

A survey of horseflies (Diptera: Tabanidae) on mires in the Cheshire Plain area during 2019

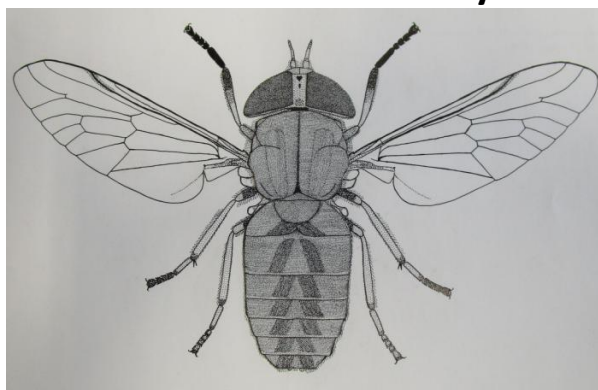
Including notes on other invertebrates of interest and a full species list

A report to the Tanyptera Trust by Andrew Grayson

Illustrations of *Atylotus plebeius* – the Cheshire Horsefly



Male



Female

Illustrations of four other Cheshire Plain area horseflies (females only)



Chrysops viduatus



Haematopota pluvialis



Hybomitra montana



Tabanus autumnalis



This project was aided by an award made on 24th May 2019 through the Small Grants Scheme of the Tanyptera Trust

ILLUSTRATIONS ON THE FRONT COVER

INTRODUCTION

Whilst at Little Budworth Common on 24th July 2019, the author took a series of photographs that featured *Atylotus plebeius* (Fallén) – the Cheshire Horsefly. It was envisaged that one or two of these photographs would be chosen for the front cover of this report; but, very regrettably, the entire series were so unsatisfactorily out-of-focus, that none were suitable for inclusion anywhere within this report. Other photographs of different horsefly species taken by the author during the survey were likewise not of sufficient quality to be included within this report.

In the absence of any useable photographs of living horseflies from the survey, and considering that it is useful for the reader to have some idea of the general appearance of the horseflies that were found, the author has included some of his old black and white line drawings that illustrate typical examples of each species. With the exception of *Atylotus plebeius* on the front cover, these illustrations are restricted to females only. With most species, females are the sex that is most often encountered in the field. These illustrations were drawn in the early to mid 1990s: most (the illustrations with darkened eyes) were published in a monograph of Yorkshire's horsefly fauna by Grayson (1995).

ILLUSTRATIONS OF ATYLOTUS PLEBEIUS

The male and female illustrated were borrowed from The Manchester Museum and drawn by the author in 1994 and 1993 respectively. The male was taken at Abbots Moss on 20th July 1941 by H. Britten; whereas, the female was found at the adjacent Newchurch Common on 12th July 1942 by H. L Burrows. Thankfully, this rare fly still persists in at least three widely-separated sites in the Cheshire Plain area. It should probably be mentioned that H. Britten would probably be Harry Britten senior, but could possibly have been his son, Harry Britten junior – both men studied Diptera, and were active entomologists at the time.

ILLUSTRATIONS OF FOUR FEMALE HORSEFLIES

Chrysops viduatus (Fabricius) [Square-spot Deerfly]: *Chrysops* species are widely distributed on Cheshire Plain area wetlands. Three species were found during the 2019 survey, of which this was the most numerous, especially in the Delamere Forest.

Haematopota pluvialis (Linnaeus) [Notch-horned Cleg]: this is by far the most numerous tabanid in the Cheshire Plain region, and represented about half the individual horseflies that were found during the 2019 survey. A closely-related species, *Haematopota crassicornis*, was found just once during 2019.

Hybomitra montana (Meigen) [Slender-horned Horsefly]: *Hybomitra* species are widely distributed on Cheshire Plain area wetlands; however, this particular species is very localised; far more so than the other two *Hybomitra* which were found in 2019.

Tabanus autumnalis Linnaeus [Large Marsh Horsefly]: *Tabanus* species are generally infrequent and uncommon on Cheshire Plain mire sites. This was the only *Tabanus* species found during the 2019 survey. It is a recent arrival to the region, having expanded its British range northwards over recent years.

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Including notes on other invertebrates of interest and a full species list

A report to the



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INTRODUCTION

PRINCIPAL AIMS AND PRIORITY SPECIES

The project aimed to satisfactorily bring to a conclusion a programme of extensive surveying for horseflies (Diptera: Tabanidae) on Cheshire Plain area mires and former mire sites that had commenced in 2018 and was the subject of a report by Grayson (2019). The current report should be regarded as both a supplement and a companion to that original report.

Permissions were obtained to visit a large number of Cheshire Plain area mires during 2018, but it was not physically possible to visit them all during the optimum flight-period for most British horseflies; this generally being from the second week in June to mid-July (in a typical year). In the case of sites that were not visited during this optimum period in 2018, the follow-up fieldwork of 2019 aimed to address this inadequacy by re-visiting such mires and their immediate vicinities during this optimum period for the occurrence of adult horseflies.

As was the case with the 2018 survey, the entire horsefly family (Tabanidae) were the priority; and within this group, the two main priority species for the 2019 project remained the same as for the project of 2018, i.e. the horseflies *Atylotus plebeius* (Fallén, 1817) and *Hybomitra lurida* (Fallén, 1817) [respectively, the 'Cheshire Horsefly' and 'Broad-headed Horsefly' of Stubbs & Drake (2001 & 2014)]. A follow-up investigation was needed for *Hybomitra lurida* in particular, as it was not found in the Cheshire Plain region during 2018. The 2019 project aimed to increase the chances of re-discovering this horsefly in the region (if it remained extant) by paying two visits (in the late May to mid-June period) to the extensive tracks of mire habitats which are collectively designated as The Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses Complex SSSI, plus visits to other plausible sites, e.g. Wybunbury Moss, during the same period.

Atylotus plebeius was rediscovered on quaking bogs in three widely-separated localities in the broad Cheshire Plain area during 2018. The 2019 project aimed to include occasional brief visits to these sites, in order to carrying out some degree of monitoring and observations on this diminutive horsefly; but, for the most part, time and effort in 2019 would be given over to trying to discover if *Atylotus plebeius* was present on any additional mires in the Cheshire Plain region, particularly those which contained some areas of quaking bog habitat. The provisional list of sites for further investigation for this species included the aforementioned SSSI complex, and the following mires which were mentioned by Grayson (2019) as being probably the most likely to deserve future investigations for the possible occurrence of *Atylotus plebeius*: Barnsbridge Basin (SJ 5420 7190), Black Lake (SJ 5373 7091), Brackenhurst Bog (SJ 5956 6983), Boggy Pool (SJ 5970 6910), Gull Moss (SJ 6011 6871), Hogshead Moss (SJ 5842 6952), Lily Pool (SJ 5956 6925) and South Moss (SJ 5937 6863).

Aside from Tabanidae, the main priority species for the 2019 survey were the small black hoverfly *Orthonevra intermedia* (Lundbeck, 1916) and the picture-winged crane-fly *Idioptera linnei* Oosterbroek 1992. The mires of the Cheshire Plain region are of national importance to these species; indeed, *Orthonevra intermedia*, is not known elsewhere in Britain. It was added to the British list by Drake (2006) on the basis of specimens taken in the Delamere Forest at Norley Moss and Barnsbridge Basin during 2003. The studies of 2018 (Grayson, 2019), were able to add a further Delamere Forest locality (Black Lake), and two sites in the broad Abbots Moss area (Hogshead Moss and Shemmy Moss).

OUTLYING MIRES WHICH WERE NOT INVESTIGATED IN 2018

The 2019 project was extended to include studies at extra basin mires that are well-disconnected from the main mire-complexes of the broad Cheshire Plain region. These additions included Brookhouse Moss (SJ 8052 6191), which is situated between Sandbach and Congleton. Also included were outlying mires near Wrexham that are known as Llay Bog (featuring a small basin mire at SJ 3223 5539), and Vicarage Moss (which includes two basin mires, centred on SJ 3602 5392 and SJ 4806 3523).

The remaining additional mire sites for investigation during 2019 were situated north or north-east of Warrington. These comprised Highfield Moss (SJ 6135 9560), Holcroft Moss (SJ 6850 9326), and the parts of Risley Moss which were publicly-accessible, including its 'mini-moss' at SJ 6629 9198. The main mossland at Risley Moss is centred on SJ 6695 9190, but there was no permitted access beyond its periphery.

BACKGROUND INFORMATION

The report on the Cheshire Plain area horsefly studies of 2018 by Grayson (2019) included basic notes on the Cheshire Plain and its basin mires, detailed historical background information on the two main target species for the studies (*Atylotus plebeius* and *Hybomitra lurida*), and brief notes on other horseflies which have been recorded in the region. As this background information has already been divulged, it is not repeated in the current report. As planned, the majority of specimens which were taken during the course of the 2018 studies were forwarded by the author to Gary Hedges of the World Museum (Liverpool) in 2019, in order that they could be added to the World Museum collections, and provide vouchers for the records in Grayson (2019).

METHODOLOGY

SUMMARY OF PLANNED FIELDWORK AND AMENDMENTS

The 2019 project was expected to involve a minimum of ten days of fieldwork; this expectation being made upon the unlikely assumption that travelling to and between sites would be entirely unrestricted, ideal hot and sunny weather conditions would be available throughout all survey days, and no unexpected extra time would be needed for fieldwork at any of the sites. As it was very likely that time would be lost due to factors such as unsatisfactory weather conditions, traffic delays, and the need to spend more time onsite than was anticipated at some sites; then it was more likely that twelve days would be the minimum number needed to satisfactorily carry out the necessary fieldwork.

Each survey visit was planned to be spread over two days, with the author travelling to the Cheshire Plain area during the morning of the first day, and returning home during the late evening of the second day, having stayed overnight in the Cheshire Plain region: this approach had worked well during the 2018 survey. All two-day survey periods would be undertaken on the basis that short-term (not later than the evening before a visit) BBC weather forecasts had predicted that both days would be likely to have optimum weather conditions for Tabanidae activity.

Whilst onsite, most fieldwork would be biased towards recording Tabanidae. For most horsefly species, the general, and most practical recording method, would involve the author collecting female horseflies in the vicinity of basin mires, and around their peripheries (in most cases the mires would be too hazardous to cross on foot), having made himself a prime target for female horseflies that were in search of a blood-meal. Becoming a prime target would be achieved by spending as much time as possible (during optimum hot, sunny and still weather conditions) in locations that would be the most likely to attract female horseflies in search of a blood-meal. In addition to the open parts of mires, these locations would include any sheltered 'sun-traps' (such as the wooded peripheries of many mires), and the general flight paths used by many larger horseflies (such as along tracks and roads in wooded areas).

As it was not entirely possible to satisfactorily survey for the main target horseflies *Atylotus plebeius* and *Hybomitra lurida* at all suitable (and potentially suitable) sites during the optimum period in 2018, these species would be particularly looked-for at all such sites that were not able to be satisfactorily investigated during 2018.

The survey of 2018 covered a large number of mires in the Cheshire Plain region; therefore, due to time-constraints, it was inevitable that some sites could only be visited beyond the end of the optimum period for the occurrence of adult Tabanidae. Such mire sites usually produced no horsefly records in 2018; therefore, to correct this deficiency, the 2019 survey planned to re-visit them within the optimum period for Tabanidae activity, i.e. early June to mid July 2019. Most of the mires which required such a re-visit were located in the Delamere Forest.

A detailed programme was worked out for all mire sites which were to be visited during the optimum period for adult Tabanidae activity in 2019. Each site was allocated an expected number of visits, and an anticipated length of survey period during each visit (ranging between half an hour for the smaller mires, and half a day for the most extensive ones). The programme of fieldwork studies for 2019 could only be precisely adhered to if optimum weather conditions persisted throughout the entire, or almost entire, survey period of ten or twelve days.

Unfortunately, inclement weather afflicted much of the optimum period for Tabanidae activity in the Cheshire Plain area during 2019, and was a major impediment to the survey plans. This was particularly so during the first part of the viable survey period for horsefly activity (from mid May through June). Although each two-day field trip was undertaken on the basis that optimum, or near optimum, weather conditions were predicted by short term BBC weather forecasts; the actual weather encountered during many survey days was sub-optimal at best, and sometimes entirely unsuitable for recording Tabanidae. The Cheshire Plain region, and northern and western Britain as a whole, was generally affected by swift-moving Atlantic weather systems throughout the late spring and early summer period: this very much reduced local and regional weather-predicting to guesswork.

The extended period of inclement weather in May and June 2019 caused many amendments to the fieldwork schedule. Plans to visit some outlying basin mires were amended from two visits to one, and many of these single visits had to be made beyond the optimum early June to mid July period. When an early-season survey day was affected by weather that was unsuitable for Tabanidae activity, the survey focus was shifted to other invertebrates of interest, especially the crane-fly *Idioptera linnei*.

On survey days that featured optimum weather conditions, these often alternated with periods of sub-optimum conditions; thereby causing extra time than was initially planned being spent at many sites. This was especially relevant to investigations for the potential occurrence of *Atylotus plebeius* on mires from where it is not known, but may be suitable for its ecology; and mires where it may still be extant, but has not been recorded for many decades.

The next section of this report includes some details of the localities visited; and of the weather conditions during survey periods.

SURVEY DATES AND SITE VISITS

SUMMARY

It was hoped that the first survey visit would take place immediately after support for the project was approved by the Tanyptera Trust on 24th May 2019; however, the following week provided unsuitable inclement weather conditions in the Cheshire Plain area. The first two-day visit was therefore delayed until 31st May and 1st June. These dates were chosen on the basis that the afternoon of 31st May was forecast to be entirely sunny with westerly winds of variable speed, and 1st June was forecast to be a day of light cloud and sunny spells, with temperatures in the high 20s°C. Unfortunately, the actual weather on those days was mainly overcast, and was generally the exact opposite of the optimum conditions required for horsefly activity. A prolonged period of equally unsuitable weather continued through most of June, including much of the next two survey days (18th and 19th June), which were far less conducive to horsefly surveying than weather forecasts of 17th June had predicted. Thereafter, the remainder of the 2019 horsefly season (until early August) provided a general mixture of weather conditions, including a few days of optimum weather for horsefly activity. The generally sub-standard weather of the earlier part of the horsefly season in the Cheshire Plain region caused much cancellation and postponement of planned visits to outlying mires.

31st MAY

The survey commenced with visits to the following Delamere Forest mires: **Linmere (south)**, **Linmere (north)**, **Hockenhull** and **Black Lake**. These sites were investigated between 13.04 and 15.32, initially in overcast humid conditions with occasional brief sunny breaks through the cloud, and a light to moderate breeze at 20°C; soon becoming fully overcast with a fresh cool breeze. A trip was then made to the broad Abbots Moss area, and two further mires were investigated. Firstly, **Hogshead Moss** was visited between 16.02 and 16.45, in generally hot and sunny but very windy conditions; and lastly, **South Moss** was investigated from 18.07 until the approach of dusk, during generally overcast and windy conditions.

1st JUNE

Today was earmarked for visits to the Whixall area mosses complex (principally to look for *Hybomitra lurida*) and the Vicarage Moss and Llay Bog mires; however, the weather conditions were simply unsuitable for horsefly activity, feeling fresh, still and overcast, with occasional showers. As an alternative study, the mires on Little Budworth Common were visited (at 11.00: 16°C), principally to investigate if *Idioptera linnei* was present: this investigation proved successful. The mires on Little Budworth Common were visited in the following order: **Whitehall Moss**, **East Moss**, **Central Moss** and **North Moss**. Investigations at Little Budworth Common were abandoned when the overcast sky started to produce drizzle at 13.25 (reading 20°C, but feeling much cooler). Studies moved to the Abbots Moss area, where visits were made to **Shemmy Moss** and **Gull Moss**. Weather conditions continued to deteriorate, becoming very dull and humid under an overcast sky; and with no prospect of an improvement before nightfall, the day's surveying was abandoned at 15.48.

18th JUNE

Visits were made to three outlying mire sites in the Warrington area. These sites had not been previously investigated by the author; therefore, surveying was a mixture of reconnaissance work and invertebrate recording. Fieldwork commenced somewhat later than was anticipated due to an unexpected road closure and related traffic jam which prevented access to Holcroft Moss at midday; therefore, the first site to be visited was **Risley Moss**. This was investigated between 13.01 (20°C) and 15.01 (22°C), under weather conditions which did not reflect the temperature readings, being high overcast with poor light-intensity, and generally feeling cool. **Holcroft Moss** was reached via a long detour, and was surveyed between 16.05 and 17.39. The local weather during this period was humid under a high overcast sky, which produced very dull and cool conditions that felt nowhere near the measured temperature of 20°C. **Highfield Moss** was investigated between 18.15 and 19.57 under very similar conditions to those that were encountered at Holcroft Moss.

19th JUNE

The day began dull and overcast after much rainfall overnight, with the forecast being for a generally overcast, dull and cool day, which would generally not be conducive for horsefly activity; except, perhaps, during some of the predicted brief sunny breaks. The forecast proved quite accurate; nevertheless, some useful fieldwork was able to be completed, including the discovery of *Hybomitra montana* at **Whitehall Moss** on Little Budworth Common, this being the first site to be visited (09.54 to 11.13), in generally still, cool and overcast conditions (16°C at 10.05); but with occasional sunny breaks when warm humid conditions occurred. The remainder of the day was mainly humid under a high overcast sky, with some sunny breaks and periods of hazy sunshine, and temperatures ranging between 18°C and 23°C. After investigations at **East Moss**, **Central Moss** and **North Moss** on Little Budworth Common, a trip was then made to the Abbots Moss mire-complex (where **Shemmy Moss**, **South Moss**, **Gull Moss** and **Gull Pool** were investigated), and then Delamere Forest (where visits were made to the mires at **Hockenhull**, **Black Lake**, **Basin Mire N1** and **Basin Mire N2**). Despite being far from ideal for recording horseflies, the day provided a few successes.

SURVEY DATES AND SITE VISITS

2nd JULY

Visits were made to the three outlying mire sites in the Warrington area, in the hope that weather conditions would be at least partly conducive for Tabanidae recording. The day was affected by a moderately-strong cool north-westerly breeze, and variable cloud that was generally high overcast, with some sunny breaks which provided optimum conditions for horseflies in any areas that were sheltered from the breeze. Such sheltered areas mainly occurred at **Risley Moss**, which was visited between 13.11 and 14.31. **Highfield Moss** was visited between 15.04 and 17.12, followed by **Holcroft Moss** between 17.33 and 18.55. Measured temperatures throughout the survey periods varied between 18°C and 20°C.

3rd JULY

The day provided a reasonable amount of optimum weather conditions for the recording of adult horseflies. These generally perfect conditions were interspersed by periods of variable cloud. Winds were generally light, but periodically approached moderate strength. All sites visited were in the broad Abbots Moss and Delamere Forest areas, commencing with a visit to the **Newchurch Common** area at 10.00. Temperature readings were taken upon arrival and departure at each mire site. These were generally 20°C, but varied between 17°C and 22°C. **Lily Pool** was visited between 11.18 and 12.30, which unfortunately coincided with a mainly cloudy period. **Shemmy Moss** was investigated during optimum conditions between 12.40 and 13.37; followed by **Hogshead Moss** in part-cloudy conditions between 13.44 and 14.03. A trip was then made to Delamere forest, where optimum conditions prevailed in most areas that were investigated. The following time-periods were spent at the following Delamere Forest mires (or in their close proximity): **Harthill (upper basin)** (14.31 to 14.53), **Finney's Moss** (14.58 to 15.40), **Harthill Moss** (15.44 to 15.58), **Barns Bridge** (16.18 to 16.30), **Barnsbridge Flushes** (16.33 to 16.48), **Basin Mire A07** (16.52 to 17.09), **Basin Mire A01b** (17.12 to 17.20), **Basin Mire A06** (17.25 to 17.38), **Rush Pool** (17.47 to 17.53), **Barnsbridge Basin** (17.55 to 18.23), and the three closely-approximated mires at Ham [**Ham Pool**, **Ham (lower basin)** and **Ham (upper basin)**] (18.30 to 18.45). A final ten-minute period of recording was carried out along a forestry road west of the basin mires known as N1, N2 and N3 (18.48 to 18.58), by which time, the day's Tabanidae activity had ceased.

22nd JULY

Visits were made to the three outlying mire sites in the Warrington area in the hope that it would be 'third time lucky' with regard to encountering optimum hot, sunny and still weather conditions, whilst being onsite in all three localities; but, unfortunately, the Tabanidae recording effort was again thwarted by sub-optimum conditions; principally, a very strong westerly breeze, which only began to abate when temperatures cooled during the evening. Temperature readings were taken six times between 12.43 and 16.59. These varied between 26°C and 27°C only; however, these temperature readings were misleadingly irrelevant due to the continuous strong cool wind. **Risley Moss** was visited between 12.43 and 13.55; **Highfield Moss** was visited between 14.14 and 16.11; and **Holcroft Moss** was visited between 16.50 and 18.12.

23rd JULY

The day provided continuous optimum weather conditions for recording Tabanidae; however, the opportunity for recording during the morning and early afternoon was lost, as the author was not able to be in the Cheshire Plain area, having been unexpectedly required to return home on 22nd July for immediate treatment following notification of a positive test for Lyme disease. Surveying therefore began rather later than was planned with a visit to **Thieves Moss and Thieves Pool** between 13.51 and 15.09. The temperature upon arrival and departure from this site was 28°C. Weather conditions during the day's full survey period between 13.51 and 20.48 were rather consistently hot and sunny, with a general temperature of 30°C: the maximum reading being 31°C at 17.52. The nearby Delamere Forest was then visited, specifically the following mires (arrival times are given in parentheses): **Blain's Moss** (15.19), **Basin Mire N2** (15.43), **Basin Mire N1** (15.52), **Hatch Mere** (16.25), **Basin Mire N3** (17.29), **Ham (lower basin)** (17.52), **Ham Pool** (18.05), **Ham (upper basin)** (18.16), **Rush Pool** (18.39) and **Barnsbridge Basin** (19.10). To end the day's surveying, the Abbots Moss and Little Budworth Common areas were visited, with relatively brief visits being made to **Hogshead Moss** (19.29 to 19.37), **Lily Pool** (19.42 to 19.54) and **Whitehall Moss** (20.14 to 20.48).

24th JULY

With the prospect of mainly optimum weather conditions, a trip was made to the Whixall area mosses complex, where it was planned to generally spend time investigating areas of mire which were not looked at in 2018. Surveying began at 11.27 in hot, sunny, humid conditions, with light cloud and light breezes, at 23°C. Cloud-cover gradually increased to give overcast conditions by mid afternoon; but this was a hot and humid day throughout, becoming very hot (31°C) when sunny conditions returned shortly before the cessation of surveying on the Whixall area mosses complex at 17.35. The following areas were investigated: the western and central areas (11.27 to 12.03) and eastern and central areas (14.02 to 15.05) of **Whixall Moss**, the western part of **Fenn's Moss** (12.04 to 13.35), and the English (15.27 to 16.22) and Welsh (16.23 to 17.35) parts of **Bettisfield Moss**. To conclude the day's fieldwork, two mires on Little Budworth Common (**East Moss** and **Central Moss**) were investigated in sultry conditions under hazy sunshine (25°C) between 18.43 and 19.48.

SURVEY DATES AND SITE VISITS

25th JULY

With the weather forecast predicting optimum oppressively-hot conditions (albeit with the risk of thundershowers), a trip was made to the outlying Cheshire Plain mires near Wrexham at Llay Bog and Vicarage Moss. Surveying in the **Llay Bog** area began at 11.01, in hot, sunny, still conditions, measuring 27°C; the sky being mainly blue, with a few light clouds. Weather conditions remained similar, and were consistently hot throughout the survey period, which ended at 13.26; by which time the temperature had risen to 32°C. The open area of basin mire at Llay Bog occupies a relatively small area of 'the bog wood' (see page 18), and is only reachable via a walk of several hundred metres through sometimes difficult terrain; therefore, most survey time was spent in areas surrounding and nearby the basin mire, rather than on the mire itself. The **Vicarage Moss** area was investigated between 14.25 and 17.43; although, most actual survey time was during the latter part of this period, when sunny breaks provided hot and sultry conditions, with temperatures reaching 32°C. The earlier part of the survey period was affected by deluges caused by local thunderstorms; this, coupled with the fact that the two basin mires at Vicarage Moss proved difficult to access, meant that almost all fieldwork was carried out after 15.47.

2nd AUGUST

This was a consistently humid day, which featured a mixture of sunshine and showers during most travel periods between the sites which were visited; but, no rainfall was encountered whilst the author was in the field. The **Brookhouse Moss** area was visited first, during mainly optimum hot and sunny weather conditions (24°C) between 13.31 and 15.20. The main basin mire at Brookhouse Moss was investigated between 13.48 and 14.50. A trip was then made to **Wybunbury Moss**; where, unfortunately, the hot and sunny optimum weather conditions (25°C) that were encountered upon arrival at the site were soon mainly replaced by long gloomy periods where the Sun was obscured by slow-moving dark clouds. The Wybunbury Moss area was investigated between 15.50 and 18.00, with the basin mire being looked at between 16.27 and 15.35. To conclude the days' fieldwork, a visit was made to the Abbots Moss area, where **South Moss** and **Shemmy Moss** were investigated during alternating periods of sunshine and dark cloud between 18.57 (at 23°C) and the approach of dusk.

3rd AUGUST

This, the final survey day of the study, was mainly spent in the Delamere Forest, and was somewhat disappointing weather-wise. Tabanidae proved scarce, which was unsurprising given the general gloominess of the day, and the late point of the local Tabanidae season. It was noticeable that most of the mires in the Delamere Forest were holding much more water than had been the case during the dry summer of 2018. The first to be visited was **Black Lake**, which was investigated during a 45-minute period of hazy sunshine and light breeze from 10.02 (at 19°C). Optimum conditions then prevailed for visits to the following Delamere Forest mires (arrival times and temperatures upon arrival are given in parentheses): **Basin Mire LM09** and the adjoining **Basin Mire LM10** (10.51: 20°C), **Hockenhull** (11.42: 22°C), **Blakemere Moss** (12.00: 22°C) and **Linmere Moss (north)** (12.37: 23°C). Due to a new lock on a forest gate in the eastern part of Delamere Forest, the basin mires at **Harthill (upper basin)**, **Finney's Moss** and **Harthill Moss** had to be reached on foot from the main visitor car park at Whitefield. This journey began in optimum conditions at 12.37 (at 23°C); however, weather conditions were changing, and soon became hazy, then progressively duller and overcast, albeit remaining humid. The last three basin mires were visited in gloomy overcast humid conditions at 23°C. Arrival times for these sites were: **Flaxmere Moss**, 14.34; **Barnsbridge Basin**, 15.12; and **Shemmy Moss**, 17.15. Surveying was curtailed for the day at 18.55, as light-intensity failed to improve, and dusk was approaching.

OVERVIEW OF SITE VISITS AND WEATHER CONDITIONS

With the exception of a few mires on the land of Cheshire Scouts' Forest Camp Activity Centre, visits were able to be made to all mire sites that were earmarked for investigation during the season for adult Tabanidae. Some good results were achieved by this fieldwork, despite the earlier part of the season being affected by undesirable inclement weather conditions more often than not, and optimum conditions mainly being available only at the latter end of the season.

A pre-survey schedule was carefully planned. This covered which sites were to be visited, when visits would take place, and the expected duration of each visit. In order for the plans to be successfully enacted, the availability of optimum weather conditions (hot, sunny and still, or with slight breezes) during the periods for which visits were planned was essential. Unfortunately, the earlier part of the season was not only afflicted by unsatisfactory weather conditions, but short term (the day before a visit) BBC weather forecasts were often inaccurate, as the weather proved very difficult to predict, and often deteriorated beyond what was expected. This caused much alteration to the survey plans, and meant that it was not feasible to visit many outlying sites until the back end of the survey period, which was beyond the local flight-period for many Tabanidae species.

OPPORTUNITIES FOR FURTHER STUDY

It was hoped that the 2019 project could successfully conclude that of 2018 (Grayson, 2019); however, copious opportunities still remain available for further useful studies on the horsefly fauna of the Cheshire Plain region. Several sites require further investigation for the possible occurrence of *Atylotus plebius* or *Hybomitra lurida*, and several sites remain much understudied.

LOCALITIES

INTRODUCTION

The localities (mainly basin mires) that are featured in this section of the report (pages 6 to 22) are generally presented in the order that they are listed at the head of Appendix 3 (the combined spreadsheet of data for 2018 and 2019). The central locations of these localities within the broad Cheshire Plain region are shown by a combination of plans on pages 44 to 49 (Appendix 1) of this report, and pages 48 to 55 (Appendix 1) of the baseline report for 2018 (Grayson, 2019).

This section of the report aims to give some rudimentary habitat-descriptions for localities that were first visited in 2019. Habitat-descriptions are not usually given for sites that were being re-visited in 2019 (those basin mires and other wetlands that were first visited in 2018), as such sites were covered on pages 5 to 25 of the report for 2018 (Grayson, 2019).

Assembling a series of habitat photographs that were of sufficient quality to include in this section of the report was itself rather challenging during 2019, as many days were affected by periods of weather that were very gloomy and overcast, which made photography impractical. Consequently, some of the photographs that are shown in this section of the report are of sub-standard quality; and others, e.g. those taken in the Ham area of Delamere Forest (page 12), although taken during warm sunny periods when Tabanidae were active, were taken at sub-optimum times of day, in this case approaching dusk.

It should be noted (particularly in the case of the larger and more-mobile horseflies such as *Hybomitra bimaculata* and *H. distinguenda*) that the actual capture points for many individuals recorded during the survey was in the sun-traps that are provided by sheltered open areas within woodlands. These sunny sheltered open areas not only included the margins of many basin mires, but also (and often especially) nearby clearings and forestry roads. Such places usually offer the best opportunities to record female horseflies in search of a blood-meal. This section of the report includes photographs of some forestry roads and clearings that proved especially productive in terms of the capture and recording of female horseflies in 2019.

ABBOTS MOSS COMPLEX MIRES

Investigations during 2019

Gull Pool (SJ 6009 6883) was visited briefly during very gloomy conditions on 19th June. Its boggy southern margins with thick *Sphagnum* were much wetter than in 2018, and proved fairly inaccessible. **Lily Pool** (SJ 5956 6925), which lies adjacent to the Forest Camp Activity Centre car park, features seemingly high quality quaking bog that may support *Atylotus plebeius*. This rare fly was not found at Lily Pool during the author's two visits during 2019 (on 3rd and 23rd July); however, another rare Cheshire Plain area speciality, the hoverfly *Orthonevra intermedia*, was found to be present at Lily Pool on 3rd July.

Investigations during 2018

Gull Pool and Lily Pool were subject to short visits on 7th June and 8th August. The southern margin of Gull Pool was also investigated in a brief fashion on 5th July.



Gull Pool (19th June)



Lily Pool (3rd July)

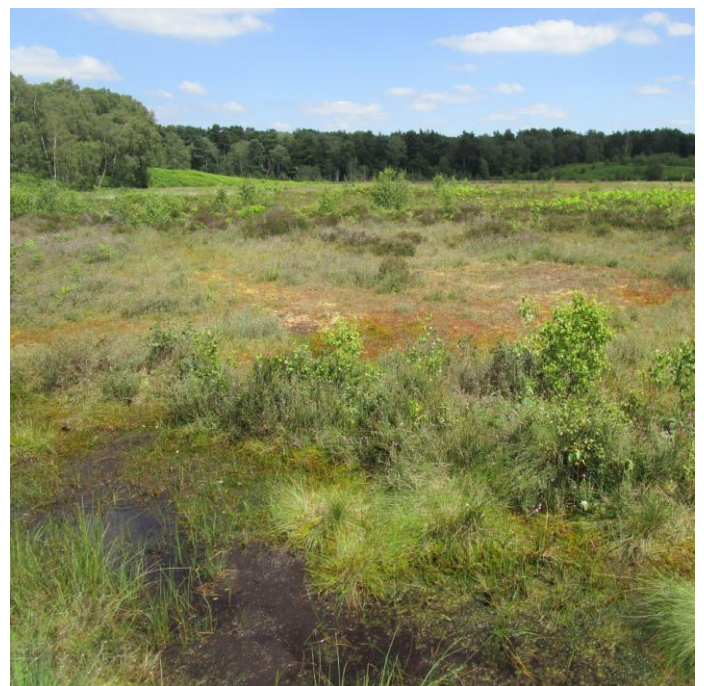
ABBOTS MOSS COMPLEX MIRES

Investigations during 2019

The areas of quaking bog that occur at **Gull Moss** (SJ 6011 6871) and **South Moss** (SJ 5937 6863) were investigated principally for the possible occurrence of *Atylotus plebeius*. These investigations were generally carried out in sub-optimal weather conditions, and *A. plebeius* was not found. Gull Moss was visited on 1st and 19th June. South Moss was visited on 31st May, 19th June and 2nd August. Survey time in the Abbots Moss area was biased towards these sites rather than **Shemmy Moss** (SJ 5949 6892), which was visited briefly on 1st and 19th June, 3rd July and 2nd August. A visit to **Newchurch Common** (SJ 6055 6894) on 3rd July was restricted to an exercise in catching Tabanidae along the road which bisects the two large lakes (illustrated by the photograph).

Investigations during 2018

Gull Moss was visited on 7th June and 5th July. Shemmy Moss was visited on twelve occasions; however, most visits were rather brief affairs that were principally in order to service a Manitoba trap that was erected at Shemmy Moss for the duration of the 2018 summer. The dates of the visits were: 7th, 9th, 10th, 14th, 23rd, 27th and 30th June; 5th, 14th and 25th July; 7th August and 12th September. South Moss was investigated on 7th, 14th, 27th and 30th June; 5th and 25th July; and 7th August. Newchurch Common (especially the margins of its two large fishing lakes) was visited on 8th August.

**Gull Moss** (1st June)**Shemmy Moss** (7th June)**South Moss** (31st May)**Newchurch Common** (3rd July)

DELAMERE FOREST MIRES

Investigations during 2019

The basin mires of the Delamere Forest were investigated rather less than was anticipated due to unsuitable weather conditions causing havoc with the overall project plans for 2019. The general presentation of the following accounts of investigations at Delamere Forest mires and their environs during 2019 is mainly by alphabetical order of the sites.

The four localities shown on the photographs below were visited briefly on one occasion only (3rd July). Although suffering from a lack of water, the basin mire known as **Barnsbridge Basin** (SJ 5420 7190) was potentially of special invertebrate-interest, and deserved additional visits. Due to raised water-levels on 3rd July, it was impractical (and generally dangerous) to enter the basin mires at **Basin Mire A01b** (SJ 5357 7211) (which is part of the Alvanley group of mires), **Barns Bridge** (SJ 5411 7172), and **Barnsbridge Flushes** (SJ 5398 7182): therefore, Tabanidae were only collected along sections of forestry road beside these sites.

Investigations during 2018

The basin mire at Barns Bridge was visited on 4th, 5th, 25th and 26th July. The basin mires at Barnsbridge Flushes, Barnsbridge Basin and Basin Mire A01b were visited on 25th and 26th July.



Barns Bridge (3rd July)



forestry road beside Barnsbridge Flushes (3rd July)



Barnsbridge Basin (3rd July)



Basin Mire A01b (3rd July)

DELAMERE FOREST MIRES

Investigations during 2019

The rather self-contained **Basin Mire A06** (SJ 5386 7202) and sprawling **Basin Mire A07** (SJ 5375 7197) are part of the Alvanley group of mires in the north-western quarter of Delamere Forest. These recovering mires were visited somewhat briefly on 3rd July. Most of the Tabanidae catches from these visits were from the sections of forestry road that run alongside Basin Mire A06 and Basin Mire A07, rather than on the margins of these mires. Both mires held considerably more water than was the case during visits which were made during the drought of 2018.

The conjoined **Basin Mire LM09** (SJ 5379 7109) and **Basin Mire LM10** (SJ 5387 7111) are situated in the south-western part of Delamere Forest, being part of the Little Midgel group of mires. Their peripheries were investigated on 3rd August, during a period of optimum conditions for horsefly activity.

Investigations during 2018

Basin Mire A06 and Basin Mire A07 were investigated on 25th and 26th July. Basin Mire LM09 and Basin Mire LM10 were investigated on 30th June and 25th July.



Basin Mire A06 (3rd July)



Basin Mire A07 (3rd July)



Basin Mire LM09 (3rd August)



Basin Mire LM10 (3rd August)

DELAMERE FOREST MIRES

Investigations during 2019

The north-eastern corner of Delamere Forest contains the Norley/Hatch Mere group of mires, the most prominent being **Basin Mire N1** (SJ 5497 7212), **Basin Mire N2** (SJ 5502 7208) and **Basin Mire N3** (SJ 5492 7205). Basin Mire N1 (just visible in the centre right of the photograph below) is a valley bottom bog that is connected to, and runs into, the large peaty pool with patches of rushes that is known as Basin Mire N2. Basin Mire N3 (a deep flooded natural amphitheatre with a central raft of floating *Sphagnum*) is situated near the top of a hill on the western side of basin mires N1 and N2. No Tabanidae were found in this part of the Delamere Forest during the 2018 survey, principally because it was not visited until 26th July, by which time the local Tabanidae season had ended (unusually early). No Tabanidae were found also on the first visit to this area in 2019 (on 19th June), which was unsurprising due to sub-optimum weather conditions. The second visit (on 23rd July 2019) produced *Chrysops caecutiens*, *Chrysops viduatus* and *Hybomitra bimaculata*: these were mainly taken on forestry roads near the basin mires.

Investigations during 2018

The margins and close environs of Basin Mire N1, Basin Mire N2 and Basin Mire N3 were investigated on 26th July. Basin Mire N2 and its southern approach forestry road were also investigated briefly on 8th August.



Forestry road and clearing beside Basin Mire N1 (23rd July)



Basin Mire N2 (23rd July)



Basin Mire N3 (23rd July)



forestry road west of N1, N2 and N3 (23rd July)

Investigations during 2019

Black Lake (SJ 5373 7091), specifically its extensive marginal quaking bog habitat, was of special interest to the project. It was visited on three occasions (31st May, 19th June and 3rd August). Unfortunately, none of these visits coincided with optimum consistently hot and sunny weather conditions, and the species list obtained was inevitably impoverished. The degraded, but recovering, **Blakemere Moss** (SJ 5469 7120), was visited just once (a brief investigation of its central-southern margin on 3rd August). Another recovering basin mire, **Blain's Moss** (SJ 5525 7177), was also visited on just one occasion (23rd July). The open mire habitat at **Hatch Mere** (SJ 5521 7206) was likewise visited on just one occasion (also 23rd July).

Investigations during 2018

Manitoba traps were placed at Black Lake and Blakemere Moss for the duration of the 2018 summer; therefore, these sites were subject to a relatively-large number of visits, as the contents of the traps needed to be emptied on a regular basis. Ten visits were made to Black Lake and Blakemere Moss, these being on identical dates (7th, 10th, 14th, 23rd and 30th June; 4th, 14th and 25th July; 7th August and 12th September). Blain's Moss was visited on 14th and 23rd June, and 4th and 5th July. Hatch Mere was visited on 14th June and 5th July.



Black Lake (31st May)



Blain's Moss (23rd July)



Blakemere Moss (3rd August)



Hatch Mere (23rd July)

DELAMERE FOREST MIRES

Investigations during 2019

In 2018, the north-eastern corner of Delamere Forest was not visited until 26th July; by which time, the local horsefly season had ended unusually early. The basin mires which occur in the north-eastern corner area of Delamere Forest were therefore able to be assessed in a basic fashion in 2018, but there was a gap in record-coverage, as no Tabanidae were recorded. One objective in 2019, was to correct this deficiency by revisiting the Ham group of mires, and the Norley/Hatch Mere group of mires (see page 10), in the hope that at least some Tabanidae would be recorded. This objective was particularly successful with *Chrysops* females at Ham on 23rd July 2019, when 12 *Chrysops viduatus* and 3 *Chrysops caecutiens* were recorded as the shadows lengthened towards evening. This was in stark contrast to an unproductive recording session in the same area three weeks earlier (on 3rd July 2019). The Ham series of basin mires comprise **Ham Pool** (SJ 5459 7204), which is a small heavily-shaded peaty pool at the top of a slope, and the mires known as **Ham (lower basin)** (SJ 5467 7205) and **Ham (upper basin)** (SJ 5467 7193): these are situated either side of a forestry road at the bottom of the slope that descends from Ham Pool.

Investigations during 2018

The Ham series of mires were visited on just one occasion (26th July 2018).



Ham Pool (23rd July)



forestry road at Ham (23rd July)



Ham (lower basin) (23rd July)



Ham (upper basin) (23rd July)

DELAMERE FOREST MIRES

Investigations during 2019

Two visits were made to the Hart Hill part of Delamere Forest in order to investigate the horsefly fauna of its three basin mires and their environs. A car was used to travel between these mires on 3rd July; but they had to be accessed via foot on 3rd August, due to a new lock on the forest entrance gate at Whitefield car park. During the dry summer of 2018, it was possible to walk on most of **Finney's Moss** (SJ 5596 7155), as it was devoid of open water, and was covered instead by alternating areas of bare open wet peat and patches of rushes. In 2019, these areas were covered by open water, and were therefore inaccessible. The surfaces of the basin mires known as **Harthill Moss** (SJ 5633 7142) and **Harthill (upper basin)** (SJ 5600 7108) had standing water and were equally inaccessible in both 2019 and 2018. 3rd July 2019 provided optimum conditions in which to encounter female horseflies in search of a blood-meal; therefore, it was unsurprising that several species were encountered at the margins of the aforementioned Hart Hill area basin mires, or in open sunny areas in close proximity of the mires, and especially along nearby forestry roads, where the haul of species included *Hybomitra bimaculata* and *Hybomitra distinguenda*.

Investigations during 2018

The Hart Hill area of Delamere Forest was investigated on just one occasion (26th July 2018).



Finney's Moss [eastern end] (3rd July)



Harthill Moss [southern end] (3rd July)



Harthill (upper basin) (3rd July)



open area near Harthill (upper basin) (3rd July)

DELAMERE FOREST MIRES

Investigations during 2019

The basin mires known as **Hockenhull** (SJ 5421 7094), **Linmere Moss (north)** (SJ 5469 7070) and **Linmere Moss (south)** (SJ 5451 7054), are located in the south-central part of Delamere Forest; whereas, **Rush Pool** (SJ 5435 7195) is in the north-central part. Much restoration work has been carried out at the south-central basin mires during recent years, including blocking drains to help restore Linmere Moss (north) and Linmere Moss (south). Recent restoration work at Hockenhull has included breaking the mire into sections by using a network of raised embankments made of peat, in addition to the blocking of drains. All visits to these four sites during 2019 were somewhat brief. Linmere Moss (north) was investigated on 31st May and 3rd August; whereas, Linmere Moss (south) was looked at very briefly on 31st May only. Hockenhull was investigated on 31st May, 19th June and 3rd August. At Rush Pool, Tabanidae were mainly collected along the forestry road at its southern edge (visits on 3rd and 23rd July).

Investigations during 2018

Linmere Moss (north) was investigated on 10th June, and 5th and 25th July. Linmere Moss (south) was visited briefly on 26th July and 8th August. Hockenhull was investigated on 30th June, and 5th and 25th July. Rush Pool and its immediate environs were investigated on 25th and 26th July. The report for 2018 (Grayson, 2019) featured a photograph of Rush Pool on page 16.



Hockenhull (19th June)



Linmere Moss (north) (3rd August)



Linmere Moss (south) (31st May)



forestry road beside Rush Pool (23rd July)

LITTLE BUDWORTH COMMON MIRES

Investigations during 2019

The special invertebrate interest of Little Budworth Common is concentrated on its four fairly closely approximated, but separated, mires; that are known as **Central Moss** (SJ 5850 6574), **East Moss** (SJ 5859 6570), **North Moss** (SJ 5842 6585) and **Whitehall Moss** (SJ 5878 6580). These were not a priority target for investigations during the 2019 survey, which endeavoured to plan occasional brief visits only, principally in order to monitor *Atylotus plebeius* activity. The four mires were all investigated on 1st and 19th June, the first visit being principally to search for the crane-fly *Idioptera linnei*, which was found in numbers on North Moss, and also occurred on Whitehall Moss. The visit of 19th June recorded *Atylotus plebeius* at Whitehall Moss, and more-interestingly, as it was new to the site, *Hybomitra montana*. *Atylotus plebeius* was also recorded during very brief visits during the sultry late evenings of 23rd July (to Whitehall Moss only) and 24th July (to East Moss and Central Moss only).

Investigations during 2018

All four mires were visited briefly on 10th and 27th June, with *Atylotus plebeius* being found on East Moss, Central Moss and Whitehall Moss on both dates. These three mires were also investigated on 7th August, which was beyond the end of the local horsefly season in 2018. *Atylotus plebeius* was not found on North Moss, which was investigated on 10th and 27th June only.



Central Moss (24th July)



East Moss (24th July)



North Moss (1st June)



Whitehall Moss (19th June)

MISCELLANEOUS DELAMERE AREA MIRES

Investigations during 2019

In addition to the numerous mires illustrated on the preceding pages and described in more detail in the report for 2018 (Grayson, 2019), the Delamere area has several other outlying basin mires. Three such mires were visited during 2019. With the exception of hot and sunny weather during an investigation at **Thieves Moss and Thieves Pool** (SJ 5648 6906) on 23rd July, the two other miscellaneous Delamere area mires were visited in rather sub-optimal conditions, especially **Flaxmere Moss** (SJ 5565 7229), which was visited on 3rd August: the swampy marsh shown below is adjacent to its mire habitat. **Hogshead Moss** (SJ 5842 6952) was investigated on 31st May (when the Nationally Scarce robberfly *Lasiopogon cinctus* was found), and on 3rd and 23rd July. Hogshead Moss possesses very challenging mire terrain that is mainly inaccessible on foot. It is, however, a quick and easy site to reach, as it lies very close to a quiet public road, with ample areas to park nearby a path which passes close to the mire.

Investigations during 2018

Fairly unproductive visits were made to Flaxmere Moss on 14th June, and Thieves Moss and Thieves Pool on 7th and 8th August. Hogshead Moss proved to be much more fruitful. It was investigated fairly briefly on 9th and 10th June, and 25th July. The finds at Hogshead Moss included such national rarities as the crane-fly *Idioptera linnei* and the hoverfly *Orthonevra intermedia*.



Flaxmere Moss [swampy marsh] (3rd August)



Hogshead Moss (3rd July)



Thieves Moss (23rd July)



Thieves Pool (23rd July)

BROOKHOUSE MOSS AND WYBUNBURY MOSS

Investigations during 2019

Brookhouse Moss (SJ 8052 6191) and **Wybunbury Moss** (SJ 6965 5021) are situated in the southern part of Cheshire, being well-separated from the main block of Cheshire mires in the Delamere Forest and Abbots Moss areas, and the block of mires on the Denbighshire/Shropshire border. Two visits were planned for both sites in the late May to mid July period; but unsuitable weather caused changes to the survey plans, and the sites were visited once only, on 2nd August. This late visit to Wybunbury Moss recorded *Atylotus plebeius*. The visit to Brookhouse Moss established that at least one of the larger horseflies occurs there (a female briefly encircled the author, but was not able to be captured for identification purposes). These are both mires of interest for Tabanidae. Both have been impoverished by drainage, but Wybunbury Moss still retains a small area of genuine quaking bog, and Brookhouse Moss has small areas of semi-quaking habitat on its western part, and along its central drain.

Investigations during 2018

Brookhouse Moss was not visited during 2018. Wybunbury Moss was visited on 24th and 25th June. This proved to be a very successful investigation which produced six horsefly species, including *Atylotus plebeius*.



Brookhouse Moss [semi-quaking Bog] (2nd August)



Brookhouse Moss [eastern end] (2nd August)



Wybunbury Moss [quaking bog] (2nd August)



Wybunbury Moss [western margin] (2nd August)

LLAY BOG

Investigations during 2019

Survey plans for 2019 included two visits to the basin mire and bog woodland at **Llay Bog** (SJ 3223 5539) near Wrexham in Denbighshire during the late May to mid July period; however, delays to the survey programme (caused by problematic weather), meant that only a single visit was possible: this took place on 25th July, by which time the only horsefly present was *Haematopota pluvialis*. This species proved quite plentiful throughout the Llay Bog area on the day of the visit, and it is very likely that several other species of Tabanidae will also occur. At the time of the survey visit, the open area of *Sphagnum*-dominated basin mire habitat at Llay Bog was restricted to a small clearing within the eastern end of the bog woodland block. Incidentally, this block is known locally as ‘the bog wood’. It was very difficult to access, except at its eastern end, the remainder being very waterlogged and inaccessible. The western end of ‘the bog wood’ featured drains and areas of marshland. A small section of drain and marsh (from the north-western corner of ‘the bog wood’) is shown in the bottom-left photograph below.

Investigations during 2018

Llay Bog was not investigated during 2018.



Llay Bog [basin mire] (25th July)



Llay Bog [bog woodland] (25th July)



Llay Bog [drain and marshland] (25th July)



Llay Bog [field on south side of the bog wood] (25th July)

VICARAGE MOSS

Investigations during 2019

It was planned to make two visits to the basin mires of **Vicarage Moss** near Wrexham in Denbighshire during the late May to mid July period. Unfortunately, the weather had other ideas; therefore, only a single visit was possible: this occurred on 25th July, by which time, the only horsefly present was *Haematopota pluvialis*. This cleg was found in small numbers at Vicarage Moss and its broad surrounding areas. Other Tabanidae must surely occur: further visits are desirable. There are two basin mires at Vicarage Moss, plus a 'small raised basin' (not a dew pond) that would possibly have been mire habitat historically, but is now dominated by coarse grasses. The main (north) basin mire of Vicarage Moss was covered by a typical range of mire plants, alternating with robust tussocks, and scattered invasive scrub. Its wettest parts were around the drains of its wooded periphery. Although slightly treacherous in parts, the main (north) basin mire was not truly quaking. The smaller (south) basin mire was likewise not truly quaking, but required care to cross, and contained a healthy covering of *Sphagnum* and other typical bog plants.

Investigations during 2018

Vicarage Moss was not visited during 2018.



Vicarage Moss (north basin mire) [eastern end] (25th July)



Vicarage Moss (north basin mire) [southern end] (25th July)



Vicarage Moss (south basin mire) (25th July)



Vicarage Moss (small raised basin) (25th July)

HIGHFIELD MOSS AND HOLCROFT MOSS

Investigations during 2019

The South Lancashire (vice-county 59) basin mires at **Highfield Moss** (SJ 6135 9560) and **Holcroft Moss** (SJ 6850 9326) were investigated on three occasions (18th June, 2nd and 22nd July); but, unfortunately, these visits failed to coincide with optimum weather conditions for Tabanidae activity. It is likely that several horsefly species occur at both sites, but sub-optimal conditions produced just *Haematopota pluvialis*. This common cleg was easily-encountered on all three visits to Holcroft Moss; but proved hard to find at Highfield Moss, where it was found in small numbers on 22nd July only. Both these sites are fairly easily-accessible, but only via off-road paths and tracks; and both sites were found to be adversely-affected by drainage at the times of the visits. Highfield Moss retained some patches of wet mire habitat around its two central pools, but was otherwise very well-drained towards its southern and western margins, as was evident by the speed of water-flow off the mossland on 18th June. With very little exception, the expanse of open mire habitat at Holcroft Moss was quite dry on all three visits during 2019.

Investigations during 2018

Highfield Moss and Holcroft Moss were not investigated during 2018.



Highfield Moss [central area] (2nd July)



Highfield Moss [drain at margin] (18th June)



Holcroft Moss [north-east corner] (2nd July)



Holcroft Moss [north-west corner] (2nd July)

RISLEY MOSS

Investigations during 2019

Three visits were made to **Risley Moss** Local Nature Reserve in vice-county 59 (South Lancashire). This extensive site was a late addition to the survey programme for 2019, but proved a fruitful one for Tabanidae, as six species were recorded (*Chrysops relictus*, *Haematopota crassicornis*, *H. pluvialis*, *Hybomitra bimaculata*, *H. distinguenda* and *Tabanus autumnalis*). Visits were made to Risley Moss on 18th June, and 2nd and 22nd July. These visits were generally made during sub-optimal weather conditions; but when brief sunny breaks occurred, horsefly activity was quick to commence. Most of the species were recorded along tracks which run through the 'birch woodland', or at rest on the rails of a boardwalk which runs along the eastern edge of the 'mini-moss'. Public access is discouraged from the main area of 'mossland' at Risley Moss (the 'Mossland Conservation Area'); therefore, recording was restricted to one point of its extreme margin. Likewise, the actual surface of the 'mini-moss' was not accessed; all recording being restricted to its periphery, especially along its boardwalk. The pond shown below was situated beside a path in the 'birch woodland': its fauna included the marshland hoverflies *Anasimyia contracta* and *A. lineata*.

Investigations during 2018

Risley Moss was not visited during 2018.



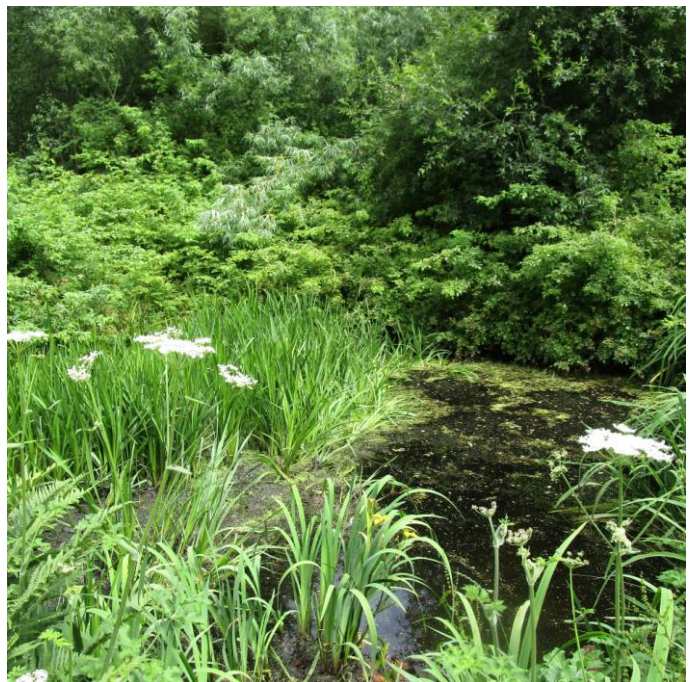
Risley Moss (mini-moss) (22nd July)



Risley Moss (mossland) (22nd July)



Risley Moss (birch woodland) [track] (22nd July)



Risley Moss (birch woodland) [pond] (2nd July)

THE FENN'S, WHIXALL, BETTISFIELD, WEM AND CADNEY MOSSES COMPLEX SSSI MIRES

Investigations during 2019

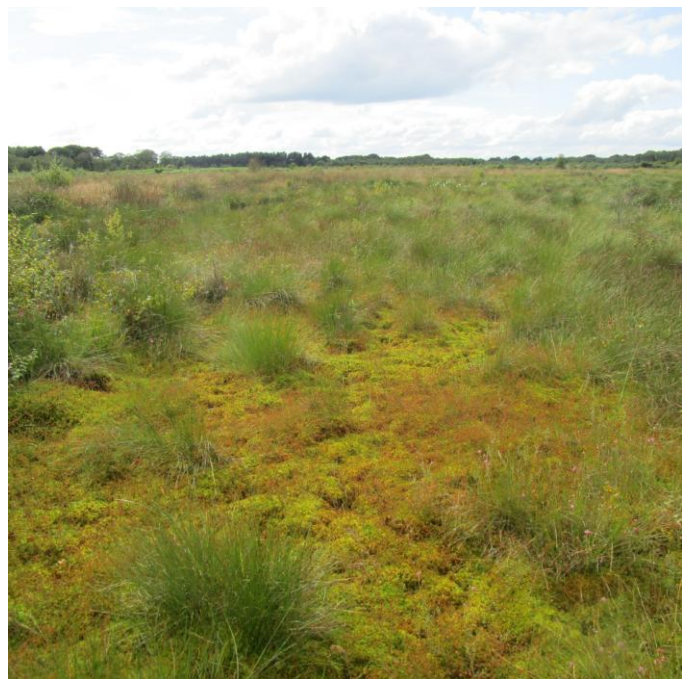
Pre-survey planning anticipated that two visits (during late May to mid-June) would be made to the extensive tracks of mire habitats which are collectively designated as The Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses Complex SSSI. Unfortunately, these plans were sabotaged by a prolonged period of inclement weather during May and June 2019, and it was not until 24th July (a hot and humid day) that a visit was made to the Fenn's and Whixall area mosses complex. This visit aimed to spend most time investigating areas of mire that had not been looked at during three previous visits in June 2018. Central O. S. National Grid references are given in parentheses for the following areas that were investigated on 24th July: the western and central areas (SJ 4860 3559), and eastern and central areas (SJ 4939 3626) of **Whixall Moss**; the western part of **Fenn's Moss** (SJ 4804 3621); and the English (SJ 4821 3518), and Welsh (SJ 4767 3533) parts of **Bettisfield Moss**.

Investigations during 2018

Three visits were made to this extensive mire-complex (on June 15th, 24th and 26th). The five individually-named parts of the complex were investigated on the dates given within parentheses: Fenn's Moss (24th June); Whixall Moss (15th, 24th and 26th June); Bettisfield Moss (24th June); Wem Moss (15th and 26th June); and Cadney Moss (24th June).



Bettisfield Moss [southern end of Welsh part] (24th July)



Bettisfield Moss [centre of English part] (24th July)



Fenn's Moss [centre of western part] (24th July)



Whixall Moss [centre of eastern part] (24th July)

RESULTS

TABANIDAE

MAIN PRIORITY SPECIES

Atylotus plebeius (Fallén) [Cheshire Horsefly]

Rather than monitoring numbers and making observations at the five mires where it was found in 2018 (Grayson, 2019), the recording effort of 2019 concentrated on investigating potentially-new sites for *Atylotus plebeius* (sites which may be suitable for its ecology, which is not fully known, but involves quaking bog habitat). It was not found at any new mire sites during 2019; but it should be noted that most fieldwork on potentially suitable mires was carried out in sub-optimal conditions. With the exception of Shemmy Moss, it was re-recorded in 2019 at all quaking bogs whence it was found in 2018 (see the table below).

Hybomitra lurida (Fallén) [Broad-headed Horsefly]

Hybomitra lurida was not found during the 2019 survey; neither was it found during the survey of 2018. It was thought that the best opportunities to record this horsefly in the Cheshire Plain region would be at The Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses Complex SSSI during the earlier part of the Tabanidae season (specifically between late May and early June); therefore, pre-survey planning in 2019 and 2018 included early visits to this mire-complex. Unfortunately, opportunities for these early visits were lost in both years: mainly due to insurance issues in 2018, and entirely due to inclement weather in 2019. It was also expected that Wybunbury Moss would be investigated for *Hybomitra lurida* in the same early period during both survey years; but this regionally important mire could not be visited before late June in 2018, and not until 2nd August in 2019.

TABLE OF TABANIDAE RECORDED IN THE CHESHIRE PLAIN REGION DURING 2019

Details of all horsefly records from 2019 (and 2018) are given in the spreadsheet which accompanies this report (Appendix 3).

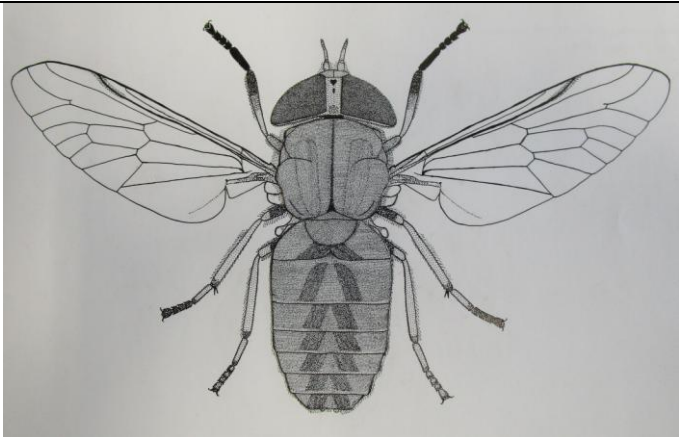


SCIENTIFIC NAME	LOCALITIES (VC = vice-county)
<i>Atylotus plebeius</i> (Fallén)	VC58 Little Budworth Common (Central Moss), Little Budworth Common (East Moss), Little Budworth Common (Whitehall Moss), Wybunbury Moss
<i>Chrysops caecutiens</i> (Linnaeus)	VC58 Basin Mire N2, Basin Mire N3, Ham (lower basin), Ham Pool, Harthill (upper basin), Rush Pool
<i>Chrysops relictus</i> Meigen	VC40 Bettisfield Moss (England), Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Bettisfield Moss (Wales), Fenn's Moss (western area) VC59 Risley Moss (mossland)
<i>Chrysops viduatus</i> (Fabricius)	VC40 Bettisfield Moss (England), Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Bettisfield Moss (Wales), Fenn's Moss (western area) VC58 Basin Mire LM10, Basin Mire N2, forestry road west of N1 N2 and N3, Black Lake, Blain's Moss, Ham (lower basin), Ham (upper basin), Ham Pool, Hatch Mere, Rush Pool, Wybunbury Moss
<i>Haematopota crassicornis</i> Wahlberg	VC59 Risley Moss (mini-moss)
<i>Haematopota pluvialis</i> (Linnaeus)	VC40 Bettisfield Moss (England), Bettisfield Moss (World's End Car Park), Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Bettisfield Moss (Wales), Fenn's Moss (western area), Llay Bog (basin mire and bog woodland), Llay Bog area (fields and woodland), Llay Bog area (Park Lane), Vicarage Moss (north basin mire), Vicarage Moss (south basin mire), Vicarage Moss (small raised basin), pasture to north of Vicarage Moss, Gatehouse Farm (Vicarage Lane), Springfield Farm (Vicarage Lane) VC58 Barnsbridge Flushes, Blain's Moss, Brookhouse Lane, Brookhouse Moss, Finney's Moss, Flaxmere Moss, Ham Pool, Harthill Moss, Harthill (upper basin), Lily Pool, Little Budworth Common (Whitehall Moss), Newchurch Common, Shemmy Moss VC59 Highfield Moss, Holcroft Lane, Holcroft Moss, Risley Moss (birch woodland), Risley Moss (mossland)
<i>Hybomitra bimaculata</i> (Macquart)	VC58 Barns Bridge, Barnsbridge Flushes, Basin Mire A01b, Basin Mire A06, forestry road west of N1 N2 and N3, Finney's Moss, Harthill Moss, Harthill (upper basin), Hockenhull, Rush Pool, Shemmy Moss VC59 Risley Moss (mini-moss)
<i>Hybomitra distinguenda</i> (Verrall)	VC58 Barnesbridge Flushes, Basin Mire A01b, Finney's Moss, Harthill Moss, Harthill (upper basin), Hatch Mere, Lily Pool, Newchurch Common VC59 Risley Moss (birch woodland)
<i>Hybomitra montana</i> (Meigen)	VC40 Bettisfield Moss (England), Whixall Moss (western and central areas) VC50 Bettisfield Moss (Wales), Fenn's Moss (western area) VC58 Little Budworth Common (Whitehall Moss)
<i>Tabanus autumnalis</i> Linnaeus	VC58 Shemmy Moss VC59 Risley Moss (mini-moss)





NOTES ON TABANIDAE RESULTS IN 2018 AND 2019 WITH ILLUSTRATIONS OF FEMALES

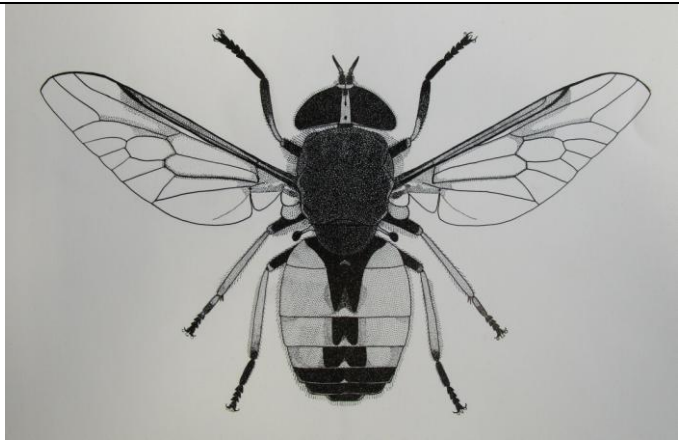



In the absence of any useable photographs of living horseflies taken during the survey, and considering that it is useful for the reader to have some idea of the general appearance of the horseflies which were found, the author has included some of his black and white line drawings which illustrate typical examples of each species. With the exception of *Atylotus plebeius* on the front cover of this report, these illustrations are restricted to females only, as this is the sex that is most usually encountered in the field; indeed, the vast majority of horseflies that were encountered by the author during the two survey years were females in search of a blood-meal. Only 26 males were recorded, almost half of which were a single species (*Atylotus plebeius*).

In the following species accounts, the term 'localities' often refers to parts of larger sites which could alternatively be considered to be sub-sites. This particularly applies to differently-named areas of the Whixall Moss area mire-complex, and the individual quaking bogs on Little Budworth Common. It has been necessary to estimate (or round-up) the Manitoba trap capture-dates. A vernacular English name is given in brackets after each species. These vernacular names were originally attributed to individual British horseflies by Stubbs & Drake (2001).

The illustrations shown below were drawn in the early to mid 1990s: most (the illustrations with darkened eyes) were published in a monograph of Yorkshire's horsefly fauna by Grayson (1995).

<p><i>Atylotus plebeius</i> (Fallén) [Cheshire Horsefly]</p> <p>VC58: 13 females, 12 males: 9 dates: 5 localities</p> <p>This diminutive and rare horsefly was found in three parts of the Cheshire Plain area in 2018: all localities being quaking bogs. The recording effort in 2019 focussed on other potential sites, but it was not found elsewhere. Three of the localities where it was found during both years were on Little Budworth Common (Central Moss, East Moss and Whitehall Moss). It was also found at Wybunbury Moss in both years and at Shemmy Moss in 2018 only.</p>	
<p><i>Chrysops caecutiens</i> (Linnaeus) [Splayed Deerfly]</p> <p>VC58: 11 females: 5 dates: 9 localities</p> <p>Mainly found in the northern part of the Delamere Forest, where it was encountered at (or in close proximity to) 6 mire localities. Also found in the western part of Delamere Forest at Harthill (upper basin), where single females were captured in both years. Elsewhere, single females were taken at South Moss (part of the Abbots Moss mire-complex), and at Petty Pool, specifically on the lane between the large Petty Pool lake and Pettypool Brook.</p>	
<p><i>Chrysops relictus</i> Meigen [Twin-lobed Deerfly]</p> <p>VC40: 16 females: 4 dates: 3 localities VC50: 3 females: 1 date: 2 localities VC59: 1 female: 1 date: 1 locality</p> <p>This general marshland horsefly was recorded during both survey years; but not often, as the surveys did not target its usual habitats. With the exception of a female from the fringe of the main mossland at Risley Moss on 22nd July 2019, all records were from the conjoined sites known as Bettisfield Moss, Fenn's Moss and Whixall Moss.</p>	

<p><i>Chrysops viduatus</i> (Fabricius) [Square-spot Deerfly]</p> <p>VC40: 20 females: 4 dates: 3 localities VC50: 3 females: 1 date: 2 localities VC58: 54 females: 10 dates: 17 localities</p> <p>In both survey years, this was found to be the second most-numerous horsefly overall; however, it was restricted to three main areas. It occurred widely in the Delamere Forest, but principally in its northern parts. It was also fairly numerous at Wybunbury Moss, and on the conjoined mires of Bettisfield Moss, Fenn's Moss and Whixall Moss.</p>	
<p><i>Haematopota crassicornis</i> Wahlberg [Black-horned Cleg]</p> <p>VC58: 4 females, 1 male: 4 dates: 3 localities VC59: 1 male: 1 date: 1 locality</p> <p>The surveys did not target its usual habitats (typically near small streams and seepages); therefore, it was rarely found. It was found just once in 2019 (a male on the top rail of a boardwalk beside the mini-moss at Risley Moss on 18th June). In 2018, a male was found beside Shemmy Moss on 10th June, and females were captured by Manitoba traps that were placed on Brackenhurst Bog and Blakemere Moss.</p>	
<p><i>Haematopota pluvialis</i> (Linnaeus) [Notch-horned Cleg]</p> <p>VC39: 72 females: 3 dates: 7 localities VC40: 139 females, 1 male: 5 dates: 9 localities VC50: 44 females, 1 male: 3 dates: 15 localities VC58: 243 females: 20 dates: 44 localities VC59: 29 females, 1 male: 3 dates: 5 localities</p> <p>Common throughout the Cheshire Plain region during both years; being particularly numerous on the more expansive sites. Males were rarely found (3 only), but females were more numerous than all other Tabanidae species combined.</p>	
<p><i>Hybomitra bimaculata</i> (Macquart) [Hairy-legged Horsefly]</p> <p>VC39: 2 females: 2 dates: 2 localities VC40: 5 females: 3 dates: 5 localities VC58: 35 females: 11 dates: 17 localities VC59: 1 female: 1 date: 1 locality</p> <p>This was the most numerous of the larger horseflies during both survey years, being particularly so in The Delamere Forest, and particularly so on 3rd July 2019, when it was found in all parts of Delamere Forest that were visited. It proved to be very widespread on Cheshire Plain mire sites.</p>	

<p><i>Hybomitra distinguenda</i> (Verrall) [Bright Horsefly]</p> <p>VC39: 1 female: 1 date: 1 locality VC40: 3 females: 2 dates: 2 localities VC50: 1 female: 1 date: 1 locality VC58: 19 females, 1 male: 10 dates: 15 localities VC59: 3 females: 2 dates: 1 locality</p> <p>Along with <i>Hybomitra bimaculata</i> (compared with which it was slightly less numerous), this was the only other large horsefly which proved to be widely distributed and not uncommon in the Cheshire Plain area during both years.</p>	
<p><i>Hybomitra montana</i> (Meigen) [Slender-horned Horsefly]</p> <p>VC40: 3 females: 2 dates: 3 localities VC50: 3 females: 2 dates: 3 localities VC58: 7 females, 6 males: 4 dates: 2 localities</p> <p>This typical species of upland bogs was in reality found only at three mire sites, all of which are undoubtedly breeding locations. Single females were captured in six different parts ('localities') of the conjoined Bettisfield Moss, Fenn's Moss and Whixall Moss mire complex. It was also found at Shemmy Moss in 2018 and Whitehall Moss in 2019.</p>	
<p><i>Tabanus autumnalis</i> Linnaeus [Large Marsh Horsefly]</p> <p>VC58: 5 females, 1 male: 6 dates: 4 localities VC59: 1 male: 1 date: 1 locality</p> <p>This marshland fly has greatly extended its British range northwards over recent years. It was recorded twice during the 2019 survey, viz. a female at Shemmy Moss on 3rd July, and a male at Risley Moss (mini-moss) on 2nd July. Grayson (2019) enumerated five 2018 records from the following localities: a block of stables near Brackenhurst Bog, Shemmy Moss, Blakemere Moss and Chester Zoo Nature Reserve.</p>	
<p><i>Tabanus maculicornis</i> Zetterstedt [Narrow-winged Horsefly]</p> <p>VC39: 1 female: 1 date: 1 locality VC40: 3 females: 1 date: 2 localities VC50: 1 female: 1 date: 1 locality VC58: 1 female: 1 date: 1 locality</p> <p>Found in 2018 only, when single females were taken at Wybunbury Moss on 25th June, Chartley Moss on 28th June, Cadney Moss on 24th June, and Clarepool Moss on 26th June. Two females were also taken near Clarepool Moss (along a lane between Clarepool Moss and Cole Mere) on 26th June.</p>	

QUANTITATIVE COMPARISONS BETWEEN TABANIDAE NUMBERS IN 2018 AND 2019

Some comparisons are feasible between the Tabanidae results that were achieved in the Cheshire Plain region during 2018, and those which were achieved during the follow-up study in 2019. Although these comparisons provide some interesting results, it should be recognised that disproportionate amounts of time were spent on sites that lie in the traditional Watsonian vice-county of Cheshire (VC58), compared with sites that are in other vice-counties. Furthermore, disproportionate amounts of time were spent looking for priority species and investigating priority sites. Horsefly species which occur in wetlands other than mires (e.g. marshland species) were disproportionately under-recorded. It should also be recognised that the weather conditions of the two survey years were very different; being mainly optimum for a prolonged period in 2018, which caused the local horsefly season to be truncated unusually early. Weather conditions during the Cheshire Plain horsefly season in 2019 were more typical of a British summer, being a general mixture of fine and inclement weather. A further consideration is that there were many more survey days (21) in 2018 than in 2019 (12), and Manitoba traps (at four mire sites) were operated in 2018 only. The figures in the 'Average' column are the total number of horseflies divided by the total number of survey days for the year(s).

TABLE SHOWING DISSECTION OF TABANIDAE NUMBERS IN 2018

SCIENTIFIC NAME	VERNACULAR NAME	VC39	VC40	VC50	VC58	TOTAL	AVERAGE
<i>Atylotus plebeius</i> (Fallén)	Cheshire Horsefly				16	16	.76
<i>Chrysops caecutiens</i> (Linnaeus)	Splayed Deerfly				4	4	.19
<i>Chrysops relictus</i> Meigen	Twin-lobed Deerfly		5			5	.24
<i>Chrysops viduatus</i> (Fabricius)	Square-spot Deerfly		7		26	33	1.57
<i>Haematopota crassicornis</i> Wahlberg	Black-horned Cleg				5	5	.24
<i>Haematopota pluvialis</i> (Linnaeus)	Notch-horned Cleg	72	111	9	213	405	19.29
<i>Hybomitra bimaculata</i> (Macquart)	Hairy-legged Horsefly	2	5		19	26	1.24
<i>Hybomitra distinguenda</i> (Verrall)	Bright Horsefly	1	3	1	9	14	.67
<i>Hybomitra montana</i> (Meigen)	Slender-horned Horsefly		1	1	5	7	.34
<i>Tabanus autumnalis</i> Linnaeus	Large Marsh Horsefly				5	5	.24
<i>Tabanus maculicornis</i> Zetterstedt	Narrow-winged Horsefly	1	3	1	1	6	.29
TOTAL		76	135	12	303	526	25.05

TABLE SHOWING DISSECTION OF TABANIDAE NUMBERS IN 2019

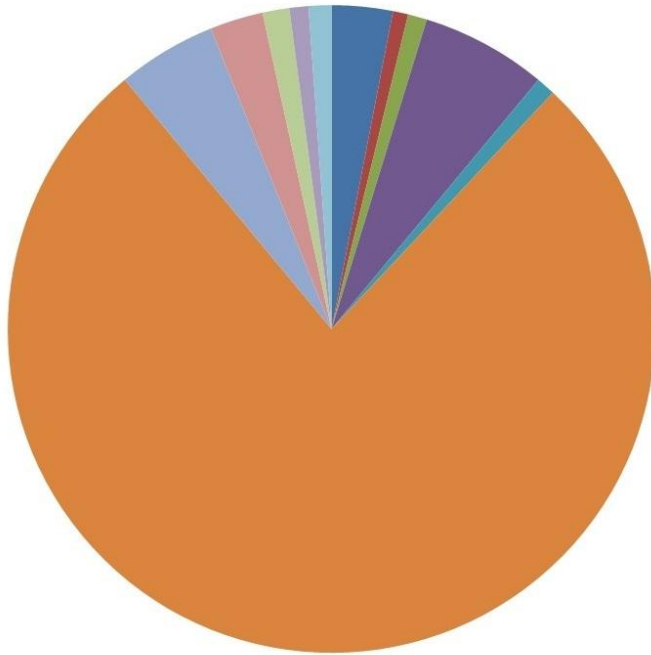
SCIENTIFIC NAME	VERNACULAR NAME	VC40	VC50	VC58	VC59	TOTAL	AVERAGE
<i>Atylotus plebeius</i> (Fallén)	Cheshire Horsefly			9		9	.75
<i>Chrysops caecutiens</i> (Linnaeus)	Splayed Deerfly			7		7	.58
<i>Chrysops relictus</i> Meigen	Twin-lobed Deerfly	11	3		1	15	1.25
<i>Chrysops viduatus</i> (Fabricius)	Square-spot Deerfly	13	3	28		44	3.67
<i>Haematopota crassicornis</i> Wahlberg	Black-horned Cleg				1	1	.08
<i>Haematopota pluvialis</i> (Linnaeus)	Notch-horned Cleg	29	36	30	30	125	10.42
<i>Hybomitra bimaculata</i> (Macquart)	Hairy-legged Horsefly			16	1	17	1.42
<i>Hybomitra distinguenda</i> (Verrall)	Bright Horsefly			11	3	14	1.17
<i>Hybomitra montana</i> (Meigen)	Slender-horned Horsefly	2	2	8		12	1.00
<i>Tabanus autumnalis</i> Linnaeus	Large Marsh Horsefly			1	1	2	.17
TOTAL		55	44	110	37	246	20.50

TABLE SHOWING DISSECTION OF COMBINED TABANIDAE NUMBERS IN 2018 AND 2019

SCIENTIFIC NAME	VC39	VC40	VC50	VC58	VC59	2018	2019	TOTAL	AVE.
<i>Atylotus plebeius</i> (Fallén)				25		16	9	25	.76
<i>Chrysops caecutiens</i> (Linnaeus)				11		4	7	11	.33
<i>Chrysops relictus</i> Meigen		16	3		1	5	15	20	.61
<i>Chrysops viduatus</i> (Fabricius)		20	3	54		33	44	77	2.33
<i>Haematopota crassicornis</i> Wahlberg				5	1	5	1	6	.18
<i>Haematopota pluvialis</i> (Linnaeus)	72	140	45	243	30	405	125	530	16.06
<i>Hybomitra bimaculata</i> (Macquart)	2	5		35	1	26	17	43	1.30
<i>Hybomitra distinguenda</i> (Verrall)	1	3	1	20	3	14	14	28	.85
<i>Hybomitra montana</i> (Meigen)		3	3	13		7	12	19	.58
<i>Tabanus autumnalis</i> Linnaeus				6	1	5	2	7	.21
<i>Tabanus maculicornis</i> Zetterstedt	1	3	1	1		6		6	.18
TOTAL	76	190	56	413	37	526	246	772	23.39

PIE CHART OF TABANIDAE NUMBERS IN 2018

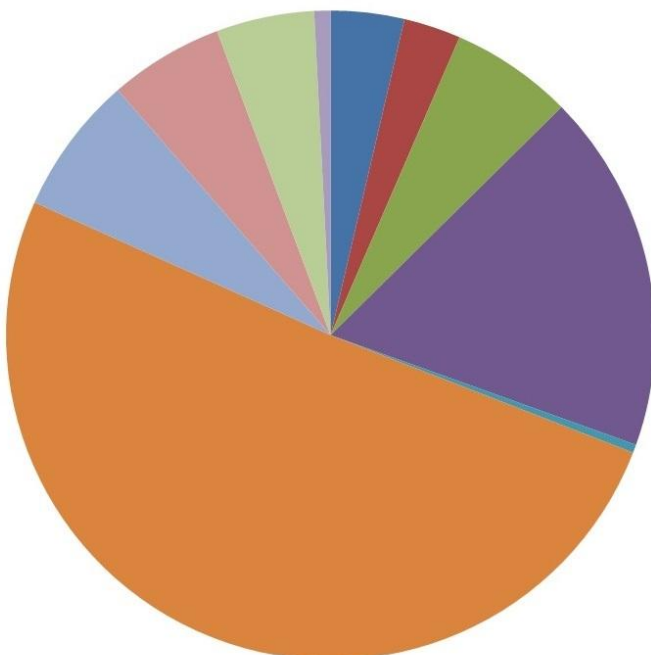
Tabanidae Nos. 2018



- Atylotus plebeius (16)
- Chrysops caecutiens (4)
- Chrysops relictus (5)
- Chrysops viduatus (33)
- Haematopota crassicornis (5)
- Haematopota pluvialis (405)
- Hybomitra bimaculata (26)
- Hybomitra distinguenda (14)
- Hybomitra montana (7)
- Tabanus autumnalis (5)
- Tabanus maculicornis (6)

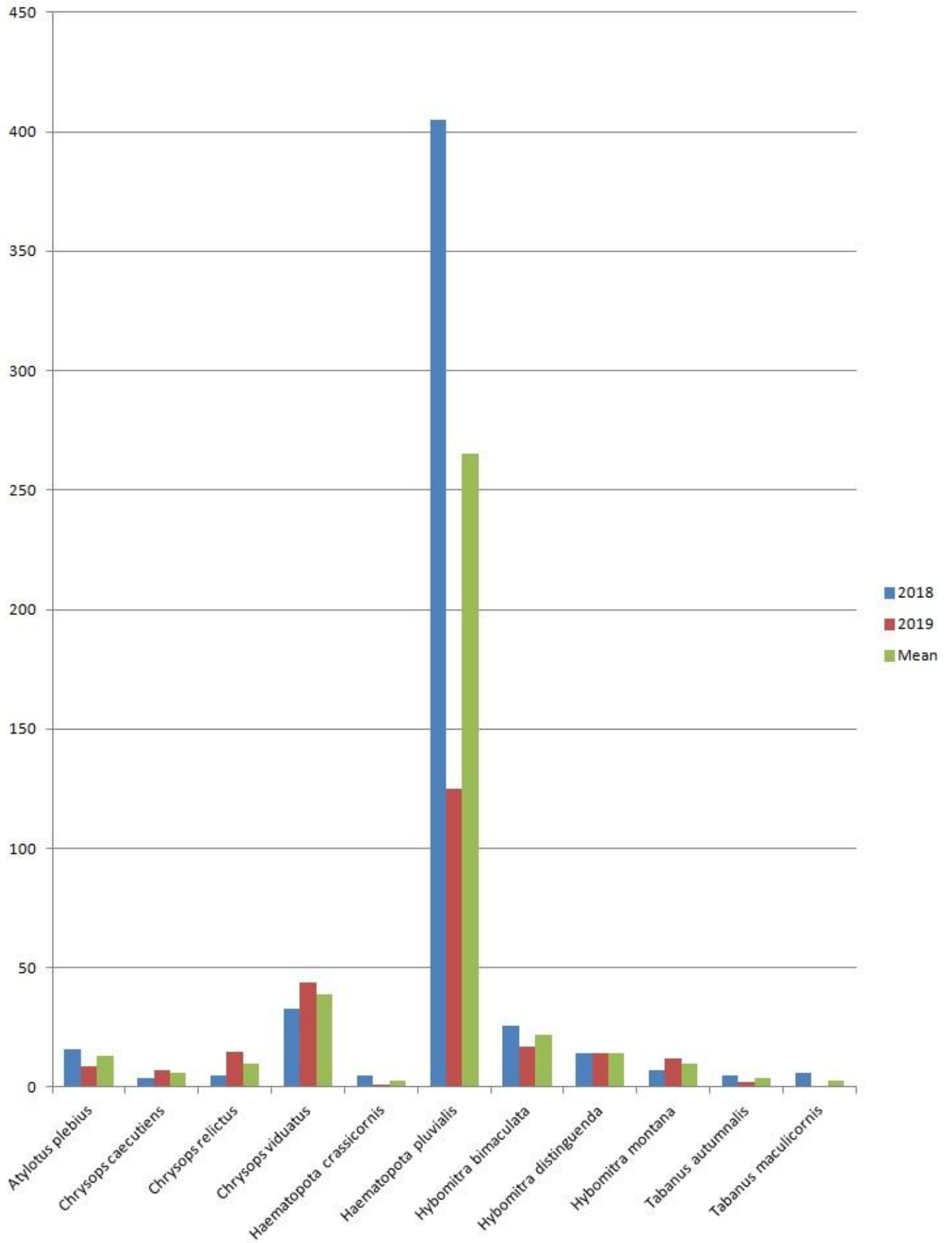
PIE CHART OF TABANIDAE NUMBERS IN 2019

Tabanidae Nos. 2019



- Atylotus plebeius (9)
- Chrysops caecutiens (7)
- Chrysops relictus (15)
- Chrysops viduatus (44)
- Haematopota crassicornis (1)
- Haematopota pluvialis (125)
- Hybomitra bimaculata (17)
- Hybomitra distinguenda (14)
- Hybomitra montana (12)
- Tabanus autumnalis (2)

COLUMN CHART OF TABANIDAE NUMBERS IN 2018 AND 2019 INCLUDING MEAN QUANTITIES



N. B. It should be noted that the number of survey days in 2018 (21) was approaching double the number of survey days in 2019 (12), and optimum weather conditions for horsefly activity occurred more often during survey days in 2018 than in 2019

OTHER INVERTEBRATES RECORDED IN 2019

INTRODUCTION

The author's fieldwork in the Cheshire Plain area during 2019 was not entirely restricted to investigating its horsefly fauna. Two other 'main priority species' (the flies *Idioptera linnei* and *Orthonevra intermedia*) were also specifically looked-for when time allowed. These were both found in the Cheshire Plain area during 2019: the records are enumerated below with annotations.

Eight 'other species with significant conservation statuses' were also found: these are enumerated with annotations over the following pages (30 to 32). In this case, 'significant' has more than one meaning. It can mean a current national status of at least Nationally Scarce significance, as awarded under the auspices of the Joint Nature Conservation Committee (JNCC). 'Significant' also includes any currently-valid JNCC conservation designations which were based on pre 1994 International Union for Conservation of Nature (IUCN) criteria and terminology, that are of equivalent or greater conservation value than the current 'Nationally Scarce' status category. 'Significant' can also refer to any invertebrate that has statutory part-protection, having been designated as a Species of Principal Importance in England (SPIE) under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. SPIE species were formerly designated as UK BAP Priority Species, a national categorisation which remains valid despite being effectively superseded by SPIE designation following devolution.

A 'table of other invertebrates recorded in 2019' follows on pages 33 to 42. This table lists all invertebrates that were recorded apart from the horseflies (Tabanidae): these are tabulated on page 23. With the exception of the two 'main priority species', no special effort was made to locate and record any particular species; therefore, the table effectively consists of field records of conspicuous and easily-identifiable species, plus the results of some casual collecting.

The 10m² Ordnance Survey National Grid references given in the species accounts over pages 30 to 32 are central points for the sites investigated, and not necessarily the points at which noteworthy invertebrates were recorded. These accounts also mention if any particular species was also recorded during the Cheshire Plain survey of 2018 (Grayson, 2019).

MAIN PRIORITY SPECIES

Diptera: Limoniidae

Idioptera linnei Oosterbroek [a crane-fly]

The generally inclement weather which afflicted the earlier part of the survey during 2019 at least provided an opportunity to temporarily transfer the main survey-focus to searching for this distinctive picture-winged crane-fly, particularly on mires from where it had not been previously recorded. The 2019 findings were as follows: one male and two females on South Moss (SJ 5937 6863) on 31st May; four males on Shemmy Moss (SJ 5949 6892) on 1st June; nine males at North Moss (SJ 5842 6585) on Little Budworth Common on 1st June; two males at Whitehall Moss (SJ 5878 6580) on Little Budworth Common on 1st June; and, at the same locality on 19th June, an individual which was not able to be sexed, as its abdomen had been mainly eaten at the time it was observed as a prey item of a male *Enallagma cyathigerum* (Common Blue Damselfly).

Idioptera linnei is a delicate and uncommon fly that was categorised (sub nom. *Limnophila fasciata*) with RDB1 – Endangered national conservation status by Falk (1991). During the 2018 survey, it was found by the author at three mires in Cheshire. On 9th June 2018, a male was found at Hogshead Moss (SJ 5842 6952), and two males and a female were found at Shemmy Moss (SJ 5949 6892). A male was also seen on 10th June 2018 at Whitehall Moss (SJ 5878 6580) on Little Budworth Common. Historically, the author had also found a male *Idioptera linnei* at Flaxmere Moss (SJ 5565 7229) on 21st July 1996 (Grayson, 2019).

Diptera: Syrphidae

Orthonevra intermedia Lundbeck [a hoverfly]

The predominance of inclement weather, and necessity to prioritise Tabanidae recording during any precious sunny periods, inevitably impacted opportunities to look for this diminutive black hoverfly; therefore, the discovery of two males at Lily Pool (SJ 5956 6925) on 3rd July 2019 was a reasonable result, especially as this was a new British site for this little-recorded fly.

Orthonevra intermedia was found at three sites during the 2018 survey; specifically: a male at Hogshead Moss (SJ 5842 6952) and a female at Shemmy Moss (SJ 5949 6892) on 10th June, a female in a Manitoba trap at Black Lake (SJ 5377 7089) between 30th June and 4th July, and a male in the same trap between 14th and 25th July. The national conservation status of *Orthonevra intermedia* was given as Data Deficient by Ball & Morris (2014); as, at the time, it was only known as British from specimens taken in the Delamere Forest in 2003 at Norley Moss and Barnsbridge Basin (Drake, 2006).

OTHER SPECIES WITH SIGNIFICANT CONSERVATION STATUSES

Orthoptera: Tettigoniidae

Metrioptera brachyptera (Linnaeus) [Bog Bush-cricket]

Two males were encountered at Holcroft Moss (SJ 6850 9326) on 2nd July 2019. During the previous year, a male nymph was recorded from Shemmy Moss (SJ 5949 6892) on 10th June (Grayson, 2019). This widespread but very local bog cricket was given a Nationally Scarce conservation status by Sutton (2015).

Lepidoptera: Erebidae

Tyria jacobaeae (Linnaeus) [The Cinnabar]

This distinctive moth is very conspicuous, both as an adult in flight or at rest, or as a caterpillar on its main foodplant *Senecio jacobaea* (Common Ragwort). It remains widespread and not uncommon in Britain; however, it has SPIE status, having been designated in order to facilitate monitoring for research purposes following evidence of its decline in some areas of Britain. It was recorded very widely during the 2019 survey, most frequently so in the Shemmy Moss area, where an adult (3rd July) and caterpillars (2nd and 3rd August) were seen at the southern edge of Shemmy Moss (SJ 5949 6892). Adults were also seen along the tracks between Gull Moss and Shemmy Moss (SJ 5977 6889) on 1st and 19th June, and a single adult was seen on 31st May along a forestry road that facilitates access to Shemmy Moss (SJ 5904 6851).

Tyria jacobaeae caterpillars were seen at several locations in the Delamere Forest during 2019: viz. approximately 100 along a forestry road west of the basin mires known as N1, N2 and N3 (SJ 5483 7202) on 23rd July; approximately 100 close to Harthill (upper Basin) (SJ 5600 7108) on 3rd August; and approximately 30 at both Finney's Moss (SJ 5596 7155) and Harthill Moss (SJ 5633 7142), also on 3rd August. Elsewhere in 2019, *Tyria jacobaeae* was recorded at Highfield Moss (SJ 6135 9560) on 22nd July (approximately 200 caterpillars), along the entrance track to Holcroft Moss (SJ 6865 9355) on 18th June (3 adults) and 22nd July (1 caterpillar), and in the fields and woodland of the Llay Bog area (SJ 3212 5527) on 25th July (approximately 20 caterpillars).

Tyria jacobaeae was also recorded at the following three localities in Staffordshire (VC39) on 29th June 2018 (Grayson, 2019). On Cannock Chase, one adult was present near Penkridge Bank Car Park (SK 0008 1694), and approximately ten caterpillars were seen on *Senecio jacobaea* (Common Ragwort) near Whitehouse Car Park (SJ 9931 1621). Approximately two hundred caterpillars were also seen on the same foodplant in the Staffordshire University Nature Reserve (SJ 8825 4529).

Lepidoptera: Nymphalidae

Coenonympha tullia (Müller) [Large Heath]

This butterfly is very local but widespread on bogs throughout northern and western Britain. It has current SPIE status and was designated with a Vulnerable JNCC national classification by Fox *et al.* (2010). It was seen just once in 2019, this being a single adult on the English part of Bettisfield Moss (SJ 4821 3518) on 24th July. In 2018, two adults were also seen in the same area on 24th June (not 24th July as stated in error in Grayson, 2019: 32), and it was noted at the adjoining Whixall Moss (SJ 4926 3603) on 15th June (three adults), on 24th June (approximately twenty adults), and on 26th June (approximately thirty adults).

Coleoptera: Chrysomelidae

Agelastica alni (Linnaeus) [Alder Leaf Beetle]

This conspicuous dark metallic blue leaf beetle is now a fairly common species in Britain, having undergone a remarkable proliferation and range-expansion since being provisionally categorised as nationally Extinct by Shirt (1987). Its status was revised to RDBK – Insufficiently Known by Hyman & Parsons (1992), which considered that it was “possibly only an immigrant to the British shores”. The most recent national review which covered Chrysomelidae (Hubble, 2014) allocated *Agelastica alni* an IUCN status category of ‘Data Deficient’ (this being somewhat equivalent to the former ‘RDBK’ status category), and a ‘Nationally Rare’ GB Rarity Status designation. On distribution, Hubble (2014: 63) commented: “Recently re-established in NW England (Lancashire and Cheshire) and Wales”. Its continued national proliferation and expansion of range over very recent years would necessitate a significant downgrade of national status in any current review. Its larvae are known to feed on a range of trees. *Alnus* (alders), *Corylus* (hazels), *Betula* (birches) and *Salix* (willows) were cited as host plants by Lazenby (2014) – a paper that enumerated several recent records from localities in the modern counties of South Yorkshire and Derbyshire.

Agelastica alni was not noticed during the 2018 Cheshire Plain Tabanidae survey (Grayson, 2019), but was observed on nine occasions during 2019 (at seven localities). The localities and dates of observations were: Linmere Moss (south) (SJ 5451 7054) on 31st May; the forestry road to Shemmy Moss (SJ 5904 6851) on 31st May and 1st June; Risley Moss (birch woodland) (SJ 6631 9167) on 18th June and 2nd July; Gull Moss (SJ 6011 6871) on 19th June; Hockenhull (SJ 5421 7094) on 19th June; South Moss (SJ 5937 6863) on 19th June; and Basin Mire A07 (SJ 5375 7197) on 3rd July.

OTHER SPECIES WITH SIGNIFICANT CONSERVATION STATUSES

Diptera: Asilidae***Lasiopogon cinctus* (Fabricius) [Spring Heath Robber-fly]**

The most recent national review (Drake, 2017) gave *Lasiopogon cinctus* the following categorisations: Nationally Scarce (GB Rarity Status) and Least Concern (IUCN status). Stubbs & Drake (2001) described *Lasiopogon cinctus* as ‘a rather small yet stoutly built species’ that ‘requires dry sandy soils as on heaths and dunes, usually in the proximity of trees’. A single male was found along a sandy path through the coniferous plantation at the southern side of Hogshead Moss (SJ 5842 6952 on 31st May 2019).

Diptera: Syrphidae***Xylota abiens* Meigen [a hoverfly]**

Single males were captured in three parts of Delamere Forest during the surveys of 2018 and 2019. In 2019, it was found on 31st May at both Black Lake (SJ 5373 7091) and Linmere Moss (north) (SJ 5469 7070). In the previous year, it was found at Barnsbridge Flushes (SJ 5398 7182) on 25th July. *Xylota abiens* is very easily overlooked for the superficially similar and much commoner *Chalcosyrphus nemorum* (Fabricius). It was attributed Nationally Scarce conservation status in the most recent JNCC review that covered hoverflies (Ball & Morris, 2014).

N. B. The 2018 report (Grayson, 2019) contained a record of the hoverfly ***Microdon mutabilis*** (Linnaeus) from North Moss (SJ 5842 6585) on Little Budworth Common on 10th June 2018. This needs correcting to *M. mutabilis* [sensu lato], as adults of this species are indistinguishable from those of *Microdon myrmicae* Schönrogge, Barr, Wardlaw, Napper, Gardner, Breen, Elmes & Thomas; and, by virtue of habitat-association, the actual species would most likely be *M. myrmicae* (Roger Morris, pers. comm.). The 2019 survey produced further *M. mutabilis* [sensu lato] records from Whitehall Moss (SJ 5878 6580) on Little Budworth Common and South Moss (SJ 5937 6863) in the Abbots Moss mire-complex. Given that these locations are basin mires, according to habitat-association, the specimens would likely be *M. myrmicae*, rather than true *M. mutabilis* [i.e. sensu stricto].

Diptera: Scathophagidae***Cordilura rufimana* Meigen [a dung fly]**

A female was taken on 3rd July 2019 at Lily Pool (SJ 5956 6925). During the 2018 survey, *Cordilura rufimana* was mainly found at Shemmy Moss (SJ 5949 6892), where single males were taken on 9th and 10th June, and two males were taken on 14th June. Other captures during 2018 were of single females at Black Lake (SJ 5373 7091) on 4th July and at Flaxmere Moss (SJ 5565 7229) on 14th June. This medium-sized black fly was given Notable national conservation status by Falk (1991).

Diptera: Sarcophagidae***Macronychia dolini* Verves & Khrokalo = *striginervis* sensu auctt., nec (Zetterstedt) = *ungulans* sensu auctt., nec (Pandellé) [a flesh fly]**

A female *Macronychia dolini* was found in the birch woodland at Risley Moss (SJ 6631 9167) on 2nd July 2019. Sub nom. *Macronychia striginervis*, this impressive uncommon fly was given a ‘provisional’ Nationally Scarce status in Falk & Pont (2017): this being the most recently-published JNCC national status review that included Sarcophagidae. It is fair to point out that, with the exception of a few flies that were placed in the ‘Regionally Extinct’ and ‘Data Deficient’ status categories; Falk & Pont (2017) gave ‘provisional’ statuses to all other species that were included in the review. Sub nom. *Macronychia striginervis*, Falk & Pont (2017) included the following notes on the national distribution, habitat, ecology and status of *Macronychia dolini*: mainly recorded from southern England, but records extend to Yorkshire and Wales; habitats include broad-leaved woodland and heathland; the larvae develop as cleptoparasites in the nests of *Ectemnius* wasps (Hymenoptera: Sphecidae). N. B. *Ectemnius* species nest in dead wood. Cleptoparasitism is the term most often applied to evolved, advantageous, multiparasitic ecological strategies (Gauld & Bolton, 1988).

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

The following table arranges higher classifications in their generally-accepted usual order; but, for the purposes of simplification and ease of reference, omits subgenera, and arranges genera and species in alphabetical order. The spreadsheet which accompanies this report (Appendix 3) gives full details for all records in the following table.

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
Class: Gastropoda	Slugs & snails etc.	
Family: Arionidae	Terrestrial slugs	
<i>Arion ater</i> (Linnaeus) [sensu lato]	Black Slug (complex)	VC58 Little Budworth Common (Whitehall Moss) VC59 Highcroft Moss, Holcroft Moss
Family: Helicidae	Terrestrial snails	
<i>Cepaea nemoralis</i> (Linnaeus)	Brown-lipped Snail	VC58 tracks between Gull Moss and Shemmy Moss
<i>Cornu aspersum</i> (Müller)	Garden Snail	VC58 track to Holcroft Moss
Order: Odonata	Dragonflies & damselflies	
Suborder: Zygoptera	Damselflies	
Family: Coenagriidae	Blue damselflies etc.	
<i>Coenagrion puella</i> (Linnaeus)	Azure Damselfly	VC58 Gull Moss, Lily Pool, Little Budworth Common (Whitehall Moss), Shemmy Moss, forestry road to Shemmy Moss VC59 Highfield Moss
<i>Enallagma cyathigerum</i> (Charpentier)	Common Blue Damselfly	VC58 Gull Moss, Little Budworth Common (Whitehall Moss), Shemmy Moss VC59 Holcroft Moss
<i>Ischnura elegans</i> (Vander Linden)	Blue-tailed Damselfly	VC40 Whixall Moss (western and central areas) VC58 Black Lake, Gull Moss, Little Budworth Common (open central area), Little Budworth Common (Whitehall Moss), Shemmy Moss, forestry road to Shemmy Moss
<i>Pyrrhosoma nymphula</i> (Sulzer)	Large Red Damselfly	VC58 Barnes Bridge, Basin Mire N2, Black Lake, Finney's Moss, Harthill Moss, Hogshead Moss, Lily Pool, Linnere Moss (north), Linnere Moss (south), Shemmy Moss, forestry road to Shemmy Moss VC59 Highfield Moss, track to Holcroft Moss
Family: Lestidae	Emerald damselflies	
<i>Lestes sponsa</i> (Hansemann)	Emerald Damselfly	VC40 Whixall Moss (western and central areas) VC58 Barnsbridge Basin, Basin Mire LM09, Basin Mire LM10, Black Lake, Blakemere Moss, Hockenhull, Lily Pool VC50 Fenn's Moss (western area) VC59 Highfield Moss
Suborder: Anisoptera	Dragonflies	
Family: Aeshnidae	Hawkers	
<i>Aeshna cyanea</i> (Müller)	Southern Hawker	VC50 Llay Bog (basin mire and bog woodland) VC58 South Moss
<i>Aeshna grandis</i> (Linnaeus)	Brown Hawker	VC50 Llay Bog area (fields and woodland), pasture to north of Vicarage Moss VC58 Brookhouse Moss, Shemmy Moss, Hockenhull, Hogshead Moss VC59 track to Holcroft Moss, Newton Road (Town of Lowton), Risley Moss (mini-moss)
<i>Anax imperator</i> Leach	Emperor Dragonfly	VC58 Basin Mire LM10, Hockenhull, Lily Pool, Little Budworth Common (Central Moss), Little Budworth Common (open central area)
Family: Libellulidae	Skimmers & darters etc.	
<i>Libellula quadrimaculata</i> Linnaeus	Four-spotted Chaser	VC58 Black Lake, Blakemere Moss, Lily Pool, Linnere Moss (north), Finney's Moss, Shemmy Moss VC59 Highfield Moss, Holcroft Moss, track to Holcroft Moss
<i>Sympetrum danae</i> (Sulzer)	Black Darter	VC40 Bettisfield Moss (England), Whixall Moss (western and central areas) VC50 Fenn's Moss (western area) VC59 Holcroft Moss
<i>Sympetrum striolatum</i> (Charpentier)	Common Darter	VC50 Llay Bog (basin mire and bog woodland), Vicarage Moss (north basin mire), Vicarage Moss (small raised basin) VC59 Highfield Moss, Risley Moss (mini-moss)
Order: Orthoptera	Grasshoppers etc.	
Family: Tettigoniidae	Bush-crickets etc.	
<i>Metrioptera brachyptera</i> (Linnaeus)	Bog Bush-cricket	VC59 Holcroft Moss

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
Order: Hemiptera	True bugs etc.	
Suborder: Heteroptera	True bugs	
Family: Pentatomidae	Shieldbugs	
<i>Pentatoma rufipes</i> (Linnaeus)	Red-legged Shieldbug	VC59 Risley Moss (mini-moss)
Family: Miridae	Plant bugs etc.	
<i>Stenodema calcarata</i> (Fallén)	a grass bug	VC40 Whixall Moss (western and central areas)
Suborder: Auchenorrhyncha	Planthoppers etc.	
Family: Cicadellidae	Leafhoppers	
<i>Cicadella viridis</i> (Linnaeus)	Green Leafhopper	VC50 Vicarage Moss (south basin mire)
Order: Mecoptera	Scorpion flies etc.	
Family: Panorpidae	Scorpion flies etc.	
<i>Panorpa germanica</i> Linnaeus	a scorpion-fly	VC59 Highfield Moss
Order: Lepidoptera	Butterflies & moths	
Suborder: Heterocera	Moths	
Family: Adelidae	Longhorn moths	
<i>Nemophora degeerella</i> (Linnaeus)	a longhorn moth	VC59 Highfield Moss
Family: Tortricidae	Leafroller moths etc.	
<i>Phiaris schulziana</i> (Fabricius)		VC58 Brookhouse Moss
Family: Crambidae	Grass moths	
<i>Crambus pascuella</i> (Linnaeus)	a grass moth	VC58 Little Budworth Common (Whitehall Moss) VC59 Holcroft Moss
Family: Lasiocampidae	Eggars etc.	
<i>Lasiocampa quercus</i> (Linnaeus)	Oak Eggar	VC50 Fenn's Moss (western area)
Family: Sphingidae	Hawk-moths	
<i>Laothoe populi</i> (Linnaeus)	Poplar Hawk-moth	VC59 Newton Road (Town of Lowton)
Family: Geometridae	Carpet moths etc.	
<i>Perconia strigillaria</i> (Hübner)	Grass Wave	VC58 Little Budworth Common (East Moss)
Family: Erebidae	Tiger moths etc.	
<i>Diacrisia sannio</i> (Linnaeus)	Clouded Buff	VC58 Shemmy Moss
<i>Euproctis similis</i> (Fuessly)	Yellow-tail	VC58 Delamere Office Car Park (Forestry Commission)
<i>Tyria jacobaeae</i> (Linnaeus)	The Cinnabar	VC50 Llay Bog area (fields and woodland) VC58 forestry road west of N1 N2 and N3, Finney's Moss, Harthill Moss, Harthill (upper basin), tracks between Gull Moss and Shemmy Moss, Shemmy Moss, forestry road to Shemmy Moss VC59 Highfield Moss, track to Holcroft Moss
Family: Noctuidae	Owlet moths	
<i>Autographa gamma</i> (Linnaeus)	Silver Y	VC50 Llay Bog (basin mire and bog woodland) VC58 Barnsbridge Basin, Brookhouse Moss, Little Budworth Common (East Moss), Shemmy Moss, Wybunbury Moss
<i>Noctua pronuba</i> (Linnaeus)	Large yellow Underwing	VC58 Little Budworth Common (East Moss)
Suborder: Rhopalocera	Butterflies	
Family: Hesperidae	Skippers	
<i>Ochlodes sylvanus</i> (Esper)	Large Skipper	VC50 Fenn's Moss (western area) VC59 Highfield Moss, Moss Lane (track to Highfield Moss)
<i>Thymelicus sylvestris</i> (Poda)	Small Skipper	VC50 track to Vicarage Moss VC59 Highfield Moss
Family: Pieridae	Whites & yellows etc.	
<i>Gonepteryx rhamni</i> (Linnaeus)	Brimstone	VC40 Bettisfield Moss (England), Whixall Moss (Morris Bridge Car Park) VC50 Fenn's Moss (western area) VC58 Brookhouse Moss
<i>Pieris brassicae</i> (Linnaeus)	Large White	VC50 Llay Bog area (fields and woodland), Vicarage Moss (south basin mire) VC58 Basin Mire N2, Thieves Moss and Thieves Pool VC59 Highfield Moss

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Pieris napi</i> (Linnaeus)	Green-veined White	VC50 Llay Bog (basin mire and bog woodland), Llay Bog area (fields and woodland), pasture to north of Vicarage Moss VC58 Brookhouse Moss, Barnsbridge Basin, Finney's Moss, Wybunbury Moss VC39 Highfield Moss, Risley Moss (birch woodland)
<i>Pieris rapae</i> (Linnaeus)	Small White	VC58 Little Budworth Common (open central area) VC59 Highfield Moss
Family: Nymphalidae	Brush-footed butterflies including browns etc.	
<i>Aglais io</i> (Linnaeus)	Peacock	VC40 Bettisfield Moss (England), Whixall Moss (Morris Bridge Car Park) VC50 Bettisfield Moss (Wales), Fenn's Moss (western area), Llay Bog area (fields and woodland) VC58 Barnsbridge Basin, Brookhouse Moss, forestry road west of N1 N2 and N3, Harthill Moss, Harthill (upper basin), Linmere Moss (north), Newchurch Common, Thieves Moss and Thieves Pool, Wybunbury Moss VC59 Holcroft Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Aglais urticae</i> (Linnaeus)	Small Tortoiseshell	VC40 Whixall Moss (Morris Bridge Car Park) VC50 Fenn's Moss (western area), pasture to north of Vicarage Moss VC59 Highfield Moss, Moss Lane (track to Highfield Moss), track to Holcroft Moss
<i>Aphantopus hyperantus</i> (Linnaeus)	Ringlet	VC40 Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Llay Bog (basin mire and bog woodland), Llay Bog area (fields and woodland) VC58 Thieves Moss and Thieves Pool, Wybunbury Moss
<i>Coenonympha tullia</i> (Müller)	Large Heath	VC40 Bettisfield Moss (England)
<i>Maniola jurtina</i> (Linnaeus)	Meadow Brown	VC40 Bettisfield Moss (England), Bettisfield Moss (World's End Car Park), Whixall Moss (western and central areas) VC50 Fenn's Moss (western area), Llay Bog (basin mire and bog woodland), Llay Bog (fields and woodland), Vicarage Moss (north basin mire), Vicarage Moss (south basin mire) VC58 Brookhouse Moss, Harthill (upper basin), Thieves Moss and Thieves Pool VC59 Highfield Moss, Risley Moss (birch woodland)
<i>Pararge aegeria</i> (Linnaeus)	Speckled Wood	VC40 Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Llay Bog area (fields and woodland), pasture to north of Vicarage Moss VC58 Barnsbridge Basin, Basin Mire A06, Finney's Moss, Flaxmere Moss, Harthill (upper basin), Newchurch Common, Rush Pool, Wybunbury Moss VC59 Highfield Moss, Risley Moss (birch woodland)
<i>Polygonia c-album</i> (Linnaeus)	Comma	VC40 Bettisfield Moss (World's End Car Park), Whixall Moss (Morris Bridge Car Park) VC50 Llay Bog area (fields and woodland), Llay Bog area (Park Lane) VC58 Finney's Moss
<i>Pyronia tithonus</i> (Linnaeus)	Gatekeeper	VC40 Bettisfield Moss (England), Whixall Moss (eastern and central areas) VC50 Fenn's Moss (western area), Llay Bog area (fields and woodland), track to Vicarage Moss, pasture to north of Vicarage Moss VC58 Barnsbridge Basin, Basin Mire LM09, Black Lake, Brookhouse Moss, South Moss, Wybunbury Moss VC59 Highfield Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Vanessa atalanta</i> (Linnaeus)	Red Admiral	VC40 Whixall Moss (Morris Bridge Car Park) VC50 Fenn's Moss (western area), Llay Bog area (Park Lane) VC58 Barnsbridge Basin, Harthill Moss, Newchurch Common, forestry road to Shemmy Moss, Thieves Moss and Thieves Pool VC59 Highfield Moss, Moss Lane (track to Highfield Moss), Risley Moss (birch woodland)

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Vanessa cardui</i> (Linnaeus)	Painted Lady	VC58 Barns Bridge, Basin Mire A01b, Lily Pool, tracks between Gull Moss and Shemmy Moss VC59 Moss Lane (track to Highfield Moss), Risley Moss (birch woodland)
Family: Lycaenidae	Blues & hairstreaks etc.	
<i>Callophrys rubi</i> (Linnaeus)	Green Hairstreak	VC58 Gull Moss
<i>Celastrina argiolus</i> (Linnaeus)	Holly Blue	VC58 Barnesbridge Basin, Brookhouse Moss, Brookhouse Lane, Delamere Office Car Park (Forestry Commission)
<i>Lycaena phlaeas</i> (Linnaeus)	Small Copper	VC58 Little Budworth Common (open central area)
<i>Polyommatus icarus</i> (Rottemburg)	Common Blue	VC58 Little Budworth Common (open central area)
Order: Coleoptera	Beetles	
Suborder: Adephaga	Ground beetles etc.	
Family: Carabidae	Ground beetles	
<i>Cicindela campestris</i> Linnaeus	Green Tiger Beetle	VC40 Whixall Moss (western and central areas) VC58 Little Budworth Common (open central area), Shemmy Moss
<i>Harpalus affinis</i> (Schrank)	a ground beetle	VC59 Moss Lane (track to Highfield Moss)
<i>Harpalus rufipes</i> (De Geer)	a ground beetle	VC58 Wall Hill Guest House (Acton Bridge) [Room 6]
<i>Pterostichus madidus</i> (Fabricius)	a ground beetle	VC59 Risley Moss (birch woodland)
Family: Silphidae	Sexton beetles etc.	
<i>Silpha atrata</i> (Linnaeus)	a carrion beetle	VC58 forestry road west of N1 N2 and N3
Family: Staphylinidae	Rove beetles	
<i>Platydracus stercorarius</i> (Olivier)	a rove beetle	VC59 Highfield Moss
Family: Scarabaeidae	Dung beetles etc.	
<i>Hoplia philanthis</i> Fuessly	Welsh Chafer	VC59 Holcroft Moss, Risley Moss (birch woodland)
<i>Phyllopertha horticola</i> (Linnaeus)	Garden Chafer	VC58 Linmere Moss (north), Little Budworth Common (North Moss), forestry road to Shemmy Moss
Family: Cantharidae	Soldier beetles	
<i>Cantharis lateralis</i> (Linnaeus)	a soldier beetle	VC59 Holcroft Moss
<i>Cantharis rustica</i> Fallén	a soldier beetle	VC58 Little Budworth Common (open central area)
<i>Rhagonycha fulva</i> (Scopoli)	a soldier beetle	VC 40 Whixall Moss (eastern and central areas), Whixall Moss (western and central areas) VC50 Fenn's Moss (western area), Llay Bog (basin mire and bog woodland), Llay Bog area (fields and woodland) VC58 Basin Mire N2, Little Budworth Common (Whitehall Moss), Rush Pool, Shemmy Moss, Thieves Moss and Thieves Pool, Wybunbury Moss VC59 Highfield Moss, Holcroft Moss, track to Holcroft Moss, Risley Moss (birch woodland)
Family: Coccinellidae	Ladybirds	
<i>Coccinella septempunctata</i> (Linnaeus)	7-spot Ladybird	VC40 Bettisfield Moss (England) VC58 Linmere Moss (north), Linmere Moss (south) VC59 track to Holcroft Moss
<i>Harmonia axyridis</i> (Pallas)	Harlequin Ladybird	VC40 Bettisfield Moss (World's End Car Park) VC50 Llay Bog (basin mire and bog woodland), track to Vicarage Moss VC58 Gull Moss, Basin Mire LM09, Linmere Moss (north), Little Budworth Common (Central Moss), Thieves Moss and Thieves Pool VC59 track to Holcroft Moss
Family Tenebrionidae	Darkling beetles	
<i>Lagria hirta</i> (Linnaeus)	a darkling beetle	VC59 Highfield Moss
Family: Oedemeridae	False blister beetles	
<i>Oedemera nobilis</i> (Scopoli)	Fat-legged Flower Beetle	VC58 Lily Pool
Family: Pyrochroidae	Cardinal beetles etc.	
<i>Pyrochroa coccinea</i> (Linnaeus)	Black-headed Cardinal Beetle	VC58 Linmere Moss (north)
Family: Cerambycidae	Longhorn beetles	
<i>Leptura quadrifasciata</i> Linnaeus	a longhorn beetle	VC59 Risley Moss (birch woodland)

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Rhagium bifasciatum</i> (Fabricius)	Two-banded Longhorn Beetle	VC58 forestry road to Shemmy Moss
<i>Rutpela maculata</i> (Poda)	Black and Yellow Longhorn Beetle	VC59 Risley Moss (birch woodland)
Family: Chrysomelidae	Leaf beetles	
<i>Agelastica alni</i> (Linnaeus)	Alder Leaf Beetle	VC58 Basin Mire A07, Gull Moss, Hockenhull, Linmere Moss (south), forestry road to Shemmy Moss, South Moss VC59 Risley Moss (birch woodland)
Order: Hymenoptera	Sawflies, bees & ichneumons etc.	
Suborder: Apocrita	Bees, wasps & ichneumons etc.	
Superfamily: Aculeata	Bees, wasps & ants	
Family: Vespidae	Social wasps	
<i>Vespa crabro</i> Linnaeus	Hornet	VC58 Black Lake
<i>Vespula rufa</i> (Linnaeus)	Red Wasp	VC59 Holcroft Moss
<i>Vespula vulgaris</i> (Linnaeus)	Common Wasp	VC58 Wybunbury Moss
Family: Colletidae	Mining bees	
<i>Colletes succinctus</i> (Linnaeus)	Heather Mining Bee	VC58 Wybunbury Moss
Family: Andrenidae	Mining bees	
<i>Andrena haemorrhoa</i> (Fabricius)	Early Mining Bee	VC58 forestry road to Shemmy Moss
<i>Andrena lapponica</i> Zetterstedt	Bilberry Mining Bee	VC58 Shemmy Moss, South Moss
Family: Halictidae	Mining bees etc.	
<i>Sphecodes pellucidus</i> Smith	Sandpit Blood bee	VC58 Wybunbury Moss
Family: Megachilidae	Mason bees etc.	
<i>Coelioxys rufescens</i> Lepeletier & Audinet-Serville	Rufescent Sharp-tail Bee	VC58 Wybunbury Moss
<i>Megachile ligniseca</i> (Kirby)	Wood-carving Leaf-cutter Bee	VC58 Basin Mire N1
Family: Anthophoridae	Nomad bees	
<i>Nomada rufipes</i> Fabricius	Black-horned Nomad Bee	VC58 Shemmy Moss
Family: Apidae	Bumblebees etc.	
<i>Apis mellifera</i> Linnaeus	Honey Bee	VC40 Bettisfield Moss (England) VC40 Fenn's Moss (western area), Llay Bog area (fields and woodland), track to Vicarage Moss VC58 Basin Mire N1, Basin Mire N2, Black Lake, Brookhouse Moss, Gull Moss, Ham (upper basin), Harthill Moss, Harthill (upper basin), Hatch Mere, Newchurch Common, Shemmy Moss, Thieves Moss and Thieves Pool, Wybunbury Moss VC59 Highfield Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Bombus hypnorum</i> (Linnaeus)	Tree Bumblebee	VC58 Black Lake, Hogshead Moss, forestry road to Shemmy Moss
<i>Bombus lapidarius</i> (Linnaeus)	Red-tailed Bumblebee	VC58 Barnsbridge Flushes, tracks between Gull Moss and Shemmy Moss VC59 Highfield Moss
<i>Bombus pascuorum</i> (Scopoli)	Common Carder-bee	VC40 Fenn's Moss (western area), pasture to north of Vicarage Moss VC58 Barnsbridge Basin, Gull Moss, Little Budworth Common (East Moss), Little Budworth Common (open central area), forestry road to Shemmy Moss, Wybunbury Moss VC59 Highfield Moss
<i>Bombus pratorum</i> (Linnaeus)	Early Bumblebee	VC58 Gull Moss, Hockenhull, forestry road to Shemmy Moss, tracks between Gull Moss and Shemmy Moss
<i>Bombus terrestris</i> (Linnaeus)	Buff-tailed Bumblebee	VC58 tracks between Gull Moss and Shemmy Moss
<i>Bombus vestalis</i> (Geoffroy)	Vestal Cuckoo-bee	VC58 Gull Moss, tracks between Gull Moss and Shemmy Moss VC59 Risley Moss (birch woodland)

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
Order: Diptera	True flies	
Suborder: Nematocera	Thread-horns	
Family: Tipulidae	Crane-flies	
<i>Nephrotoma flavipalpis</i> (Meigen)	a crane-fly	VC58 Thieves Moss and Thieves Pool
<i>Prionocera turcica</i> (Fabricius)	a crane-fly	VC50 Bettisfield Moss (Wales) VC58 Black Lake, Blakemere Moss, Gull Moss, Shemmy Moss
<i>Prionocera</i> indeterminate [<i>turcica</i> (Fabricius) or <i>pubescens</i> Loew]	a crane-fly	VC58 Blakemere Moss, Gull Moss
<i>Tipula luna</i> Westhoff	a crane-fly	VC58 Little Budworth Common (North Moss)
<i>Tipula lunata</i> Linnaeus	a crane-fly	VC58 Gull Moss VC59 Highfield Moss
<i>Tipula oleracea</i> Linnaeus	a crane-fly	VC40 Whixall Moss (eastern and central areas) VC59 Highfield Moss, Holcroft Moss
<i>Tipula rufina</i> Meigen	a crane-fly	VC58 Linmere Moss (north)
<i>Tipula scripta</i> Meigen	a crane-fly	VC40 Bettisfield Moss (England)
Family: Limoniidae	Crane-flies	
<i>Idioptera linnei</i> Oosterbroek	a crane-fly	VC58 Little Budworth Common (North Moss) Little Budworth Common (Whitehall Moss), Shemmy Moss, South Moss
<i>Metalimnobia bifasciata</i> (Schrank)	a crane-fly	VC59 Highfield Moss
<i>Phylidorea fulvonervosa</i> (Schummel)	a crane-fly	VC59 Holcroft Moss
<i>Phylidorea squalens</i> (Zetterstedt)	a crane-fly	VC58 Shemmy Moss
Family: Culicidae	Mosquitoes	
<i>Ochlerotatus annulipes</i> (Meigen)	a mosquito	VC59 Risley Moss (birch woodland)
Suborder: Brachycera	Short-horns	
Family: Rhagionidae	Snipeflies	
<i>Chrysopilus cristatus</i> (Fabricius)	Black Snipefly	VC40 Whixall Moss (western and central areas) VC58 Newchurch Common VC59 track to Holcroft Moss, Risley Moss (birch woodland)
<i>Rhagio scolopaceus</i> (Linnaeus)	Down-looker Fly	VC59 Holcroft Moss
<i>Rhagio tringarius</i> (Linnaeus)	Marsh Snipefly	VC59 Highfield Moss
Family: Stratiomyidae	Soldierflies	
<i>Chloromyia formosa</i> (Scopoli)	Broad Centurion	VC50 Fenn's Moss (western area)
Family: Therevidae	Stiletto-flies	
<i>Thereva nobilitata</i> (Fabricius)	Common Stiletto-fly	VC58 Basin Mire A07
Family: Asilidae	Robberflies	
<i>Lasiopogon cinctus</i> (Fabricius)	Spring Heath Robber-fly	VC58 Hogshead Moss
<i>Machimus atricapillus</i> (Fallén)	Kite-tailed Robberfly	VC50 Llay Bog area (fields and woodland)
<i>Machimus cingulatus</i> (Fabricius)	Brown Heath Robber-fly	VC50 Fenn's Moss (western area)
<i>Neoitamus cyanurus</i> (Loew)	Common Awl Robberfly	VC58 Basin Mire A07, Black Lake, Ham (lower basin), Linmere Moss (north), Linmere Moss (south)
Family: Empididae	Dance flies	
<i>Empis livida</i> Linnaeus	a dance fly	VC59 Holcroft Moss
<i>Empis tessellata</i> Fabricius	a dance fly	VC58 Black Lake, Hockenhull, forestry road to Shemmy Moss VC59 track to Holcroft Moss, Risley Moss (birch woodland)
Family: Dolichopodidae	Long-legged flies	
<i>Chrysotimus molliculus</i> (Fallén)	a long-legged fly	VC40 Whixall Moss (western and central areas)
<i>Chrysotus neglectus</i> (Wiedemann)	a long-legged fly	VC40 Bettisfield Moss (England)

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Dolichopus trivialis</i> Haliday	a long-legged fly	VC59 Holcroft Moss
<i>Dolichopus unguulatus</i> (Linnaeus)	a long-legged fly	VC59 Risley Moss (birch woodland)
<i>Gymnopternus aerosus</i> (Fallén)	a long-legged fly	VC59 Highfield Moss
<i>Poecilobothrus nobilitatus</i> (Linnaeus)	a long-legged fly	VC58 Hogshead Moss VC59 Highfield Moss
<i>Sympycnus desoutterii</i> Parent	a long-legged fly	VC50 Llay Bog area (fields and woodland)
Family: Lonchopteridae	Pointed-winged flies	
<i>Lonchoptera lutea</i> Panzer	a pointed-winged fly	VC40 Whixall Moss (western and central areas) VC59 Highfield Moss
Family: Syrphidae	Hoverflies	
<i>Anasimyia contracta</i> Claussen & Torp	a hoverfly	VC59 Risley Moss (birch woodland)
<i>Anasimyia lineata</i> (Fabricius)	a hoverfly	VC59 Highfield Moss, Risley Moss (birch woodland)
<i>Baccha elongata</i> (Fabricius)	a hoverfly	VC59 Holcroft Moss
<i>Chalcosyrphus nemorum</i> (Fabricius)	a hoverfly	VC58 Gull Moss
<i>Cheilosia illustrata</i> (Harris)	a hoverfly	VC58 tracks between Gull Moss and Shemmy Moss VC59 Risley Moss (birch woodland)
<i>Cheilosia pagana</i> (Meigen)	a hoverfly	VC59 Highfield Moss
<i>Cheilosia scutellata</i> (Fallén)	a hoverfly	VC50 Fenn's Moss (western area) VC58 Barnsbridge Flushes VC59 Risley Moss (birch woodland)
<i>Cheilosia vulpina</i> (Meigen)	a hoverfly	VC58 Black Lake
<i>Chrysogaster solstitialis</i> (Fallén)	a hoverfly	VC50 Fenn's Moss (western area), Llay Bog (fields and woodland)
<i>Chrysogaster virescens</i> Loew	a hoverfly	VC58 Barnsbridge Flushes, Black Lake, Hogshead Moss, Lily Pool, Shemmy Moss
<i>Chrysotoxum festivum</i> (Linnaeus)	a hoverfly	VC58 Lily Pool
<i>Didea fasciata</i> Macquart	a hoverfly	VC58 Basin Mire LM10
<i>Epistrophe grossulariae</i> (Meigen)	a hoverfly	VC58 Basin Mire N2
<i>Episyrphus balteatus</i> (De Geer)	a hoverfly	VC40 Bettisfield Moss (England), Whixall Moss (western and central area) VC50 Fenn's Moss (western area), Llay Bog area (fields and woodland), pasture to north of Vicarage Moss VC58 Basin Mire LM10, Basin Mire N2, Black Lake, Blakemere Moss, Brookhouse Moss, Finney's Moss, Flaxmere Moss, Harthill Moss, Harthill (upper basin), Newchurch Common, Rush Pool, Shemmy Moss, South Moss, Wybunbury Moss VC59 Highfield Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Eristalis arbustorum</i> (Linnaeus)	a hoverfly	VC58 Llay Bog area (fields and woodland)
<i>Eristalis intricarius</i> (Linnaeus)	a hoverfly	VC50 Fenn's Moss (western area) VC59 Risley Moss (birch woodland)
<i>Eristalis pertinax</i> (Scopoli)	a hoverfly	VC40 Whixall Moss (western and central areas) VC50 Fenn's Moss (western area), Llay Bog area (fields and woodland) VC58 Finney's Moss, Harthill (upper basin), Little Budworth Common (open central area), forestry road to Shemmy Moss, Thieves Moss and Thieves Pool VC59 Highfield Moss, Risley Moss (birch woodland)
<i>Eristalis tenax</i> (Linnaeus)	Drone-fly	VC58 Barnsbridge Flushes
<i>Eupeodes corollae</i> (Fabricius)	a hoverfly	VC58 Little Budworth Common (Whitehall Moss)
<i>Ferdinandea cuprea</i> (Scopoli)	a hoverfly	VC59 Risley Moss (birch woodland)
<i>Helophilus hybridus</i> Loew	a hoverfly	VC50 Vicarage Moss (north basin mire)

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Helophilus pendulus</i> (Linnaeus)	a hoverfly	VC58 Brookhouse Moss, Wybunbury Moss
<i>Leucozona laternaria</i> (Müller)	a hoverfly	VC59 Risley Moss (birch woodland)
<i>Melanostoma mellinum</i> (Linnaeus)	a hoverfly	VC40 Bettisfield Moss (England) VC58 Lily Pool, Shemmy Moss VC59 Highfield Moss, Holcroft Moss
<i>Melanostoma scalare</i> (Fabricius)	a hoverfly	VC58 Rush Pool VC59 Highfield Moss
<i>Microdon mutabilis</i> (Linnaeus) [sensu lato]	a hoverfly	VC58 Little Budworth Common (Whitehall Moss), South Moss
<i>Myathropa florea</i> (Linnaeus)	a hoverfly	VC58 Wybunbury Moss VC59 Risley Moss (birch woodland)
<i>Neoascia tenur</i> (Harris)	a hoverfly	VC58 Hogshead Moss
<i>Orthonevra intermedia</i> Lundbeck	a hoverfly	VC58 Lily Pool
<i>Pipiza noctiluca</i> (Linnaeus)	a hoverfly	VC58 Basin Mire N2
<i>Platycheirus albimanus</i> (Fabricius)	a hoverfly	VC50 Vicarage Moss (north basin mire) VC58 Basin Mire LM09, Black Lake, Blakemere Moss, Brookhouse Moss, Ham (lower basin), Shemmy Moss, Wybunbury Moss
<i>Platycheirus clypeatus</i> (Meigen) [sensu stricto]	a hoverfly	VC40 Bettisfield Moss (England) VC50 Fenn's Moss (western area), Llay Bog area (fields and woodland) VC58 Blakemere Moss, Brookhouse Moss, Little Budworth Common (Whitehall Moss), Shemmy Moss VC59 Highfield Moss, Holcroft Moss
<i>Platycheirus occultus</i> Goeldlin de Tiefenau, Maibach & Speight	a hoverfly	VC58 Lily Pool
<i>Platycheirus peltatus</i> (Meigen) [sensu stricto]	a hoverfly	VC58 Little Budworth Common (Central Moss)
<i>Rhingia campestris</i> Meigen	a hoverfly	VC58 Brookhouse Moss
<i>Scaeva pyrastris</i> (Linnaeus)	a hoverfly	VC50 Llay Bog area (fields and woodland)
<i>Sericomyia lappona</i> (Linnaeus)	a hoverfly	VC58 Barnsbridge Basin, Hogshead Moss
<i>Sericomyia silentis</i> (Harris)	a hoverfly	VC58 Blakemere Moss, Finney's Moss, Hogshead Moss, Shemmy Moss, Wybunbury Moss VC59 Risley Moss (birch woodland)
<i>Sphaerophoria philanthus</i> (Meigen)	a hoverfly	VC58 Shemmy Moss
<i>Sphaerophoria scripta</i> (Linnaeus)	a hoverfly	VC59 Moss Lane (track to Highfield Moss)
<i>Syrirta pipiens</i> (Linnaeus)	a hoverfly	VC40 Bettisfield Moss (England) VC58 Black Lake
<i>Syrphus ribesii</i> (Linnaeus)	a hoverfly	VC59 Highfield Moss
<i>Volucella bombylans</i> (Linnaeus)	a hoverfly	VC59 Highfield Moss, Holcroft Moss, Risley Moss (birch woodland)
<i>Volucella pellucens</i> (Linnaeus)	a hoverfly	VC58 Finney's Moss, Shemmy Moss, tracks between Gull Moss and Shemmy Moss VC59 Moss Lane (track to Highfield Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Xanthogramma pedissequum</i> (Harris) [sensu stricto]	a hoverfly	VC58 Little Budworth Common (North Moss), Little Budworth Common (Whitehall Moss)
<i>Xylota abiens</i> Meigen	a hoverfly	VC58 Black Lake, Linmere Moss (north)
<i>Xylota segnis</i> (Linnaeus)	a hoverfly	VC58 Basin Mire LM10, Lily Pool, Linmere Moss (south) VC59 Risley Moss (birch woodland)
Family: Conopidae	Thick-headed flies	
<i>Conops flavipes</i> Linnaeus	a thick-headed fly	VC58 Thieves Moss and Thieves Pool
<i>Sicus ferrugineus</i> (Linnaeus)	a thick-headed fly	VC50 Fenn's Moss (western area) VC58 Barnsbridge Basin, Little Budworth Common (Central Moss), Little Budworth Common (Whitehall Moss), Shemmy Moss, tracks between Gull Moss and Shemmy Moss

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
Family: Pallopteridae	Picture-winged flies	
<i>Paloptera umbellatarum</i> (Fabricius)	a picture-winged fly	VC59 Highfield Moss
Family: Sciomyzidae	Marsh flies	
<i>Tetanocera elata</i> (Fabricius)	a marsh fly	VC59 Holcroft Moss
Family: Sepsidae	Black scavenger flies	
<i>Sepsis cynipsea</i> (Linnaeus)	a black scavenger fly	VC40 Bettisfield Moss (England)
<i>Sepsis fulgens</i> Meigen	a black scavenger fly	VC40 Whixall Moss (western and central areas) VC50 Llay Bog (fields and woodland) VC58 Little Budworth Common (Whitehall Moss)
Family: Opomyzidae	Cereal flies	
<i>Opomyza germinationis</i> (Linnaeus)	a cereal fly	VC40 Whixall Moss (western and central areas)
Family: Scathophagidae	Dung flies etc.	
<i>Cordilura ciliata</i> Meigen	a dung fly	VC58 Lily Pool
<i>Cordilura rufimana</i> Meigen	a dung fly	VC58 Lily Pool
<i>Scathophaga furcata</i> (Say)	a dung fly	VC58 South Moss
<i>Scathophaga inquinata</i> Meigen	a dung fly	VC58 Brookhouse Moss, South Moss
<i>Scathophaga stercorea</i> (Linnaeus)	Yellow Dung Fly	VC40 Whixall Moss (western and central areas) VC50 Llay Bog area (fields and woodland), track to Vicarage Moss VC58 Barnsbridge Basin, Brookhouse Moss, Blakemere Moss, Gull Moss, Hatch Mere, Hockenhull, Lily Pool, Little Budworth Common (Central Moss), Little Budworth Common (East Moss), Little Budworth Common (Whitehall Moss), Shemmy Moss VC59 Highfield Moss, track to Holcroft Moss
Family: Anthomyiidae	Root-maggot flies etc.	
<i>Eustalomyia festiva</i> (Zetterstedt)	an anthomyiid fly	VC59 Risley Moss (birch woodland)
<i>Eustalomyia</i> indeterminate [festiva (Zetterstedt) or histrio (Zetterstedt)]	an anthomyiid fly	VC59 Risley Moss (birch woodland)
<i>Hylemya nigrimana</i> (Meigen)	an anthomyiid fly	VC58 Black Lake
Family: Muscidae	Housefly & sweat flies etc.	
<i>Coenosia femoralis</i> (Robineau-Desvoidy)	a muscid fly	VC40 Whixall Moss (eastern and central areas)
<i>Eudasyphora cyanella</i> (Meigen)	a muscid fly	VC50 Vicarage Moss (small raised basin) VC59 Holcroft Moss
<i>Eudasyphora cyanicolor</i> (Zetterstedt)	a muscid fly	VC50 Llay Bog area (fields and woodland)
<i>Helina depuncta</i> (Fallén)	a muscid fly	VC58 Little Budworth Common (Whitehall Moss)
<i>Helina setiventris</i> Ringdahl	a muscid fly	VC58 Thieves Moss and Thieves Pool
<i>Hydrotaea irritans</i> (Fallén)	a sweat fly	VC58 Lily Pool
<i>Mesembrina meridiana</i> Linnaeus	Noon Fly	VC58 Rush Pool
<i>Morellia hortorum</i> (Fallén)	a muscid fly	VC58 Wybunbury Moss
<i>Musca autumnalis</i> De Geer	a muscid fly	VC40 Bettisfield Moss (England) VC58 Black Lake, Wybunbury Moss
<i>Muscina prolapsa</i> (Harris)	a muscid fly	VC59 Highfield Moss
<i>Neomyia cornicina</i> (Fabricius)	a muscid fly	VC58 Brookhouse Moss
<i>Phaonia angelicae</i> (Scopoli)	a muscid fly	VC58 Newchurch Common VC59 Highfield Moss
<i>Phaonia fuscata</i> (Fallén)	a muscid fly	VC58 Black Lake
<i>Phaonia pallida</i> (Fabricius)	a muscid fly	VC58 Basin Mire LM10, Flaxmere Moss
<i>Phaonia subventa</i> (Harris)	a muscid fly	VC58 Lily Pool, South Moss VC59 Highfield Moss

TABLE OF OTHER INVERTEBRATES RECORDED IN 2019

SCIENTIFIC NAME	VERNACULAR NAME	LOCALITIES (VC = vice-county)
<i>Phaonia valida</i> (Harris)	a muscid fly	VC40 Bettisfield Moss (World's End Car Park) VC58 Linmere Moss (north), Little Budworth Common (open central area)
<i>Polietes lardarius</i> (Fabricius)	a muscid fly	VC58 Thieves Moss and Thieves Pool
<i>Thricops diaphanus</i> (Wiedemann)	a muscid fly	VC58 Barnsbridge Basin
Family: Calliphoridae	Bluebottles etc.	
<i>Calliphora vicina</i> Robineau-Desvoidy	Common Bluebottle	VC58 bridge near Black Lake, tracks between Gull Moss and Shemmy Moss, Newchurch Common VC59 Highfield Moss, Moss Lane (track to Highfield Moss), Holcroft Moss, track to Holcroft Moss, Risley Moss (birch woodland)
<i>Lucilia caesar</i> (Linnaeus)	Common Greenbottle	VC40 Bettisfield Moss (England) VC58 Thieves Moss and Thieves Pool VC59 Highfield Moss
<i>Protocalliphora azurea</i> (Fallén)	Bird Blowfly	VC58 Brookhouse Moss, Wybunbury Moss
Family: Polleniidae	Cluster flies	
<i>Pollenia rudis</i> (Fabricius)	Common Clusterfly	VC58 Black Lake, Brookhouse Moss
Family: Sarcophagidae	Flesh flies	
<i>Macronychia dolini</i> Verves & Khrokalo	a flesh fly	VC59 Risley Moss (birch woodland)
<i>Sarcophaga carnaria</i> (Linnaeus)	a flesh fly	VC59 Highfield Moss
<i>Sarcophaga variegata</i> (Scopoli)	a flesh fly	VC59 Highfield Moss
Family: Tachinidae	Parasitic flies	
<i>Dexiosoma caninum</i> (Fabricius)	a parasitic fly	VC50 Llay Bog area (fields and woodland) VC59 Highfield Moss
<i>Eriothrix rufomaculata</i> (De Geer)	a parasitic fly	VC50 Llay Bog area (fields and woodland), Vicarage Moss (north basin mire) VC58 South Moss, Wybunbury Moss
<i>Eurithia anthophila</i> (Robineau-Desvoidy)	a parasitic fly	VC58 Linmere Moss (north)
<i>Linnaemya vulpina</i> (Fallén)	a parasitic fly	VC50 Vicarage Moss (north basin mire) VC58 Wybunbury Moss VC59 Highfield Moss
<i>Prosenia siberita</i> (Fabricius)	a parasitic fly	VC58 Wybunbury Moss
<i>Tachina fera</i> (Linnaeus)	a parasitic fly	VC59 Risley Moss (birch woodland)

ACKNOWLEDGEMENTS

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Chris Ecton (Forestry Commission) provided a key that opened most gates on the Delamere Forest roads. Local farmer Geoff Jones and his son were very helpful regarding access to the two basin mires at Vicarage Moss. Permissions to collect and record invertebrates were usually obtained well in advance of survey visits; an exception being for Lily Pool (on the land of the Forest Camp Activity Centre), where those in charge were kind enough to give permission on the days of my visits (3rd and 23rd July).

REFERENCES

- Ball, S. G. & Morris, R. K. A.** (2014) A review of the scarce and threatened flies of Great Britain. Part 6: Hoverflies: family Syrphidae. *Species Status* **9**. Peterborough: Joint Nature Conservation Committee.
- Drake, C. M.** (2006) *Orthonevra intermedia* Lundbeck, 1916 (Diptera, Syrphidae) new to Britain. *Dipterists Digest* (Second Series) **13**: 87-91.
- Drake, C. M.** (2017) A review of the status of Larger Brachycera flies of Great Britain. *Species Status* **29**. Natural England Commissioned Report NECR192.
- Falk, S. [J.]** (1991) A review of the scarce and threatened flies of Great Britain (Part 1). *Research & survey in nature conservation* **39**. Peterborough: Nature Conservancy Council.
- Falk, S. J. & Pont, A. C.** (2017) *A Provisional Assessment of the Status of Calypterate flies in the UK*. Natural England Commissioned Report NECR234.
- Fox, R., Warren, M. S. & Brereton, T. M.** (2010) A new Red List of British Butterflies. *Species Status* **12**. Peterborough: Joint Nature Conservation Committee.
- Gauld, I.[D.] & Bolton, B.** [eds.] (1988) *The Hymenoptera*. Oxford [principally]: Oxford University Press in association with the British Museum (Natural History).
- Grayson, A.** (1995) *The Horseflies of Yorkshire: A comprehensive county account*. Kirkbymoorside: Andyg Publications.
- Grayson, A.** (2019) *The status and distribution of the horseflies *Atylotus plebeius* and *Hybomitra lurida* on the Cheshire Plain area of North West England: Including assessments of mire habitats and accounts of other horseflies (Tabanidae)*. [Report to the Tanyptera Trust]
- Hubble, D. S.** (2014) A review of the scarce and threatened beetles of Great Britain: The leaf beetles and their allies: Chrysomelidae, Megalopodidae and Orsodacnidae. *Species Status* **19**. Natural England Commissioned Report NECR164.
- Hyman, P. S. & Parsons, M. S.** (1992) A review of the scarce and threatened Coleoptera of Great Britain. Part 1. *UK Nature Conservation* **3**. Peterborough: Joint Nature Conservation Committee.
- Lazenby, A. S.** (2014) The Alder Leaf Beetle *Agelastica alni* (L.) (Chrysomelidae) population explosion in Sheffield, South Yorkshire. *The Sorby Record* **50**: 7.
- Shirt, D. B.** (editor) (1987) Insects. *British Red Data Books* **2**. Peterborough: Nature Conservancy Council.
- Stubbs, A. E. & Drake, [C.] M.** (2001) *British Soldierflies and their Allies. An illustrated guide to their identification and ecology: covering all flies (Diptera) in the the [sic] families Acroceridae, Asilidae, Athericidae, Bombyliidae, Rhagionidae, Scenopinidae, Stratiomyidae, Tabanidae, Therevidae, Xylomyidae and Xylophagidae*. Reading: British Entomological and Natural History Society.
- Stubbs, A. E. & Drake, [C.] M.** (2014) *British Soldierflies and their Allies. An illustrated guide to their identification and ecology: covering all flies (Diptera) in the the [sic] families Acroceridae, Asilidae, Athericidae, Bombyliidae, Rhagionidae, Scenopinidae, Stratiomyidae, Tabanidae, Therevidae, Xylomyidae and Xylophagidae*. Reading: British Entomological and Natural History Society.
- Sutton, P. G.** (2015) A review of the Orthoptera (Grasshoppers and crickets) and allied species of Great Britain. *Species Status* **21**. Natural England Commissioned Report NECR187.

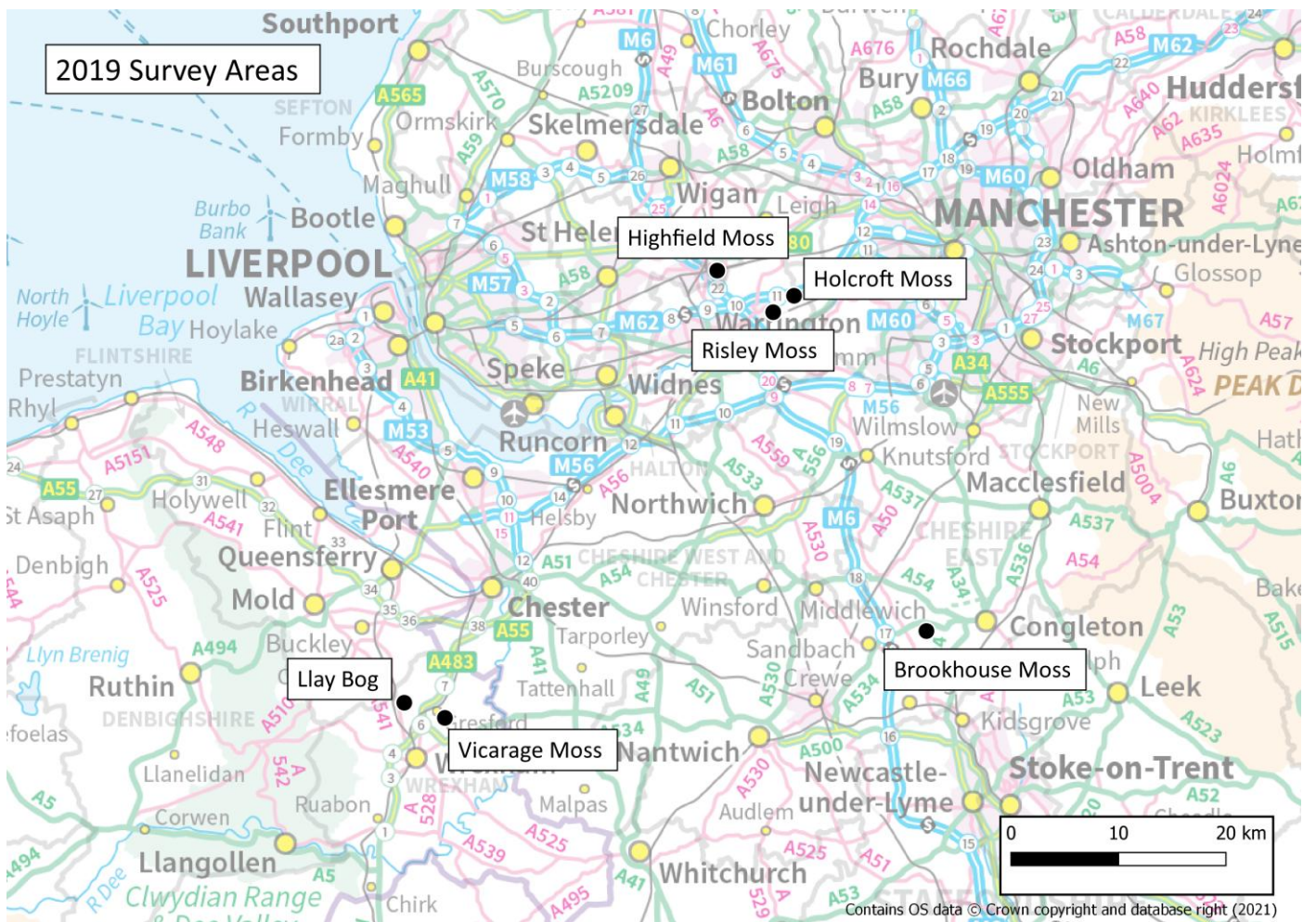
APPENDIX 1

INTRODUCTION TO PLANS

Plans in this report (kindly produced by Gary Hedges) are restricted to ‘outlying’ basin mires that were investigated for Tabanidae-interest in 2019 only. Plans are not given here for basin mires that were re-visited in 2019, having previously been investigated during 2018. Plans that show the locations of such basin mires (and their associated ‘supplementary localities’), can be found on pages 48 to 55 of the report which covered Cheshire Plain Tabanidae studies during 2018 (Grayson, 2019).

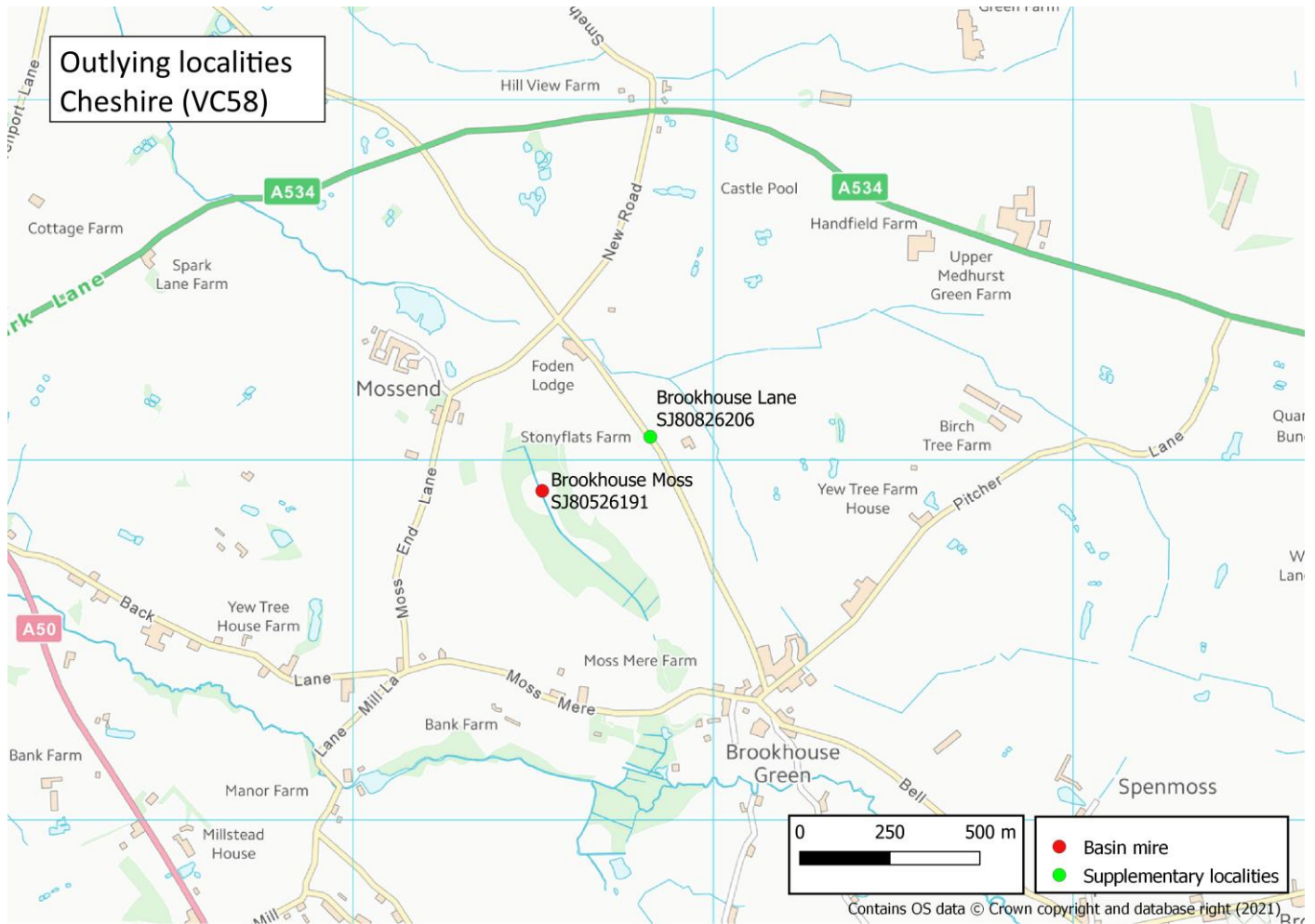
The term ‘outlying’, as used here, refers to basin mires that are situated well beyond the fringes of the main blocks of basin mires in the Cheshire Plain region. The term ‘supplementary localities’, refers to localities that were not basin mires: such localities were generally in close proximity to basin mires, e.g. access tracks.

LOCATIONS OF OUTLYING BASIN MIRES THAT WERE FIRST VISITED IN 2019



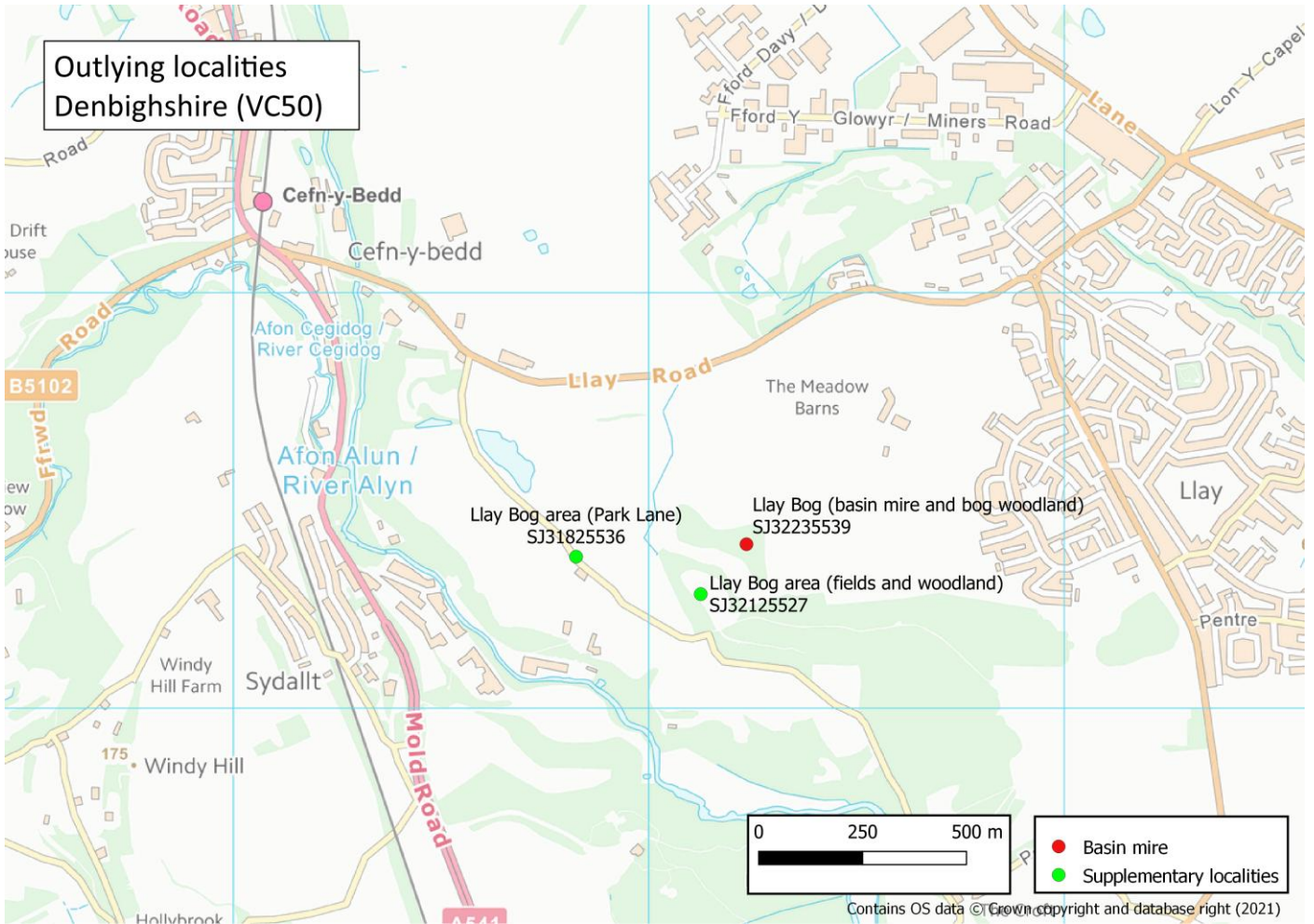
LOCATIONS OF OUTLYING BASIN MIRES IN CHESHIRE (VC58)

BROOKHOUSE MOSS

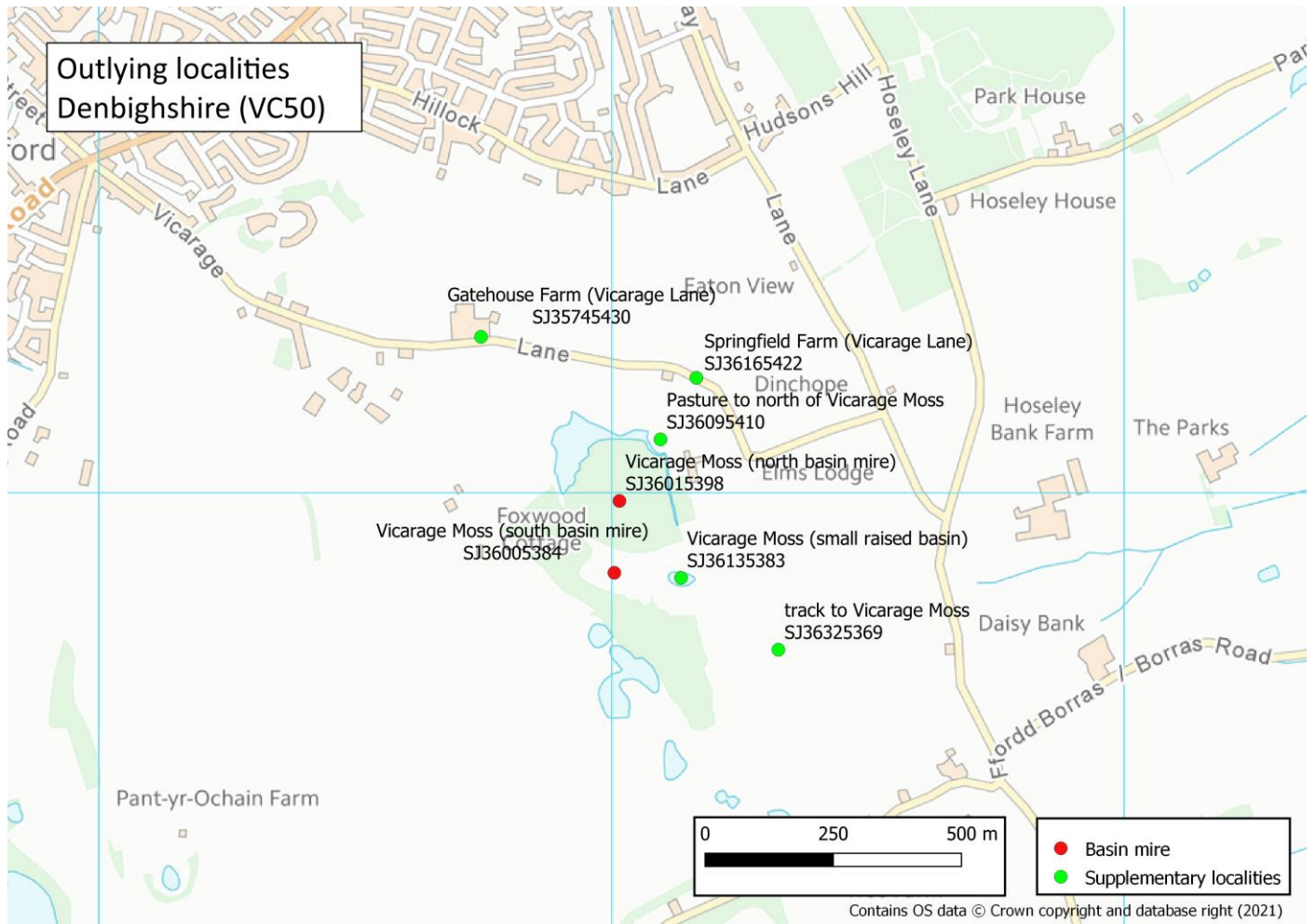


LOCATIONS OF OUTLYING BASIN MIRES IN DENBIGHSHIRE (VC50)

LLAY BOG

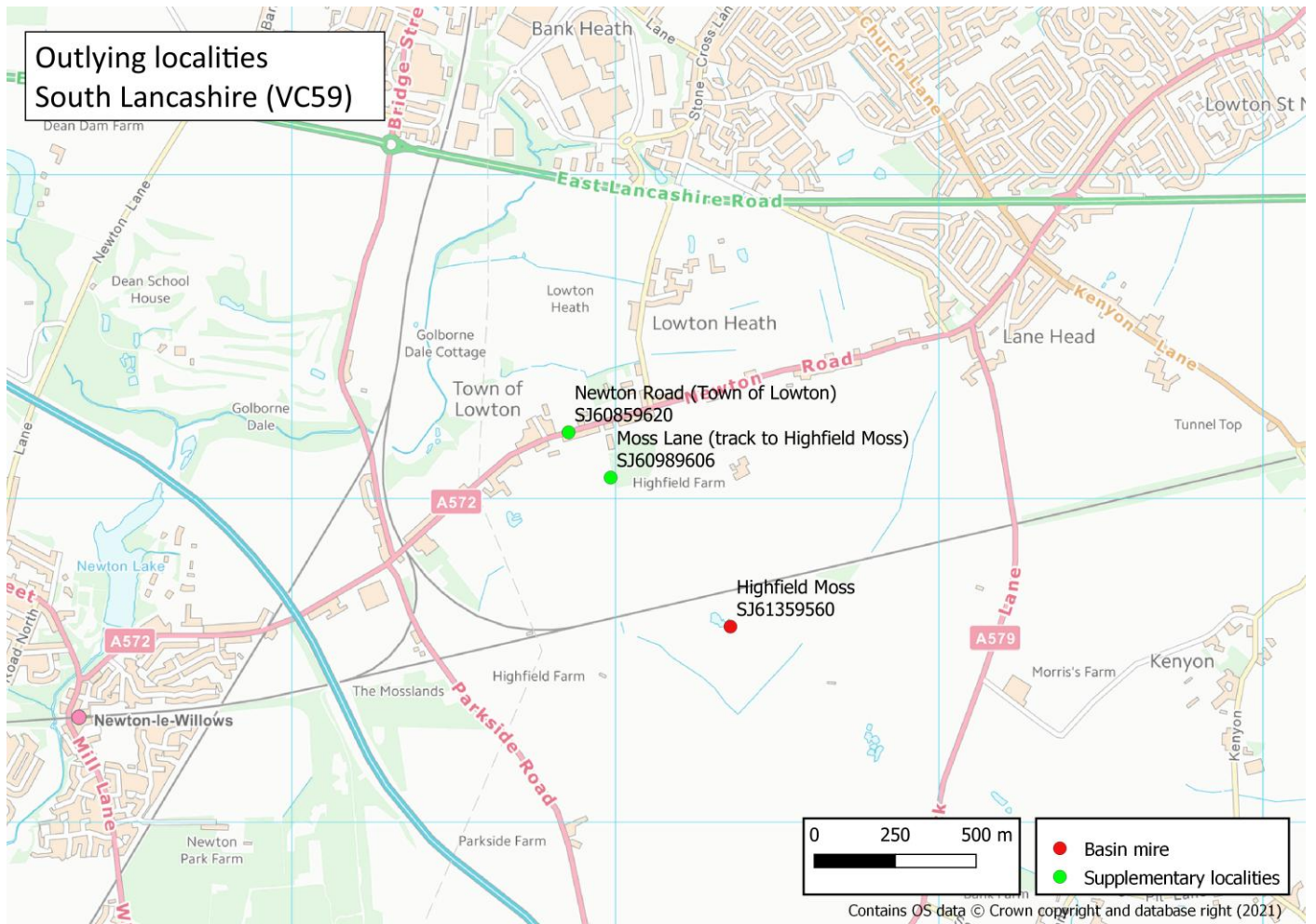


VICARAGE MOSS

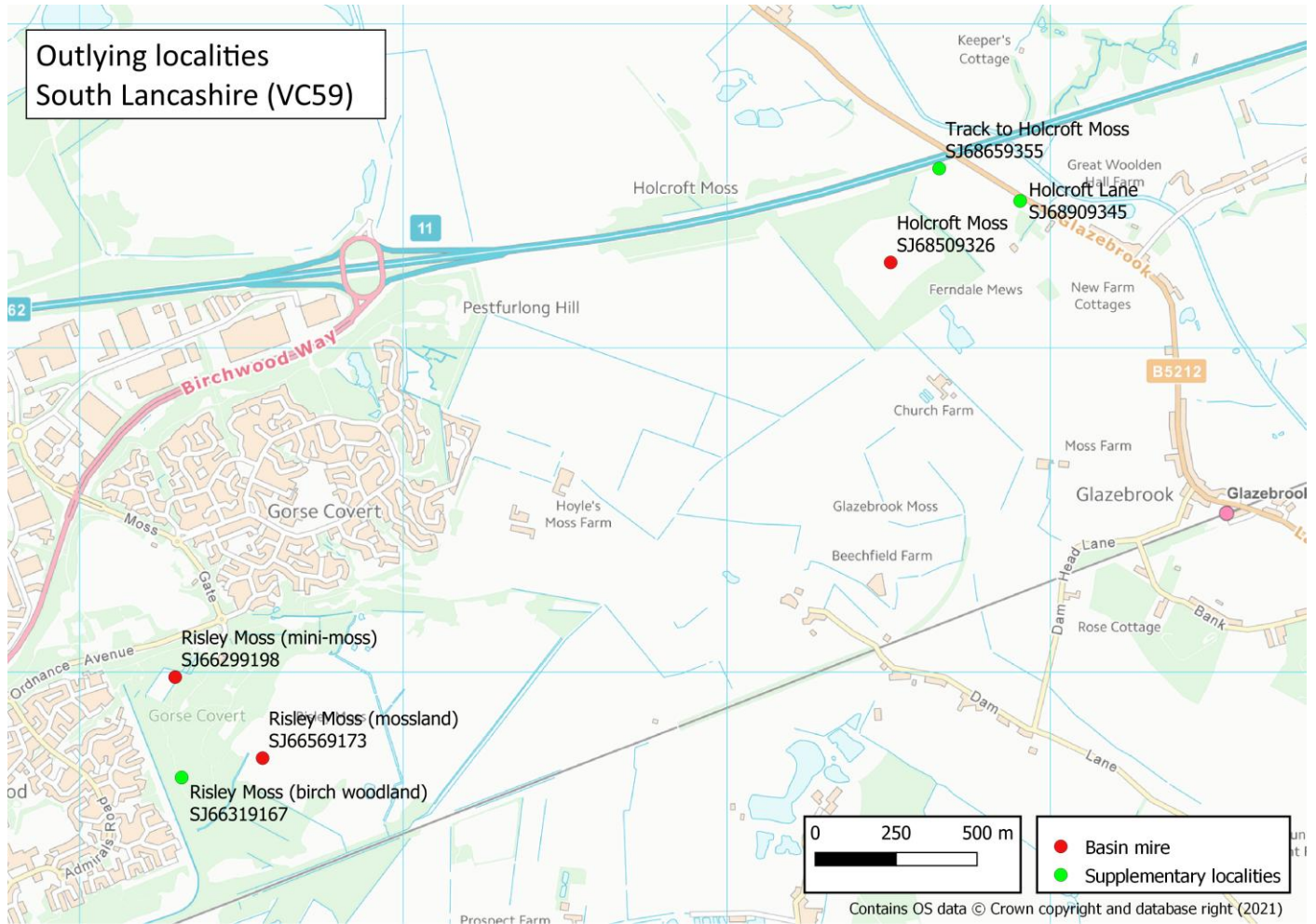


LOCATIONS OF OUTLYING BASIN MIRES IN SOUTH LANCASHIRE (VC59)

HIGHFIELD MOSS



HOLCROFT MOSS AND RISLEY MOSS



APPENDIX 2

PHOTOGRAPHS OF FOUR CONSPICUOUS INVERTEBRATES

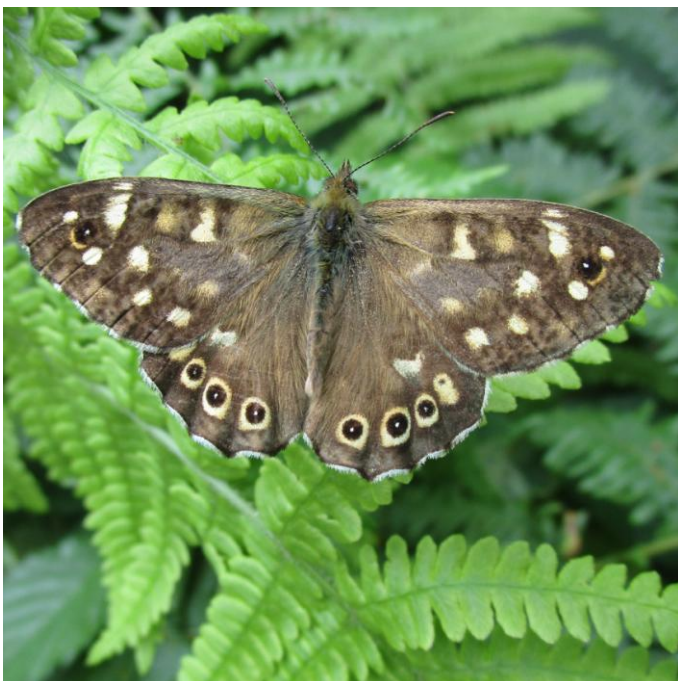
Very regrettably, it was not possible for this report to include any photographs of living horseflies that were taken during the 2019 survey; as all photographs taken of Tabanidae in the field were of sub-optimal quality, including a long series of images which featured *Atylotus plebeius* (Cheshire Horsefly) at Little Budworth Common on 24th July; all of which were out-of-focus to varying degrees. No special effort was made to photograph invertebrates other than Tabanidae; however, it was inevitable that a few conspicuous insects would occasionally present themselves to the photographer: these included the three butterflies and one beetle featured below. The *Pieris napi* (Green-veined White) in copula were photographed under gloomy conditions on 2nd August 2019, in a meadow which adjoins the western side of the basin mire at Wybunbury Moss. *Aglais urticae* (Small Tortoiseshell), was photographed on 22nd July 2019, along the entrance track which adjoins the north-eastern corner of Holcroft Moss. *Pararge aegeria* (Speckled Wood), was photographed beside a forestry road near Harthill (upper basin) on 3rd August 2019. *Agelastica alni* (Alder Leaf Beetle), was photographed on a fence-rail near Linmere Moss (south) on 31st May 2019.



Pieris napi (Green-veined White butterfly)



Aglais urticae (Small Tortoiseshell butterfly)



Pararge aegeria (Speckled Wood butterfly)



Agelastica alni (Alder Leaf Beetle)