# Mosquito monitoring 2024

## Dr. Peter Enevoldson


**Summary.**

1. Monitoring was carried out along the same lines as in the last few years, with weekly adult trapping, marsh pool dipping, biting nuisance forecasting and online bite reporting.
2. The number of adult mosquitoes caught in the traps was high compared to normal years (though roughly half the record numbers caught in 2023) from August until December (i.e. even later than normal). This was explained by the high spring tides on 23rd August and mid-October, the wet September and the mild Autumn. Numbers peaked in week 39 (13-19th October) at about 8 times the peaks from the years 2019-2022. Total numbers were 10 times higher than in those four years. There was a significant mosquito biting nuisance anecdotally though the number of bite reports were less than a third of 2023 and also less than in 2019 and 2020 (possible reasons discussed). Notably, mosquitoes were caught in the traps even in late December, despite three prior frosts and Storm Darragh.
3. Research continued, partly in collaboration with university academics.


**Methods**

1. Traps (which capture adult female mosquitoes attracted to carbon dioxide and octenol, and so only those species of mosquitoes that may bite humans, as well as other mammals and sometimes birds)
   a. Weekly from 4th April (week 14), and this year continued later than previous years, till end of December.
   b. 2 days a week
   c. Four traps, two very near marsh, two 1 – 2km from marsh, Little Neston and Parkgate/Neston, reducing to 2 or 3 traps in December
2. Weekly surveillance of study pools at Quayside, similar to last 14 years
3. Wider surveillance of other marsh pools, mainly near Quayside, roughly weekly and year round
4. Wider surveillance of some known freshwater mosquito breeding sites over radius of about 3 miles.

**Trap Results**

**1.** As usual, *Aedes detritus* remains the by far the most numerous and widespread trapped species, also occurring in more weeks than any other species. (Fig 1)

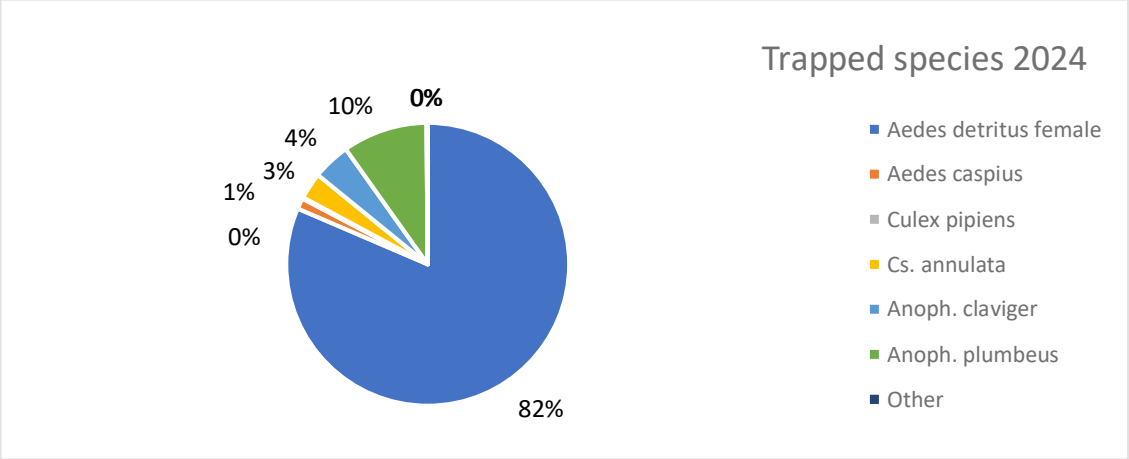



**Fig 1.**

**2.** There was a not unexpected minor peak in numbers (very largely Aedes detritus, Fig 2a) in late April and May and a larger surge starting in late July and continuing throughout August caused by heavy rain filling the breeding pools in early and mid-July. As the breeding pools were drying up in August, they were refilled with sea water by the spring tide on 23/8/24, causing a synchronised mass hatching of eggs. The temperatures and abundant rainfall in September permitted continued development of larvae in the pools and probably prolonged survival of the adults that emerged. This resulted in very high numbers of adults from mid-September throughout October. This surge faded by mid-November (relatively mild) but some lingered as long as late December, with 11 being trapped on Christmas Eve and Christmas Day!

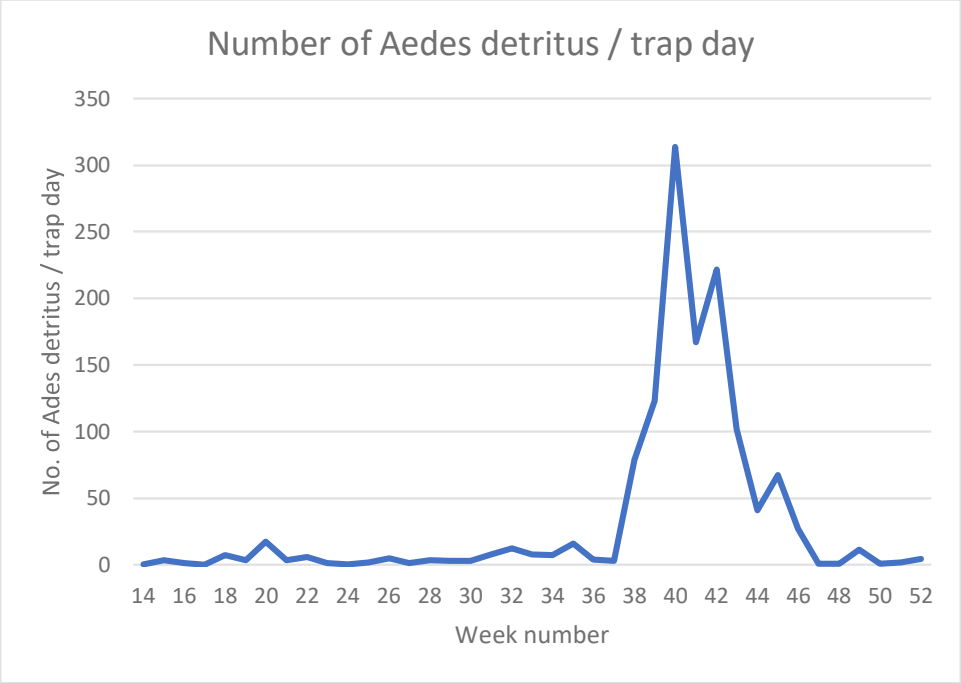



**Fig 2a.**

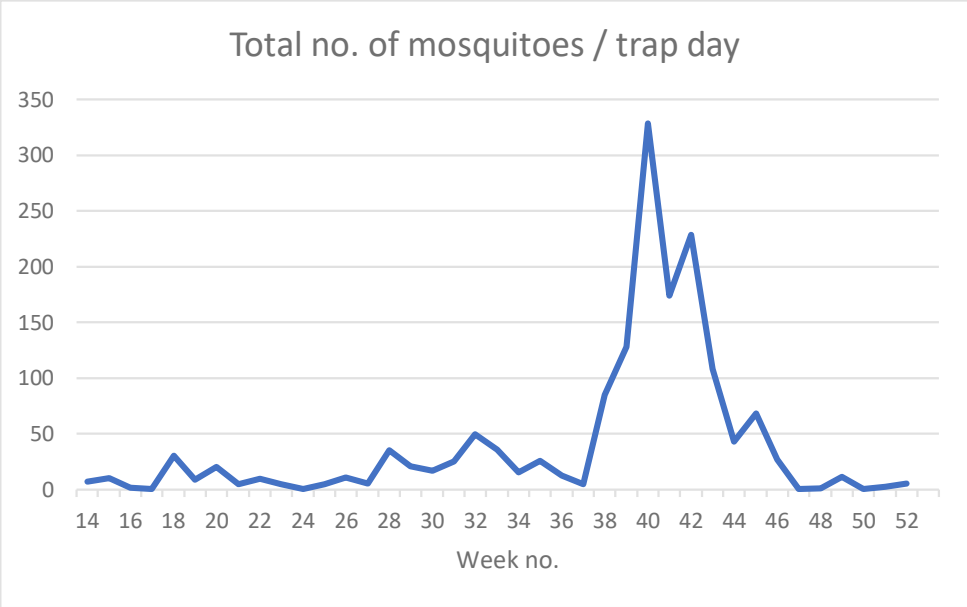



**Fig. 2b**

3. Though the numbers were very small in comparison, there was also an unprecedented summer peak in another species, *Anopheles plumbeus* (Fig 3). This is a mosquito that breeds in mature deciduous trees and was found in particular in a garden in Parkgate which is surrounded by such trees. Smaller numbers were trapped elsewhere. The numbers were sufficient to represent an important resource for researchers at the Liverpool School of Tropical Medicine and at the University of Wurzburg.

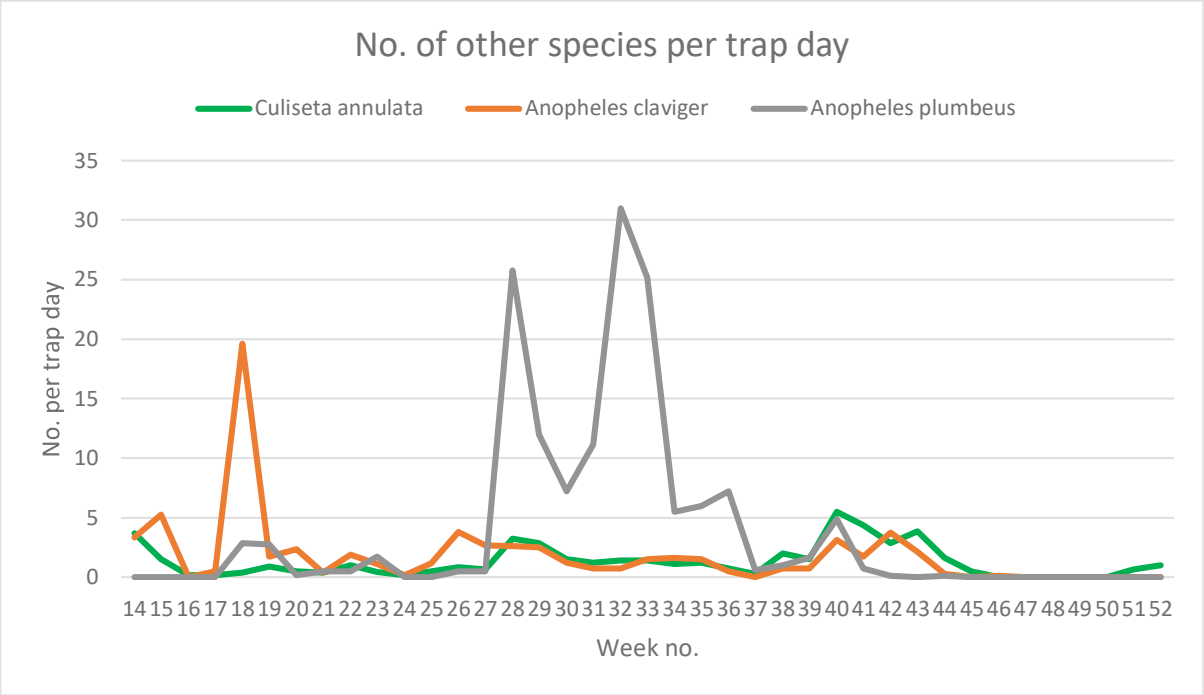



**Fig. 3**

4. Unusually, this year the greatest number of mosquitoes was trapped in Parkgate, in the trap at top of Earle Drive (Fig 4).

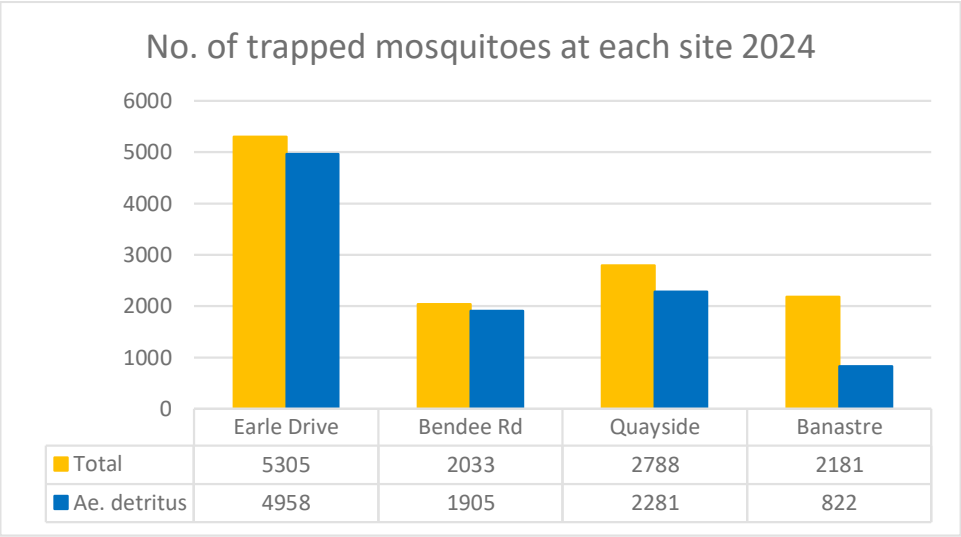



**Fig 4.**

5. We can compare numbers to previous years reliably in two ways:

a. We have data from one trap site (Bendee Road) since 2013, and the results emphasise how exceptional this year has been (Fig. 5a), though still far below last year.

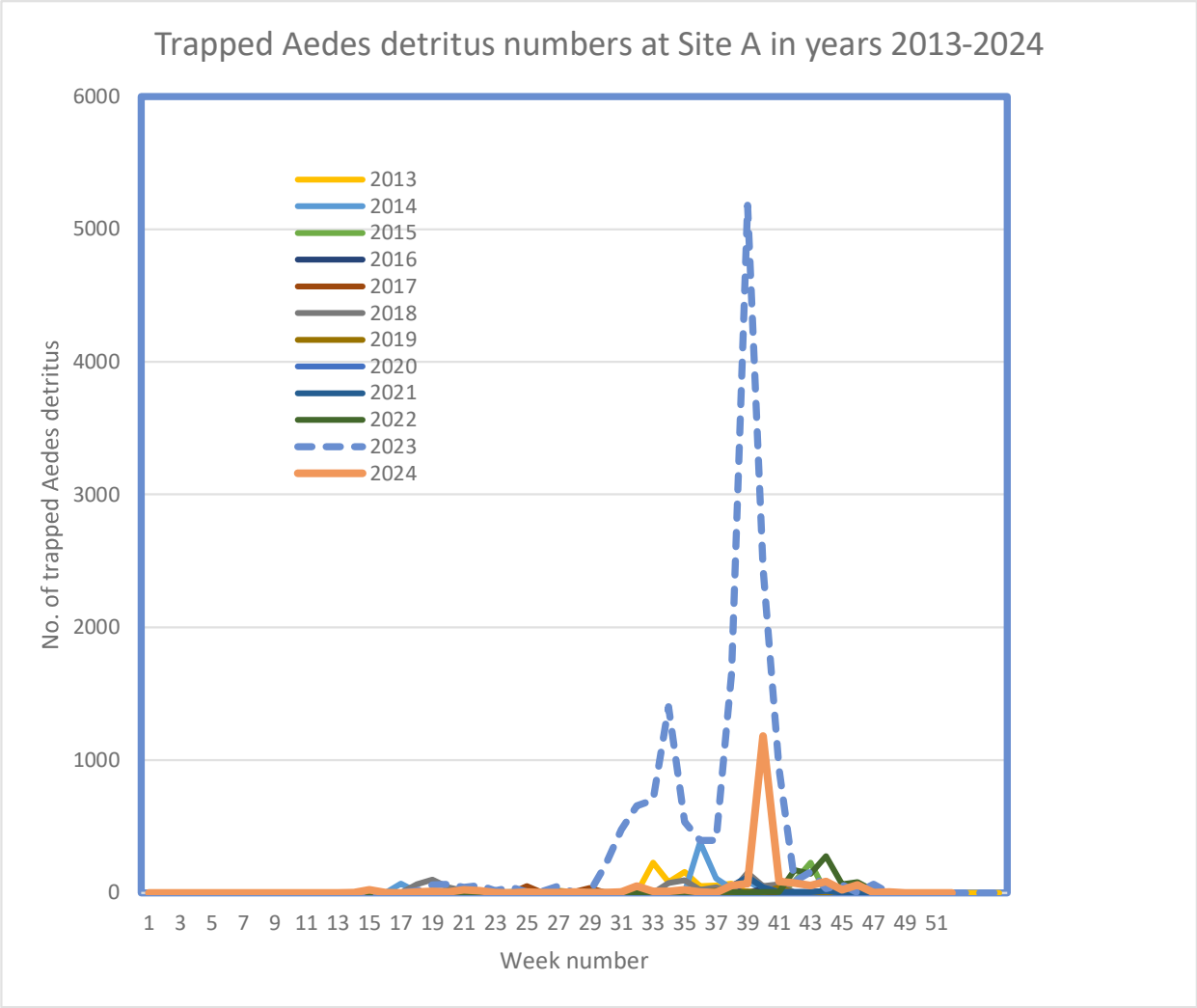



**Fig. 5a**

b. The annual sum of trapped mosquitoes (all species) and Aedes detritus (only breeds on the marsh) are shown in Fig 5b for all four present traps for the last 5 years.

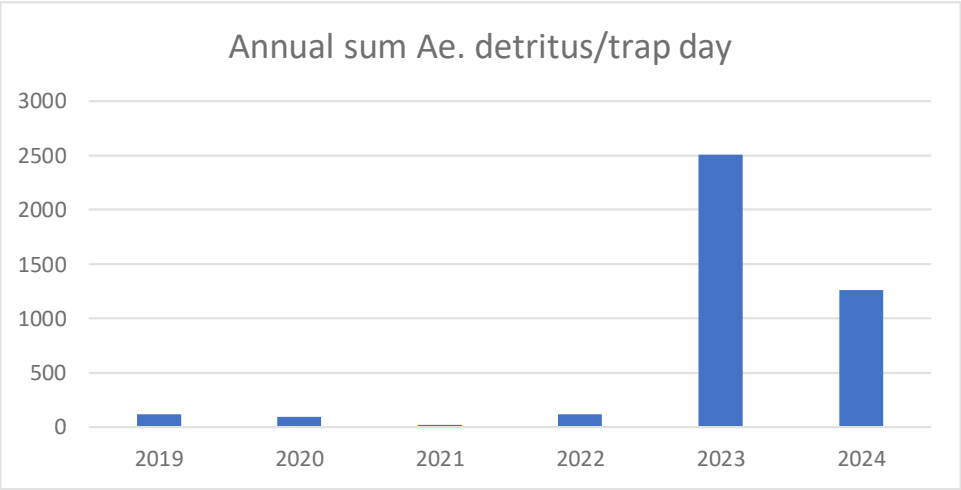



**Fig 5b**

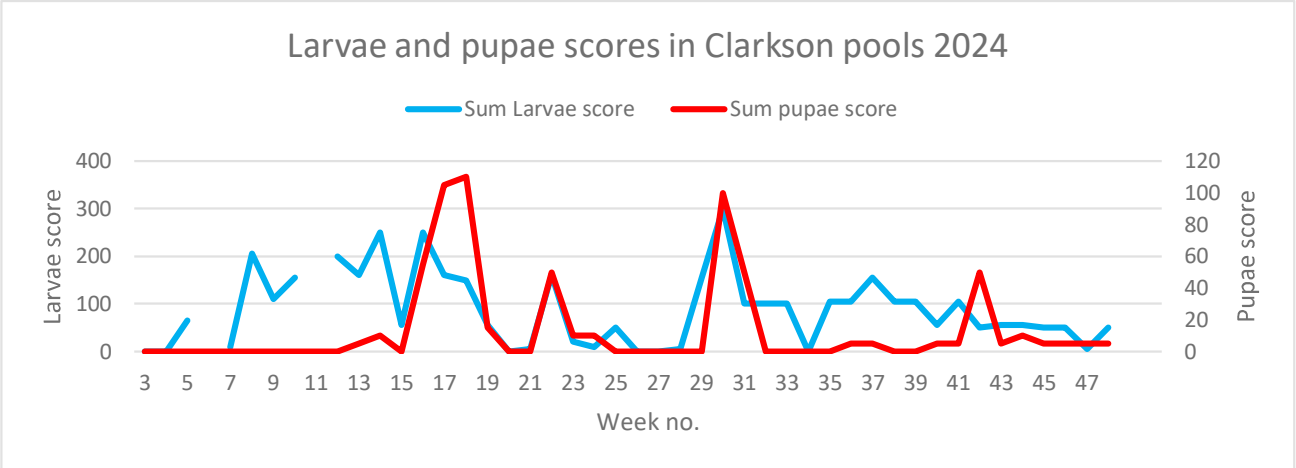
**Pool dipping results**

1 Prof. Clarkson started collecting data from dipping pools at Quayside in Little Neston in about 2012. Pretty well the same pools have been surveyed ever since. For the last 5 years this has been done weekly and extended to include all weeks of the year. For the sake of consistency, this report has confined its quantitative results to the data arising from these numbered "Clarkson pools". However, over the last 5 years, pools from a much wider area have been dipped in addition to the "Clarkson pools". Generally the results have been broadly similar and there has been no conflict in terms of using the results for the purposes of the mosquito forecast. However, some discrepancies have been noted in some weeks, and this emphasises what Prof. Clarkson and I had already realised, namely that the Clarkson pools are not completely representative of the local marsh pools (and a number of reasons may be advanced for this). Sampling of other pools revealed the presence of larvae at times when none were found in the Clarkson pools. In consequence, a wider range of pools has been surveyed each week and the results used in the weekly forecast.

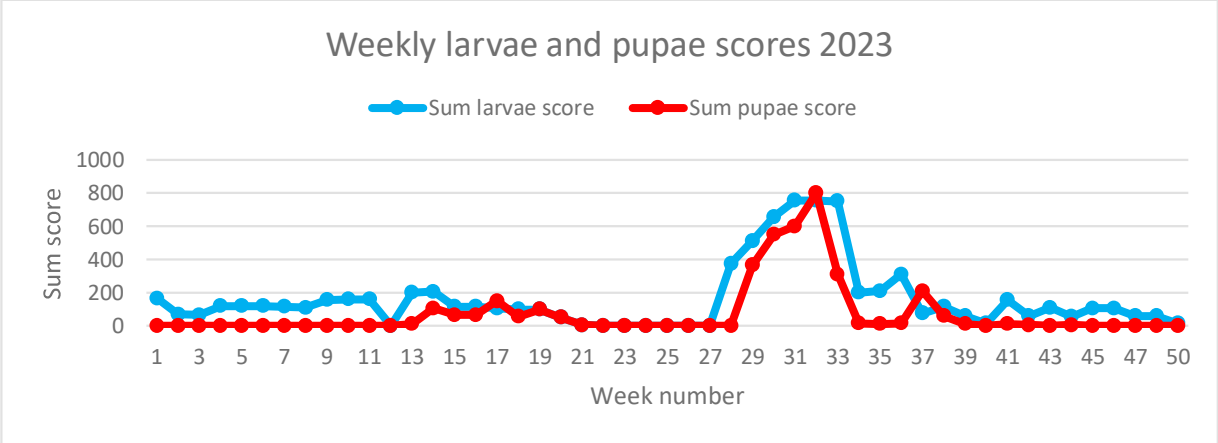
2 There were fewer larvae throughout the year in 2024 (Fig 6a) compared to the record year of 2023 (Fig 6b) but more than in 2022 (a very dry year), 2021 (dry summer), 2020 and 2019 (both had wet spells in summer).

**Fig. 6 (note different vertical scales in a and b)**

**a)**




**b)**



3 The breeding pools were full all Spring, with rain and a spring tide in week 11, but became essentially dry by week 18 (early May). There was heavy rain in mid-May and early June (weeks 20-24) that refilled the pools and provoked egg hatching. The weather turned warmer and drier for a while but there was heavy rain in mid-July (weeks 28 and 29). There was a mass hatching of eggs and these matured as expected during July. By late July, there were huge numbers of advanced larvae and pupae (the worst I have ever seen, the pools seemed to have black clouds in them). Fortunately, the weather was dry and reasonably warm in late July and this dried up most of the breeding pools before the adults emerged in most breeding pools. It was a "very close-run thing": a day or two later and there would have been a massive surge in mosquitoes.

4 The pools were dry during most of August (weeks 32-34) but were refilled by the high spring tide of 23/8/24, leading to mass synchronised hatching of eggs in week 35. The graph, which is based on data collected from the "Clarkson"pools does not adequately reflect the numbers of larvae and pupae found in other ("non-Clarkson") pools in September and October.

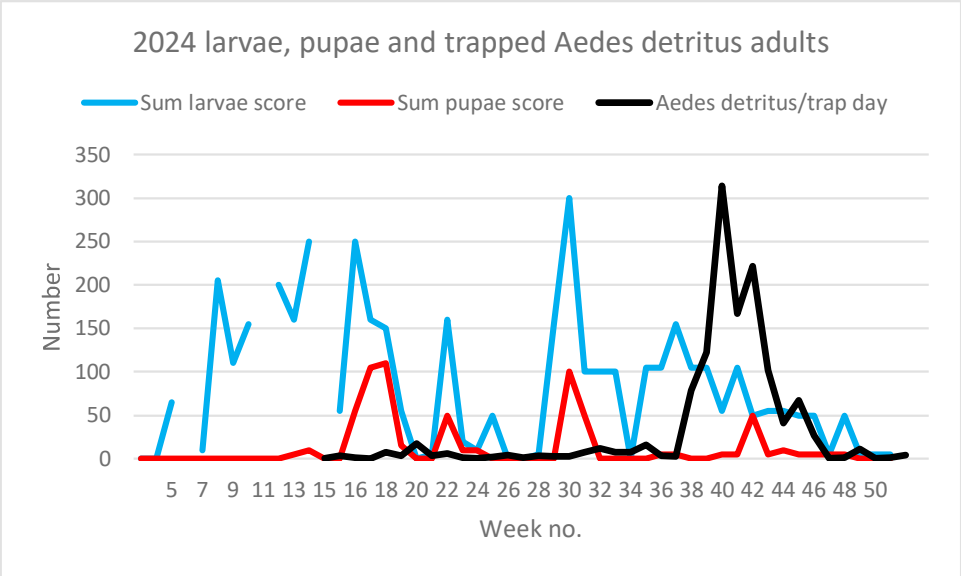



**Fig 6c**

5 Nevertheless, it is noticeable (Fig 6c) that the numbers of adults trapped in September and October are disproportionately high compared to the number of larvae and pupae in August and September. This may be indicating longer survival of the adults, perhaps permitted by the warm, damp weather.

6 Other notable results from the dipping are:

a. Over the last 5 years, larvae have been discovered which have been shown by various methods to be a species called *Culiseta litorea*. This species bites birds but importantly has never been found in the Dee estuary previously and classically was thought only to occur in southern England. More extensive dipping studies this year have identified that this species is only found in certain types of pools: small, highly vegetated and near the edge of the "marsh". Furthermore they appear to be emerging as adults rather earlier in the year than published data would suggest. These findings are being extended with a view to publication in 2025.

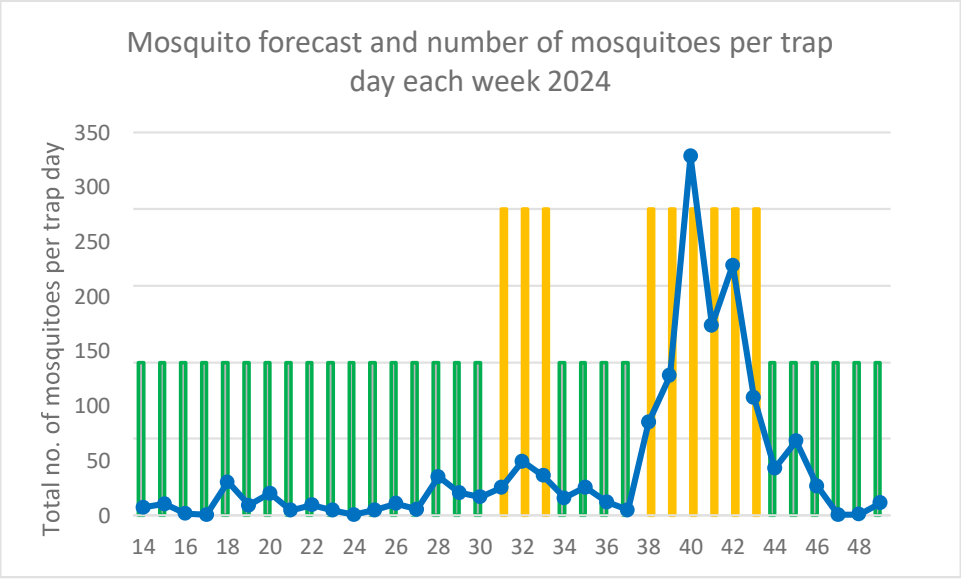
b. Over the summer, some larvae of a species called *Culex pipiens* were found, as in most years. This is a very common species (elsewhere in the UK it is the commonest) which very rarely bites humans and animals (and so it is not attracted to our Mosquito Magnet traps) and typically bites birds. It most commonly breeds in freshwater (e.g.

water butts, rain-filled buckets or flood puddles) but can also breed in weak brackish water (as was the case in these pools which had been filled by rainwater). This species will not have added to the mosquito biting nuisance locally or contributed to the reported trap results. Most importantly, **none of the many reared from the marsh samples or the few caught in the traps in September were of the species *Culex modestus***.

## Forecast results

1 Produced weekly (Friday, looking forward to forthcoming week) from early April to end of November. Published on NTC website and Neston Life, About My Area.
2 Traffic light report (Fig. 7)
3 The forecast is based upon trap results from preceding few days, pool dipping on the previous day, and weather forecast for forthcoming week (the most difficult element)
4 Some narrative explanation
5 Accompanying encouragement to report any bites online.
6 The site also includes advice about preventative measures and treatment of mosquito bites during red and amber forecast weeks

**Fig. 7**



**Bite reports**

1 Online reporting, now with a mapping facility. Unfortunately, ***temporary technical problem caused failure to register all bite reports in some weeks in September.***
2 Form deliberately kept simple
3 161 reports of 197 bites filed (in weeks 18 to week 48), rather fewer than in previous years.

| Year | No. of bite reports | First week | Last week | Peak number bite report/wk | Week of peak bite report |
|---|---|---|---|---|---|
| 2024 | 161 reports (197 bites) | 14 | 48 | 48 | 38 |
| 2023 | 553 reports (690 bites) | 19 | 46 | 134 | 36 |
| 2022 | 38 | 18 | 46 | 8 | 43 |
| 2021 | 169 | 15 | 46 | 26 | 23 |
| 2020 | 293 | 19 | 48 | 45 | 26 |
| 2019 | 216 | 16 | 45 | 66 | 35 |

4 Reasonable correlation with trap results and with forecasts (Fig. 8), considering likely daily weather variations affecting trap results and biting nuisance.
5 Analysis by
a. weekly distribution (Fig. 8a), including the forecast (Fig 8b)
b. day of week Fig. 9, from 2020-2024 Fig 9a, 9b and 9c (2020-24)
c. time of day (Fig. 10a): as usual, the most common time for bites to be reported is between noon and 6pm, followed by between 6pm and midnight. Note that this may depend upon time of the year, the time of the sunset and temperatures but seems consistent across the years (Fig. 10 b)
d. location (Fig. 11a & 11b, larger scale). Data is being stored for future analysis on temporal and spatial correlation each week as we accumulate more data over coming years.

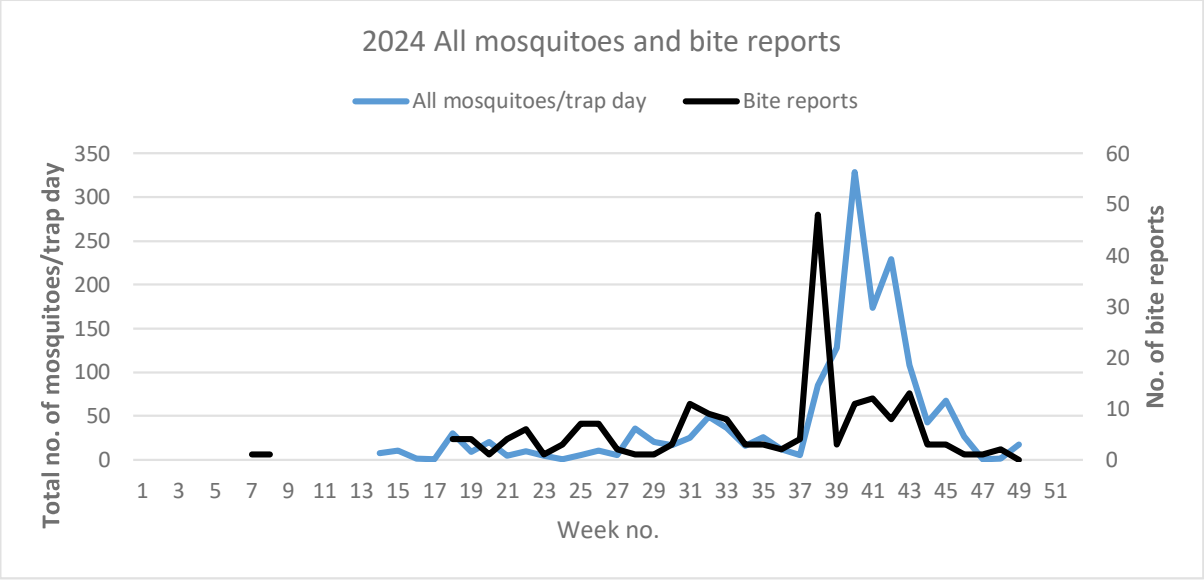



**Fig. 8a Weekly bite reports and numbers of mosquitoes trapped**

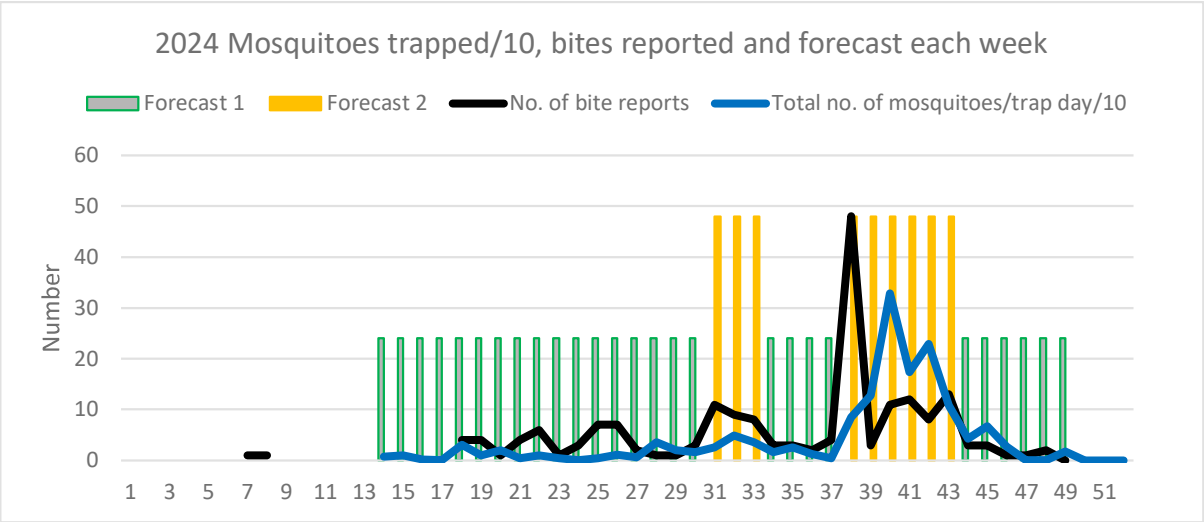



**Fig. 8b**

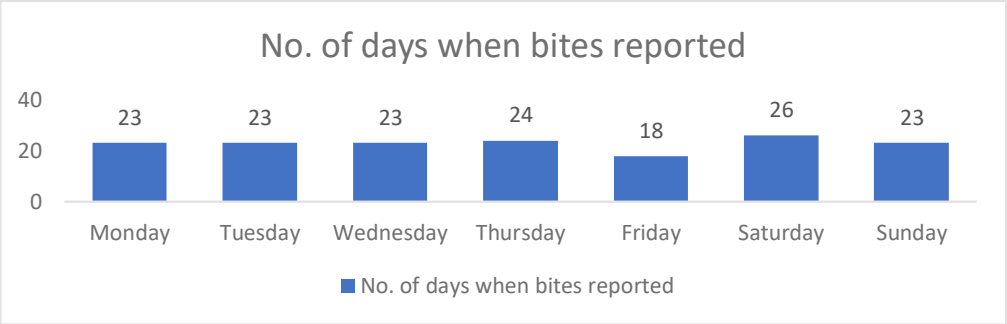



**Fig. 9a Numbers of days of the week when bites were reported 2024**

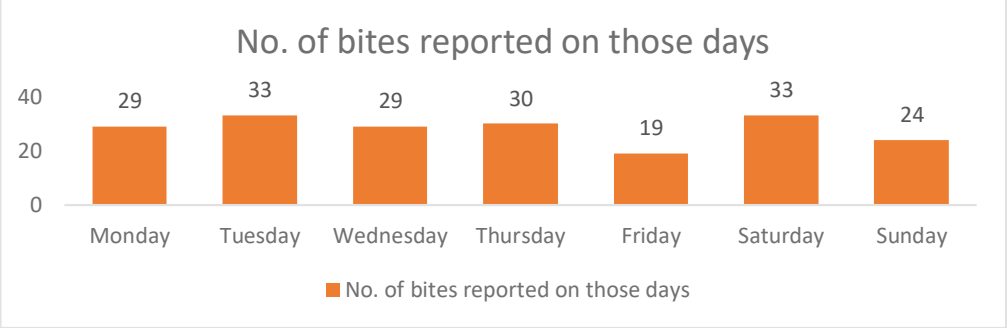



**Fig. 9b Number of bite reports on different days of the week 2024**

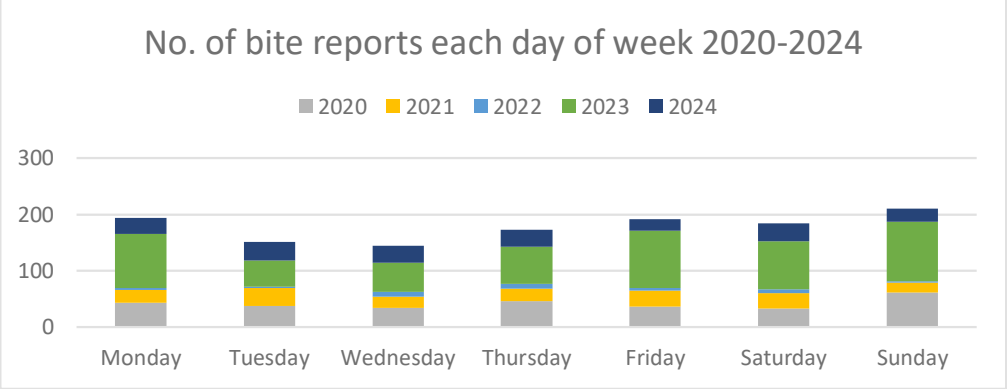



**Fig. 9c Bite reports each day of the week 2020-2024**

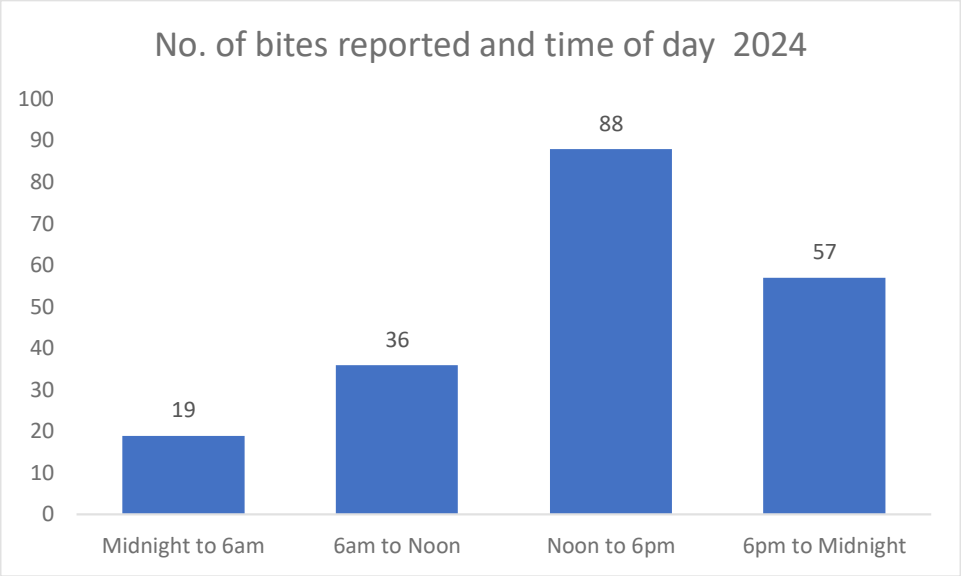



**Fig. 10a Bite reports at different times of the day 2024**

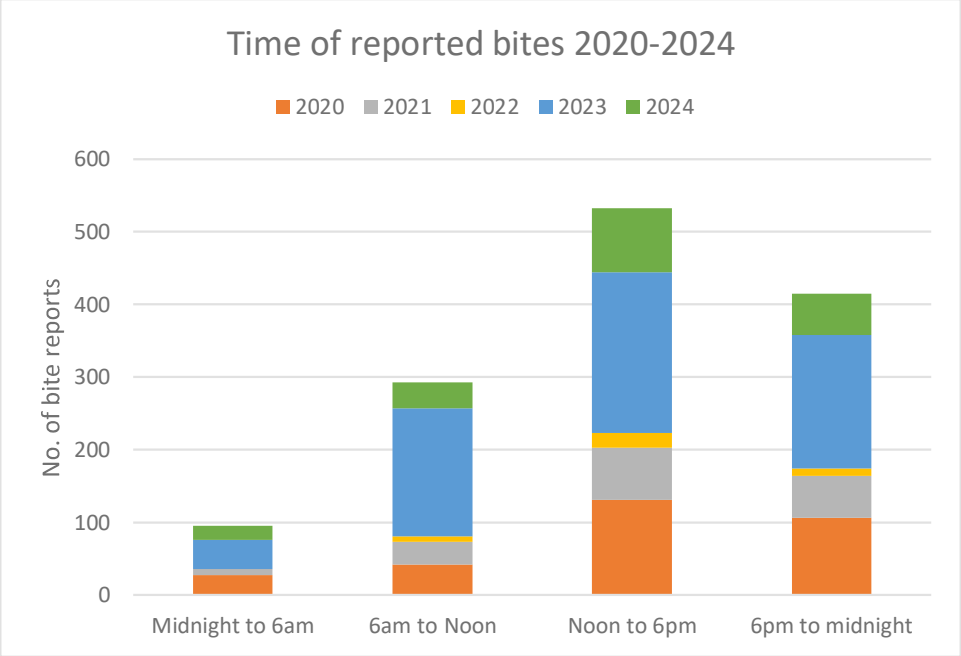
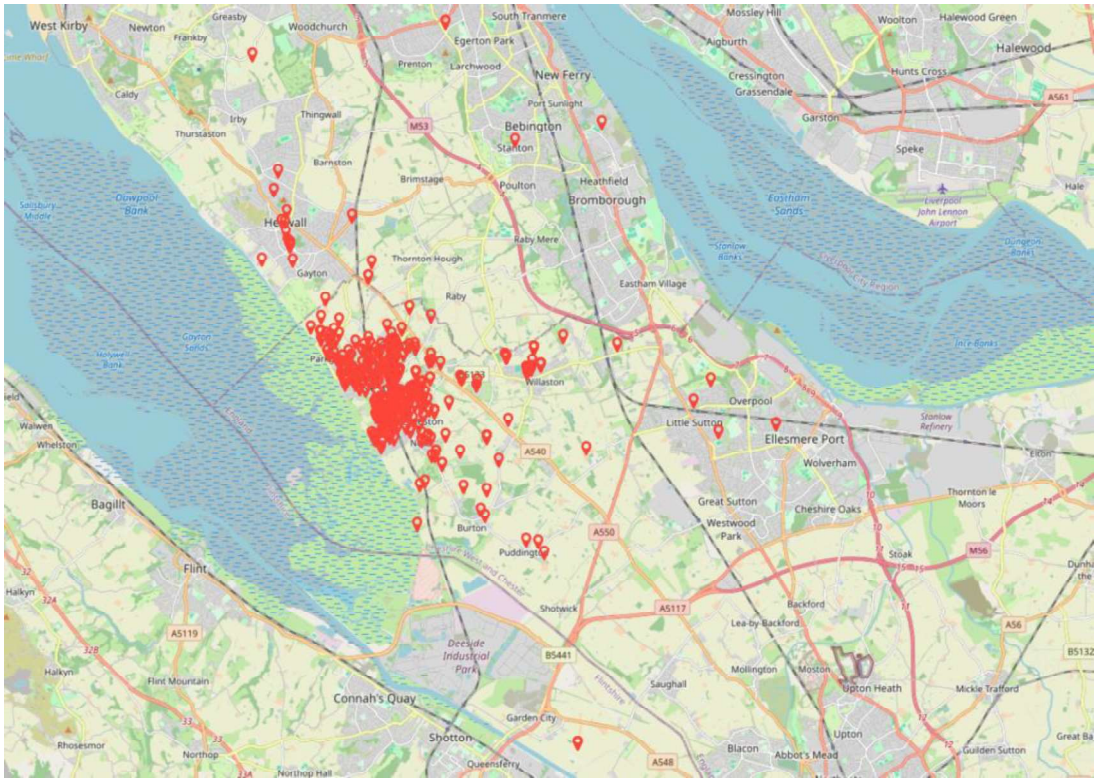



**Fig. 10b Bite reports at different times of the day 2020-2024**

**Fig. 11 Location of bite reports 2023**

**a**

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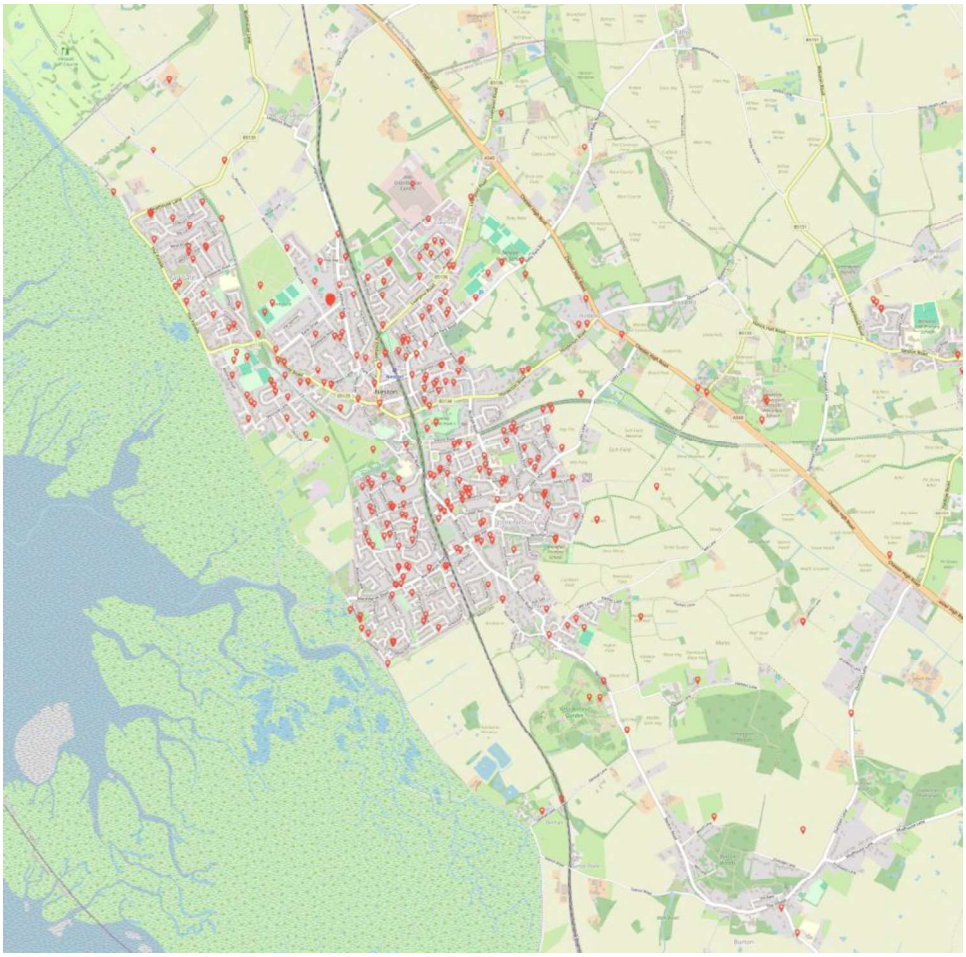

# Research

**As yet unpublished, in preparation:**
Survival of viable *Aedes detritus* eggs, over-wintering of *Aedes detritus*, distribution of *Culiseta litorea*.

**Ongoing collaborations:** with research scientists at

- Liverpool School of Tropical Medicine (virome studies and adult mosquito dispersion, provision of *Anopheles plumbeus* to LSTM and Univ of Wurzberg)
- the Veterinary School at Leahurst (virology infectivity, e.g. Usutu virus and *Aedes detritus*), University of Liverpool
- Liverpool Museum and Edge Hill University

Results also reported to UK Health Security Agency annually