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Front cover: Brown Long-eared Bat *Plecotus auritus* (see p105). Photo: *Robert Bell.*

Back cover: Members of the Yorkshire Naturalists' Union, Yorkshire Wildlife Trust and Capturing our Coast staff and volunteers setting off to record wildlife on Filey Brigg on Sunday 15th July. Photo: *Nicky Dobson*

The Naturalist

Editorial

We have learnt the very sad news that Albert Henderson, a long-standing and extremely active member of the Union, died on 19 July. We extend our deepest sympathies to his family. A full obituary will appear in a future edition of *The Naturalist*.

Unfortunately Albert, an active member of the Editorial Board for this journal since its format changed in 2011 and the initiator and editor of the *Bulletin*, one of its predecessor journals, was not able to see the next step in the evolution of *The Naturalist*. As editor of the *Bulletin* Albert introduced a coloured cover and central four pages. We have continued this, but increasingly we have had to make compromises because of the limited colour space available. From this issue onwards, we will be able to use colour on up to 50% of *The Naturalist'*s pages, and so this gives us the ability to use more of the illustrations sent to us, and to avoid having to turn coloured charts etc. to black and white versions which invariably have less impact. We know that one or two of our authors have decided to publish articles elsewhere because we were unable to render illustrations in colour.

There will inevitably be some adjustment and experimentation on our parts whilst we get used to this new facility, but we hope that this move will bring us more into line with other publications which we naturalists read regularly. We hope that this initiative will encourage new authors and photographers to submit articles and images to us, and we look forward to the prospect of representing Yorkshire's natural world in the full colour that it deserves.

Stranger on the Shore

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What can museum collections tell us about the algal biodiversity of our shores in the past and how can citizen scientists add to our current knowledge of the abundance and distribution of intertidal species?

Britain is a seaweed biodiversity hotspot with around 650 of an estimated global seaweed flora of between 12,000 and 15,000 species. Not all the seaweeds found in Britain occur on every shore – some are ubiquitous but others have more restricted distributions, occurring only on western or eastern coasts; some are at their southern distribution limit, others at their northern limit. The checklist of seaweeds of Britain (Brodie *et al.*, 2016) includes 31 non-native algae and is already out of date as others have been added to the list. There may be upward of 100 seaweeds on a single shore and identifying many of them requires the use of detailed keys and close observation, often requiring examination under a compound microscope and in some instances molecular tools are needed. Recognising strangers on the shore can be difficult and relies on expert knowledge of seaweed morphology.

The distribution and abundance of species, including seaweeds, living in the intertidal and shallow seas is not static, being influenced as they are by the tidal cycle and the interactions between a wide range of physical and biological factors. Distribution patterns within and between shores have been well described but longer term variation is more difficult to determine. We need to know what is where and when it was there and in order to measure change we need robust qualitative and quantitative data. Climate change, including sea surface temperature rise and ocean acidification, as well as the effects of pollution and the arrival, settlement and spread of non-native species, perhaps at the expense of indigenous ones, make the need for base line data all the more pressing.

The accumulation of large data sets about the distribution and abundance of intertidal species, particularly long term data sets, is beyond the capability of individual researchers carrying out field surveys, so where will these data come from? Possible sources are herbarium collections (seaweeds are preserved in algaria) and citizen science projects.

Algaria in museum, university and private collections represent a huge and largely untapped source of information. The Natural History Museum in London alone has an estimated 250,000 seaweed specimens from around the world, including approximately 80,000 from the UK and Ireland, in a collection dating back to the late 17th century. Almost certainly many museums around the country, university departments and collections made by amateur naturalists will contain many more specimens which as yet remain concealed, in some cases ignored and therefore unexplored – with seaweed collections largely playing second fiddle to the more charismatic and sexy groups such as mammals, birds and flowering plants. Who knows what insights these algaria could provide? A veritable treasure trove of information, they contain type and voucher specimens which are useful as reference material for plant identification; link species to specific times and places, and provide information on phenology as well as ecology, biology and biogeography. It has even been possible to extract DNA from some specimens for sequencing and analysis in molecular systematics to resolve issues in taxonomy or to track plant movements, e.g. non-native species.

Such collections invariably, and perhaps inevitably, reflect the preoccupations of the contributors: when they could collect (time of year); where they lived/went on holiday[1]; what they were interested in (common species are often overlooked in favour of seeking out the rare and unusual); and with whom they corresponded and exchanged specimens. Such phycological philately can be an advantage too if individual collectors were not actively seeking out particular seaweeds, e.g. aliens or rarities, although selection bias in individual collections may be less apparent in a large herbarium containing many specimens.

The advantage of herbaria over records of sightings, even those accompanied by photographs, is that they are tangible evidence of what was where and when, and they can be examined by researchers at the time and in the future, sometimes using methods undreamt of at the time of collection. The "what, when, where and [collected by] who(m)" quartet is an important mantra to be borne in mind by all collectors of natural history specimens, whether amateur or professional, when labelling items, because without such information even the most carefully prepared and preserved specimen is rendered virtually useless. We none of us know where our collections may end up – hopefully not on the bonfires of over-zealous collections curators but incorporated into an important national collection, so we should label our specimens carefully.

An important aspect of large historical collections is their breadth and depth (number of species and the number of replicates they contain) and the longevity of the specimens. Whilst individual specimens provide a snapshot of history the whole collection is the film which tells the stories of such things as climate change and human impact. Unfortunately, funding cuts mean that fewer people are employed to curate collections and there has been a steep decline in the number of fully trained professional taxonomists in Britain; there are very few full-time university taxonomists and fewer universities offer courses which teach a significant amount of species identification and taxonomy; amateur experts are an ageing and diminishing group and there are few young, or even younger, members in natural history societies. In the light of these problems, described as the Taxonomic Impediment, how can these data locked up in herbaria be made available and who will collect data today and in the future?

There are now many projects which use crowd-sourcing to engage large numbers of volunteers to collectively contribute to their aims. Online citizen science projects reliant on crowd-sourcing include several which have been developed to extract data from herbaria. The Muséum national d'Histoire naturelle in Paris estimated it would take one person 500 years to digitise all their plant records but citizen "herbonauts" (a wonderful name) are rapidly working to transcribe essential information from scanned images of labelled plant specimens in the museum's National Herbarium. In 2014 the Botany Department of the National Museum of Natural History at the Smithsonian Institution recruited over 130 volunteers who digitised c.15,000 of the 3.5 million specimens in the herbarium between June and October that year, the data collected being validated by six professional botanists. It was estimated at the time that it would take herbarium staff themselves 110 years to digitise the whole collection. Volunteers

1 The expanding rail network from the mid 1800s onwards opened up new areas. There is a good correlation between collecting sites and dates and the location and dates of railway stations.

have collected morphological and phenological data from scanned images of herbarium sheets and transcribed specimen labels. Analysis of the data has found no difference in the data quality of non-experts and experts (Willis et al., 2017), the conclusion being that non-experts are a very efficient way of collecting more data at lower cost. Searchable databases provide a means for researchers to source material and, whilst there is no substitute for seeing the actual specimen, an online search can help a researcher locate the ones they need to see and then arrange a loan or a visit. See www.wedigbio.org and https://digivol.ala.org.au for more information about digital collections and volunteering. Try http://herbariaunited.org/atHome/, a searchable database of herbarium specimens in collections held in museums and universities in the UK and further afield. The Natural History Museum London has a searchable database (http://data.nhm.ac.uk/) which to date contains just over 4 million specimens of the 80 million in its collections. Employed staff cannot possibly complete the task of databasing all their specimens without the help of volunteers.

The earliest record in the herbarium of the Natural History Museum London of a seaweed species recognised at the time of collection (1897) to be a non-native species in Britain.

An additional way in which databasing of specimens in museum collections can be achieved is by factoring in time for databasing into funded projects using herbarium specimens. In this way small subsets of the herbarium are added to the database but these projects are short term and although the number of specimens in the database increases over time it happens in a piecemeal fashion. Work is often dependent on external funding and stops when each contract ends. In 2013, the Natural History Museum London (NHM) led on an 11 month project to build the foundation of an online data portal for UK seaweed collections. Funding from the Esmée Fairbairn Collections Fund (EFCF) financed the work and partners in the project included the NHM and 13 other institutions. A target species list prioritized the data capture against species of current research interest, including non-natives, rarities and environmental indicators. Many of these seaweeds are data deficient and are generally not so well represented in herbaria, so by combining data in this way from multiple collections the spatial and temporal data available have been greatly improved. The seaweed collections were photographed and details of each specimen added to a database, Seaweed Collections Online, which can be viewed at http://seaweeds.myspecies.info/. In all, 5296 specimens of 327 seaweeds were added to the database. There must be many such projects of fixed duration with specified deliverable outputs and no possibility of extension. What happens to these databases? How many people know about them or use them? Will there be more funding to facilitate exploration of other collections or to link up the fragmented data sets already collected?

A number of citizen science projects engage volunteers to collect data about the distribution and abundance of intertidal species, including seaweeds, both native and non-native. The results can be used as baseline data or as part of longer term data sets against which future unspecified environmental change can be assessed. It may be regarded as problematic that many citizen science projects are short term, funded for a fixed period. The collection of discrete data sets may be accomplished in such short term projects but not the collection of long term data sets. Heritage Lottery Funding, for instance, will fund novel projects but not extensions to existing projects no matter how successful. Consequently much time is taken up in writing grant applications to make new projects sufficiently different from existing ones in order to comply with funding guidelines but with no guarantee of success. People employed on the original project cannot be sure that the new project will be funded so they look for other work and leave and their expertise goes with them. And what of the citizen scientists who signed up, were trained and supported and became enthusiastic volunteers collecting species and environmental data? What happens to them at the end of each project when the funding ends? Are they collateral damage or a new source of volunteers for the next short term project?

Encouraging people, with or without a scientific background, to take part in projects which engage members of the public in scientific research can be seen as "a good thing" on many levels which have been well documented. Citizen science projects enable scientists to share their knowledge and enthuse project participants about their areas of expertise. How many people not working on seaweeds know how many species there are in the world, in Britain, and on a single shore? Field phycologists with a knowledge of non-native seaweeds are few and far between so by training citizen scientists to recognise these seaweeds there is a greater chance that they will be spotted and recorded – even in projects of finite duration. Perhaps funding of citizen science through HLF and EFCF sources should not be criticised for the short term nature of the projects, the lack of continuity and piecemeal approach to data collection but instead should be seen as a way of increasing scientific literacy and raising awareness of environmental issues amongst the general public. Encouraging people to get out on the shore to be amazed at the variety of life there, including the seaweeds, whether natives or strangers from other parts of the world, thanks to citizen science projects, however they are funded, is to be applauded. Long may it continue.

References

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The state of the Watsonian Yorkshire database for the aculeate Hymenoptera, Part 1 - the 19th century

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Introduction

Up to 2017, 344 species of resident outdoor aculeate Hymenoptera have been recorded in Watsonian Yorkshire. The number of species in the three major groups (Chrysidoidea, Vespoidea, Apoidea) are shown in Table 1. The Apoidea can be conveniently divided into the wasps and bees. The social species are the Formicidae (ants), Vespidae (social wasps) and Apidae (bumblebees and Honeybee *Apis mellifera*). A further two wasps, *Eumenes papillarius* (Christ) (recorded 1989, 1999) and *Polistes dominula* (Christ) (recorded 2004), are considered vagrants from continental Europe. In addition, the wasp *Tiphia femorata* (recorded 1968) and the Long-horned Bee *Eucera longicornis* (recorded 1850) are also considered vagrants because, when recorded, they were far north of their English distribution. *T. femorata* is currently expanding its range northwards and since 2015 has been considered a resident species in Yorkshire. The other three vagrants are not considered further in this paper. Collingwood & Hughes (1987) noted ten ant species that had been recorded in Yorkshire as fossils, vagrants or residents but only in heated buildings (e.g. *Hypoponera punctatissima* and the Pharaoh Ant *Monomorium pharaonis*). These ants are not considered further in this paper.

Table 1. The number of species in each taxonomic group of aculeate Hymenoptera.

Chrysidoidea	**No. of Spp.**	**Vespoidea**	**No. of Spp.**	**Apoidea - Wasps**	**No. of Spp.**	**Apoidea – Bees**	**No. of Spp.**
Dryinidae	23	Tiphiidae	3	Sphecidae	2	Colletidae	11
Embolemidae	1	Mutillidae	2	Astatinae	1	Andrenidae	37
Bethylidae	4	Sapygidae	2	Larrinae	5	Halictidae	32
Chrysididae	18	Formicidae	19	Crabroninae	35	Megachilidae	16
		Pompilidae	25	Pemphredoninae	26	Melittidae	1
		Eumeninae	12	Mellininae	2	Nomadinae	18
		Vespinae	9	Nyssoninae	8	Apinae – solitary	3
				Philanthinae	3	Apinae – social	26
Totals	**46**		**72**		**82**		**144**

Dates of the first records

Fig.1 shows the total number of first records for species during the 19 th century and each decade of the 20th/21st. Just over a third (129, 37.5%) were first recorded in the 19th century (listed in the Appendix). After this the number of first records decreases until the 1950s and 1960s, after which further increases are shown, particularly between 1970 and 1990 (71 species, 20.6%). Archer (2014) showed that the increase of first records after the 1960s was mainly due to the activities of three persons and the increase of more favourable weather, particularly from the 1990s, resulting in the northwards dispersal of aculeates into Yorkshire from the south of England. This paper will examine species recording in the nineteenth century.

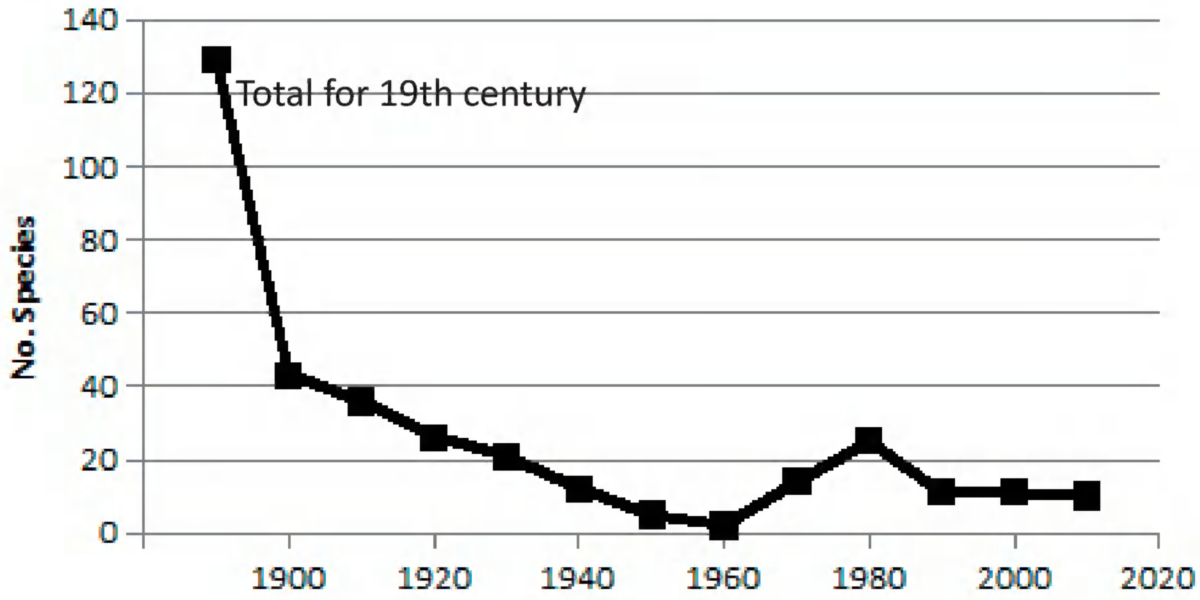

Figure 1. The total number of first species discoveries for the 19th century and each decade of the 20th/21st.

The species recorded in the nineteenth century

Fig. 2 shows the number of the first records per decade during the nineteenth century. Apart from the 1840s and 1850s, the number of species recorded per decade seems to be relatively constant. The peaks are a consequence of species lists relating to the dates of papers since the actual dates for the recording of individual specimens are not known. There are four such papers: Whitaker (1816); Cook (1840) listed mainly in Roebuck (1878); Smith (1852) and Wilson (1881) listed in Roebuck (1882b, 1907).

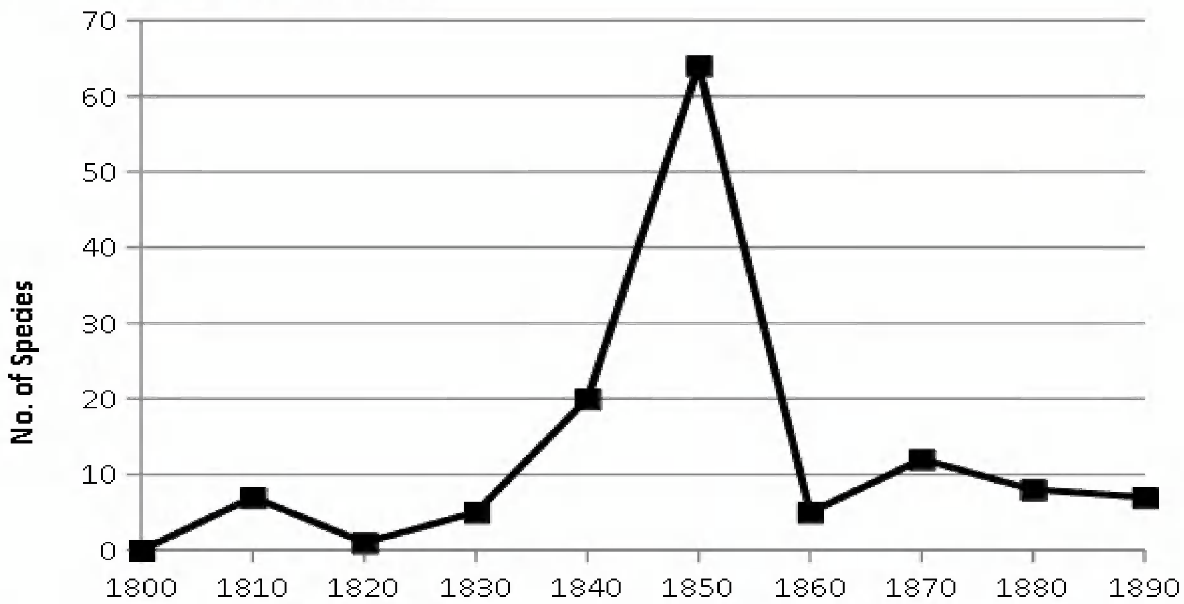

Figure 2. The number of First Species Discoveries during each decade of the nineteenth century.

Whitaker (1816) gives a list of bees in an appendix of his book entitled *Loides and Elmete* dealing with the lower parts of Airedale and Wharfedale and the entire vale of the Calder. Roebuck (1907) uses Leeds as the location for these records. Whitaker's names are derived from Kirby (1802). Whitaker lists twelve species of which eight can be interpreted by a study of the nomenclature used by Else, Bolton and Broad (2016) (Table 2). Seven of these could have been valid Yorkshire records but *Anthophora quadrimaculata* is unlikely and is rejected as it has a southern English distribution.

Table 2. Whitaker's species names with their modern interpretation.

Whitaker	Current interpretation
Melitta monilicornis	*Sphecodes monilicornis*
Melitta divisa	*Sphecodes ephippius*
Melitta aerata	*Lasioglossum leucopus*
Apis marshamella	*Nomada marshamella*
Apis ruficornis	*Nomada ruficornis*
Apis inermis	*Coelioxys inermis*
Apis subglossa	*Anthophora quadrimaculatus*
Apis subinterruptus	*Bombus pratorum*

Smith recorded perhaps 78 species that could have been found in Yorkshire, of which 68 could be the first records. The records are mainly from Smith (1862) with a few with nineteenth century year dates (Roebuck, 1879a). Butterfield & Fordham (1930: 243) refer to Talbot's copy of Smith's catalogue, in which he (Smith) marked with a cross the species which occurred or could occur near Wakefield. Roebuck (1879a) referred to such species that could occur as Smith MS species. In Roebuck (1907) the Smith MS species are recorded as if they were actual records. Since these Smith MS species had not been recorded they cannot be attributed to Smith. More details of Smith MS species are given in Archer (2002, Appendix 5).

Roebuck (1878, 1879a) published Cook's records which were from about 1840 and around York. From a study of nomenclature six wasps and 17 bees are mentioned, of which four wasps and 16 bees could have been found in Yorkshire. The rejected wasps are *Ancistrocerus quadratus*, which is very rarely recorded from southern England (Archer, 2003) and *Chrysis ignita*, which could be one of several species. The rejected bee is the Yellow-legged Mining Bee *Andrena flavipes* which is only known from southern England. Nineteen of these 20 could be the first records in Yorkshire.

Roebuck (1882b, 1907) published Wilson's records of 1881 recorded from Acomb Wood, Holgate and Poppleton, which are in and around York. Eleven species are listed which could be valid with three of them new to the Yorkshire list.

Roebuck (1878, 1879a, 1879b, 1880, 1882a, 1882b, 1907) was the main aculeate recorder for the nineteenth century. He contributed 44 of the records, including three species new to the Yorkshire list.

Twenty-one recorders were responsible for these first Yorkshire records, although usually only for one or two species but Butterfield recorded three and Dale five additions. A further 15 recorders added records but not new species to the Yorkshire list, again usually only singles with Butterfield four and Fordham five records. Thus the records of 36 recorders have survived from the nineteenth century.

There are two main problems of nineteenth century records: their verification and the need to trace changes of nomenclature.

Verification of records

Some of the nineteenth century specimens have survived in natural history museums or in private collections. Mostly at Cliffe Castle Museum, Keighley, the following were determined or confirmed by the author: *Chrysis ruddii* (Shipley Glen), *Ancistrocerus parietinus* (Wilsden, first Yorkshire record), Ashy Mining Bee *Andrena cineraria* (Wilsden), Tawny Mining Bee *A. fulva* (Eldwick), Chocolate Mining Bee *A. scotica* (Gilshead, first Yorkshire record), Common Wasp *Vespula vulgaris* (Bradford), Brown-banded Carder Bee *Bombus humilis* (Masham), Common Carder Bee *B. pascuorum* (Hornsea, Shipley Glen) and Early Bumble Bee *B. pratorum* (Shipley). At Scarborough Museum *Ancistrocerus parietinus* and *A. scotica*, both from Knottingley, were determined by Butterfield and confirmed by the author.

At Oxford University Museum G.M. Spooner determined most of the following species which are all first records for Yorkshire: *Dipogon variegatus* (near Wakefield), *Priocnemis fennica* (Yorkshire, determined by O'Toole), *Ancistrocerus parietum* (Whitby), *A. scoticus* (Whitby), *Ectemnius lapidarius* (near Wakefield) and *E. lituratus* (near Wakefield, determined by Smith and confirmed by Spooner).

A letter from Spooner indicated his determination of the following species which are all first records except for *Rhopalum clavipes* (Lastingham Moor): *Passaloecus monilicornis* (Lastingham Moor), *Nomada leucophthalma* (Hatfield Moor), *N. obtusifrons* (Hatfield Moor), *N. rufipes* (Hatfield Moor), Brown-banded Carder Bee (Thorne Moor), Bilberry Bumblebee *B. monticola* (Halifax Moor) and Common Carder Bee (Thorne Moor). The only dryinid record from the nineteenth century (*Lonchodryinus ruficornis*) was determined by Richards (1939).

If a species was recorded in the nineteenth century and during recent times (usually during the 1900s) there is a tendency to assume that such records could be valid, while if not present during recent times it may not be valid. Such a procedure has already been used for the records from Whitaker, Cook and Wilson. The work of Butterfield & Fordham (1930-1933) using Saunders (1896) with keys to British aculeates gives useful information for the verification of records.

Three species have only been recorded during the nineteenth century. The specimen of *Ectemnius lituratus* (Smith, near Wakefield in Roebuck, 1907) has been found at Oxford University Museum and confirmed by Spooner (pers. comm.) so it is a valid record. According to Edwards (1998) this record can be considered being on the northern edge of its English distribution. *Cleptes nitidulus* (Rudd, Yarm, Butterfield & Fordham, 1930) is a distinctive species. Rudd seems to have been particularly associated with the Chrysididae and *Chrysis ruddii* is named after him, so this record is probably valid. The Jet Ant *Lasius fulginosus* (Smith, near Wakefield, Roebuck, 1878) is another distinctive species and Smith took a particular interest in the ants, so this record is probably valid. This would have been regarded then as being on the northern edge of its English distribution, although now it is contracting southwards (Edwards, 1997). Will these species ever be found again in Yorkshire? Certainly species found in the nineteenth century have sometimes been recorded again after many years (Table 3).

Recent studies, however, can give reasons to reject nineteenth century records. Roebuck (1878) reported that Smith has bred *Chrysis ignita* (Linnaeus) from a nest of Red Wasp *Vespula rufa* (as *Vespa rufa*). Current studies show that *C. ignita* could be one of several species: *C. angustula* Schenck, *C. impressa* Schenck, *C. mediata* Linsenmaier, *C. rutiliventris vanlithi* Linsenmaier, as well as *C. ignita.* Since the separation of these ruby-tailed wasps occurred only recently (Morgan, 1984) *C. ignita* records from the nineteenth century should be rejected.

Table 3. Nineteenth century species records that have been recorded again after a long period of time.

Species	First record	Next Record	No. Years
Chrysura radians	1897 (Yorkshire)	1976 (Askern)	79
Myrmosa atra	1852 (nr. Wakefield)	1921 (Allerthorpe Common)	69
Sapyga clavicornis	1852 (nr. Wakefield)	1956 (Gundale)	104
Priocnemis fennica	1852 (nr. Wakefield)	1950 (Leeds)	98
Andrena nitida	1840 (about York)	2002 (Hagg Wood, York)	162
Sphecodes ephippius	1816 (Leeds)	1948 (South Cave)	132
Anthidium manicatum	1840 (about York)	2001 (Sheffield)	161
Coelioxys quadridentata	1852 (nr. Wakefield)	1942 (Allerthorpe Common)	90

Yorkshire has two species of mound-building ants, the widespread Northern (or Hairy) Wood Ant *Formica lugubris* and the very rare Southern (or Red) Wood Ant *F. rufa*. The separation of these two ants in Britain was worked out at quite a late date by Yarrow (1955). It is very likely that the early records of Southern Wood Ant are really Northern Wood Ant. A nest of Southern Wood Ant at Brockadale (VC63), first recorded during 1864 by Hepworth (J) was well known and finally died out in 1963 due to shading by Sycamore (Collingwood & Hughes, 1987).

Recognition of bumblebees has been a major problem from the earliest times. The bumblebees from the Kirby collection (Kirby, 1802) have been identified by Smith (1866) and Yarrow (1968). The identifications of Yarrow represent the modern concepts of the bumblebee species. Using Yarrow as the authority, Smith could not separate Brown-banded Carder Bee, Moss Carder Bee *B. muscorum* and Common Carder Bee, naming all three as Moss Carder Bee. Smith could not always separate Heath Bumblebee *B. jonellus*, Small Garden Bumblebee *B. hortorum* and Large Garden Bumblebee *B. ruderatus* from each other. Smith identified Gipsy Cuckoo Bee *B. bohemicus* as Vestal Cuckoo Bee *B. vestalis* or Barbut's Cuckoo Bumblebee *B. barbutellus*. Smith could not always separate Broken-Belted Bumblebee *B. soroeensis*, White-Tailed Bumblebee *B. lucorum* and Buff-Tailed Bumblebee *B. terrestris* or Early Bumble Bee, Red-Shanked Carder-Bee *B. ruderarius* and Large Red-Tailed Bumblebee *B. lapidarius* from each other. Smith did correctly identify Great Yellow Bumble Bee *B. distinguendus*, Field Cuckoo Bumblebee *B. campestris* and Hill Cuckoo Bee *B. rupestris*. This is a confusing situation since most of these bees would have been present in Yorkshire during Smith's time, although each specimen would not always have been identified correctly. Thus, only Smith's records of Great Yellow Bumble Bee and Field Cuckoo Bumblebee can be accepted although the author has accepted Red-Shanked Carder-Bee because of the accurate description of this bee in Smith (1855).

Nomenclature problems

The nomenclature of Whitaker species (1816) has already been considered. Smith's (1851, *in* Roebuck, 1878) record of the cuckoo wasp *Chrysis ruddii* is almost certainly correct because of the detailed description given in Smith (1862). The similar *C. rutiliventris vanlithi* was unknown to Smith. At Manchester University Museum specimens of '*C. ruddii*' were found to be a mixture of *C. ruddii* and *C. r. vanlithi* (Archer, unpublished). The first confirmed specimen of *C. ruddii* was found at Cliffe Castle Museum dated 1890 (Archer, unpublished).

Smith (1852) recorded the red ants *Myrmica rubra* and *M. laevinodis*, but Yarrow (1955) found that *M. laevinodis* should be treated as a synonym of *M. rubra*, so Smith's record of *M. laevinodis* must be rejected.

Westwood's Ant *Stenamma westwoodi* was found by Lawson and reported by Smith (1872, in Roebuck, 1878), who also indicated it was a guest ant in the nests of Southern Wood Ant. This seems unlikely as Westwood's Ant is not a guest ant and is restricted to southern England. Butterfield & Fordham (1930) realised its misidentification for Shining Guest Ant *Formicoxenus nitidulus,* which is a guest ant of *Formica*.

The Small Black Ant *Lasius niger* has been recently recognised as being similar to *L. platythorax* and *L. neglectus*. Generally *L. platythorax* is found in wet habitats and *L. niger* and *L. neglectus* in similar drier habitats so *L. niger* becomes *L. niger* s.l.

Priocnemis femoralis (Dahlbom) has been split into *P. fennica* and *P. hyalinata* (Fabricius) with the distinction between the two given by Day (1979). There were no early records of these two spider-hunting wasps until a Yorkshire specimen of *P. fennica* was found at Oxford University Museum dated 1852 and identified by O'Toole (pers. comm. 1986).

The *Ancistrocerus parietinus* record of Smith (1852) could be confused with *A. parietum* which was not recorded by Smith. Both potter wasps were found during the nineteenth century: *A. parietinus* (Wilsden, 1888) at Cliffe Castle Museum identified by the author and *A. parietum* (Whitby, 1897) at Oxford University Museum identified by Spooner. Both Roebuck (1907) and Butterfield and Fordham (1930) treated *A. parietinus* as *A. parietum.*

Trypoxylon figulus was split into three species and separated with a key by Pulawski (1984). All three species have been found in Britain so Smith's record of *T. figulus* should be considered as *T. figulus* s.l.

Smith (1852) recorded *Crossocerus leucostomus* (as *Crabro leucostoma*) and described it as universally distributed over the country (Smith, 1855). Edwards and Roy (2009) found that this solitary wasp is nationally rare or scarce and restricted to Scotland and northern England. It was found that *C. leucostomus* was a misidentification for *C. megacephalus* (Else *et al.*, 2016) which is widespread and common (Edwards & Broad, 2006).

From a study of type specimens, Yarrow (1970) found that *Passaloecus gracilis* was misidentified for *P. singularis* Dalbom and *P. insignis* (Van der Linden) was misidentified for *P. gracilis*. Specimens before the date of this paper need to have their identifications corrected.

Smith (1852) included a record of the Chalk Yellow-Face Bee *Hylaeus dilatatus* (as *Prosopis annulatus)*, which does not occur in Yorkshire (Edwards & Roy, 2009). This record had also been recognised by Roebuck (1879a), who referred to Smith's record as Common Yellow Face Bee *P. communis* (now *H. communis* Nylander) which is common and widespread in Yorkshire (Archer, 2002). Later, Smith (1871) recognised this change of name.

Roebuck (1879b) recorded Smith taking *Andrena analis* Fab. near Wakefield. Else *et al.* (2016) found that *A. analis* was a misidentification for Tormentil Mining Bee *A. tarsata*. *A. analis* is not a British species.

Conclusion

The work of Smith, despite his unreliable naming of bumblebees, with the earlier records of Whitaker and Cook, enable a good beginning to be made to the listing of the aculeate Hymenoptera of Yorkshire during the first half of the nineteenth century. Smith was educated at Leeds but spent most of his working life in the Zoological Department of the British Museum. He often returned to the neighbourhood of Wakefield where, with friends, he carried out field work. He probably visited Seckar Moor and Woolley Edge where there is some heathland (Archer, 2001). He advocated that any knowledge gained should be published. By 1874 he had published 141 papers. He was of a very friendly disposition and died in 1879 aged 73 years.

Roebuck (1907), despite the nomenclature problems, gives a good summary of the aculeate Hymenoptera recorded by the end of the nineteenth century. Roebuck was born in Leeds but spent most of his life at Pannal near Harrogate. He was a person of independent means but his genius for organisation and administration was the inspiration for the formation of the Yorkshire and Lincolnshire Naturalists' Unions. Although principally known as a conchologist, he studied many areas of natural history including the aculeate Hymenoptera, resulting in several publications.

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Appendix – Species first recorded in the nineteenth century.

Chrysidoidea
Lonchodryinus ruficornis (Dalman)
Chrysura radian Harris
Chrysis ruddii Shuckard
C. viridula Linnaeus
Cleptes nitidulus (Fabricius)

Vespoidea	
Myrmosa atra Panzer	*A. spissa* (Schiødte)
Monosapyga clavicornis (Linnaeus)	*Anoplius viaticus* (Linnaeus)
Sapyga quinquepunctata (Fabricius)	*Ceropales maculata* (Fabricius)
Myrmica rubra Linnaeus	*Odynerus spinipes* (Linnaeus)
M. ruginodis Nylander	*Ancistrocerus antilope* (Panzer)
M. scabrinodis Nylander	*A. oviventris (Wesmael)*
M. sulcinodis Nylander	*A. parietinus* (Linnaeus)
Formicoxenus nitidulus (Nylander)	*A. parietum*
F. lugubris Zetterstedt	*A. scoticus* (Curtis)
F. rufa Linnaeus	*Symmorphus gracilis* (Brullé)
Lasius flavus (Fabricius)	*Vespa crabro* Linnaeus
L. fulginosus (Latreille)	*Dolichovespula norwegica* (Fabricius)
L. niger (Linnaeus) s.l.	*D. sylvestris* (Scopoli)
Dipogon variegatus (Linnaeus)	*Vespula austriaca* (Panzer)
Priocnemis exaltata (Fabricius)	*V. germanica* (Fabricius)
P. fennica Haupt	*V. rufa* (Linnaeus)
Pompilus cinereus (Fabricius)	*V. vulgaris* (Linnaeus)
Arachnospila anceps (Wesmael)	

Apoidea - *Wasps*	
Ammophila sabulosa (Linnaeus)	*E. lituratus* (Panzer)
Tachysphex pompiliformis (Panzer)	*Lindenius albilabris* (Fabricius)
Trypoxylon figulus (Linnaeus) s.l.	*Rhopalum clavipes* (Linnaeus)
Crabro cribrarius (Linnaeus)	*Mimesa equestris* (Fabricius)
C. peltarius (Schreber)	*M. lutaria* (Fabricius)
Crossocerus capitosus (Shuckard)	*Pemphredon inornata* Say
C. dimidiatus (Fabricius)	*P. lethifer* (Shuckard)
C. elongatulus (Van der Linden)	*P. lugubris* (Fabricius)
C. megacephalus (Rossi)	*Diodontus minutus* (Fabricius)
C. quadrimaculatus (Fabricius)	*Passaloecus gracilis* (Curtis)
C. wesmaeli (Van de Linden)	*P. monilicornis* Dahlbom
Ectemnius cephalotes (Olivier)	*Argogorytes mystaceus* (Linnaeus)
E. continuus (Fabricius)	*Nysson spinosus* (Forster)
E, lapidarius (Panzer)	

Apoidea – Bees	
Colletes daviesanus Smith	*Coelioxys elongata* Lepeletier
C, succinctus (Linnaeus)	*C. inermis* (Kirby)
Hylaeus communis Nylander	*C. quadridentata* (Linnaeus)
Andrena barbilabris (Kirby)	*C. rufescens* Lepeletier & Serville
A. chrysosceles (Kirby)	*Nomada fabriciana* (Linnaeus)
A. cineraria (Linnaeus)	*N. flavoguttata* (Kirby)

A. coitana (Kirby)	*N. integra* Brullé
A. fucata Smith	*N. lathburiana* (Kirby)
A. fulva (Müller *in* Allioni)	*N. marshamella* (Kirby)
A. haemorrhoa (Fabricius)	*N. obtusifrons* Nylander
A. labialis (Kirby)	*N. panzeri* Lepeletier
A. nigroaenea (Kirby)	*N. ruficornis* (Linnaeus)
A. nitida (Müller)	*N. rufipes* Fabricius
A. scotica Perkins	*N. striata* Fabricius
A. semilaevis (Pérez)	*Anthophora plumipes* (Pallas)
A. tarsata Nylander	*Melecta albifrons* (Forster)
A. varians (Kirby)	*Bombus distinguendus* Morawitz
A. wilkella (Kirby)	*B. humilis* Illiger
Halictus rubicundus (Christ)	*B. lapidarius* (Linnaeus)
H. tumulorum (Linnaeus)	*B. monticola* Smith
Lasioglossum albipes (Fabricius)	*B. muscorum* (Linnaeus)
L. calceatum (Scopoli)	*B. pascuorum* (Scopoli)
L. leucozonium (Schrank)	*B. pratorum* (Linnaeus)
Sphecodes ephippius (Linnaeus)	*B. ruderarius* (Müller)
S. gibbus (Linnaeus)	*B. ruderatus* (Fabricius)
S. monilicornis (Kirby)	*B. rupestris* (Fabricius)
Anthidium manicatum (Linnaeus)	*B. soroeensis* (Fabricius)
Chelostoma florisomne (Linnaeus)	*B. terrestris* (Linnaeus)
Osmia bicornis (Linnaeus)	*B. campestris* (Panzer)
Megachile centuncularis (Linnaeus)	*B. vestalis* (Geoffroy *in* Fourcroy)
M. circumcincta (Kirby)	*Apis mellifera* Linnaeus

Bat autumn swarming in South Yorkshire

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Introduction

Bat autumn swarming is widely considered to be one of the highlights of the year for bat enthusiasts, with this behaviour characterised by intense flight activity in and around the entrances of underground sites, often by multi-species groups of bats.

Bats captured at swarming sites often display a strong male bias and autumn swarming has been shown to function as a promiscuous mating behaviour (van Schaik *et al.*, 2015). The species present are usually limited to those that make use of the underground site for hibernation during the winter. Swarming is the major source of gene flow in many bats (Rivers *et al.*, 2005; Furmankiewicz & Altringham, 2007) and is also likely to allow bats the chance to assess hibernation sites ahead of roosting (van Schaik *et al.*, *loc.cit.*). Autumn swarming is potentially also a means of passing on knowledge of hibernacula locations from adults to young bats (Glover & Altringham, 2008).

The peak period for autumn swarming varies between sites and bat species (Glover & Altringham, *loc.cit.*; van Schaik *et al.*, *loc.cit.*; Rivers *et al.*, 2006), with this period extending from August to October. Peak activity is most often recorded 4-6 hours after sunset (Parsons *et al.*, 2003b; Rivers *et al.*, 2006).

Previous trapping studies at autumn swarming sites have shown that caves in other parts of northern England are used by large numbers of bats throughout the course of the swarming period (Glover & Altringham, *loc.cit.*; Rivers *et al.*, *loc.cit.*). Some of these swarming sites are considered to be of national importance to the bat species utilising them (Rivers *et al.*, *loc.cit.*). Individual bats have been shown to commute distances of up to 60 km between summer roosts and major swarming sites (Rivers *et al.*, *loc.cit.*), with bats most often returning to their day roosts after a night's swarming activity (Furmankiewicz, 2008). Studies have shown that bats may return to the swarming site of capture (Parsons *et al.* 2003b) but mainly appear to visit only a single swarming site within one swarming season (Furmankiewicz, *loc.cit.*).

Notable amongst known swarming sites in northern England are the 'windy pits', a series of mass-movement caves located close to Helmsley in North Yorkshire (Murphy & Cordingley, 2010), which were estimated to support a population of 2000–6000 Natterer's Bats *Myotis nattererii* across the three best-studied caves (Rivers *et al.*, *loc.cit.*). A study undertaken on mainland Europe also showed that bat species composition and abundance during swarming can correlate with composition and abundance during hibernation at the same site (van Schaik *et al.*, *loc.cit.*).

In 2016, following two years of preparatory surveys, South Yorkshire Bat Group (SYBG) was ready to commence its first targeted bat capture surveys at autumn swarming sites within the county. That year regular trapping was undertaken at caves in Anston Stones Wood and Nearcliff Wood, Figure 1. In 2017 the survey was extended to four new locations (Barnburgh Crags, Cadeby Pot, Rockley Tunnel and Sheffield Mine), with targeted surveys undertaken at Anston Stones Wood and Nearcliff Wood to address specific questions arising from the 2016 survey work. This paper is a summary of the findings of two study reports published on the Northern Bats web resource (Bell *et al.*, 2017; Bell *et al.*, 2018).

Site Descriptions

<u>Anston Stones Wood</u>

Anston Stones Wood is a 33ha area of mainly limestone woodland, designated as a Site of Special Scientific Interest (SSSI) for its botanical communities. The wood contains Dead Man's Cave, Fissure Cave and a large fissure (hereafter known as Large Fissure) (Brown, 1968). The two caves and Large Fissure are separated by a distance of approximately 190m.

Dead Man's Cave consists of an entrance fissure, c.2.5m wide and 1.5m high. This leads to a chamber c.4.5m long by 3m wide, with the maximum c.1.5m height located at the entrance. Fissure Cave comprises a c.8m long by 3m high chamber accessed via a squeeze from above. Bat access is also possible via two additional entrance points. Large Fissure comprises an entrance c.3m tall by 0.45m wide which can be accessed for approximately 6m before continuing for an unknown distance.

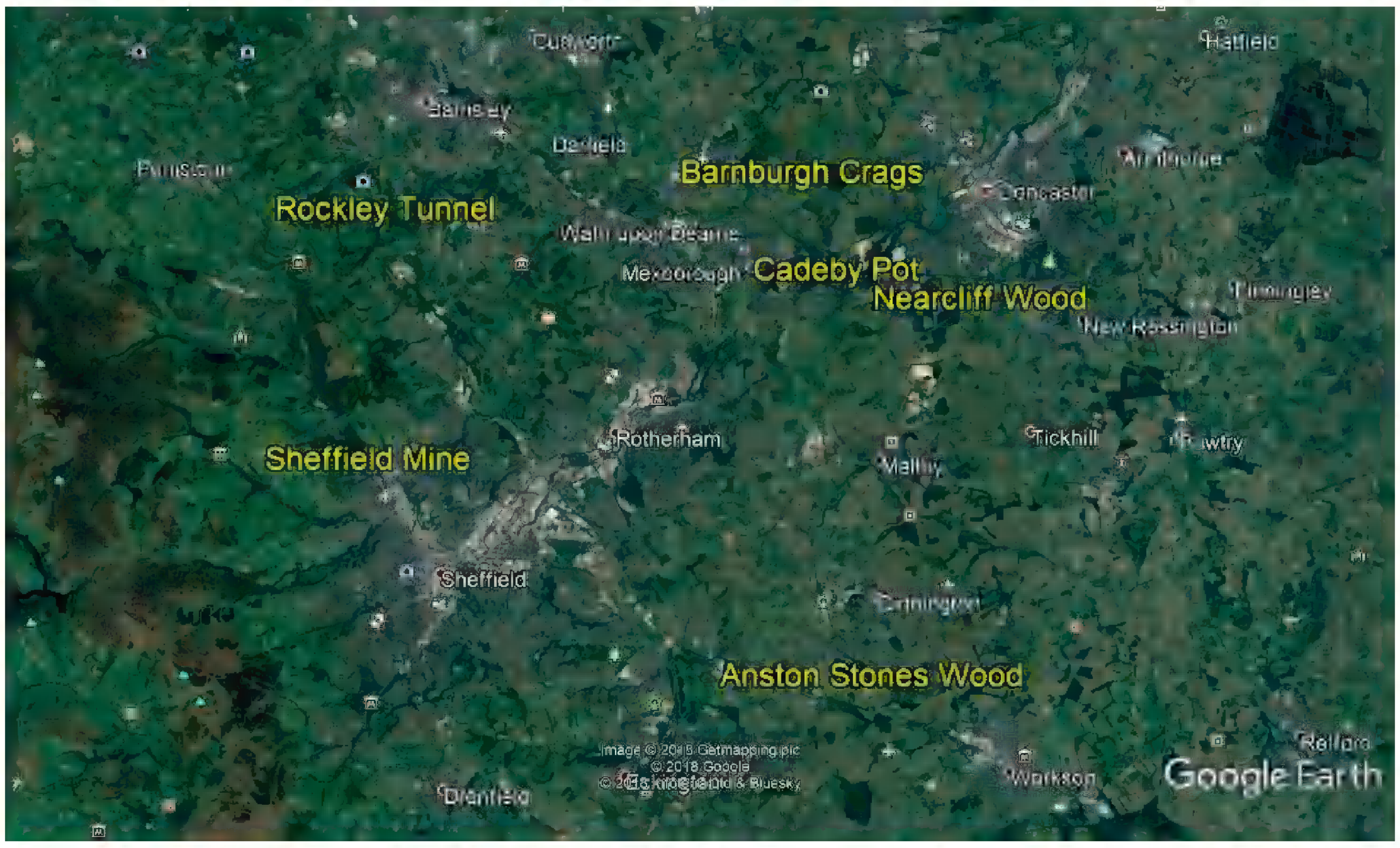

Figure 1: Map showing study site locations

To date no hibernating bats have been recorded within either of the two caves or Large Fissure (Bell *et al*., 2017).

Nearcliff Wood

Nearcliff Wood is a 21ha area of limestone woodland on the southern side of a gorge cut by the River Don. Part of the woodland is included within the Sprotbrough Gorge SSSI, designated for its botanical and invertebrate communities. Sections of Nearcliff Wood have been subject to extensive quarrying, resulting in changes to the ground levels. In addition, the woodland is bisected by a gorge cut in the early 1900s for the former Dearne Valley Railway.

A group of mass movement caves are known from this section of the River Don valley (Murphy & Cordingley, *loc.cit.*; Engering & Barron, 2007). Within Nearcliff Wood this grouping includes Nearcliff Wood Rift Cave and a number of smaller caves, associated with the former railway gorge.

Nearcliff Wood Rift Cave is 88m long by 12m deep. It can be accessed by two entrances. The upper and lower entrances both are squeezes separated by a vertical distance of 10m on the steep slope of a quarry face. This feature comprises a known bat hibernation site, with a single Brown Long-eared Bat *Plecotus auritus* (see front cover) recorded using the cave in January 2017 and a single Natterer's Bat in January 2018 (Slack, pers. comm.).

Cadeby Pot

Cadeby Pot is located to the south of Cadeby village, near Conisbrough, Doncaster. The pothole is situated towards the top of a steep limestone escarpment created to the northern side of a gorge cut by the River Don. A group of mass movement caves are known from this section of the River Don valley (Murphy & Cordingley, *loc.cit.*; Engering & Barron, *loc.cit.*), including Nearcliff Wood Rift Cave, located c.1.2km east of Cadeby Pot. A former railway line, now used as a minor lane, runs directly south of the embankment, with the embankment itself mainly covered by species rich unimproved calcareous grassland.

Cadeby Pot is 45m long and 14m deep. There are two entrances into the pothole with the western entrance trapped during this survey; it is the main entrance into the pothole with the eastern entrance being much narrower. In 2014 SYBG used a thermal camera, infra-red lit video camera and full spectrum bat detectors to first gather evidence of bat autumn swarming at Cadeby Pot. This feature also comprises a known bat hibernation site, with one Natterer's Bat recorded from this site in January 2013.

Barnburgh Crags

Barnburgh Crags, also known as Barnburgh Cliff is a limestone outcrop located along much of Cliff Plantation, near Marr, Doncaster. Cliff Plantation is a broadleaved woodland of approximately 2.8ha. The outcrop is exposed along nearly the whole length of the escarpment (Engering & Barron, *loc.cit.*). No extensive caves exist; however, a number of smaller fissures are present along the majority of the outcrop, including a single large cut measuring approximately 4m tall by 1m wide by 5m deep. A single hibernating Brown Long-eared Bat was recorded in February 2016, roosting within the western of the two narrow fissures, which lead off this cut. Barnburgh Cliff is a Doncaster Council local site, which is mentioned within the Local Biodiversity Action Plan for Crags, Caves and Tunnels (Doncaster LBAP, 2007).

Sheffield Mine

The mine is located within mixed woodland on an area of sandstone within the Millstone Grit Geology Series. The true purpose of the mine is unknown; however, it is likely to comprise a source of gannister or pot clay, used in the steel making process and mined extensively from the wider area during the 19th and early 20th Century (Battye, 2004). The mine is not marked on OS Survey Maps and consequently is taken to be at least 150 years old. The passages vary in height and construction but are typically approximately 1.5m in height and the same width, with dry stone supports in some areas and solid stone walls in others. The mine lacks standing or running water but has high humidity and has been subject to historic collapses which have cut off access to much of its previous extent. Previous inspections undertaken by site owners or their agents, during the last 30 years, showed that this mine previously extended across a number of vertical levels.

Historic bat surveys undertaken at Sheffield Mine (Bell, 2016) have shown that this feature is used by hibernating bats of one or more species of the *Myotis* genus. Static monitoring survey has also shown that it is likely to be used by autumn swarming bats.

Rockley Tramway Tunnel

Rockley Tramway Tunnel is believed to have been built around 1830 for the transport of coal and goods from Silkstone Colliery to the canal basin at Worsborough. The tunnel was built to take the carriage way drive to Stainborough Castle over the tramway using the drystone method by which structures are constructed without any mortar. It is 25m long and a little over 2m wide with a height inside of 2m at its highest point. The tunnel was first grilled in 1976 by South Yorkshire County Council to protect resident bats from disturbance, but following a number of collapses of the stonework, extensive repairs funded by the council were undertaken in 1988. In total, six metres at the southern end of the tunnel were completely re-built in September and October 1988 and new and stronger grills were installed at both ends of the tunnel.

Rockley Tramway Tunnel has the highest peak count of non-pipistrelle bats recorded from any bat hibernaculum in South Yorkshire and second in the Historic County of Yorkshire, with 17 bats recorded as part of the National Bat Monitoring Programme (NBMP) (Middleton & Bell, 2017). Bats recorded hibernating in the tunnel in the recent past include Natterer's Bat, Daubenton's Bat *Myotis daubentonii* and Brown Long-eared Bat. Rockley Tramway Tunnel has a long history of bat exploration dating from the early 1900s, when Arthur Whitaker and Joseph Armstrong first discovered the tunnel and published observations made at the site in *The Naturalist* between 1905 and 1913 (Whitley, 1987).

Aims

In 2016 study aims were to:

- Confirm the number of bat species swarming at known swarming sites.
- Compare relative levels of bat swarming between sites.
- Compare the sex ratio, age distribution and reproductive status of bats captured at the sites.

In 2017 the key aims of the study were to:

- Demonstrate the presence/absence of autumn swarming at Barnburgh Crags, Cadeby Pot, Rockley Tunnel and Sheffield Mine.
- Gather additional evidence of the presence/absence of autumn swarming Brandt's bat at caves/fissures in Anston Stones and Nearcliff Woods.
- Assess the relative importance to autumn swarming bats of Fissure Cave, in comparison with the two other surveyed features as Anston Stones Wood (Dead Man's Cave and Large Fissure).

Methodology

In the first year of the project the two study sites were surveyed on four occasions each; with a single survey visit during the below survey periods:

- Mid-late August
- Early-mid September
- Mid-late September
- Early-mid October

In the second year of the project the four new sites were surveyed on two occasions each; with a single survey visit during each of the below survey periods:

- Mid-season: Mid-August – Mid September
- Late season: Mid-September – Mid-October

Additionally, between one and two survey visits were undertaken at the caves in Nearcliff Wood and Anston Stones Wood in July and early August 2017. The focus of this component of the survey was to attempt to capture the previously unrecorded Brandt's Bat *Myotis brandtii*, which is known to swarm earlier than other *Myotis* (Roe, 2016).

A single survey was also undertaken between mid to late September 2017 at Anston Stones, in order to confirm whether the previously un-surveyed feature of Fissure Cave was also used by autumn swarming bats.

Trapping protocol

Trapping surveys were carried out according to Collins (2016) and using a pair of 4.2 m^2 Austbat triple-bank harp traps. Single traps were used to cover the openings of Dead Man's Cave, Fissure Cave and Large Fissure at Anston Stones Wood. Two individual traps were required to cover both the upper and lower entrances to Nearcliff Wood Rift Cave in Nearcliff Wood. At Barnburgh Crags, Cadeby Pot, Rockley Tunnel and Sheffield Mine, a single trap covered the main opening, with a second trap sited within a nearby vegetation pinch point. Harp traps were erected directly across cave openings in order to intercept bats entering/exiting these features, with additional sections of camouflage netting used to cover the larger spaces between trap sides and the edges of the cave opening.

Trapping nights were selected based on recent weather forecasts for the survey night. Dry survey nights, with little or no wind and temperatures above 8°C at sunset were targeted. Weather data including temperature, wind speed and rainfall at the beginning and end of each survey were taken from local weather station records. The survey team was formed of an even mix of surveyors drawn from South and West Yorkshire Bat Groups, including at least two surveyors experienced in bat trapping surveys.

Harp traps were installed from sunset until six hours after this time, with traps checked every 15 minutes during the survey period. The time of each bat retrieval was recorded with captured bats transferred to cotton drawstring bags for transfer to a processing area where species, sex, forearm length, age and, where possible, breeding status was recorded. Bats were processed in order of capture. They were aged as either adults, or juveniles, based on the degree of ossification of the joints within the finger bones, finger joint shape, the level of damage (scarring) to their wings, size, weight and breeding status (Mitchell-Jones & McLeish, 2004). A fur clipping (Natural England, 2013) was taken from all bats prior to release, in order to allow re-captured bats to be identified. Bats were identified to species level with reference to their morphological characteristics, as presented in *Bats of Britain and Europe* (Dietz & Kiefer, 2016). In order to confirm species identification of suspected Whiskered Bat *Myotis mystacinus*/ Brandt's Bat *Myotis brandtii*/Alcathoe Bat *Myotis alcathoe*, clipped fur was retained in a numbered vial for future DNA analysis, undertaken by the Waterford Institute using a targeted qPCR analysis technique.

Summary of Results

Including recaptures, a total of 265 bats were caught across all 2016 and 2017 surveys. On the basis of bat activity recorded, a determination was made regarding the likely presence or absence of bat autumn swarming behaviour at each study site. These detailed considerations are presented in the two existing study reports (Bell *et al.*, 2017; Bell *et al.*, 2018). It was considered that Cadeby Pot, Dead Man's Cave, Fissure Cave, Large Fissure, Nearcliff Wood Rift Cave and Sheffield Mine were used by autumn swarming bats. The study did not however record persuasive evidence of bat autumn swarming activity at either Barnburgh Crags or Rockley Tramway Tunnel.

In order to enable a simple comparison of bat activity at each site, the median number of bats captured per survey session was calculated. Table 1 displays a summary of basic survey findings and existing survey information associated with each feature included in the study.

Table 1: Study findings summary table

Feature name	Area	Feature type	Median number of captures/session*	Confirmed autumn swarming site	Confirmed hibernation site
Fissure Cave	Anston Stones Wood, South Anston	Cave	32	Yes	No
Dead Man's Cave	Anston Stones Wood, South Anston	Cave	19	Yes	No
Rockley Tramway Tunnel	Rockley, near Barnsley	Tunnel	17.5	No	Yes
Cadeby Pot	Cadeby, Don Gorge, near Conisbrough	Cave	16	Yes	Yes
Nearcliff Wood Rift Cave	Nearcliff Wood Don Gorge, near Conisbrough	Cave	11	Yes	Yes
Sheffield Mine	North Sheffield	Mine	9.5	Yes	Yes
Large Fissure	Anston Stones Wood, South Anston	Cave	2.5	Yes	No
Barnburgh Crags	Barnburgh	Cave	1.5	No	Yes

*not including early season surveys, during which no captures were made

The data collected from autumn swarming sites were also considered separately, in order to explore the characteristics of autumn swarming bats within South Yorkshire. The species mix recorded from all sites and from the swarming sites only, is presented in Table 2.

Natterer's Bat comprised the majority of captures, followed by Daubenton's Bat, Whiskered Bat and Brown Long-eared Bat (see Figure 3). The single Common Pipistrelle *Pipistrellus pipistrellus* is considered to be an incidental capture.

Table 2: Species breakdown

Species	Number of bat captures (confirmed swarming sites only)	Number of bat captures (all sites)
Natterer's Bat	134 (59.0%)	167 (63.0 %)
Daubenton's Bat	47 (20.7%)	48 (18.1 %)
Whiskered Bat	23 (10.1 %)	24 (9.1 %)
Brown long-eared Bat	22 (9.7 %)	25 (9.4 %)
Common pipistrelle	1 (0.4 %)	1 (0.4 %)
Total	**227**	**265**

The sex ratio of bats captured at swarming sites was heavily male biased (79.2 % male, 20.8 % female). Recapture rates at swarming sites were low, with only 4.8 % of captures comprising bats caught on one or more previous occasions.

78.3% of the bats captured at autumn swarming sites were adults and 21.7% juveniles. In 2016 when catching was completed at the same sites in August, early and late September, and October, the adult capture rate was highest in August with the rate decreasing each month until October. Conversely, the juvenile capture rate increased initially with the peak capture rate recorded in late September.

Peak nightly bat activity was recorded between three and six hours after sunset, as shown in Figure 2 (p104). It should be noted the study ceased six hours after sunset and consequently bat activity after this period remains unknown.

Discussion

Comparisons with other local studies

In comparison with other known swarming sites in northern England, the South Yorkshire swarming sites display a number of similarities. This study captured a range of bats commonly recorded at other swarming sites within the region including Natterer's Bat, Daubenton's Bat, Whiskered Bat and Brown Long-eared Bat.

Although the level of variation in species composition is notable, the overall species breakdown recorded during this SYBG study was broadly comparable to most other swarming capture projects (Glover & Altringham, *loc.cit.*, Rivers *et al.*, *loc.cit.*, Roe, *loc.cit.*), even those located in southern England (Parsons *et al.*, 2003a).

Species composition is known to differ between swarming sites. A key difference between the results of this study and work conducted in North Yorkshire (Rivers *et al., loc.cit.*; Glover & Altringham, *loc.cit.*) and Derbyshire (Roe, *loc.cit.*) is the lack of any Brandt's Bat captures. Brandt's Bat records are rare in South Yorkshire. While in part this is considered to be due to the difficulties distinguishing between the Whiskered Bat, Brandt's Bat and Alcathoe Bat group; an opportunity such as this which allowed detailed identification of physical characteristics in the hand and genetic analysis of clipped fur, was considered an ideal opportunity to add some additional Brandt's Bat records.

The sex ratio recorded at swarming sites varies across each research project and between species. However, as with similar projects (Glover & Altringham, *loc.cit.*; Rivers *et al., loc.cit.*; Roe, *loc.cit.*), the sex ratio recorded at the South Yorkshire sites was also highly male biased.

The peak period for autumn swarming varies between sites and bat species (Glover and Altringham, *loc.cit.*; van Schaik *et al., loc.cit.*; Rivers *et al. loc.cit.*), with this period generally extending from August to October. The seasonality of use recorded in this study fitted with this pattern, but was dependent on species recorded.

The earlier peak in Whiskered Bat and Daubenton's Bat swarming activity, when compared to Natterer's bat swarming, is in line with other studies (Parsons *et al.*, 2003b; Glover & Altringham, *loc.cit.*; Roe, *loc.cit.*). Parsons *et al.* (2003) propose that this could be primarily due to differences in hunting strategies as gleaning species such as Natterer's Bat may be able to continue hunting in conditions that are unsuitable for aerial hawking bats.

The lag in the start and end of swarming by juvenile bats, apparent in our 2016 results, could be the result of inexperienced juveniles taking time to learn where the swarming sites are and when to stop swarming. It is known that juveniles are more likely to be caught with other juveniles than adults (given their respective overall capture rates) (Burns & Broders, 2015) and an increased proportion of swarming juvenile bats recorded later in the season has been reported for common pipistrelle (Sendor, 2002). However, it is little known for other species such as bats from the *Myotis* genus, where autumn swarming forms part of their mating strategy (Angell *et al*., 2013, Rivers *et al*., 2005).

<u>Consideration of importance of Anston Stones Wood caves to autumn swarming bats</u>
The 47 bats caught within the six hours after sunset on 21st September 2017 at Anston Stones Wood was at the time of writing, the most bats caught at any one autumn swarming site in South Yorkshire in one night. Previously in 2016, the Dead Man's Cave and Large Fissure features recorded a peak of 27 bats (all species) (19 at Dead Man's Cave and eight at Large Fissure) between sunset and six hours after this time during the late August survey occasion.

Natterer's Bats made up the majority of captures at both Anston Stones caves during the 2017 survey. It is worth noting that trapping is unlikely to capture all bats swarming around a feature, as even where the trap blocks the majority of the entrance, it is possible that bats will avoid the trap or occasionally manoeuvre through the trap. The peak number of Natterer's Bats caught at Dead Man's Cave in 2017 (11 bats) was just under 60 % of the peak number caught there in 2016. Given that there seems to be little or no interchange of swarming bats between Dead Man's Cave and Large Fissure or Fissure Cave, it is possible the number swarming across the three features in Anston Stones Wood could peak at well over 50 Natterer's Bats a night during an optimal night in the peak season.

The low number of recaptures recorded from confirmed South Yorkshire swarming sites during both 2016 and 2017, concurs with the findings of other UK studies (Rivers *et al*., *loc.cit*.; Glover & Altringham, 2008; Parsons *et al*., 2003a) and suggests a high turnover rate of bats between nights during the swarming season. Considering that the Natterer's Bat swarming season is likely to extend from mid-August to mid-October with a peak in September, the survey results collected so far suggest that Anston Stones Wood is an important autumn swarming site for many hundreds of Natterer's Bats across a season.

<u>Distribution of bat autumn swarming sites in South Yorkshire</u>
Bats have been confirmed to engage in autumn swarming at two caves in the Don Gorge area near Conisbrough (Nearcliff Wood Rift Cave and Cadeby Pot) and three caves (Dead man's Cave, Fissure Cave and Large Fissure) in Anston Stones Wood near South Anston. All five caves are located on the Magnesian Limestone and the only surveyed site on this geology from which autumn swarming has not been confirmed is Barnburgh Crags. There are numerous other caves, crags, tunnels, subways and kilns located in the Don Gorge (Murphy & Cordingley, *loc. cit*.; Engering & Barron, *loc.cit*.; Lane *et al*., 2013), many of which have a long history of survey for hibernating bats (Lane *et al*., *loc.cit*.). It is highly likely that more autumn swarming sites will be found in the Don Gorge in future years.

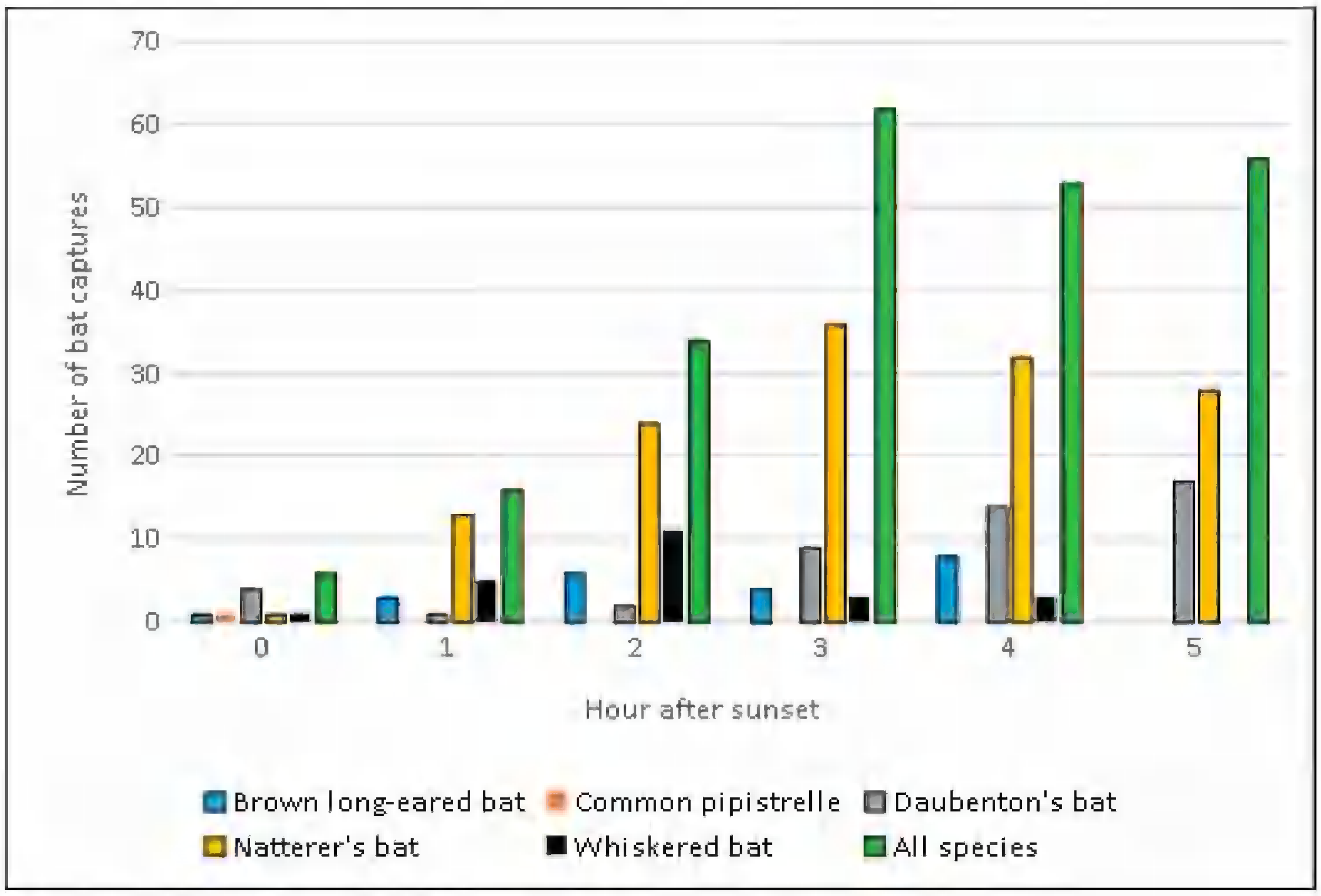

Figure 2: Bat activity through the night at autumn swarming sites

Where additional caves and crags are present on South Yorkshire's Magnesian Limestone, it is likely that targeted autumn swarming survey will be rewarded with the discovery of further bat autumn swarming sites. A short period of remote detector survey undertaken on a crag opposite Roche Abbey, near Maltby in Autumn 2015 (Bell, pers. comm.) recorded likely suggestions of autumn swarming activity that would justify further survey at this site.

In 2017, surveys at Sheffield Mine showed the presence of bat autumn swarming at this location, a first for the city. Mining for minerals such as the heat resistant gannister and pot clay took place at numerous locations in the hills around Sheffield (Battye, *loc.cit.*), fuelled by the growth of the steel production industries. All these mines are now disused and most have been lost to collapse or infilling. Observations made at Sheffield Mine add impetus to efforts to locate any remaining Sheffield mines, in order to determine their usage by roosting or autumn swarming bats. Given that any remaining mines are likely to be at risk of collapse or deliberate closure, it is advised that works to locate and survey them should be considered an urgent conservation priority.

To date, no strong evidence of bat autumn swarming has been recorded from features other than caves or a mine in South Yorkshire. The county does however support other types of underground features known to be used by hibernating bats, notably including several large rail tunnels, and it would be interesting to explore the potential for autumn swarming use of these features in the future.

Relative importance of sites as autumn swarming and hibernation locations

A recent study in the Netherlands showed that bat species composition and abundance during swarming can correlate with composition and abundance during hibernation at the same site (van Schaik *et al*., *loc.cit*.). This relationship can, however, be difficult to demonstrate in practice as *Myotis* and *Plecotus* bats often hibernate out of sight (Stebbings, 1988) and consequently visual surveys may be poor methods of assessing hibernacula (Glover & Altringham, 2008).

Figure 3: The 'big four' bats recorded from autumn swarming sites in South Yorkshire. Top left: Natterer's Bat *Myotis nattererii* Top right: Daubenton's Bat *Myotis daubentonii.* Bottom: Whiskered Bat *Myotis mystacinus*. Front cover: Brown Long-eared Bat *Plecotus auritus.* Pink chalk markings are visible on the forearms of the Daubenton's and Whiskered Bats. Photos: *Robert Bell*.

Whilst limited hibernation survey has been undertaken at the study sites, the survey findings do appear to suggest that a far larger number of bats swarm at the caves in Anston Stones Wood than subsequently hibernate within them. In particular, Dead Man's Cave is small, relatively easily surveyed and experiences high levels of human disturbance. In the context of study results, relatively high numbers of bats appear to swarm at Dead Man's Cave, however, to date, no bats have been recorded hibernating there. It is likely that in areas with few caves, small caves with limited chamber development and low suitability as hibernacula may nevertheless be of conservation importance as a location for autumn swarming.

By comparison, Rockley Tramway Tunnel has the highest peak count of non-pipistrelle bats recorded from any bat hibernaculum in South Yorkshire. Despite regular usage of this feature by hibernating bats, the swarming survey work undertaken recorded no persuasive evidence of autumn swarming from this site.

Far more involved studies than ours have established a strong link between the use of sites by both hibernating and autumn swarming bats. However, based on the results of the surveys presented within this document, several of our study sites appear not to fit this general trend.

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How have recent lepidopteral colonisers fared in Yorkshire?

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Introduction

Yorkshire's latitude places it at the northern edge of the ranges of several butterfly species whose populations have waxed and waned over the last two centuries for which we have sufficient extant records. Since the 1990s butterflies once considered rare or absent in Yorkshire, such as Comma *Polygonia c-album*, Speckled Wood *Pararge aegeria*, Gatekeeper *Pyronia tithonus* and Holly Blue *Celastrina argiolus* have expanded northwards to become commonplace (Asher *et al.*, 2001; Fox *et al.*, 2007). There has even been the arrival of Essex Skipper *Thymelicus lineola*, a butterfly whose northern range has historically always been to the south of Yorkshire. It is not always clear what mechanisms drive expansion and restriction in range but clearly sustained increases in global mean temperature from the early twentieth century onwards (Stott *et al.*, 2000; IPCC, 2013) has been a major factor (Asher *et al., loc. cit.*; Parmesan *et al.*, 1999). This article aims to review how the Speckled Wood, Comma, Gatekeeper, Holly Blue and Essex Skipper have fared in Yorkshire by comparing the status of these butterflies in the period

2004-2017 against the previous period of 1995-2003. The analysis will provide an update to Frost (2005) on how these recent lepidopteral colonisers of Yorkshire have fared.

Past status

Speckled Wood. Subject to large changes in range; a notable retraction from around the 1860s to the 1920s left Speckled Wood confined to the south-west of England, Wiltshire and parts of Dorset and West Sussex, lowland Wales and western Scotland (Asher *et al*., *loc. cit.*; Thomas & Lewington, 2014). Common in Yorkshire around the 1850s (Morris, 1853; Porritt, 1883), Speckled Wood was largely lost to Yorkshire by the end of the nineteenth century, with only one site (Wentbridge) still producing records to the 1970s. The first modern northwards expansion into Yorkshire began in the 1990s (see Frost, 2005).

Gatekeeper. Widely distributed and abundant in southern England, but with a habit of experiencing periodic expansions and contractions in distribution (Asher *et al*., *loc. cit.*; Thomas & Lewington, *loc. cit.*). Extant records suggest it was not particularly widespread in Yorkshire from the 1830s onward; Porritt (*loc. cit.*) suggests stronger presence along the east coast as far north as Whitby falling off towards the interior. There was a contraction back to the southern edge of Yorkshire by the late 1800s (see Frost, *loc. cit*). It remained a scarce butterfly in Yorkshire until the 1980s when there was evidence of movement into the Sheffield area (Whiteley, 1992).

Comma**.** Common throughout England and Wales now, but suffered a collapse in numbers in the early nineteenth century that left it largely confined to the Welsh borders by the end of the century (Asher *et al*., *loc. cit.*; Thomas & Lewington, *loc. cit.*). It was virtually absent from southern England for almost a hundred years between 1830 and 1930. Numbers started to build in the south around 1910-20, with the beginnings of a northwards expansion into Yorkshire marked by sporadic sightings in VC61 and VC63 in the 1940s. The first true expansion into Yorkshire was noted in the early 1980s (see Frost, *loc. cit.*).

Holly Blue**.** Though it declined nationally in the nineteenth century, the Holly Blue has suffered less than many of Britain's other butterflies during the last hundred years and has enjoyed gentle expansion in the last thirty years or so (Asher *et al*., *loc. cit.*; Thomas & Lewington, *loc. cit.*). Though a colony was present in York, Harrogate and Nidderdale from 1978, the first general expansion into Yorkshire came from the south in 1990. Large numbers were reported in VC61 and large swarms came in from the east at Spurn, presumably as northwards movement shearing back into land (Frost & Frost, 1991; Frost, *loc. cit.*).

Essex Skipper**.** This is a butterfly new to Yorkshire in 1996 when it was seen at Wintersett Reservoir near Wakefield in VC63. It has since expanded locally in areas around Doncaster. A separate point of entry into Yorkshire was effected presumably by passage across the Humber estuary when a colony was established at Spurn NNR in 2003 (Frost, *loc. cit.*). After apparently stalling for around a decade, Essex Skipper has recently shown signs of renewed further expansion (Smith, 2015; Beaumont *et al*., 2016, 2017, 2018).

Method

The Butterfly Conservation Yorkshire (BCY) database was searched for records of the target butterflies for the period 1995 to 2017 from the five Watsonian vice-counties (VC61-VC65) traditionally comprising the county of Yorkshire for recording purposes.

Several measures were derived of the extracted records from the BCY database. *Levana* mapping software (version 3.98) allowed the easy creation of maps at tetrad resolution (2 x 2km squares) and also provided tetrad counts within those maps. To perform basic statistical tests SPSS 24 was used; to visualise data as density maps, calculate boundary lines and calculate surface areas, the *R* statistical package (*R* version 3.4.4, R Core Team, 2018) and additional statistical mapping packages were used (Calenge, 2006; Wickham, 2009; Kahle & Wickham, 2013; Baddeley *et al.*, 2015; Becker *et al.*, 2016; Becker *et al.*, 2017; Schnute *et al.*, 2017). The excellent *R* manual (Thomas *et al.*, 2015) is highly recommended and helped in first motivating some of these spatial analyses.

Reference to butterfly range in this article includes the notion of National Character Areas (NCAs). These are useful entities defined by Natural England (2014) to capture distinctive natural areas of England that, due to a unique combination of landscape, bio- and geo-diversity, history and cultural and economic activity, can be seen as providing a meaningful 'sense of place'. The Yorkshire and Humber region spans 28 of these areas – as can be seen in the figure below this region follows natural topography rather than administrative boundaries, but nevertheless shows reasonable affinity to the five Watsonian vice-counties.

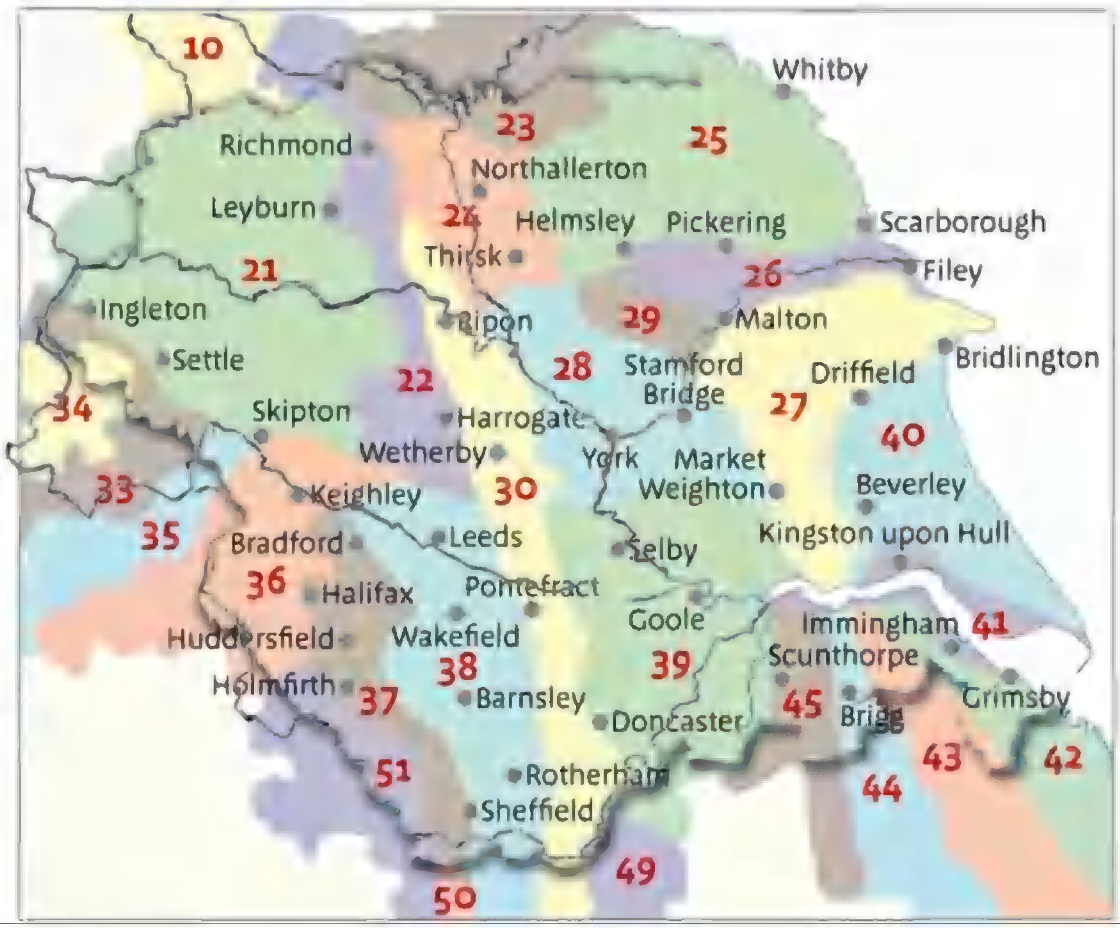

Figure 1. The Yorkshire and Humber region (delineated by the shaded boundary) comprises some 28 National Character Areas (NCAs) which are natural subdivisions of England (Natural England, 2014). The five Yorkshire VCs (61-65) boundary lines are shown superimposed upon the NCAs. The following numbering and names are those used by Natural England. The map contains public sector information licensed under the Open Government Licence v3.0.

NCA	NCA Name	NCA	NCA Name
10	North Pennines	36	Southern Pennines
21	Yorkshire Dales	37	Yorkshire Southern Pennine Fringe
22	Pennine Dales Fringe	38	Nottinghamshire, Derbyshire and Yorkshire Coalfield
23	Tees Lowlands	39	Humberhead Levels
24	Vale of Mowbray	40	Holderness
25	North Yorkshire Moors and Cleveland Hills	41	Humber Estuary
26	Vale of Pickering	42	Lincolnshire Coast and Marshes
27	Yorkshire Wolds	43	Lincolnshire Wolds
28	Vale of York	44	Central Lincolnshire Vale
29	Howardian Hills	45	Northern Lincolnshire Edge with Coversands
30	Southern Magnesian Limestone	49	Sherwood
33	Bowland Fringe and Pendle Hill	50	Derbyshire Peak Fringe and Lower Derwent
34	Bowland Fells	51	Dark Peak
35	Lancashire Valleys		

Results

Speckled Wood. Figure 2 (p112) shows the tetrad distribution maps for Speckled Wood for the 1995-2003 period (Frost, *loc. cit.*), the current survey period 2004-2017 and the gains and losses between the two periods. It is important to underline that the following descriptions are based on the *cumulative* records for each time period; the dynamic year-by-year expansions and contractions are not captured. Nevertheless, it is arguable that long-term change in distribution is something that is best captured by a long exposure time rather than a short snapshot. The contour lines (in Figure 2: Top-left and Top-right) are drawn by eye and delineate which parts of Yorkshire have 'strong' presence of Speckled Wood (black bold contour line) and which areas are in the process of 'apparent' colonisation (black faint contour line).

In the period 1995-2003 Speckled Wood had a strong presence in the eastern half of VC63 expanding from the Southern Magnesian Limestone ridge, westwards into the Yorkshire Coalfield east of the Pennines and eastwards into the western half of the Humberhead Levels (Figure 2: Top-left). A band of partial colonisation some 20-30km wide surrounds the main area and extends to the east coast across the Holderness plain and the northern banks of the Humber Estuary. By 2017 (Figure 2: Top-right) the areas of partial colonisation in 1995-2003 have been fully colonised, with further dense colonisation into the Vale of York and the Vale of Mowbray, and the whole of the east coast extending some 10-20km inland is also heavily colonised from Bridlington up to the northern edge of VC62. The only areas of Yorkshire still only partially colonised are the Vale of Pickering, the Wolds, the Howardian Hills, the southern half of the North Yorkshire Moors and Cleveland Hills, the northern half of Holderness, and western VC64 (Yorkshire Dales). Speckled Wood is absent from the far north-west of VC65 (but this is an under-recorded area). Figure 2: Bottom-left shows the gains in tetrads from both 'filling in' known strong areas of colonisation in 1995-2003 but also the spectacular further spread of Speckled Wood over large areas of Yorkshire between the two survey periods (1995-2003 and 2004-2017). Figure 2: Bottom-right shows that there have been very few losses in tetrads between the two survey periods.

Drawing lines by eye can be subjective (though as a pattern matcher the eye and brain is still unparalleled; witness the success of such citizen science endeavours as the exoplanet categorisation project which classifies transit light curve data from NASA's Kepler Space telescope to uncover planets orbiting other stars - see https://www.planethunters.org/.) However, calculation is more tricky for the eye! To characterise the areas of colonisation, the Speckled Wood reports for the period 1995-2003 – the Frost (*loc. cit.*) survey period – were turned into a density map. Figure 3: Left shows a density map overlaid over a satellite map of Yorkshire where the presence and number of reports at any location is taken into account (we are interested in both where butterflies have been spotted but also how many times they have been spotted there). Imagine water dripping onto a blotting pad so that individual water drops falling at a particular location make that spot increasingly damp. Further imagine that the dampness spreads in the blotting pad so that we have a smeared damp patch. Here we have instead of water droplets butterfly reports. What the density maps show is the evidence for the presence of a butterfly of a particular species (in this case Speckled Wood) in a location based on the recorded presence of the butterfly in *that location* plus the *surrounding regions*[1]. Each separate Speckled Wood report is represented by a yellow spot – the spots are semi-transparent so that repeated reports at one location build incrementally to increase yellow spot opacity. The white contour lines are different report densities so that increasingly packed contour lines indicate steeper gradients of report density (using the same logic as altitude contour lines in OS maps or barometric pressure isobars in weather maps). It is important to note that the contour lines are normalised to the records *within* the survey period so that they characterise the *relative* rather than *absolute* strength and distribution of records. As such they provide a nuanced picture of density within the survey period. To a certain extent highest report densities are over major urban centres – lots of people, lots of reports. The two most densely reported areas are Doncaster (especially south Doncaster) and the Wakefield, Barnsley and Pontefract areas. It is probably more instructive to look at the outermost contour line as it encloses a region where Speckled Wood is present even outside areas of major populations. It is clear that the density map (Figure 3: Left) captures rather neatly the patterns drawn by eye (Figure 2: Top-left) for 'strong' presence of Speckled Wood.

To *quantify* 'strong' presence within the density map, use was again made of kernels which are particularly well suited to bounding irregular distributions, to create 'habitat' maps (Calenge, 2006). A habitat map is the area of the *minimum* range in which there was a specified probability of encountering a butterfly. The advantage of such a notion is that a calculation can be made of the surface area in km^2 of the habitat map. To capture the region of 'strong' presence of a butterfly (equivalent to the bold contour line in Figure 2: Top-left and the outermost contour line in Figure 3: Left), the probability level of encountering a butterfly was set at 90% probability

1 Technically the method used is kernel density estimates. Each butterfly report produces a Gaussian distribution of probability centred at the location it was seen (think of a 3D bump at that location where we have the two dimensions of space x and y (longitude and latitude) and the third dimension of height z (denoting degree of presence). Each report adds one to the presence at that location). Finally, we sum up all the activations across the sampling grid spatially and in the z-dimension which means we produce a bumpy 3D map of presence which, if viewed from directly above the map, becomes a 2D density map. It is a 2D probability density distribution.

(denoted *strong-90*). The surface area of the *strong-90* region for the survey period 1995-2003 is 3,420km^2. To quantify 'apparent' colonisation the specified probability was relaxed to 99% chance of encountering a butterfly, denoted the *weak-99* region. This region effectively spans all of Yorkshire where there has been some evidence of a Speckled Wood being seen. The surface area of the filled *weak-99* region for the survey period 1995-2003 is 10,009km^2, which after the subtraction of the *strong-90* region, means that the *weak-99* area covers 6,589km^2. Figure Appendix 1: Top (first) row shows these 'habitat' maps calculated for Speckled Wood where the habitat region is filled white. Comparison between Figures 2, 3 and Figure Appendix 1 maps show a fairly close agreement between patterns revealed in all figures.

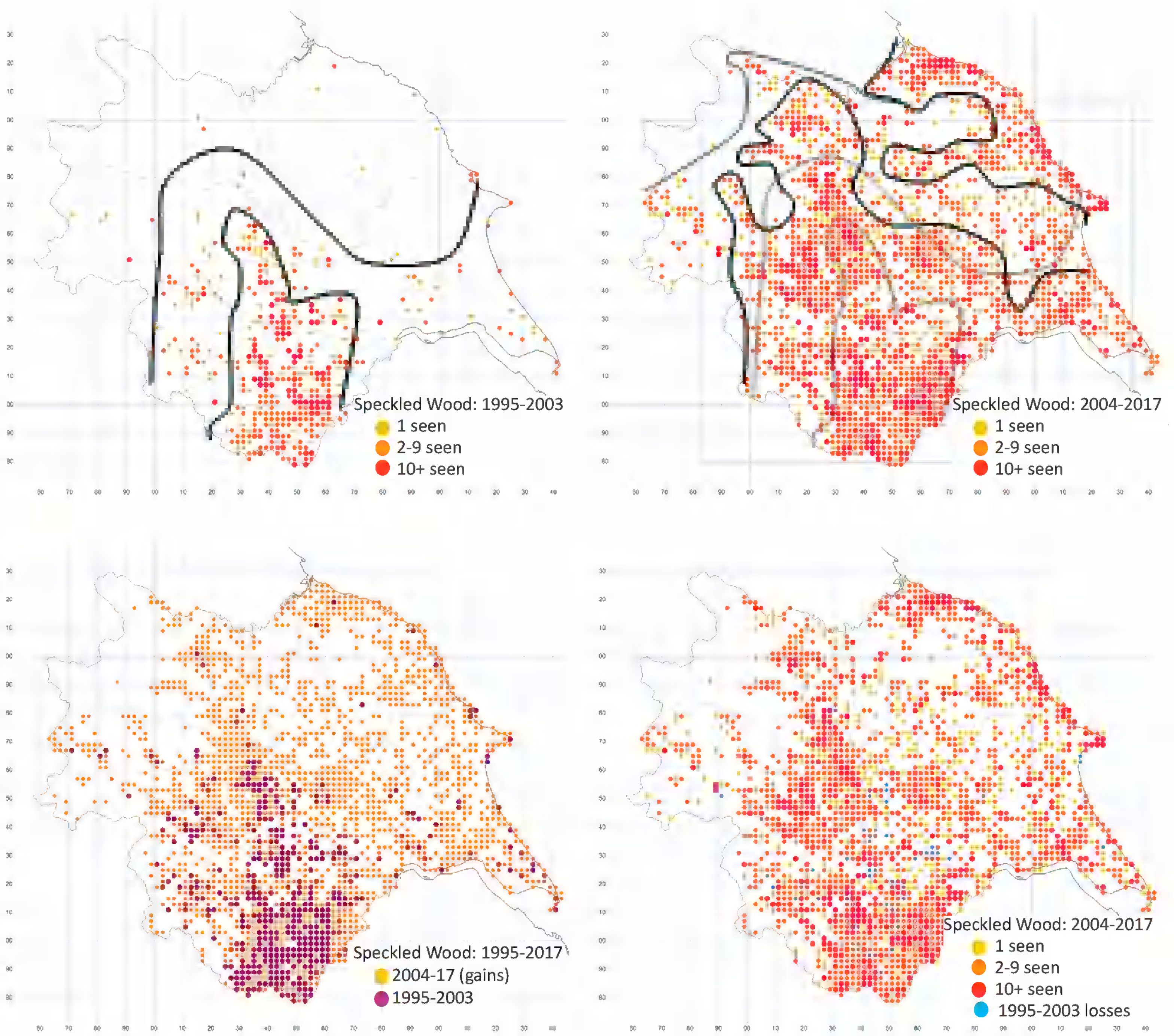

Figure 2. Levana tetrad distribution maps for Speckled Wood *Pararge aegeria*. Top-left: 1995-2003: The survey period reported in Frost (2005). Speckled Wood present in 430 of 3232 recorded tetrads (=13.3%). The black bold contour line marks 'strong' presence and the black faint contour line marks 'weak' presence, suggestive of colonisation. All contour lines drawn by eye. Top-right: 2004-2017. Speckled Wood present in 2023 of 3720 recorded tetrads (=54.3%). The black bold and faint contour lines same meaning as in Top-left. The 1995-2003 contour lines have been redrawn but in grey. Bottom-left: Comparison between the two periods with gains shown as orange dots. Bottom-right: Comparison between 1995-2003 and 2004-2017 with losses shown as blue dots.

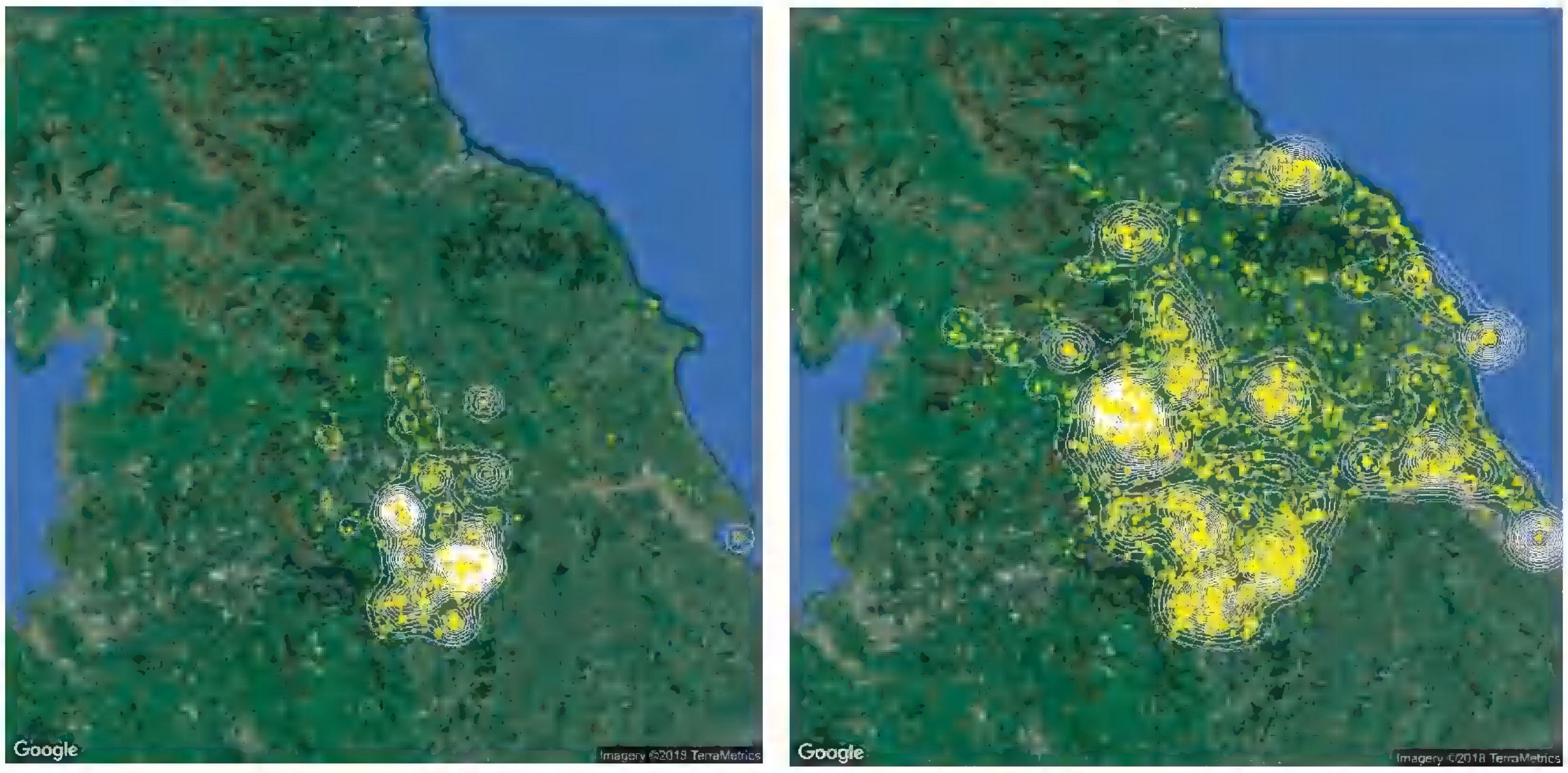

Figure 3. Speckled Wood density maps overlaid over Yorkshire for the survey period 1995-2003 (left) and 2004-2017 (right). Individual reports of Speckled Wood are shown as semi-transparent yellow dots, with multiple reports at the same location being overlaid on top of each other thus determining dot opacity. The density maps represent the probability distribution across Yorkshire of the presence of Speckled Wood. They can be thought of loosely as representing the evidence of the presence of Speckled Wood in any one location based on the recorded presence and abundance of the butterfly in *that location* plus the *surrounding regions*. The white contour lines delineate zones of increasing density normalised to the range within the individual survey periods.

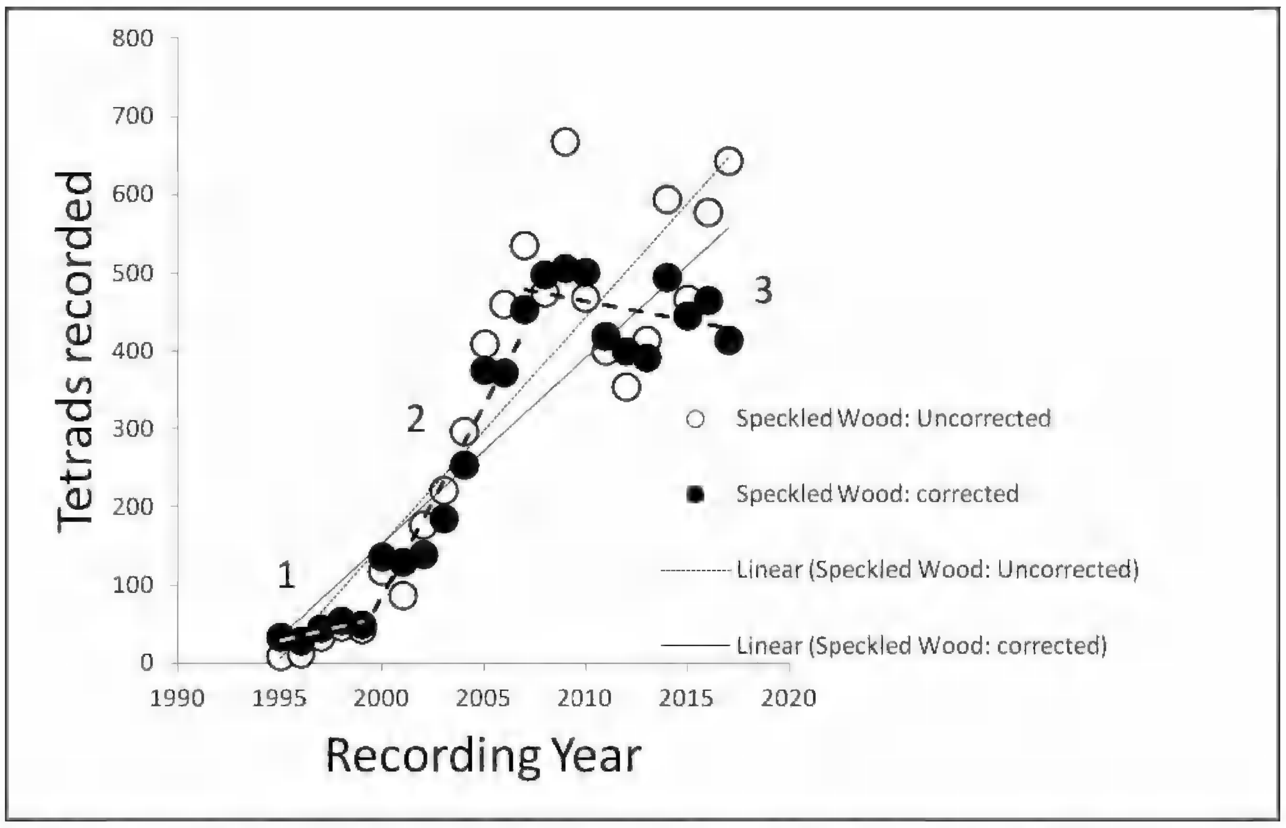

Figure 4. Number of tetrads in Yorkshire where Speckled Wood was seen as a function of recording year. Three distinct phases can be discerned: negligible growth (1995-1999), rapid growth (1999-2007), and then stability (possible decline) between 2007-2017 (marked respectively 1, 2 and 3).

The same method as above was used to create density maps for the Speckled Wood reports for the survey period 2004-2017. Figure 3: Right shows in the most recent survey period of 2004-2017 that Speckled Wood report numbers have greatly increased (compare the number of yellow dots!), that there has been a spread throughout Yorkshire, and that the focus of greatest reports has shifted to Leeds. The story that the density map shows is consistent with the description given above for Figure 2: Top-right.

The *strong-90* and *weak-99* regions were also calculated for the Speckled Wood 2004-2017 reports using the same kernel boundary methods and criteria as outlined above to create habitat maps, see Figure Appendix 1: Bottom row. The habitat map surface areas calculated were 11,607km^2 and 13,634km^2 for the *strong-90* and *weak-99* regions respectively. The area in km^2 of the strong presence of Speckled Wood in Yorkshire has grown by a factor of 3.4 and the area in km^2 of apparent presence of Speckled Wood in Yorkshire has grown by a factor[2] of 2.07. We can see that the area of apparent colonisation in 1995-2003 has been fully colonised by 2004-2017 (compare Figure 2: Top-left faint black line with Figure 3: Right).

Figure 4 plots the number of tetrads in Yorkshire where Speckled Wood was seen during each recording year. The open circles represent number of tetrads with no correction for the number of tetrads recorded in the recording year. Given there is a correlation with recorder effort and number of tetrads returned, it is wise to attempt to correct for this. Please see Figure Appendix 2 for Levana maps showing number of visits for the periods 1995-2003 and 1995-2017. It is clear that increased recorder effort is reflected in a much greater number of tetrads visited and visited multiple times. To attempt to ameliorate this bias, the number of tetrads with Speckled Wood returned in each year was multiplied by a correction factor calculated as the number of tetrads recorded in that year divided into the mean number of tetrads for all years between 1995 and 2017.

Thus in 1995 there were 9 tetrads with Speckled Wood reported from a total of 334 tetrads recorded in that year for all butterflies, which when corrected becomes $9*(x/334) \rightarrow 33$ where x is the mean number of tetrads recorded between 1995 and 2017 and is equal to 1218. Similarly in 2017 there were 644 tetrads with Speckled Wood reported from 1889 tetrads recorded in that year for all species, which when corrected becomes $644*(x/1889) \rightarrow 415$.

A note of caution is due here as the correction factor x represents an average measure of recorder effort and will work more or less for any one particular butterfly species as far as the recorder effort for that butterfly species is typical of the average recorder effort *for all* Yorkshire butterfly species. However, the five target butterfly species reviewed here are common in Yorkshire so we can with some confidence assume that recording effort for each of them closely matches the average recorder effort for all butterflies. The solid circles represent number of tetrads with a correction for the number of tetrads in a given recording year. The dotted line is the best-fit linear regression where there has been no correction in number of tetrads recorded from within a given year and the solid line is where there has been a correction applied to

2 Factor comparisons are probably wiser than absolute numbers comparisons (in km^2) because any 'errors' in drawing the density and habitat maps will tend to cancel out. For instance, the habitat maps (Appendix Figure 1) include areas of the sea or neighbouring VCs which contribute to the km^2 number but will fall out in a factor comparison.

the number of tetrads recorded from within a given year. Tetrads recorded (corrected) is significantly related to recording year (bivariate Pearson correlation, two-tailed $r(23) = 0.894$, 95% CI [0.805, 0.953], $p < 0.001$). There has been a 5.7 fold increase in the number of tetrads occupied by Speckled Wood between 1995 (n=33) and 2017 (n=415) when tetrad number is controlled for the increase in recording[3]. Further inspection of Figure 4 suggests that the rise in the number of tetrads with Speckled Wood records as a function of recording year can be broken down into three distinct phases: negligible growth (1995-1999), rapid growth (1999-2007), and then stability (possible decline) between 2007-2017 (marked respectively 1, 2 and 3 in Figure 4).

Gatekeeper (Fig.6 p116). Figure 5 shows the tetrad distribution maps for Gatekeeper for the 1995-2003 period (Frost, *loc. cit.*), for the period 2004-2017 and the comparison between the two periods. Gatekeeper had a strong presence in the south and south-east of Yorkshire by 1995-2003 (Figure 5: Top-left). There was a northerly zone of partial colonisation reaching to about Scarborough (40km northwards from Hornsea at the most easterly point) and reducing to 15-20km wide at the most westerly point in the acidic gritstone moorlands west of the Vale of York. There was also a narrower range of eastwards colonisation (about 15-20km wide) running through VC63 and VC64, with a further 20km westwards tongue of colonisation to Settle about 10km wide in the lower Yorkshire Dales. By 2004-2017 (Figure 5: Top-right) the areas where Gatekeeper had a strong presence in 1995-2003 have been further filled in. The northerly expansion has largely failed to materialise and there has been a marginal shift of 15-20km west reducing northwards, with further movement into the Vale of York. The main expansion has been in the areas of partial colonisation which have expanded into the northernmost parts of VC62 and north east into the south east of VC65. The lack of significant northwards expansion on the eastern side of Yorkshire is presumably due to the higher inland altitudes of the North York Moors. Figure 5: Bottom-left shows that gains have been largely restricted to the filling in of tetrads in the strong presence areas of 1995-2003. Figure 5: Bottom-right shows that losses have been largely restricted to VC61 and VC62.

Density maps for Gatekeeper records for the survey periods 1995-2003 and 2004-2017 are shown in Figure 7. Again there is an encouraging match in patterns between boundary lines drawn by eye (Figure 5, p116) and calculated density maps (Figure 7, p117). The 2004-2017 density map hints that the relative strength of Gatekeeper has shifted towards the western parts of Yorkshire (particularly Leeds) with some fall off in spread density in the Holderness plain. The *strong-90* and *weak-99* habitat region surface areas were calculated for Gatekeeper for the survey periods 1995-2003 and 2004-2017 reports using the same kernel boundary methods and criteria as used for Speckled Wood (for the sake of brevity these maps have been omitted). The habitat surface areas calculated were 8,313km^2 and 6,271km^2 for the *strong-90* and *weak-99* regions respectively for Gatekeeper in 1995-2003. For Gatekeeper 2004-2017, the habitat surface areas calculated were 7,875km^2 and 6,224km^2 for the *strong-90* and *weak-*

3 If we do not correct for growth in recording activity across the years then there has been a 72-fold increase between 1995 (when there were 9 Speckled Wood tetrads) and 2017 (when there were 644 Speckled Wood tetrads). That would be a biased comparison because there was relatively little recording going on in 1995 (coupled with few Speckled Woods) which underlines the need for a correction factor when comparing numbers across the years to avoid confounding the two variables of report activity and butterfly presence.

99 regions respectively. These numbers support the observations by eye that the range of Gatekeeper does not appear to have increased since 1995-2003 (and even hints at retraction) in some areas (Figure 5: Bottom-right, Figure 7: Right).

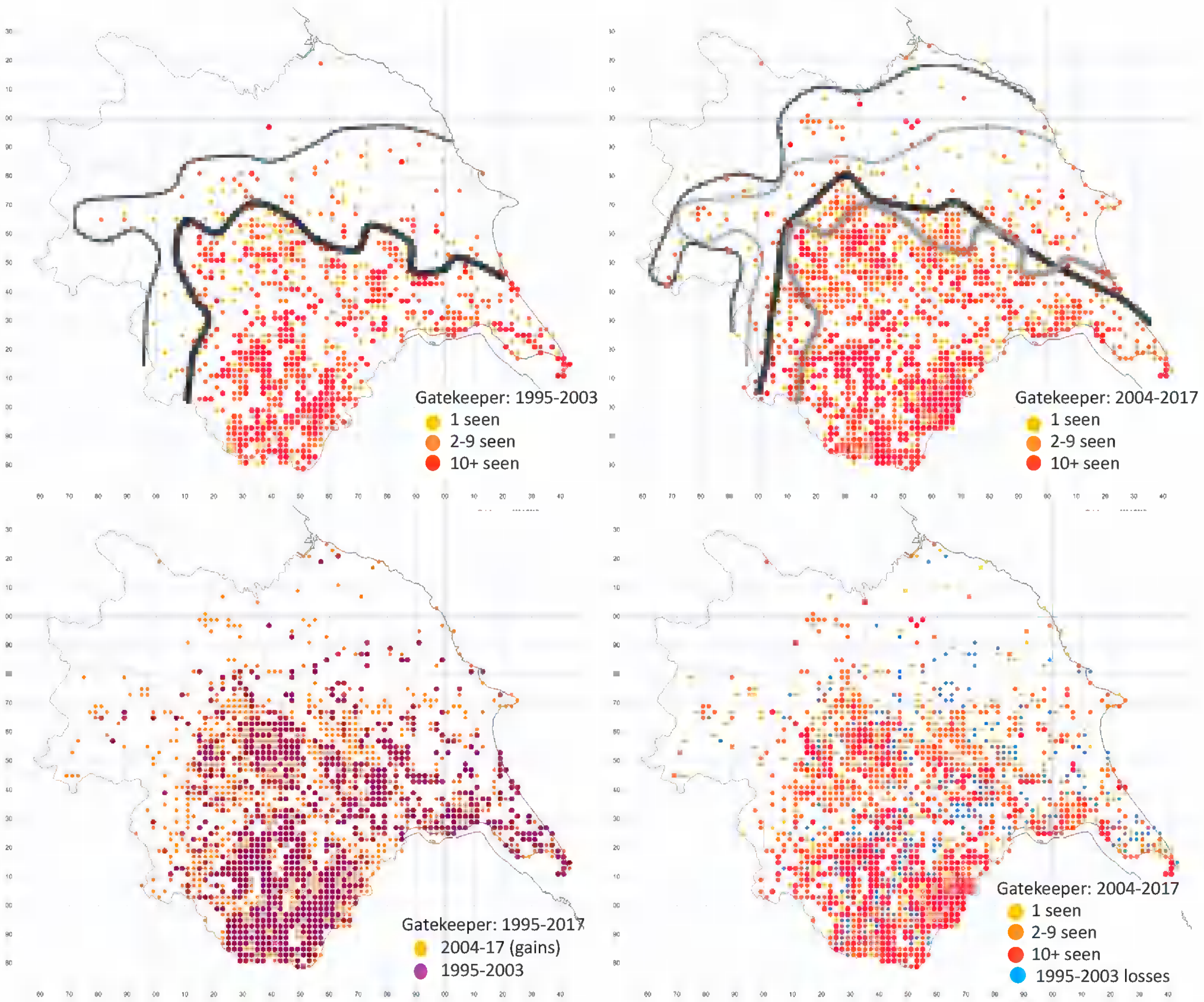

Figure 5. Tetrad distribution maps for Gatekeeper *Pyronia tithonus*. Top-left: 1995-2003. The survey period reported in Frost (2005). Gatekeeper present in 826 of 3232 recorded tetrads (=25.5%). Top-right: 2004-2017. Gatekeeper present in 1280 of 3720 recorded tetrads (=34.4%). Comparison between 1995-2003 and 2004-2017 with gains (Bottom-left) and losses (Bottom-right). Please see Figure 2 for further details.

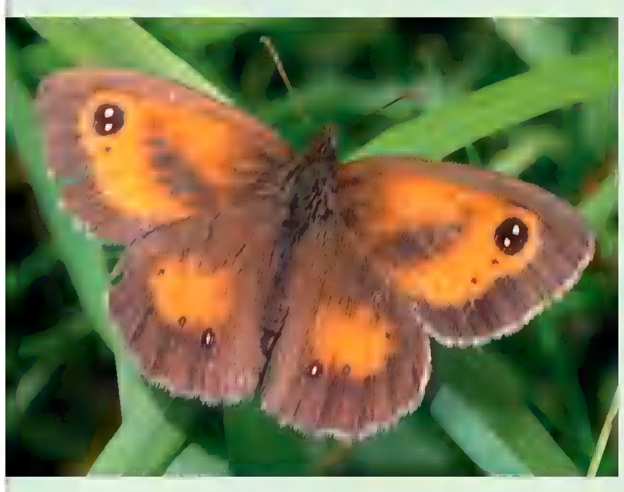

Figure 6.
Left: Male Gatekeeper *Pyronia tithonus*
Right: Comma ***Polygonia c-album***

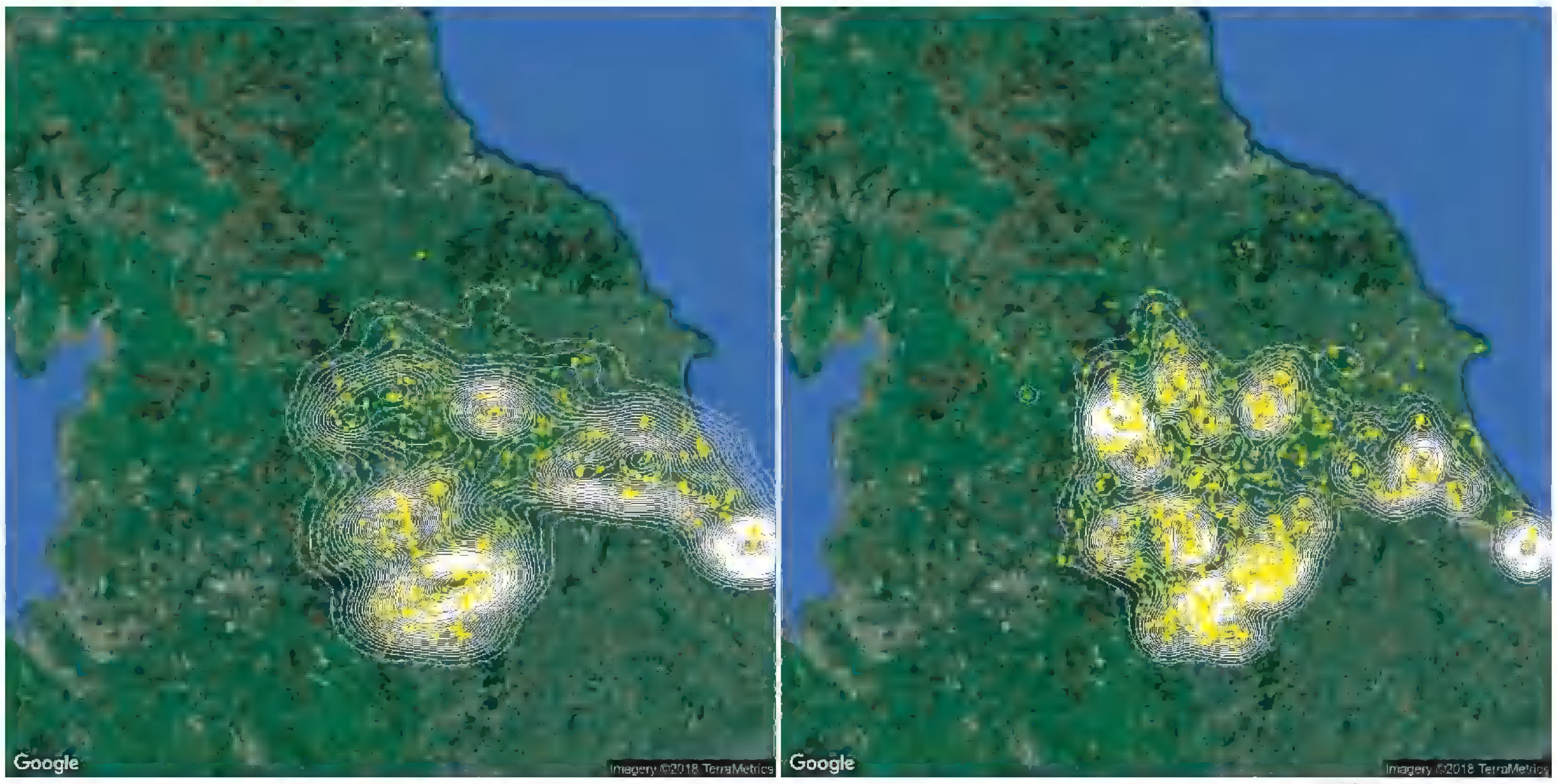

Figure 7. Gatekeeper density maps overlaid over Yorkshire for the survey period 1995-2003 (left) and 2004-2017 (right). For explanation of maps please see Figure 3.

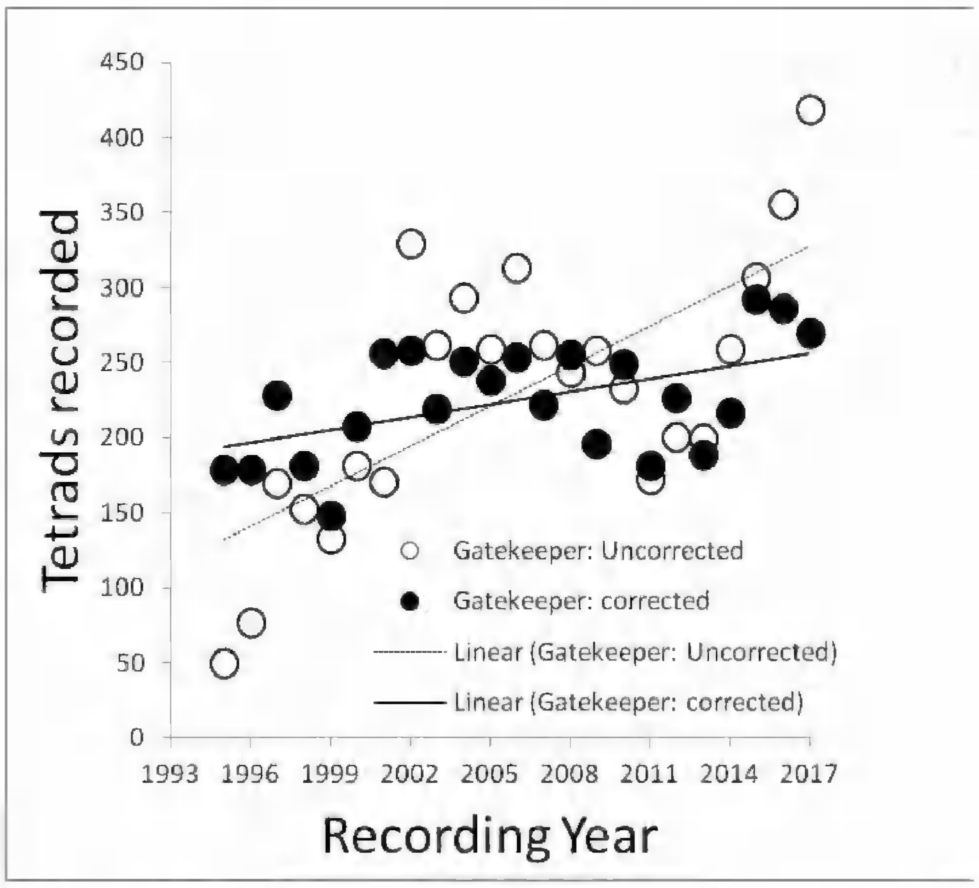

Figure 8. Number of tetrads in Yorkshire where Gatekeeper was seen as a function of recording year.

Figure 8 plots the number of tetrads in Yorkshire where Gatekeeper was seen as a function of recording year. The solid line is the best-fit linear regression where there has been a correction applied to the number of tetrads recorded from within a given year. Tetrads recorded (corrected) is significantly related to recording year ($r(23) = 0.498$, 95% CI [0.095, 0.769], $p = 0.016$). There has been a 30% increase in tetrad coverage between the two survey periods of 1995-2003 and 2004-2017, but this has largely been due to filling in of already colonised areas (Figs. 5 & 7).

Comma (Fig. 6 p116). Figure 11 (p120) shows the tetrad distribution maps for Comma for the 1995-2003 period (Frost, *loc. cit.*), for the period 2004-2017 and the comparison between the two periods. By 1995-2003 there was a strong presence in three areas in Yorkshire (Figure 11: Top-left). The largest area of concentration was the Southern Magnesian Limestone ridge, extending westwards into the Yorkshire Coalfield, the Southern Yorkshire Pennine Fringe and the Pennine Dales Fringe. This roughly rectangular area of land measures about 40km wide by 100km high. There was a second area of high concentration occupying the south east of Yorkshire (most of VC61) covering the Wolds and the Holderness plain, extending into the Vale of York. These two larger areas of dense colonization are separated by the Humberhead Levels. There was a smaller area comprising the woods of the lower slopes of the North York Moors. The areas of partial colonisation extended across the rest of Yorkshire excepting perhaps the outermost fringes of VC64 and VC65. However, these areas are notoriously under-recorded. By 2004-2017 (Figure 11: Top-right) the two largest areas of strong presence have merged as the Humberhead Levels were colonised leaving the Comma present across the entire south and south east of Yorkshire. The concentration in the North York Moors is largely the same but two new areas of strong presence have appeared; the first in the Middlesbrough area (in the Tees Lowlands) and the second around Richmond and Leyburn (Pennine Dales Fringe) and parts of the Vale of Mowbray. Inspection of the gains and losses between 2004-2017 and 1995-2003 (Figure 11: Bottom row) shows more gains than losses, with no particular discernible pattern.

Density maps for Comma records for the survey periods 1995-2003 and 2004-2017 are shown in Figure 9. Once again there is a welcome match in patterns between boundary lines drawn by eye (Figure 11) and the computer-generated density maps (Figure 9). The 2004-2017 density map hints that the relative strength of Comma has retracted somewhat in upper VC61 and the lower half of VC62, with greater densities achieved in western Yorkshire especially along the Southern Magnesian Limestone ridge. However, it should be noted that there are a *lot more* records in the second period as shown by the much greater number of white dots, each mapping a Comma report. The surface areas calculated were 12,682km^2 and 8,236km^2 for the *strong-90* and *weak-99* habitat regions respectively for Comma in 1995-2003. For Comma 2004-2017, the surface areas calculated were 11,077km^2 and 8,436km^2 for the *strong-90* and *weak-99* regions respectively. There has been a slight retraction in the strong presence areas.

Figure 10 plots the number of tetrads in Yorkshire where Comma was seen as a function of recording year. The solid line is the best-fit linear regression where there has been a correction applied to the number of tetrads recorded from within a given year. Tetrads recorded (corrected) is significantly related to recording year ($r(23) = 0.574$, 95% CI [0.153, 0.783], $p = 0.004$). There has been a 45% increase in tetrad coverage between the two survey periods of 1995-2003 and 2004-2017, which is largely due to filling in within strong presence areas along the Southern Magnesian Limestone ridge (Figure 11: Bottom-left). Gains in tetrads in the eastern half of Yorkshire (northern VC61 and southern VC62) are largely balanced out by losses.

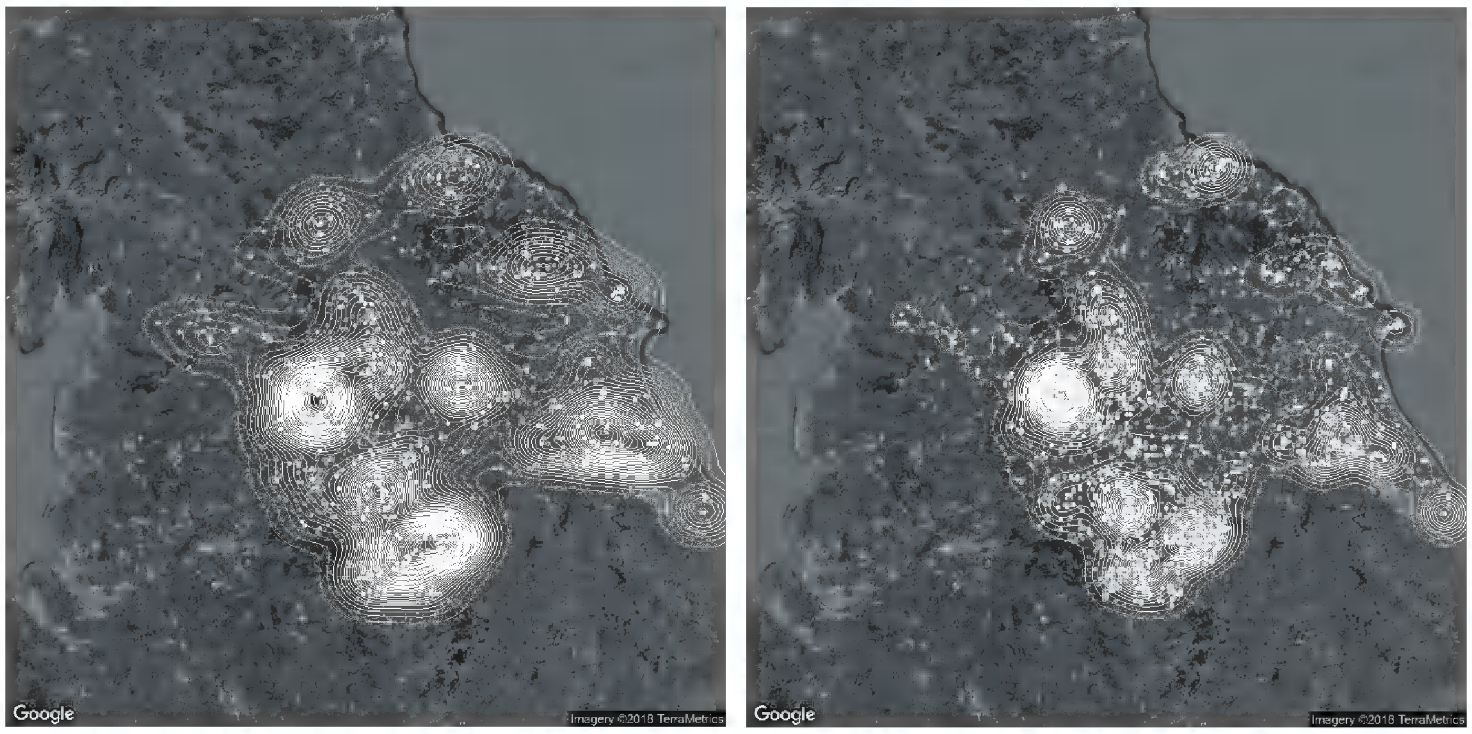

Figure 9. Comma density maps overlaid over Yorkshire for the survey period 1995-2003 (left) and 2004-2017 (right). For explanation of maps please see Figure 3.

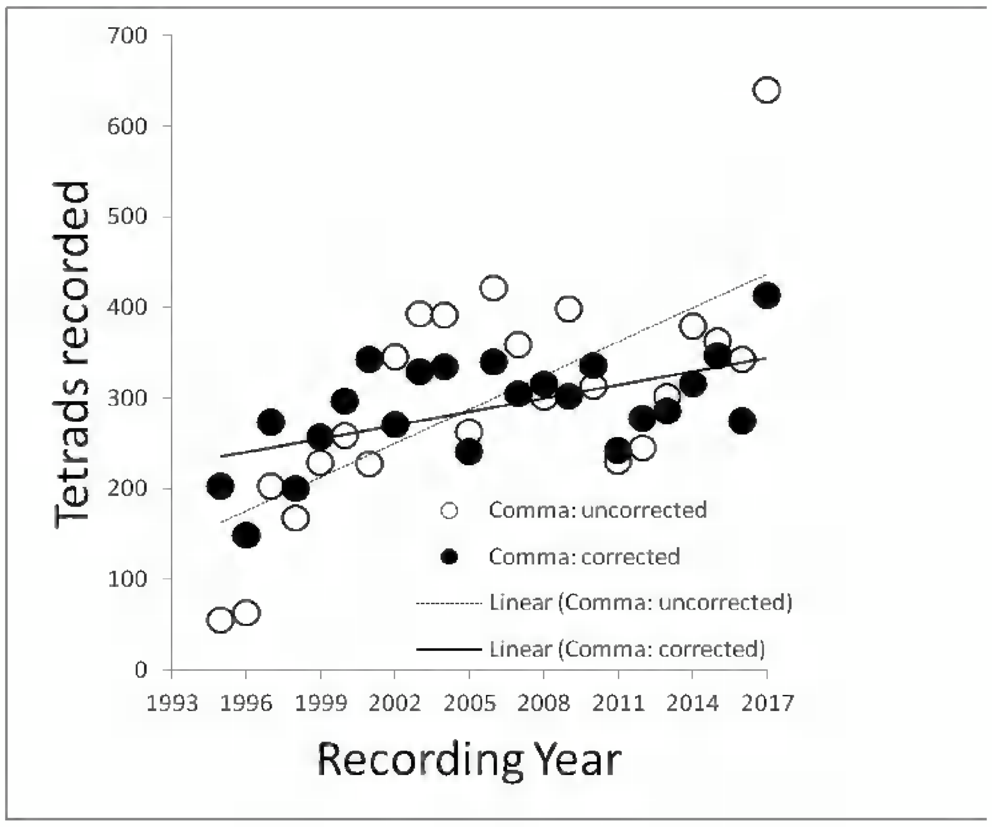

Figure 10. Number of tetrads in Yorkshire where Comma was seen as a function of recording year.

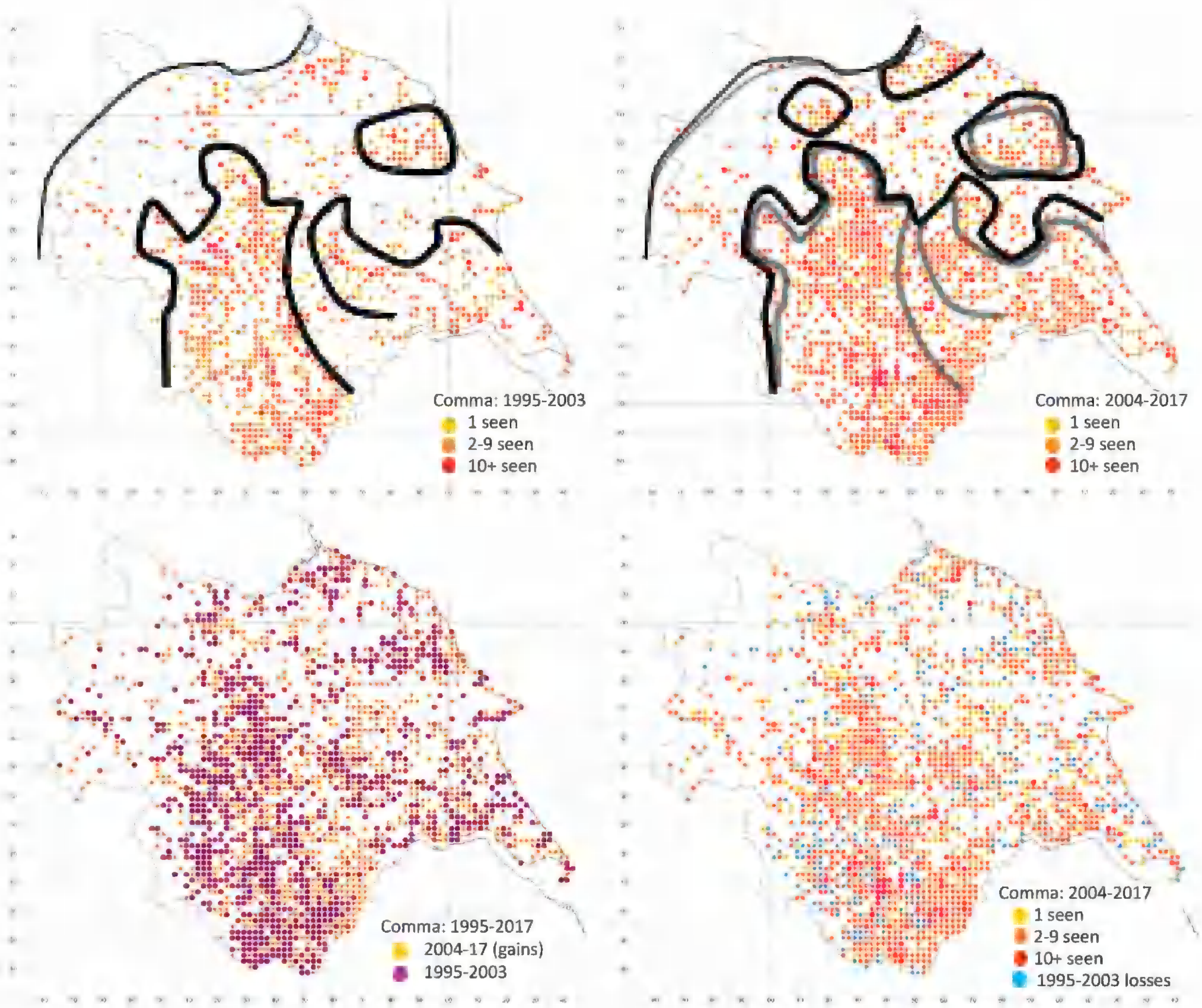

Figure 11. Tetrad distribution maps for Comma *Polygonia c-album.* Top-left: 1995-2003. The survey period reported in Frost (2005). Comma present in 998 of 3232 recorded tetrads (=30.8%). Top-right: 2004-2017. Comma present in 1927 of 3720 recorded tetrads (=51.8%). Comparison between 1995-2003 and 2004-2017 with gains (Bottom-left) and losses (Bottom-right). Please see Figure 2 for further details.

Holly Blue (Fig.16 p124). Figure 12 shows the tetrad distribution maps for Holly Blue for the 1995-2003 period (Frost, *loc. cit.*), for the period 2004-2017 and the comparison between the two periods. By 1995-2003 it was firmly established in VC63, up into 20km short of the northern borders of Yorkshire covering the Yorkshire Coalfield, Vale of York, the Humberhead Levels and most of VC61 except the Wolds (Figure 12: Top-left). Areas of partial colonisation included almost all of Yorkshire shy of the under-recorded farther reaches of VC65. By 2004-2017 (Figure 12: Top-right) there had been little change in distribution, with the exception of a strengthening in Middlesbrough in the Tees Lowlands (possibly arising from a *southwards* movement from colonies in Durham and Northumberland). Comparisons of the gains and losses in Holly Blue between the 1995-2003 and 2004-2017 periods show similar numbers and patterns across Yorkshire (Figure 12: Bottom-left and bottom-right respectively).

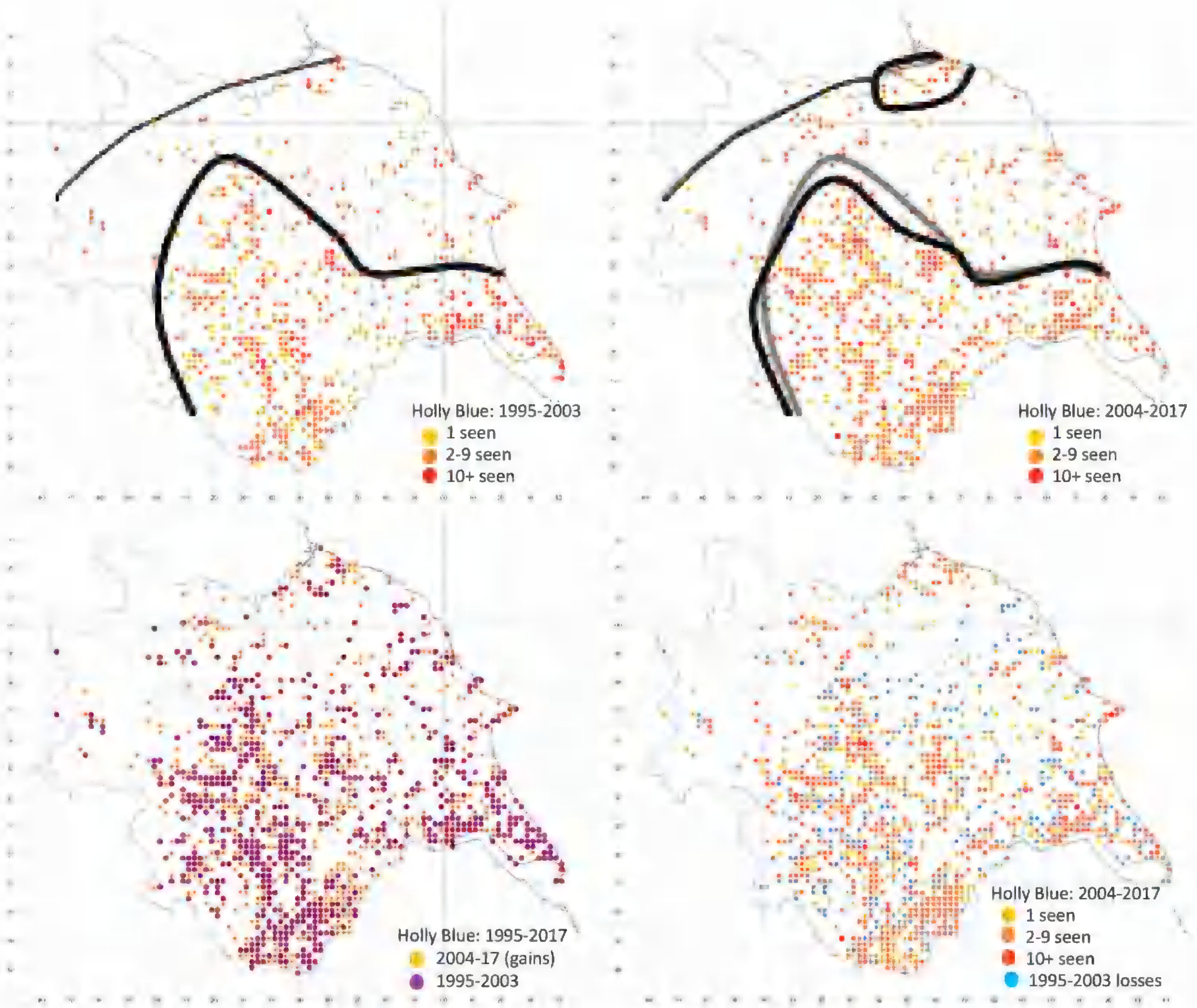

Figure 12. Tetrad distribution maps for Holly Blue *Celastrina argiolus*. Top-left: 1995-2003. The survey period reported in Frost (2005). Holly Blue present in 683 of 3232 recorded tetrads (=21.1%). Top-right: 2004-2017. Holly Blue present in 887 of 3720 recorded tetrads (=23.8%). Comparison between 1995-2003 and 2004-2017 with gains (Bottom-left) and losses (Bottom-right). Please see Figure 2 for further details.

Density maps for Holly Blue records for the survey periods 1995-2003 and 2004-2017 are shown in Figure 13. Again there is a good match in patterns between boundary lines drawn by eye (Figure 12) and the computer-generated density maps (Figure 13). The 1995-2003 density map shows strong presence of Holly Blue in the gardens of Hull and surrounding areas; by 2004-2017 Holly Blue has also strengthened in the midland town gardens. Increases in number of reports (as shown by number of white dots) acting as a proxy for abundance, show some increase between the two survey periods. The surface areas calculated were 11,150km^2 and 9,715km^2 for the *strong-90* and *weak-99* habitat regions respectively for Holly Blue in 1995-2003. For Holly Blue 2004-2017, the surface areas calculated were 10,650km^2 and 8,754km^2 for the *strong-90* and *weak-99* regions respectively. There has been some retraction in the distribution of Holly Blue as shown by drops both in *strong-90* and *weak-99* habitat surface areas.

Figure 14 plots the number of tetrads in Yorkshire where Holly Blue was seen as a function of recording year. The solid line is the best-fit linear regression where there has been a correction applied to the number of tetrads recorded from within a given year. Tetrads recorded (corrected) is not significantly related to recording year ($r(23) = 0.006$, 95% CI [-0.503, 0.517], $p = 0.980$). There has been no change (< 1%) in tetrad coverage between the two survey periods of 1995-2003 and 2004-2017.

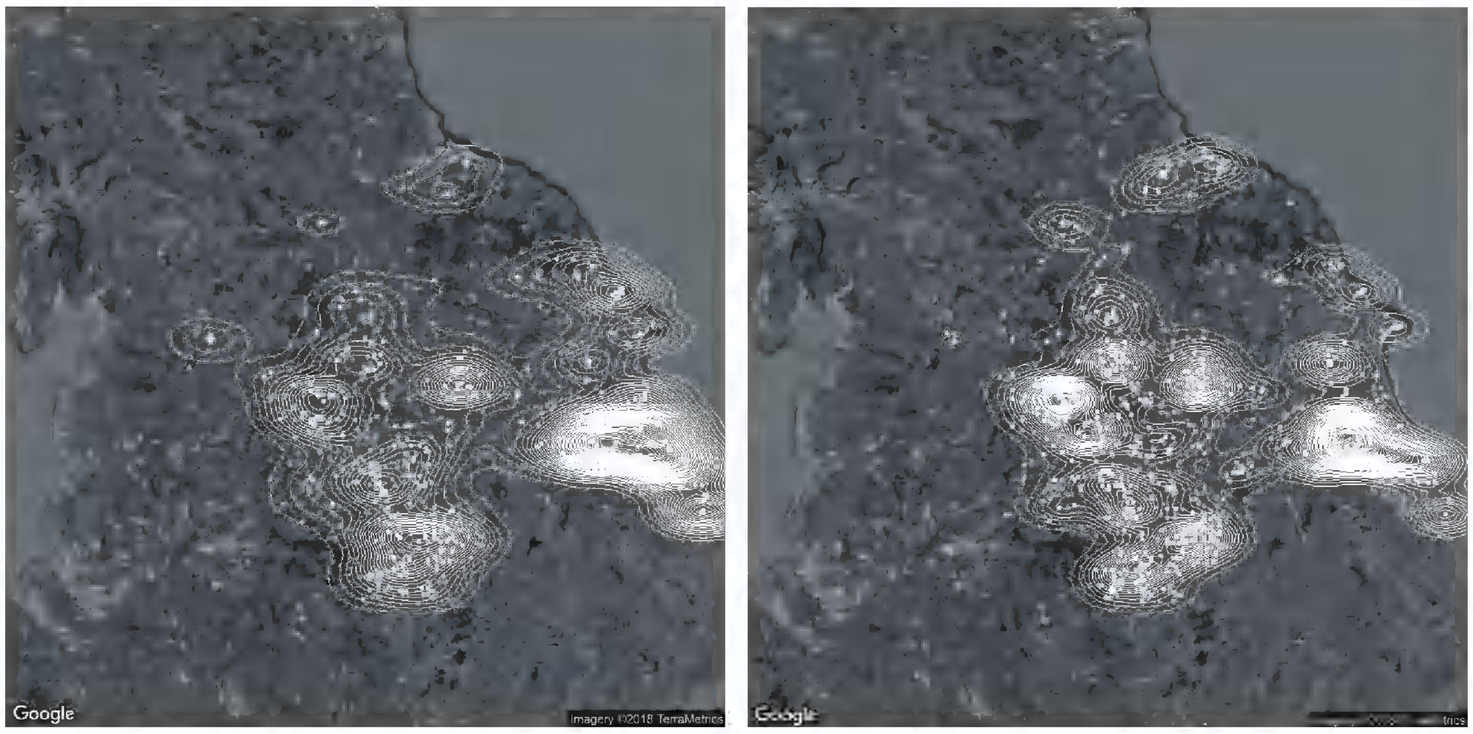

Figure 13. Holly Blue density maps overlaid over Yorkshire for the survey period 1995-2003 (left) and 2004-2017 (right). For explanation of maps please see Figure 3.

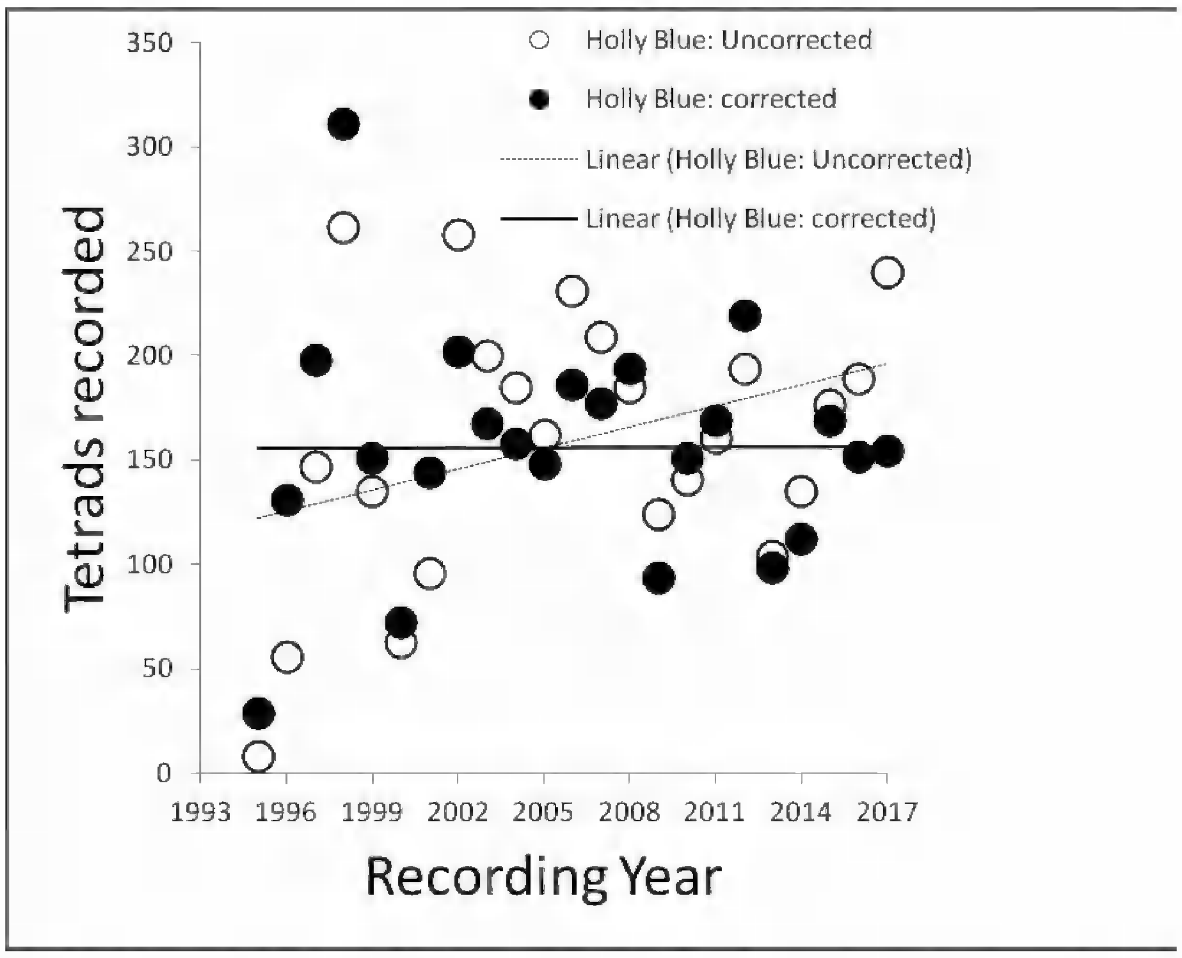

Figure 14. Number of tetrads in Yorkshire where Holly Blue was seen, as a function of recording year.

Essex Skipper (Fig.16 p124). Figure 15 shows the tetrad distribution maps for Essex Skipper for the 1995-2003 period (Frost, *loc. cit.*), for the period 2004-2017 and the comparison between the two periods. By 1995-2003 there were two minimal incursions from the south; a slim finger extending north-west for about 20km from Doncaster in VC63 where Essex Skipper was locally present and a colony at Spurn NNR (Figure 15: Top-left). By 2004-2017 (Figure 15: Top-right) the south-east border region of VC63 had been colonised (albeit at a low density) and the north banks of the Humber with high numbers recorded especially around Sunk Island in 2017 (by Sean Clough).

Most of the expansion of Essex Skipper appears to have occurred (or been noticed) since 2015 (Beaumont *et al.*, 2016, 2017, 2018). Essex Skipper was spotted in July 2015 north of Middlesbrough (in VC66) and recorders were asked to take extra pains to check Small Skippers *Thymelicus sylvestris* (Smith, 2015). We must remember that Essex Skipper is quite hard to distinguish from Small Skipper (differing principally in the colour of the underside-tip of the antennae) and is thus easily over-looked. Increased vigilance when recording butterflies did not turn up Essex Skipper in VC62 but did lead to the detection of spread from known sites in the southern parts of Yorkshire. The area of potential colonisation is flung out north-west from the known areas of strong presence, with a width of about 40km in the far west of VC63 narrowing down to just a few kms before meeting above Goole. There are very few losses and many gains indicating a period of current expansion for Essex Skippers albeit in small numbers (Figure 15: Bottom row).

Density maps for Essex Skipper records for the survey periods 1995-2003 and 2004-2017 are shown in Figure 17. The data for 1995-2003 failed to provide contour lines in the density map because there were too few reports for the algorithm to reliably enclose an area. Therefore, the *strong-90* and *weak-99* habitat regions could not be calculated. For Essex Skipper 2004-2017 there were more records, therefore the density maps were created and the surface areas calculated were 6,288km^2 and 8,433km^2 for the *strong-90* and *weak-99* regions respectively.

Figure 18 plots the number of tetrads in Yorkshire where Essex Skipper was seen as a function of recording year. The solid line is the best-fit linear regression where there has been a correction applied to the number of tetrads recorded from within a given year. Tetrads recorded (corrected) is significantly related to recording year ($r(23) = 0.689$, 95% CI [0.522, 0.840], $p < 0.001$). There has been a seven-fold increase in tetrad coverage between 1995-2003 and 2004-2017. However, it can be seen that there are two distinct phases of growth: negligible growth between 1995-2014, followed by a steep increase in recorded tetrads between 2015-17 (marked respectively 1 and 2 in Figure 18).

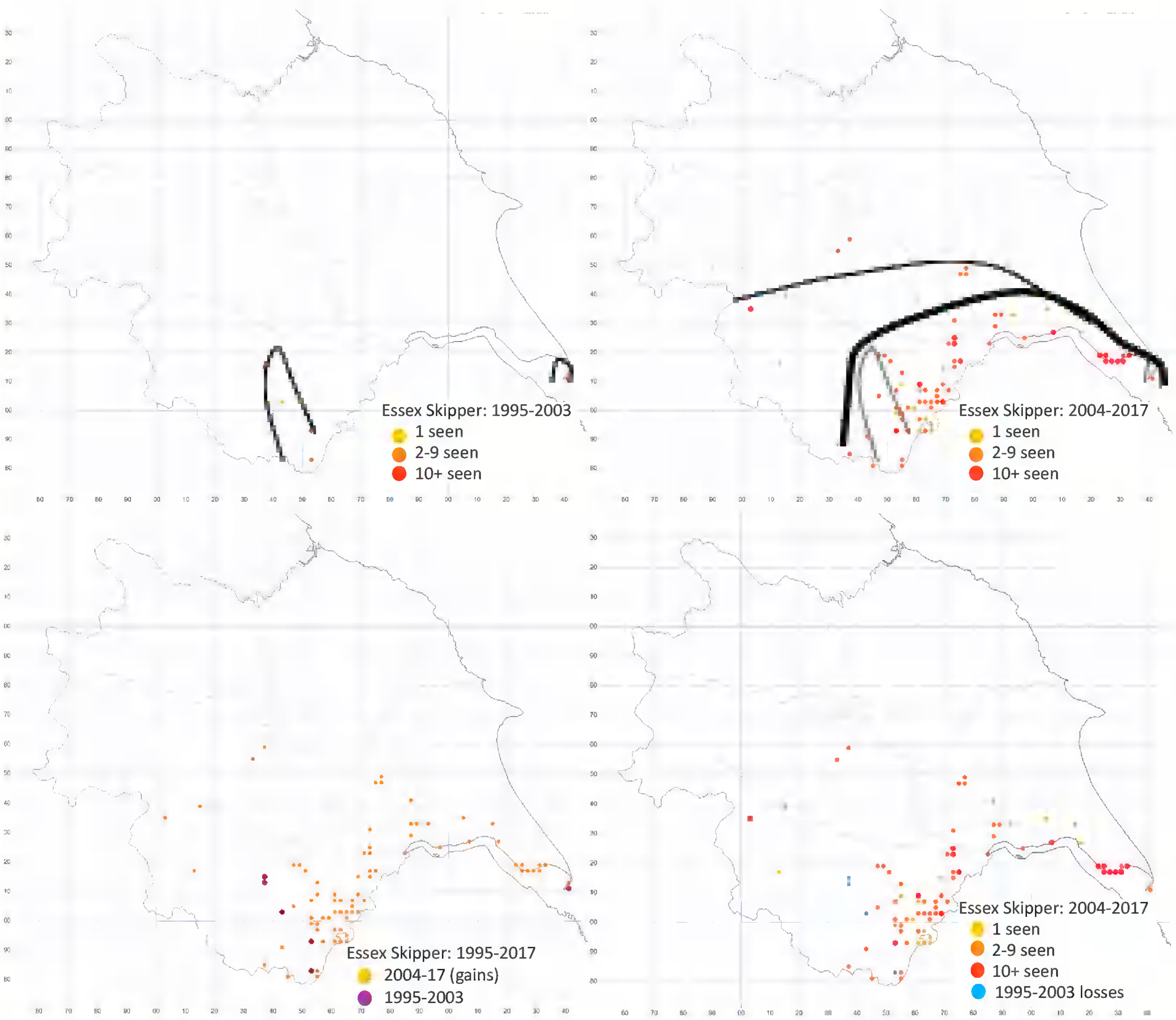

Figure 15. Tetrad distribution maps for Essex Skipper *Thymelicus lineola*. Top-left: 1995-2003. The survey period reported in Frost (2005). Essex Skipper present in 6 of 3232 recorded tetrads (=0.02%). Top-right: 2004-2017. Essex Skipper present in 76 of 3720 recorded tetrads (=2.0%). Comparison between 1995-2003 and 2004-2017 with gains (Bottom-left) and losses (Bottom-right). Please see Figure 2 for further details.

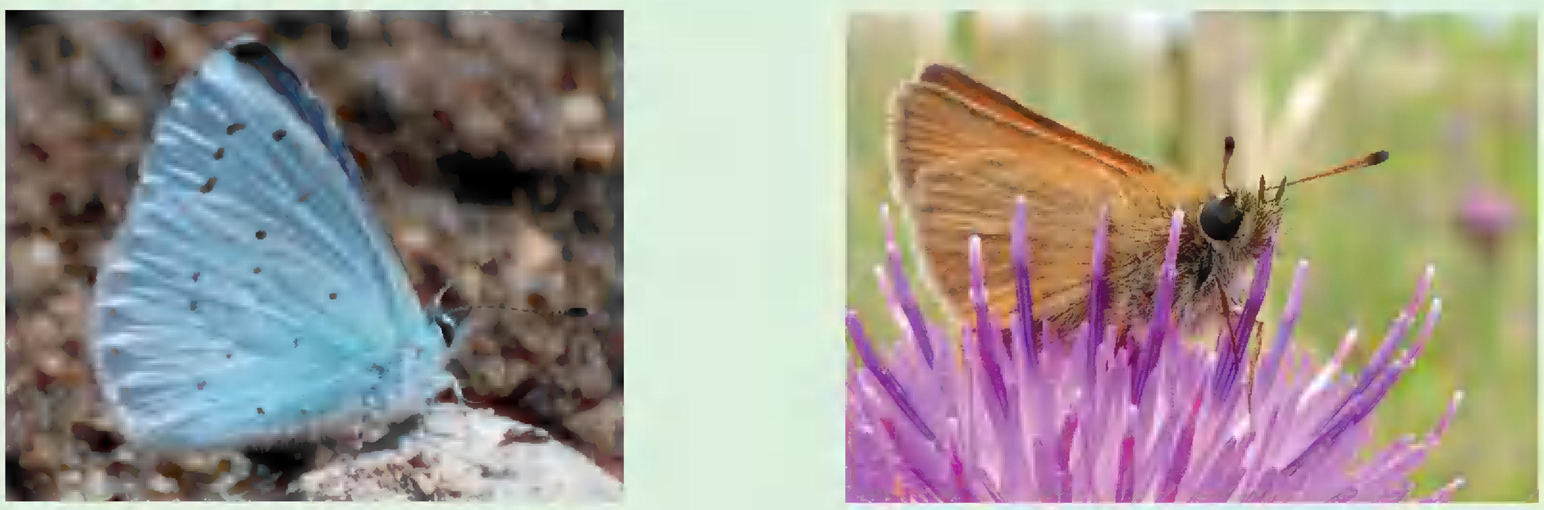

Figure 16. *Left*: Holly Blue *Celastrina argiolus.*
Right: Essex Skipper *Thymelicus lineola*. Note the black underside of the antenna tips which distinguishes it from Small Skipper *Thymelicus sylvestris*.

Figure 17. Essex Skipper density maps overlaid over Yorkshire for the survey period 1995-2003 (left) and 2004-2017 (right). For explanation of maps please see Figure 3.

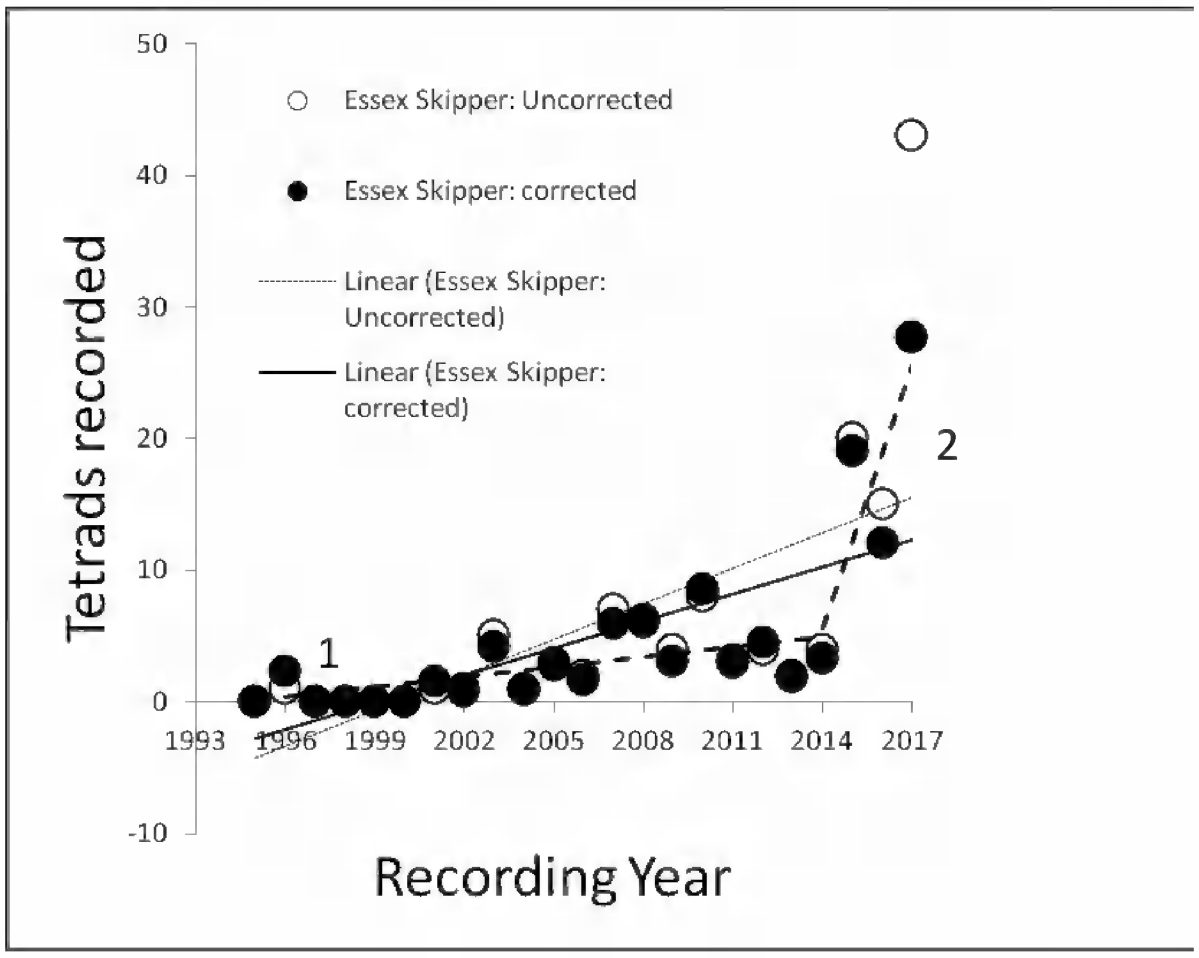

Figure 18. Number of tetrads in Yorkshire where Essex Skipper was seen, as a function of recording year. Two distinct phases can be discerned: negligible growth (1995-2014) and then rapid growth (2015-2017) marked respectively 1 and 2.

Discussion

The five recent lepidopteral colonisers identified in Frost (*loc. cit.*) have had a mixed recent history since Frost's 1995-2003 survey period. Speckled Wood has spread throughout most of Yorkshire and is only relatively limited now in the Vale of Pickering (VC61/62), the northern Wolds of VC61 and western VC64 (Figures 2-4). Gatekeeper has remained largely contained in its original strongholds, with some indication of partial colonisation (Figures 5,7,8). Comma has filled in and merged its two strongholds in the south and south-east of Yorkshire. It has also strengthened in VC62 and in the south-east of VC65 (Figures 9-11). Holly Blue shows no change in distribution since 1995-2003; the only wrinkle is a strengthening around Middlesbrough (Figures 12-14). Finally, Essex Skipper has only shown any expansion since about 2015 when it has spread further into VC63 and VC61 from toeholds established in 1995-2003 (Figures 15,17,18).

When butterflies contract or expand in range they do so dynamically in time; a good summer might see a sudden range expansion which is stalled by a poor summer. There are periods of consolidation when numbers build over a number of years within pre-existing regions of strong presence. Then there might be a burst of sudden expansion. Some butterflies are subject to periodic predator-prey cycles that cause large fluctuations in butterfly numbers; for instance, Holly Blue numbers cycle up and down every 4-6 years as the parasitic wasp *Listrodomus nycthemerus* periodically overwhelms the caterpillar population though this particular ichneumon has never been recorded in Yorkshire (W.A. Ely, pers. comm.). Looking at longer periods of time than a year blurs and essentially loses this information. However, it could be argued that using range distribution maps based on longer time periods (1995-2003 and 2004-2017) reveals medium range shifts that are more meaningful. For instance, a poor summer and a good summer cancel out; a run of good summers (or poor summers) might underpin sustained range expansion (or retrenchment). Time periods of around a decade are probably more digestible and understandable for us as humans to appreciate – that an area had no Speckled Wood once, and now it has a firmly established population, can take a decade to happen and that is something that registers with us.

The (spatial) analysis level of this report is also firmly regional. If the report had a finer level of granularity then the analysis might have captured those aspects of expansion and retraction in range that are driven by availability of host plants and suitable habitat (for instance, see Suggitt *et al*., 2011). This report adopts again a half-way house – a large enough scale to encompass general movement (such as the suggestion of north-west movement in most of the butterfly species in this report) but small enough to capture and notice intra-regional spread at the level of NCAs. It is also the case that the five butterfly species reviewed in this report are wider countryside butterflies so they will be less affected by issues of habitat suitability than if they were habitat specialists (such as Northern Brown Argus *Aricia artaxerxes*).

When the *Butterflies of Yorkshire* was published (Frost, *loc. cit.*), one might have been tempted to imagine that the northwards expansion of recent colonising butterflies would proceed unabated in the next two decades. This has not been the case – the story is a complicated nuanced one at the local level for Yorkshire – only Speckled Wood and, most recently, Essex Skipper – have spread prodigiously (and for Essex Skipper only in the last three years). When Frost was publishing there had been sustained increases in central England temperatures of 1.5^{o}C between 1976 and 1998 (Roy & Sparks, 2000) which presumably drove the northwards expansion of the lepidopteral colonisers at the very end of the millennium. However, between 1995 and 2014 there has been no discernible shift in mean spring, summer, autumn or winter temperatures in Yorkshire (Smith & Smith, 2014). The years 2015-2017 have included the warmest two years globally on record – nevertheless, even factoring these additional years into the temperature series between 1995 and 2017 reveals no significant shift in mean spring, summer, autumn or winter temperatures in Yorkshire [spring, $r(23) = -0.092$, 95% CI [-0.529, 0.343], $p = 0.678$ *NS*; summer, $r(23) = 0.005$, 95% CI [-0.411, 0.420], $p = 0.984$ *NS*; autumn, $r(23) = -0.171$, 95% CI [-0.535, 0.330], $p = 0.436$ *NS*; winter, $r(23) = 0.319$, 95% CI [-0.05, 0.719], $p = 0.138$ *NS*]. This is interesting as it suggests that further expansion was possibly attendant on sustained temperature increases at least for Gatekeeper, Comma and Holly Blue. The summers have been increasingly dull and overcast and this may also limit expansion – in this respect, it is not surprising that Speckled Wood, which is tolerant of shade, has been the greatest beneficiary of the last two decades.

Acknowledgements

I am grateful for the Butterfly Monitoring Scheme (UK BMS) and Butterfly Conservation and their volunteer recorders for the butterfly records from Yorkshire upon which this research is based. This article has benefitted from the helpful comments of a reviewer.

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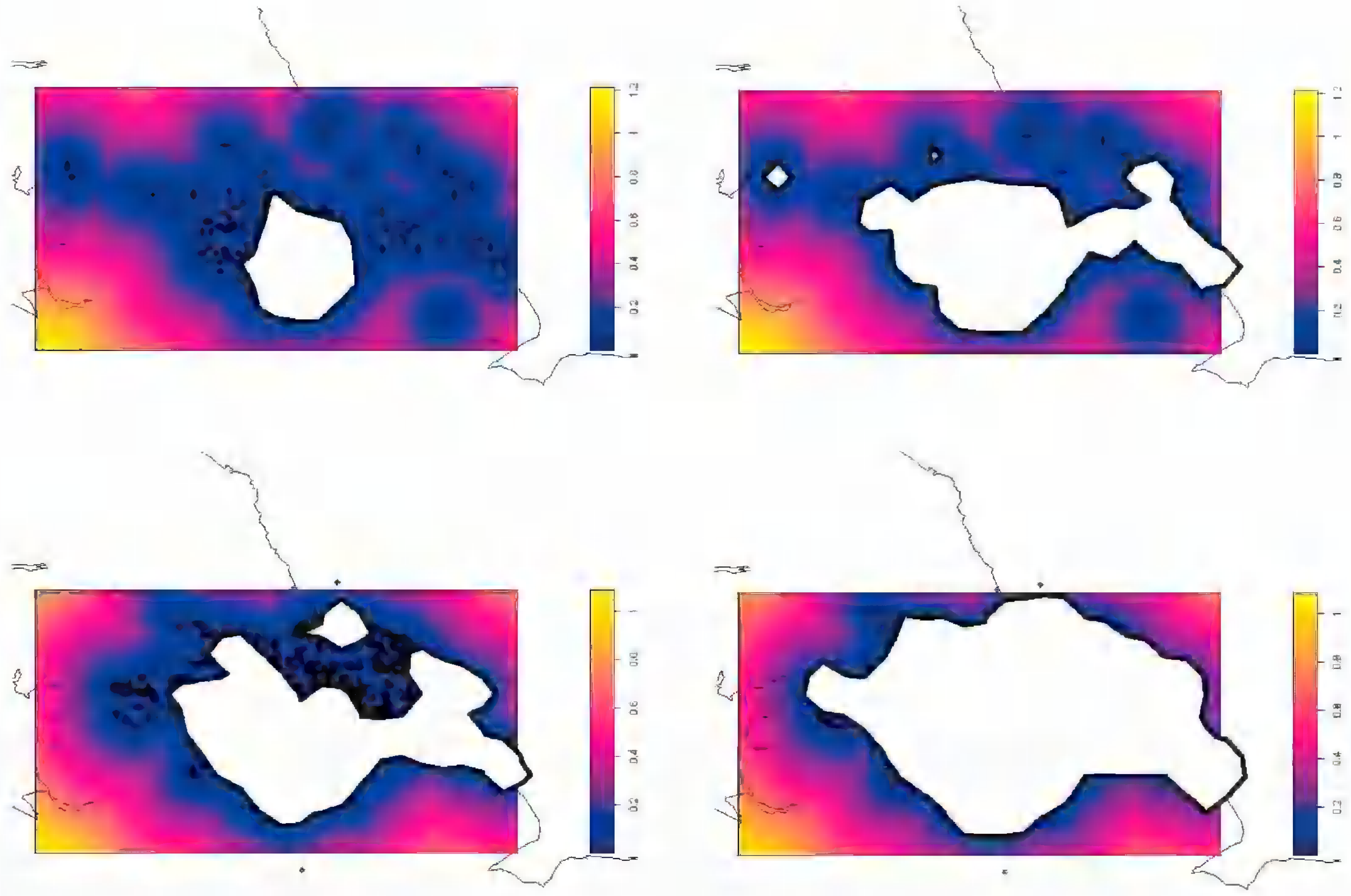
Appendices

Figure Appendix 1. Speckled Wood continuous heat maps overlaid over Yorkshire for the survey periods 1995-2003 (first row) and 2004-2017 (second row). Individual records of Speckled Wood are shown as black crosses, with multiple records being overlaid on top of each other (which will influence the heat map colouring). The heat maps are analogous to the density maps (see Figure 3) and represent the possibility of seeing a Speckled Wood in a location based both on the recorded presence and number of reports of that butterfly in that location plus the surrounding regions. Colour coding shows high density (blues) to low density (yellow). The bold black solid contour lines surrounding the filled-white regions bound an area defined as the *minimum* area in which there is a specified probability of encountering a butterfly.



The bounding contour line in the first column encloses an area within which there is a 90% probability of the butterfly being encountered – this is the 'strong' presence area denoted *strong-90*. The bounding contour line in the second column encloses an area within which there is a 99% probability of the butterfly being encountered – this is the 'weak' presence area denoted *weak-99*. Thus the top-left figure is *strong-90* presence in 1995-2003, top-right is *weak-99* presence in 1995-2003, bottom-left is *strong-90* presence in 2004-2017, and bottom-right is *weak-99* presence in 2004-2017.

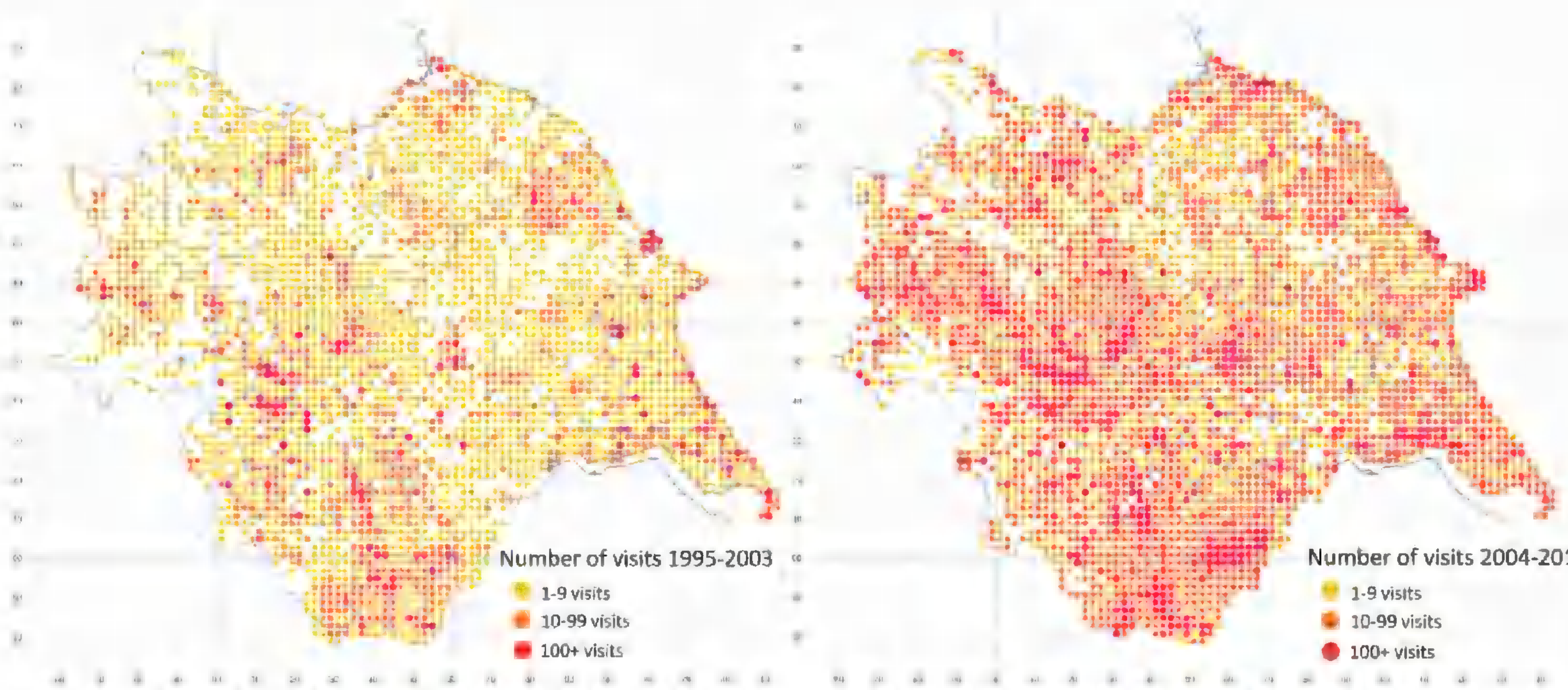


Figure Appendix 2. Levana maps showing recorder effort by number of visits to each tetrad.
Left: 1995-2003. Based on 158,931 records and 3224 tetrads visited (=78% of Yorkshire visited).
Right: 2004-2017. Based on 488,428 records and 3695 tetrads visited (=90% of Yorkshire visited).

Field Note: An opportunist fish list from the Holderness coast

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From late February to early March 2018 a weather system dubbed by the press as 'The Beast from the East' manifested itself on the Holderness coast with air temperatures down to -4°C and severe gale force (force 9) easterly winds of up to 54mph coinciding with tides in excess of 6 metres. The progress of the wind speeds, air temperatures, tide heights and precipitation monitored in nearby Bridlington from 24 February to 5 March 2018 can be seen in Figure 1. This savage onslaught produced a 'wreck' of marine life-forms scoured from the adjacent shallow sea bed and cast ashore along the Holderness coast. The main local focus of deposition was between Fraisthorpe and Barmston (TA1763; 1762; 1761) where substantial coastal erosion also took place. Elsewhere along the east coast similar effects were experienced in Norfolk and Kent.

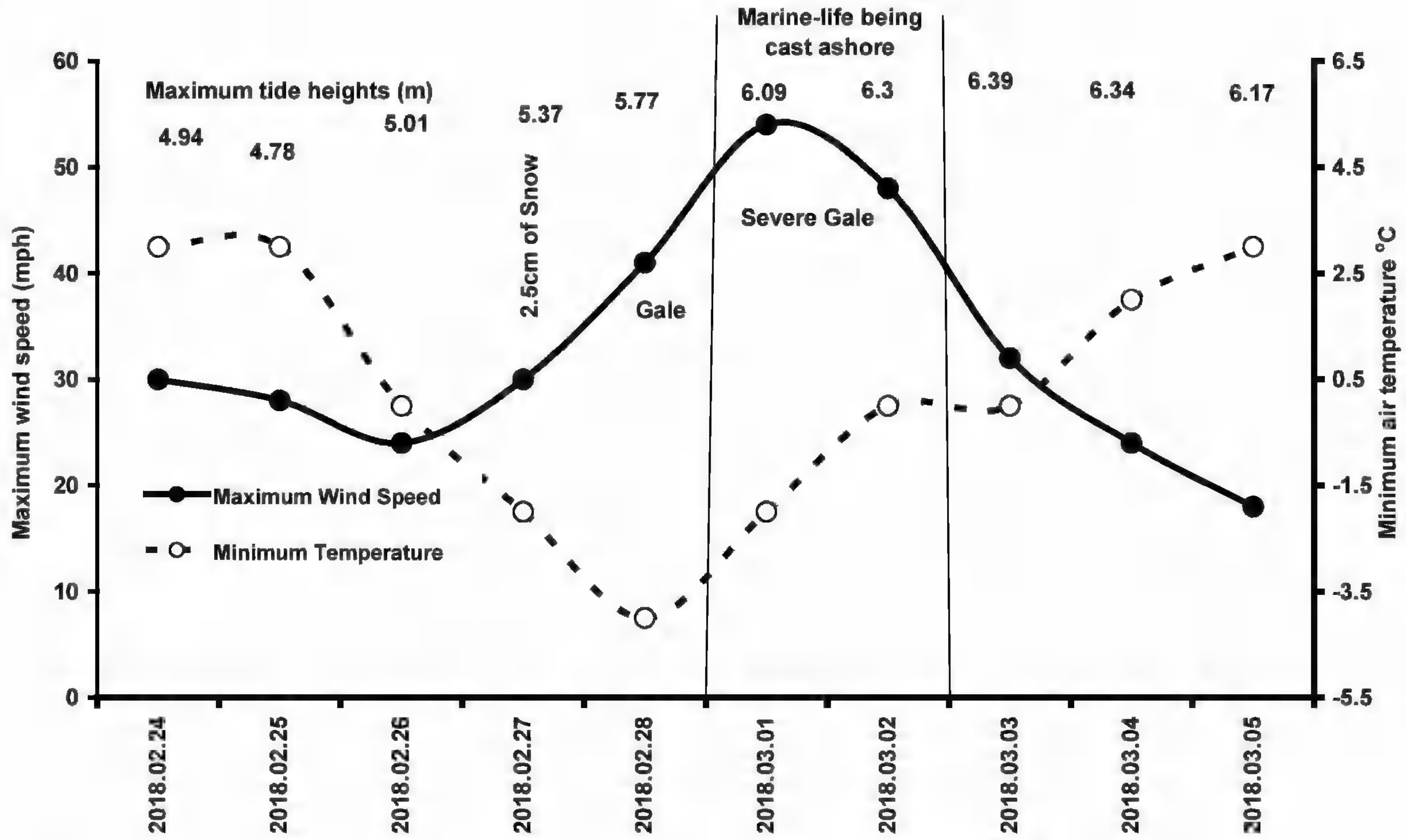

Figure 1. Maximum recorded wind speed (mph), minimum air temperature (°C), precipitation (cm) and tidal height (m) at Bridlington, based on data from www.timeanddate.com.weather/uk/bridlington.

Publicity of this remarkable event via digital, print and broadcast media attracted large numbers of visitors to witness the spectacle, to assist in salvaging any surviving creatures and to gather up the huge accumulations of plastic litter.

Images of the phenomenon feature on numerous websites, samples of which are listed below. These show ankle-deep drifts of marine algae (including Serrated Wrack *Fucus serratus* and Kelp *Laminaria* spp.), bryozoa (including *Flustra* sp.), molluscs (largely Mussels *Mytilus edulis* and *Modiolus modiolus*, Razor shells *Ensis* sp. and Whelks *Buccinum undatum* with occasional Lesser Octopus *Eledone cirrosa*), crustaceans (largely Lobster *Homarus gammarus* and Velvet Swimming crab *Necora puber* but including Edible crab *Cancer pagurus*) and echinoderms (mainly Common Starfish *Asterias rubens* with occasional Sunstars *Crossaster papposus* and Sea Urchins *Echinus esculentus*).

Vertebrates cast ashore included a Harbour Porpoise *Phocoena phocoena*, Grey Seals *Halichoerus grypus* and Guillemots *Uria aalge* but the wreck also included fish species, photographs of which appeared in a number of websites and blogs (see below). Using Wheeler (1978) as a guide to identification, the following list has been compiled from my own field observations and from some of the aforementioned published photographs. Sources are indicated as follows: * personal observation; + photographs posted on the internet; # listed in the press or radio broadcasts.
† New Vice-county 61 record.

Scyliorhinidae (Dogfishes)
*+Small-spotted catshark *Scyliorhinus canicula* (L. 1758)

Rajidae (Rays and Skates)
*Cuckoo Ray *Leucoraja naevus* Muller & Henle, 1841 †.
+Starry Ray *Amblyraja radiata* Donovan, 1808 †.
#Thornback Ray *Raja clavata* L. 1758 †.

Anguillidae (Eels)
+Eel *Anguilla anguilla* L. 1758
+Conger Eel *Conger conger* L. 1758 †.

Gadidae (Cod Fishes)
#Cod *Gadus morhua* L. 1758 †.
#Ling *Molva molva* L. 1758 †.
+Three-bearded Rockling *Gaidropsarus vulgaris* Colquet, 1824 †.

Cottidae (Bullheads)
* Bull Rout *Myoxocephalus scorpius* (L. 1758) †.
*+Sea Scorpion *Taurulus bubalis* Euphrasen, 1786 †.

Cyclopteridae (Lumpsuckers and Sea-snails)
*+Lump Sucker *Cyclopterus lumpus* L. 1758 †.
*Sea-snail *Liparis liparis* (L. 1766) †.

Labridae (Wrasses)
*+Ballan Wrasse *Labrus bergylta* Ascanius, 1758 "... in Northern Europe suffers in very severe winters when many may be killed" (Wheeler 1978) †.
*+Goldsinny *Ctenolabrus rupestris* (L. 1758) †. Clarke (1944) was only aware of one Yorkshire occurrence, being a recently consumed specimen he had removed from the stomach of a Cod he caught off the pier at Scarborough on 20 November 1933.

Trachinidae (Weevers)
+Lesser Weever *Echiichthys vipera* Cuvier, 1829 †.

Ammodytidae (Sandeels)
#+Lesser Sand Eel *Ammodytes tobianus* L. 1758 †.

Scophthalmidae (Left-eyed Flatfish)
+Turbot *Scophthalmus maximus* L. 1758 †.

Pleuronectidae (Right-eyed Flatfish)
*+Plaice *Pleuronectes platessa* L. 1758.
+Flounder *Platichthys fleus* L. 1738 †.

Soleidae (Soles)
#Sole *Solea solea* Quensel, 1806 †.

Fig.1 Images of some of the stranded fish. Left: Small-spotted Catshark, *Scyliorhinus canicula*. Right: Unknown Wrasse. Photos: *Rob Spray*.

Although these 21 fish represent a rich 'bio-blitz' sample for this limited section of shoreline, the list is far from comprehensive as demonstrated by sea angling records periodically featured in popular sport angling magazines. With relatively few published reviews of fish fauna specifically referring to the Holderness coast (see Yorkshire Marine Fish checklist on the YNU Website) most of the fish in this Fraisthorpe list represent new VC61 records.

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Field note: Fir Tamarisk-moss at Ledsham Bank Nature Reserve

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Fir Tamarisk-moss *Abietinella abietina* var. *abietina* is a Nationally Scarce pleurocarpus moss (Pescott, 2016) and has only previously been recorded from a handful of Yorkshire sites. This moss was discovered by the author at Ledsham Bank Yorkshire Wildlife Trust (YWT) Nature Reserve in 2017 and is the first time it has been recorded from the site. Ledsham Bank is on the Magnesian Limestone east of Leeds and forms part of the Madbanks and Ledsham Banks SSSI. Since 2000 there is one other Yorkshire record of this moss, at Burton Leonard Lime Quarries Nature Reserve (another YWT site).

The population of Fir Tamarisk-moss at Ledsham Bank covers a 25m section of low bank between SE45982994 and SE45982966. The bank is over 50m long with a height of around 1m and a width of 1-2m and runs north-south, with the southern end at higher elevation. Close-cropped turf is present only in the southern section and Fir Tamarisk-moss is present only in this area. It is a conspicuous part of the sward of the bank in winter. A series of five 75x50cm quadrats recorded in November 2017 showed the average cover of Fir Tamarisk-moss in the sward to be c.10%. The reserve is grazed over winter and the bank is directly adjacent to the main footpath along the higher part of the reserve, which appears to encourage grazing.

Figure 1. Fir Tamarisk-moss growing on the bank at Ledsham Bank.
Photo: *Steven Heathcote*.

Fir Tamarisk-moss is a calcicole and typically requires close-cropped turf as it is a poor competitor with vascular plants. Throughout its range it is often associated with ancient earthworks because, where grazed, they provide the shallow soil that restricts competition (Porley & Hodgetts, 2010). Small eroded sections at Ledsham Bank show that a layer of stones is present in the soil at shallow depths. The mean pH of the top few centimetres of soil (the layer in which the moss grows) is 6.5, reflecting the typical nutrient depletion in the top layers of calcareous soils. These conditions support a vascular plant community with a high cover of calicolous forbs including Common Rock-rose *Helianthemum nummularium* and Salad Burnet *Sanguisorba minor* ssp. *minor*. Further north along the bank the coarse grasses Tor-grass *Brachypodium pinnatum* and Upright Brome *Bromopsis erecta* are dominant, and their dense cover excludes bryophytes. The current reserve management, with mixed winter grazing, sustains the short-cropped turf on the bank that allows Fir Tamarisk-moss to thrive.

A number of other notable calicolous bryophytes are present on the bank including Montagne's Cylinder-moss *Entodon concinnus* and Swan-necked Earth-moss *Microbryum curvicole*. Fir Tamarisk-moss is absent from other areas of short-cropped turf at Ledsham Bank. In these areas Comb-moss *Ctenidium molluscum* and Pointed Spear-moss *Calliergonella cuspidata* are the most prominent species.

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I would like to thank the Yorkshire Wildlife Trust for permission to record at the site and to submit this article.

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Connections – insects and plants

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For the past few years, since retiring from the YNU Executive in 2011, I have been involved with Nature Conservation Assessments for the National Trust both in Dorset where I live and occasionally in Yorkshire where I spent my working life.

A conundrum occurred whilst surveying Hudswell Wood, Richmond, in 2013-14. In Billy Bank Wood there is an extensive stand of Mountain Currant *Ribes alpinum.* The *New Atlas of the British Flora* (Preston et al., 2002) suggests that the plant is native in 26 x 10km squares, mainly on the Carboniferous Limestone but also on the Magnesian Limestone as in Richmond (NZ1601, NZ1701). Mountain Currant is often infected by a gall aphid *Cryptomyzus korschelti.* The gall was not present in Billy Bank Wood although present against outcrops of Magnesian Limestone at the other three places I know where Mountain Currant grows. It is facing south at Easby, Richmond NZ1701, east at Fountains Abbey SE2768 and at Roche Abbey SK5489 whereas in Billy Bank Wood it is north-facing. Chinery (2011) reports that the aphid *C. ribis* occurs mainly on Red and cultivated White Currants *Ribes rubrum*. The blisters become reddish with the aphids accumulating on the undersides. Mature aphids leave the galls and fly to Hedge Woundwort *Stachys sylvatica* where they produce more generations. In the autumn, the aphids return to the Currant bushes and lay their overwintering eggs on the twigs. An interesting conundrum for entomologists surveying in Yorkshire where Mountain Currant grows is to see where the Mountain Currant gall aphids spend their summers.

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Yorkshire Ichneumons: Part 8 - additions and compilations by date

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Introduction

Yorkshire statuses are taken from the chart shown on the YNU website.
www.ynu.org.uk/insects/parasitic_wasps

† = new county record

* = new vice-county record

Subfamily **PIMPLINAE**

Addition to Ely (2013):

Tribe ***Ephialtini***

Liotryphon crassisetus (Thomson, 1877). Rare in Yorkshire.

*VC62: Haxby 24.9.2017 T.J.Crawford.

Acrodactyla carinator (Aubert, 1965). Rare in Yorkshire.

*VC61: Village Lake, North Cave Wetlands YWT NR 1.8.2015 R.Crossley.

The YNU records of Pimplinae have been compiled as follows:

Decade	Species	Records	Records/ Species	Collectors
1860-1869	4	4	1	2
1870-1879	3	6	2	2
1880-1889	9	11	1.2	5
1890-1899	2	2	1	2
1900-1909	9	13	1.5	3
1910-1919	17	38	2.25	8
1920-1929	20	98	5	7
1930-1939	22	137	6.2	14
1940-1949	30	217	7.2	7
1950-1959	27	93	1.5	7
1960-1969	7	15	2.1	4
1970-1979	27	112	4.15	20
1980-1989	50	505	10.1	41
1990-1999	38	108	3.1	19
2000-2009	60	580	9.7	23
2010-2019	64	704	10.9	46

Note: The compilations listed here are based on the total YNU ichneumon database. Most 19th century records are drawn from published works and the number of records is not much greater than the number of species. Presumably there was little incentive to publish records of insects which had already been recorded from Yorkshire. During the 20th century many specimens were deposited in museums, so the number of records grew faster than the number of species and the number of both whose determination can now be checked rose dramatically. The last 40 years has seen a growth of records lodged in databases and a consequent increase in records per species. Apart from occasional flurries of interest the number of individual collectors has been tiny until the last few decades. Their achievements, though, have been significant, as the 1920s results demonstrate; many of these are due to the work of two collectors, William John Fordham and John Wood. The death of Douglas Hincks in 1960 was keenly felt by Yorkshire entomologists and the ichneumon records took a decade to get back on track. The 1960s gap was largely filled by Dr Peter Skidmore's collecting before the new band of entomologists kicked in. The current crop of collectors is outperfoming those of all previous decades, although there are still many undetermined specimens in museums not yet taken into account.

Subfamily **POEMINIINAE**

Addition to Ely (2014a):

Deuteroxorides elevator (Panzer, 1799). Scarce in Yorkshire.

*VC65: Freeholders' Wood, Aysgarth 11.6.2017 C.H.Fletcher.

The YNU records of Poeminiinae have been compiled as follows:

Decade	Species	Records	Records/ Species	Collectors
1980-1989	1	1	1	1
1990-1999	1	1	1	1
2000-2009	4	58	14.5	1
2010-2019	2	3	1.5	3

Subfamily **TRYPHONINAE**

Additions to Ely (2015a):

Tribe ***Phytodietini***

Netelia (Bessobates) pallescens (Schmiedeknecht, 1910). Rare in Yorkshire.

*VC62: Pexton Bank 7.6.2017 T.J.Crawford, P.J.Mayhew.

Tribe ***Tryphonini***

Grypocentrus albipes Ruthe, 1855. Rare in Yorkshire.

*VC61: Cali Heath YWT NR 16.8.2015 R.Crossley.

Tribe ***Exenterini***

Eridolius alacer (Gravenhorst, 1829). Rare in Yorkshire.

*VC62: Haxby 12.11.2016 T.J.Crawford.

The YNU records of Tryphoninae have been compiled as follows:

Decade	Species	Records	Records/ Species	Collectors
1860-1869	3	4	1.3	2
1870-1879	2	2	1	1
1880-1889	10	11	1.1	2
1890-1899	4	5	1.25	4
1900-1909	12	21	1.75	6
1910-1919	23	50	2.2	11
1920-1929	32	94	3	6
1930-1939	25	40	1.6	6
1940-1949	34	65	1.9	6
1950-1959	21	39	1.9	6
1960-1969	9	24	2.7	7
1970-1979	35	122	3.5	23
1980-1989	59	445	7.6	38
1990-1999	35	89	2.5	11
2000-2009	50	149	3	12
2010-2019	73	792	10.6	40

Subfamily **CRYPTINAE**

Tribe ***Gelini***

Addition to Ely (2015b):

Subtribe ***Acrolytina***

Encrateola laevigata (Ratzeburg, 1848). Frequent in Yorkshire.

*VC65 Marne Barracks 22.10.2016 ex *Phyllonorycter tristrigella* C.H.Fletcher.

Addition to Ely (2016):

Subtribe ***Phygadeuontina***

Gnotus macrurus (Thomson,1884). Rare in Yorkshire.

*VC64: Hollins Hill, Baildon 9.10.2015 H.N.Whiteley.

Addition to Ely (2017):

Tribe ***Cryptini***

Listrognathus obnoxius (Gravenhorst, 1829). Rare in Yorkshire.

*VC62: landslip, South Bay, Scarborough 3.6.2011 D.Whiteley.

Cryptus titubator (Thunberg, 1824). Scarce in Yorkshire.

*VC65: Nosterfield NR reedbed 13.7.2017 S.Warwick, P.W.& S.Flint.

The YNU records of Cryptinae have been compiled as follows:

Decade	Species	Records	Records/ Species	Collectors
1830-1839	3	3	1	1
1850-1859	1	1	1	1
1860-1869	16	16	1	1
1870-1879	1	1	1	1
1880-1889	15	16	1.1	3
1890-1899	8	8	1	4
1900-1909	18	22	1.2	7
1910-1919	44	70	1.6	10
1920-1929	46	82	1.8	4
1930-1939	58	121	2.1	8
1940-1949	83	256	3.1	5
1950-1959	49	89	1.8	9
1960-1969	8	11	1.4	4
1970-1979	55	139	2.8	21
1980-1989	113	676	6	30
1990-1999	64	201	3.2	24
2000-2009	101	517	5.15	9
2010-2019	148	1361	9.1	52

Subfamily **BANCHINAE**

Tribe Glyptini

Addition to Ely (2018):

Glypta (Glypta) pictipes Taschenberg, 1863. Rare in Yorkshire.

*VC65: Nosterfield NR reedbed 13.7.2017 S.Warwick, P.W.& S.Flint.

Glypta (Glypta) vulnerator Gravenhorst, 1829. Scarce in Yorkshire.

*VC65: Nosterfield NR reedbed 13.7.2017 S.Warwick, P.W.& S.Flint.

The YNU records of Banchinae have been compiled as follows:

Decade	Species	Records	Records/ Species	Collectors
1870-1879	1	1	1	1
1880-1889	9	9	1	2
1890-1899	10	15	1.5	8
1900-1909	12	19	1.6	7
1910-1919	15	39	2.6	11

1920-1929	19	52	2.7	5
1930-1939	28	103	3.6	8
1940-1949	33	141	4.3	7
1950-1959	28	89	3.2	9
1960-1969	10	11	1.1	7
1970-1979	43	94	2.2	17
1980-1989	49	287	5.9	22
1990-1999	27	87	3,2	16
2000-2009	25	75	3	10
2010-2019	47	438	9.4	37

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YNU Entomological Section Recorders' reports for 2017

presented at the meeting in Wilberfoss on Saturday, 3rd March, 2018

W. A. Ely 9 Clifton Lane, Rotherham, South Yorkshire S65 2AA

The Spring meeting is traditionally the one at which the Entomological Section's Recorders report to the members on the information which has been gathered during the previous year. The disruptive snowfall of the week before this meeting resulted in fewer members than usual attending and fewer reports being presented.

The **Lepidoptera** reports presented by Charles Fletcher and Harry Beaumont will be published in the joint YNU/Butterfly Conservation (Yorkshire) issue of *Argus.*

Dr Michael Archer presented the report on the **aculeate Hymenoptera** of Watsonian Yorkshire. He thanked fifteen people for submitting records, including from emails, iRecord and Facebook, and specimens for identification/confirmation: Ian Andrews (*Cerceris rybyensis* and *Philanthus triangulum* from North Ferriby), Robin Arundale, Gavin Boyd (*Coelioxys rufescens* in his Dalton garden), Janet Capel, Roy Crossley, Bill Ely (*Pemphredon morio* at Langold Holt and *Agenioideus cinctellus* at Fence, South Yorkshire), Charles Fletcher, Andrew Grayson (*Coelioxys rufescens* and *Nomada fulvicornis* at Three Hagges Wood), Joanne Hood (*Melecta albifrons* at South Landing), Gordon Jackson, Paul Leyland (*Cerceris rybyensis* at Fairburn), Jim Middleton, Tracey Money (*Andrena thoracica* at Robin Hood's Bay and Boggle Hole), Pip Seccombe (*Philanthus triangulum* at Hatfield Common), Julian Small (*Gorytes laticinctus* at Acomb, York, which is **new to Yorkshire**, *Myrmica sabuleti* at Wheldrake and *M. sulcinodis* at Glaisdale High Moor) while

Michael had *Philanthus triangulum* at Blaxton Common and *Bombus jonellus* at Allerthorpe Common.

Michael had published *Gains and losses of species abundances of bees of Watsonian Yorkshire* in *The Naturalist* 142: 41-48. He had led bee walks at Three Hagges Wood, Escrick Park, and Bishopthorpe Cycle Path as part of his role on the advisory committee for York Buzz. The number of records added to the YNU's aculeate Hymenoptera database during the past year are: 2 DEBs (Dryinids, Embolemidae and Bethylidae), 65 wasps and ants and 234 bees, giving a total of 36,061. Records have been copied to NEYEDC and BWARS. The relevant archives are held in twelve box files.

Bill Ely reported that he had replaced the list of **Yorkshire ichneumons** on the YNU website at the beginning of February and the webmaster kindly uploaded it. About 30 species have been added to the list of confirmed Yorkshire ichneumons over the past year, some of them confirmations of previously recorded ones and others completely new. There are now 1128 confirmed species plus 162 which have not yet been confirmed.

During 2017 records of parasitica were received from Julian Small, a new experience! Records, principally of wasp galls, arrived via iRecord, several from VC61 from Richard Shillaker. There were many specimens from naturalists around Yorkshire, including Gavin Boyd, Jerry Brown, Terry Crawford, Roy Crossley, Bill Dolling, Graham Featherstone, Charles Fletcher, Andrew Grayson, Ray Holden, Peter Kendall, Paul Leonard, Jim Morgan, Mike Smethurst, Jill Warwick, Terry Whitaker, Derek Whiteley and Harry Whiteley and photographs from Brian Best. He was grateful to each one for helping to improve our knowledge of Yorkshire's Parasitic Hymenoptera, though he admitted that he had not managed to identify many 2017 specimens yet, although he had almost finished with those from 2015!

He reported at the AGM in November that a new species was described from a Yorkshire specimen 110 years after it was collected. Additions to the Yorkshire ichneumon list since then have included two insects **new to Britain**, both Cryptinae. The German ichneumonologist Klaus Horstmann published a key to *Charitopes* in 1998 and *Charitopes leucobasis* Townes, 1983 was collected by Harry Whiteley in water traps placed in his garden at Baildon, Bradford in August 2015. Bill collected one in the Ribble Valley a month later and both specimens were sent to Martin Schwarz in Vienna. He has retained the Baildon specimen and the Ribble Valley one has been deposited in NHM.

Martin Schwarz circulated a draft key to the genus *Orthizema* recently. This genus has a more elongate propodeum than most ichneumons and it is granulate rather than smooth. An ichneumon collected at Thorne Moors in October 2015 ran to Martin's "species 3" and he has confirmed this determination. Martin published the description this January and named it *Orthizema gracilicornutum* based on specimens from Germany, Austria and Bulgaria. The Thorne specimen has also been deposited in NHM.

One pimpline is **new to Yorkshire**: *Tromatobia variabilis* (Holmgren, 1856), collected at Strensall Military Training Area in 2015 by Roy Crossley. Two tryphonines are **new to the county list**: *Polyblastus* (*Polyblastus*) *cancer* (Hartig, 1837) from North Cave Wetlands YWT NR in August 2015, also by Roy, and *Eclytus difficilis* Kasparyan, 1977, collected in his Baildon water traps by Harry Whiteley in October 2016. For a long time it was thought that there was only one species of *Eclytus* with open areolets in the forewings but in 1977 the Russian ichneumologist Dmitri Kasparyan described 18 new species from Europe, northern Asia and North America. Identification is primarily based on the shape of their eggs, and Harry's specimen is the first female Bill had come across. He dampened the abdomen, tore the membrane between the tergites and sternites and fished around inside until he found a scrap of tissue which turned out to be a batch of 10-12 eggs. They are ovoid and each has a 'neck' at one end which has a dilation/anchor at the apex; the egg attaches to the base of the ovopisitor with this 'anchor' at one side and the egg on the other with the 'neck' held between the valves. The position of the neck and its length and thickness are the characteristics used for determination. One Adelognathine is **new to Yorkshire**: *Adelognathus thomsoni* Schmiedeknecht, 1911, collected at Hickleton in June 1977 by Peter Skidmore, which was found as an undetermined specimen in the Doncaster Museum & Art Gallery collection last year. There are another two dozen additions, some of which are included in the report on p135.

Stuart Foster submitted the report on the Hemiptera, Neuroptera & Odonata. Among the Hemiptera Heteroptera he reported on two flower bugs (family Anthocoridae). The small brown *Buchananiella continua* (White, 1880), first recorded in Yorkshire from VC61 in 2001, had three new sites in VC63, bringing the total sites to 11. It occurs on twiggy shrubs and in litter. The small reddish *Cardiastethus fasciiventris* (Garbiglietti, 1869) (Fig.1) is **new to Yorkshire**. It was found on willows at Stork Hill Wood near Beverley by Bill Dolling on 21 July 2017. The Auchenorrhyncha included three leafhoppers: *Eupteryx decemnotata* Rey, 1891 (Fig. 1), which is associated with Sage and *Verbena*. The third Yorkshire record, from VC63, was collected in a Malaise trap by Bob Marsh on 12 July 2017. *Lindbergina aurovittata* Dlabola, 1958, associated with brambles and oaks; the fourth Yorkshire record is from a house window in VC63 by Stuart Foster on 19 October 2017. The third Yorkshire record of *Opsius stactogalus* Fieber, 1866 (Fig. 1) was at Market Weighton (by Bill Dolling on 3 October 2017) on Tamarisk.

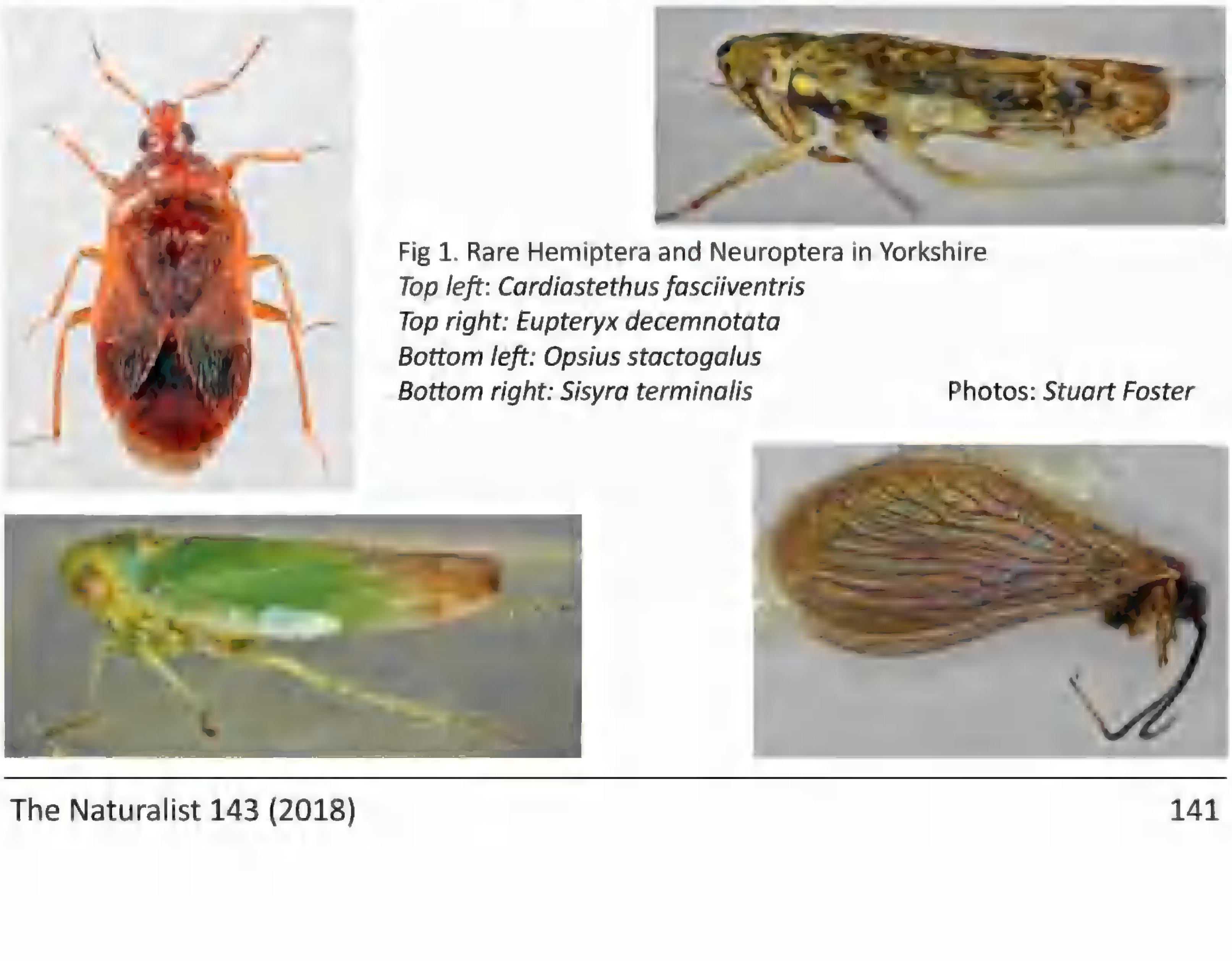

Fig 1. Rare Hemiptera and Neuroptera in Yorkshire
Top left: *Cardiastethus fasciiventris*
Top right: Eupteryx decemnotata
Bottom left: Opsius stactogalus
Bottom right: Sisyra terminalis
Photos: *Stuart Foster*

Only a handful of Neuroptera records had been received for 2017 but one species is **new to Yorkshire**: *Sisyra terminalis* Curtis, 1854 (Fig. 1, p141), a single male at Julian Small's Wheldrake Ings light trap on 28 September 2017. It has distinctive pale apical antennal segments.

Stuart did not have anything to report on the Odonata but Richard Shillaker reported that the pond near Goole where Red-veined Darter had bred in 2017 (see Hinks in *The Naturalist* 1096: 203) was under threat from the proposed Siemens manufacturing plant.

Bob Marsh and Michael Denton are working on an atlas of Yorkshire Aleocharinae for the YNU website. This will be a similar atlas to those already present on the website.

Roy Crossley's report on the **Diptera: Dolichopodidae** concentrated on '*Hercostomus* - a rag-bag genus'. His report is printed on p145.

Tom Higginbottom gave the **Report on Plant Galls**. He started with the oak gall wasps:
Having recorded plant galls for a number of years it is interesting to reflect on how many different species have appeared in our area in recent times. The Knopper Gall *Andricus quercuscalicis*, which galls the acorn of the Pedunculate Oak *Quercus robur*, first arrived in Britain in the 1950s and has become common in Yorkshire since the 1960s. In 2017 it was abundant, galling almost every acorn of some trees. Some authorities indicate that it does not occur on Sessile Oak *Q. petraea* although it can be found on the hybrid of the two native oaks *Q. x rosacea*, which can be more abundant than either of its parents. In 2011 the Ram's Horn Gall *A. aries* was discovered formed on an oak bud on Lindholme Moor. This gall is aptly named because a curved structure reminiscent of a ram's horn emerges from the bud. Recently there has been some debate about examples which are much longer and it is thought that this increase in size may be linked to the gall causer being parasitised. Ram's Horn Gall has become common in VC63.

Turkey Oak *Q. cerris* was introduced into Britain in 1735 and planted as a specimen tree in gardens. In the Doncaster area there are mature Turkey Oaks in Brodsworth Hall Gardens and Sandall Park but there are younger trees in the hedgerows in other areas. The gall causer *A. grossulariae* has a spring generation galling Turkey Oak catkins and a summer generation galling Pedunculate Oak acorns. It is thought that it first appeared in Britain around 2000. The catkins galled by the first generation form reddish currant galls with distinctive points, which often remain until autumn, turning brown. The second generation forms blunt rectangular spines, sometimes with lines running along each spine, in the acorn cup. Both generations are becoming common in VC63. In 2017 *Neuroterus saliens* was found on the leaves of a young Turkey Oak at Denaby Ings YWT NR. This wasp forms spingle-shaped swellings along the midribs on the undersides of leaves and along young twigs.

In 2012 the first Yorkshire specimens of *A. gemmeus* (Fig.2 p144) were found in Scabba Wood near Sprotbrough Flash YWT NR. It is often seen on epicormic shoots emerging from the bark. In more recent years it has never been discovered in great numbers, although ten examples were recorded on a single oak in King's Wood, Bawtry, in 2017. Specimens were found in VC64 in 2016, at Gledhow Woods in Leeds and at the East Keswick Wildlife Trust near Wetherby. The Hedgehog Gall *A. lucidus* was first recorded in Britain in Regent's Park in the 1990s, a similar time to the first records of Ram's Horn Gall, *A. gemmeus* and *A. grossulariae*. Unlike the others it is still confined to the south of the country, although Ian Farmer found a single old example in Hurst Plantation to the east of Rossington. In 2017 it was common in Dulwich Park, London, with one example galling the same bud as a Ram's Horn Gall.

The distribution of galls can vary on an annual basis. The Oak Apple *Biorhiza pallida* is often not very common but, in all the years that I have been recording galls, 2017 was exceptional for it. I was alerted to this by comments from Steve Robbins, a naturalist friend who lives in Durham and has recorded this gall in VC66 over many years but had never seen it in great abundance. He was overwhelmed in April 2017 to discover c.150 Oak Apples on a single mature tree. One of the finest oak woods in VC63 is King's Wood near Bawtry, where I discovered 50 Oak Apples on a single tree last May. In previous years my counts had never reached double figures even when I had been recording for a whole day. It is thought that the variation in the number of galls is linked to when the asexual female lays her eggs in dormant leaf buds. She is wingless and emerges from a root gall in December or January, then climbs the oak trunk and searches for a suitable bud. She drills repeatedly with her ovipositor, laying many eggs in the bud. The process of checking the bud and laying eggs can take up to three hours and all the while the female may be exposed to high winds, cold and rain in the leafless oak tree. The Oak Apple is fully developed in May or early June.

The common spangle galls found on the undersides of oak leaves were common in 2017. In recent years the galls of *Cynips* – Pea Galls *C. agama* and *divisa,* Striped Pea Gall *C. longiventris* and Cherry Gall *C. quercusfolii* have been uncommon. What was surprising was visiting the Dearne Valley CP and finding these galls on Sessile Oak.

Gall wasps on other hosts: The Robin's Pincushion *Diplolepis rosae* is seen frquently during wanders in VC63. *Phanacis hypochoeridis* have been found distorting the stems of Cat's-ear *Hypochoeris radicata* in VC61 and at Potteric Carr YWT NR. Botanist Gabrielle Jarvis recorded *Liposthenes glechomae* forming hairy swellings on the undersides of Ground Ivy *Glechomae hederacea* leaves at South Cave (VC61). Jill Cunningham of Darlington & Teesdale Naturalists Field Club found 48 examples of *Diastrophus rubi* galls swelling the stems of a bramble at Nosterfield NR near Ripon (VC65). Each gall may contain up to 200 spherical chambers, each containing a white larva. The larvae overwinter in the gall and adults emerge the following spring. This is an uncommon gall, often with a local distribution. In January 2018, as a result of Jill's record, I checked out one of the few sites in VC63 where this gall has been recorded. In a stretch of 100m I discovered 66 examples. The galls are easier to see in January because they have turned silvery with numerous exit holes while vegetation surrounding them is less abundant.

Galls caused by flies: The picture winged fly *Urophora cardui* causes swellings on the stems of Creeping Thistle *Cirsium arvense*, which are common in VC63 and gradually spreading into VC61 and VC62; sometimes large populations are discovered. *U. stylata* forms a hard, woody gall on the receptacle and achenes of Spear Thistle *C. vulgare* which is occasionally recorded. Hard, woody chambers on the receptacles and achenes of Hardhead *Centaurea nigra* by *U. jaceana* are often recorded. While searching through Common Reed *Phragmites australis* at Potteric Carr, swellings on the stem were discovered, caused by *Lipara lucens,* which formed a cluster of leaves with a woody central chamber containing a single fly larva. An uncommon gall caused by *L. rufitarsus,* which forms less distinctive swellings, was also recorded. In 2017 the thickened, pouch-like swellings on Stinging Nettle *Urtica dioica* of *Dasineura urticae* were more frequently recorded than in previous years. Geoff Oxford passed on records of the midge gall *Rhopalomyia tanaceticola* (Fig. 2) from the Selby Canal (VC64) while searching for the Tansy Beetle *Chrysolina graminis.* This causes hard, flask-shaped swellings on Tansy *Tanacetum vulgare* flower heads. Large colonies of Tansy are not always host to the midge but small numbers of galls have been recorded at Sprotbrough Flash and Denaby Ings. At Potteric Carr the uncommon midge gall *Ozirhinus tanaceti,* which enlarges an achene to twice its normal size, was recorded. Thickened pods on Tufted Vetch *Viccia cracca* caused by *Dasineura spadicea* were also discovered. *Obolodiplosis robiniae* (Fig.2), which rolls the leave edges of False-acacia *Robinia pseudacacia* downwards, is becoming more common in Yorkshire. Galls have been found on trees in Doncaster parks and on a tree by the River Ouse in York. A large colony of *Dasineura hirtae*, forming hairy leaf rolls, was found on Hairy Violet *Viola hirta* at the Nosterfield NR.

Mite galls: *Aceria ilicis* causes upward bulges on Holm Oak *Quercus ilex* and is being frequently recorded. Silver Maple *Acer saccharinum* is a common tree in parks and is often galled by *Vasates quadripedes*, which forms red pimples on the leaves. In Newton-on-Derwent the uncommon pouch galls formed by *Eriophyes viburni* were found on the leaves of Wayfaring-tree *Viburnum lantana.* The pimples of *E. torminalis* were abundant on some leaves of Wild Service-tree *Sorbus torminalis,* an uncommon tree in Yorkshire, in Wadworth Wood. In June the folds caused by *Acalitus plicans* were found on a Beech *Fagus sylvatica* leaf during a wet VC65 excursion to Freeholders' Wood in Wensleydale.

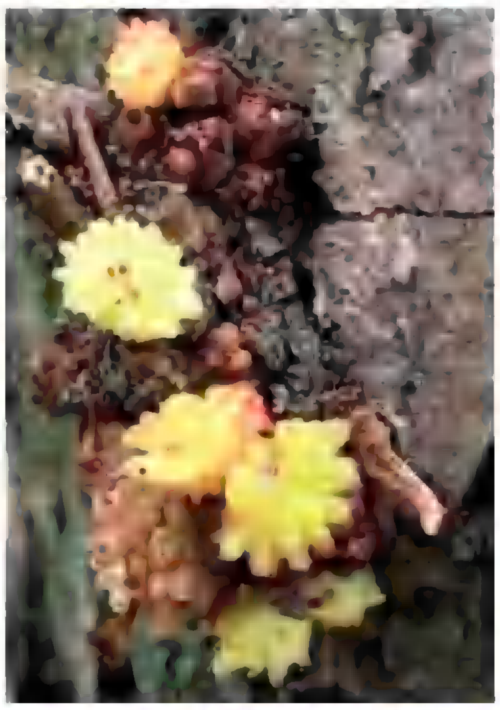

Fig. 2. Some plant galls becoming more common in Yorkshire.
Left: *Andricus gemmeus* on oak.
Bottom left: Midge gall *Rhopalomyia tanaceticola* on Tansy *Tanacetum vulgare*.
Bottom right: *Obolodiplosis robiniae*, which rolls the leave edges of False-acacia *Robinia pseudacacia.*
Photos: *Tom Higginbottom*

Hercostomus Loew, 1857 (Diptera:Dolichopodidae), a former 'dustbin' genus, with reference to the Yorkshire species-list

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This paper is based on my 'Recorder's Report for 2017' presented to the Entomological Section of the Yorkshire Naturalists' Union at the meeting held on 3 March 2018 at Wilberfoss.

In the standard key to British dolichopodid flies published forty years ago (Assis Fonseca, 1978) the genus *Hercostomus* contains 22 species, including 2 sub-generic singletons (*Muscididaecus* and *Orthochile*). At that time 11 species were recorded in Yorkshire, with many of them being noted from only a small number of localities. The publication of this 'Handbook' provided a stimulus to an increasing interest in Dolichopodidae, and over the intervening forty years seven species have been added to the County list of '*Hercostomus*' as formerly recognised, and the number of individual records has increased enormously, both in this and other genera. An example of this increase is provided by *H.aerosus*; by 1978 this common and widespread species had been recorded from only 11 sites scattered across Yorkshire, whereas it is now recorded from scores of localities in 63 tetrads.

Several post-1978 taxonomic revisions have been published which have dramatically changed the composition of the genus. The original 22 species of the 'Handbook' were a disparate group of flies and *Hercostomus* looked as if it had been a dumping ground in the past. However, in a major revision (Pollet, 1990), an old sub-genus *Gymnopternus* was resurrected (with *Hercostomus* as another sub-genus), effectively splitting *Hercostomus* into two sub-genera and at the same time describing 2 new *Gymnopternus* species, one of which (*silvestris*) has now been found at several sites in Yorkshire.

In 1991 Negrobov raised *Muscidideicus* to full generic rank in the 'Catalogue of Palaearctic Diptera' and later, following a proposal by C.E.(Peter) Dyte in 1988 (Empid and Dolichopodid Study Group Newsheet No.5), *Ortochile* (formerly spelt *Orthochile*), was afforded full generic status in the British 'Check-List' (Chandler, 1998). Further changes resulted following three later publications: Pollet (2003); Brooks and Wheeler (2005) in which *H.chalybeus* was transferred to the newly created genus, *Ethiromyia*; and Drake *et al*. (2013).

Notes on the currently known Yorkshire species

Gymnopternus aerosus (Fallen): As indicated earlier, this is widespread across much of Yorkshire and there is a handful of undated records in the legendary Chris Cheetham's hand, but probably from the 1920s and 1930s, with representatives from all five vice-counties. As with many dolichopodids, it was not until the late 1970s that energetic recording of '*Hercostomus*' took off in the County, and this species is now the one most commonly found.

G. angustifrons (Staeger): First reported in Yorkshire at Askham Bog in 1953, followed by Hotham Carrs (VC61) in 1971 and then, from 1984 onwards, in a number of classic lowland peat sites such as Thorne Moors, Strensall and Skipwith Commons. It is now recorded from a loose cluster of nine hectads east of York, at some of which it can be very numerous. Interestingly, there are no records from upland peat sites in Yorkshire, which is contrary to the usual distribution pattern of most peat-associated insects. The only exception I have encountered was a solitary female swept from the dry grassland of a roadside verge in the chalk Wolds valley of Water Dale in 2017.

G. assimilis (Staeger): First recorded in the County at Thorne Moors in 1975 and at Kingsdale Head in the far north-west two years later, this species has since been reported from sites in a further 22 hectads, with many localities being some form of wetland.

G. brevicornis (Staeger): The first record was from the riverside at Stainton (VC65) in June 1981 and another a week later by the river at Duncombe Park. Since then it has been recorded in some twenty localities in 15 hectads, mostly in VC62. The females of this and the next species are, in my opinion, inseparable with certainty and records based on this sex should be treated with caution.

G. celer (Meigen): First recorded in Yorkshire by Chris Cheetham at Austwick in 1920/21, this remained the only County record until a visiting dipterist reported it from Colsterdale in 1974. From 1980 onwards there have been many records scattered across the County, with no clear habitat association.

G. cupreus (Fallen): The most ubiquitous member of the genus, being widespread across the County, the exception being in the east, where there are no coastal records south of Cayton Bay, and a complete absence across Holderness except for Hornsea Mere. Again, there are only a handful of records prior to 1980. This is mainly a spring species, with few records beyond the end of June.

G. metallicus (Stannius): First recorded by Chris Cheetham at Wistow (VC64) in July 1926 and the following day at Castle Howard (VC62), these remained the only Yorkshire records until 1981. Since then it has been reported from sites in more than thirty hectads widely spread across the County, perhaps reflecting the distribution of collectors rather than the fly! In some wetland sites, such as Askham Bog, it can be abundant at times.

G. silvestris Pollet, 1990: The first Yorkshire record for this recently described species was from Carr Drain at Yokegate near Howden in 1992, but there may be earlier examples lurking in old collections, possibly amongst the widespread and common *G. aerosus,* to which there is a superficial similarity. The 'new' species has now been recorded from a dozen lowland sites in ten hectads. Two particularly interesting records are from Askham Bog, where it was first discovered in 2017. This has been a well-worked site for dolichopodids in recent years and it is puzzling that it had not been found there much earlier. The second locality is Eastrington Ponds (VC61) where, during a mini-survey in 2017, it was found to be numerous and the only *Gymnopternus* at the site apart from *G.metallicus*.

Hercostomus chetifer (Walker): A distinctive but elusive species, usually found singly, often along water-courses. There are records from about 15 localities in 11 widely scattered hectads from Mulgrave Woods and Hayburn Wyke on the north-east coast to Gunnerside and Hubberholme in the north-western Dales. There are no records from VC61, despite much recording effort over the past thirty years.

H. fulvicaudis (Haliday in Walker): This species is little recorded in Yorkshire. The first examples were 2 males and 2 females in water traps set amongst *Phragmites* at the RSPB's Blacktoft Sands reserve in July 1978. It was thirty years before any more were reported, the first being a female on the grassy slopes of a lagoon at North Cave Wetlands YWT reserve in July 2008; none have been found there since. Others have subsequently been reported from the margins of the Humber flood-bank near Welton Waters and Broomfleet and at Redcliff near North Ferriby, but always as singletons or a couple. This remains an enigmatic Yorkshire species; where there is one there are likely to be others – they just seem to escape detection!

H. germanus (Wiedemann): This distinctive species was first recorded in the 1920s by Cheetham from several scattered localities and it was recorded in 1928 at Barmby Moor by Dr Fordham. It has subsequently been found to be widespread across the County but always localised and with an apparent association with dry calcareous grassland. This bright metallic-green fly is commonly found on roadside verges in Wolds valleys.

H. nanus (Macquart): Prior to 1979 the only Yorkshire record of this species was from 1921 when Chris Cheetham reported it from Austwick. It is now known from sites in thirty hectads widely scattered across the County. As with many of the former '*Hercostomus*', this one is usually found in wet habitats be they in woodland or open marshes.

H. nigrilamellatus (Macquart): Known in Yorkshire from only two specimens (both in VC62), a single male in Riccaldale in 1990 (A. Grayson det. R.C.), and a single male at Terrace Bank Wood, Rievaulx the following year (R.C.). This is perhaps a truly rare Yorkshire insect – or maybe just elusive, who knows! In the most recently published national review (Falk & Crossley, 2005) it is accorded Lower Risk (Nationally Scarce) status and the habitat preference is quoted as 'old broadleaved woodland, some localities, however, are wetland and river bank sites.'

H. nigripennis (Fallen) (Fig. 1 p148): Widespread across much of Yorkshire, with the usual pattern of records, the first being in 1919 from Melbourne (VC61) by Dr Fordham (and identified by J.E. Collin, one of the leading British dipterists of the day). Then three or four in the 1920s and a handful up to the 1960s with the bulk coming after 1979. Curiously, there are no records from coastal sites nor in Holderness, so the distribution map is blank east of TA/00. There seems to be no strong habitat preference but I always associate it with drier places than the majority of the former '*Hercostomus*' species.

H. parvilamellatus (Macquart): First recorded in Yorkshire by W.A. Ely at Hooton Roberts in 1982, this tiny black fly has subsequently been found at about fifteen sites in ten hectads across the County. Many of the localities are calcareous and wet. It is likely that this species has been overlooked in the past and the present distribution doubtless reflects the activities of recorders rather than the true range of the fly!

H.plagiatus (Loew): This appears to be a genuinely rare species in Yorkshire, with only two records from sites in the extreme south of the County (Norwood Locks and Fatty Boyns Ponds) on the same day in July, 1987 (W.A.Ely). Being found in two localities it seems unlikely that they were both 'strays' and there may well be others awaiting discovery, even though there have been no reports for thirty years. There are suitable habitats for them - Askham Bog seems a good bet, particularly as my own encounters with this species have been in the classic East Anglian sites of Chippenham, Wicken and Woodwalton Fens.

Fig. 1. *Hercostomus nigripennis*, a widespread species.
Photo: *Ian Andrews*

Ethiromyia chalybea (Wiedemann): This species was first reported (as *Hercostomus chalybeus*), from a Yorkshire site in 1987 when one was found by W.A. Ely on the Don Canal tow-path. Since then it has been found in a further eleven, mostly wetland, lowland sites. It is unlikely that earlier generations overlooked this distinctive fly and it appears to be a genuine arrival in the County, which is continuing to spread.

Poecilobothrus chrysozygos (Wiedemann): A male, formerly known as *Hercostomus chrysozygos*, found at Campsall Park by Peter Skidmore in 1977, was the only Yorkshire record for this species until I swept another single male from the side of a footpath at North Cave Wetlands YWT Reserve in July, 2015. Another distinctive species, it is hardly likely to have been overlooked and the history of discovery suggests that these records may refer to 'strays'.

Muscidideicus praetextatus (Haliday): It is perhaps mischievous to conclude this brief review with a species that has not yet been reported in Yorkshire – but it jolly well ought to be! *M.preatextatus* occurs on coastal marshes as far north as Durham (Fonseca, *op.cit.*) and I have found it on the salt-marsh at Tetney in north Lincolnshire, directly across the estuary from Spurn. This is not the only coastal dolichopodid which does not seem to have yet crossed the Humber. *Dolichopus notatus* Staeger, is another. Is this an indication of poor quality salt-marsh habitat on the Yorkshire side of the Humber or just a lack of recording effort? Perhaps it is a bit of both. The ubiquitous salt-marsh dolichopodid *Hydrophorus oceanus* (Macquart) was not recorded in Yorkshire until 1982, when it was found at Kilnsea; it is now known to occur in suitable habitats on the north bank of the estuary from the mouth of the Humber as far inland as Brough. It is amazing that it escaped detection until comparatively recently!

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YNU Conference 2018 - Non-native species: research, recording and the conservation agenda

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I am an ecologist working at the Centre for Ecology and Hydrology, Wallingford, and hoping to start my PhD on invasive species this summer. This was my first Yorkshire Naturalists' Union conference and I absolutely loved it! Held on 7th April at the University of York, the conference topic provided a lot of fascinating information from a variety of excellent speakers.

Sarah White (President of the YNU for 2017) chaired the morning session, which began with a Keynote presentation by Helen Roy. Helen, who works at the Centre for Ecology and Hydrology, was, as ever, wonderfully informative, enthusiastic and insightful around the complex networks of non-native species (NNS). Her talk set up the day nicely by covering definitions in terminology of NNS, distinguishing between invasive and non-invasive ones and then considering the extremely deleterious effects of some invasive non-native species (INNS). Helen also gave overviews of the ways in which data collected through citizen science and recording societies, etc., is used, for example through databases of first records. Such data can feed into the global picture on NNS. She emphasised the importance of using science to try to predict future possible INNS (a process known as horizon scanning) and why international co-operation, for example with the EU, was so important.

Roger Morris, from the Hoverfly Recording Scheme, followed on with a great talk about additions to the UK Hoverfly species list, which is about one species per year since 1901! He considered possible factors such as taxonomic splits, prior under-recording, natural dispersal and introduction through human-mediated channels. Roger is hugely knowledgeable and showed very effectively the complexities around understanding these range shifts. It was wonderful to hear about such issues, illustrated through the detailed life histories of these exquisite flies.

Jane Pottas, President-elect of the YNU for 2019, was up next with a very entertaining talk about seaweeds, the hazards of collection and the huge importance of herbaria and reference specimens in determining new records. Her talk is printed on p82.

We then broke for coffee and to look around the exhibits, book stands and posters. This was a lovely opportunity to discuss more with the speakers about their talks and to catch up with old friends.

After the break, Amy-Jane Beer, writer and biologist, re-started the session with a thought-provoking talk about non-native mammals and the complexities of human emotions around perceived cuteness (e.g. mink) and then the shock at the damage they can do. Amy is a great story-teller and included lots of lovely pictures in her talk.

There then followed three quick-fire 5-minute talks. Kate Hills spoke first on the Mammal Society's November Meeting and gave an overview of the extensive work of the Mammal Society. She did a fine job of standing in at the last minute for a speaker who could not attend. Julien Courant then talked about his PhD on the African Clawed Frog *Xenopus laevis*. Julien gave a fascinating account of his study on the change in feeding behaviours in the African Clawed Frog outside of its natural range and how these might have long-term impacts on macroinvertebrate communities. His detailed studies provide important information on the mechanisms behind the impacts that this frog is having. The final quick-fire talk by Jasmine Barr was on the ecology and hazards of Giant Hogweed *Heracleum mantegazzianum*. This plant, which was brought in to the UK through the horticultural trade, has established around much of the country. Jasmine discussed its dangers to human health and natural ecosystems, along with allelopathy (the chemical inhibition of one plant by another) as a possible way of controlling INNS.

Ben Rowson from the National Museum, Wales, finished the morning session with a wonderfully funny and entertaining talk about slugs, laced with some hugely unusual information on slug anatomy and the fact that a quarter of our slugs have been discovered since 2000! He also made reference to the Ghost Slug *Selenochlamys ysbryda* recording scheme, which members of the audience were encouraged to take part in. Ben then presented Adrian Norris with an award to celebrate the incredible achievement of over 50 years recording for the Yorkshire Naturalists' Union (see p152).

We then broke for lunch and had another opportunity to look around the exhibits.

The afternoon session was chaired by Andy Godfrey, Chairman of the YNU Executive, and started with a very lively keynote presentation by Chris Thomas from York University. This began with a photo of Chris in a field, standing in a hole up to his waist with the piles of spoil from the hole neatly separated into different types, each reflecting a different landscape type going back about 15,000 years! This was an amusing and vivid way of demonstrating how dynamic and changeable ecosystems are over relatively short ecological/geological time scales. Chris raised the idea that NNS provide an opportunity to increase species numbers and are part of the ever changing nature of the living world. He also described the way in which new species are naturally colonising Britain as the climate warms and highlighted the potential for Britain to become a refuge for some species that may be threatened in their natural range due to environmental change. Chris's talk certainly gave the audience much food for thought on this idea.

Olaf Booy from the Great Britain Non-Native Species Secretariat (GBNNSS) then gave a brilliantly engaging talk on its work. He described the structure of the Secretariat and the way in which its coordinating work aligns with the GB Strategy on INNS. He provided clarity on defining NNS and INNS, highlighting the importance of prioritising efforts on INNS. Olaf gave some excellent examples of INNS and emphasised figures from the IUCN which indicate that over 16% of red data list species had gone extinct due solely to the impact of INNS. He then went on to describe the huge range of work coordinated by the GBNNSS.

Philip Whelpdale from the Yorkshire Wildlife Trust was originally down for a quick-fire talk but, due to the change in scheduling, gave an extended version entitled 'The Good, the Bad and the Ugly'. In this he related NNS to landscape scale conservation based on the ideas of Prof. John Lawton's report *Making Space for Nature*. Philip, as with Chris, discussed the ideas around the beneficial effects of some NNS, along with some of those that had adverse effects.

Alison Dunn from Leeds University then gave a detailed and very useful talk on practical aspects of biosecurity, particularly with respect to inadvertently translocating INNS around the UK, including by conservation ecologists! She provided quantitative information on the risks of translocation and also practical steps and strategies to minimise these risks.

Suzy Wood from the Centre for Agriculture and Biosciences International (CABI) gave a hugely informative talk, rich with examples on the work of CABI and biocontrol. This talk very effectively challenged potential pre-conceptions around the topic, demonstrating several examples of where biocontrol has been successfully used to eradicate plant INNS.

Roger Key from the YNU then concluded the day with a wonderfully descriptive and engaging talk around the NNS of St Helena. His pictures highlighted the enormous impact of some INNS and he outlined some of the efforts to mitigate the damage. Thank you Roger for inspiring me to spend time in St Helena!

Andy Godfrey closed the conference and thanked the speakers. I would also like to give a HUGE thank you to Paula Lightfoot for organising such an amazing day with such efficiency, grace and humility! I loved it. I would very much recommend attending future YNU conferences!

Editor's Note: Presentation files for many of the speakers at the 2018 YNU Conference can be downloaded from: https://www.ynu.org.uk/Conference2018

Yorkshire Naturalists' Union celebrates a half-century

Terry J. Crawford

No, not a birthday of the YNU itself, which has been going strong since 1861. The clue is in the Minute Book of the Conchological Section of the YNU, in the record of the 1967 AGM held on 28th October (Figure 1). I have included a transcript because older members of the YNU may recognise some names.

YCS, below, refers to the Yorkshire Conchological Society which shares its membership and meetings with the YNU Section. There are some interesting details in the Secretary's Report, not least the failure to find the Edible Snail *Helix pomatia* near Wentbridge (!), and the first British *Vitrea subrimata* record near Austwick. What really caught my eye, however, was that Adrian Norris became Recorder of the YNU Conchological Section precisely 50 years before the 2017 AGM, also to be held on 28th October, at his home in Leeds. Typically modest, he had not mentioned this anniversary to us, but we were able to congratulate him on his remarkable achievement.

1967
The Annual Meeting was held in Leeds City Museum, Municipal Buildings, Leeds at 4pm on October 28th. Mr Robinson presided and the following were present: Messrs Armitage, Appleyard, Dearing, Thompson, Norris & Dearing.
The minutes of the 1966 Annual Meeting were read & adopted as was the Secretary's Annual Report. This year the YNU meetings had only been attended on 2 occasions and one of these was unsatisfactory as the YNU party had left HQ by the time Mr Norris arrived.
Officers for 1968 were re-elected with the addition of;
Recorder: Mr A. Norris c/o City Museum, Leeds.
The programme as arranged by the Y.C.S. was adopted for forwarding to the Editor of the Naturalist for printing on the YNU members' Cards.

E.Robinson 26/10/68

Figure 1: Minutes of the 1967 AGM of the YNU Conchological Section, with a transcript (right). Photo: *Terry Crawford.*

Three weeks later the YNU held its AGM which Adrian was unable to attend. Under AoB I informed those present of Adrian's amazingly long term as Conchology Recorder, which must be extremely rare, if not a record, among the many YNU sectional recorders now and in the past. There followed discussion of the significant other roles within YNU undertaken by Adrian over the years, e.g. past President, Trustee for nearly 40 years, chair of several key committees, organiser and co-ordinator of field meetings, and a deep involvement in training initiatives. Before long it was agreed that formal recognition was required. Several members had heard on the BBC Radio 4 programme *Saturday Live* that very morning a discussion of slugs and snails, somewhat derogatory at times, but highlighting a 'golden snail' garden ornament. Paula Lightfoot swung into action, obtained a golden snail, and designed a certificate of appreciation. She was also organising the YNU Annual Conference on non-native species to be held in York on 7th April 2018. Ben Rowson was speaking on 'The slugs of Britain and Ireland: a fauna full of surprises' and agreed to make a surprise presentation to Adrian at the end of his talk (figure 2). Ensuring that the secret was kept, but also that the right people were in the know, was a challenge but successful; Adrian's wife, Barbara, must have found a convincing reason to attend the YNU Conference! Adrian's surprise and heart-felt appreciation were obvious to everyone. Barbara later told me how much it had meant to Adrian, because both conchology and the YNU have been so important in his life.

It was particularly fitting that Ben should have made the presentation (Fig.2) because he is taking over from Adrian as the Conchological Society's Hon. Non-Marine Census Recorder, a post that Adrian has held for over 10 years. Adrian is continuing as Mollusc Recorder for the Yorkshire Naturalists' Union. There is still plenty of work required in the massive county of Yorkshire, both routine recording in new sites and also monitoring of rare and sensitive molluscs. We will continue to benefit from Adrian's encyclopaedic knowledge of the county's slugs and snails and their habitats.

Figure 2: Ben Rowson and Adrian Norris at the YNU Conference 2018. Photo: *Paula Lightfoot*.

A pterosaur wing bone from Huntsman Quarry, Naunton, Gloucestershire collected by Mr A. J. Phipps of Yorkshire

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A personal introduction

The author was fortunate enough to have a father with whom he shared an interest in palaeontology and geology. Many happy hours were spent as a young child exploring the coastline of Yorkshire, rockpooling, birdwatching and searching for fossils. Summer holidays spent at Flamborough provided a seemingly endless range of opportunities for the budding naturalist and his parents to discover new and exciting wonders. Later in life, the need for a university dissertation topic led to the discovery of the almost disused site known as South Cave Station Quarry. The problem of access to the quarry needed to be overcome and the author's father, now to be referred to as A.J.P., provided the solution.

Following a career in the Royal Navy, A.J.P. joined a fledgling frozen food company at its site in Kingston upon Hull in 1961 and stayed with this company until his retirement in 1996. Whilst at work, he mentioned the quarry at South Cave to one of his colleagues who revealed that the owner of the site was actually a relative. From this point, access to Station Quarry was no longer a problem and the study could commence. Having graduated, the author returned to South Cave for higher degree studies and A.J.P. provided invaluable support with field activities such as digging sampling pits, measuring sections and collecting samples. The work carried out at South Cave Station Quarry formed the basis of a thesis and four research papers (Phipps, 2003, 2007, 2008; Selden, Baker & Phipps, 2008; Phipps, 2017). In one of these, the discovery of the Jurassic mite named in memory of A.J.P. is described (Selden, Baker & Phipps, *loc. cit.*).

A.J.P.'s passion for fossils was well known at work. As the Health and Safety Officer for its Hull and Grimsby sites, he regularly travelled to other factories in England and this gave the opportunity for further fossil collecting. Whilst travelling home from the other sites he would call at likely quarries and simply ask if they had any fossils available. No money was ever exchanged. One such visit in his retirement year was made on a journey home from Gloucester. This site, Huntsman Quarry, Naunton, yielded two unusual finds: a fine ammonite and an indeterminate bone set in a large slab of rock. The ammonite was, and still is, highly cherished but the bone, which was described by the author as from a pterosaur, was carefully wrapped in protective materials and then placed in a storage box. It has remained in Yorkshire for the last twenty-two years and this bone is the subject of this article.

Details of the site

Huntsman Quarry, also known as Huntsmans or Huntsman's, (SP123255) is situated 2km to the north-east of the village of Naunton in Gloucestershire. A.J.P. had recorded details of its location in the form of a sketch-map on a sheet of paper in his road atlas, probably for use if the opportunity to return to the site ever arose. It is currently the only major working quarry in the area but, unfortunately, most of the rock extracted is crushed for road-building aggregate and ready-mixed concrete (Joynes, pers. comm., 2018). The site was famous in the past for the production of 'Cotswold Slate', the tilestone which provided the characteristic roofing materials of the Cotswolds.

The location is described in detail by Richardson (1929, pp113-114) and more modern descriptions are provided by Mudge (1995, p44; fig.9, p42) and Sumbler (2002, pp194-196). It is mentioned in the works produced by McKerrow (1964, pp4-5), Ager *et al.* (1973) and Sumbler *et al.*, 2000, p58). Although A.J.P. was unaware of its significance when he called at the entrance gate, Huntsman Quarry is renowned as "the best Cotswold Slate locality, and source of six or seven species of [fossil] reptiles." (Benton & Spencer, 1995). The quarry is recognized by Natural England as a Site of Special Scientific Interest due to its great palaeontological and stratigraphical significance.

In addition to providing the best exposure of the Cotswold Slate in the area, Huntsman Quarry is the type locality of the Eyford Member of the Fuller's Earth Formation (Sumbler, *loc. cit.*). The ammonites which the site has yielded, most notably *Procerites progracilis* (Cox & Arkell, 1950) and *P. mirabilis* (Arkell, 1958), indicate that the Cotswold Slates should be assigned to the Progracilis Zone of the Middle Bathonian Stage (Middle Jurassic) (Torrens, 1969).

Incidentally, the location has botanical interest as it supports a legally protected population of Cotswold Pennycress *Thlaspi perfoliatum*, which is a Priority Species under the United Kingdom Biodiversity Action Plan (Cotswold District Council, 2003).

Details of the specimen

The bone has been preserved in a large slab (550mm long, 460mm wide and 60mm deep) that was intended for walling-stone. Huntsman Quarry still produces small quantities of stone for this purpose (Joynes, pers. comm., 2018) but such stone formed a more significant element of the site's output in the recent past. Unfortunately, the slab was broken into two similar-sized pieces before it was collected by A.J.P. Therefore, the pterosaur bone was also broken and the central portion had been lost (Figure 1, p156).

The bone is not crushed, although there has been a minor element of compression during the fossilization process. As the specimen was not found *in situ*, the exact level from which it originated could not be established. Unlike most, if not all, of the specimens collected by previous workers, this example has not had the surrounding matrix removed. As a result, it provides an indication of the environment in which it was deposited. The slab is a fossiliferous limestone containing bivalves, including *Praeexogyra acuminata* (J. Sowerby, 1816) and high-spired, possibly cerithioid, gastropods. The presence of these organisms, together with the fine example of *Procerites mirabilis* Arkell, 1958 collected by A.J.P. from this site, suggests that the area was covered by a shallow sea during the Middle Bathonian Stage.

The specimen is thought to be a first wing finger phalanx of an indeterminate pterosaur. Figure 2, kindly provided by Dr M. Witton (University of Portsmouth), gives an indication of its position in relation to other elements of the pterosaur wing. The small groove and opening towards the proximal end of the bone is thought to mark the position of a tendon (Owen, 1874, p.11) or blood vessel (Hone, pers. comm., 2018) The bone is very similar to the type specimen of *Pterodactylus kiddi* described and illustrated by Owen in his monograph of 1874 (O'Sullivan, pers. comm., 2018). However, pterosaur taxonomy is in need of revision and this name is

Figure 1. General view of first wing finger phalanx of an indeterminate Middle Bathonian (Progracilis Zone) pterosaur from the Cotswold Slate (Eyford Member, Fuller's Earth Formation) at Huntsman Quarry, Naunton, Gloucestershire. Oxford University Museum of Natural History specimen number: OUMNH J.21692.

considered to be a *nomen dubium*. Most pterosaurian limb bones are non-diagnostic at a lower taxon level (Mulder, pers. comm., 2018) and therefore this specimen is best described as belonging to an indeterminate Middle Bathonian pterosaur from the Cotswold Slate (Eyford Member, Fuller's Earth Formation).

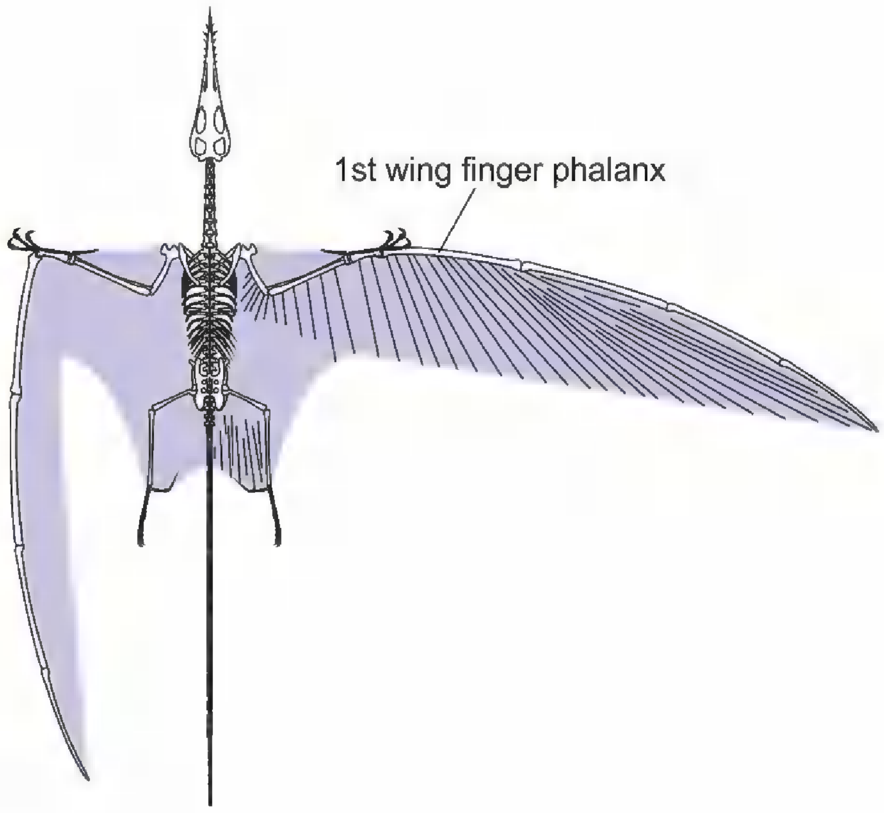

Figure 2. Diagram to show the position of the first wing finger phalanx in *Rhamphorhynchus muensteri* Goldfuss, 1831 (a similar species to *P. kiddi* Owen, 1874). Illustration produced by Dr M. Witton, University of Portsmouth.

The specimen will be deposited with Oxford University Museum of Natural History (specimen number: OUMNH J.21692). This is a fitting home for the bone as it will join the Callovian Stage fossils of South Cave Station Quarry described and figured in the papers mentioned in the Introduction (Phipps, *op. cit*.; Baker, Selden and Phipps, *op. cit*.). In addition, Oxford University Museum of Natural History holds a collection of pterosaur remains of international renown and the pterosaur bone will be closer to the area in which it was discovered.

An additional comment

The Naunton pterosaur bone originated in a rock unit which does not occur in Yorkshire. Rocks deposited during the Middle Bathonian Stage in this area were largely deltaic and estuarine in origin. Consequently, marine invertebrates, especially ammonites, are absent or rare. Progracilis Zone deposits in East Yorkshire are not exposed but in North Yorkshire they form part of the Long Nab Member of the Scalby Formation (Cox, 2002, fig. 5.2, p.317). This seems strangely appropriate, from a sentimental viewpoint, as it links the Naunton finds with Scalby, north of Scarborough. This location was often visited during our family holidays and day-trips exploring the delights of the Yorkshire Coast.

Acknowledgements

The author wishes to thank Dr D. Hone (Queen Mary University of London), Ms S. Joynes (Breedon Group, Naunton), Dr E. Mulder (Natura Docet Wonderryck Twente, Denekamp, The Netherlands), Prof. D.M. Martill (University of Portsmouth) and especially Dr M. O'Sullivan (Limerick, Eire) for their interest and advice. Special thanks are due to Dr M. Witton (University of Portsmouth) for help with photographic issues and for producing the diagram shown in Figure 2. Ms E. Howlett (Oxford University Museum of Natural History) kindly provided the specimen number for this find.

Sincere thanks to Mrs P.I. Phipps for providing constant help, support and encouragement throughout the production of this article.

This paper is dedicated to the memory of Mr A.J. Phipps (1931-2001).

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An ancient record of toads killing and eating mice

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In 1975 I cut from the *Westmorland Gazette* a brief note that reprinted a report published in that newspaper exactly 100 years earlier, an account of the killing and eating of mice by two Common Toads *Bufo bufo*. The exact identity of the mice (or voles) is uncertain but Wood Mouse *Apodemus sylvaticus* seems the most likely. As such predation by Common Toad is seldom recorded, the original report of July 3, 1875, under the heading 'Toads and mice' is reproduced here to preserve these notable facts in a suitable repository. The locality, Storrs, is near Windermere. The facts are clearly and succinctly recorded:

'At Storrs gardens on Wednesday last, Mr. Evans, gardener, had his attention drawn to the peculiar attitude taken by a couple of toads. The toads have been in the cucumber house, one for the last five years and the other for two years. The reptiles (sic.) were intently viewing the movements of some mice which were prowling about the cucumber beds setting them like dogs setting game or cats lurking for mice. And when within distance, pounced upon the mice and swallowed them up. In this way one toad disposed of three mice and the other made a meal of two or more.'

Mammals and non-avian vertebrates - Annual Report 2017

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Records have been gratefully received from Bill Ely, John Hipkin, John Newbould and Terry Whitaker, Yorkshire Dales National Park, the Vincent Wildlife Trust and the International Otter Survival Fund.

The section cooperated with the Yorkshire Dales National Park Authority in setting up and providing background data for its Hedgehog road casualty monitoring project.

Papers completed and published are as follows:

Howes, C.A. (2017) A Review of the Thresher Shark, Fox Shark or Sea Fox in Yorkshire waters. *The Naturalist* 142: 96-103.

Shillaker, R. & Roberts, M. (2017) Mass mortality of adult Common Toads at two breeding sites in Yorkshire. *The Naturalist* 142: 178-190.

Howes, C.A. (2017) Rabbit activity zones and water table distribution on Lindholme Old Moor: Could 'Isobunnies' be used to predict residual acrotelms? *Thorne & Hatfield Moors Papers* 10: 57-60.

Howes, C.A. (2017) The strange case of lawn turf rolling: Seasonal foraging by badgers. *Thorne & Hatfield Moors Papers* 10: 98-103.

Howes, C.A.(2018) A note on the Otter *Lutra lutra* at Lindholme Lake and the Hatfield Moor drains. *Thorne & Hatfield Moors Papers* 11: 149.

Howes, C.A.(2018) A Historical review of Bat records from Lindholme Old Moor and adjacent areas. *Thorne & Hatfield Moors Papers* 11: 146-149.

Articles featuring examples of Yorkshire-taken Sturgeon *Acipenser sturio* and Tunny *Thunnus thynnus,* exhibited in Doncaster, were:

Howes, C.A. (2018) Royal Fish sold for Miners' Children's Distress Fund. *The Doncaster Naturalist* 3: 39-40.

Howes, C.A. (2018) Tunny in Doncaster. *The Doncaster Naturalist* 3: 40-43.

As contributions to the 2018 YNU Conference theme of alien species, the following studies were compiled and forwarded for publication:

Howes, C.A. (2018) The Silver Carp: a new species in Yorkshire and Humberside. *The Naturalist* 143: 37-38.

Howes, C.A. (2018) Topmouth Gudgeon: an alien fish in Yorkshire. *The Naturalist* 143: 39-41

Howes, C.A.(2018) Pacific Pink (or Humpback) Salmon in British waters and the first Yorkshire record. *The Naturalist* 143: 34-37.

Howes, C.A. (2018) Lindholme Lake and imported Sturgeon in the Humberhead region. *Thorne & Hatfield Moors Papers* 11:150-154

YNU History Section

Colin A Howes 7 Aldcliffe Crescent, Doncaster DN4 9DS

In commemorating the centenary of WW1 and in connection with initiatives from the Imperial War Museum and Doncaster Museum, the following studies have been undertaken:

Howes, C.A. (2017) Yorkshire naturalists at war: Part 1 - News from the front, YNU members on active service. *The Naturalist* 142: 133-141.

Howes, C.A. (2017) Yorkshire Naturalists at War: Part 2 - On the Home Front; *The Naturalist* 142: 196-203.

Collecting Butterflies on the Somme, *Doncaster Times: At Home and at War,* Issue 3 (2017): 12-13.

YNU Calendar 2018

Up-to-date information and further details can be found at www.ynu.org.uk/events, and the YNU Membership Card.

Sept	8	Conchological Section - Ellers Spring and Thornton Dale. Meet at 11:00 in Dalby Forest Visitor Centre car park at SE855875
	9	Entomological Section meeting at Dearne Valley Country Park. Details tba.
	9	Marine & Coastal Section field meeting to Boggle Hole (NZ952037). Meet at 9.00 in car park on Bridge Holm Lane. The Marine & Coastal section events in Yorkshire are seashore bioblitz days organised by the University of Hull as part of the Heritage Lottery Funded project 'Capturing our Coast' and supported by the YNU. For further information, visit the YNU website or contact Paula Lightfoot.
	27	Basic Field Skills for University of Leeds MSc Students. St Chad's Parish Centre, Headingley, Leeds.
Oct	6	Conchological Section field meeting to Brockadale in VC63 to survey for *Truncatellina cylindrica*. Meet at 11.00 in the car park at SE51271734. All are welcome to attend but please contact Adrian Norris if you will be attending.
	13	Bryological Section field meeting at Nosterfield Quarry (VC65). Meet at 10:00 in the car park at the Nosterfield Quarry Visitors' Centre (SE283804).
	13	The Executive meeting takes place in the lounge of St Chad's Parish Centre, Leeds, 10:30 to 12:30.
	20	Entomological Section AGM, Doncaster Museum and Art Gallery, from 11:00 to 16:30.
	27	Conchological Section AGM at 17 West Park Drive, Leeds LS16 5BL, at 13:00. Please contact Adrian Norris if you are able to attend.
	27	Marine & Coastal Section field meeting to South Landing, Flamborough (TA230695). Meet at 11:30 at the YWT Living Seas Centre (pay car park).
Nov	3	A meeting of the Natural Sciences Forum will be held in the function hall of St Chad's Parish Centre, Otley Road, Far Headingley, Leeds, from 11:00 to 12:30.
	3	The AGM will take place in the function hall of St Chad's Parish Centre, Headingley, Leeds, from 1:30pm to 4:00pm. The meeting will be hosted by Leeds Naturalists' Club.

Yorkshire Naturalists' Union

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The Naturalist

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Notice to contributors

Contributors should indicate whether they wish their manuscripts to be subjected to anonymous peer review. All other manuscripts will be reviewed by the Editorial Board who at their discretion may send them to third parties for comment and advice.

Original articles should be submitted electronically as an MS Word document to Dr A. Millard at:
editor@ynu.org.uk

Please look at a recent issue of the journal for a general idea of how to present your article. Also see *The Naturalist - Guidance for authors* at www.ynu.org.uk/naturalist and please **avoid** the following:

- using any paragraph formatting and line spacings other than single.
- using tabs to tabulate information (please use MS Word table format).
- inserting any figures, graphs or plates into the text; indicate their proposed locations in the text and send them as separate files.

Good quality, high resolution images are very welcome and should be sent as .jpg files, with a separate MS Word file containing the caption and name of the person to whom the image should be attributed.

If electronic submission is not possible, contributions should be sent to Dr. A. Millard, Woodland Villas, 86 Bachelor Lane, Horsforth, Leeds LS18 5NF (Tel. 0113 258 2482).

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