservation Any grassland sites for the species should be managed to give a mosaic of vegetation heights, preferably with some bare ground and with tussocks. Light grazing is the optimal way to achieve this, preferably concentrated in the winter months. Rabbit grazing may provide a particularly good structure, and rabbit populations should be encouraged where possible. Though light grazing of stock over the whole of a site is preferable, rotational grazing may prove suitable for this species. A rotational regime of cutting or mowing might provide a satisfactory substitute if grazing is impossible. On sites of artificial origin management should aim to maintain as wide as possible a range of successional stages, including bare ground and grass tussocks. Public access and light recreational use may assist in maintaining such conditions. Periodic scrub clearance may be

needed, and occasional mechanical substrate disturbance may be beneficial or necessary to maintain early successional stages.

References Allen, A.A. (1979), Clemons, L. (1982), Edelsten, H.M. (1940), Edwards, J. (1884), Edwards, J. (1889), Edwards, J. (1896), Edwards, J. (1914), Ellis, H. Willoughby (1903), Felton, J.C. (1968), Giddens, C., Bristow, H. & Allen, N. (1988), Le Quesne, W.J. (1960c), Marshall, T.A. (1865), Morley, C. (1905), Morley, C. (1909), Nast, J. (1972), Stewart, A.J.A. (1988).

CALLIGYPONA REYI

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family DELPHACIDAE

Calligypona reyi (Fieber)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution There are only four confirmed British records: Weybourne, Norfolk (1887); Seaford, Sussex; Arne, Dorset (pre-1960); Bembridge, Isle of Wight (1971, 1973). There is also an unconfirmed record from Wychwood Forest, Oxfordshire. It is recorded from Ireland, and is widespread in mainland Europe, from Finland in the north to Greece in the south, extending east to Turkestan.

Habitat and ecology In Britain, this insect has been taken amongst rushes *Juncus* in coastal marshes. In mainland Europe, it has also been found on *Juncus*, common club-rush *Scirpus lacustris* and grey club-rush *Scirpus tabernaemontani* at the margins of rivers and lakes. There seems no obvious reason why the species should not also occur in similar circumstances in Britain. There is a single unconfirmed British inland record, from a malaise trap in woodland, which seems an unlikely habitat. In Britain, adults have been taken in August, but the season is probably much longer: in mainland Europe, adults have been found from May to September, and last instar nymphs in May. It is thought to hibernate as a nymph.

Status Very local and rare. It seems that it may generally occur at low density where found. Edwards recorded it "in moderate numbers" at Weybourne in 1887, but was unable to find it again at the site in subsequent years.

Threats There are currently plans for the construction of a marina and for residential and other development in the Bembridge Harbour area, which would be likely to have a direct or indirect effect on *C. reyi*. More general threats to its habitat include coastal development and reclamation; pollution, particularly in estuaries and near major coastal towns; damage to the upper levels of saltmarshes by the construction or renovation of sea defences.

Conservation The known habitats for *C. reyi* are in general likely to need little active management provided site safeguard is ensured. If the species occurs in marshy grassland behind sea walls, light grazing is the ideal management, but care must be taken to avoid overgrazing; some tall and fairly dense clumps of rushes are probably needed.

References Edwards, J. (1889), Edwards, J. (1896), Gillham, M.C. (1987), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1975), Nast, J. (1972), Ossiannilsson, F. (1978).

CHLORIONA DORSATA

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Chloriona dorsata Edwards

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution Widely distributed in southern Britain north to Yorkshire, particularly in coastal counties. There are records from Yorkshire, Lancashire, Lincolnshire, Warwickshire, Huntingdonshire, Bedfordshire, Cambridgeshire, Norfolk, Suffolk, Essex, Sussex, Hampshire, Dorset, Gloucestershire, Glamorgan, Radnor,

Carmarthen and Denbighshire. In mainland Europe, it has been recorded from Sweden, Denmark, Holland, France, Poland, Latvia and Lithuania.

Habitat and ecology The foodplant is common reed *Phragmites australis*. *C. dorsata* has been recorded from reed-beds in a wide range of situations, including coastal and estuarine sites, fens, and freshwater pool margins. There are records from three gravel pit complexes in Cambridgeshire and Huntingdonshire. Most, but not all, records are from sites with quite large reed-beds. Adults are found in June and July. Other members of the genus which have been studied, and which have similar adult phenology, overwinter as part-grown nymphs. All stages feed on reeds, so far as is known. There may be a preference for relatively short and sparsely growing reeds at the edge of larger beds and on invading reed fronts. Adults and large nymphs can be found quite high on the stems, but small nymphs of the genus are generally more difficult to find, and may feed lower down.

Status Very local. The wide distribution, and the presence of the species in both inland and coastal reed-beds, make it likely that more localities remain to be discovered. It may be missed in mixed populations with commoner species of the genus, which it superficially resembles. It would seem to be well-established around the Humber estuary, and other estuaries supporting suitable habitats may also prove to have widespread populations.

Threats Coastal and estuarine sites may be threatened by development and reclamation, by construction and renovation of sea defences, and by infilling of brackish habitats supporting reed-beds behind sea walls or other defences. Inland sites may be threatened by drainage and improvement, by falling water tables on wetland sites resulting from water abstraction and drainage schemes in the surrounding area, by the infilling of disused mineral workings, and by the use of such flooded workings for recreational purposes, with resultant damage to marginal vegetation by boat wash or other causes. The effects of management are not clear, but it is noticeable that most records are from unmanaged reed-beds. It is possible that prolonged management by cutting or burning may be damaging, but more survey work is needed on managed reed-beds to clarify this.

Conservation Coastal sites in general will probably require little or no active management, and site safeguard is likely to be all that is required. On inland sites which have traditionally been managed by cutting and/or burning, such management may be continued or reinstated. It should be noted, however, that the effects of cutting, and of burning, on this species are not known. The majority of records appear to be from sites which have had little or no recent management. Cutting or burning should be undertaken on as long a rotation as is compatible with the maintenance of open *Phragmites* beds, and only a fraction of the available habitat should be cut or burnt in any one year. Where there is heavy scrub invasion in a neglected reed bed some scrub clearance may be necessary. If in a reed-bed on a water margin such scrub invasion may indicate falling water levels, or natural succession which may be difficult to control, and it may be more practical to adjust the water levels, or to allow the upper levels of the reed-bed to go over to carr and to rely on natural extension and development of the reed-bed for habitat continuity.

References Butler, E.A. (1910a), Flint, J.H. (1968), Flint, J.H. (1977a), Foster, S. (1986), Le Quesne, W.J. (1960c), Morris, M.G. (1973a), Morris, M.G. (1975c), Nast, J. (1972), Ossiannilsson, F. (1978).

CHLORIONA VASCONICA

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Chloriona vasconica Ribaut

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution There are records from Yorkshire (Thorne Moors; Cusworth Hall; Shirley Pool), Warwickshire (Herald Way Marsh), Huntingdonshire (Woodwalton Fen; Fenstanton); Norfolk (Thornham; Brancaster; Reedham), Suffolk (Walberswick), Sussex (Birdham); Isle of Wight (Bembridge), and Buckinghamshire (Pitstone Fen). Elsewhere, it is known from Denmark, Czechoslovakia, Germany, Hungary, Italy, Poland and South Russia.

Habitat and ecology The foodplant is common reed *Phragmites australis*. There are records from coastal reed beds and from inland marshes and fens. It seems clear that, in common with the other British *Chloriona* species,

C. vasconica can occur in reed-beds in a wide range of circumstances. The reasons for its extreme localisation are not known. Adults are found in June and July. Commoner species of the genus which have been studied and which show a similar adult phenology, have a single generation per year, overwintering as part-grown nymphs. Large nymphs and adults occur quite high on reeds, but earlier instars can be difficult to find, and may be more restricted to lower levels.

Status Very local. The known distribution is rather scattered, and the species can be mistaken in the field for other, common, members of the genus, with which it usually occurs. It is therefore likely that further localities remain to be discovered.

Threats Coastal sites are vulnerable to the effects of the construction or renovation of coastal defences, and may themselves be subject to reclamation for agriculture or development. Inland sites may be damaged by drainage and improvement, by lowering of water tables as a result of drainage or water abstraction on surrounding land, and by scrub invasion and succession on unmanaged sites, particularly where the water table is falling.

Conservation Coastal sites in general are likely to need little active management, and site safeguard is all that should be required. If inland reed-beds found to support the species have been traditionally managed by cutting or burning, such management should perhaps be continued or reinstated. Management should be undertaken on as long a rotation as possible, and only a fraction of the habitat should be burnt in any one year. It should be noted, however, that the effects of such management on *C. vasconica* are not fully known. The majority of records are from sites which have had no recent management. Where there is serious scrub invasion in a neglected site some scrub clearance may be necessary. On some sites scrub invasion may indicate falling water levels, and attempts to control the levels may be a simpler management option in the long term. Where scrub invasion occurs in a reed-bed at a water margin, it may be more practical to accept the inevitability of succession and allow the upper levels to go over to carr, relying on the natural extension and development of the reed-bed into open water to provide habitat continuity.

References Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Nast, J. (1972), Ossiannilsson, F. (1978), Skidmore, P., Limbert, M. & Eversham, B.C. (1987).

CRIOMORPHUS MOESTUS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Criomorphus moestus (Boheman)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution A northern species. There are single records for Midlothian and for Westmorland, and a number of localities in Yorkshire. It is otherwise found in north and central Europe.

Habitat and ecology Acid grassland. In Yorkshire, where most of the records originate, it is apparently associated with patches of rough meadow grass *Poa trivialis*, in areas dominated by wavy hair grass *Deschampsia flexuosa*. Within stands of pure *D. flexuosa*, it is replaced by *C. albomarginatus* (Flint 1964). On the continent, it has been found on purple small-reed *Calamagrostis canescens*, a plant absent from at least some of the British sites. Adults have been recorded in Britain from mid-May to late June. In Sweden they have been found into July. All stages appear to live low down amongst grass stems, and are to some measure ground-dwelling.

Status Apparently very local. The habitat type is not a rare one in upland Britain, and the species may be widely overlooked in the north. If the observations made in Yorkshire of its occurrence in small localised areas amongst more extensive populations of the superficially similar *C. albomarginatus* is generally applicable, the species might easily be missed.

Threats Improvement or ploughing of acid grassland; overgrazing.

Conservation Management should aim to maintain open grassland with a good range of vegetation structure, including areas of tussocky grass. A degree of neglect may do little harm to this species, since in the short-term such neglect favours growth of grasses. In the longer term, however, *D. flexuosa* may come to dominate the entire site, and grazing should be introduced before this stage. Overgrazing, leading to a short uniform sward, should be avoided. If grazing is not possible, cutting may be a viable management option. Only a fraction of a site should be cut in any one year, and the interval between cuts should be as long as is compatible with the maintenance of suitable vegetation structure.

References China, W.E. (1939c), Crossley, R. (1976b), Flint, J.H. (1957), Flint, J.H. (1960), Flint, J.H. (1964b), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1985), Le Quesne, W.J. (1986), Nast, J. (1972), Ossiannilsson, F. (1978).

CRIMORPHUS WILLIAMSI

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Criomorphus williamsi China

Identification Le Quesne (1960).

Distribution Recorded from Yorkshire, Northamptonshire, Oxfordshire, Buckinghamshire, Huntingdonshire, Bedfordshire, Hertfordshire, Middlesex, Essex, Surrey and Berkshire. Most of the records form a rather tight cluster centred on Buckinghamshire and Oxfordshire. There are no records from coastal areas. The recent Yorkshire record suggests that it may be overlooked in other midland counties. It has only recently been recognised elsewhere in Europe, and is so far known only from Czechoslovakia and Hungary.

Habitat and ecology In grassland, usually in rather damp places. Most sites are in areas of slightly to moderately acid soils. Adults have been found from May to July. The food plants are unknown, but are likely to be grasses.

Status Very local, but possibly under-recorded.

Threats Drainage, improvement or ploughing of damp grassland for farming purposes probably poses the major threat. Loss of unimproved grassland to development may be threatening locally, as may falling water tables resulting from drainage or water abstraction in surrounding land. Neglect of previously managed grassland will result in dominance by tall coarse vegetation and eventually in scrub invasion, which must ultimately make the vegetation unsuitable for the insect. In woodlands, loss of open ride structure is likely to be the chief threat, resulting from neglect of previously managed woodlands and consequent overgrowth and shading of rides and clearings. Conversion of ancient woodland sites to plantations of conifers or uniformly aged broadleaved species may also be damaging, but need not be disastrously so if wide rides are maintained.

Conservation Water tables in areas of damp grassland should be kept high. Open grassland should be managed so as to retain a good range of plant species and structural diversity. This is best achieved by moderate grazing. Grazing levels should be carefully monitored, to ensure that overgrazing does not occur. Where grazing is impossible, a rotational cutting regime may provide a suitable alternative. Woodland rides should be kept broad, open and sunny. This may be aided by rideside coppicing or the creation of small rideside clearings. When it is necessary to cut the rides only part of the length, or only one side, of a ride should be cut in any given year, and the intervals between cuts should be as long as is compatible with the maintenance of suitable structure.

References China, W.E. (1939c), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1985), Le Quesne, W.J. (1986), Nast, J. (1972), Roche, P.J.L. (1944), Salmon, M.A. (1954), Wilson, M.R. (1979).

DELPHACODES CAPNODES

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Delphacodes capnodes (Scott)**Identification** Le Quesne (1960); Ossiannilsson (1978).**Distribution** This is a predominantly southern species. There are records from Cornwall, Dorset, Hampshire, Berkshire, Oxfordshire, Norfolk, Yorkshire, Pembrokeshire, Carmarthen, Radnor, Cardiganshire, Caernarvonshire and Denbighshire. It is widely distributed but seemingly local in northern and central Europe.**Habitat and ecology** A peatland species. Most records are from lowland bogs, but there is a single record from an upland site on the North Yorkshire moors. It is similarly confined to peatlands on the continent. Cotton-grass *Eriophorum* has been suggested as a possible foodplant. Adults, and presumably also nymphs, are largely ground-dwelling or confined to the very low levels of vegetation. They have been found in *Sphagnum*, and are seemingly most readily recorded using pitfall traps. Adults overwinter. They have chiefly been taken between January and April, in June and July, and again from September to November.**Status** Seemingly very local. It may be under-recorded, particularly in the north and west. It would seem to keep very close to the ground, and perhaps also to occur at low density, which would make it easy to overlook.**Threats** Drainage of lowland bogs; lowering of water tables on lowland wetland sites through drainage or water abstraction on surrounding land; lack of management, particularly grazing, on previously managed peatlands leading to scrub invasion, particularly where the water table is falling; afforestation may be damaging either directly through the draining and planting of boggy areas or indirectly through invasion of the bog surface by seedlings from surrounding plantations.**Conservation** Water tables on wetland sites should be kept high. Management should aim to maintain a mix of vegetation heights and structure, including areas of low *Sphagnum*-dominated bog surface. Such conditions are probably best maintained by light grazing, but grazing levels should be carefully monitored to ensure that the site is not overgrazed or heavily trampled. Grazing a small and isolated area of wetland may be impossible. Provided water tables are kept high and scrub invasion at the margins checked, such small sites may be more or less stable in the short to medium term at least. If lack of management and/or falling water tables have led to extensive dominance by tall coarse vegetation, cutting may be used to rehabilitate the vegetation, provided the site is not so wet that such work would cause major damage to the substrate. The intervals between cuts should be as long as possible. Burning is the least desirable management option, and should be avoided. If a site has been traditionally managed by burning, continuation of such management may do little harm in the short term, but should be phased out if possible. If it is to be continued, it is best if only a fraction of the site is burnt in any given year.**References** China, W.E. (1938b), Coulson, J.C. & Butterfield, J.E.L. (1979), Le Quesne, W.J. (1960c), Nast, J. (1972), Ossiannilsson, F. (1978), Roche, P.J.L. (1944).

DICRANOTROPIS DIVERGENS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Dicranotropis divergens Kirschbaum**Identification** Le Quesne (1960).**Distribution** A predominantly northern species, recorded from Inverness-shire, Perthshire, Morayshire, Midlothian, Aberdeenshire, Westmorland, Northumberland, Radnorshire, Caernarvonshire and Denbighshire. It is widespread in north and central Europe, though apparently absent from Scandinavia, and is recorded from mountainous areas in Greece, Italy and Yugoslavia.

Habitat and ecology *D. divergens* is usually recorded from both acidic and base rich grassland on both well-drained and wet soils, but there are some records from low altitudes and it has occurred in grazed poor fen. It is a montane species in mainland Europe. The foodplants are unknown, but are probably grasses, sedges or rushes, in common with other members of the family. Adults have been recorded from June to August, but the life history is otherwise unknown.

Status Local, but widely distributed in the north. It is likely to be considerably under-recorded; the habitat is not a rare one, and many upland areas have not been thoroughly worked for Auchenorrhyncha. It may eventually prove that notable status is not justified for this species.

Threats Drainage and improvement of upland pastures, and perhaps also overgrazing. The exact tolerances of the species for sward height are not known, but it is unlikely that a very short and uniform sward would be suitable.

Conservation The exact tolerances and preferences of the species are not known. It is probably best if management aims to maintain as varied a vegetation structure as possible, including both areas of short turf and areas of longer flowering grasses. Such varied structure is best achieved by moderate grazing.

References China, W.E. (1939c), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1961a), Nast, J. (1972), Payne, K. (1979a).

EURYSA DOUGLASI

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Eurysa douglasi

Identification Le Quesne (1960).

Distribution Known in Britain only from a few localities in Kent: Folkestone Warren (19th century); near Wye (1967); Meopham (1975); Murston (1982). It is seemingly very rare in Europe.

Habitat and ecology *E. douglasi* is recorded from chalk grassland and from dry coastal grassland. It has been found low down amongst grass *Brachypodium pinnatum* on chalk hillsides. This probably represents the usual habitat for the species. It has also been found amongst rushes *Juncus* growing on dry ground. Such a combination implies either seasonally wet conditions or a recent change in drainage patterns; it seems unlikely that such conditions represent the usual habitat for this species. All records are from Kent, which implies limited climatic tolerance in Britain. Adults have been recorded in August and September.

Status Very local and rare, and of very restricted distribution. *E. douglasi* may prove to be present elsewhere in Britain, perhaps escaping notice through living low down in dense tussocks of vegetation. It would be unusual for a chalk grassland species to be confined to Kent.

Threats Improvement or ploughing of chalk or other unimproved grassland; loss of grazing, resulting from cessation of stock grazing and loss of rabbits through myxomatosis, leading to dominance by coarse vegetation and to scrub invasion; overgrazing leading to loss of *Brachypodium* tussocks; destruction of sites through development. Lack of management of chalk grasslands may be less serious for this species in the short term than for many other calcicoles, since such neglect favours *Brachypodium*, which seems a likely food plant.

Conservation Management should aim to maintain a varied vegetation structure, including some *Brachypodium* tussocks. Such structure is best maintained by grazing. Rabbit grazing may be particularly effective in maintaining suitable structure, and rabbit populations should be encouraged where possible. The ideal pattern for stock grazing is to have moderate grazing over the whole of a site. If this is not possible, rotational grazing or cutting may be attempted. The suitability of these latter two management options is uncertain, however, since the exact requirements and ecology of the insect are not known.

References Duffield, C.A.W. (1931), Duffield, C.A.W. (1960b), Le Quesne, W.J. (1960c), Nast, J. (1972).

Eurysula lurida (Fieber)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution So far recorded from only six localities in Britain. Four of these form a well-defined area of distribution in the East Midlands, in Cambridgeshire (Wicken Fen and Earith Pits), Huntingdonshire (Woodwalton Fen and Holme Fen) and Northamptonshire (Castor Hanglands). The remaining record is an old one from Kent (Charing) and requires confirmation. The species is widely distributed in mainland Europe, though not so far known from several mediterranean countries, and has also been recorded from North Africa.

Habitat and ecology The known food plants are small-reeds *Calamagrostis* spp. It has been found on wood small-reed *Calamagrostis epigeios*, and elsewhere in Europe has been found and reared on purple small-reed *Calamagrostis canescens*. It has been recorded from three fenland sites and once from a site with woodland and wet and dry grassland. The habitat at the Kent site is not known. Adults have been recorded from June to August. Nymphs overwinter.

Status Very local. The insect seemingly lives low on vegetation, and the host plants tend to form quite dense growth, so it may well be overlooked in a number of sites. It seems likely, however, from current evidence, that it will prove to be decidedly restricted in its distribution.

Threats In remaining East Midlands fens, the chief dangers are probably neglect of previously managed sites, leading to scrub invasion and shading of the host plants, and falling water tables resulting from water abstraction and drainage on surrounding land. Eutrophication of fen sites as a result of increased nutrient levels in incoming water, particularly from run-off from farmland, may also be a problem. All these problems are likely to be more severe in small sites or marginal fenland sites, where there may be little opportunity to oppose the changes. Small or marginal sites may also be threatened by drainage and destruction for farming purposes. Drainage and neglect are likely to be less serious and immediate threats for this species than for many true fenland species, since the grasses involved are themselves quite strong competitors, and *C. epigeios*, in particular, grows well in seasonally dry conditions. In woodland rides the chief threat is probably neglect of previously managed woods, leading to dominance by rank vegetation and shading, and consequent loss of good stands of the host plant. Coniferisation is a potential threat, and has already affected a number of woods in the general area of the known distribution of the bug. However, it need not lead to complete loss of interest provided broad rides are maintained, and may be beneficial in the first few years after clearance and planting, in that large areas are opened up, which *Calamagrostis* is well able to colonise.

Conservation Castor Hanglands, Woodwalton Fen and Holme Fen are National Nature Reserves. Wicken Fen is a property of the National Trust. Management of fens, particularly fenland edges where there is good growth of *Calamagrostis*, should aim to maintain open conditions with good growth of tall grasses. Light grazing may maintain such conditions. Periodic cutting is likely to be suitable on many sites, but too frequent cutting should be avoided. A rotational pattern of management, with only a fraction of the area of habitat cut in any one year, and as long as possible a period between successive cuts, is desirable. Occasional clearance of invading scrub may be adequate to maintain suitable conditions for some time. Woodland, rides and clearings supporting *Calamagrostis epigeios* should be kept broad, open and sunny. Scrub invading the margins should be monitored carefully, and clearance undertaken when it shows signs of actively invading. When cutting is necessary along rides, only a fraction of the available habitat should be cut in any one year, and cutting should be as infrequent as is compatible with other management requirements.

References China, W.E. (1939c), Duffield, C.A.W. (1960b), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1965a), Nast, J. (1972), Ossiannilsson, F. (1978).

Florodelphax paryphasma (Flor)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution South-east England. There are records from Northamptonshire (Sutton Heath and Bog), Norfolk (Booton; Swardeston Common), Suffolk (Mildenhall), Surrey (Wimbledon Common), Kent (Dungeness) and Buckinghamshire (Long Herdon Meadow). It is a northern species in Europe, recorded as far south as the Netherlands, Germany and Yugoslavia.

Habitat and ecology *F. paryphasma* is a wetland species of rather obscure ecology. The records available to date suggest tolerance of a fairly broad range of conditions, but detailed information as to circumstances of capture are not generally available. In mainland Europe, it has been recorded in wet meadows and on lake shores. In view of the fairly wide distribution in the south-east of Britain and the lack of evidence of very specialised habitat requirements, it is not obvious why it should be so very localised and rare. Part of the explanation may be that, in common with a number of other wetland delphacids, it is generally to be found low down among the vegetation, and may easily escape notice. It has been taken amongst tall vegetation. The few records suggest that this may be a species of water margins and seepages rather than of wetland expanses. Adults have been recorded in June and July in Britain, and from May to August in mainland Europe.

Status Very local. This species may be under-recorded, perhaps escaping notice through spending much time at or near ground level, and perhaps also being generally at low density.

Threats Drainage and improvement of wetlands, perhaps particularly small wetland areas such as marshy meadows adjoining streams or pools; regrading and diversion of rivers and streams where this leads to destruction of marginal vegetation; neglect of ponds leading to uncontrolled succession, loss of open water, and ultimately loss of open wetland vegetation; unsympathetic management of ditch, river and pool margins leading to extensive destruction of marginal vegetation; eutrophication of still and running water bodies as a result of nutrient input from sewage, farm effluent, or runoff from arable land and fertilised grassland. At Dungeness, water tables in the natural pools are being adversely affected by water abstraction and the consequences of extensive gravel diggings. Wimbledon Common has been much degraded since the time that records were made, and the continued presence of the species on the site is unlikely.

Conservation Water tables on wetlands and areas supporting pools and flowing water of significant conservation interest should be kept high, and the water in such sites should be isolated as far as possible from sources of eutrophication and pollution. Marshes and wet grasslands supporting the species are probably best managed by light grazing. Where management of streams and rivers is unavoidable, damage to marginal vegetation should be kept to a minimum, and all working should be undertaken as far as possible from one bank, leaving the vegetation on the other untouched. When re-profiling, a gentle shelf should be made at the margin to facilitate re-colonisation by marginal plants. Pools should be kept open, with a representation of open water. Management should be undertaken only when essential to maintain open conditions. Only a fraction of marginal vegetation should be cut in any one year, and only a fraction of any mats of vegetation invading the open water should be cleared.

References Edwards, J. (1896), Le Quesne, W.J. (1960c), Le Quesne, W.J. (1987a), Nast, J. (1972), Ossiannilsson, F. (1978).

LAODELPHAX STRIATELLUS**NOTABLE**

Order HEMIPTERA

Family DELPHACIDAE

Laodelphax striatellus (Fallen)**Identification** Le Quesne (1960); Ossiannilsson (1978).**Distribution** Formerly widespread in south-eastern England. There are records from Norfolk, Buckinghamshire, Kent, Surrey, Sussex, Hampshire, Dorset and Gloucestershire. The most recent record from the south-east is from Buckinghamshire (Holmer Green, 1954). There is a single more recent record from Yorkshire (Crowther Wood, 1985). It occurs throughout the Palearctic, and is also found in the Philippines and Sumatra.**Habitat and ecology** British records are predominantly from damp grassland. It is probably polyphagous on grasses. In mainland Europe and elsewhere it is recorded from both wet and dry grassland, on grasses in cultivated fields, and on cereal crops. It is an important virus vector in some eastern parts of its range, and transmits cereal tillering disease on barley and oats in Sweden, though it is not common enough to be important. Adults have been recorded between May and September in Britain, but its life history in this country is otherwise unknown. There are two generations per year in Sweden and Siberia, and four to seven in Japan.**Status** Apparently greatly declined. The bulk of the records are from the last century.**Threats** The reasons for the decline of this species are not certainly known. The widespread draining, improvement and ploughing of grassland in the present century may well have had an effect, but the decline seems to have begun before the bulk of such changes. The range of recorded habitats elsewhere in Europe do not seem to imply a restricted habitat requirement, and it seems improbable that habitat destruction is an adequate explanation. Climatic changes may be more important. The species is clearly on the edge of its range in Britain, and relatively minor climatic shifts may be significant. Habitat destruction, particularly the drainage, improvement or ploughing of damp grassland are likely to be the major threats to surviving populations.**Conservation** Knowledge of the ecology of the species in Britain is too limited to make it easy to give detailed management prescriptions for the species. Management should aim to maintain open grassland without excessive scrub invasion, and with a good range of vegetation structure, ideally including both short close-cropped sward and tall seeding grasses. The management to maintain such conditions is light grazing. Where grazing is not possible, cutting may be attempted as an alternative. Such cutting should be undertaken on a rotational programme, with only a fraction of the site cut in any one year.**References** Edwards, J. (1896), Le Quesne, W.J. (1960c), Nast, J. (1972), Ossiannilsson, F. (1978).

MEGAMELODES LEQUESNEI**NOTABLE**

Order HEMIPTERA

Family DELPHACIDAE

Megamelodes lequesnei Wagner**Identification** Le Quesne (1960).**Distribution** Widely distributed in Britain, but most frequent in south-eastern England. There are recent records from Kirkcudbrightshire, Lincolnshire, Northamptonshire, Norfolk, Suffolk and Caernarvonshire, and older records also from Morayshire, Yorkshire, Cambridgeshire, Berkshire, Hampshire, Sussex and Dorset. It has also been found in Ireland. It appears to have a rather limited distribution in Europe, with records from The Netherlands, Germany, Hungary, Romania, and Yugoslavia.**Habitat and ecology** Recorded from a quite wide range of wetland conditions, but mostly from base-rich marshes and fens. Most records are from ancient wetland sites. It may therefore be a poor coloniser. It is normally short-winged and flightless, though fully-winged individuals do occur. Adults have been found in

abundance amongst mixed vegetation in sedge beds in the Norfolk Broads, and also amongst the emergent and marginal vegetation along drains. At a Suffolk site, it occurred in a vegetation-choked ditch in grazing levels, where it appeared to be associated with blunt-flowered rush *Juncus subnodulosus*. Here it occurred low on plants where they were standing in shallow water. Adults have been found in March, and from mid-July to late October. This implies that it overwinters as an adult: this is unusual amongst Delphacids, which generally overwinter as partly-grown nymphs. The occurrence of adults as early as mid-July suggests the possibility of at least a partial second generation.

Status Very local. There are many old records, but these were followed by a gap of almost thirty years until 1982, since when, this species has been quite widely recorded again.

Threats The chief threats to wetland sites in the area from which there are recent records are probably the destruction by drainage, the lowering of water tables as a result of water abstraction and drainage on surrounding land, and eutrophication and pollution, particularly resulting from runoff from arable land. Water quality in the Norfolk Broads has declined considerably in recent decades as a result of increased nutrient input both from farmland and sewage. Remaining wetland sites in eastern England have often suffered from lack of management in recent decades, which has led to scrub invasion and dominance by coarse vegetation. A further threat may be posed by poor management of ditches and drains. Extensive clearance of marginal vegetation from such water bodies may destroy colonies of the insect, and if the margins are left steeply shelving colonisation by emergent and marginal vegetation will be inhibited.

Conservation On sites supporting the species part of the wetland vegetation should be kept open and unshaded. The insect appears to occur at the base of tall rushes and other plants, and beds of this type of vegetation should be maintained. *M. lequesnei* has been recorded both from grazed sites and from sites managed by cutting. Light grazing is probably the most generally suitable technique. Where cutting is used, a rotational programme should be used, with only a fraction of the habitat cut in any one year, and the period between cuts as long as possible. Water tables should be kept high. The water supply to wetland sites should be isolated as far as possible from sources of pollution and enrichment. Where water with a high nutrient content must be used to irrigate a site, the use of beds of vegetation such as reeds *Phragmites* to extract nutrients from incoming water may alleviate the deleterious effects. Ditches and drains should be managed as little as is compatible with their continued function. When clearance is necessary, it should be performed along short stretches, or at most along only one side, of a drain in any one year. Margins should be left gently shelving to facilitate colonisation by emergent vegetation.

References Edwards, J. (1894), Le Quesne, W.J. (1960c).

ONCODELPHAX PULLULUS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Oncodelphax pullulus (Boheman)

Distribution *O. pullulus* is a predominantly northern and western species. It has a wide but rather scattered distribution in Scotland, northern England, and Wales, with records from the Inner Hebrides (Rhum), Inverness-shire, Perthshire, Morayshire, Cumberland, Yorkshire, Montgomeryshire, Pembrokeshire, Glamorgan, Radnor, Cardiganshire and Caernarvonshire. There are also records of apparently isolated populations in Norfolk and Suffolk. Other isolated southern populations may occur in ancient peatland sites elsewhere in the south. It occurs in Ireland, and is widespread in northern and central Europe, extending south to France and Switzerland.

Habitat and ecology This is a wetland species, recorded both from acid peatlands and from fens. Most records are from lowland sites. The foodplants are not known, but an association with sedges *Carex* spp. has been suggested. Adults have been taken in May, June, July and September in Britain: June and July would seem to be the most usual months. It is usually found low down amongst vegetation, and may be effectively recorded using pitfall traps. It is generally found in small numbers, even where pitfall traps are used, so may usually occur at genuinely low density.

Status Very local, but no doubt still under-recorded in the north and west. This species was not recorded from Wales until 1987, when a survey of peatlands recorded it from 4 sites in two vice-counties, using pitfalls. More widespread use of pitfalls in peatland sites might well add significantly to the total of sites for the species.

Threats Drainage of wetlands; afforestation; falling water tables, particularly on isolated wetland sites, as a result of drainage or water abstraction from surrounding land; neglect of wetland sites, particularly those which are relatively small and isolated, leading to scrub invasion and dominance by coarse vegetation. Pollution and eutrophication may also be a problem, particularly in sites such as valley bogs where the incoming water supply may be affected by runoff from surrounding farmland. It is not known how the burning of wetland sites affects this species, but it is likely to be damaging.

Conservation Water tables should be kept high. Management should aim to maintain open conditions with good growth of sedges and other plants, and a varied structure which includes both low carpets of moss with sparse other vegetation, and areas of taller plants, including sedges, growing relatively densely. Some sites may remain in suitable condition without active management. Light grazing is probably the best way to achieve this on most sites. Cutting may provide suitable alternative management where grazing is not possible or where cutting has been the traditional management. Only a fraction of the site should be cut in any one year. Burning is the least desirable management option, but if there has been a history of burning at a site, its continuation in the short term is unlikely to do further harm if undertaken with care. Only a fraction of the site should be burnt in any one year.

References Crossley, R. (1981), Day, F.H. (1919), Le Quesne, W.J. (1960c), Morley, C. (1933), Ossianniilsson, F. (1978), Payne, K. (1979a).

PARADELPHACODES PALUDOSUS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Paradelphacodes paludosus (Flor)

Identification Le Quesne (1960); Ossianniilsson (1978).

Distribution South eastern England, chiefly the coastal counties. There are records from Cumberland, Norfolk, Suffolk, Essex, Berkshire, Surrey, Hampshire, Cornwall, Shropshire, Cardiganshire, Merionethshire and Caemarvonshire. It is recorded from Ireland, and is widely distributed in Europe from Finland in the north to Italy in the south, and east to Hungary, Yugoslavia and north Russia.

Habitat and ecology A wetland species, most commonly found in sphagnum bogs and other sites on acid peat, but with occasional records from more base-rich situations. A survey of Welsh peatlands in 1987 and 1988, which has so far provided over half the known British records for the species, recorded it from a wide range of peatland sites. Elsewhere in Europe it has also been recorded from wet meadows. The foodplants are not known with certainty. An association with sedges *Carex* has been suggested, but it has also been found on purple moor-grass *Molinia caerulea*. It lives very low down, and can be found amongst sphagnum. Adults have chiefly been captured from May to August, with the bulk of captures in July. There is a single record from October. It is known to hibernate as a nymph in mainland Europe.

Status Very local, but probably under-recorded. Over half the known British records come from a single year's survey work on Welsh peatlands using pitfall traps. It seems likely that *P. paludosus* lives very close to the ground in very wet places and is therefore difficult to record by direct searching. More widespread use of pitfall traps in the study of Auchenorrhyncha in southern peatlands may show the species to be more widely distributed and frequent.

Threats Drainage of wetlands for farming or forestry purposes; lowering of water tables, especially on isolated lowland sites, as a result of improved drainage or increased water abstraction in surrounding land; eutrophication and pollution of the water supply to wetland sites, particularly as a result of runoff from farmland; neglect of formerly managed wetland sites leading to scrub invasion, particularly where nearby plantations or birch scrub or woodland provide a seed source. The effects of different management regimes on the species is not known.

Burning of wet peatlands may well be deleterious, but since the life-history seems to be spent close to the ground, the population may survive a rapid fire.

Conservation Management should aim to maintain open conditions with varied vegetation structure. On a typical acid bog this should include both low vegetation dominated by sphagnum, and patches of sedges and other taller plants. Light grazing is the best method of maintaining such conditions on most sites. Cutting may be a viable option on some sites, but others may be too wet throughout the year to allow such management. On very nutrient-poor sites, suitable conditions can probably be maintained for a considerable time in the absence of grazing and cutting provided water levels are kept high and invading scrub removed.

References Edwards, J. (1896), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978).

PARALIBURNIA CLYPEALIS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family DELPHACIDAE

Paraliburnia clypealis (J.Sahlberg)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution For many years this species was known in Britain only from Wicken Fen, Cambridgeshire. Since 1980, however, it has been recorded from Huntingdonshire (Woodwalton Fen), Norfolk (Catfield Fen, Scoulton Mere, Swangey), Somerset (Southey Moor and Munty) and Kirkcudbrightshire (Cally Palace). It has been found in Ireland, and is also recorded from Sweden, Finland, Germany, Czechoslovakia and north Russia.

Habitat and ecology The only known foodplant is purple small-reed *Calamagrostis canescens*, but it seems unlikely that this is the only foodplant in Britain. British records are predominantly from fenland, but it can occur in other wetland habitats, including wet heath and bog, as it does elsewhere in Europe. Adults have been taken in June and July. It probably overwinters as a nymph, in common with the majority of British Delphacids.

Status Very local, but probably under-recorded.

Threats The chief threats facing wetland sites in lowland Britain are drainage; falling water tables resulting from improved drainage and increased water abstraction on surrounding land; eutrophication and pollution of the water supply, for example by runoff from intensively managed farmland and sewage input into rivers; neglect of previously managed wetlands leading to dominance by coarse vegetation and by scrub invasion.

Conservation Wicken Fen is a property of the National Trust and a SSSI. Woodwalton Fen is a National Nature Reserve. Catfield Fen is an SSSI and Norfolk Wildlife Trust reserve. Management of any site in which *P. clypealis* is found should aim to maintain a high water table and open and reasonable unshaded conditions with good growth of *Calamagrostis canescens*. Either light grazing or periodic cutting should be adequate management techniques. If cutting is used, only a fraction of the site should be cut in any one year, and the period between cuts should be as long as possible. If a site has been neglected for sufficiently long to suffer from significant scrub invasion, and there is little chance of introducing grazing or cutting in the immediate future, short-term viability may be assured by scrub clearance sufficient to maintain open areas.

References Drake, C.M. (1989b), Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Morris, M.G. (1974), Ossiannilsson, F. (1978).

RIBAUODELPHAX ANGULOSUS**NOTABLE**

Order HEMIPTERA

Family DELPHACIDAE

Ribautodelphax angulosus (Ribaut)**Identification** Le Quesne (1960); Ossiannilsson (1978).**Distribution** South-eastern England. There are records from Hertfordshire, Berkshire, Surrey, Hampshire, the Isle of Wight and Dorset. It is widely distributed in northern and central Europe, and extends east to Kazakhstan and Mongolia.**Habitat and ecology** *R. angulosus* is a species of dry grassland. It has both on strongly calcareous and on fairly acid soils. It is likewise recorded chiefly from dry grassland in mainland Europe, though it has also been reported from a wet meadow. Sweet vernal grass *Anthoxanthum odoratum* is a known foodplant elsewhere in Europe, and is probably the host in Britain also. The insect would seem to much more local than apparently suitable habitat. The likely explanation is that it is at the edge of its climatic tolerance in Britain, and can survive only in areas of particularly favourable climate, such as south-facing slopes with short vegetation. Adults have been recorded from May to August. The life history is otherwise unknown, but it is likely that, in common with related species, it overwinters as a nymph.**Status** Very local, but rather uncertain. The records are rather scattered in south-eastern England and do not seem to be closely tied to a narrowly defined habitat type. This may therefore be a local and sporadic species which is difficult to find, perhaps by virtue of forming small colonies or living close to the ground.**Threats** Improvement or ploughing of dry grassland; destruction of dry grassland for development, an increasing problem in the south-east; neglect of dry grassland leading to dominance by coarse grasses and to scrub invasion, particularly as a result of cessation of stock grazing, exacerbated by the loss of rabbit populations through myxomatosis.**Conservation Management** of dry grassland should aim to maintain open conditions and a varied structure, including areas of short or sparse vegetation and taller tussocks and swards. Such structure is best achieved by grazing, and grazing stock should be maintained or introduced wherever possible. Rabbit grazing produces a particularly good grassland structure with a small-scale mosaic of disturbed ground, short turf and taller vegetation. Rabbit grazing should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter or burrowing. Cutting or mowing may be used where grazing is impossible. *R. angulosus* has apparently persisted for at least ten years on one site which is cut twice a year for hay.**References** Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978), Salmon, M.A. (1954), den Bieman, C.F.M. (1981), den Bieman, C.F.M. (1987).

RIBAUODELPHAX IMITANS**INSUFFICIENTLY KNOWN**

Order HEMIPTERA

Family DELPHACIDAE

Ribautodelphax imitans (Ribaut)**Identification** Le Quesne (1960).**Distribution** Recorded only from Devon (Axmouth-Lyme Regis) and Dorset (Southwell, Portland; Corfe). It is otherwise known from southern and central Europe, north to Germany and Poland.**Habitat and ecology** *R. imitans* has been recorded from calcareous grassland, and may also occur on other types of dry grassland. The grass *Festuca arundinacea feras* is a known foodplant in France and Greece. This subspecies does not occur in Britain, but tall fescue *Festuca arundinacea arundinacea* is common, and could

be a host. Adults have been taken in August in Britain. The life history is otherwise unknown, but related species generally hibernate as nymphs.

Status Very local and rare. The apparent restriction of the species in Britain to a section of the south coast known for the richness of the invertebrate fauna of species at the edge of their European range suggests that this species, too, is able to survive in this country only in areas of particularly favourable conditions.

Threats The greatest threats to this species are probably the improvement or ploughing of dry grassland, the neglect of previously managed unimproved grasslands leading to dominance by coarse vegetation and scrub, and the reduction of rabbit populations through myxomatosis. Loss of suitable habitat to development may also be damaging locally.

Conservation Grasslands should be managed by grazing where possible. This should be adjusted to a level at which a varied structure is maintained, including both short turf and taller tussocks and swards. Rabbit grazing produces the best structure, and rabbit populations should be maintained or encouraged wherever possible. In most places, however, it is unlikely that rabbits alone will be able to produce suitable habitat structure in the absence of grazing stock.

References Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), den Bieman, C.F.M. (1981), den Bieman, C.F.M. (1987).

RIBAUODELPHAX PALLENS

INSUFFICIENTLY KNOWN

Order HEMIPTERA

Family DELPHACIDAE

Ribautodelphax pallens (Stal)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution So far recorded from only two British sites: Wytham Wood, Berkshire, and Martin Down, Hampshire. It is widely distributed in northern Europe, and extends east to Siberia. Records from southern Europe are more scattered, and some are unconfirmed.

Habitat and ecology Calcareous grassland: on limestone at Wytham, Berkshire; on chalk at Martin Down, Hampshire. Details of the habitat at Wytham are lacking. At Martin Down it was found amongst long grass. Elsewhere in Europe it is predominantly a species of dry grassland, but has occasionally been found in wetter grassland and in cultivated fields. Adults have been recorded in July and August in Britain, and in June and July elsewhere in Europe. The life history is otherwise unknown, but it is likely that, in common with related species which have been studied, they overwinter as nymphs. Sheep's fescue *Festuca ovina* has been recorded as a host plant in Norway and Finland.

Status This is clearly a very local species. The extent of possible under-recording is difficult to estimate from the two known records. It seems likely that it is an easy species to overlook. The record of the species from long grass at Martin Down may imply that it spends much time low down amongst tall grasses.

Threats Improvement and ploughing of calcareous grassland; neglect of calcareous grassland leading to dominance by coarse grasses and to scrub invasion. Development and road construction may be locally threatening.

Conservation Management of calcareous grassland should aim to maintain a diverse structure, including both areas of short or sparse turf and taller tussocks and swards. Such a structure is best maintained by grazing. Rabbit grazing is particularly effective at maintaining a mosaic of different structures, and rabbit populations should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter and burrowing. In most sites, however, rabbit grazing alone is unlikely to produce satisfactory results, and stock grazing will also be needed. A rotational regime of grazing may be satisfactory, though the mobility of the insect is uncertain, and it cannot be guaranteed that it would prove able to undertake the necessary colonisation. Where grazing cannot be introduced, management by cutting is better than neglect. Only a fraction

of the site should be cut in any one year. Management by cutting is likely to be more satisfactory where there is some rabbit grazing to encourage diversity of sward structure.

References Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978), Whittaker, J.B. (1969), den Bieman, C.F.M. (1987).

RIBAUTODELPHAX PUNGENS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Ribautodelphax pungens (Ribaut)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution Southern England. There are records from Kent, Surrey, Berkshire, the Isle of Wight, Dorset and Gloucestershire. It has a wide but scattered distribution in mainland Europe, from Sweden in the north to the Mediterranean countries, and extends east to the Ukraine.

Habitat and ecology Dry grassland. British records come chiefly from chalk and limestone grassland, but it has been recorded from coastal dunes at Sandwich Bay, Kent. It has been found in a wider range of dry grassland types elsewhere in Europe. In mainland Europe it has been recorded from several grasses of the genus *Brachypodium*. In the west the foodplant is tor grass *Brachypodium pinnatum*, which is probably also utilised in Britain. Adults have been found in all months from April to September. It is known to hibernate as a nymph in mainland Europe, and the long season suggests that there may be two generations a year.

Status Very local. The extent of under-recording is difficult to estimate, but the recorded localities are sufficiently consistent in character, and of sufficiently high habitat quality, to suggest that this is a genuinely restricted species.

Threats Improvement and ploughing of calcareous grassland; neglect of previously grazed calcareous grassland leading to dominance by coarse grasses and to scrub invasion. Development and road-building may be threatening locally. The dunes at Sandwich Bay, Kent, have been extensively developed as golf courses, and parts of the remainder suffer heavy public pressure. Recreational developments and erosion by public pressure are the most likely threats to be faced by other dune sites on which the species may occur.

Conservation Management of calcareous grassland should aim to maintain varied vegetation structure, which should include both short or sparse turf and areas of taller grasses and tussocks. Grazing is the best way to maintain such structure. Rabbit grazing is particularly good at producing a small-scale mosaic of disturbed ground, close-grazed turf and taller vegetation. Rabbit populations should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter or burrowing. Rabbit grazing alone is unlikely to be able to maintain most sites in a suitable condition, and stock grazing should be introduced or continued wherever feasible. A rotational regime of grazing may be suitable. However, the mobility of the insect is not known, and it cannot be guaranteed that it will colonise newly available areas of suitable habitat at the required rate. Where grazing is not possible, management by cutting is better than neglect. Only a part of the site should be cut in any given year.

References Duffield, C.A.W. (1960b), Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978), Whittaker, J.B. (1969), den Bieman, C.F.M. (1981), den Bieman, C.F.M. (1987).

Order HEMIPTERA

Family DELPHACIDAE

Stenocranus fuscovittatus (Stal.)**Identification** Le Quesne (1960).

Distribution Predominantly southern England, with records from Yorkshire, Brecknock, Norfolk, Suffolk, Cambridgeshire, Berkshire, Kent, Sussex, Dorset and Cornwall. There is an isolated record from West Ross, and one from Caernarvonshire. It is widely distributed in southern and central Europe, and extends east to Siberia.

Habitat and ecology *S. fuscovittatus* is known to occur in both wetlands (including both acid bogs and fens) and in dry breckland. Some of the earlier records are now impossible to assign to habitat. In the brecks it appears to be associated with sand sedge *Carex arenaria*. Other sedges may be the hosts in wetland situations, or it may be more broadly polyphagous on grasses as well. It has been found in litter of reed canary grass *Phalaris arundinacea* in Yorkshire. It is not obvious, from the wide scattering of records in southern England, and from what is known of its habitat preferences, why it should be so local. Adults have been recorded from June to September. The life history is otherwise unknown, but two common species of the same genus are known to hibernate as adults.

Status Very local. The limiting factors controlling the distribution and abundance of the species, and its habitat preferences and tolerances, are too poorly known to enable an estimate of the likely extent of under-recording. It is clearly an uncommon species, however, since it is not so cryptic and retiring as to be difficult to record.

Threats On wetland sites the chief threats are drainage; lowering of water tables as a result of increased drainage and water abstraction in surrounding land; eutrophication and pollution of wetland sites as a result of enrichment of the water supply, particularly as a result of runoff from farmland; neglect of previously managed wetland sites leading to scrub invasion and dominance by coarse vegetation. The area of open breckland has greatly declined in the present century. Large areas have been lost to afforestation, and there have also been considerable losses to agriculture. The remaining areas of unspoilt breck have suffered from a decline in grazing, first through the decline in the formerly widespread sheep grazing, and secondly through the decimation of the rabbit population by myxomatosis. This decline in grazing has led to extensive domination by coarse dense vegetation and to scrub invasion, both by shrubs and trees native to the area and also by self-seeded pines from the afforested blocks. *S. fuscovittatus* may have suffered less from the decline of grazing than many more strictly breckland species of insect, since it can be found amongst areas of dense growth of *Carex arenaria* and other plants, but heavily scrubbed areas are unsuitable for it.

Conservation On wetland sites, water tables should be kept high and sites should be isolated as far as possible from potential sources of pollution and enrichment. Management should aim to maintain open conditions with varied vegetation structure including good growth of sedges, both as mixed beds and in single-species clumps. Such conditions may be maintained either by grazing or by a regime of cutting, the choice depending on the past management of the site and on the options available. Where cutting is used, only a fraction of the site should be cut in any one year. On breckland sites, the maintenance of open conditions is again critical, but this species is less dependent on short sparse vegetation and disturbance than are many of the characteristic breckland species. Grazing should be maintained or introduced wherever possible, and rabbit populations should be encouraged. A rotational regime of cutting may be used where grazing is impossible. Suitable habitat for *S. fuscovittatus* may be maintained, in the short term at least, simply by the control of invading scrub, even if the remaining vegetation should become relatively coarse and dense. Periodic substrate disturbance may be the best way of maintaining open conditions and early successional stages.

References Edwards, J. (1894), Edwards, J. (1909), Foster, A.P. (1987a), Le Quesne, W.J. (1960c).

STIROMA BICARINATA**NOTABLE**

Order HEMIPTERA

Family DELPHACIDAE

Stiroma bicarinata (Herrich-Schaeffer)**Identification** Le Quesne (1960); Ossiannilsson (1978).**Distribution** *S. bicarinata* is widely distributed in Britain. There are a number of widely scattered records for England and two for Scotland, but it is as yet unrecorded for Wales. It has been reported from Perthshire, West Lothian, Yorkshire, Staffordshire, Cambridgeshire, Norfolk, Hertfordshire, Berkshire, Surrey, Hampshire, and Gloucestershire. It is widespread throughout Europe, and also occurs in North Africa.**Habitat and ecology** This is a woodland species, found in rides, margins and clearings, and in open woods on steep slopes. It is found on low vegetation. The foodplants are not recorded in Britain, but on the continent it is known to migrate to cereal fields, so it may be polyphagous on grasses. So far as is known, all Delphacids feed on grasses, sedges or rushes. Adults have been recorded from June to August, and may be either fully-winged or short-winged and flightless. Elsewhere in Europe, the fully-winged form has been shown to fly during the day during periods of high temperature. The wide distribution and scattered records of the species in Britain suggest the existence of limiting ecological factors, but there is no obvious common thread linking the records to suggest what they might be.**Status** Local. The widely scattered records do not at present constitute a wholly satisfactory distribution, and the species may be overlooked in parts of its range.**Threats** Destruction of woodlands through clearance for agriculture or quarrying may be locally damaging. Coniferisation of broadleaved woods is a more widespread threat. In some areas, particularly in the uplands, access of grazing stock to woods frequently prevents regeneration and will ultimately lead to loss of woodland cover. Increasing intensification of use of farmland surrounding woodlands in recent decades has led to loss of well-structured margins. In lowland England particularly, woods now tend to have very abrupt margins which may be severely affected by chemical drift from adjoining farmland. Lack of management of many woods in recent decades, particularly former coppice woodlands, has led to loss of open rides and clearings and the creation of shaded conditions which are probably unsuitable for *C. bicarinata*.**Conservation** Woodland rides and clearings should be kept broad, open and sunny. Rideside coppicing and the creation of rideside clearings may assist this. Where possible, woodland margins should be allowed to abut onto non-intensively managed land, so that a gradation through scrub to grassland or other vegetation is present.**References** Edwards, J. (1896), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978).

STRUEBINGIANELLA DALEI**NOTABLE**

Order HEMIPTERA

Family DELPHACIDAE

Struebingianella dalei (Scott)**Identification** Le Quesne (1960).**Distribution** Southern England. There are records from Berkshire, Buckinghamshire, Surrey, Kent, Hampshire, Dorset, and Devon. It is otherwise known only from south-western Europe, with records from Germany, France, Portugal, Spain and Italy.**Habitat and ecology** *S. dalei* is a species of dry grassland. Most records are from grassy heaths and acid grassland, but also recorded from dune grassland. Records are predominantly from the sandy heathland areas of Surrey, Dorset and Hampshire, and from coastal sites on sand. There are occasional records from well-drained sites on other substrates. The exact foodplants are unknown, but are likely to be grasses. So far as is known, all

Delphacidae feed on grasses, sedges or rushes. Adults have been taken in March, May, and from July to September, but the life history is otherwise unknown.

Status Local. Some under-recording is possible, perhaps particularly in the west.

Threats Improvement and ploughing of dry grassland and heath; destruction of dry grassland and heath for development and road-building, a particularly serious problem in the Poole Basin of Dorset; afforestation; lack of management of dry grassland and heath leading to loss of open structure and to scrub invasion and dominance by coarse vegetation. Loss of grazing on heaths and acid grasslands in much of the south of England, through loss of grazing and also as a result of the decimation of the rabbit population by myxomatosis.

Conservation Management should aim to maintain open conditions and varied vegetation structure, including areas both of short turf and long grassy vegetation. On some coastal sites no active management may be needed to maintain suitable conditions, but on inland grasslands such structure is best maintained by grazing. Grazing stock should be introduced or maintained wherever possible. Rabbit grazing is particularly effective in producing a small-scale mosaic of disturbed ground, short grazed vegetation and taller plants. Rabbit populations should be encouraged wherever possible, for example by maintaining areas of scrub used for shelter and burrowing, but it is unlikely that rabbit populations alone will be able to maintain suitable conditions in most sites. Where grazing is impossible and conditions are obviously declining cutting may be a viable alternative.

References Badmin, J.S. (1981), Edwards, J. (1896), Le Quesne, W.J. (1960c).

STRUEBINGIANELLA LITORALIS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Struebingianella litoralis (Reuter)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution A northern and western species, recorded from Perthshire, Inverness-shire, Cumberland, Yorkshire, Pembrokeshire, Cardiganshire, Montgomeryshire, Radnor, Merionethshire, Caernarvonshire and Denbighshire. It is seemingly an international rarity, otherwise known only from Finland.

Habitat and ecology *S. litoralis* is usually found in bogs and at acid water margins. The first British record was from sedges around a small loch in the Scottish Highlands. It has since been recorded from raised bogs, basin mires, and fens. There is a Finnish record from a seashore, where it occurred amongst reed *Phragmites australis* and spike-rush *Eleocharis* sp. Bottle sedge *Carex rostrata* has been suggested as the host. The Welsh Peatland Survey has recorded from a sample site where the vegetation was dominated by *Carex rostrata*, but has also found it amongst cotton grass *Eriophorum*. Adults have been taken in June and July. The life history is otherwise unknown, but most British members of the family whose life history is known overwinter as nymphs, and the phenology of the adults suggests that this may also be the case with *S. litoralis*.

Status Very local and rare, but no doubt still under-recorded. All of the Welsh records were made over two years using pitfall traps. More widespread use of this technique in collecting Auchenorrhyncha from wetland sites might reveal the insect to be still more widespread. The more southern sites, however, are all ancient wetlands of high conservation value, so it is likely to remain very local in this part of its range. The extent of under-recording in the north is uncertain. Britain may be the world stronghold for this species, since there are otherwise only three Finnish records, the most recent in 1940.

Threats In the north afforestation is the most likely threat. In more southern and lowland regions, drainage of wetlands and improvement of surrounding land for farming purposes poses an additional danger. Falling water tables, as a result of increased drainage and water abstraction in surrounding land, may also be a problem in smaller and more isolated sites. The most southerly of its English sites, at Thorne Moors, South Yorkshire, is being intensively exploited for peat extraction. Large-scale peat extraction elsewhere would likewise be extremely damaging. Neglect of previously managed sites may lead to scrub invasion and the shading out of plant communities requiring more open conditions. Management of wet peatland sites by burning may also be

threatening, since it might be expected to damage one or other stage of the life history of the insect at any time of year. However, there is no direct evidence of the damaging effects of fire.

Conservation Water tables should be kept high. Management should aim to maintain open conditions with a varied vegetation structure, including good growth of sedges. In some sites, suitable conditions may be maintained without active management, for example in the extreme north and at high altitude, or in sites where low wetland vegetation forms an actively invading front over a large water body. In other sites, open conditions are likely to have been maintained in the past by grazing. Light grazing should continue on such sites if possible. If a site shows significant signs of deterioration, and grazing is impossible, scrub clearance and cutting may be used to clear coarse vegetation, provided conditions allow this without damage to the surface. Small-scale peat cutting, based on traditional methods, may be useful in maintaining open conditions on some sites.

References Le Quesne, W.J. (1960a), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978), Payne, K. (1979a), Skidmore, P., Limbert, M. & Eversham, B.C. (1987).

XANTHODELPHAX FLAVEOLUS

NOTABLE

Order HEMIPTERA

Family DELPHACIDAE

Xanthodelphax flaveolus (Flor)

Identification Le Quesne (1960); Ossiannilsson (1978).

Distribution South-eastern England. There are single records from Suffolk, Surrey, Berkshire, Buckinghamshire and Dorset. It is widely distributed in Europe, and extends east to Siberia.

Habitat and ecology Dry grassland. British records come primarily from acid grassland and from the East Anglian breckland. In mainland Europe it occurs in a wider range of grassland types, and also in cereal fields and ley grassland. It would seem to be a species at the edge of its climatic tolerance in Britain, and the details of local climate are probably of primary importance in deciding its distribution. The hostplants in Britain are not certainly known, but are presumably grasses: so far as is known, all Delphacidae feed on grasses, sedges or rushes. In Britain, adults have been recorded in June and July. They occur as late as August in Sweden, and as early as May elsewhere in Europe.

Status Rare and very local. Some degree of under-recording is possible, particularly in East Anglia, which has not been well-worked for Auchenorrhyncha in recent decades.

Threats Improvement and ploughing of dry grassland; loss of grazing on dry grassland sites, through cessation of stock grazing and decimation of the rabbit population by myxomatosis, leading to scrub invasion and loss of open conditions; afforestation.

Conservation Management of dry grassland should aim to maintain open conditions with a range of vegetation structure including both short or sparse turf and taller vegetation. Such conditions are best maintained by grazing, and grazing stock should be introduced or maintained wherever possible. Rabbits are particularly effective in producing a small-scale mosaic of disturbed ground, short turf and longer grassland. Rabbit populations should be encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter or burrowing. Where grazing is impossible, management by a rotational regime of cutting may be effective. It is unlikely to be as successful as grazing in maintaining good vegetation structure, but the effects will be improved if there is also rabbit grazing on the site. Where there is extensive scrub invasion of a site, clearance work should be undertaken, but complete clearance may not be necessary or desirable. Mechanical disturbance of the substrate to create open conditions may be appropriate in some sites, for example in the East Anglian breckland.

References Edwards, J. (1896), Le Quesne, W.J. (1960c), Ossiannilsson, F. (1978).

Issus muscaeformis

Identification Ossiannilsson (1981; 1983). There remains some doubt as to whether *I. muscaeformis* is genuinely distinct from *I. coleoptratus*.

Distribution This species has only recently been recognised in Britain, though taken as long ago as 1945. There are currently only three known records: Wray Castle, Westmorland (modern Cumbria) (1945); Gait Barrows, Lancashire (1977) and Eaves Wood, Silverdale, Lancashire (1980). All specimens of *Issus* from southern Britain so far examined are of the commoner *I. coleoptratus*, which is superficially very similar to *I. muscaeformis*. This strongly indicates that *I. muscaeformis* is a northern species, but the exact limits of its distribution are uncertain at present. In mainland Europe, *I. muscaeformis* is the more widely distributed of the two species, occurring from Norway in the North to the Mediterranean countries, and extending east to the Ukraine.

Habitat and ecology Both in Britain and in mainland Europe this species seems to be most often recorded from bushes and the lower parts of trees growing in exposed and sunny positions. On the continent it has been recorded particularly from oak *Quercus*, but has also been found on yew *Taxus baccata* in Britain. British specimens have been found on bushes growing on open limestone grassland or on limestone pavement. There are currently so few British records that it is impossible to say whether this association with limestone is significant. The biology of the species is poorly known. Adults have been collected in August and October in Britain, and in June and July elsewhere in Europe. Fourth instar nymphs have been found as late as October, and nymphs probably overwinter. In mainland Europe nymphs have also been found in April and August. It has been suggested that *I. muscaeformis* may have a two-year life-cycle, but equally it may be that there is a rather disorganised single annual generation, with growth rates differing widely between individual nymphs.

Status Uncertain, though clearly very local. Populations of the commoner *I. coleoptratus* in southern Britain can be decidedly localised and readily overlooked. If the same is true of *I. muscaeformis* there may be many more populations awaiting discovery in northern England.

Threats If the habitat requirement of this species is for bushes or trees with low growth in open and sunny situations, long-term stability of suitable environmental conditions may depend on the exact management of the site. On grassland, the level of grazing will be critical: too heavy a grazing pressure will remove low growth from bushes and trees, and prevent regeneration of further scrub; too little grazing will produce dense scrub and shading. On limestone pavement prolonged exposure to grazing animals may remove or drastically reduce the extent of tree and bush growth in the long term. The destruction of limestone pavement by removal for rockery stone continues to be a threat in places. On grassland sites, an additional threat is posed by the improvement of grassland for farming purposes: even if isolated trees and bushes are left in the course of such improvement, the increased grazing levels which are possible afterwards are unlikely to be compatible with vegetation structure suitable for *I. muscaeformis* in the long term.

Conservation Light grazing is the best management for recorded habitats. Management should aim to maintain varied vegetation structure, and to leave shrubs and small trees in place, and with good low growth, not greatly trimmed by animals. Management by cutting should be perfectly compatible with the maintenance of suitable scrub structure, provided care is taken to ensure adequate regeneration.

References Le Quesne, W.J. (1983a), Le Quesne, W.J. (1985), Nast, J. (1972), Ossiannilsson, F. (1981), Ossiannilsson, F. (1983), Payne, K. (1979b), Payne, K. (1981).

Order HEMIPTERA

Family TETTIGOMETRIDAE

Tettigometra impressopunctata Dufour**Identification** Le Quesne (1960).**Distribution** Southern England and Wales. There are records from Oxfordshire, Buckinghamshire, Surrey, Kent, Wiltshire, Isle of Wight, Dorset, Gloucestershire, Glamorgan and Pembrokeshire. It is found elsewhere in central and southern Europe, and extends east to the Ukraine and Russia.**Habitat and ecology** Chalk and limestone grassland, and calcareous dunes. It is typically a species of fairly short or thin grassy vegetation, often with patches of bare ground or sand. It is usually found in sheltered hollows and on south-facing slopes. The associated vegetation, in addition to grasses, usually contains thyme *Thymus drucei* and other low calcicoles. The foodplants are apparently unknown. Adults may be found for much of the year, and there are records from February to May, and from July to October, implying overwintering as an adult. The overwintering sites are not known, but there may be a need for tussocky vegetation or thick moss nearby to provide suitable hibernation sites. All stages appear to spend most of their time on or near the ground.**Status** Very local.**Threats** Improvement and ploughing of calcareous grassland; loss of grazing on calcareous grassland, brought about by cessation of stock grazing in many areas and by the decimation of the rabbit population by myxomatosis, leading to dominance by coarse grasses and to scrub invasion. Dunes have been less seriously damaged in recent decades than calcareous grassland, but reduction of rabbit populations may have had a measurable effect in such sites by reducing the extent of short vegetation with high insolation. Developments associated with recreation, such as camping and caravan sites, and the erosion associated with increased public pressure, increasingly threaten a number of dune systems.**Conservation** Management of calcareous grassland should aim to maintain species-rich turf and a good range of vegetation structure, including both areas of short or sparse turf, ideally with areas of bare ground, and longer swards or tussocks. Such structure is best maintained by grazing, and grazing stock should be maintained or introduced wherever possible. Rabbits are particularly effective in producing a small-scale mosaic of areas of disturbed bare ground, short turf, and longer vegetation. Rabbit populations should be maintained or encouraged wherever possible, for example by the maintenance of areas of scrub used for shelter or burrowing, but it is unlikely that on the majority of sites rabbit grazing alone will be sufficient to maintain suitable structure. A rotational regime of grazing may be suitable for the species, but its mobility is not known, and it cannot be guaranteed that it will be able to move between suitable areas with the necessary efficiency to maintain viable populations in the long term. A consistent management regime which will maintain suitable conditions continually on the same area of ground is preferable. If grazing is not possible, a rotational cutting regime may be used as an alternative, but is less likely to be satisfactory. Management by cutting will be more successful if the effects are enhanced by localised rabbit grazing. Sites on sand dunes may need no active management, but some grazing may be beneficial. Rabbits may be adequate to supply such grazing on many sites, but the addition of small numbers of grazing stock to larger dune systems may be beneficial.**References** Anon, (1987), Duffield, C.A.W. (1960b), Edwards, J. (1896), Le Quesne, W.J. (1960c), Marshall, T.A. (1866a), Scott, J. (1871a).

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<i>Hypnum</i>	60,61,137	<i>maritima, Artemisia</i>	18,160
I		<i>maritima, Puccinellia</i>	18,19,152,154,156, 190
<i>idaeus, Rubus</i>	31,151	<i>maritima, Suaeda</i>	154
<i>incana, Alnus</i>	168	<i>maritimum, Erodium</i>	39
<i>incana, Salix</i>	198	<i>maritimus, Scirpus</i>	18,192
iris, stinking	108	marjoram	35
<i>Iris</i>	108,145,191	marram	19,59,65,102,134, 196
<i>italica, Populus nigra</i> var	97,179	<i>Matricaria</i>	21
ivy	47,179	mayweed	21
ivy, ground	55	medic	46
J		Medic, black	46,66,108,124
<i>jacobeae, Senecio</i>	14,	<i>Medicago</i>	46,66,108,124,184
<i>Jasione</i>	131	<i>Melampyrum</i>	6,34,107,110,111
<i>Juncus</i>	18,19,75,135,144, 183,190,207,212, 216	mellilot, tall	46
juniper	15,35,40,60,61, 114,121,136	<i>Micropus</i>	106
<i>Juniperus</i>	40,60,61,114,121, 136	<i>millefolium, Achillea</i>	153
K		millet	84,189
<i>kali, Salsola</i>	125	<i>minor, Rhinanthus</i>	34
<i>Knautia</i>	129	mistletoe	98
knotweed	184	<i>minutissimus, Carduncellus</i>	119
L		<i>Molinia</i>	17,75,134,151,157, 158,217
<i>lacustris, Schoenoplectus</i>	85,207	<i>mollis, Holcus</i>	199
<i>laevis, Ulmus</i>	179	<i>mollugo, Galium</i>	16
		<i>monogyna, Crataegus</i>	47,113
		<i>montana, Jasione</i>	131
		moss	20,38,39,44,49,55, 56,57,58,59,60,61, 62,66,68,70,71,73, 74,77,81,83,84,87, 88,92,105,110,137 143,158
		moss (cont)	76
		mouse-ear, little	76
		mugwort	160
		mullein	84,92
		<i>myrtilus, Vaccinium</i>	31,114,198
		<i>Myosotis</i>	62

<i>Myrica</i>	151,152,205		137,150,191,201
myrtle,bog	151,205		222
N		pine,Scots	2,4,12,24,60,61,62, 125,136,150
<i>Nardus</i>	157	<i>pinnatum,Brachypodium</i>	212,221
<i>natans,Potamogeton</i>	185	<i>Pinus</i>	60,62,125,135,150
nettle	7,16,120	<i>Plantago</i>	21,44,205
<i>nigra,Ballota</i>	55,78	Plantain,bucks-horn	21,44
<i>nigra,Carex</i>	181	ribwort	200
<i>nigra,Centaurea</i>	13,37	<i>Pleurococcus</i>	6
<i>nigra,Populus</i>	97,179	<i>Pleurozium</i>	87
<i>nigricans,Schoenus</i>	161	<i>Poa</i>	209
<i>nigrum,Empetrum</i>	60	pondweed,broad-leaved	185
<i>nissolia,Lathyrus</i>	84	poplar,lombardy	97,179
<i>Nothophagus</i>	172	black	97,179
<i>Nuphar</i>	185	grey	131
<i>Nymphaea</i>	185	white	97
O		<i>Populus</i>	97
Oak	93,99,110,131, 150,173,178,194, 226	<i>Polygonum</i>	184
pedunculate	172,173	<i>portaculoides,Halimione</i>	18,63,154,156
sessile	172,173	<i>portlandica,Euphorbia</i>	52,53
Turkey	172	potato	120,184
oat	215	<i>Potentilla</i>	44,49,74
<i>obliqua,Nothophagus</i>	172	<i>pratense,Cardamine</i>	8,41
<i>Odontites</i>	110	<i>pratense,Melampyrum</i>	6,34,107,110
<i>odoratum,Anthoxanthum</i>	200,219	<i>pratensis,Lathyrus</i>	103,108
<i>officinalis,Valeriana</i>	6	<i>pratensis,Salvia</i>	117
<i>officinarum,Pilosella</i>	44,74	<i>procera,Nothophagus</i>	172
<i>Onoperdon</i>	91	<i>procera,Ulmus</i>	168,178,179,182, 183
<i>Origanum</i>	35	<i>Prunella</i>	66
<i>Ornithopus</i>	103	<i>Prunus</i>	31,91,113
osier	170	<i>pseudacorus,Iris</i>	191
<i>ovina,Festuca</i>	220	<i>pseudocyperus,Carex</i>	144,145
<i>oxycoccus,Vaccinium</i>	114	<i>pseudoplatanus,Acer</i>	90
P		<i>Pteridium</i>	194
<i>palustre,Cirsium</i>	49	<i>Puccinellia</i>	18,19,152,154,156, 190
<i>palustre,Galium</i>	17	<i>pulchrum,Hypericum</i>	42,49
<i>palustris,Caltha</i>	137	<i>pumila,Ulmus</i>	179
<i>palustris,Lathyrus</i>	104	<i>purpurea,Salix</i>	198
<i>palustris,Potentilla</i>	49	purse,shepherd's	76
<i>panicea,Carex</i>	181	purslane,sea	18,63,154,156
<i>Panicum</i>	84,189	<i>pyramidalis,Populus</i>	97
<i>paralias,Euphorbia</i>	52,89	<i>Pyrus</i>	91,113
<i>Parietina</i>	158	Q	
pea,marsh	104	<i>Quercus</i>	172,173,194,226
pellitory-of-the-wall	59	R	
pepper,wall	74 (see <i>Sedum</i> acre)	ragwort	14
<i>perenne,Lolium</i>	204	<i>ramosissima,Salicornia</i>	125
<i>perforatum,Hypericum</i>	42,58	raspberry	31,151
<i>perpusillus,Ornithopus</i>	103	rattle,yellow	34
<i>petandra,Salix</i>	126	reed	151,152,187,192, 200,205,210,216, 224
<i>petraea,Quercus</i>	172,173	reed,common	17,161,192,201, 208
<i>Phalaris</i>	109,222	purple small	109,209,213,218
<i>Phlox</i>	120	wood small	213
<i>Phragmites</i>	17,49,151,161,187, 192,193,200,205, 208,216,224	<i>repens,Elymus</i>	84,192
<i>Pilosella</i>	44,74	<i>repens,Salix</i>	20,114,122,128, 198
pine	22,30,48,61,79,93, 116,121,124,128,	<i>repens,Trifolium</i>	153
		<i>reptans,Ajuga</i>	92
		<i>Rhacomitrium</i>	60
		<i>Rhamnoides,Hippophae</i>	43

<i>Rhinanthus</i>	34	<i>Sedum</i>	74,76,77,111,112
rhododendron	2,12	selfheal	66
<i>Ribes</i>	31	<i>semicundrum, Cerastium</i>	76
<i>robur, Quercus</i>	172,173	<i>sempervirens, Buxus</i>	47
rockrose	23,67,171,194	<i>sempervivum, Sedum</i>	111
common	67	<i>Senecio</i>	14
white	67	<i>Setaria</i>	189
<i>Rosa</i>	31,170	sloe	55
<i>rosea, Althaea</i>	120	smock, lady's	8,41
rose	170	<i>Solanum</i>	120,184
rose, dog	31	<i>Sorbus</i>	91,169
<i>rostrata, Carex</i>	134,224	sorrel	11,47,48
rowan	169	sorrel, sheep's	11,47
<i>rubrum, Ribes</i>	31	<i>sophia, Descuriania</i>	41
<i>Rubus</i>	31,151	<i>Spartina</i>	142
<i>Rumex</i>	11,47,153,198,200	<i>spergularia</i>	86
<i>rupestris, Puccinellia</i>	190	<i>Sphagnum</i>	17,75,82,137,143, 211,217
<i>rupicola, Spargularia</i>	86	spike-rush	224
rush,	135,143,207,212, 224,226	<i>spinosa, Prunus</i>	31
black bog	161	<i>squarrosus, Juncus</i>	183
blunt flowered	216	spruce	30
heath	183	spurge,	59
saltmarsh	190	Cypress	52
soft	144	leafy	53
		Portland	52,53
S		sea	52,89
		wood	6,53,89
<i>sabina, Juniperus</i>	114	<i>Stachys</i>	16
<i>Salsola</i>	125	St. John's wort, perforate	42,58
sage, wood	44	slender	42,49
<i>Salicornia</i>	18,125	stonecrop	76,111
<i>salina, Juniperus</i>	136	broad leaved	111
<i>Salix</i>	20,105,114,122, 123,126,128,151, 170,194,198	white	111
	114,115,128,131, 151,194	yellow	76
sallow	151,194	storksbill	9,20,38,39,44,45, 59,70,76,79
saltwort	125	<i>Suaeda</i>	154
<i>Salvia</i>	117	<i>subnodosus, Juncus</i>	216
<i>Santolina</i>	160	swine-cress, Lesser	41
<i>Sarothamnus</i>	175	sycamore	24,90,100
<i>sativa, Cannabis</i>	179	<i>sylvatica, Stachys</i>	16
<i>sativa, cucumis</i>	120	<i>sylvaticus, Scirpus</i>	85,86
<i>sativa, Medicago</i>	184	<i>sylvestris, Malus</i>	91
<i>sativa, Vicia</i>	108	<i>sylvestris, Pinus</i>	60,62,125,136, 150
<i>saxatile, Galium</i>	33,108		
scabious, field	129	T	
sheep's bit	131	<i>tabernaemontani, Potentilla</i>	74,
<i>Schoenoplectus</i>	85	<i>tabernaemontani, Schoenoplectus</i>	85,207
<i>Schoenus</i>	161	Tamarisk	2,
<i>schreberi, Pleurozium</i>	87	<i>Tamarix</i>	2,
<i>Scirpus</i>	18,85,86,186,192, 207	<i>Tanacetum</i>	160
	175	Tansey	160
<i>scoparius, Sarothamnus</i>	175	<i>Taraxacum</i>	153
<i>scorodonia, Teucrium</i>	44	<i>Taxus</i>	226
seablite, annual	154	<i>Teucrium</i>	44
shrubby	154	<i>Thesium</i>	35
sedge	135,153,162,163, 164,181,191,212, 216,217,224,225, 226	thistle	91
bottle	224	thistle, marsh	49
sedge, carnation	181	<i>thracica, Anthemis</i>	91
common	181	thyme	23,64,65,88,159, 227
Cyperus	144,145	<i>Thymus</i>	23,64,88,159,227
sand	222	<i>Tilia</i>	193
saw	161	toadflax, bastard	35
slender	134,161	tormentil	49,132
star	181	trefoil, birds-foot	103,108
		large birds-foot	6,17,103,104,107

<i>triandra, Salix</i>	198	X	
trefoil, birds foot	103, 108		
large	6, 17, 103, 104, 107	<i>xylosteum, Lonicera</i>	31
<i>Trifolium</i>	77, 108, 153, 184		
<i>tripolium, Aster</i>	18	Y	
<i>trivialis, Poa</i>	209		
<i>tuberosum, Solanum</i>	120, 184	yew	35, 47, 226
U			
<i>Ulex</i>	108		
<i>uliginosus, Lotus</i>	6, 17, 103, 104		
<i>Ulmus</i>	168, 173, 178, 179, 182, 184		
<i>ulva-ursi, Arctostaphyles</i>	22, 60, 114, 116		
umbellifers	41		
<i>Urtica</i>	16, 120		
V			
<i>Vaccinium</i>	31, 32, 114, 198		
valerian	6, 54		
<i>Valeriana</i>	6, 54		
<i>Valerianella</i>	6, 54		
var <i>italica, Populus nigra</i>	97, 179		
<i>Verbascum</i>	84, 92		
<i>verum, Galium</i>	32, 33, 119, 130, 200		
vetch, common	108		
horseshoe	200		
tufted	103		
vetchling, grass	84		
meadow	103, 108		
<i>Vicia</i>	103, 108		
<i>viminalis, Salix</i>	170		
<i>Viola</i>	13		
violet	13		
<i>Viscium</i>	98		
<i>vivipara, Festuca</i>	167		
<i>vulgare, Cynoglossum</i>	62		
<i>vulgare, Echium</i>	14, 20, 62, 200		
<i>vulgare, Leucanthemum</i>	87		
<i>vulgare, Origanum</i>	35		
<i>vulgare, Tanacetum</i>	160		
<i>vulgaris, Artemisia</i>	160		
<i>vulgaris, Calluna</i>	8, 73, 84, 116, 127, 172, 198, 201		
<i>vulgaris, Prunella</i>	66		
W			
water-lily, white	185		
yellow	185		
whin, petty	175		
willow	24, 105, 170, 198		
eared	170		
bay	126		
crack	170		
creeping	20, 114, 115, 122, 123, 128, 129, 132, 198		
white	105, 123, 170		
willowherb, rosebay	198		
wormwood	159		
field	84		
sea	18, 160		
wormwood, field	84		
woundwort, hedge	16		

APPENDIX 1. RED DATA BOOK AND NOTABLE SPECIES LISTED BY FAMILY

Aradidae			<i>Eremocoris plebejus</i> (Fallen)	Notable B
<i>Aradus aterrimus</i> Fieber	RDB 3		<i>Graptopeltus lynceus</i> (Fabricius)	Notable B
<i>Aradus betulae</i> (Linnaeus)	Notable B		<i>Henestaris halophilus</i> (Burmeister)	RDB 2
<i>Aradus corticalis</i> (Linnaeus)	RDB 3		<i>Heterogaster artemisiae</i> Schilling	Notable B
Acanthosomatidae			<i>Ischnodemus quadratus</i> Fieber	RDB 1
<i>Elasmucha ferrugata</i> (Fabricius)	Extinct		<i>Lasiosomus enervis</i> (Herrich-Schaeffer)	Notable B
Cydniidae			<i>Macroplox preyssleri</i> (Fieber)	RDB 3
<i>Geotomus punctulatus</i> (Costa)	RDB 1		<i>Megalonotus antennatus</i> (Schilling)	Notable B
<i>Legnotus picipes</i> (Fallen)	Notable B		<i>Megalonotus dilatatus</i> (Herrich-Schaeffer)	Notable B
<i>Sehirus biguttatus</i> (Linnaeus)	Notable B		<i>Megalonotus praetextatus</i> (Herrich-Schaeffer)	Notable B
<i>Sehirus dubius</i> (Scopoli)	Notable B		<i>Megalonotus sabulicola</i> (Thomson)	Notable B
Scutelleridae			<i>Nysius graminicola</i> (Kolenati)	RDB 3
<i>Eurygaster austriaca</i> (Schrank)	Extinct		<i>Nysius helveticus</i> (Herrich-Schaeffer)	RDB 3
<i>Eurygaster maura</i> (Linnaeus)	Notable B		<i>Ortholomus punctipennis</i> (Herrich-Schaeffer)	RDB 3
<i>Odontoscelis fuliginosa</i> (Linnaeus)	RDB 3		<i>Pachybrachius luridus</i> (Hahn)	RDB 3
<i>Odontoscelis lineola</i> Rambur	Notable B		<i>Peritrechus gracilicornis</i> Puton	RDB K
Pentatomidae			<i>Pionosomus varius</i> (Wolff)	RDB 3
<i>Chlorochroa juniperina</i> (Linnaeus)	Extinct		<i>Pterometus staphyliniformis</i> (Schilling)	RDB 3
<i>Eurydema dominulus</i> (Scopoli)	Notable A		<i>Raglius alboacuminatus</i> (Goeze)	Notable B
<i>Eysarcoris aeneus</i> (Scopoli)	RDB 3		<i>Rhyparochromus pini</i> (Linnaeus)	Notable B
<i>Holcostethus vernalis</i> (Wolff)	RDB 3		<i>Scolopostethus pictus</i> (Schilling)	Notable A
<i>Jalla dumosa</i> (Linnaeus)	Extinct		<i>Taphropeltus hamulatus</i> (Thomson)	Notable B
<i>Sciocoris cursitans</i> (Fabricius)	Notable B		<i>Taphropeltus limbatus</i> (Fieber)	RDB 3
Coreidae			<i>Trapezonotus ullrichi</i> (Fieber)	RDB 3
<i>Arenocoris waltli</i> (Herrich-Schaeffer)	RDB 2		<i>Tropistethus holosericeus</i> (Scholtz)	Notable B
<i>Bathysolen nubilus</i> (Fallen)	Notable B		Berytinidae	
<i>Gonocerus acuteangulatus</i> (Goeze)	RDB 1		<i>Berytinus hirticornis</i> (Brulle)	Notable B
<i>Spathocera dahlmanni</i> (Schilling)	Notable A		<i>Cymus aurescens</i> Distant	Notable A
Rhopalidae			Piesmatidae	
<i>Rhopalus maculatus</i> (Fieber)	Notable B		<i>Piesma quadratum spergulariae</i> Woodruffe	RDB 3
<i>Rhopalus rufus</i> Schilling	RDB 3		Tingidae	
<i>Stictopleurus abutilon</i> (Rossi)	Extinct		<i>Acalypta platycheila</i> (Fieber)	Notable B
<i>Stictopleurus punctatonevrosus</i> (Goeze)	Extinct		<i>Catoplatys fabricii</i> (Stal)	Notable B
Pyrrhocoridae			<i>Lastacantha capucina</i> Germar	RDB 3
<i>Pyrrhocoris apterus</i> (Linnaeus)	RDB 1		<i>Onchochila simplex</i> (Herrich-Schaeffer)	Notable A
Stenocephalidae			<i>Physatocheila harwoodi</i> China	RDB 1
<i>Dicranocephalus agilis</i> (Scopoli)	Notable B		<i>Physatocheila smreczynskii</i> China	Notable A
<i>Dicranocephalus medius</i> (Mulsant & Rey)	Notable B		<i>Tingis angustata</i> (Herrich-Schaeffer)	RDB 3
Lygaeidae			<i>Tingis reticulata</i> Herrich-Schaeffer	Notable B
<i>Acompus pallipes</i> (Herrich-Schaeffer)	RDB 3		Reduviidae	
<i>Aphanus rolandri</i> (Linnaeus)	Notable A		<i>Empicoris baerensprungi</i> (Dohrn)	Notable A
<i>Drymus latus</i> Douglas & Scott	Notable B		<i>Pygolampis bidentata</i> (Goeze)	RDB K
<i>Drymus pilicornis</i> (Mulsant)	Notable B		Nabidae	
<i>Drymus pilipes</i> Fieber	Notable A		<i>Nabis brevis</i> Scholtz	RDB 3
<i>Drymus pumilio</i> Puton	Notable B		<i>Nabis pseudoferus</i> Remane	Notable B
<i>Emblethis verbasci</i> (Fabricius)	RDB 3		<i>Prostemma guttula</i> (Fabricius)	Extinct
<i>Eremocoris abietis</i> (Linnaeus)	Notable B		Cimicidae	
<i>Eremocoris fenestratus</i> (Herrich-Schaeffer)	RDB 1		<i>Anthocoris amplicollis</i> Horvath	RDB 3
			<i>Anthocoris minki</i> Dohrn	RDB 3
			<i>Anthocoris visci</i> Douglas	Notable B
			<i>Cimex columbarius</i> Jenyns	RDB 3
			<i>Temnostethus tibialis</i> Reuter	RDB 3
			<i>Xylocoridae brevipennis</i> Reuter	Notable B
			<i>Xylocoris formicetorum</i> (Boheman)	Notable A

Microphysidae			
<i>Myrmedobia coleoprata</i> (Fallen)		Notable B	
<i>Myrmedobia inconspicua</i> (Douglas & Scott)		Notable B	
Miridae			
<i>Adelphocoris seticornis</i> (Fabricius)		Notable A	
<i>Adelphocoris ticiensis</i> (Meyer-Dur)		Notable B	
<i>Agnocoris reclairei</i> (Wagner)		Notable B	
<i>Amblytylus brevicollis</i> Fieber		Notable B	
<i>Amblytylus delicatus</i> (Perris)		RDB 3	
<i>Capsodes flavomarginatus</i> (Donovan)		Notable A	
<i>Capsodes sulcatus</i> (Fieber)		Notable B	
<i>Capsus wagneri</i> Remane		Notable B	
<i>Charagochilus weberi</i> (Wagner)		RDB 3	
<i>Chlamydatus evanescens</i> (Boheman)		RDB 3	
<i>Chlamydatus pulicarius</i> (Fallen)		Notable B	
<i>Deraeocoris olivaceus</i> (Fabricius)		Notable B	
<i>Dichroscytus gustavi</i> Josifov		Notable B	
<i>Globiceps cruciatus</i> (Reuter)		Notable B	
<i>Globiceps flavomaculatus</i> (Fabricius)		Notable B	
<i>Globiceps juniperi</i> Reuter		Notable B	
<i>Hadrodemus m-flavum</i> (Goeze)		Extinct	
<i>Hallodapus montandoni</i> (Reuter)		RDB 3	
<i>Halticus macrocephalus</i> Fieber		RDB K	
<i>Halticus saltator</i> (Geoffroy in Fourcroy)		Notable B	
<i>Lygus pratensis</i> (Linnaeus)		RDB 3	
<i>Lygus punctatus</i> (Zetterstedt)		Notable B	
<i>Monosynamma bohemani</i> (Fallen)		RDB 3	
<i>Monosynamma maritima</i> Wagner		RDB 3	
<i>Monosynamma sabulicola</i> Wagner		Notable B	
<i>Myrmecoris gracilis</i> (Sahlberg)		RDB 3	
<i>Orthotylus fuscescens</i> (Kirschbaum)		Notable B	
<i>Orthotylus rubidus</i> (Fieber in Puton)		RDB 3	
<i>Orthotylus virens</i> (Fallen)		Notable B	
<i>Phytocoris insignis</i> Reuter		RDB 3	
<i>Pilophorus confusus</i> (Kirschbaum)		RDB 1	
<i>Pliacochilus seladonicus</i> (Fallen)		RDB K	
<i>Polymerus vulneratus</i> (Wolf)		RDB 1	
<i>Psallus albicinctus</i> (Kirschbaum)		Notable B	
<i>Strongylocoris luridus</i> (Fallen)		Notable B	
<i>Systellonotus triguttatus</i> (Linnaeus)		Notable B	
<i>Teratocoris caricis</i> Kirkaldy		Notable B	
<i>Trigonotylus psammaecolor</i> Reuter		Notable B	
<i>Tytthus geminus</i> (Flor)		Notable B	
<i>Zygimus nigriceps</i> (Fallen)		Notable A	
Dipsocoridae			
<i>Pachycoleus waitli</i> Fieber		Notable B	
Saldidae			
<i>Aepophilus bonnairei</i> Signoret		Notable B	
<i>Micracanthia marginalis</i> (Fallen)		Notable A	
<i>Saldula arenicola</i> (Scholtz)		Notable A	
<i>Saldula fucicola</i> (Sahlberg)		Notable B	
<i>Saldula opacula</i> (Zetterstedt)		Notable B	
<i>Saldula setulosa</i> (Puton)		RDB 2	
Hebridae			
<i>Hebrus pusillus</i> (Fallen)		Notable B	
Hydrometridae			
<i>Hydrometra gracilentata</i> Horvath		RDB 3	
Veliidae			
<i>Microvelia buenoi umbricola</i> Wroblewski		RDB 3	
<i>Microvelia pygmaea</i> (Dufour)		Notable B	
Gerridae			
<i>Aquarius paludum</i> (Fabricius)		Notable B	
Corixidae			
<i>Corixa iberica</i> Anderson		Notable B	
<i>Micronecta minutissima</i> (Linnaeus)		RDB 3	
<i>Sigara striata</i> (Linnaeus)		Notable B	
Cicadidae			
<i>Cicadetta montana</i> (Scopoli)		RDB 1	
Cercopidae			
<i>Aphrophora alpina</i> Melichar		Notable B	
<i>Neophilaenus longiceps</i> Puton		Notable A	
Cicadellidae			
<i>Agallia brachyptera</i> (Boheman)		Notable B	
<i>Aphrodes aestuarinus</i> (Edwards)		Notable B	
<i>Aphrodes albiger</i> (Germar)		Notable B	
<i>Aphrodes duffieldi</i> Le Quesne		RDB K	
<i>Aphrodes limicola</i> (Edwards)		Notable B	
<i>Aphrodes trifasciatus</i> (Geoffroy in Fourcroy)		Notable B	
<i>Austroagallia sinuata</i> (Mulsant & Rey)		RDB K	
<i>Austroasca vittata</i> (Lethierry)		Notable A	
<i>Chlorita dumosa</i> Ribaut		Notable A	
<i>Chlorita viridula</i> (Fallen)		Notable A	
<i>Cicadella lasiocarpae</i> Ossiannilsson		Notable A	
<i>Cicadula flori</i> (J.Sahlberg)		Notable B	
<i>Cicadula ornata</i> (Melichar)		Notable B	
<i>Cicadula quinquenotata</i> (Boheman)		Notable B	
<i>Cosmotettix caudatus</i> (Flor)		Notable A	
<i>Cosmotettix costalis</i> (Fallen)		RDB K	
<i>Cosmotettix panzeri</i> (Flor)		Notable B	
<i>Doratura impudica</i> Horvath		RDB K	
<i>Ebarrius cognatus</i> (Fieber)		Notable B	
<i>Edwardsiana alnicola</i> (Edwards)		Notable B	
<i>Edwardsiana ishidaei</i> (Matsumura)		Notable B	
<i>Edwardsiana lanternae</i> (Wagner)		Notable B	
<i>Edwardsiana rosaesugans</i> (Cerutti)		RDB K	
<i>Edwardsiana tersa</i> (Edwards)		Notable B	
<i>Emelyanoviana contraria</i> (Ribaut)		Notable A	
<i>Erythria aureola</i> (Fallen)		RDB K	
<i>Eurhadina kirschbaumi</i> Wagner		Notable A	
<i>Eurhadina ribauti</i> Wagner		Notable B	
<i>Euscelidius schenckii</i> (Kirschbaum)		Notable A	
<i>Euscelidius variegatus</i> (Kirschbaum)		Notable B	
<i>Euscelis ohausi</i> Wagner		Notable B	
<i>Euscelis venosus</i> (Kirschbaum)		RDB K	
<i>Hephathus nanus</i> (Herrich-Schaeffer)		Notable B	
<i>Iassus scutellaris</i> (Fieber)		Notable A	
<i>Idiocerus fulgidus</i> (Fabricius)		Notable A	
<i>Kyboasca bipunctata</i> (Oshanin)		Notable A	
<i>Kybos calyculus</i> (Cerutti)		Notable B	
<i>Limotettix atricapillus</i> (Boheman)		RDB K	
<i>Macropsis glandacea</i> (Fieber)		RDB K	
<i>Macropsis mendax</i> (Fieber)		Notable B	
<i>Macrosteles alpinus</i> (Zetterstedt)		Notable B	
<i>Macrosteles cristatus</i> (Ribaut)		Notable B	
<i>Macrosteles cyane</i> (Boheman)		RDB K	
<i>Macrosteles fieberi</i> (Edwards)		Notable B	
<i>Macrosteles frontalis</i> (Scott)		Notable B	
<i>Macrosteles lividus</i> (Edwards)		RDB K	

<i>Macrosteles oshanini</i> Razvyaskina	RDB K	<i>Chloriona dorsata</i> Edwards	Notable B
<i>Macrosteles quadripunctulatus</i> (Kirschbaum)	Notable A	<i>Chloriona vasconica</i> Ribaut	Notable B
<i>Macrosteles sordidipennis</i> (Stal)	Notable B	<i>Criomorphus moestus</i> (Boheman)	Notable B
<i>Metalimnus formosus</i> (Boheman)	RDB K	<i>Criomorphus williamsi</i> China	Notable B
<i>Mocuellus collinus</i> (Boheman)	RDB K	<i>Delphacodes capnodes</i> (Scott)	Notable B
<i>Paralimnus phragmitis</i> (Boheman)	Notable B	<i>Dicranotropis divergens</i> Kirschbaum	Notable B
<i>Pediopsis tiliæ</i> (Germar)	Notable B	<i>Eurysa douglasi</i> (Scott)	Notable A
<i>Platymetopius undatus</i> (Degeer)	Notable A	<i>Eurysula lurida</i> (Fieber)	Notable A
<i>Psammotettix albomarginatus</i> Wagner	Notable B	<i>Florodelphax paryphasma</i> (Flor)	Notable A
<i>Psammotettix frigidus</i> (Boheman)	Notable A	<i>Laodelphax striatellus</i> (Fallen)	Notable A
<i>Psammotettix maritimus</i> (Perris)	RDB K	<i>Megamelodes lequesnei</i> Wagner	Notable B
<i>Psammotettix striatus</i> (Linnaeus)	RDB K	<i>Oncodelphax pullulus</i> (Boheman)	Notable B
<i>Sagatus punctifrons</i> (Fallen)	RDB K	<i>Paradelphacodes paludosus</i> (Flor)	Notable A
<i>Scleroracis decumanus</i> (Kontkanen)	Notable B	<i>Paraliburnia chlypealis</i> (J.Sahlberg)	RDB K
<i>Stroggylocephalus livens</i> (Zetterstedt)	Notable B	<i>Ribautodelphax angulosus</i> (Ribaut)	Notable B
<i>Ulopa trivialis</i> Germar	Notable B	<i>Ribautodelphax imitans</i> (Ribaut)	RDB K
<i>Zygina rubrovittata</i> (Lethierry)	Notable B	<i>Ribautodelphax pallens</i> (Stal)	RDB K
		<i>Ribautodelphax pungens</i> (Ribaut)	Notable B
Cixiidae		<i>Stenocranus fuscovittatus</i> (Stal)	Notable B
<i>Cixius caledonicus</i> China	RDB K	<i>Stiroma bicarinata</i> (Herrich-Schaeffer)	Notable B
<i>Cixius cambricus</i> China	Notable B	<i>Struebingianella dalei</i> (Scott)	Notable B
<i>Cixius remotus</i> Edwards	Notable B	<i>Struebingianella lioralis</i> (Reuter)	Notable B
<i>Oliarus leporinus</i> (Linnaeus)	Notable B	<i>Xanthodelphax flaveolus</i> (Flor)	Notable A
<i>Oliarus panzeri</i> Low	Notable B		
<i>Trigonocranus emmeae</i> Fieber	Notable B	Issidae	
		<i>Issus muscaeformis</i> (Schrank)	Notable B
Delphacidae		Tettigometridae	
<i>Asiraca clavicornis</i> (Fabricius)	Notable B	<i>Tettigometra impressopunctata</i> Dufour	Notable B
<i>Calligypona reyi</i> (Fieber)	RDB K		

APPENDIX 2. ALPHABETIC LIST OF RED DATA BOOK AND NOTABLE SPECIES.

<i>Acalypta platycheila</i> (Fieber)	Notable B	<i>Drymus pumilio</i> Puton	Notable B
<i>Acompus pallipes</i> (Herrich-Schaeffer)	RDB 3	<i>Ebarrius cognatus</i> (Fieber)	Notable B
<i>Adelphocoris seticornis</i> (Fabricius)	Notable A	<i>Edwardsiana alnicola</i> (Edwards)	Notable B
<i>Adelphocoris ticinensis</i> (Meyer-Dur)	Notable B	<i>Edwardsiana ishidai</i> (Matsumura)	Notable B
<i>Aepophilus bonnairei</i> Signoret	Notable B	<i>Edwardsiana lanternae</i> (Wagner)	Notable B
<i>Agallia brachyptera</i> (Boheman)	Notable B	<i>Edwardsiana rosaesugans</i> (Cerutti)	RDB K
<i>Agnocoris reclairei</i> (Wagner)	Notable B	<i>Edwardsiana tersa</i> (Edwards)	Notable B
<i>Amblytylus brevicollis</i> Fieber	Notable B	<i>Elasmucha ferrugata</i> (Fabricius)	Extinct
<i>Amblytylus delicatus</i> (Perris)	RDB 3	<i>Emblethis verbasci</i> (Fabricius)	RDB 3
<i>Anthocoris amplicollis</i> Horvath	RDB 3	<i>Emelyanoviana contraria</i> (Ribaut)	Notable A
<i>Anthocoris minki</i> Dohrn	RDB 3	<i>Empicoris baerensprungi</i> (Dohrn)	Notable A
<i>Anthocoris visci</i> Douglas	Notable B	<i>Eremocoris abietis</i> (Linnaeus)	Notable B
<i>Aphanus rolandri</i> (Linnaeus)	Notable A	<i>Eremocoris fenestratus</i> (Herrich-Schaeffer)	RDB 1
<i>Aphrodes aestuarinus</i> (Edwards)	Notable B	<i>Eremocoris plebejus</i> (Fallen)	Notable B
<i>Aphrodes albiger</i> (Germar)	Notable B	<i>Erythria aureola</i> (Fallen)	RDB K
<i>Aphrodes duffieldi</i> Le Quesne	RDB K	<i>Eurhadina kirschbaumi</i> Wagner	Notable A
<i>Aphrodes limicola</i> (Edwards)	Notable B	<i>Eurhadina ribauti</i> Wagner	Notable B
<i>Aphrodes trifasciatus</i> (Geoffroy in Fourcroy)	Notable B	<i>Eurydema dominulus</i> (Scopoli)	Notable A
<i>Aphrophora alpina</i> Melichar	Notable B	<i>Eurygaster austriaca</i> (Schrank)	Extinct
<i>Aquarius paludum</i> (Fabricius)	Notable B	<i>Eurygaster maura</i> (Linnaeus)	Notable B
<i>Aradus aterrimus</i> Fieber	RDB 3	<i>Eurysa douglasi</i> (Scott)	Notable A
<i>Aradus betulae</i> (Linnaeus)	Notable B	<i>Eurysula lurida</i> (Fieber)	Notable A
<i>Aradus corticalis</i> (Linnaeus)	RDB 3	<i>Euscelidius schenckii</i> (Kirschbaum)	Notable A
<i>Arenocoris waitli</i> (Herrich-Schaeffer)	RDB 2	<i>Euscelidius variegatus</i> (Kirschbaum)	Notable B
<i>Asiraca clavicornis</i> (Fabricius)	Notable B	<i>Euscelis ohausi</i> Wagner	Notable B
<i>Austroagallia sinuata</i> (Mulsant & Rey)	RDB K	<i>Euscelis venosus</i> (Kirschbaum)	RDB K
<i>Austroasca vittata</i> (Lethierry)	Notable A	<i>Eysarcoris aeneus</i> (Scopoli)	RDB 3
<i>Bathysolen nubilius</i> (Fallen)	Notable B	<i>Florodelphax paryphasma</i> (Flor)	Notable A
<i>Berytinus hirticornis</i> (Brulle)	Notable B	<i>Geotomus punctulatus</i> (Costa)	RDB 1
<i>Calligypona reyi</i> (Fieber)	RDB K	<i>Globiceps cruciatus</i> (Reuter)	Notable B
<i>Capsodes flavomarginatus</i> (Donovan)	Notable A	<i>Globiceps flavomaculatus</i> (Fabricius)	Notable B
<i>Capsodes sulcatus</i> (Fieber)	Notable B	<i>Globiceps juniperi</i> Reuter	Notable B
<i>Capsus wagneri</i> Remane	Notable B	<i>Gonocerus acuteangulatus</i> (Goeze)	RDB 1
<i>Catoplatys fabricii</i> (Stal)	Notable B	<i>Graptopeltus lynceus</i> (Fabricius)	Notable B
<i>Charagochilus weberi</i> (Wagner)	RDB 3	<i>Hadrodemus m-flavum</i> (Goeze)	Extinct
<i>Chlamydatus evanescens</i> (Boheman)	RDB 3	<i>Hallodapus montandoni</i> (Reuter)	RDB 3
<i>Chlamydatus pulicarius</i> (Fallen)	Notable B	<i>Halticus macrocephalus</i> Fieber	RDB K
<i>Chloriona dorsata</i> Edwards	Notable B	<i>Halticus saltator</i> (Geoffroy in Fourcroy)	Notable B
<i>Chloriona vasconica</i> Ribaut	Notable B	<i>Hebrus pusillus</i> (Fallen)	Notable B
<i>Chlorita dumosa</i> Ribaut	Notable A	<i>Henestaris halophilus</i> (Burmeister)	RDB 2
<i>Chlorita viridula</i> (Fallen)	Notable A	<i>Hephathus nanus</i> (Herrich-Schaeffer)	Notable B
<i>Chlorochroa juniperina</i> (Linnaeus)	Extinct	<i>Heterogaster artemisiae</i> Schilling	Notable B
<i>Cicadella lasiocarpae</i> Ossianilsson	Notable A	<i>Holcostethus vernalis</i> (Wolff)	RDB 3
<i>Cicadetta montana</i> (Scopoli)	RDB 1	<i>Hydrometra gracilentia</i> Horvath	RDB 3
<i>Cicadula flori</i> (J.Sahlberg)	Notable B	<i>Iassus scutellaris</i> (Fieber)	Notable A
<i>Cicadula ornata</i> (Melichar)	Notable B	<i>Idiocerus fulgidus</i> (Fabricius)	Notable A
<i>Cicadula quinquenotata</i> (Boheman)	Notable B	<i>Ischnodemus quadratus</i> Fieber	RDB 1
<i>Cimex columbarius</i> Jenyns	RDB 3	<i>Issus muscaeformis</i> (Schrank)	Notable B
<i>Cixius caledonicus</i> China	RDB K	<i>Jalla dumosa</i> (Linnaeus)	Extinct
<i>Cixius cambricus</i> China	Notable B	<i>Kyboasca bipunctata</i> (Oshanin)	Notable A
<i>Cixius remotus</i> Edwards	Notable B	<i>Kybos calyculus</i> (Cerutti)	Notable B
<i>Corixa iberica</i> Anderson	Notable B	<i>Laodelphax striatellus</i> (Fallen)	Notable A
<i>Cosmotettix caudatus</i> (Flor)	Notable A	<i>Lasiacantha capucina</i> Germar	RDB 3
<i>Cosmotettix costalis</i> (Fallen)	RDB K	<i>Lasiosomus enervis</i> (Herrich-Schaeffer)	Notable B
<i>Cosmotettix panzeri</i> (Flor)	Notable B	<i>Legnotus picipes</i> (Fallen)	Notable B
<i>Criomorphus moestus</i> (Boheman)	Notable B	<i>Limotettix atricapillus</i> (Boheman)	RDB K
<i>Criomorphus williamsi</i> China	Notable B	<i>Lygus pratensis</i> (Linnaeus)	RDB 3
<i>Cymus aurescens</i> Distant	Notable A	<i>Lygus punctatus</i> (Zetterstedt)	Notable B
<i>Delphacodes capnodes</i> (Scott)	Notable B	<i>Macroplox preyssleri</i> (Fieber)	RDB 3
<i>Deraeocoris olivaceus</i> (Fabricius)	Notable B	<i>Macropsis glandacea</i> (Fieber)	RDB K
<i>Dichrooscytus gustavi</i> Josifov	Notable B	<i>Macropsis mendax</i> (Fieber)	Notable B
<i>Dicranocephalus agilis</i> (Scopoli)	Notable B	<i>Macrosteles alpinus</i> (Zetterstedt)	Notable B
<i>Dicranocephalus medius</i> (Mulsant & Rey)	Notable B	<i>Macrosteles cristatus</i> (Ribaut)	Notable B
<i>Dicranotropis divergens</i> Kirschbaum	Notable B	<i>Macrosteles cyane</i> (Boheman)	RDB K
<i>Doratura impudica</i> Horvath	RDB K	<i>Macrosteles fieberi</i> (Edwards)	Notable B
<i>Drymus latus</i> Douglas & Scott	Notable B	<i>Macrosteles frontalis</i> (Scott)	Notable B
<i>Drymus pilicornis</i> (Mulsant)	Notable B	<i>Macrosteles lividus</i> (Edwards)	RDB K
<i>Drymus pilipes</i> Fieber	Notable A	<i>Macrosteles oshanini</i> Razvyaskina	RDB K

<i>Macrosteles quadripunctulatus</i> (Kirschbaum)	Notable A	<i>Psammotettix albomarginatus</i> Wagner	Notable B
<i>Macrosteles sordidipennis</i> (Stal)	Notable B	<i>Psammotettix frigidus</i> (Boheman)	Notable A
<i>Megalonotus antennatus</i> (Schilling)	Notable B	<i>Psammotettix maritimus</i> (Perris)	RDB K
<i>Megalonotus dilatatus</i> (Herrich-Schaeffer)	Notable B	<i>Psammotettix striatus</i> (Linnaeus)	RDB K
<i>Megalonotus praetextatus</i> (Herrich-Schaeffer)	Notable B	<i>Pterotmetus staphyliniformis</i> (Schilling)	RDB 3
<i>Megalonotus sabulicola</i> (Thomson)	Notable B	<i>Pygolampis bidentata</i> (Goeze)	RDB K
<i>Megamelodes lequesnei</i> Wagner	Notable B	<i>Pyrrhocoris apterus</i> (Linnaeus)	RDB 1
<i>Metalimnus formosus</i> (Boheman)	RDB K	<i>Raglius alboacuminatus</i> (Goeze)	Notable B
<i>Micracanthia marginalis</i> (Fallen)	Notable A	<i>Rhopalus maculatus</i> (Fieber)	Notable B
<i>Micronecta minutissima</i> (Linnaeus)	RDB 3	<i>Rhopalus rufus</i> Schilling	RDB 3
<i>Microvelia buenoi umbricola</i> Wroblewski	RDB 3	<i>Rhyparochromus pini</i> (Linnaeus)	Notable B
<i>Microvelia pygmaea</i> (Dufour)	Notable B	<i>Ribautodelphax angulosus</i> (Ribaut)	Notable B
<i>Mocuellus collinus</i> (Boheman)	RDB K	<i>Ribautodelphax imitans</i> (Ribaut)	RDB K
<i>Monosynamma bohemani</i> (Fallen)	RDB 3	<i>Ribautodelphax pallens</i> (Stal)	RDB K
<i>Monosynamma maritima</i> Wagner	RDB 3	<i>Ribautodelphax pungens</i> (Ribaut)	Notable B
<i>Monosynamma sabulicola</i> Wagner	Notable B	<i>Sagatus punctifrons</i> (Fallen)	RDB K
<i>Myrmecoris gracilis</i> (Sahlberg)	RDB 3	<i>Saldula arenicola</i> (Scholtz)	Notable A
<i>Myrmedobia coleoprata</i> (Fallen)	Notable B	<i>Saldula fucicola</i> (Sahlberg)	Notable B
<i>Myrmedobia inconspicua</i> (Douglas & Scott)	Notable B	<i>Saldula opacula</i> (Zetterstedt)	Notable B
<i>Nabis brevis</i> Scholtz	RDB 3	<i>Saldula setulosa</i> (Puton)	RDB 2
<i>Nabis pseudoferus</i> Remane	Notable B	<i>Sciocoris cursitans</i> (Fabricius)	Notable B
<i>Neophilaenus longiceps</i> Puton	Notable A	<i>Scleroracrus decumanus</i> (Kontkanen)	Notable B
<i>Nysius graminicola</i> (Kolenati)	RDB 3	<i>Scolopostethus pictus</i> (Schilling)	Notable A
<i>Nysius helveticus</i> (Herrich-Schaeffer)	RDB 3	<i>Sehirus biguttatus</i> (Linnaeus)	Notable B
<i>Odontoscelis fuliginosa</i> (Linnaeus)	RDB 3	<i>Sehirus dubius</i> (Scopoli)	Notable B
<i>Odontoscelis lineola</i> Rambur	Notable B	<i>Sigara striata</i> (Linnaeus)	Notable B
<i>Oliarius leporinus</i> (Linnaeus)	Notable B	<i>Spathocera dahlmanni</i> (Schilling)	Notable A
<i>Oliarius panzeri</i> Low	Notable B	<i>Stenocranus fuscovittatus</i> (Stal)	Notable B
<i>Onchochila simplex</i> (Herrich-Schaeffer)	Notable A	<i>Stictopleurus abutilon</i> (Rossi)	Extinct
<i>Oncodelphax pilululus</i> (Boheman)	Notable B	<i>Stictopleurus punctatonervosus</i> (Goeze)	Extinct
<i>Ortholomus punctipennis</i> (Herrich-Schaeffer)	RDB 3	<i>Stiroma bicarinata</i> (Herrich-Schaeffer)	Notable B
<i>Orthotylus fuscescens</i> (Kirschbaum)	Notable B	<i>Stroggylocephalus livens</i> (Zetterstedt)	Notable B
<i>Orthotylus rubidus</i> (Fieber in Puton)	RDB 3	<i>Strongylocoris luridus</i> (Fallen)	Notable B
<i>Orthotylus virens</i> (Fallen)	Notable B	<i>Struebingianella dalei</i> (Scott)	Notable B
<i>Pachybrachius luridus</i> (Hahn)	RDB 3	<i>Struebingianella litoralis</i> (Reuter)	Notable B
<i>Pachycoleus waltli</i> Fieber	Notable B	<i>Styellonotus triguttatus</i> (Linnaeus)	Notable B
<i>Paradelphacodes paludosus</i> (Flor)	Notable A	<i>Taphropeltus hamulatus</i> (Thomson)	Notable B
<i>Paraliburnia clypealis</i> (J.Sahlberg)	RDB K	<i>Taphropeltus limbatus</i> (Fieber)	RDB 3
<i>Paralimnus phragmitis</i> (Boheman)	Notable B	<i>Temnostethus tibialis</i> Reuter	RDB 3
<i>Pediopsis tiliae</i> (Germar)	Notable B	<i>Teratocoris caricis</i> Kirkaldy	Notable B
<i>Peritrechus gracilicornis</i> Puton	RDB K	<i>Tettigometra impressopunctata</i> Dufour	Notable B
<i>Physatocheila harwoodi</i> China	RDB 1	<i>Tingis angustata</i> (Herrich-Schaeffer)	RDB 3
<i>Physatocheila smreczynskii</i> China	Notable A	<i>Tingis reticulata</i> Herrich-Schaeffer	Notable B
<i>Phytocoris insignis</i> Reuter	RDB 3	<i>Trapezonotus ullrichi</i> (Fieber)	RDB 3
<i>Piesma quadratum spergulariae</i> Woodroffe	RDB 3	<i>Trigonocranus emmae</i> Fieber	Notable B
<i>Pilophorus confusus</i> (Kirschbaum)	RDB 1	<i>Trigonotylus psammaecolor</i> Reuter	Notable B
<i>Pionosomus varius</i> (Wolff)	RDB 3	<i>Tropistethus holosericeus</i> (Scholtz)	Notable B
<i>Placochilus seladonicus</i> (Fallen)	RDB K	<i>Tytthus geminus</i> (Flor)	Notable B
<i>Platymetopius undatus</i> (Degeer)	Notable A	<i>Ulopa trivia</i> Germar	Notable B
<i>Polymerus vulneratus</i> (Wolff)	RDB 1	<i>Xanthodelphax flaveolus</i> (Flor)	Notable A
<i>Prostemma guttula</i> (Fabricius)	Extinct	<i>Xylocoridae brevipennis</i> Reuter	Notable B
<i>Psallus albicinctus</i> (Kirschbaum)	Notable B	<i>Xylocoris formicetorum</i> (Boheman)	Notable A
		<i>Zygimus nigriceps</i> (Fallen)	Notable A
		<i>Zygina rubrovittata</i> (Lethierry)	Notable B

APPENDIX 3. RED DATA BOOK AND NOTABLE SPECIES LISTED BY STATUS

Extinct		Corixidae	<i>Micronecta minutissima</i> (Linnaeus)
Acanthosomatidae	<i>Elasmucha ferrugata</i> (Fabricius)	RDB K	
Scutelleridae	<i>Eurygaster austriaca</i> (Schränk)	Lygaeidae	<i>Peritrechus gracilicornis</i> Puton
Pentatomidae	<i>Chlorochroa juniperina</i> (Linnaeus)	Reduviidae	<i>Pygolampis bidentata</i> (Goeze)
	<i>Jalla dumosa</i> (Linnaeus)	Miridae	<i>Halticus macrocephalus</i> Fieber
Rhopalidae	<i>Stictopleurus abutilon</i> (Rossi)		<i>Placochilus seladonicus</i> (Fallen)
	<i>Stictopleurus punctatonevrosus</i> (Goeze)	Cicadellidae	<i>Aphrodes duffieldi</i> Le Quesne
Nabidae	<i>Prostemma guttula</i> (Fabricius)		<i>Austroagallia sinuata</i> (Mulsant & Rey)
Miridae	<i>Hadrodemus m-flavum</i> (Goeze)		<i>Cosmotettix costalis</i> (Fallen)
			<i>Doratura impudica</i> Horvath
RDB 1			<i>Edwardsiana rosaesugans</i> (Cerutti)
Cydnidae	<i>Geotomus punctulatus</i> (Costa)		<i>Erythria aureola</i> (Fallen)
Coreidae	<i>Gonocerus acuteangulatus</i> (Goeze)		<i>Euscelis venosus</i> (Kirschbaum)
Pyrrhocoridae	<i>Pyrrhocoris apterus</i> (Linnaeus)		<i>Limotettix atricapillus</i> (Boheman)
Lygaeidae	<i>Eremocoris fenestratus</i> (Herrich-Schaeffer)		<i>Macropsis glandacea</i> (Fieber)
	<i>Ischnodemus quadratus</i> Fieber		<i>Macrosteles cyane</i> (Boheman)
Tingidae	<i>Physatocheila harwoodi</i> China		<i>Macrosteles lividus</i> (Edwards)
Miridae	<i>Pilophorus confusus</i> (Kirschbaum)		<i>Macrosteles oshanini</i> Razvyvaskina
	<i>Polymerus vulneratus</i> (Wolff)		<i>Metalimnus formosus</i> (Boheman)
Cicadidae	<i>Cicadetta montana</i> (Scopoli)		<i>Mocuellus collinus</i> (Boheman)
			<i>Psammotettix maritimus</i> (Perris)
RDB 2			<i>Psammotettix striatus</i> (Linnaeus)
Coreidae	<i>Arenocoris waltli</i> (Herrich-Schaeffer)	Cixiidae	<i>Sagatus punctifrons</i> (Fallen)
Lygaeidae	<i>Henestaris halophilus</i> (Burmeister)	Delphacidae	<i>Cixius caledonicus</i> China
MiridaeSaldidae	<i>Saldula setulosa</i> (Puton)		<i>Calligypona reyi</i> (Fieber)
			<i>Paraliburnia clypealis</i> (J.Sahlberg)
RDB 3			<i>Ribautodelphax imitans</i> (Ribaut)
Aradidae	<i>Aradus aterrimus</i> Fieber		<i>Ribautodelphax pallens</i> (Stål)
	<i>Aradus corticalis</i> (Linnaeus)	Notable A	
Scutelleridae	<i>Odontoscelis fuliginosa</i> (Linnaeus)	Pentatomidae	<i>Eurydema dominulus</i> (Scopoli)
Pentatomidae	<i>Eysarcoris aeneus</i> (Scopoli)	Coreidae	<i>Spathocera dahlmanni</i> (Schilling)
	<i>Holcostethus vernalis</i> (Wolff)	Lygaeidae	<i>Aphanus rolandri</i> (Linnaeus)
Rhopalidae	<i>Rhopalus rufus</i> Schilling		<i>Drymus pilipes</i> Fieber
Lygaeidae	<i>Acompus pallipes</i> (Herrich-Schaeffer)		<i>Scolopostethus pictus</i> (Schilling)
	<i>Emblethis verbasci</i> (Fabricius)	Berytinidae	<i>Cymus aurescens</i> Distant
	<i>Macroplox preysleri</i> (Fieber)	Tingidae	<i>Onchochila simplex</i> (Herrich-Schaeffer)
	<i>Nysius graminicola</i> (Kolenati)		<i>Physatocheila smreczynskii</i> China
	<i>Nysius helveticus</i> (Herrich-Schaeffer)	Reduviidae	<i>Empicoris baerensprungi</i> (Dohrn)
	<i>Ortholomus punctipennis</i> (Herrich-Schaeffer)	Cimicidae	<i>Xylocoris formicetorum</i> (Boheman)
	<i>Pachybrachius luridus</i> (Hahn)	Miridae	<i>Adelphocoris seticornis</i> (Fabricius)
	<i>Pionosomus varius</i> (Wolff)		<i>Capsodes flavomarginatus</i> (Donovan)
	<i>Pterotmetus staphyliniformis</i> (Schilling)		<i>Zygmis nigriceps</i> (Fallen)
	<i>Taphropeltus limbatus</i> (Fieber)	Saldidae	<i>Micracanthia marginalis</i> (Fallen)
	<i>Trapezonotus ultrichi</i> (Fieber)		<i>Saldula arenicola</i> (Scholtz)
Piesmatidae	<i>Piesma quadratum spergulariae</i> Woodroffe	Cercopidae	<i>Neophilaenus longiceps</i> Puton
Tingidae	<i>Lasiacantha capucina</i> Germar	Cicadellidae	<i>Austroasca vittata</i> (Lethierry)
	<i>Tingis angustata</i> (Herrich-Schaeffer)		<i>Chlorita dumosa</i> Ribaut
Nabidae	<i>Nabis brevis</i> Scholtz		<i>Chlorita viridula</i> (Fallen)
Cimicidae	<i>Anthocoris amplicolis</i> Horvath		<i>Cicadella lasiocarpae</i> Ossiannilsson
	<i>Anthocoris minki</i> Dohrn		<i>Cosmotettix caudatus</i> (Flor)
	<i>Cimex columbarius</i> Jenyns		<i>Emelyanoviana contraria</i> (Ribaut)
	<i>Temnostethus tibialis</i> Reuter		<i>Eurhadina kirschbaumi</i> Wagner
Miridae	<i>Amblytulus delicatus</i> (Perris)		<i>Euscelidius schenckii</i> (Kirschbaum)
	<i>Charagochilus weberi</i> (Wagner)		<i>Iassus scutellaris</i> (Fieber)
	<i>Chlamydatus evanescens</i> (Boheman)		<i>Idiocerus fulgidus</i> (Fabricius)
	<i>Halodapus montandoni</i> (Reuter)		<i>Kyboasca bipunctata</i> (Oshanin)
	<i>Lygus pratensis</i> (Linnaeus)		<i>Macrosteles quadripunctulatus</i> (Kirschbaum)
	<i>Monosynamma bohemani</i> (Fallen)		<i>Platymetopius undatus</i> (Degeer)
	<i>Monosynamma maritima</i> Wagner		<i>Psammotettix frigidus</i> (Boheman)
	<i>Myrmecoris gracilis</i> (Sahlberg)	Delphacidae	<i>Eurysa douglasi</i> (Scott)
	<i>Orthotylus rubidus</i> (Fieber in Puton)		<i>Eurysula lurida</i> (Fieber)
	<i>Phytocoris insignis</i> Reuter		<i>Florodelphax paryphasma</i> (Flor)
Hydrometridae	<i>Hydrometra gracilentia</i> Horvath		<i>Laodelphax striatellus</i> (Fallen)
Veliidae	<i>Microvelia buenoi umbricola</i> Wroblewski		<i>Paradelphacodes paludosus</i> (Flor)

	<i>Xanthodelphax flaveolus</i> (Flor)		<i>Sigara striata</i> (Linnaeus)
Notable B		Cercopidae	<i>Aphrophora alpina</i> Melichar
		Cicadellidae	<i>Agallia brachyptera</i> (Boheman)
Aradidae	<i>Aradus betulae</i> (Linnaeus)		<i>Aphrodes aestuarinus</i> (Edwards)
Cydnidae	<i>Legnotus picipes</i> (Fallen)		<i>Aphrodes albiger</i> (Germar)
	<i>Sehirus biguttatus</i> (Linnaeus)		<i>Aphrodes limicola</i> (Edwards)
	<i>Sehirus dubius</i> (Scopoli)		<i>Aphrodes trifasciatus</i> (Geoffroy in Fourcroy)
Scutelleridae	<i>Eurygaster maura</i> (Linnaeus)		<i>Cicadula flori</i> (J.Sahlberg)
	<i>Odontoscels lineola</i> Rambur		<i>Cicadula ornata</i> (Melichar)
Pentatomidae	<i>Sciocoris cursitans</i> (Fabricius)		<i>Cicadula quinquenotata</i> (Boheman)
Coreidae	<i>Bathysolen nubilus</i> (Fallen)		<i>Cosmotettix panzeri</i> (Flor)
Rhopalidae	<i>Rhopalus maculatus</i> (Fieber)		<i>Ebarrius cognatus</i> (Fieber)
Stenocephalidae	<i>Dicranocephalus agilis</i> (Scopoli)		<i>Edwardsiana abnicola</i> (Edwards)
	<i>Dicranocephalus medius</i> (Mulsant & Rey)		<i>Edwardsiana ishidae</i> (Matsumura)
Lygaeidae	<i>Drymus latus</i> Douglas & Scott		<i>Edwardsiana lanternae</i> (Wagner)
	<i>Drymus pilicornis</i> (Mulsant)		<i>Edwardsiana tersa</i> (Edwards)
	<i>Drymus pumilio</i> Puton		<i>Eurhadina ribauti</i> Wagner
	<i>Eremocoris abietis</i> (Linnaeus)		<i>Euscelidius variegatus</i> (Kirschbaum)
	<i>Eremocoris plebejus</i> (Fallen)		<i>Euscelis ohausi</i> Wagner
	<i>Graptopeltus lynceus</i> (Fabricius)		<i>Hephathus nanus</i> (Herrich-Schaeffer)
	<i>Heterogaster artemisiae</i> Schilling		<i>Kybos calyculus</i> (Cerutti)
	<i>Lasiosomus enervis</i> (Herrich-Schaeffer)		<i>Macropsis mendax</i> (Fieber)
	<i>Megalonotus antennatus</i> (Schilling)		<i>Macrosteles alpinus</i> (Zetterstedt)
	<i>Megalonotus dilatatus</i> (Herrich-Schaeffer)		<i>Macrosteles cristatus</i> (Ribaut)
	<i>Megalonotus praetextatus</i> (Herrich-Schaeffer)		<i>Macrosteles fieberi</i> (Edwards)
	<i>Megalonotus sabulicola</i> (Thomson)		<i>Macrosteles frontalis</i> (Scott)
	<i>Raglius alboacuminatus</i> (Goeze)		<i>Macrosteles sordidipennis</i> (Stal)
	<i>Rhyparochromus pini</i> (Linnaeus)		<i>Paralimnus phragmitis</i> (Boheman)
	<i>Taphropeltus hamulatus</i> (Thomson)		<i>Pediopsis tiliae</i> (Germar)
	<i>Tropistethus holosericeus</i> (Scholtz)		<i>Psammotettix albomarginatus</i> Wagner
Berytinidae	<i>Berytinus hirticornis</i> (Brulle)		<i>Scleroracis decumanus</i> (Kontkanen)
Tingidae	<i>Acalypta platycheila</i> (Fieber)		<i>Stroggylocephalus livens</i> (Zetterstedt)
	<i>Catoplatys fabricii</i> (Stal)		<i>Ulopa trivia</i> Germar
	<i>Tingis reticulata</i> Herrich-Schaeffer		<i>Zygina rubrovittata</i> (Lethierry)
Nabidae	<i>Nabis pseudoferus</i> Remane	Cixiidae	<i>Cixius cambricus</i> China
Cimicidae	<i>Anthocoris visci</i> Douglas		<i>Cixius remotus</i> Edwards
	<i>Xylocoridae brevipennis</i> Reuter		<i>Oliarus leporinus</i> (Linnaeus)
Microphysidae	<i>Myrmedobia coleoptata</i> (Fallen)		<i>Oliarus panzeri</i> Low
	<i>Myrmedobia inconspicua</i> (Douglas & Scott)		<i>Trigonocranus emmae</i> Fieber
Miridae	<i>Adelphocoris ticinensis</i> (Meyer-Dur)	Delphacidae	<i>Asiraca clavicornis</i> (Fabricius)
	<i>Agnocoris reclairei</i> (Wagner)		<i>Chloriona dorsata</i> Edwards
	<i>Amblytylus brevicollis</i> Fieber		<i>Chloriona vasconica</i> Ribaut
	<i>Capsodes sulcatus</i> (Fieber)		<i>Criomorphus moestus</i> (Boheman)
	<i>Capsus wagneri</i> Remane		<i>Criomorphus williamsi</i> China
	<i>Chlamydatus pulicarius</i> (Fallen)		<i>Delphacodes capnodes</i> (Scott)
	<i>Deraeocoris olivaceus</i> (Fabricius)		<i>Dicranotropis divergens</i> Kirschbaum
	<i>Dichrooscytus gustavi</i> Josifov		<i>Megamelodes lequesnei</i> Wagner
	<i>Globiceps cruciatus</i> (Reuter)		<i>Oncodelphax pullulus</i> (Boheman)
	<i>Globiceps flavomaculatus</i> (Fabricius)		<i>Ribautodelphax angulosus</i> (Ribaut)
	<i>Globiceps juniperi</i> Reuter		<i>Ribautodelphax pungens</i> (Ribaut)
	<i>Halticus saltator</i> (Geoffroy in Fourcroy)		<i>Stenocranus fuscovittatus</i> (Stal)
	<i>Lygus punctatus</i> (Zetterstedt)		<i>Stiroma bicarinata</i> (Herrich-Schaeffer)
	<i>Monosynamma sabulicola</i> Wagner		<i>Struebingianella dalei</i> (Scott)
	<i>Orthotylus fuscescens</i> (Kirschbaum)		<i>Struebingianella lioralis</i> (Reuter)
	<i>Orthotylus virens</i> (Fallen)	Issidae	<i>Issus muscaeformis</i> (Schrank)
	<i>Psallus albicinctus</i> (Kirschbaum)	Tettigometridae	<i>Tettigometra impressopunctata</i> Dufour
	<i>Strongylocoris luridus</i> (Fallen)		
	<i>Systellonotus triguttatus</i> (Linnaeus)		
	<i>Teratocoris caricis</i> Kirkaldy		
	<i>Trigonotylus psammaecolor</i> Reuter		
	<i>Tythus geminus</i> (Flor)		
Dipsocoridae	<i>Pachycoleus walli</i> Fieber		
Saldidae	<i>Aepophilus bonnairei</i> Signoret		
	<i>Saldula fucicola</i> (Sahlberg)		
	<i>Saldula opacula</i> (Zetterstedt)		
Hebridae	<i>Hebrus pusillus</i> (Fallen)		
Veliidae	<i>Microvelia pygmaea</i> (Dufour)		
Gerridae	<i>Aquarius paludum</i> (Fabricius)		
Corixidae	<i>Corixa iberica</i> Anderson		