LODDON FISHERIES AND CONSERVATION CONSULTATIVE

Barkham Brook - White-clawed Crayfish

This is an update on the work to assess crayfish populations in the Barkham Brook during 2023.

Previously

The White-clawed crayfish, *Austropotamobius pallipes,*(WCC) is the UK's only native or indigenous freshwater crayfish. It is considered a keystone species i.e.one that has a disproportionally large effect on its natural environment relative to its abundance. It is endangered throughout its range not only in the UK but also mainland Europe.

Since the 1970s there has been a very great decline in this species mainly thought to be the result of the introduction of American Signal crayfish, *Pascifastacus leniusculus*, (ASC). This species is capable of outcompeting WCC whilst it is also a carrier of crayfish plague, *Aphanomyces astaci,* (Aa). This disease is lethal to many crayfish species outside North America, the WCC being particularly susceptible. It should be noted that there have been instances recorded in the UK where both species have co-existed for a number of years, probably due to the ASC being free of Aa, but even in these circumstances the ASC tends to overcome the WCC in time.

This type of population decline has been very marked in the Thames catchment and there are now only a few WCC populations known in very localised situations.

WCC are protected under the Wildlife and Countryside Act 1981. It is an offence to intentionally take them. They are classified as endangered on the last International Union for Conservation of Nature (IUCN) Red List 2010, whilst they are also listed as a rare and most threatened species under Section 41 of the Natural Environment and Rural Communities Act (2006).

2023

Following monitoring efforts that took place in 2021-22, further surveys have taken place during 2023. These have included eDNA sampling plus some Environment Agency trapping.

eDNA sampling

This was carried out on 2 occasions (10th May, 6th October) during which many of the sites from 2022 were re-sampled. To validate the results samples were taken at a known WCC site in Hampshire, whilst standard negative and positive controls were also conducted.

Results

10th May

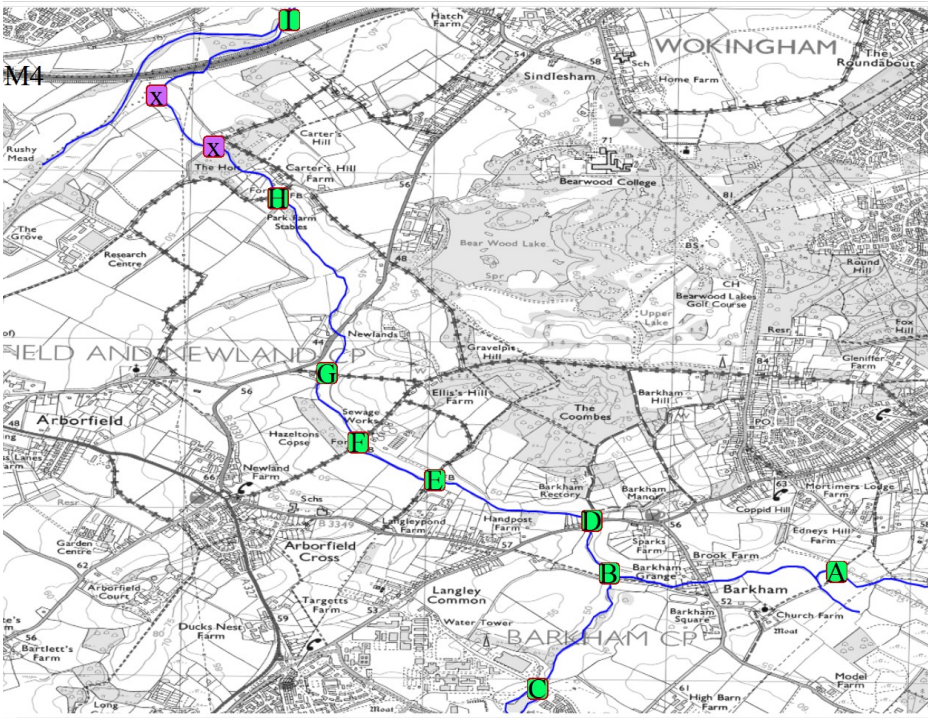
Site E: POSITIVE (3/6 replicates. Two strongly positive)

All other sites were NEGATIVE

6th October (with students)

Site D: Possible positive (1/6 replicates weakly positive)

All other sites were NEGATIVE



Hampshire - 9th May.
3 separate sampling sites were used (top, middle and bottom) Results were as follows:

Site Top: POSITIVE (5/6 replicates positive. One replicate was strongly positive)

Site Middle: BORDERLINE (2/6 replicates positive. One replicate was strongly positive)

Site Bottom: POSITIVE (3/6 replicates positive. Two replicates were strongly positive)

In addition all positive controls came out positive and negative controls came out negative.

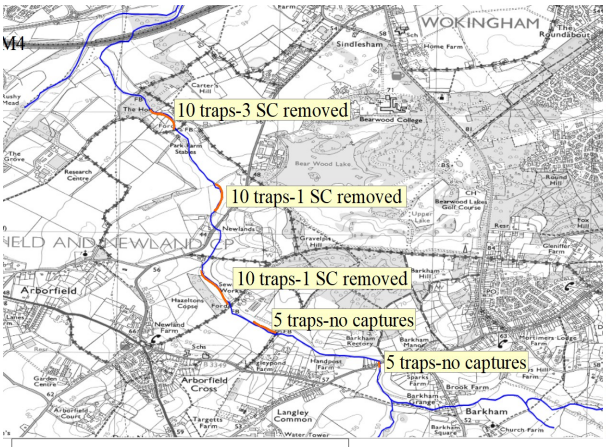
Please note the following comments from Dr. Soon Gweon who analised the samples at University of Reading regarding the May sampling.

"I successfully ran a round of qPCR for the white-clawed crayfish samples we collected on May 9th – 10th, 2023. I had limited reagents, so I could only use the filter samples collected by Ian Watson. These samples were collected from Barkham Brook (9 sites) and a location in Hampshire with known populations of WCC.

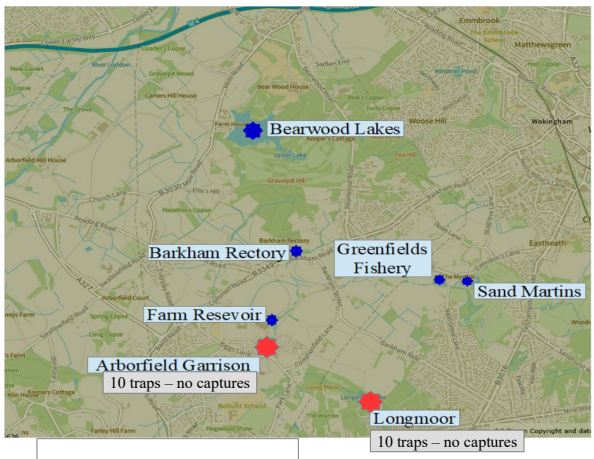
I am using a conservative threshold to determine positive/negative classifications. I define a positive outcome when 50% or more of the technical replicates yield positive results. Some would consider a positive outcome even if only one technical replicate yields positive result. If that's the case, then all Hampshire sites would be classified as positive. No Barkham Brook samples other than Site E had positive in any of the replicates.

This was a very clean qPCR run with no amplification (even at later cycles) in all six negative controls. In this regard, I'm confident that Site E had detectable WCC eDNA. Since WCC eDNA appears to be quite difficult to "capture", it is likely that we are not be seeing the full picture, i.e. all Hampshire sites should have come out as strongly positive, but Site Middle did not. I still think it's pretty amazing that we can capture WCC naked/extraorganismal eDNA from 500 ml of water. The results are somewhat different from last qPCR results but I guess that's expected from a lotic/fluvial environment."

Trapping



Reaches trapped
SU 7768 6690 - SU 7766 6694
SU 7700 6723 - SU 7688 6732
SU 7670 6744 - SU 7655 6766
SU 7662 6818 - SU 7661 6841
SU 7636 6889 - SU 7616 6908



Stillwaters trapped
Arborfield SU774658
Longmoor SU784651

A single trapping effort was conducted in August in conjunction with the Environment Agency. A number of reaches of the Barkham Brook were targeted in addition to the 2 large stillwaters towards the head of the southern arm, Longmoor Lake at California Country Park and the Arborfield Garrison Lake. Trapping was conducted using baited Gees Minnow Traps, slightly modified to widen the trap funnel or inscale. The traps were set for an approximate 24 hour period, overnight between 10th-11th August. The trapping in the actual Barkham Brook tended to target the slightly deeper pools, especially those locations with rocks, hardcore or tree roots present. Some sections were too shallow to set the traps effectively, offered little cover and were thus ignored. In the lakes the trapping effort was concentrated in the most likely areas to be favoured by crayfish. These included around the outlet structure and amongst marginal tree roots, rather than the generally featureless silt typical of much of the lake beds.

Results

5 ASC were caught, all downstream of the Barkham STW outlet.

Although there are reports that ASC are present in Longmoor Lake none were found at this location.

No WCC were caught

ASC, Minnow trap and bait box

Otter Spraint

During the trapping work otter spraints were found under the Barkham Road bridge. There is a possibility that crayfish remains may be present in the spraints, but further examination has not yet been conducted. If it is possible to confirm that the spraints contain WCC remains, then this could support the theory that they are present in this part of the Barkham Brook. However this would also illustrate that there is a further natural pressure on the remaining population.

Onward Management.

There are a few options regarding next steps, plainly dependant on available resources and commitment. It would be beneficial if further monitoring of the crayfish populations could be continued. In addition protecting of any remaining WCC could be considered, but the method and likely success would need to be evaluated. It could be argued that the results to date suggest that both WCC and ASC populations are relatively light and that there may currently be no overlap, possibly due to water quality effects from the STW outlet.

The detection of the WCC is proving difficult. eDNA sampling results do suggest that there is likely to be a small (probably very small) population existing somewhere between the the confluence of the east and south arms (sampling point B) and the outlet to the STW (just upstream of sampling point F). Why detection is occurring at a single point and not downstream is unclear, but could be due to the poor persistence of the eDNA in the water coupled with the undoubtedly small quantity of available material. It is believed, but not tested, that WCC do not release significant amounts of DNA, the release could be more concentrated at certain times of the year (during hatching of eggs, moulting and mating), whilst diurnal / nocturnal activity fluctuations could also be significant.

Further monitoring by trapping, eDNA or other survey techniques could provide more information about the current distribution or even ongoing occurrence of the WCC, along with information about the upstream advance of the ASC. There are currently no funds available to continue any eDNA work, whilst trapping, at least of the WCC, is currently dependant on EA co-operation. It may be worthwhile targeting any WCC crayfish trapping between sampling points D and E, as current information appears to suggest that this is the most likely area for WCC to be present. This theory is supported by the 2020 sighting and recent positive eDNA readings. Little is known about this section of over 700 metres in length, although the 100-150 metres immediately downstream of sampling point D is shallow and does not seem to provide particularly suitable habitat. The (assumed) very small and dispersed population of WCC may explain the difficulty of obtaining repeat and consistent results and the failure of trapping to turn up any specimens. However, the fact that positive eDNA results have been obtained on several occasions does suggest that WCC persist in the Barkham Brook. With such a small population, conservation measures may be difficult.

Downstream trapping, either using baited or habitat traps could also be used to either remove or permit population manipulation of the ASC. This could be undertaken with untrained operatives, but should any WCC be encountered then this approach would require licensed operatives. Trapping, especially the use of baited traps, requires more site visits than eDNA sampling, whilst landowner permissions would need to be arranged to increase access. However if it was decided to attempt population control by removing the female pleopods then this could be attempted by using habitat traps, an approach that would also provide population information, through “marked recapture” analysis. Pleopod removal is being attempted with some European populations of non-native crayfish species, but no results regarding its effectiveness are currently available.

Pleopod removal on female ASC should in theory reduce recruitment, by removing their ability to brood eggs yet they would still be available for mating, thus hopefully using up some of the resources of the males in the population. The 2023 trapping suggested that the ASC population is currently light. Any female pleopod removal may thus not be a daunting exercise, whilst it should not immediately affect the current population dynamic. Self control through cannibalism in the ASC population could thus continue, whilst at the same time reducing recruitment and possibly population spread. There is a danger that predation of the WCC may be increased in any areas of population overlap, but if this overlap is occurring then it should be detected by trapping, at which point it may be possible to reassess the strategy.

There is no current evidence of population overlap, but it should be noted that ASC were trapped in the same locality as WCC were seen in 1992, and both upstream and downstream of the last point that the were detected by EA sampling on 27/10/1999 (EA Sampling Site No 33224).

It should be noted that any trapping program would always come with the slight risk that crayfish plague could be imported to the system.

Next steps

Contacts for possible collaboration (This could involve or may require publicity.)	TVERC, BBOWT Environment Agency Thames Water Local Landowners Barkham Parish Council ZSL

EA Fishery Site Permits.

Any fishery that is to be stocked currently requires an EA issued Site Permit. These could be revised to strengthen the protection offered to the WCC, particularly specifying the need to source stock from Aa free sites.

Surveys

Additional fish surveys could be useful to possibly support the Local Wildlife Site designation application.

References

EA Ecology & Fish Data Explorer

Open WIMS data (EA Water quality data archive, data going back to Jan 2000 is available)

Acknowledgements

The results of this work to date would not have been possible without the valuable assistance of Dr Soon Gweon at |Reading University.

In addition the help received from Tim Flood from the Environment Agency with the trapping effort was greatly appreciated as was the cooperation from some of the local landowners in facilitating access

Assistance from Dr Ben Rushbrook in facilitating the visit to the Hampshire WCC site to obtain positive controls was also greatly appreciated.