

# **Mosquito monitoring 2022**

**Dr. Peter Enevoldson**

## **Summary.**

1. We note with great sadness the death of Professor Michael Clarkson, who initiated local mosquito monitoring and ran it single-handedly for so many years.
2. Monitoring was carried out along the same lines as in the last few years: adult trapping, marsh pool dipping, bite reporting and biting nuisance forecasting, all weekly.
3. The mosquito biting nuisance was considerably less all year except for a brief period in late September and October, probably due to the exceptionally prolonged and hot dry weather.
4. Research continued, partly in collaboration with local university academics.

## **Methods**

1. Traps (which capture adult female mosquitoes attracted to carbon dioxide and octenol, and so those species of mosquitoes that may bite humans, as well as other mammals and sometimes birds)
  - a. Weekly from 1<sup>st</sup> April to end of November
  - b. 2 days a week
  - c. Four traps, two very near marsh, two 1 – 2km from marsh, Little Neston and Parkgate/Neston
2. Weekly surveillance of study pools at Quayside, similar to last 12 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.
5. For a few weeks, trapping at RSPB reserve at Burton Mere

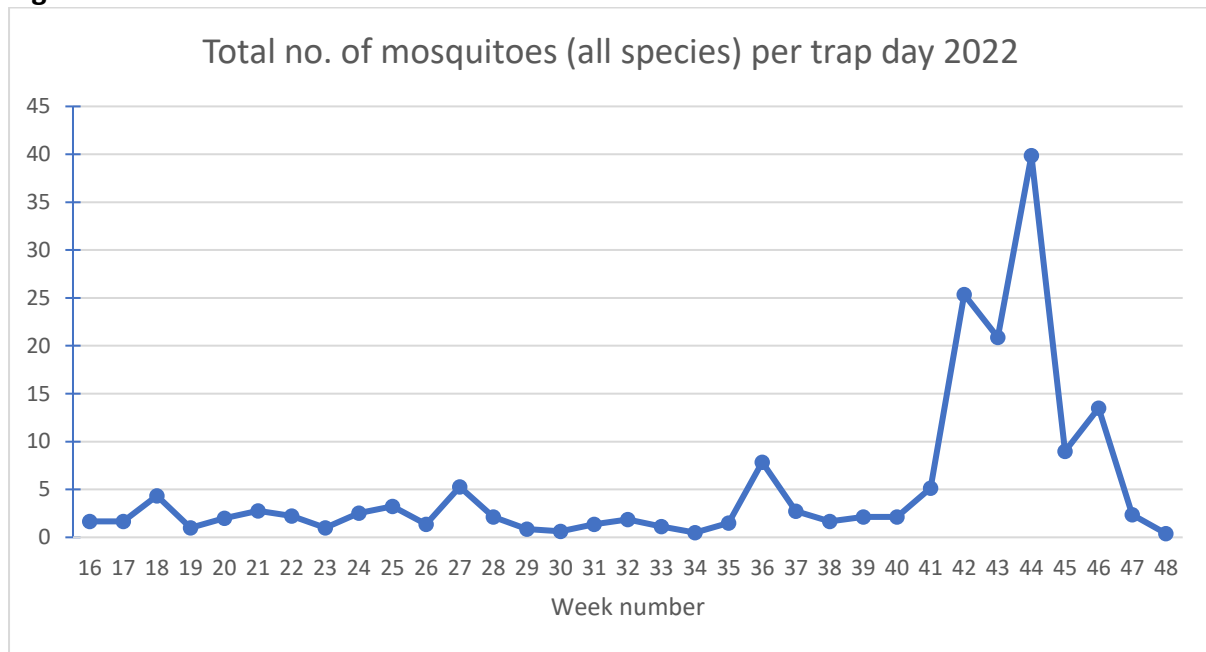
## **Trap Results**

1. As usual, *Aedes detritus* remains the most widespread trapped species, also occurring in more weeks than any other species, with the expected autumnal peak but none in April & May (due to drought) (see Figs. 1a & 1b). The main autumnal peak occurred later than usual in October through till mid-November (see later). This year, because the marsh pools were completely dry between mid-April and early September, there were very few *Aedes caspius* (also from marsh) caught in the traps.
2. Despite the drought causing there to be very few adult mosquitoes in Spring and Summer, due to high numbers in one Little Neston trap during the autumn, there were more adults were caught in traps in 2022 than 2021 and 2020, and about the same as 2019. The numbers trapped in the autumnal surge in other traps were quite modest (Fig 2).
3. The range of species trapped locally was similar to previous years (Fig. 3), though with different proportions of the lesser species (especially more *Anopheles claviger*, which can breed in fresh and brackish water). At Burton Mere RSPB reserve, *Anopheles plumbeus*, *Anopheles claviger* and *Coquillettidia richiardii* were trapped in huge numbers in July and August; the last of these species has not been found on the Wirral previously, but its

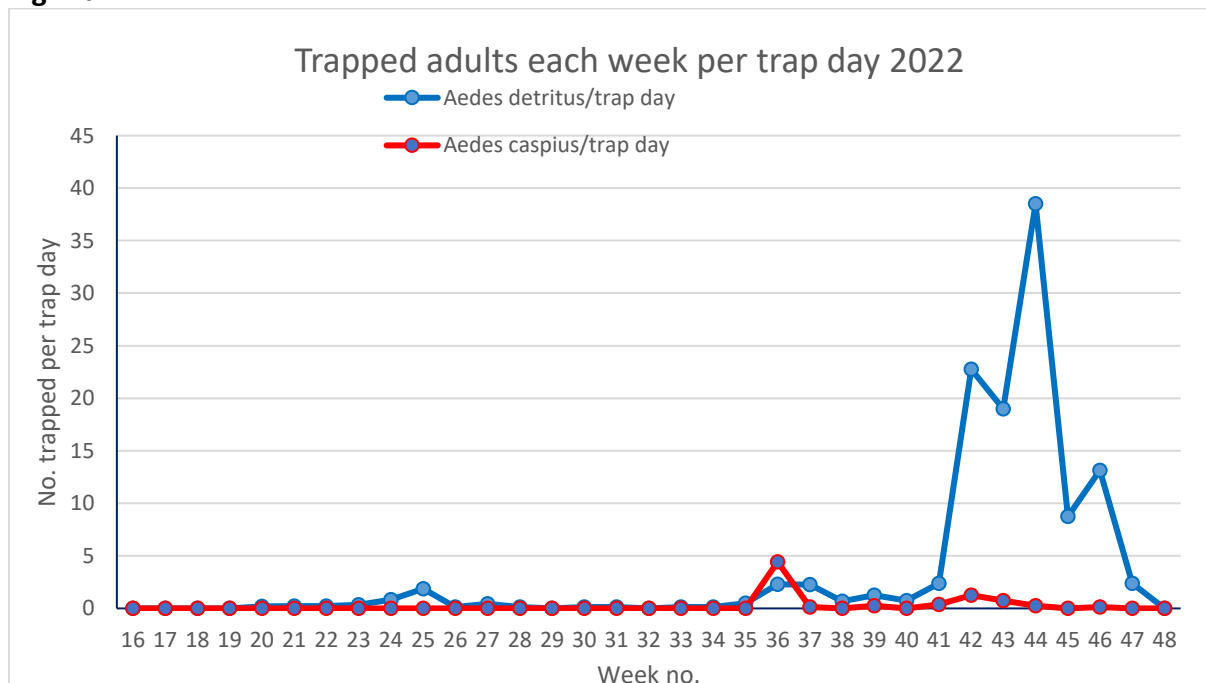
presence is not surprising considering the particular vegetation in the freshwater pools in the reserve (which persisted throughout the drought).

- There were still technical problems with traps quite often this year, exacerbated by weather, leading to gaps in data and considerably more collection time

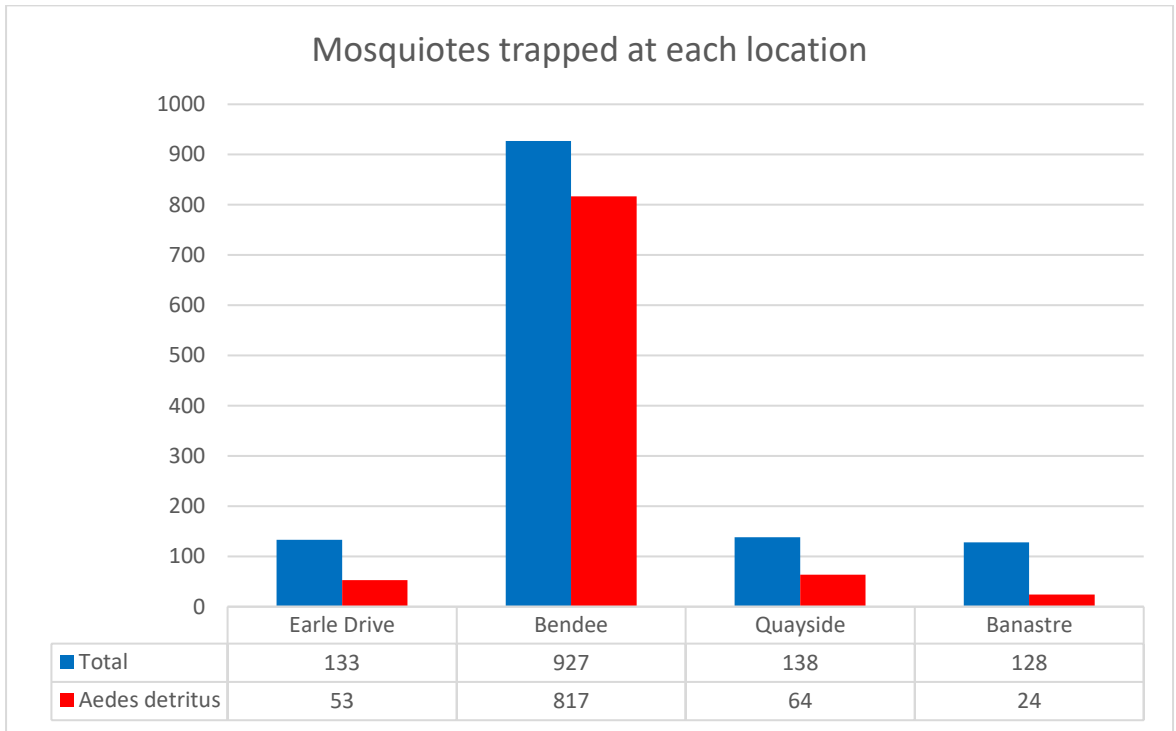
**Fig. 1a**



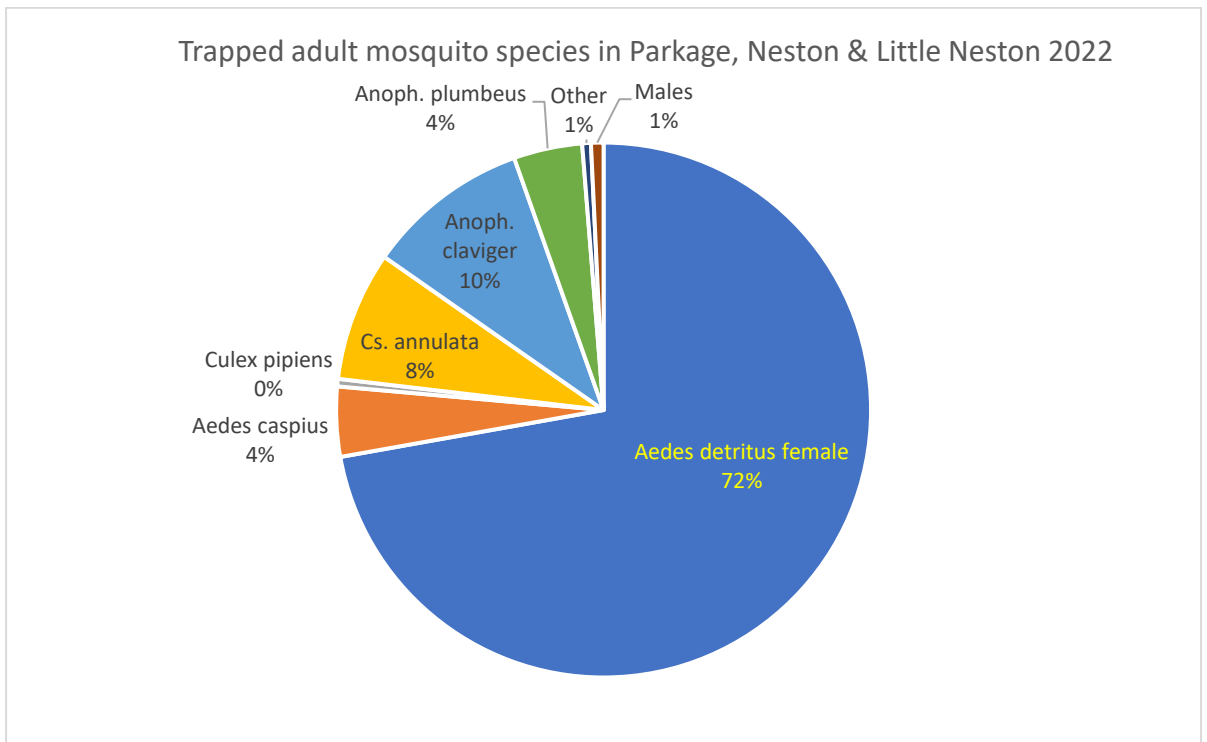
**Fig. 1b**



**Fig. 2**



**Fig. 3**



## Pool dipping results

- 1 Prof. Clarkson started collecting data from dipping pools at Quayside in Little Neston in about 2021. Pretty well the same pools have been surveyed ever since. For the last 3-4 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 3-4 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, this year some discrepancies were noted in some weeks, and this emphasises what Prof. Clarkson and I had already realised over the last 3-4 years, 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 future years, a wider range of pools will be *reported*, hopefully giving a more representative picture.
- 2 There were more larvae found early in the year in 2022 (Fig 5a) compared to 2021 (Fig 5b) and 2020 (Fig 5c), but such high numbers (or more) have also been found previously (e.g.2019). Many of these early year larvae perish by being washed out by spring storms or alternatively by the pools drying out before the larvae can mature to adults.
- 3 After being replenished by the last high spring tide in week 17, the pools rapidly dried out and all pools were essentially dry by week 18 (**Fig. 5a.**). Since there was essentially no rain, the Clarkson pools remained dry till week 42, though some *other* pools did partially fill with the spring tide in week 38.
- 4 Overall, there were fewer larvae & pupae in the Clarkson pools compared to most years (e.g. Fig. 5b and 5c, note different vertical scales, and Fig. 11a,b & c).
- 5 Elsewhere, there were more larvae & pupae compared to Clarkson pools but not as many as in 2019, 2020 or 2021.
- 6 Rather disconcertingly, in the November and December of 2022, with all the pools full, mosquito larvae have been discovered in some pools where none have been found in previous years (i.e. in addition to the usual pools). Samples have been taken for rearing to adulthood to permit species identification but they will almost certainly be *Aedes detritus*. One can suggest reasons for this in a year with such exceptional weather but without firm evidence.
- 7 Over the last 2-3 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.

8 Fig. 5a

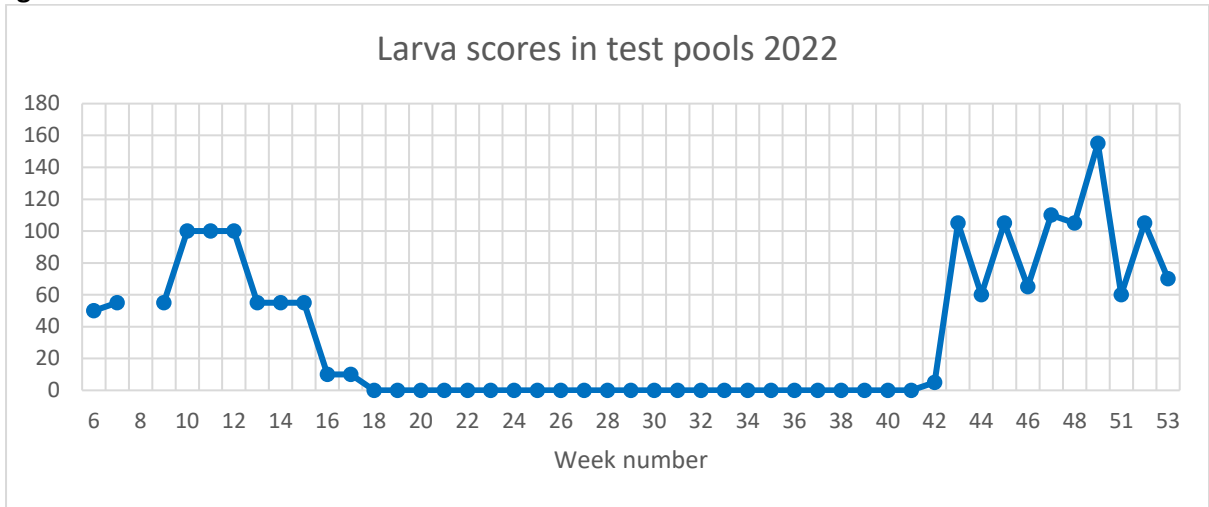


Fig. 5b

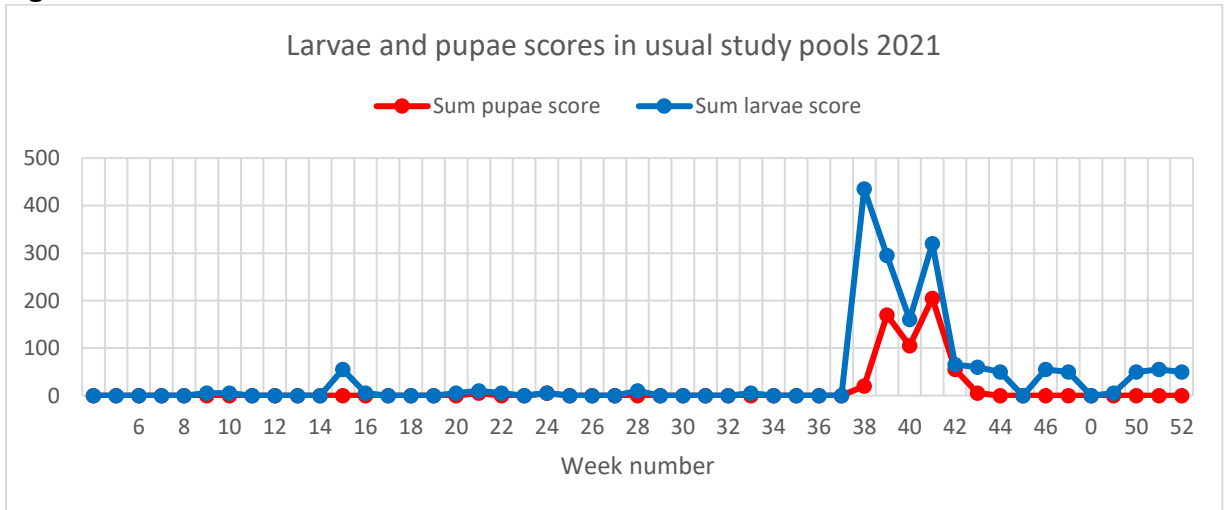
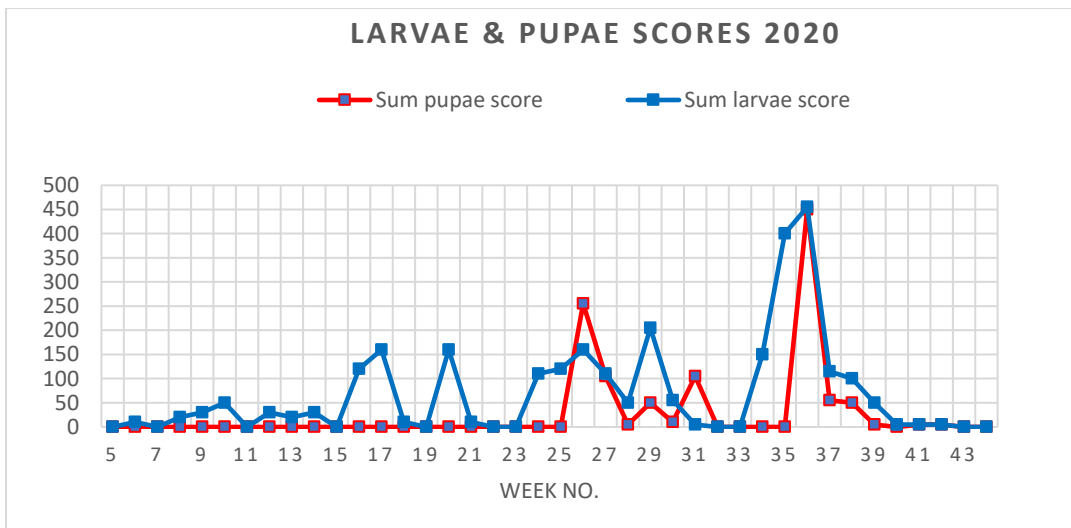


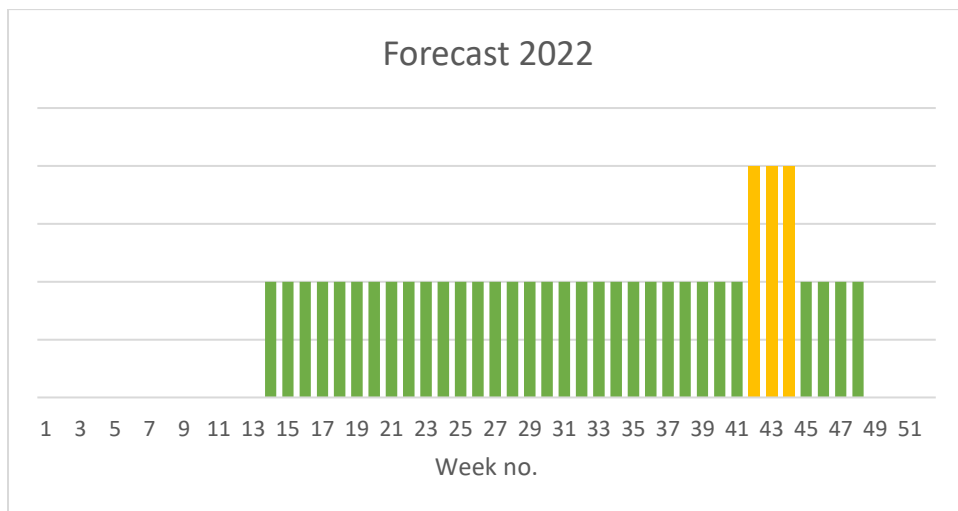
Fig. 5c



## Forecast results

- 1 Produced weekly (Friday, looking forward to forthcoming week) from early April to end of October. Published on NTC website and Neston Life, About My Area.
- 2 Traffic light report (Fig. 6)
- 3 Based upon trap results from preceding few days, pool dipping on the previous day, and weather forecast for forthcoming week (most difficult element)
- 4 Some narrative explanation
- 5 Accompanying encouragement to report any bites online

**Fig. 6**



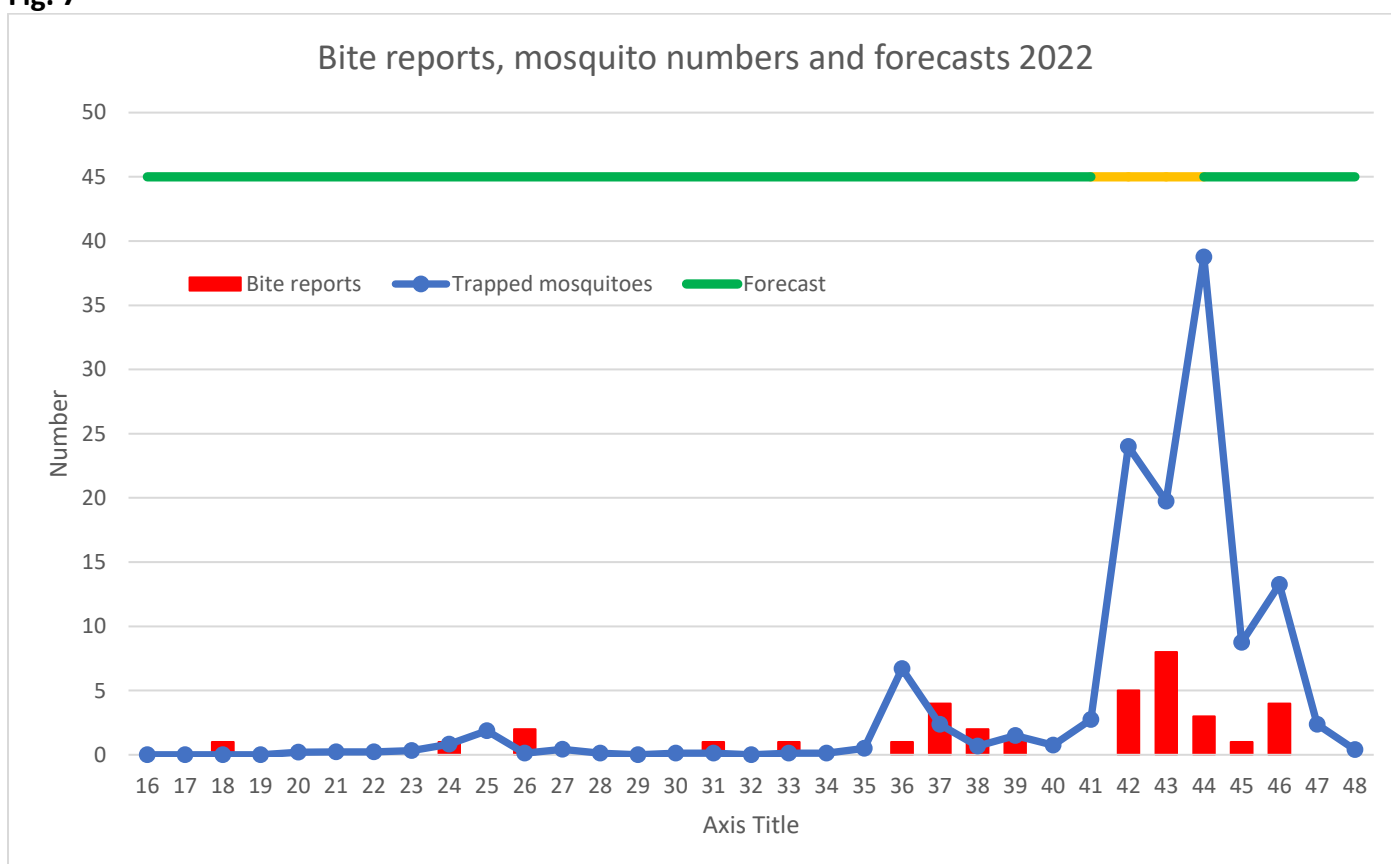
## Bite reports

- 1 Online, now with mapping facility
- 2 Form deliberately kept simple
- 3 38 reports filed in weeks 18 to 46, a large reduction (to be discussed).

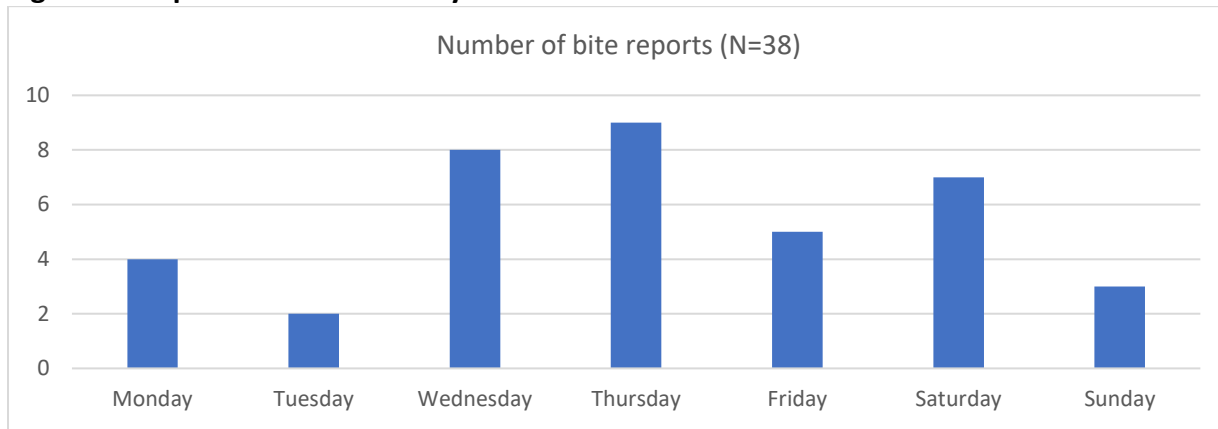
Year	No. of bite reports	First week	Last week	Peak number bite report	Week of peak bite report
2022	38	18	46	8	43
2021	169	15	46	26	23
2020	293	19	48	45	26
2019	216	16	45	66	35

- 4 Always <8 per week
- 5 Good correlation with trap results and with forecasts (Fig. 7)
- 6 Analysis by
  - a. weekly distribution (Fig. 7),
  - b. day of week (Thursday and Wednesday most common, previously Sunday) Fig. 8,
  - c. time of day (Fig. 9) (again mainly noon to 6pm, but numbers too few to allow meaningful analysis of variation with time of year)
  - d. location (Fig. 10a & 10b, larger scale). Data being stored for future analysis on temporal and spatial correlation each week as we accumulate more data over coming years.

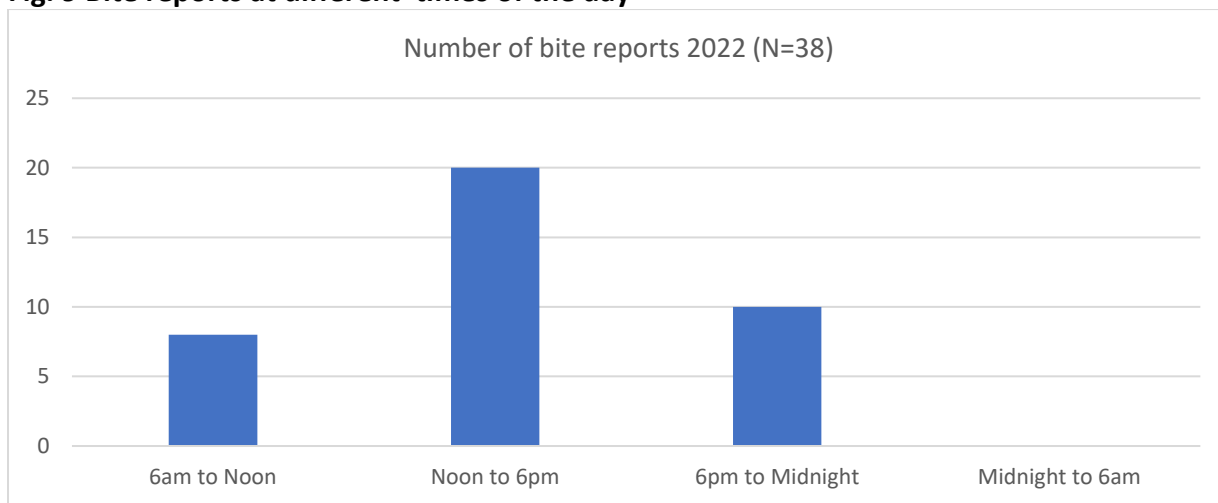
**Fig. 7**



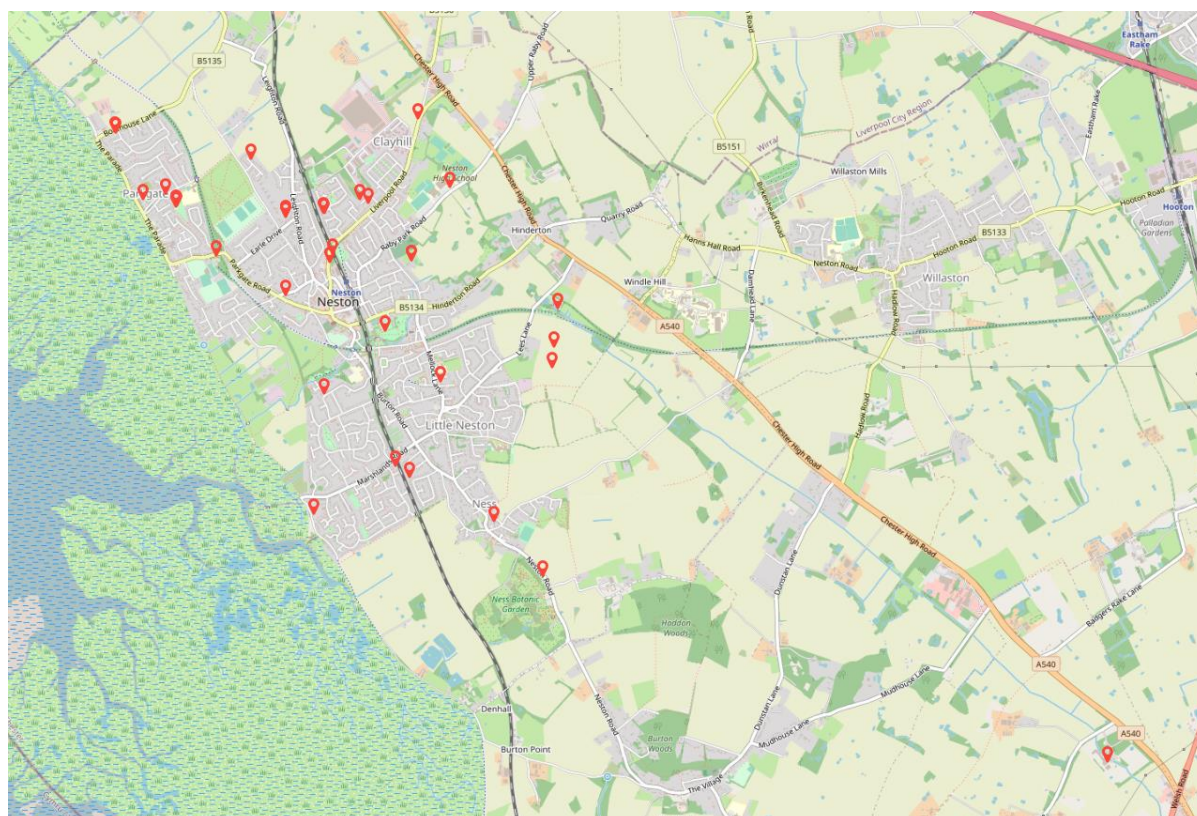
**Fig. 8 Bite reports on different days of the week**



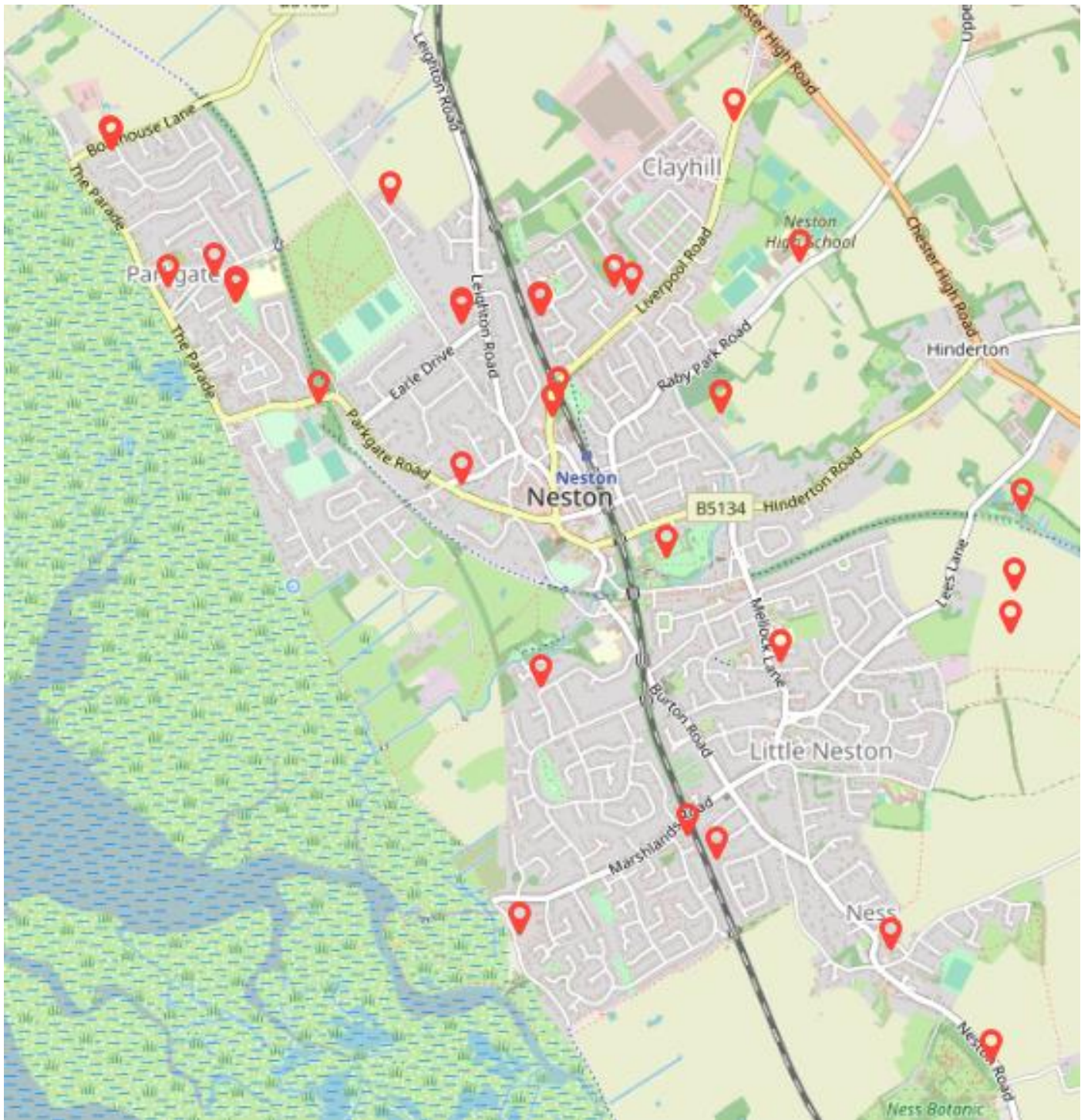
**Fig. 9 Bite reports at different times of the day**



**Fig. 10 Location of bite reports**



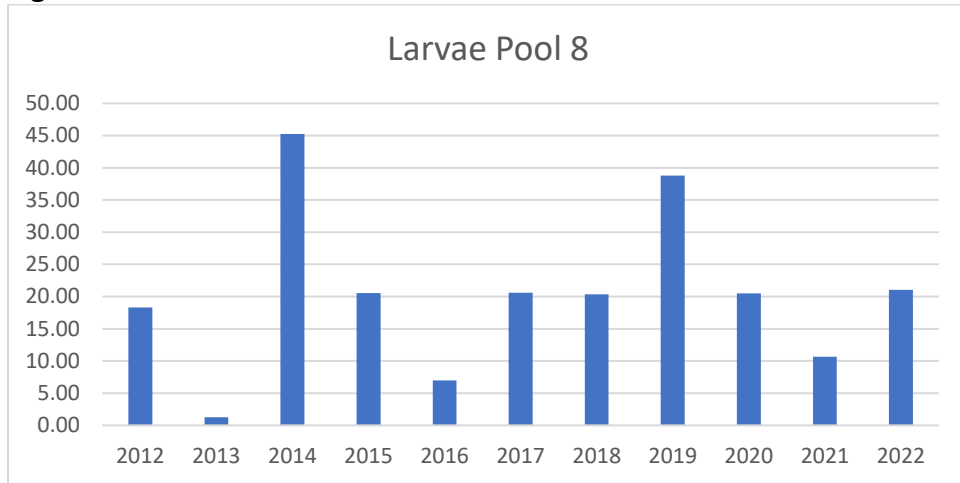




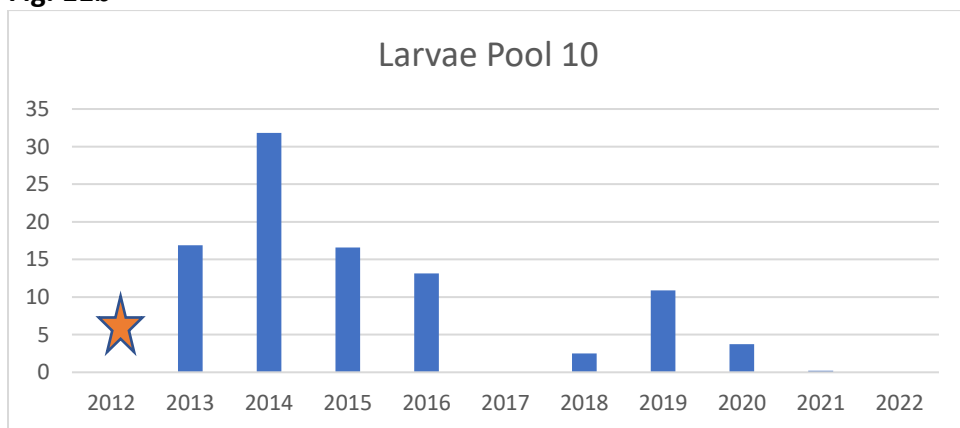
**Fig. 11 a, b & c**  
**Larvae & pupae comparison to earlier years in study pools**

 = No sampling from that pool in that year

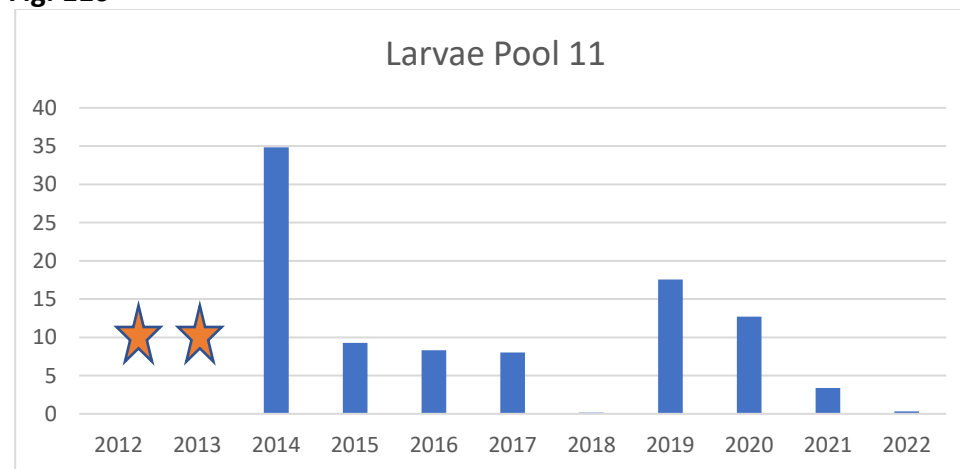
**Fig. 11a**



**Fig. 11b**



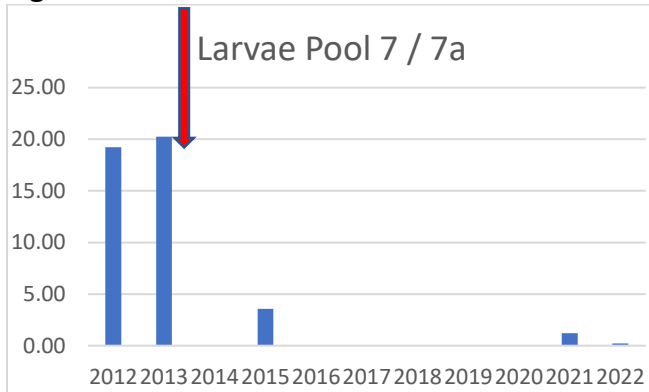
**Fig. 11c**



## Effects of excavations of pools

Benefits of pool excavation in late 2013 (red arrow) continue.

Fig. 13a



In 2012 and 2013, a collection of small pools was collectively called "Pool 7".

In November 2013, about half of these were excavated and joined together into one large pool, subsequently called Site 7a. The other half of the small pools were not excavated and remained as "Site 7b".

Very few or no larvae were identified in the large pool, Pool 7a, following excavation (indeed the few this year turned out to be another species, *Culex pipiens*, which does not generally bite humans). However, the small unexcavated pools ("Pool 7b") continue to produce significant numbers of larvae.

Fig. 13b

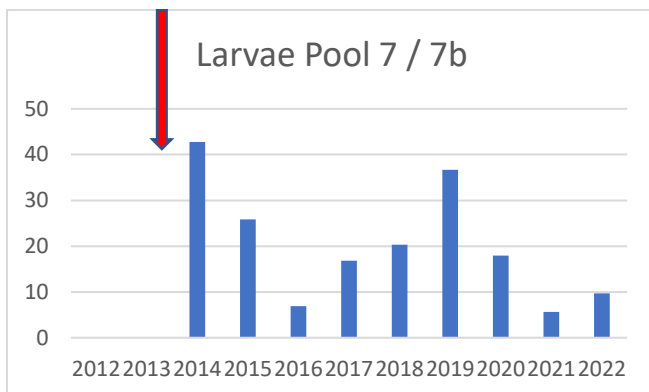
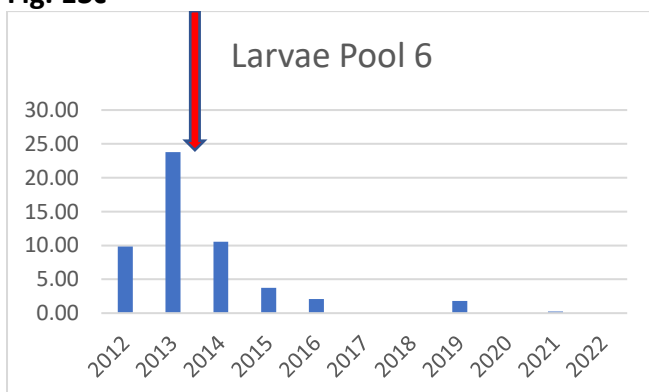


Fig. 13c



Pool 6 was excavated to make it deeper and steep sided in late 2013.

# Research

## Published:

<https://bmcbiol.biomedcentral.com/articles/10.1186/s12915-022-01508-8>

Rapid identification of mosquito species and age by mass spectrometric analysis

Biochemistry, Molecular and Cellular Biology *BMC Biol* **21**, 10 (2023)

Iris Wagner, Linda Grigoraki, Peter Enevoldson, Michael Clarkson, Sam Jones, Jane L Hurst, Robert J Beynon

Dedication: This paper is dedicated to the memory of Professor Michael Clarkson

**Ongoing collaborations:** with research scientists at Liverpool School of Tropical Medicine, the Veterinary School at Leahurst, Edge Hill University, and University of Oxford