

Report on Asker, Mangerton and Lower Brit Riverfly monitoring in 2021

This report considers Riverfly monitoring at the following sites on the Asker, 1) above Askerswell village, 2) by Folly Farm, 3) Uploders, 4) Lower Loders and 5) by the Co-op, Bridport. In addition, it covers Milton Mill on the Mangerton River and Plottingham on the Brit in Bridport.

1: Anglers' Riverfly Monitoring Initiative (ARMI) based on the abundance of eight invertebrates

All locations were subject to Riverfly monitoring for eight invertebrates at monthly intervals from April to September 2021. The combined data showed seasonal changes in the percentage contribution of each invertebrate to the total number of individuals recorded on that occasion (Figure 1).

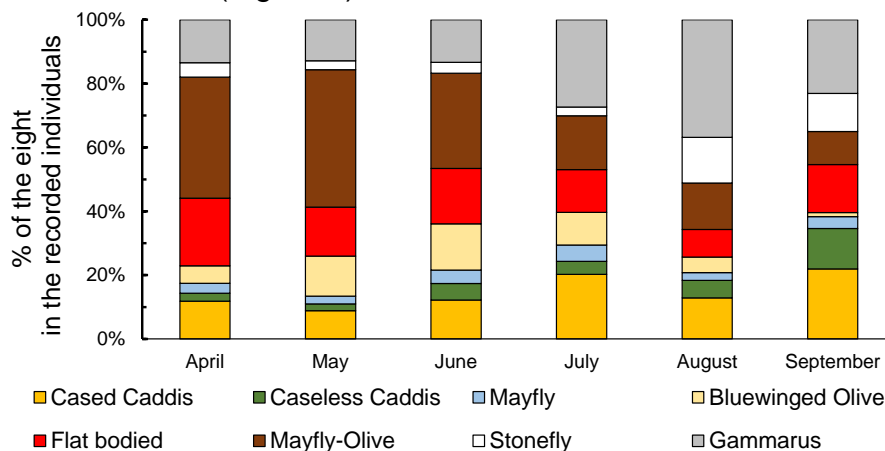


Figure 1: The proportions of the eight recorded invertebrates recorded each month from April to September based on all monitoring locations.

These seasonal changes were shown by several of the groups with statistical significance ($P < 0.05$; Oneway ANOVA SNK test) for both Mayfly-Olive which shows an estimated peak abundance in mid-April and Stoneflies that increased significantly as autumn approached (Figure 2).

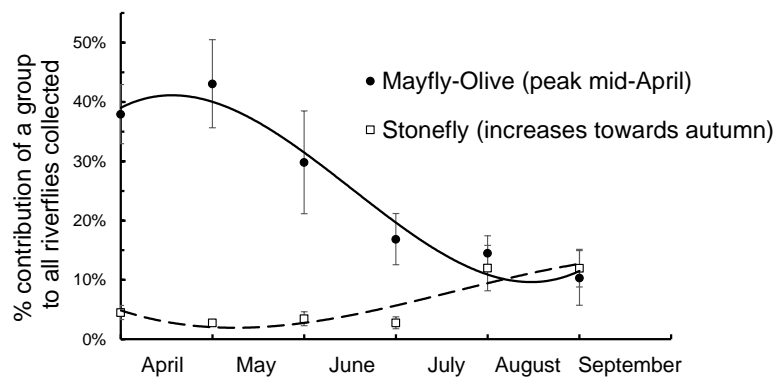


Figure 2: Mayfly-Olive varied in their percentage contribution to recorded individuals which was significant based on the actual number collected. Stoneflies also varied on that basis increasing as autumn approached. Values are means \pm the standard error of the mean (SEM).

Blue-winged Olives had a peak of abundance in mid-May one month later than the Olives. Mayfly did not show a clear seasonal peak, but this may result from a low incidence providing insufficient data for effective analysis. In addition, some groups may include more than one species with different life histories.

Members of the group were not found in equal abundance at all sites. Cluster analysis was used to identify those whose abundance followed a similar pattern. The analysis indicates that Mayfly, Blue Winged Olives, Flat bodied Mayflies and the freshwater shrimp *Gammarus* had similar distributions. Caseless Caddis and Stoneflies were also co-occurring as were Cased Caddis and Mayfly-Olive. The different habitats available such as substrate and flow rate probably relate partly to these differences. Diet may also be a factor although both Blue Winged Olive and Mayfly-Olive are both algae and detritus feeders but favoured different locations. Both types of Caddis are a combined category in the group of eight that includes species with different dietary preferences.

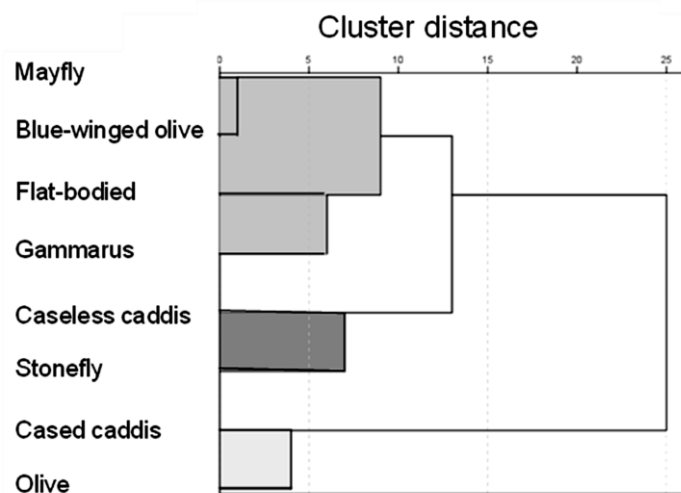


Figure 3: Cluster distances for the eight invertebrates for all the monitoring sites combined indicated three clusters.

The cluster analysis above assumes all the monitoring sites were similar which is not the case. When the analysis is based on the locations differences do emerge. There are three clusters that represent a) the upper reaches of the Asker, b) the midsection of this river and the Mangerton and c) the lower reaches of the confluence of these two rivers and the nearby Brit (Figure 4). This is the same pattern as evident in the report for 2019.

The recorded scores by site varied from 10.2 to 12.7 in 2019 and from 11.2 to 14.2 in 2021 (Figure 5). There were no significant differences among the sites in either year but the overall mean for 2019 of 11.3 ± 0.39 was significantly lower (t test, $P < 0.05$) than that of 12.7 ± 0.33 in 2021.

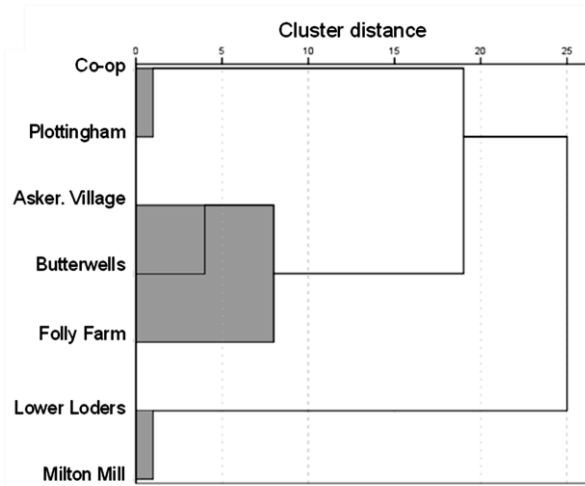


Figure 4: Cluster distances for the seven monitoring sites indicating the extent to which sites were similar in their abundance of individuals of the eight recorded invertebrates.

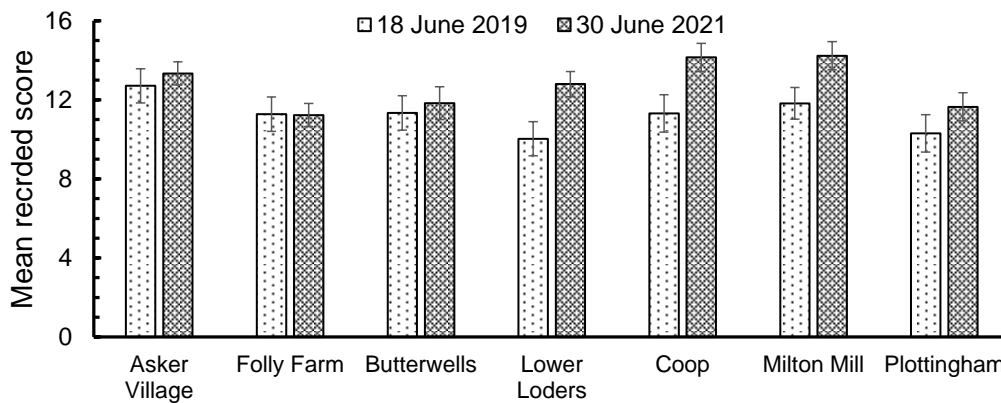


Figure 5: The mean recorded scores for the seven sites estimated at a mean date in June for the two years based in Univariate ANOVA

The mean score of 12.7 ± 0.33 represents a high score within the ARMI national site for values recorded in June 2021. It places the monitoring sites overall within the top 15% of national sites with highest scores (Figure 6).

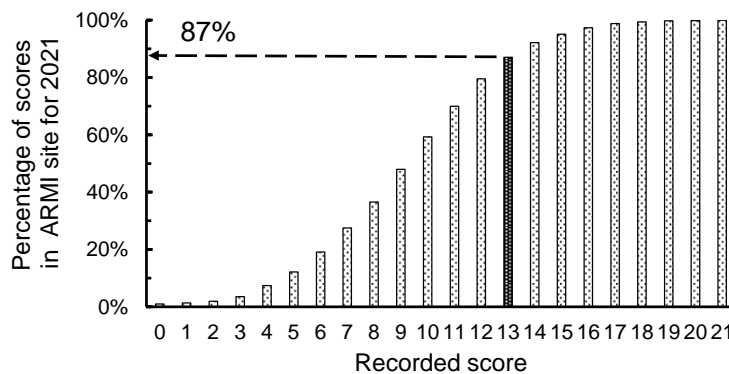


Figure 6: Accumulative percentage of scores in June 2021 for all sites in the national ARMI data base. The mean value for the seven sites in this report in June 2021 was c13.

The scoring for the AMRI group of eight is unavoidably influenced by the total number of invertebrates recorded. The approach relies on strict adherence to the standardised collection details recommended by ARMI and the completeness and accuracy of any estimates of additional invertebrates remaining when counting ends.

2: Analysis based on Extended Riverfly scores

This system differs from the group of eight. It provides scores for 33 different invertebrates including the original eight. It also has positive or negative weights of the score for the different invertebrates depending on their tolerance to water quality. As a consequence, the score tends to be lower than obtained with the group of eight. The scores for both approaches are provided for the sites on the Asker where both measurements have been made. The group of 33 score is a more variable measure than that of the groups of 8 ($P < 0.01$, Pitman's test).

Additional analyses can be carried out using the extended riverfly groups as nearly all the invertebrates collected during sampling are allocated to the groups and so can be used for approaches that require this full collection.

Some estimates used in ecological studies: The Shannon index increases as both the range of different organisms increases in a community and the similarity in the number present of each. Typical values are generally between 1.5 and 3. Its values for the 2021 extended riverfly groups changed significantly with sample month and so are estimated in mid-June by a standard statistical approach (Univariate analysis). The value for above Askerswell Village, below the Loders weir and Milton Mill were 2.285 ± 0.087 , 2.384 ± 0.087 , 2.078 ± 0.087 respectively (means \pm standard errors). A significantly lower value was calculated for Folly Farm of 1.759 ± 0.087 ($P < 0.01$).

Simpson's index is another widely used approach to characterise a community's diversity. It increases from 0 to a maximum of 1 as the number of different organisms present increases also taking into account the number of each present. Simpson's index provided similar values of 0.980 ± 0.012 , 0.966 ± 0.012 , 0.985 ± 0.013 for Askerswell village, Milton Mill and below Loders weir respectively. The value for Folly Farm of 0.931 ± 0.012 was again significantly lower than the other values (Univariate analysis, $P < 0.01$). Both indices may not be appropriately applied to the group of eight as they represent only a subset of the range of invertebrates each site. They did not vary significantly with month and were arranged in a similar rank order with Folly Farm being lower than the Askerswell Village, Milton Mill and below Loders weir with Butterwells and Plottingham, but not the Co-op, also being at the lower end of the range. The values for Simpson's index are similar to the values for the four sites with extended group with, in this case, Plottingham being significantly lower than all other sites ($P < 0.05$; SNK, Oneway ANOVA).

Species at risk (SPEAR): this index used by the Environment Agency to record water quality from a measure of species at risk (SPEAR) from pollution. Data was collected for many years at Yonderover, Loders by the Agency. These values and those obtained from the group of 33 monitoring are given in Figure 7. They show a clear trend from moderate to good and now high for water quality.

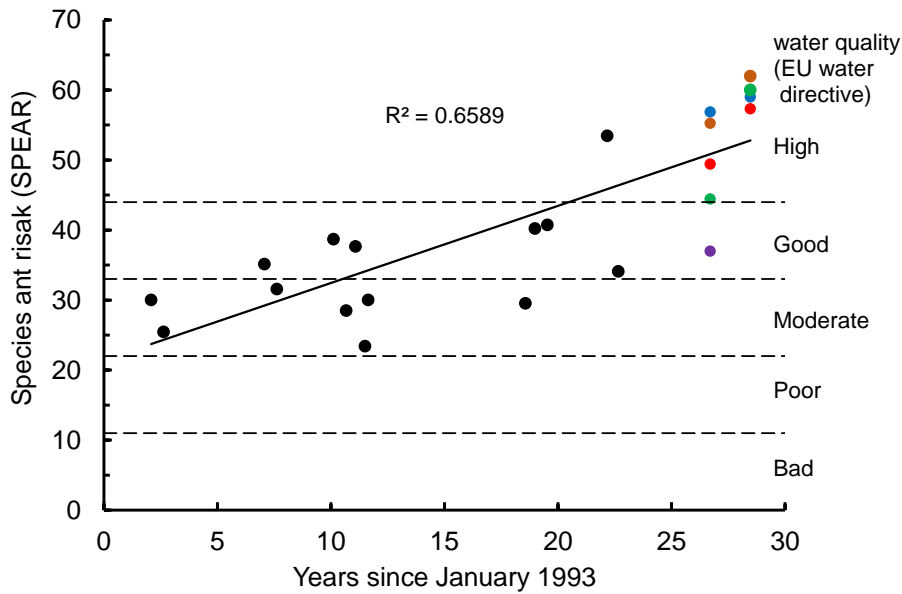


Figure 7: The relationship between the index of species at risk (SPEAR) from pollution and lapsed years since data was first collected in 1993. Data from The Environment agency for Yondover, Loders (•) and collected in 2019 and 2021 for sites at Askerswell village: (•); Folly Farm (•); Lower Loders (•); Milton Mill (•) and Loders Mill race (•)

Lotic Invertebrate Flow Evaluation (LIFE): River flow rates can be estimated using a flow group value for each of the extended groups weighted by their log scale abundance based on the same scoring system as used for the group of eight. The accumulated score (one value per group) is divided by the number of groups. A LIFE score of less than 6.00 generally indicates sluggish or still water conditions. The value increases with higher flow rates with values greater than 7.5 indicating a very fast flow.

The values for the four sites where the extended riverfly scores were compiled varied significantly both by month and site (Univariate analysis). The value estimated in mid-June for Folly Farm was 8.35 ± 0.091 . This value is higher than the three similar values of 7.98 ± 0.091 , 7.79 ± 0.091 and 8.02 ± 0.091 for above Askerswell village, below Loders weir and Milton Mill respectively. The Folly Farm site is on riffles in a short section with an appreciable gradient and so it is best set aside to give a LIFE value of c 8.0 that characterises the Asker to Loders and also the Mangerton at Milton Mill. The Environment Agency has recorded the river at Yondover, Loders with a gradual increase from c7 in the mid 1980s to c7.5 in 2014. The continual increase with time in the LIFE value may arise from factors such as reducing pollution rather than an increase in river flow rates.

Proportion of sediment-sensitive invertebrates (PSI index): This is calculated similarly to the LIFE index but different weightings are allocated to four groups depending on their sensitivity to sediment. There are no significant differences either with month or by site. The overall value is 66.8 ± 1.41 which indicates that the sites are slightly sedimented. This is the same outcome as obtained by the Environment Agency in 2012 and 2014.

(<http://www.askerswellparish.org/Community/Asker.Full.Report.Jan.2019.PDF>).

Water chemistry

The Asker has stable water chemistry. The river at both Askerswell village and Folly Farm have a constant alkaline pH of c8.4. The conductivity and phosphate levels also do not change much between monthly samples (Table 2). The conductivity of water sampled at Uploders (Butterwells) was just within the hard category (range 640-840 $\mu\text{S/cm}$) with the remaining four sites moderately hard (range 500-640 $\mu\text{S/cm}$). All sites had phosphate levels within the revised system of moderate level (second highest of four categories: UKTAG Final report 2013). They are in the expected range for a chalk river of 100-300 $\mu\text{g/L}$ (<https://catchmentbasedapproach.org/wp-content/uploads/2021/10/CaBA-CSR-Strategy-MAIN-REPORT-FINAL-12.10.21-Low-Res.pdf>). This suggests the levels recorded are not related to activities such as agriculture.

The river can be considered therefore as a stable aquatic environment free of pollution concerns which probably underpins its high ARMI scores.

Table 2: mean conductivity and phosphate in the Asker and Mangerton rivers in 2019 and 2021.

| Parameter | 2019 | | 2021 | | | | |
|-----------------------------------|----------------|----------------|---------------|----------------|---------------|----------------|--------------|
| | Ask Vill. | Folly farm | Ask Vill. | Folly farm | Uploders | Lower Loders | Milton Mill |
| Conductivity ($\mu\text{S/cm}$) | 553 \pm 10.5 | 591 \pm 10.5 | 493 \pm 6.4 | 501 \pm 15.2 | 656 \pm 7.7 | 553 \pm 19.4 | 618 \pm 78 |
| Phosphate ($\mu\text{g/L}$) | 109 \pm 30.4 | 115 \pm 30.4 | 150 \pm 12 | 193 \pm 32.4 | 100 | 83 \pm 44 | 150 \pm 32 |

3: Classification of the Asker and Mangerton rivers

Chalk streams in the UK have been subdivided into four types (A-D) in 2021. The Asker is classified as an example of a Group C: scarp-face chalk streams. The Mangerton has not been included in this classification. Group C: scarp-face chalk streams rise at the base of the chalk and tend to run for a short distance over older (clay rich) chalk and then flow out onto the underlying gault clay and greensand beds (<https://catchmentbasedapproach.org/wp-content/uploads/2021/10/CaBA-CSR-Strategy-MAIN-REPORT-FINAL-12.10.21-Low-Res.pdf>). The Asker is considered moderately sensitive to water abstraction (middle of 3 categories) supporting a good flow. It is categorised as good for its low phosphorus levels (second best in five categories; <https://catchmentbasedapproach.org/wp-content/uploads/2021/10/CaBA-CSR-Strategy-APPENDICES-FINAL-12.10.21-Low-Res.pdf>.)

An earlier report suggests a river type that seems to apply to the Asker. (https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Type%20Specific%20Reference%20Conditions%20for%20Rivers_Draft_060604). It is an example of a river defined by small catchment area (10-100 km^2), a low mean catchment altitude (<200m), with a predominantly calcareous geology. It provides a range of characteristics that fit well for the Asker. Rivers of this type have low turbidity values except when re-suspension of deposited material occurs during periods of high flow. The Asker normally has a turbidity <12 nephelometric turbidity units (NTU) but values of 25 NTU and 14 NTU were recorded at Folly Farm in early July and August respectively and 50 at Uploders in late June. The turbidity at Folly Farm was related to flow from the North Eggardon tributary as turbidity remained at less than 12 NTU in the flow at Askerswell village. The hydrology of type 2 rivers is dominated by the subdued hydrological response to rainfall. The alkaline pH of 8.4

with buffering from the dissolved salts is apparently sufficient to prevent rainwater from lowering its value. That water chemistry may occur after heavy rainfall but that is unlikely to be detected by monthly monitoring.

The river also has an invertebrate community expected of a Type 2 river. These characteristic invertebrates are (those recorded in the extended river monitoring of the Asker are underlined): Hydrobiidae, Sphaeriidae, Oligochaeta, Gammaridae, Baetidae, Elmidae and Chironomidae are almost always present, while Ancyliidae, Glossiphoniidae, Hydropsychidae, Tipulidae and Simuliidae occur. Fish typical of type 2 rivers include (those detected in the Asker are underlined): Brown Trout, Bullhead, minnow and Brook Lamprey. Where there are no natural barriers to migratory fish, salmon and/or sea trout and Eel are to be expected together with river and/or sea lamprey. In the middle reaches Stone Loach will also occur together with Grayling.

The similarity between the Askers group of eight invertebrates and other chalk streams of Dorset also with data in the ARMI national data base is confirmed by cluster analysis. The characteristics differ however from two other chalk rivers in the data base (Figure 8). It is uncertain if the group of eight profile indicates other aspects of water chemistry than pollution effects.

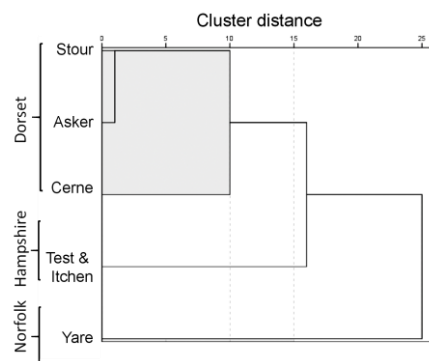


Figure 8: Cluster analysis of chalk rivers in Dorset and elsewhere for which ARMI holds group of 8 records.

4: Birds and mammals associated with the Asker.

The DAONB 60th anniversary fund awarded a grant of three trail cameras to support the objectives of our grant application They were:

1. Determine the locale and breeding status of mammals and birds known from the river.
See list below
2. Define key feeding areas for bats.
See below
3. Monitor the failure of Salmonids to ascend two weirs to spawning grounds.
Failure of these fish to ascend the height of Lodgers mill dam has been recorded
4. Deploy camera traps including at DWT-installed leaky dams to gain insights on their biodiversity benefits for mammals and birds
These leaky dams are in Askerswell parish, and the trail cameras have been located at them for approximately 14 days on each of several occasions each
5. Continue Riverfly monitoring.
See this report

The cameras have been placed for 16 months at sites in the Askerswell, Uploders and Loders. The range of animals that have been recorded to date are listed in Table 3. The main riverine species not yet detected are dipper, water shrew and water vole. A likely former site has been found.

Table 3: List of birds and mammals imaged by the trail cameras.

| | |
|---------|---|
| Birds | Buzzard, Owl (Tawny?), Pheasant, Woodpigeon, Collared Dove, Heron, Moorhen, Wren, Bluetit, Grey Wagtail, Blackcap, Crow, Jackdaw, Magpie, Kingfisher, Mallard, Blackbird and chickens |
| Mammals | G. Squirrel, Roe, Fallow, Fox, Badger, Otter, Brown Rat, Mouse (field?), Dog, Cat, Human. |

5: Bats

A bat has been detected rarely by the trail cameras. Often, they are likely to fly above the detection range of the camera. In addition, their small size and rapid movement may not always trigger the night-time detection system when flying just above the river. Bat detectors have been used in both Askerswell and Loders. Detection around Askerswell village has involved confirmation of the recordings via the BTO acoustic pipeline (a computer accessible online). It is considered the most reliable interpreter available of high frequency calls by mammals and insects. Surprisingly, 17 species have been recorded around Askerswell village. This is all species known to occur in the UK except one for which there is only one single animal known. Also, there is possible detection of a bat only recorded to-date at one location in the UK. The data is summarised in Table 4. Not all the recorded bats utilise the resources that the Asker provides. Daubenton's bat (the water bat) is the species likely to be most dependent on the river, but it feeds more widely within Askerswell village. Others recorded in vicinity of the river and elsewhere are the Common and Soprano Pipistrelles, Serotine and Barbastelle.

Table 4: Bats recorded in Askerswell village in 2021 with comments on their abundance and diets

| High probability of correct identification based on 95% or more probability for records on more than one day | Comment† |
|--|--|
| Barbastelle bat | Very Rare. Feeds on moths and has a stealth strategy |
| Brandt's bat | Widespread but less common than some other Myotis bats |
| Brown Long-eared bat* | Widespread. Riverflies provide a minor component of its diet. |
| Common Pipistrelle bat* | Widespread. Very numerous in the recording area. |
| Daubenton's Bat* | Widespread. A Myotis bat, the water bat. Caddis is a main prey item and other riverflies are consumed |
| Grey Long-eared Bat | Very rare. Under study in East Devon AONB. |
| Lesser Horseshoe Bat | Decreasing in abundance. |
| Noctule bat | Widespread in England and Wales |
| Serotine bat* | Widespread in S and E. England |
| Soprano Pipistrelle bat* | Widespread. |

| | |
|---|--|
| Considered a correct identification based on 90-91% probability for records on more than one day | |
| Nathusius' Pipistrelle | Rare , discovered to be breeding in UK in the late 1990's. |
| Natterer's bat | Widespread . A Myotis bat. Riverflies are a component of its diet. |
| 90-91%probably of correct identification but recorded on only one occasion at that level | |
| Greater Horseshoe | Becoming rare . A very distinctive echolocation signal underpins confidence. Riverflies are a minor component of its diet. |
| Leisler's bat (Lesser Noctule) * | Rare in England . It was detected in another day with a probability of 74%. Caddis a component of its diet |
| Whiskered bat | Widespread . A Myotis bat. They lack very distinctive calls. Riverflies are a component of its diet |
| Uncertain identifications | |
| Bechstein's bat | Very rare . A Myotis bat. One occasion at 20% probability only. A woodland species. |
| Kuhl's Pipistrelle bat | Very Rare . It was detected on two occasions with 85% and 24% probabilities. A Mediterranean species: only recorded once before in UK |

*, Also detected in Loders

†, Comments are based on information in P. Richardson (2017) *Bats*, ISBN 9781873580950

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