

**LEICESTERSHIRE & RUTLAND
ENTOMOLOGICAL SOCIETY**

**VC55 Terrestrial
Heteroptera
Part 1: Recorders and Recording**



Liocoris tripustulatus (KN)

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INTRODUCTION

In 2023, we became joint Heteroptera and Auchenorrhyncha Co-ordinators for VC55 Leicestershire & Rutland with the agreement of local recorders, our local Environmental Records Centre (LRERC) and the national experts for the group.

We decided to cover terrestrial Heteroptera (shieldbugs, plant bugs, lace bugs, damsel bugs etc.), aquatic Heteroptera (water boatmen, pond-skaters, etc.) and Auchenorrhyncha (plant and leaf hoppers, etc.) but not the Sternorrhyncha (aphids, psyllids, etc.).

We agreed some priorities:

1: to improve our knowledge and expertise in surveys and species identification especially in some tricky and under-recorded families (lead role: Alan);

2: to collate historical data from documentary and digital sources and Museum specimens (lead role: Kate and Sue);

3: to publish data and information on NatureSpot and to verify records submitted there (lead role: Alan and Sue);

4: to produce the first checklist of terrestrial Heteroptera in VC55 (lead role: Sue and Kate).

The following account describes our experiences and the process we used to produce the provisional VC55 Terrestrial Heteroptera Checklist which is in Part 2 (LESOPS 64).

Leicestershire checklists were produced in 1907 and 1973 (see sections 1.1 and 1.3 for further details) but there has never been a checklist covering both Leicestershire and Rutland.

Finally, of course, we hoped to enjoy ourselves recording a fascinating, attractive, under-recorded and occasionally challenging group of insects!

1. BUG RECORDING AND RECORDERS IN VC55

1.1 Early recorders and the first Leicestershire checklist

Recording Heteroptera in VC55 was not as popular or prolific as some other invertebrate groups so that early records are rather thin on the ground. Historically, many species of Heteroptera were of southern and coastal distribution in the British Isles with most Victorian and Edwardian collectors concentrating their efforts there.

The first checklist for Leicestershire was compiled by Frank Bouskell for the Victoria County History (VCH) for Leicestershire (Bouskell, 1907). Bouskell was a well-respected entomologist but is chiefly remembered as a beetle recorder as well as the organisational force and first secretary of the Entomology section of the Leicester Literary and Philosophical Society (LLPS) – a precursor of the Leicestershire and Rutland Entomological Society (LRES). Unfortunately, the manuscript that formed the basis of Bouskell's list has been lost (Lott, 2009).

Earlier publications often omitted details of records and we do not have recorders' names, location or dates for many of these early records – the best we can do, in some instances, is "Leicestershire, pre-1907". 'Stanyon' and 'Marshall' are credited with a few records but, apart from this, all Bouskell tells us is that "In the following list, the writer is indebted to Mr John

Stanyon for most of the notes; others have been furnished by coleopterists who have taken chance specimens." The impression is that bugs were recorded as a by-catch of beetle-hunting – a common theme of bug recording for many years.

It is likely that Bouskell referred to the two standard books then available: Douglas & Scott's '*The British Hemiptera – Heteroptera*' (1865) and Saunders' '*The Hemiptera Heteroptera of the British Isles*' (Saunders, 1892). These included references to Heteroptera found in Leicestershire often collected by Rev. T.A. Marshall, one of the few named early bug recorders in VC55.

In 1923 '*A Biology of the British Hemiptera – Heteroptera*' by E.A. Butler was published (Butler, 1923) including much information on the early stages of bugs along with tables of Heteroptera for each county.

Information from the three standard books and Bouskell's lists was extracted by Ian M. Evans when producing the second Leicestershire checklist of 1973 (Clements & Evans, 1973 - see section 1.3 below). Ian also scoured entomological papers and publications for VC55 records and references carrying out historical research into early recorders. Other sources tracked down by Ian were a series of notes by A. Roebuck (Roebuck, 1924, 1927, 1929, 1932) who lived in Kegworth and worked at the Midland Agricultural College at Sutton Bonington, with his main interest being agricultural pests.



Figure 1: *Grypocoris stysi*
Holwell, 2023 (AC)



Figure 2: *Plagiognathus arbustorum*
Cropston, 2023 (KN)

The first bug record we have found for VC55 is a plant bug, *Grypocoris stysi* (Figure 1), caught by Dr Power at Thornton Reservoir sometime before 1865 and referred to in Douglas & Scott (1865) under the name *Calocoris sexguttatus*. The first terrestrial Heteroptera bug record found for Rutland was *Plagiognathus arbustorum* (Figure 2) listed in Butler (1923).

In 1945 Bedwell and Masee published a list of Leicestershire Heteroptera (Bedwell & Masee, 1945), which was updated in 1946 and 1955, but Ian was unable to trace the source of the species on their list. In common with many of these earlier publications, there are few details of date, location or recorder. As part of his project to compile a Heteroptera card index, Derek Lott visited the Biological Records Centre at Monks Wood in Cambridgeshire to consult their entomological bibliography and to study A.M. Masee's personal papers (see LRERC

Archive S70-20-051). His mission was unsuccessful about the 1945 list but he was able to find some additional records by G.B. Ryle, including first records for *Apolygus lucorum* and *Apolygus spinolae*. Ryle was the Forestry Commission's Conservator for England after the War, becoming Director of Forestry for Wales in 1954 and for England in 1958 before then taking the role of Deputy Director of the Commission until he retired in 1965. Derek also found a record of the Assassin bug (*Reduvius personatus*) in Market Harborough from R.N. Sculthorpe, only the second Vice-county record for this mainly southern species.

We are enormously grateful to Ian for doing this research and for making his archive available to us. The above is a very brief summary; for more details and full references refer to Clements & Evans (1973). As an example of the detective work involved, see Ian Evans' paper 'Let us now Praise famous men . . .' in the Leicester Literary & Philosophical Society's Natural History Section Newsletter of Spring 1974 (Evans, 1974) where he describes how he tracked down some of the early naturalists, including the elusive Rev T.A. Marshall.

Ian's research was for Leicestershire only. Early records for Rutland are even harder to find, with the Victoria County History for Rutland (Scott, 1908) having no comparable list to Bouskell's for Leicestershire. We have only found a handful of records for Rutland in the other publications given above, but we have not carried out a thorough search such that there may be more Rutland bug records hidden in entomological publications.

1.2 Don Tozer (1907 – 1993)

Although he is known mainly as a beetle and moth recorder, Don Tozer also recorded Hemiptera between the two wars and afterwards. The earliest records of his are from 1927, which makes him one of the first named recorders of bugs in VC55, his last such bug record being in 1967 – a long recording life. Most of his records and specimens are of shieldbugs with the first known VC55 records for the Hawthorn Shieldbug (*Acanthosoma haemorrhoidale*) (Figure 3), Spiked Shieldbug (*Picromerus bidens*), Bronze Shieldbug (*Troilus luridus*) and Blue Shieldbug (*Zicrona caerulea*). He also was the first to record the flat-bug *Aradus depressus* (Figure 4).



Figure 3: *Acanthosoma haemorrhoidale*
D. Tozer, Buddon, 1929



Figure 4: *Aradus depressus*
D. Tozer, Gumley, 1933

Specimens in Leicestershire Museum Service's collection (Photos: KN)

More information on Don Tozer is in Lott (2009) and in the UK Beetles Biographical Dictionary <https://www.coleoptera.org.uk/node/23588>.

1.3 Harry A.B. Clements and Ian M. Evans - the second Leicestershire checklist

Bug recording was still the preserve of a select few until the landmark publication in 1959 of Southwood & Leston's '*Land and Water Bugs of the British Isles*' in Warne's affordable '*Wayside and Woodland*' series (Southwood & Leston, 1959). Still in print today as a facsimile edition, and remaining the only complete guide to all Heteroptera in the British Isles, they brought bug recording to a wider audience. It was the gift of a copy of this work that tempted Harry A.B. Clements to take up the challenge of contributing to the knowledge of the group in Leicestershire (Clements & Evans, 1973).

Harry's pioneering survey work was reported in the second and more complete checklist of Heteroptera for Leicestershire (Clement & Evans, 1973) with most of his surveys being around Shepshed and Charnwood Forest. He is credited with several first vice-county records including *Cymus glandicolor*, *Dictyonota strichnocera*, *Teratocoris saundersi*, *Heterocordylus tibialis*, *Heterocordylus genistae* (Figure 5), *Macrolophus rubi* and *Pithanus maerkelii*. His specimen of *Himacerus (Stalia) boops* is in the Leicestershire Museums Service Collections Resources Centre at Barrow upon Soar; this is still the only record of this bug from VC55. The species listed above are still not often recorded today and are a testament to his field skills; he must have undertaken targeted surveys to have found them because all are associated with specific habitats or plant species.



Figure 5: *Heterocordylus genistae*
H.A.B. Clements, Piper Wood, 1963



Figure 6: *Mecomma dispar*
I.M. Evans, Long Whatton, 1963

Specimens in Leicestershire Museum Service's collection (Photos: ST)

Ian did much of the historical research for the checklist but also recorded many bugs. It is pleasing to note that he found *Mecomma dispar* (Figure 6) at Long Whatton in 1963, having been last recorded (as *Globiceps ater*) by Rev T.A. Marshall in August 1865. Ian's specimens can be seen in the County Collections along with many of Harry's.

Ian Evans came to Leicester in 1959 as Assistant Keeper (Biology) at the City Museum, later becoming Deputy Director before he retired in 1991. He was a leading member of the LLPS Natural History Section and the Leicestershire & Rutland Wildlife Trust, initiating a pioneering baseline of 'field-by-field' studies of Leicestershire and Rutland parishes in the 1980s. He was

responsible for encouraging many local naturalists to develop their interests in recording species, often those groups that were little-recorded (Dawson, 1992).

We know very little about Harry Clements, and would be grateful for any more information about him. We are indebted to Ian for informing us that Harry studied for a degree in agricultural science, possibly from the Midland Agricultural College at Sutton Bonington. When Ian first met him in the early 1960s he had just returned from service as an Agricultural Officer in Aden. He worked down a deep coal mine in Leicestershire where he trapped mice for the Museum mammal collections. He also worked in or visited Germany where he met his first wife Clare; he later remarried and lived in Cossington. Ian and Harry worked together on a mammal and mammal-parasite project at Charnwood Lodge and together they acquired material for an unpublished checklist of Leicestershire fleas (Ian recalls that this involved excavating a mole's nest at Shepshed). He was an early member of the Loughborough Naturalists' Club and, later, for many years compiled the mammal notes for their publication '*Heritage*' (Evans, pers.comm. 2023).

1.4 Derek A. Lott (1953-2011) and Don G. Goddard (1947-2000)

The next phase of recording was in the 1980s. Derek Lott was *de facto* vice-county Recorder for Heteroptera 1982–1985, corresponding with Peter Kirby, the national recorder at the time. He collated data and compiled a set of VC55 record cards for Terrestrial Heteroptera currently in the Museum collection.

Derek was a remarkable naturalist and entomologist with his records, including many of the more difficult species to identify which often required genitalia dissection. He was the first to record *Psallus haematodes*, *P. perrisi*, *P. wagneri*, *P. flavellus* and *P. diminutus* (*confusus*) in VC55; some of his *Psallus* specimens with their dissected-out parts are still in the Leicestershire Collections.

A notable record was the southern and coastal *Chorosoma schillingi*, caught by Derek and Jeremy Woodhead at Humberstone Wharf railway sidings in Leicester. This is one of the first inland and Midland records for this species. (Figure 17).



Figure 7: *Berytinus minor*
D.A. Lott, Tilton, 1983



Figure 8: *Capsus wagneri*
D.A. Lott, Loughborough Big Meadow, 1982

Specimens in Leicestershire Museum Service's collection (Photos: ST)

He also recorded bugs in Rutland, being one of the earliest recorders to do so. Ketton Quarry NR consists of open mosaic habitats and is a rewarding hunting ground for bugs; here he caught the first VC55 records for Turtle Shieldbug (*Podops inuncta*), *Coriomeris denticulatus*, *Eremocoris podagricus* and the Ant Damsel-bug (*Himacerus mirmicoides*). Derek did much recording in Buddon Wood, around Swithland Reservoir and at Barrow Gravel pits near his home. Other notable records to his credit are the first Gorse Shieldbug (*Piezodorus lituratus*) and *Berytinus minor* (Figure 7), *Phytocoris populi* (Figure 20), *Anthocoris limbatus*, *Alloeotomus gothicus* and the nationally rare *Capsus wagneri* (Figure 8).

Between 1978 and 1983, Don G. Goddard was contracted by the Leicestershire Museums Service to carry out surveys of sites across the two counties including the River Soar corridor, Ashby Canal, Lockington Marshes, Donington Park and Knipton Reservoir, among many smaller sites. While the survey reports cover a wide range of invertebrates as well as Heteroptera, he was chiefly interested in beetles. He too has some first vice-county bug records to his credit. At Knipton Reservoir he recorded the locally rare sedge-loving *Cyrtorhinus caricis* (Figure 10) and *Fieberocapsus flaveolus* (the sole County record, with the specimen in the County Collections). Other firsts from Don are the now common *Ischnodemus sabuleti* (Figure 9) and *Oncotylus viridiflavus* with three species that are still rarely recorded in VC55 - the lacebug *Monanthia humuli* (now called *Dictyla convergens*) found on Water Forget-me-not, *Pseudoloxops coccineus* and *Sthenarus roseri* (now *Salicarus*).

Don moved away from Leicestershire in 1983 (Lott, 2009) and Derek soon switched his attention to beetle recording. More information about both can be found on the UK Beetle Recording website Biographical Dictionary <https://www.coleoptera.org.uk/node/24422> and <https://www.coleoptera.org.uk/node/22926>.

Many of Derek's and Don's specimens are in the County Collections and most of their site survey reports are in Leicestershire and Rutland Environmental Record Centre's (LRERC) archives.



Figure 9: *Ischnodemus sabuleti*
D.G. Goddard, Donisthorpe, 1980



Figure 10: *Cyrtorhinus caricis*
D.G. Goddard, Knipton Reservoir, 1979

1.5 The Loughborough Naturalists' Club – Howard Bradshaw and Peter Gamble

In the late 1990s and early 2000s, new species of shieldbugs and allies began to turn up in Leicestershire and Rutland. This followed a national trend for range expansion north and west from the southern and coastal regions that had long been the main preserve of Heteroptera (see 4.2 below for more on this phenomenon). The Loughborough Naturalists' Club (LNC) archive allows us to track the colonisation of these species mainly through the records of two naturalists: Peter H. Gamble and Howard Bradshaw. They were both interested in shieldbugs and allies and were in the right place at the right time to record this extraordinary incursion of new species into Leicestershire. Most of Peter's records are from the Loughborough and Quorn areas where he also noted many attracted to his moth-trap light. Howard roved further afield on his bicycle throughout Leicester and into the countryside immediately north, south and east of the city – areas not often recorded.

Many of these new arrivals are now some of the most commonly recorded species in VC55. For example, Peter Gamble caught the first Green Shieldbug (*Palomena prasina*) for VC55 from Quorn in 1997 and in the following year he recorded the first Hairy or Sloe Shieldbug (*Dolycoris baccarum*) since 1907 (Bouskell, 1907). Howard Bradshaw recorded the first Bishop's Mitre Shieldbug (*Aelia acuminata*) (Figure 11) from several sites in Leicester in 2004 and the first Dock Bug (*Coreus marginatus*) (Figure 12) at Aylestone Meadows in 2005.



Figure 11: *Aelia acuminata*
A. Cann, Stonesby Quarry, 2023



Figure 12: *Coreus marginatus* nymphs
S. Timms, Glenfield 2018

1.6 The present day

Recorders in the latter half of the 20th century still had to rely on Southwood and Leston's 1959 book. Despite its value, it was becoming dated; taxonomy and distribution of many species had changed, new species had turned up, species concepts changed and new keys had been produced. A new source of help was needed to hook new recorders and this appeared with the development of the 'British Bugs' website <https://www.britishbugs.org.uk> by Tristan Bantock and Joe Botting.

The superb gallery of photos remains the best resource for those starting to record terrestrial Heteroptera, stimulating a new phase of bug recording in VC55. Since 2000, the numbers of recorders and records have increased dramatically.

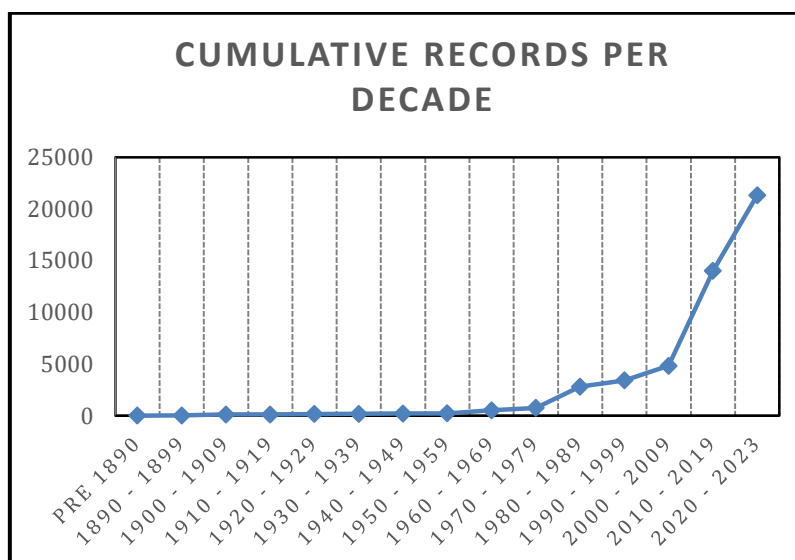
Much of the current recording is casual. The main source of VC55 data is now NatureSpot (www.naturespot.org.uk) and iRecord (<https://irecord.org.uk>) with dozens of recorders submitting data to these websites. Half of VC55 Heteroptera records have come from NatureSpot which has a gallery of images, data and distribution maps for Heteroptera in VC55.

As a final note, the value of structured site surveys cannot be over-estimated. Good sources of data are the professional entomology reports produced to support planning or minerals applications, often on brownfield land, and sometimes yielding new County records or sightings of rare species. Tristan Bantock and Colin Plant recorded the Slender-horned Leatherbug (*Ceraleptus lividus*) at the former coal-washing site at Ashby de la Zouch in 2012, the second record for this bug in VC55. Steve A. Lane recorded the second VC55 lacebug *Catoplatus fabricii* on a coal-waste site in Ellistown/Hugglescote in 2014, the only other record being an unconfirmed specimen caught in Loughborough in 1945 and now in the Tullie House museum in Cumbria. Steve also surveyed the excellent brownfield site at Quarry Farm, near Stamford/Little Casterton in 2021, recording several unusual species including the first Vice-county record for the lacebug *Campylosteira verna*.

1.7 Number of records

Records are being added to the Vice-county database at a rapidly increasing rate (Diagram 1). The increase starts around 2010, probably relating to the setting up of the *British Bugs* website and the adoption of on-line recording - NatureSpot was also set up in 2010.

Diagram 1 - number of records



2. MUSEUM COLLECTIONS

2.1 Introduction

The Heteroptera collection for Leicestershire is held at the County Resources Centre (CRC) in Barrow upon Soar. The Centre is managed by a small team of staff overseen by Alison Clague, Senior Curator.

The Natural Life section contains preserved botanical and zoological specimens and supporting archives including original collectors' notes and record cards. The entomological collections are housed in a series of wooden drawers with glass tops within cabinets (Figure 13). There are approximately 3,560 Heteroptera specimens comprising examples from the UK, a small number from continental Europe and some of unknown origin. Approximately 980 specimens are from VC55.



Figure 13: Part of the Leicestershire Museum Service's collection of terrestrial Heteroptera (KN)

2.2 Overview of recent work on the Heteroptera collection

Between 2004 and 2009 Dave Budworth, VC55 County Recorder for Hemiptera until his death in 2022, started extracting data from VC55 and non-VC55 terrestrial Heteroptera specimens completing the shieldbugs and allies and some of the Lygaeidae. In 2010, Helen Ikin worked on parts of the collection and made several additions.

From 2011 to 2012 Steve Lane (invertebrate ecologist and national organiser of the Clown Beetles Recording Scheme) was employed to identify and reorganise Coleoptera specimens. He also sorted and accessioned approximately 700 miscellaneous Hemiptera (allocating a unique reference number to objects formally acquired by a museum, cross-referenced in an accession register or 'day book' with details of donor, date, method of acquisition etc) and processed a box of specimens collected by Derek Lott.

In March 2023, Sue Timms and Kate Nightingale commenced a series of visits to the Centre with the aim of extracting the remaining VC55 label data following on from the work undertaken by Dave Budworth. This exercise was later expanded to include double-checking of data already extracted, confirming identifications and photographing selected specimens.

2.3 Organisation of the collection

Specimens are organised and labelled according to the order set out in "*Land and Water Bugs of the British Isles*" (Southwood & Leston, 1959). The vast majority of specimens are attached to cards with water-soluble entomological glue, dorsum up, with a pin through the mounting card and the labels beneath. Some have been set with wings open, but most are closed. The majority of specimens are muddled within their section and are not organised according to date or collector.

Some areas are very overcrowded, with specimens jammed in sideways and over-spilling into other sections; adjustments were made to spacing wherever possible and the contents of one over-crowded drawer split into two.

The first three drawers were reorganised by Dave Budworth or Steve Lane, with specimens transferred to smaller unit trays lined with Plastazote. Remaining drawers are lined with thick paper over cork, making smooth removal and replacement of specimens somewhat difficult risking damage to adjacent specimens in particularly overcrowded areas.

2.4 Label data

The level of detail on the specimen labels is inconsistent. Most labels include sufficient information to merit addition to the vice-county database held at Leicestershire and Rutland Environmental Records Centre (LRERC), including recorder/collector name, date, location and accession number. Occasionally other details are incorporated such as grid reference, collection method, survey details, sex, host plant, determiner and determination date.

Some specimens include an 'orange disc' label to denote VC55 but its use is not consistent or widespread.

A number of specimens have very sparse label data but cross-checking with archive materials yielded useful information. Most specimens have an accession number enabling cross-checking against the details in the Museum's 'day book'. Unfortunately, the majority of specimens collected by T.W. Tailby did not have sufficient data for inclusion on the LRERC database, despite his reputation as a prolific collector within Leicestershire.

2.5 Condition

There is obvious degradation of many specimens (Figures 14 & 15), principally colour changes and fading due to age. Several of the smaller and more fragile species were missing body parts, occasionally leaving just legs and antennae glued to the cards. There were fewer issues with the relatively large and robust specimens such as the shieldbugs and *Coreidae*.

Many specimens, particularly the older ones, are very contaminated with dust, dirt, fibres and other debris, potentially obscuring identification characteristics. Only one specimen, a *Nezara viridula* (Southern Green Shieldbug), showed obvious signs of fungal contamination: although thought to no longer pose a threat, the drawer was quickly quarantined in the Centre's freezer for several weeks.

Most of the pins are in reasonable condition but some showed evidence of verdigris. One collector used short thick dress-making pins, rather than entomological pins, making labels hard to read and in some cases causing them to stick together.



Figure 14: dirt and fluff adhering to specimen of *Drymus brunneus* (ST)
C.W. Henderson, Charnwood Forest, 1929



Figure 15: *Phytocoris* sp. - past insect damage (KN)

2.6 Determinations

After completing the initial exercise to extract label data, and thus being able to assess the size and scope of the VC55 specimens, a shortlist of specimens for further investigation and checking was drawn up. This included (a) first County records (species with a single or very few VC55 specimens), (b) uncommon (scarce and otherwise notable) species and (c) those considered most likely to have been potentially misidentified for various reasons, including absence from Southwood & Leston (1959) at the time of collection.

The genitalia of several specimens collected by Derek Lott had already been examined by him and glued adjacent to the specimen on the mounting card.

A significant number of Harry Clements' specimens were determined in 1985 by Claire A. Pearce, a Museum volunteer supervised by Ian Evans. Her main remit was to accession Harry's specimens but her level of skill and experience is unknown - thus many of her determinations have subsequently been re-checked with a few redeterminations being necessary.

During his work with the beetle collection, Steve Lane checked and re-determined some Heteroptera specimens, moving them to the correct section within a drawer, but re-determination labels were not added; a few notes were pinned in the collections indicating likely problem areas, including the *Lygus* species.

2.7 Examples of redeterminations

Close examination, microscopy and keying out using Southwood & Leston (1959) and other authoritative sources revealed several incorrectly determined specimens. To date, more than 30 redeterminations have been made, mainly relating to species that are 'red' in NatureSpot's RAG rating system, plus a few 'amber'. Redeterminations included:

- 1: two specimens of '*Tingis reticulata*' (Don Tozer, Kilby 1952, and Don Goddard, Empingham 1982) redetermined as *Tingis ampliata*;
- 2: three specimens of '*Tetraphleps bicuspis*' (Harry Clements, Shepshed 1964) redetermined as *Lyctocoris campestris*;
- 3: a specimen labelled '*Nabis pseudoferus*' from Charnwood Lodge, which Derek Lott also queried, was re-determined to *Nabis rugosus*, evidenced by pronotum dimensions;

- 4: several specimens labelled *Trigonotylus ruficornis* which were determined before this genus was split in two were redetermined to *T. caelestialium* (Figure 19);
- 5: two specimens of '*Megaloceroea relicticornis*' redetermined as *Notostira elongata*;
- 6: late-instar nymph labelled *Palomena prasina* Green Shieldbug (V.J. Heath, Desford 1977) immediately raised suspicions. If correct, this would pre-date the first County record on the draft checklist by 20 years but the shape, relative antennal length and pinkish colouration of the pronotal edges pointed towards *Acanthosoma haemorrhoidale* Hawthorn Shieldbug; redetermination was confirmed by Tristan Bantock of British Bugs;
- 7: three shieldbugs labelled *Eurydema dominulus* Scarlet Shieldbug including two from a garden in Evington (L.K. Dallaston, 1975) and one from Spain, were examined (Figure 16). The Spanish specimen and one of the Evington individuals were re-determined as *Eurydema ventralis*; the second Evington specimen is *Eurydema ornata* Ornate Shieldbug; all were confirmed by Tristan Bantock. *E. ornata* is a relatively recent addition to the British checklist but *E. ventralis* is not currently included. It is likely that the Evington specimens were accidental imports and, at the time of collection, all three would have matched the description in Southwood & Leston (1959) - "*bright red insects with black markings. 6-7mm*";
- 8: three specimens labelled *Lygocoris lucorum*, flagged by Steve Lane as possibly incorrect, were re-determined as *Lygus rugulipennis*.



Figure 16: The three *Eurydema*: from l-r:
E. ventralis (Spain), *E. ventralis* (Evington, 1975), *E. ornata* (Evington 1975)
 Specimens in Leicestershire Museum Service's collection (KN)

2.8 Anomalies

Nezara viridula (Southern Green Shieldbug) - a single specimen from King Richard's Road in Leicester in 1970, collector/recorder unknown. Museum records revealed that it was found in a bunch of grapes and, therefore, we have not included it on the checklist - we do not know where the grapes came from! This species has not yet been found in the wild in VC55. It is a relatively recent UK arrival being listed in Southwood & Leston (1959) as a foreign species sometimes found on imported fruit and vegetables from southern climes;

Aelia acuminata (Bishop's Mitre Shieldbug) - a specimen from Leicester in 1965, collector/recorder unknown. Museum documents stated "*found in pot of jam*" so we have not included it on the checklist; we do not know where the jam fruit came from! The first VC55 record from the wild was 2004.

2.9 Missing' and other specimens separate from main collection

Several specimens were missing with a note stating 'removed to Citizen Science' or 'Education'. They were found in drawer 56 in a separate 'Teaching' cabinet with a note stating 'a few examples of the specimens listed in the 'Reprint from the Transaction of the Leicester Literary and Philosophical Society, Vol LXVII by H.A.B. Clements . . . and IM Evans...'. The 'Teaching' drawer also contains first County specimens collected by Don Tozer including *Aradus depressus* (Figure 4, Gumley 1933) the solitary specimen of this species. The specimen of *Himacerus (Stalia) boops* (Harry Clements, Ulverscroft 1967) is the only VC55 record to date (Figure 18).



Figure 17: *Chorosoma schillingi*
D.A. Lott & J. Woodhead, Humberstone Wharf
Specimens in Leicestershire Museum Service' collection (Photos: KN)



Figure 18: *Himacerus (Stalia) boops*
H.A.B. Clements, Ulverscroft, 1967

2.10 Future work

We have made some recommendations to the curation staff:

- some areas of the bug collection are still cramped and parts need re-spacing, utilising empty space and drawers within the overall collection; many of the 'holding' areas which were set up are not occupied by specimens – especially in the 'Homoptera' drawers;
- the section labelling and order will need to be updated in line with subsequent additions to the British checklist, changes to taxon name and/or family, and 'splitting' of species;
- all VC55 specimens should be marked in some way either by consistent use of the orange discs or separation into VC55 and non-VC55 sections;
- various problem areas should be tackled including re-labelling the specimens re-determined by Steve Lane;

- we have checked many specimens, but identifications need to be systematically checked, prioritising critical genus, and adding re-determination labelling. Critical families/genus include: within Miridae, the *Lygus*/*Lygocoris*/*Neolygus*/*Apolygus* complex, *Dicyphus*, *Orthops*, *Phytocoris*, *Psallus*, *Orthotylus*; Anthocoridae; some Nabidae; some Lygaeidae (e.g. *Drymus*, *Scolopostethus*). It may never be possible to confirm the identity of certain specimens for a number of reasons. Potentially destructive genital determination is not acceptable, and specimens that are glue-mounted ventrally and which require examination of the underside characteristics cannot be tackled unless specimens are removed from their cards.



Figure 19: *Trigonotylus caelestialium* (ST).



Figure 20: *Phytocoris populi* (ST)

Derek Lott's specimens in Leicestershire Museum's collection, showing characteristic basal antennal patterns used in verification of these two species.

3. SOURCES OF DATA, VERIFICATION AND LOCAL STATUS

Data used to produce the provisional checklist has been collated from the following sources (Diagram 2).

3.1 Museum specimens

Leicestershire Museum Collection, Barrow Stores – see section 2 above.

3.2 Documentary sources

Ian M Evans' Archive and H.A.B. Clements' record cards

These documents were used to produce Clements & Evans (1973) and were passed to Sue by Ian. They will eventually be lodged with LRERC.

Terrestrial Heteroptera Record card index

These are held at the CRC. The main card index was set up by Derek Lott and derived from documentary sources including Clements & Evans (1973). Most of these documents are in LRERC's archives including Don Goddard's site survey reports – an important source of data on many taxon groups as well as Heteroptera. Also included are data from the North-East Leicestershire Coalfield survey (Evans, 1979) of an area north of Melton Mowbray carried out by Leicestershire Museum staff in 1978 to inform the proposal to open up a new coalfield in the Belvoir and Asfordby area. Derek did not trawl through the Museum collections when compiling his card index which only goes up to 1985. Some additional Terrestrial

Heteroptera Record cards were discovered in the Barrow stores. They were compiled by volunteer Claire Pearce in 1985-1986. Many of the cards relate to shieldbugs in Don Tozer's and Ian Evans' collections, with many duplicated elsewhere, but a few new records were found.

LRERC document archive

This is an important source of data which is held in the species file index 'S70' and in the Parish file archive. Very little of this data had been extracted and put onto the VC55 database.

Jenny Owen's card index from her garden in Leicester, 1984-2001

Between 1984 and 2001 Jenny Owen and her husband Dennis carried out systematic garden surveys, at their home at 66 Scraftoff Lane, Leicester, using Malaise and pitfall traps. The results were published in *'The Ecology of a Garden: The First Fifteen Years'* (Owen, 1991) and the follow-up *'The Wildlife of a Garden: A Thirty-year Study'* (Owen 2010). Jenny's original record card index boxes, notebooks and other documents related to her surveys were donated to the Environmental Records Centre by her daughter, Sue Owen, and are now at the CRC at Barrow. Peter Kirby verified many of the records. There is a card per species but these do not have precise dates for records - just years.

Leicester Literary & Philosophical Society (Natural History Section) newsletters (LLPS:NHS)

Scanned copies of these newsletters were received from Ray Morris.

Leicestershire (& Rutland) Entomology Society Newsletters (LES/LRES)

Scanned copies are available on NatureSpot's website - '& Rutland' was added to later editions. They yielded a few more records, the most notable being a record of the Scarab Shieldbug (*Thyreocoris scarabaeoides*) from Ketton Quarry by Jon Daws in 1994, some 20 years before the next sighting which also came from Ketton (Figure 21). It was verified by Steve Lane and returned to Leicestershire Museum but sadly the specimen has not been found in the collection.



**Figure 21: Scarab Shieldbug *Thyreocoris scarabaeoides*
(Mark Skevington, Ketton Quarry, 2014)**

Loughborough Naturalists' Club (LNC) archive

Paper copies of the records of sightings received by LNC are held at LRERC; they are the source of the accounts in LNC's quarterly newsletter 'Heritage'. They proved to be a valuable source of data on shieldbug and allied groups – see section 1.5 above for more on the two main bug recorders, Peter Gamble and Howard Bradshaw.

3.3 Digital sources

LRERC's Orca database

This is the main source of digital data to which all data collated during this current project will be passed to LRERC for input into Orca. Although very little historical bug data was already on Orca, it does hold more recent records from iRecord, NatureSpot, Steve Woodward and other local naturalists, Museum and Records Centre staff surveys, records from members of the public and miscellaneous ecology reports including those received in support of planning and minerals applications.

NatureSpot records received in 2023

These were not yet on Orca when the checklist was compiled, so records have been accessed directly from NatureSpot.

National Recording Scheme databases

A copy of the Plant Bugs and Allies scheme database was received from the national recorder, Jim Flanagan, in February 2023. The Shieldbugs and Allies national recording scheme's data is placed onto iRecord, from which VC55 data has been extracted and imported to LRERC's Orca database. Much of the verification of this data is done by Maria Justamond and Tristan Bantock. The national database includes records from noted Heteroptera experts including Keith N.A. Alexander, Peter Kirby, Bernard S. Nau, Jim Flanagan, Tristan Bantock and Steve A. Lane.

Rutland Natural History Society

A spreadsheet from Ray Morris

Graham Finch

A spreadsheet of records from his MapMate database which also included some records from Steve Lane.

Mark Skevington

A spreadsheet of records from his MapMate database; these had been sent to the previous vice-county Recorder, Dave Budworth.

National Biodiversity Network (NBN)

Records up to the end of 2023 were received but very little new data were present in the download apart from some from Steve Lane and Dave Budworth along with a few miscellaneous records. The latter included an intriguing record from Loughborough in 1948 of a specimen of a rarely recorded lacebug, *Catoplatus fabricii*, in the Tullie House Museum in Cumbria.

DaNES database

The previous VC55 County Recorder, Dave Budworth, kept some VC55 data on the database that he maintained for the Derbyshire and Nottinghamshire Entomological Society (DaNES) until his sudden death in February 2022. Kieron Huston of DaNES then became Records Co-ordinator for DaNES and the custodian of the database (<https://www.danes-insects.org.uk/recording.html>). He sent a copy of bug records to the national recorder for plant-bugs, Jim Flanagan, who in turn filtered out the VC55 records and passed them to us. There is much duplication of data from other sources but it yielded c400 new records, including some from Dave Budworth.

Personal records of the authors

Records from Sue, Kate and Alan will end up on Orca in due course, often via NatureSpot or iRecord, but not all this data has found its way on to the database in time for this publication.

3.4. Summary

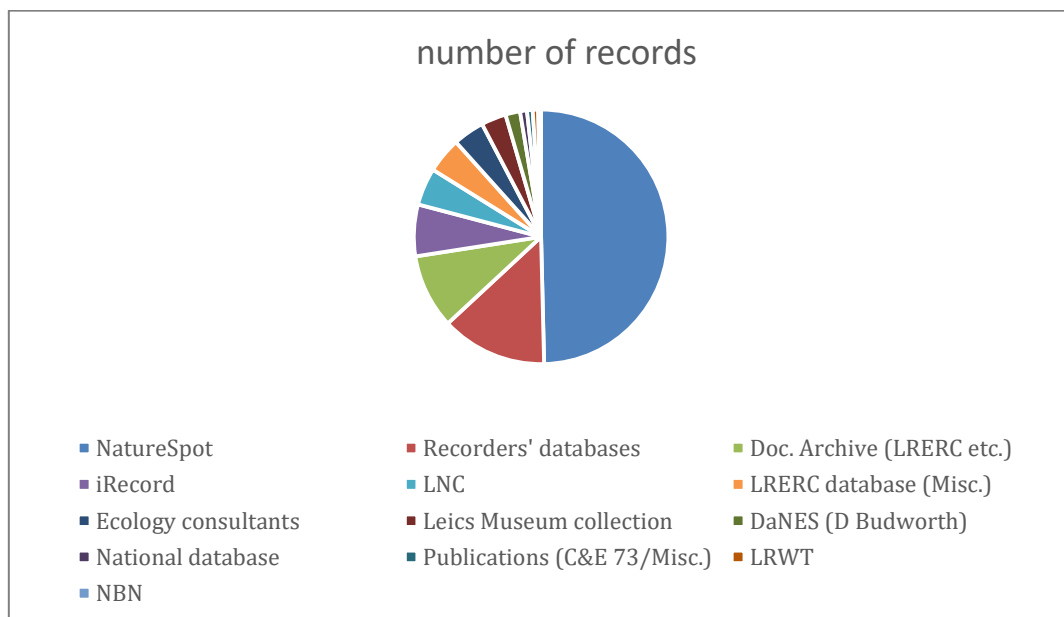
Due to the duplication of many records that appear on multiple sources, this is only illustrative. The original source of the data should be the primary one but can be hard to establish. Some sources have been combined into a miscellaneous category (Table 1).

Table 1: Sources of data

Source	Number of records	Percentage of total
NatureSpot	10,536	50
Recorders' databases	2,860	13.5
Document Archive (LRERC etc.)	2,006	9.5
iRecord	1,394	6.5
Loughborough Naturalists' Club (LNC)	1,006	4.5
LRERC database (Miscellaneous)	958	4.5
Ecology Consultants	844	4
Leicestershire Museum's collection	672	3
DaNES (D Budworth)	394	2
National database	186	<1
Publications (C&E 73/Miscellaneous)	153	<1
Leics & Rutland Wildlife Trust (LRWT)	146	<1
National Biodiversity Network (NBN)	78	<0.5
Total	21,233	

LRERC = Leicestershire & Rutland Environmental Records Centre
 DaNES = Derbyshire & Nottinghamshire Entomological Society database maintained by D Budworth
 C&E 73 = Clements H.A.B. & Evans I.M. (1973). *Leicestershire Bugs*. Trans. LLPS 67 50-68

Diagram 2: Sources of records



3.5 Duplication of records

There is much duplication between the Leicestershire Museum specimens, LRERC's archive, the Terrestrial Heteroptera Record cards, Clements & Evans (1973), Orca/NatureSpot, the NBN/iRecord and national databases. As far as possible, duplicated records have been identified but it is very likely that some have slipped through the net.

'Duplicates' are not always exact copies of records; those that are very close in terms of date, grid reference, locations, recorder or notes but not exactly the same, are very hard to spot. The 'record drift' factor (akin to Chinese Whispers) can cause minor changes and errors to creep into data. Common sense and detective work, mainly by checking various documentary sources, has been applied. Wherever possible, the source closest to the record in used - often this is a written report or a specimen, rather than a collated list or set of record cards - but this is not always the case.

Whilst every effort has been made to retain only one version of a record, sometimes the same record from a different source includes more detailed information.

3.6 Verification and validation

Verification is the agreement by a local or national expert that species identification is correct.

Validation is checking record details – names, location, grid references and dates.

To validate records, cross-checking with other sources can help to enhance and confirm location, date and recorder details. NatureSpot and Orca have a filter that flags up records with grid references that are out-of-county (often the result of confusing the SP and SK prefixes), but minor mistakes in grid references are hard to spot. Earlier records rarely have grid references – this practice became more common in the 1960s only becoming widespread much later. Estimated or centroid grid references have had to be made for many records for input onto Orca.

Perhaps the hardest task for any vice-county or national recorder is verifying other recorders' data. A balance has to be struck between a desire for accuracy and the need to compile as complete a dataset as possible. Knowledge of a recorder, their track record and reputation is very helpful but the authors' own expertise in bug identification has frequently been tested!

Older records, which are not backed up by Museum specimens or expert verification at the time, are particularly hard to verify. A further problem is taking account of recent discoveries and changes in taxonomy – for example, Southwood & Leston (1959) does not split the genus *Trapezonotus* into the current three species. Older records for these species can, therefore, only be assigned to genus. The accepted identification of some genera has become more stringent over time especially if this involves dissection of genitalia.

Reference to Museum collections has been helpful but the condition of some specimens, and the way they have been mounted, makes them impossible to verify; critical characteristics can be obscured and some specimens may only be identified to species level via dissection.

Modern records are often backed up by photographs, as on iRecord or NatureSpot, and this is encouraged – as long as the images are good enough to show key characteristics!

As all the collated data has been passed to LRERC for input into Orca, standard categories have been used in the data.

- **Known correct** - generally only used for data verified or recorded by national or county Recorder or known national expert – for example: Tristan Bantock, Peter Kirby, Keith Alexander, Bernard Nau or Jim Flanagan;
- **Presumed correct** - used for most records from known recorders or verified by them, including past Vice-county recorders, Derek Lott and Dave Budworth, and the authors;
- **Unconfirmed** - usually these are difficult species where (a) there is no supporting evidence, (b) where the evidence available is inconclusive or (c) from a recorder about whom little is known;
- **Not accepted by C/N Recorder** - when the authors felt there was insufficient evidence for a record or where the circumstances surrounding the record are such that the identification seems doubtful.

'Known correct' and 'Presumed correct' records have been used in compiling the checklist in Part 2 of this publication. A few unconfirmed records for notable species are also referred to.

3.7 Red-Amber-Green ('RAG ratings')

The rating system has been taken from NatureSpot's galleries accessed in April 2024.

- **GREEN** - the species is relatively easy to identify and is unlikely to be confused with anything else;
- **AMBER** - the species can be identified with care but there are similar species with which it could be confused;
- **RED** - detailed examination of the specimen is needed to identify the species (a photograph alone is not normally sufficient because key features are too small or hidden) and/or there are one or more similar species and confusion is common. (Figures. 22 & 23).



Figures. 22 & 23: *Anthocoris confusus* - adult male (left) and paramere (clasper) (right) Thornton Meadow, 2023. A 'Red-rated' species. Verification of some species may involve dissection of genitalia, usually of the male (Photos: AC)

4. NATIONAL CONTEXT, LOCAL STATUS AND POPULATION CHANGES

4.1 National status

The national status in the provisional checklist has been taken from the checklists on the British Bugs website (https://www.britishbugs.org.uk/systematic_het.html) with additional information from individual species accounts.

An explanatory note on the website states that '*This British Heteroptera checklist (2021) is based on Nau (2006) but includes subsequent additions and revisions to the British fauna. It is linked to each species account, if illustrated. . . . Current IUCN statuses are given for Shieldbugs & allies (Bantock, 2016) Note that national status designations for certain species of plant bugs & allies may no longer be appropriate due to range changes since the last review (Kirby, 1992).*'

4.2 Range expansion

Many terrestrial Heteroptera species are colonising the VC55 of their own accord. In particular, range expansion is happening for some shieldbugs (Pentatomoidea), squash bugs (Coreidae), Rhopalid bugs (Rhopalidae), ground bugs (Lygaeidae) and plant bugs (Miridae). Some of these are now common or very common having previously been rare or absent in VC55. This is a genuine colonisation of the vice-county following a national trend of northward and westward range expansion from the south and east coasts as well as the Thames Gateway which is of national importance for bugs. Some of these are large and distinctive species that are easily found, and would not have been overlooked before.

Climate change may be partly responsible as many bug species favour warmer climates. However, some species that were formerly strongly associated with a particular plant are spreading because they have '*discovered*' a wider diet of plants. Habitats for many of these species typically include gardens, waste ground, scrub, allotments, parks and rough grasslands: they are often not particularly associated with a quality habitat. Other species, formerly present in warm dry coastal grasslands and dunes, are colonising inland habitats - dry grasslands and open habitat mosaics, such as those associated with quarries and previously developed land.

This is not species-recovery but range-expansion; some species were either extremely rarely recorded or not recorded at all in VC55 100 years ago. Whilst they may be beneficiaries of climate change, at least in the short-term, we do not know if this will continue because the impacts of climate change are unpredictable.

Examples of such species are listed below:

- **Green Shieldbug** *Palomena prasina* - 1997 Peter Gamble (Quorn); all but two records post 2000. Now one of the commonest bugs recorded; many habitats including gardens, parks, scrub, etc;
- **Dock Bug** *Coreus marginatus* - 2004 Howard Bradshaw; now very common in places such as gardens, waste ground, tall herbage and rough grassland; on docks and associated species;
- **Cinnamon Bug** *Corizus hyoscyami* - 2010 Steve Woodward (Ulverscroft); now common in places such as gardens, waste ground, tall herbage, rough grassland;

- **Brassica Shieldbug** *Eurydema oleracea* - 2006 Howard Bradshaw (Leicester); now quite common, including gardens, allotments, waste ground, tall herbs, rough grasslands. (Figure 24);
- **Box Bug** *Gonocerus acuteangulatus* - 2014 Mike Higgott (Glenfield); 'discovered' various other woody species and now spreading out into the Vice-county being commonly recorded in scrub, gardens, parks, etc. (Figure 27);
- **Juniper Shieldbug** *Cyphostethus tristriatus* - 1984 D. Evans (Leicester); majority of records post-2000. 'Discovered' on other conifers, including Leyland Cypress and Lawson's Cypress (Cupressaceae) so that it is now quite common in VC55;
- **Bishop's Mitre Shieldbug** *Aelia acuminata* - 2004 Howard Bradshaw (Leicester); becoming common on grasslands and open mosaic habitats;
- **Tortoise Shieldbug** *Eurygaster testudinaria* - 2016 Kate Nightingale (Ketton Quarry NR); becoming common in grasslands and open mosaic habitats. (Figure 25);
- **Rhopalid bug** *Rhopalus subrufus* - one record in 1936 (all others being post-2004) Howard Bradshaw (Little Stretton); now common in grasslands and open habitat mosaics, often associated with St John's-wort (*Hypericum*);
- **Nettle bug** *Heterogaster urticae* - 1984 Derek A. Lott (Quorn); great majority of records after 2000. Now very common in some years.



Figure 24: *Eurydema oleracea*
Brassica Shieldbug, Cropston, 2022 (KN)



Figure 25: *Eurygaster testudinaria*
Tortoise Shieldbug, Thornton Meadow, 2019 (ST)

Some other plant and ground bugs that are now being recorded for the first time in VC55, could have been overlooked because they are harder to find and identify. Nonetheless, the discovery of many new species in VC55 appears to follow national trends of range expansion.

No doubt other species will colonise VC55 in the future. Some recent records for some species such as the Rhombic Leatherbug (*Syromastus rhombeus*) (2022, Mathew Berriman, Seaton), Cryptic Leatherbug (*Bathysolen nubilus*) (2020, Stephen Lewis, Asfordby), the Stilt Bug (*Berytinus hirticornis*) (2019, Mike Higgott, Anstey) and Slender-horned Leatherbug (*Ceraleptus lividus*) (2012, Tristan Bantock & Colin Plant, Ashby de la Zouch), may represent a new phase of range expansion.

4.3 Recolonisation

The Rhopalid bugs *Stictopleurus punctatonervosus* and *Stictopleurus abutilon* are special cases. Both were considered extinct in 1992 (Kirby, 1992).

Southwood & Leston (1959) lists *S. punctatonervosus* (Figure 26) as being found on dunes and sandy heaths along the south coast so that it is unlikely to have been present in Leicestershire and Rutland previously. It recolonised the British Isles in 1997 and 1992 respectively (Bantock, 2016) and is now regularly recorded in VC55 with the first known record in 2009 (D. Clements, Asfordby).

There are few confirmed VC55 records for *Stictopleurus abutilon* which is difficult to separate from *S. punctatonervosus* (Figure 26). A small colony was recorded by two of the authors at Holwell Reserve in 2023 – perhaps representing early colonisation of the Vice-county.



Figure. 26: *Stictopleurus punctatonervosus*
Cropston, 2022 (KN)



Figure 27: *Gonocerus acuteangulatus* Box Bug
Cropston, 2019 (KN)

4.4 New species to the British list

New species are frequently added to the British list, often turning up in the south-east first then spreading – sometimes quite rapidly – to the Midlands and northwards. The horticultural trade is the cause of several of these introductions. Some examples are below with the dates first recorded in Britain and in VC55.

Stephanitis takeyai (Andromeda Lacebug) is native to Japan; it was introduced into the USA and Europe via the plant trade. It feeds on *Pieris japonica*, *Rhododendron* and azaleas and is sometimes regarded as a garden pest; large infestations can damage the leaves and weaken the host. First found in VC55 in 2014 by Mike Higgott at Anstey.

Tropidosteptes pacificus is a North American bug associated with Ash and is a recent (2012) arrival in the British Isles possibly via the Netherlands. The first VC55 record was from Groby in 2023 (Sue Timms) where males and females were found together on an Ash tree.

Leptoglossus occidentalis, the large and spectacular Western Conifer Seed Bug, is native to North America and associated with various species of Pinaceae. It was reported in Europe

from Italy in 1999 and then spread very rapidly, arriving in the British Isles in 2008 with the first VC55 record in the same year (Peter Gamble, Quorn). It is often found in buildings and reported by members of the public. (Figure 28)

Rhaphigaster nebulosa (Mottled Shieldbug) was recorded in London in 2010. There is one VC55 record when found by Craig Mabbett at Magna Park, Lutterworth in 2018.

Closterotomus trivialis is native to the Mediterranean and was first recorded in London in 2009. It has probably been introduced via the plant trade and most records are from gardens; it is polyphagous. First recorded in VC55 in 2018 by Graham Calow at Sapcote and may now be fairly common.



Figure 28: *Leptoglossus occidentalis*
Leicester, 2023 (AC)



Figure 29: *Deraeocoris flavilinea*
Bagworth, 2019 (ST)

Deraeocoris flavilinea (Figure 29) has undergone rapid colonisation since its first British record in 1996 now being common in VC55, usually on Sycamore and Field Maple; the first VC55 record came in 2009 when found by Dave Nicholls at Martinshaw Wood.

Orsillus depressus is a southern European seed bug in the Lygaeidae family first recorded in the UK in the late 1980s and is occasionally recorded in VC55 with the first sighting being in 1998 by Jenny Owen (Leicester). In its native home it feeds on a variety of cypresses but is usually on Lawson's Cypress in Britain.

4.5 'Lost' species

Table 2 gives the list of species not recorded since the beginning of 2000. Many relate to early records taken from publications. These are hard to confirm as sources and details are generally not given. 'Pre-1907' refers to the first checklist (Bouskell, 1907).

Several of the other species on this list are likely to be overlooked because of their small size, under-recorded habitat or difficulty in identification. All of these species are represented by a single or handful of records in VC55; none have been widely recorded. Present-day records for any of these species are particularly welcome!

4.6 Local status and distribution of records

The local status assessments in the checklist are based on our knowledge and experience of current data up to 2023 and not on numerical occurrence in numbers of tetrads because we felt this would be misleading.

We have not attempted to create distribution maps for species; there are not enough data to make this meaningful. Parts of VC55 are particularly data-deficient in a pattern that is reflected in many other taxon groups (Map 1).

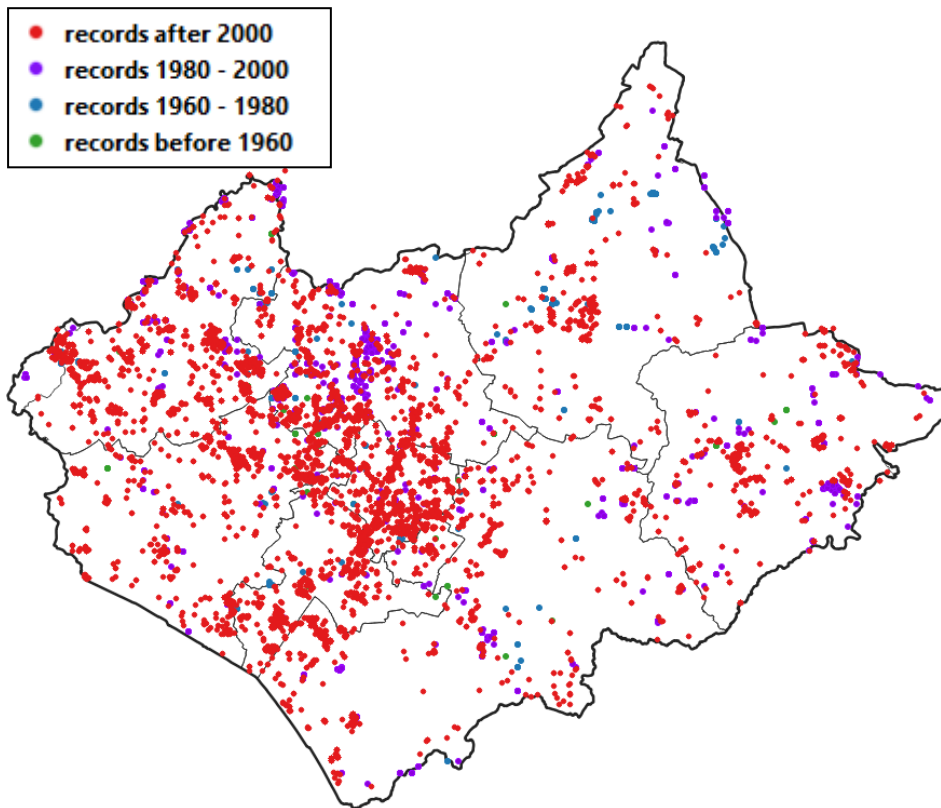
Table 2: Species not recorded since 2000

First record	Last record	Species	Note
Pre-1892	Pre-1892	<i>Psallus quercus</i>	One record
Pre-1907	Pre-1907	<i>Kleidocerys ericae</i>	One record; may be present; v similar to <i>K. resedae</i>
Pre-1907	Pre-1907	<i>Psallus variabilis</i>	One record
Pre-1907	Pre-1907	* <i>Psallus salicis</i>	One record; may be overlooked?*
Pre-1907	Pre-1907	<i>Globiceps flavomaculatus</i>	One record. NS (Nb)
Pre-1907	Pre-1907	<i>Loricula pselaphiformis</i>	One record; may be overlooked?
Pre 1907	Pre-1907	<i>Nysius thymi</i>	One record. Possibly overlooked?; difficult ID
Pre-1923	Pre-1923	<i>Chlorochroa juniperina</i>	Extinct in UK; one record (Butler); no details
Pre-1945	Pre-1945	<i>Stephanitis rhododendri</i>	One record
1963	1963	<i>Heterocordylus genistae</i>	One record, conf from specimen (HABC, 1963); host plant (<i>Genista tinctoria</i>) rare in VC55, site lost to M1 construction; may now be extinct
Pre-1907	1964	<i>Psallus betuleti</i>	3 records, plus some unconfirmed; may be overlooked; difficult ID
Pre-1865	1964	<i>Mecomma dispar</i>	4 records. Conf. from Museum specimens. Mainly N and W Britain; may now be extinct in VC55
1967	1967	<i>Himacerus (Stalia) boops</i>	One record, confirmed from Museum specimen (HABC, 1967).
1977	1977	<i>Cimex columbarius</i>	One record (D Hockin); may still be present, but RDB3
1979	1979	<i>Fieberocapsus flaveolus</i>	One record (DG Goddard, 1979 Knipton); conf. from Museum specimen
Pre-1907	1981	<i>Cimex lectularius</i>	Bed-bugs reportedly on the increase in UK; current VC55 status not known
Pre-1907	1982	<i>Cyrtorhinus caricis</i>	9 records, most confirmed from specimens; scarce habitat (swamp)
1982	1982	<i>Capsus wagneri</i>	Two records, confirmed from specimens. NS (Nb). D A Lott, 1982.
1983	1983	<i>Myrmedobia exilis</i>	Possibly overlooked?
Pre-1923	1983	<i>Blepharidopterus diaphanus</i>	3 records. Difficult ID
Pre-1892	1983	* <i>Pinalitus rubricatus</i>	3 records from 1983, conf. from specimens, (Swithland Reservoir, pines)*
Pre-1907	1983	<i>Phytocoris populi</i>	Possibly still present; difficult ID (D A Lott, 1983)
1984	1984	<i>Temnostethus gracilis</i>	One record; possibly overlooked?
Pre-1892	1984	* <i>Macrolophus pygmaeus</i>	One from 1960s, one from 1980s*
1977	1985	<i>Oeciacus hirundinis</i>	Probably overlooked; birds' nests.
Pre-1865	1989	<i>Orthotylus bilineatus</i>	4 records from 1980s. A distinctive species; lack of recent records suggests it may be rare/extinct in VC55.
Pre-1907	1990	<i>Xylocoris galactinus</i>	Probably overlooked?
1979	1993	<i>Phytocoris dimidiatus</i>	Possibly still present; difficult ID
1997	1997	<i>Psallus assimilis</i>	One record
1987	1999	<i>Nysius ericae</i>	3 records, possibly overlooked; difficult ID. Some unconfirmed records
1967	1999	* <i>Atractotomus magnicornis</i>	8 records, some confirmed from specimens; possibly overlooked?*

***Stop-press:** re-found species. *Atractotomus magnicornis*, *Macrolophus pygmaeus* and *Pinalitus rubricatus* were all recorded in 2024 at Thornton Reservoir. *Psallus salicis* was found at Donington-le-Heath in 2024.

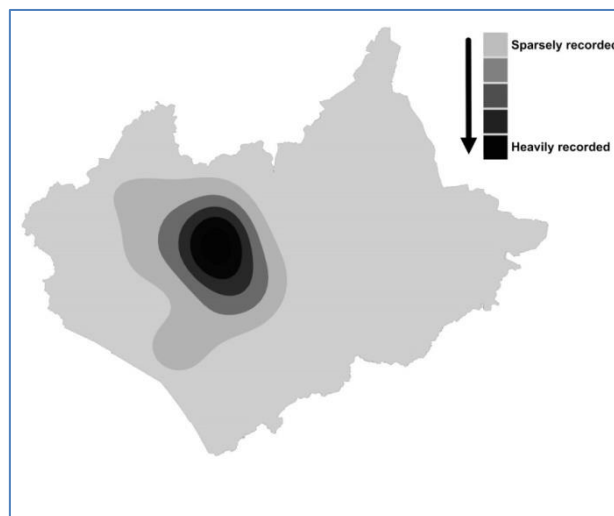
The under-recorded parts of the Vice-county are where farming is the main land-use away from the main centres of population. Access to semi-natural habitat in these areas tends to be limited. Some families are likely to be seriously under-recorded – notably the Anthocoridae, with few recent verified records. Where we feel that a nationally common species is under-recorded, due the difficulty of identification, we have added a note to local status in the checklist in Part 2 (LESOPS 64) of this study.

Map 1: All records: Terrestrial Heteroptera, up to the end of 2023



Plotted using QGIS version 3.22 and TomBio Tools plug-in. (<https://www.fscbiodiversity.uk/projects/biolinks>)

Map 2: Density map showing the variation in terrestrial Heteroptera records in VC55



Plotted using R version 4.4.1 (R Core Team (2024) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria (<https://www.R-project.org/>))

4.7 Record density

Unlike dot maps of records which seem to indicate a widespread distribution of records, the density map of recording (Map 2) shows that the majority of the Vice-county has few records. This is typical of the majority of invertebrate taxon groups.

4.8 The top 30 species

Shieldbugs and allies dominate the top 30 commonly recorded species. The Green Shieldbug *Palomena prasina* accounts for well over 10% of records (Figure 30; Diagram 3).

Diagram 3: Record numbers for the top 30 species (up to end of 2023)

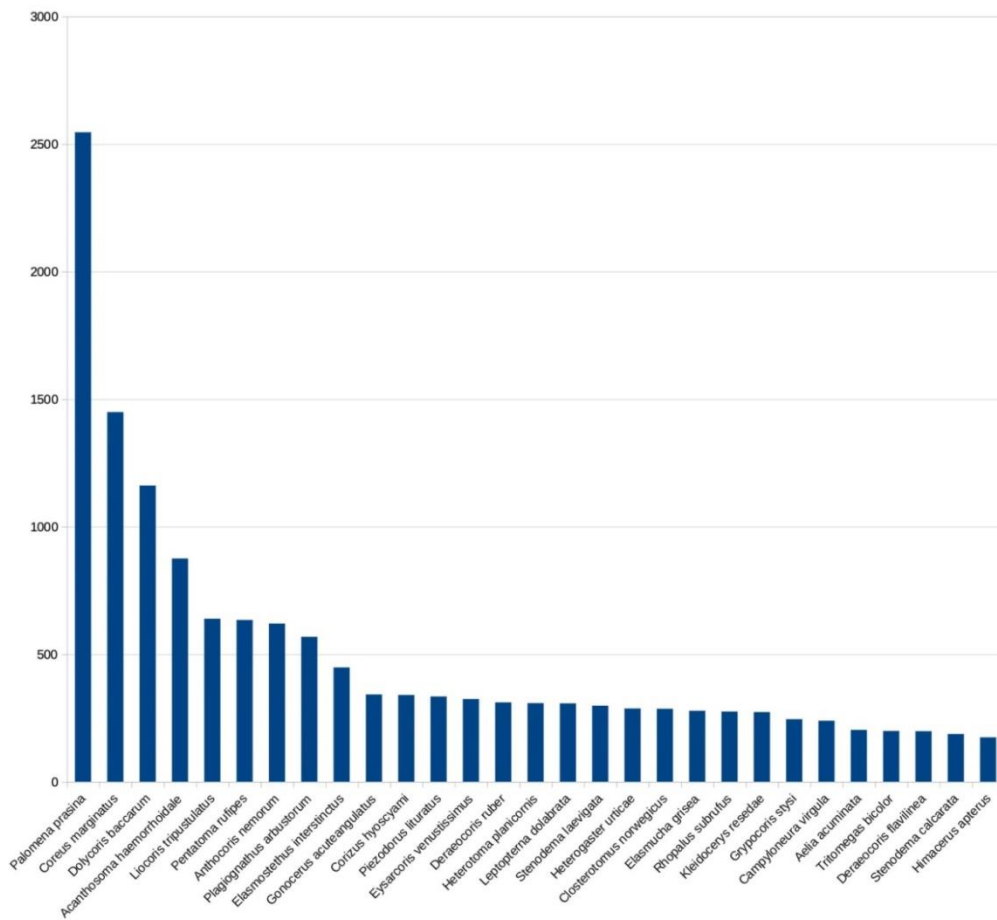
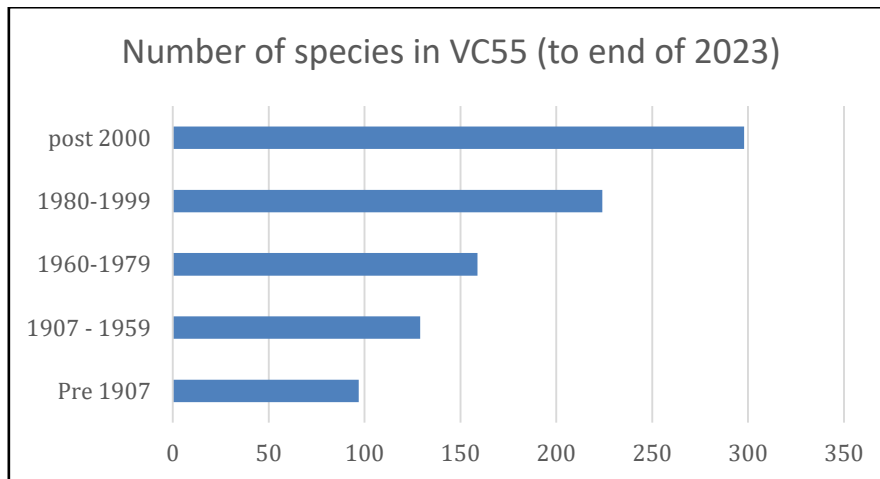


Figure 30: Green Shieldbug *Palomena prasina* nymphs Heather, 2024 (ST)

4.9 Number of species in VC55

As of the end of 2023 the current VC55 checklist stands at *297 confirmed species, approximately 57% of the UK checklist of 520 species (British Bugs website, accessed 23/05/2024). The number of species recorded in VC55 is rising and there is every expectation that the trend will continue (Diagram 4).

Diagram 4: Cumulative number of species recorded in VC55



***stop-press.** New VC55 species continue to be recorded. During 2024, the following VC55 'firsts' were found:

Metopoplax ditomoides (Cropston, KN)
Dicyphus pallidus (Great Merrible, AC; Ratby Burroughs, ST/KN)
Campozygum aequale (Thornton Reservoir, ST)
Campylomma annulicorne (Normanton le Heath, ST)
Atractotomus parvulus (Loughborough, ST)
Reuteria marqueti (Loughborough, ST)
Halticus luteicollis (Ketton Quarry, ST/KN; Great Merrible, AC)

Reasons for this increase include range expansion and the spread of new and recolonised UK species, improved access to better identification resources (especially for the difficult groups) and also the sheer numbers of recorders who have been encouraged by web-based information and advice and on-line recording platforms such as iRecord and NatureSpot.

5. HABITAT AND PLANT ASSOCIATIONS IN VC55

In the sections below, species that are considered to be of conservation importance in VC55 are listed and grouped by habitat type. We have also included some pointers for management, restoration or creation of habitats. The species listed are native to, or associated with, a particular habitat or plant axiophyte (a plant that indicates quality habitat). We have not included species that do not have specific habitat preferences.

5.1 Open habitats, dry grasslands, open mosaics, brownfield land

Many species favour flower-rich, dry nutrient-low habitats that are well-drained and warm up quickly, typically associated with quarries and previously developed land. Outside nature reserves, country parks and SSSIs, this habitat is under threat from development. All habitats of this kind are threatened by natural succession to scrub and secondary woodland, needing active management to survive.

- Bishop's Mitre Shieldbug *Aelia acuminata*
- Tortoise Shieldbug *Eurygaster testudinaria* sensu lato
- Denticulate Leatherbug *Coriomeris denticulatus* (Figure 32)
- Rhopalid bug *Chorosoma schillingi*
- Ground bugs *Megalonotus*, *Peritrechus*, *Stygnocoris* and *Trapezonotus* spp.
- Ground bug *Graptopeltus lynceus* (Viper's Bugloss *Echium vulgare*)
- Stilt bugs *Berytinus* spp.
- Lucerne Bug *Adelphocoris lineolatus*
- Plant bug *Calocoris roseomaculatus*
- Plant bugs *Chlamydatus pullus* and *Chlamydatus saltitans*
- Plant bug *Europiella artemisiae* (Mugwort *Artemisia vulgaris*)
- Plant bug *Hoplomachus thunbergii* (*Pilosella officinarum*) (73.034 *Amphipyra tragopogonis* (Mouse)-ear Hawkweed (Figure 31))
- Plant bug *Miridius quadrivirgatus*
- Plant bug *Oncotylus viridiflavus* (Knapweed *Centaurea nigra* agg.)
- Lace-bug *Catoplatatus fabricii* – (Ox-eye daisy *Leucanthemum vulgare*)



Figure 31: *Hoplomachus thunbergii*
Holwell, 2023 (AC)



Figure 32: *Coriomeris denticulatus*
Nailstone, 2023 (ST)

5.2 Species associated with grasslands of conservation value

The following species are associated with more established grassland. There is considerable overlap with the above category. Low grazing pressure is beneficial to management; bug species that spend part of their life cycle on the aerial parts of grasses and meadow plants can be decimated by cutting. If necessary, cutting should be done in sections to allow some re-colonisation of cut areas, preferably alternated with extensive low-level grazing.

- Plant bug *Pithanus maerkelii* - older damp neutral grasslands?
- Small Grass Shieldbug *Neottiglossa pusilla* (Figure 33)
- Turtle Shieldbug *Podops inuncta*
- Damsel bug *Nabis flavomarginatus*
- Damsel bug *Nabis rugosus*
- Damsel bug *Nabis limbatus*
- Ground bug *Cymus glandicolor*. Associated with rushes
- Ground bug *Cymus melanocephalus*. Associated with rushes
- Plant bug *Trigonotylus ruficornis/caelestialium*
- Plant bug *Acetopsis gimmerthalii* – neutral grasslands?

The following VC55 species have strong associations with axiophytes that are known to be rare, in decline or threatened.

Bedstraws, especially *Galium verum*

Bedstraw Shieldbug *Legnotus limbosus*
Plant bug *Polymerus nigrita* (Figure 34)
Plant bug *Polymerus unifasciatus*
Plant bug *Charagochilus gyllenhalii*

Restharrow (*Ononis* spp.)

Stilt bug *Gampsocoris punctipes*
Plant bug *Macrotylus paykulli*
Plant bug *Dicyphus annulatus*
Stilt bug *Berytinus clavipes*



Figure 33: *Neottiglossa pusilla*
Bardon Hill, 2018 (ST)



Figure 34: *Polymerus nigrita*
Holwell, 2023 (AC)

5.3 Species associated with heathland

Old heathland associated with acid grassland and with dwarf scrub, dominated by heather *Calluna vulgaris*, heath *Erica tetralix* and bilberry *Vaccinium myrtillus*, is a scarce and threatened habitat in VC55 being confined to the Charnwood Forest. Some heather has regenerated in the former coalfield area in NW Leicestershire and some smaller areas of heather dwarf scrub have also been created.

- Anthocorid bug *Orius niger*
- Ground bug *Nysius ericae*
- Plant bug *Orthotylus ericetorum* – can be abundant on heather
- Heather Shieldbug *Rhacognathus punctatus* (First VC55 record in 2017)
- Ground bug *Scolopostethus decoratus*

5.4 Species associated with gorse and broom

This habitat is often undervalued. As a scrub habitat it is not very common in VC55 but is an important component of open habitat mosaic or heath grassland. Apart from Gorse Shieldbug, these species are not often recorded and their true distribution is not known.

- Gorse Shieldbug *Piezodorus lituratus* (Figure 35)
- Plant bug *Asciodema obsoleta*
- Plant bug *Platycranus bicolor* – on Gorse
- Anthocorid bug *Anthocoris sarothamni*
- Plant bug *Heterocordylus tibialis* – on Broom
- Plant bug *Orthotylus adenocarpis* – on Broom
- Plant bug *Orthotylus virescens* – on Broom
- Lace bug *Dictyonota fuliginosa* – on Broom
- Lace bug *Dictyonota strichnocera* – on both host plants (Figure 36)



Figure 35: *Piezodorus lituratus* Gorse Shieldbug
Cropston, 2019 (KN)



Figure 36: *Dictyonota strichnocera*
Billa Barra, 2020 (ST)

5.5 Species associated with oak (*Quercus* spp.)

Many plant bugs are associated with trees and woodlands, often in rides, edges of woodland, clearings, hedgerow trees and parkland, rather than in the middle of shaded woodland. Below are examples of species associated with oak trees and woodland (not necessarily semi-natural ancient woodland sites); all are plant-bugs and may be fairly common:

- *Cyllecoris histrionius* (Figure 37)
- *Deraeocoris lutescens*
- *Dryophilocoris flavoquadrimaculatus*
- *Harpocera thoracica*
- *Megacoelum infusum*
- *Miris striatus*
- *Orthotylus tenellus*
- *Phylus melanocephalus*
- *Phytocoris dimidiatus*
- *Pilophorus perplexus*
- *Psallus confusus*
- *Psallus perrisi*
- *Psallus varians*
- *Psallus wagneri*
- *Rhodomiris striatellus* (Figure 38)



Figure 37: *Cyllecoris histrionius* nymph
Ratby Burroughs, 2023 (ST)



Figure 38: *Rhodomiris striatellus*
Bagworth, 2023 (ST)

5.6 Species associated with native Poplars (*Populus* spp.)

Aspen (*Populus tremula*) is an axiophyte but distribution has been affected by planting in the National Forest area. The native Black Poplar (*Populus nigra* var. *betulifolia*) is rare with distribution being unclear due to the difficulty of separating it from some forms of hybrid Black Poplar (*Populus x canadensis*). Lombardy Poplars (var. *italica*) are a form of Black Poplar, having been commonly planted in VC55, but many have now become over-mature and are often removed for safety reasons - they can be very good habitats. The native White Poplar (*Populus alba*) and the Grey Poplar (*Populus x canescens*) are occasionally planted. There are many species, hybrids and cultivars of non-native poplars; as far as we know these have limited value for invertebrates.

- Anthocorid bug *Anthocoris minki*. (Figures 39 & 40)
- Anthocorid bug *Orius laticollis*
- Plant bug *Orthotylus bilineatus*
- Plant bug *Phytocoris populi*
- Plant bug *Neolygus populi*. On Grey Poplar
- Plant bug *Sthenarus rotermundi*. On White or Grey Poplar



Figures. 39 & 40: *Anthocoris minki* (AC, Knighton Park, 2023) and *Pemphigus spyrotheca* gall on poplar (ST). Rarely recorded: the larvae and adults are reliant on *Pemphigus* aphids which cause the galls on poplar; they develop entirely within the galls.

5.7 Species associated with Ash (*Fraxinus excelsior*)

These may be affected by loss of Ash trees due to Ash Dieback disease caused by the fungus *Hymenoscyphus fraxineus*.

- Anthocorid bug *Anthocoris amplicollis*
- Anthocorid bug *Anthocoris simulans*
- Plant bug *Orthotylus nassatus*
- Plant bug *Psallus flavellus*
- Plant bug *Pseudoloxops coccineus*

5.8 Species associated with Aphid galls on hedgerow Elm (*Ulmus procera sensu lato*)

The aphid *Eriosoma ulmi* forms leaf-curl galls on Elms of the *Ulmus procera* type, mostly present in hedgerow. The galls are not particularly common but occurrence may be subject to natural oscillations in population. The galls sometimes harbour a bug, which feeds on the aphids within.

- Anthocorid bug *Anthocoris gallarum-ulmi*. (Figs. 41 & 42)



Figures 41 & 42: *Anthocoris gallarum-ulmi* (teneral specimen on left) and *Eriosoma ulmi* leaf-curl gall on Elm (right), Nailstone 2023 (ST).

5.9 Species associated with Sallows and Willows (*Salix* spp.) – riparian habitats, wet woodland and scrub

Sallow scrub, as a constituent of open mosaic habitats, is known to be important for many invertebrates. Species are usually *Salix caprea*, *S. cinerea* and hybrids. The habitat may be of most value as scattered scrub of varied age achieved through controlled cutting and coppicing, but mature specimens may be important reservoirs of species.

- Anthocorid bug *Anthocoris limbatus*
- Anthocorid bug *Orius laticollis* (also aspen, alder, oak – wet woodland)
- Plant bug *Lygocoris rugicollis*
- Plant bug *Orthotylus marginalis*
- Plant bug *Pilophorus clavatus*
- Plant bug *Psallus haematodes*
- Plant bug *Salicarus roseri*

Sallows and willows are associated with wetland habitats, riparian and marginal wetland and wet woodland but sallows are often early colonisers of brownfield land and are a component of many open mosaic habitats.

5.10 Species associated with Scots Pine (*Pinus sylvestris*)

Not usually considered as a conservation priority, and not native to VC55, but well established. Scots Pine is valuable for bugs, both as mature and young trees. Some of these species experienced range expansion from Scotland due to conifer planting in the last century.

- Anthocorid bug *Acompocoris pygmaeus/alpinus*
- Anthocorid bug *Elatophilus nigricornis*
- Anthocorid bug *Tetraphleps bicuspis* (Figure 44)
- Pine Cone bug *Gastrodes grossipes* (Figure 43)
- Plant bug *Alloeotomus gothicus*
- Plant bug *Dichrooscytus rufipennis*
- Plant bug *Phoenicocoris obscurellus*
- Plant bug *Pilophorus cinnamopterus*
- Plant bug *Plesiodema pinetella*, associated with pine flowers



Figure 43: *Gastrodes grossipes*
Leicester, Knighton Park, 2024 (AC)



Figure 44: *Tetrableps bicuspis*
Attenborough Arboretum, 2023(AC)

5.11 Species associated with Birch (*Betula* spp.)

Birch woodland is commonest in the north-west of the Vice-county on acid and mineral soils, frequently colonising former coalfield sites. Birch trees are common throughout Leicestershire & Rutland. These bugs may also often be found on other tree species.

- Birch catkin bug *Kleidocerys resedae* (Figure 46)
- Plant bug *Pantilius tunicatus* (Figure 45)
- Plant bug *Psallus falleni*
- Plant bug *Neolygus contaminatus*



Figure 45: *Pantilius tunicatus*
Lount, 2023 (ST)



Figure 46: *Kleidocerys resedae*
Woodhouse Eaves, 2024 (AC)

5.12 Species associated with marsh, swamp and marginal aquatic vegetation

Recent records for these species are few apart, from the common Reedmace bug; this may be linked to a decline in swamp and marshland habitats, but under-recording is likely to be a factor.

- Plant bug *Cyrtorhinus caricis* (sedges)
- Reedmace bug *Chilacis typhae* (*Typha* reedmace)
- Reed Damselbug *Nabis lineatus* (reeds, sedges, rushes)
- Plant bug *Teratocoris saundersi* (sedges)

5.13 Species associated with dead wood habitats

The following species are usually associated with dead wood. e.g. under the bark of trees affected by fungus. There are few records; they are likely to be overlooked.

- Flat bug *Aneurus avenius*
- Flat bug *Aradus depressus* (Figure 47)
- Anthocorid bug *Xylocoris cursitans*



Figure 47: *Aradus depressus* (AC)

5.14 Introduced shrubs – Rhododendron, Cypresses, Pieris, Box

An unrelated group of species, mostly recent colonisers in VC55, that are found mainly on planted non-native trees and shrubs. Some are seen as horticultural pests.

- Andromeda Lacebug *Stephanitis takeyai* – *Pieris japonica*, *Rhododendron*/Azaleas (Figure 48)
- Rhododendron bug *Tupiocoris rhododendri*
- Anthocorid bug *Anthocoris butleri* - Box
- Ground bug *Orsillus depressus* – Lawson's Cypress
- Juniper Shieldbug *Cyphostethus tristriatus* – Junipers, Leyland/Lawson Cypress (Figure 49)



Figure 48: *Stephanitis takeyai* Andromeda lacebug
Donisthorpe, 2023 (AC)



Figure 49: *Cyphostethus tristriatus* Juniper shieldbug
Cropston, 2018 (KN)

6. RECORDING BUGS

6.1 Sources of help

The advent of the Internet has revolutionized the amount of information available online and has been particularly valuable for amateur entomologists who do not have access to institutional resources such as academic libraries. 'Heteropterists' Newsletter' and 'Het News' produced between 1983 and 2003, many of which can be accessed on the 'British Bugs' website, are a valuable archive of information: <https://www.britishbugs.org.uk/HetNews.html> Publications by Péricart and Wagner describing European Hemiptera can still be purchased as printed copies with some hunting but are available free online from the Faune de France Bibliothèque virtuelle numérique (French Federation of Natural Science Societies Fauna of France Series Digital Virtual Library): <https://faunedefrance.org/toto/>

The digital versions have the advantage (for non-French speakers) that copying and pasting into Google Translate provides an instant translation, although there is often some head scratching involved at <https://translate.google.com> (Google's attempts at entomological jargon)

Social media is often criticised for inaccuracy and, while this can be true, it also provides access to a great deal of expert knowledge. The specialist Facebook groups "British Terrestrial True Bugs (Heteroptera) Recording Schemes" and "UK Hemiptera" are very useful sources of knowledge and support: <https://www.facebook.com/groups/1049706121790920/>, <https://www.facebook.com/groups/614332702002699/>

Artificial intelligence is regarded with suspicion by some entomologists and certainly, if fed with less than ideal input images, can produce ridiculous suggestions. However, as the size of the image databases on which the models are trained on grows, the speed at which accuracy of identification is improving is remarkable. Mobile phone apps such as *ObsIdentify* (<https://observation.org/apps/obsidentify/>) are progressing with almost unbelievable speed, although the accuracy of any identification is limited by the ability of a mobile phone camera to capture clear images of small insects (workaround – photograph your computer screen) and the presence of externally visible diagnostic features.

6.2 Finding "bugs"

As mentioned earlier, the value of structured surveys cannot be over-estimated but the majority of recording is done on a casual basis – species seen on walks, on windowsills and in gardens. Advances in camera technology, in particular the ubiquity of mobile phones, has greatly increased the flow of casual records. Although such records are good at revealing "obvious" species - large or brightly coloured insects basking in the sunshine for example - they are highly deficient for the more cryptic, smaller species, e.g. Anthocoridae and Lygaeidae. Statistical methods are being developed which can produce occupancy models from unstructured casual records but until these are generally applied, while we continue to document the arrival of newly arrived species, we have little idea which species are declining or have gone missing.

6.3 Survey techniques

Sweeping vegetation with nets is a venerable entomological method and, in season, produces a wide range of Hemipterans (and many other taxa). Sweeping is less effective with some groups; for example, while some species of ground bug regularly crop up in sweep nets, such as *Scolopostethus* on nettles, the method is inefficient at targetting many other species in this family.

Lightly beating vegetation over a pale coloured sheet or tray (or conveniently, an upturned white umbrella) is a very productive method of searching for Hemiptera. Trees, shrubs and herbaceous vegetation are productive while in leaf. In winter beating evergreens, such as Ivy and conifers, produces a wide range of bugs the majority of which overwinter as adults in sheltered spots (Figure 50).



Figure 50: Alan beating an oak-tree at Stathern (ST)

Sieving leaf litter or moss over a sorting tray is a productive method for the winter months when bugs are present but can seem hard to find. This should be augmented by investigation of log piles, rotting stumps and tree bark to discover overwintering species.



Figure 51: Collecting equipment (AC)

Vacuum sampling is a relatively new technique which has been given fresh impetus by the use of battery-powered leaf blowers, replacing the heavy, smelly and inconvenient two stroke petrol leaf blowers originally used. With the device set to vacuum rather than blow, a porous filter is fixed over the inlet tube which can then be tipped out into a tray for sorting. Vacuum sampling is effective year round and produces a wide range of Hemiptera, many of which are not efficiently targeted by methods such as sweeping and beating, for example Lygaeidae and Saldidae (Figure 51).

For the more sedentary Hemipterist, a range of trapping methods can augment active surveys. Coloured pan traps may produce a few Hemiptera but are not generally highly effective for bugs (although they are a standard collection method for aphids). Pitfall traps regularly produce Hemiptera although the range may be limited compared to other groups, e.g. beetles. Light traps set for moths often produce interesting specimens, mostly shieldbugs and Mirids. An increase in records of the Oak Catkin Bug *Harpocera thoracica* is due in part to the bycatch from moth traps. Few entomologists have the wherewithal to run a Malaise trap but use of such a device can extend the range and number of species recorded.

The combination of a range of different survey methods is most likely to result in a comprehensive list of species present.

6.4 Targetting

Targetting particular plants and habitat niches is valuable in establishing the presence of specific species. Broom, Gorse and conifers can all be productive for particular species which are otherwise difficult or impossible to find. In addition to host plants, the targetting of specific environmental niches is important in establishing a full list of species present. The tree canopy above arms'-reach is a rarely explored habitat. Short of felling trees (or waiting for storm-damaged trees to fall) this can be accessed, if inefficiently, with telescopic long handled sweep nets or beating trays. Who knows what is living up there? Almost no-one has looked.

6.5 Under-recorded species

In comparison to other groups of insects (e.g. Lepidoptera, Odonata), Hemiptera are under-recorded. It is no accident that the best recorded group of Hemipterans are the shieldbugs as these are quite visible in the environment, e.g. on vegetation, large enough to see and photograph easily, and can be identified from external features, such as pigmentation. In contrast, most Anthocorids and many of the Lygaeidae (Figure 52) can only be confirmed with certainty by precise measurement (to an accuracy of less than 1mm), examination under high magnification – including microscopy, and in some cases dissection for examination of the genitalia.



Figure 52: *Scolopostethus affinis*
Attenborough Arboretum, 2023 (AC)

Identification keys frequently rely on male genitalia and, in many species, males are rare or at least difficult to find. It can be no surprise that bugs which hide away are too small to be photographed with a mobile phone and have no definitive external features which can be recognised by AI image recognition apps, resulting in a serious lack of data.

Until the widespread adoption of eDNA as a tool for recording entire habitats and locations without even necessarily seeing the whole organism whose traces have been detected, the only solution for this lack of data is for dedicated Hemipterans to actively survey bugs using a range of methods, targetting specific ecological niches and to gain the skills necessary for dissection and identification of difficult species.

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WEBSITES

British Bugs	https://www.britishbugs.org.uk/index.html
iRecord	https://irecord.org.uk/
Lars Skipper	https://www.larsskipper.dk/miridae/
LRES	https://www.naturespot.org.uk/content/leicestershire-rutland-entomological-society https://leicestershirerutlandentsoc.blogspot.com/
NBN Atlas	https://nbnatlas.org/
NatureSpot	https://www.naturespot.org.uk/gallery/bugs
Wanzen Europas	http://koleopterologie.de/heteroptera/index.html

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