Report on Brit catchment Riverfly monitoring in 2024

Summary

1. The number of sites has increased relative to previous years and provides a more comprehensive coverage of the Brit catchment.
2. Collection of data based on 8 pollution sensitive invertebrates (termed Riverflies) was more widespread than the extended system scoring 33 such animals.
3. A wide range of ecological indicators based on the data collected in 2024 confirms the conclusion from previous years that the Asker and Mangerton have a high-water quality and support a wide range of invertebrates. The Brit has a somewhat lower quality level and the Simene has a relatively low water quality.
4. Evidence from data collected by the EA and more recently by our monitors indicate a progressive increase in water quality of the Asker over 31 years.
5. There was no evidence of any minor pollution events at the sites monitored.
6. The data collected by the monitors represents one of the most intense data sets per river length in Dorset although the number of Riverfly monitors is building progressively across the county.

ANALYSIS BASED ON GROUP OF 8 RIVERFLY SCORES

This report considers Anglers Riverfly monitoring initiative (ARMI) group of 8 invertebrates. Seven are insects and the other an amphipod crustacean (*Gammarus*). They are collectively called Riverflies. The numbers of each were monitoring from April to September inclusive in 2024 using a standard kick sample. The locations on the Asker: 1) above Askerswell village, 2) by Folly Farm, 3) Butterwells, Uploders, 4) Loders below its weir 5) at its confluence with the Mangerton, 6) by the Co-op, Bridport and 7) just upstream of Morrrisons supermarket in Bridport. The Mangerton River was again monitored at two sites, Milton Mill and Bradpole bottom. The latter is just before its confluence with the Asker. The Brit was sampled at St Mary's Well, Beaminster and both North Mills and Plottingham in Bridport. The Simene has been measured at four sites but not at each location throughout the season. The values are shown as the percentage for each Riverfly to the total sample for each month in Figure 1 for the Asker and Figure 2 for the other rivers. The contribution of each invertebrate varies with the site and seasonally for many.

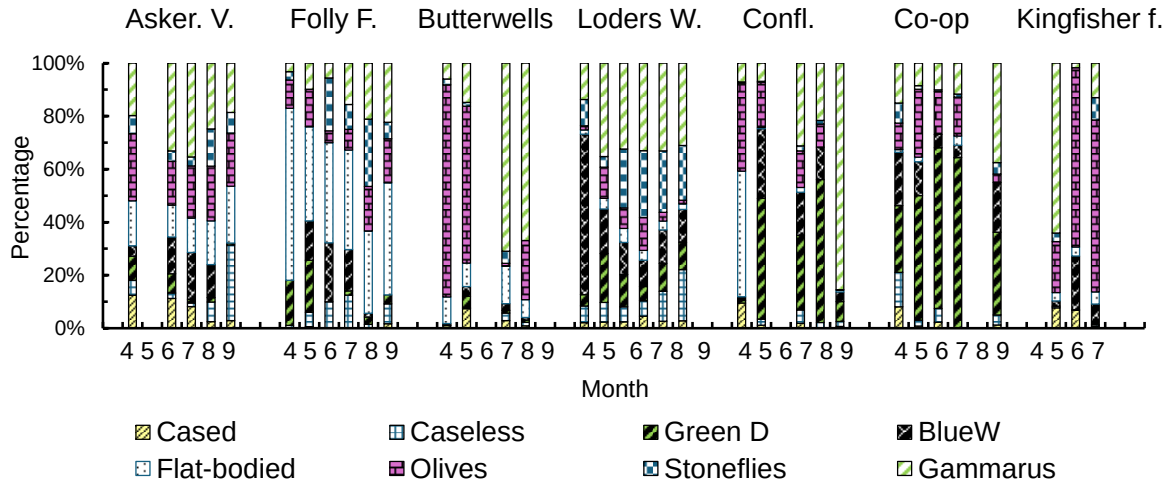

Figure 1: The percentage contribution of each of the 8 recorded invertebrates to the total collected from April to September based on seven monitoring locations along the Asker in 2024.

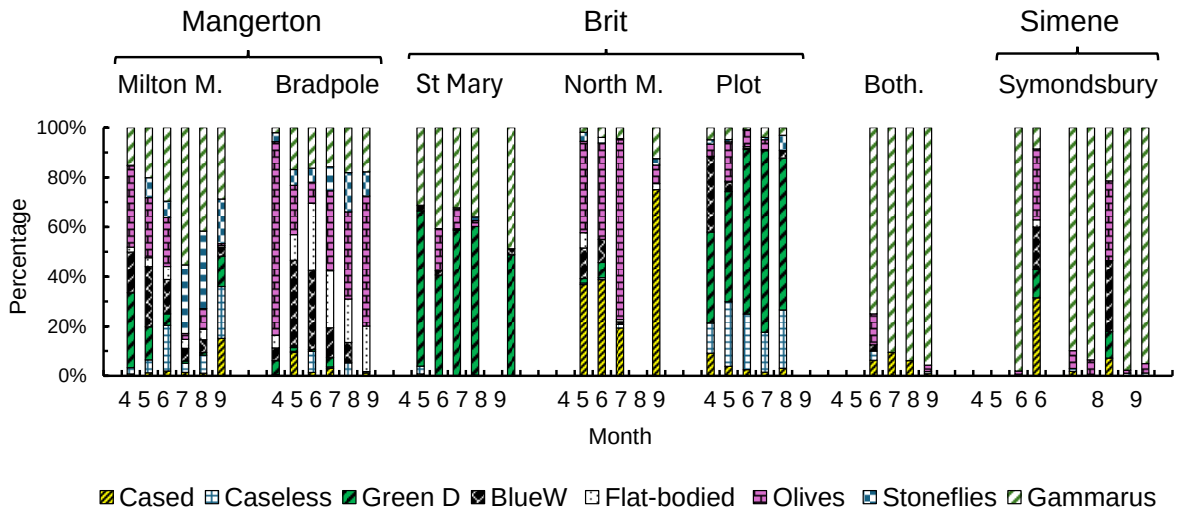

Figure 2: The percentage contribution of each of the 8 recorded invertebrates to the total collected from April to September based on monitoring locations along the Mangerton, the Brit, the Bothenhampton stream (Both.) and the Simene in 2024.

The abundance of Green Drake, Blue-winged olive and Olive mayflies decline significantly through the sampling season (Figure 3). Unlike in 2023, the data suggests the peak of abundance of these mayflies occurred before the first collection. In contrast *Gammarus* showed a significant increase in its populations through the sampling season as in 2023. Cased and caseless caddis did show a statistically insignificant peak in May before a reduction presumably associated with emergence of adults. This was followed by a subsequent recruitment of immature insects to the population by the autumn. The above interpretation is not definitive as there may well be more than one species with different life histories contributing to the changes recorded. Patterns of change with the collection season were not statistically significant for Flat-bodied mayfly.

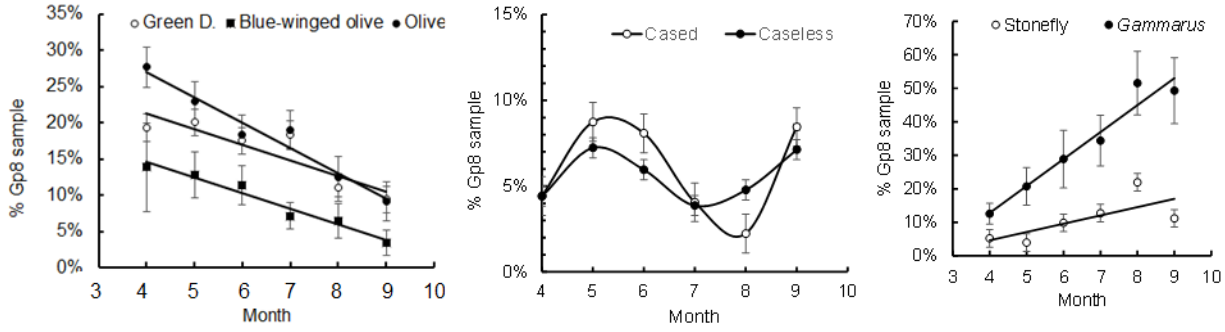

Figure 3: Seasonal changes in 6 Riverfly groups during the 2024 collection season. The linear regressions for Green Drake, Blue-winged olive and Olive mayflies plus *Gammarus* but not stoneflies are statistically significant (P<0.05).

The group of 8 ARMI score varied little by month for the Asker and Mangerton whereas the Brit did show a significant decline from a peak in May or June until a lower value in September (Figure 4). This seems correlated with a reduction in the number of animals collected in the later samples. This effect is considered later (see Figure 7).

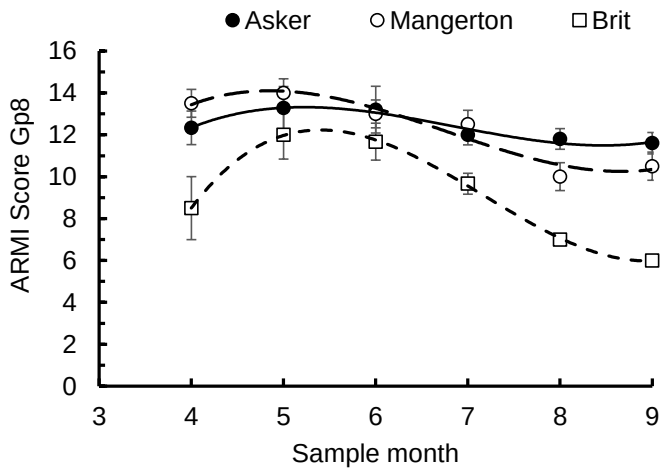

Figure 4: The ARMI group of eight scores recorded through the sampling months for the Asker, Mangerton and Brit rivers. The linear regression indicating a decline in the ARMI score with month is statistically significant for the Brit.

It is evident from Figure 1 members of the group of 8 were not found in equal abundance at all sites. Cluster analysis established that Olive mayfly in particular plus *Gammarus and* Blue-winged Olives showed individual pattern of distribution across all sites whereas the remaining 5 showed a similar distribution pattern (Figure 5 left). The results presented last year for fewer sites also indicated that *Gammarus* and Olive mayfly did not cluster with the multi-member group. Clustering mean values by site (Figure 5 right) suggested only 3 groups with Bothenhampton and the Simene being the most distinct pair. They are characterised by have a high proportion of *Gammarus*. The cluster with 7 members has a relatively high abundance of Olive mayfly while the group of 5 has no high proportion associated with any member of group of 8.

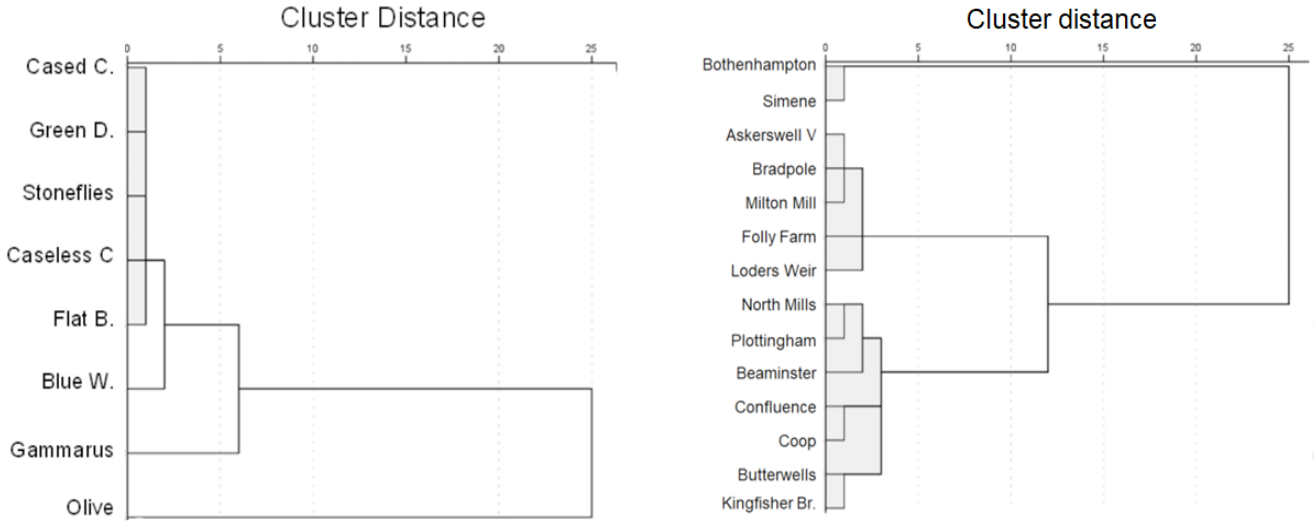

Figure 5: Cluster analysis to establish similarities of distribution for the group of eight invertebrates in 2024 (left) and by mean values for each member at each sampling sites (right).

The group of 8 score varies with month. Univariate analysis allows the sites to be compared for the adjusted means at an estimated mid-season date (18th June). Comparison of the rivers established that the Asker and Mangerton provided similar grand mean values that were significantly greater than those for the Brit (Figure 6). The values for the Bothenhampton stream and the Simene were significantly lower still and similar to each other ($P<0.01$ in all comparisons, Univariate ANOVA). The data established no significant difference for the grand mean for the eight Asker and Mangerton sites

evaluated in 2023 of 12.06 ± 0.55 and 12.10 ± 0.46 in 2024 (P=0.5, NS, t test). There was no marked change prolonged over two consecutive months at any site. That effect when detected in 2023 at one site was taken as evidence of a minor pollution incident.

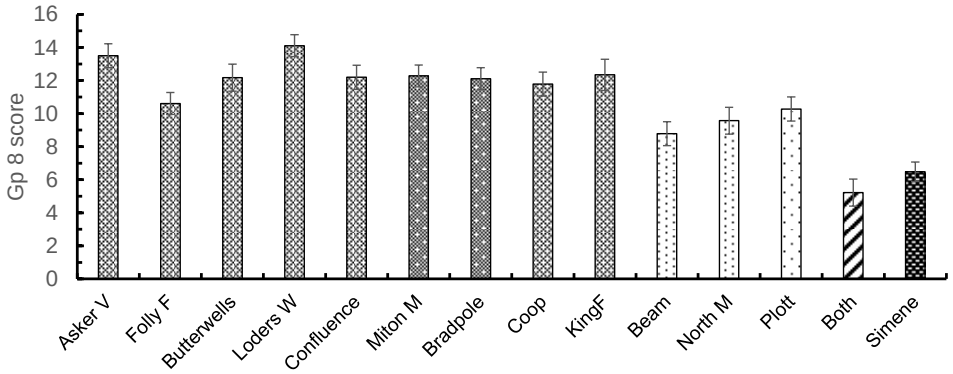

Figure 6: The adjusted mean recorded scores given for the 18th of June for the sites for each river after adjusting for the significant effect of sampling month. The overall means were similar for the Asker and Mangerton and significantly higher than for the Brit. All these three rivers differed significantly from the mean for the stream at Bothenhampton and for the Simene which were similar. Comparisons are based on Bonferroni test in Univariate ANOVA with significance indicated by $P < 0.01$.

The adjusted mean Gp8 scores for June 2024 can be compared with the range of values for 785 sites so far entered into the national ARMI website (Figure 7). The histogram indicates that the Asker and Mangerton are within the top 20% of UK rivers for water quality. The Loders weir site is within the top 10%. That high status is assumed to be partly due river aeration by the weir just upstream of the site with a disturbed flow likely to favour presence of food resources.

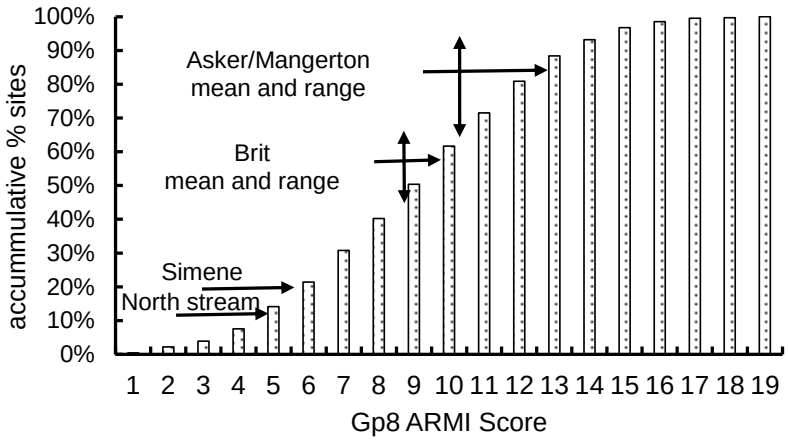

Figure 7: Accumulative percentage of ARMI group of 8 scores in June 2024 for all sites in the national data base by 12/11/2024. The positions of the four rivers are indicated by horizonal arrows with the vertical ones indicate the range for that river.

As stated in previous years, a limitation on comparisons across AMRI group of 8 is variation in total number of invertebrates recorded. This depends not just on abundance but also whether or not collection effort is for more or less than two person hours / sampling occasion. If 100 individuals are collected and 6 individuals are collected for one group member then its contribution to the ARMI score would be 1. 12 individuals would be expected if collection continued to 200 individuals and its contribution to the score would rise to 2. The effect of the number of individuals collected is clearly shown in Figure 8. Of particular interest are the sites indicated. Loders weir, Askerswell village, Milton

mill and Bradpole bottom score above the trend line whereas the Sheepwash at Simmondsbury provides a lower-than-expected value. This indicates that the high Gp8 scores recorded at several of our sites are not merely due to many animals being collected. This significant bias imposed by number of animals collected is also evident in the national database (R^2 = 0.43, P<0.001, linear regression analysis for log count and Gp8 Score).

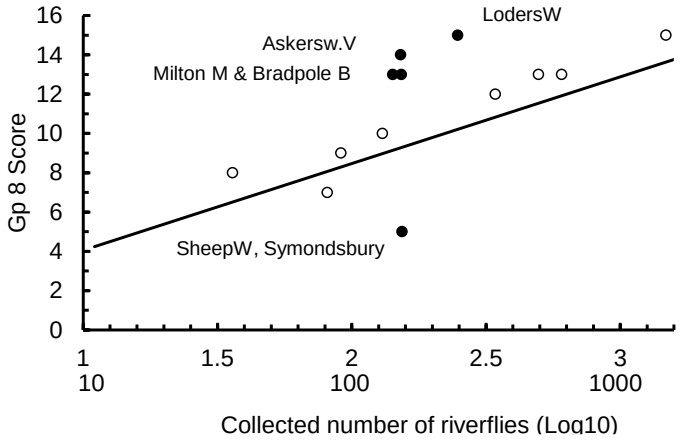

Figure 8: the relationship between the Gp8 score which is on a logarithmic basis and the logarithm of the number of Riverflies collected.

ANALYSIS BASED ON EXTENDED RIVERFLY SCORES

This system differs from the group of 8. It provides scores for 33 different invertebrates including the original 8. It also has a 1x positive or negative multiplier of the score for the different invertebrates depending on their tolerance to low water quality. Consequently, the score may be lower or higher than obtained with the group of 8. The extended scoring system recorded most invertebrates collected during sampling and so it increases the range of analyses possible allowing a variety of indicators of water and biological quality to be determined. Some, but not all, of the analyses carried out last year are repeated in this report.

This data was collected in 2024 at Askerswell village, Folly Farm, Loders Weir, Milton Mill, the confluence of the Asker and Mangerton and the Coop sites on the Asker, Milton Mill on the Mangerton and both St Marys well, Beaminster and Plottingham on the Brit.

Species at risk (SPEAR): this index is used by the Environment Agency (EA) to record water quality from a measure of species at risk from pollution. Data was collected for many years at Yondover, Loders by EA. Other rivers are not included in this comparison. These values and those obtained from the group of 33 at the Asker and Mangerton Figure 9. Curves fitted to just the EA data and the data collected by our monitors suggest a clear trend in values for SPEAR from moderate to good from the date collected by EA and now high-water quality for invertebrates at these sites.

Lotic Invertebrate Flow Evaluation (LIFE): invertebrates vary with different stream flow rates that favour their abundance. Each of the extended groups has a flow group value that weights their log scale abundance based on the same scoring system as used for the group of 8. To set the context, flat-bodied mayflies and caseless caddis are associated with high flow rates of typically more than 100cm/second. The remaining six of the Gp8 are associated with the next flow rate down of 20-100cm/second. Some other members of the extended group fit into a third group associated with slow flowing and standing waters such as dragonfly nymphs. A high flow rate is that this is likely to increase the level of dissolved oxygen in the water which has relevance to extraction of oxygen from the water for respiration.

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 indicate a very fast flow. All the sites studied had similar mean LIFE values except the confluence of the Asker and Mangerton which had a significantly lower flow rate (Figure 10). Possibly the merger of the two rivers from different angles reduced the flow rate at this location.

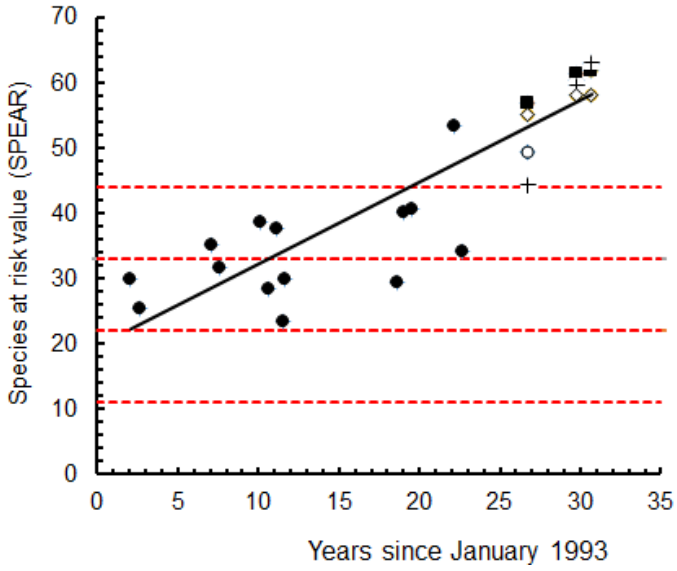

Figure 9: The relationship between the index of species at risk (SPEAR) from pollution and lapsed years since data was first collected in 1993. Data from the EA for Yondover, Loders (•) and collected in recent years for sites at Askerswell village (○); Folly Farm (■); Loders weir (+) and Milton Mill (◊). A linear regression line has been fitted to the data set. It is statistically significant ($P < 0.001$, $R^2 = 0.79$).

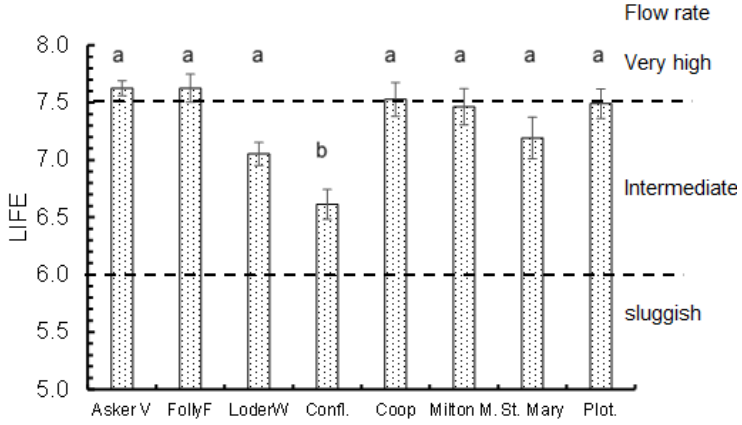

Figure 10: Lotic Invertebrate Flow Evaluation (LIFE) for the 8 sites study in 2024. The sites studied had similar mean LIFE values except the confluence of the Asker and Mangerton (confl.) which had a significantly lower flow rate ($P < 0.05$, SNK, Oneway ANOVA).

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. That approach then splits values into five categories within a scale of 0-100. Figure 11 indicates that Folly farm, the Co-op and the Saint Mary well sites had only slight sedimentation with the other sites having moderate sediment levels. Sedimentation is likely to be reduced in faster rather than slower flow rates.

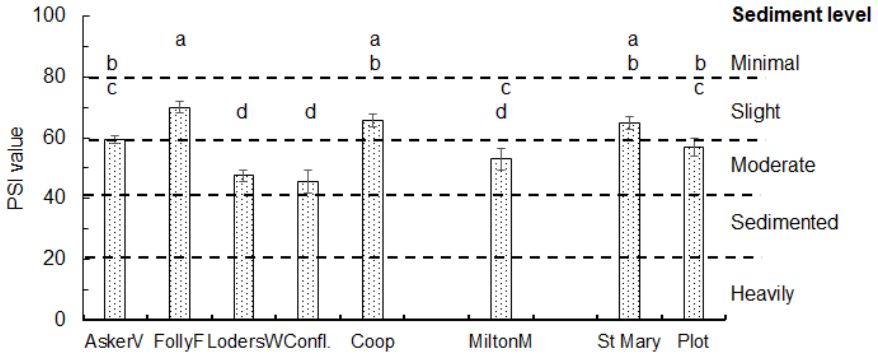

Figure 11: The Proportion of sediment-sensitive invertebrates at the sites studied in 2024. There are 5 ranges of values indicating the level of sedimentation of the river. Statistically significant groups of means belong to three groups indicated by a, b and c ($P < 0.05$, SNK, Oneway ANOVA).

WATER CHEMISTRY

The water chemistry has been reported in previous years for both the Asker and Mangerton rivers. The Asker has a stable water chemistry. The river at both Askerswell village and Folly Farm have a constant alkaline pH of 8.3 ± 0.08 in 2024 as in 2023 whereas it is less alkaline at Loders (pH 7.6 ± 0.03). The water was not hard at the four sites assessed (Table 1). The two similar conductivity instruments used at all four sites before 2024 had incorrectly high factory calibrations which were unalterable. New instruments were used this year. 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 100-300µg/L (*https://catchmentbasedapproach.org/wp-content/uploads/2021/10/CaBA-CSRG-Strategy-MAIN-REPORT-FINAL-12.10.21-Low-Res.pdf*). This year the data from West Country CSI has been extracted for the four rivers of the Brit catchment. This involves large number of sites including those considered above. Data suggest little variation in conductivity between the four rivers of the catchment. Approximately 40% of rivers in the southwest of England had in excess of 100µg phosphate/L in 2009 with about 25% arising from agricultural activities. The phosphate levels recorded are higher than this level for Simene. The mean was also high for Folly Farm but this was due to one high value of c500µg/L being recorded in May with much lower values in other months. This is suggestive of runoff from nearby agricultural land in May. The Asker, Mangerton and Brit rivers can be considered as providing a generally a stable aquatic environment, free of pollution concerns for its invertebrates which probably underpins the high ARMI scores at many sites.

Table 1: Mean conductivity and phosphate concentrations in the Asker and Mangerton rivers in 2019 to 2024and the Bit catchment in 2024.

Site	2019		2021		2022		2023		2024	
	Conductivity	Phosphate	Conductivity	Phosphate	Conductivity	Phosphate	Conductivity	Phosphate	Conductivity	Phosphate
	µS/cm	µg/L	µS/cm	µg/L	µS/cm	µg/L	µS/cm	µg/L	µS/cm	µg/L
Values of volunteers at four sites from 2019										
Ask. Vill.	553 ± 10.5	109 ± 30.4	493± 6.4	150 ± 12	491 ± 15.1	209± 33.0	484 ± 15.0	147 ± 31.7	261 ± 20.0	107 ± 6.6
Folly farm	591 ± 10.5	115 ± 10.5	501 ± 15.2	193 ± 32.4	499 ± 12.0	200 ± 36.5	469 ± 14.9	100	266 ± 16.4	158 ± 68.9
Loders			537 ± 11.1	120 ± 12.2	591 ± 13.0	146 ± 12.5	521 ± 34.2	95 ± 5.0	284 ± 7.6	100
Milton mill			617 ± 77	150 ± 32	560 ± 8.6	190 ± 40.0	550 ± 7.9	125 ± 25.0	343 ± 10.1	100 ± 25.8
The conductivity readings in 2024 are lower than previously due to earlier faulty factory calibration of both meters used.										
All Westcountry CSI entries for the Brit catchment										
Asker									289 ± 7.4	95.6 ± 11.8
Mangerton									277 ± 5.6	64.3 ± 22.5
Brit									321 ± 6.5	108 ± 10.5
Simene									338 ± 12.4	175 ± 25

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