2015 Update on the White-clawed Crayfish population within the Wyre Forest

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Introduction

A programme of annual monitoring of the native White-clawed Crayfish *Austropotamobius pallipes* population in four tributaries of Dowles Brook in the Wyre Forest has been underway for the past six years. The study started in 2010 following the discovery of White-clawed Crayfish in a small stream in the forest. During 2015 all four watercourses were re-surveyed as part of the monitoring programme and this article gives a summary of the findings of the work.

White-clawed Crayfish are classified as Endangered in the IUCN Red List of Endangered Species and their populations are declining throughout much of their range. It is predicted that the species will face extinction in much of their former range within the next few decades. White-clawed Crayfish populations are under threat from: (i) a fungal-like disease, 'crayfish plague'; (ii) direct competition from introduced alien crayfish species; and, (iii) biochemical degradation of lotic/lentic habitats. White-clawed Crayfish are protected under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended). As an Annex II species under the Habitats Directive, member states are required to maintain favourable conservation status through the selection of a series of European Sites.

The White-clawed Crayfish is listed as a Species of Principal Importance in England under Section 41 of the NERC Act 2006 and is a Priority species in the UK Biodiversity Action Plan (BAP). The UK BAP seeks to maintain the current distribution of the species through a combination of restricting the spread of non-native crayfish and crayfish plague, as well as providing suitable habitat features.

Methods

A detailed description of the survey methods are given in the annual Wyre Forest Study Group Reviews for 2010, 2011 and 2012. The daytime manual search of suitable refugia and night-time torching of the watercourses followed published guidelines and best practice (Peay 2002). The daytime manual search provides information on relative abundance and population structure, including size distribution and sex ratio. The night-time torching gives an abundance estimate of active animals.

The 2015 survey replicated (as closely as possible) the previous year's surveys with a similar team of surveyors, the same number and location of sample patches and the same amount of survey effort. Over the years, finding the precise start and end of every monitoring patch has been difficult, especially at night-time, but in 2015 more time was given to accurately locating and describing the start (and finish) of each survey patch in Forest Lodge Stream and Bell Brook to try to increase accuracy in future years. Water levels, vegetation structure and growth is also different every year and in 2015 Patch 5 in Forest Lodge Stream was not torched due to dense bramble overgrowth and fallen timber causing hazards in the channel. In addition, Dowles Brook had rising water on the night of the torching survey and so the survey was curtailed due to being a safety risk and the deteriorating survey conditions. Three of the initial 2010 core team of five surveyors undertook the monitoring surveys of Bell Brook and Forest Lodge Stream assisted by volunteers. Survey work in Kingswood Stream and Longdon Stream was undertaken by the same two surveyors that have undertaken the monitoring since the study began in 2011.

All survey work was undertaken by two licensed surveyors and several assistants between the 10 and 21 August 2015.

Comparison of the observations across the years is interpreted using Catch per Unit Effort (CPUE) data as an index for the long-term monitoring of the crayfish populations. Standard units were used i.e. one minute time periods, one refuge searched by hand and/or one baited trap. Differences in observations across the years were investigated using the following statistical tests:

- The one-tailed t-Test was used to compare the CPUE data from both the standard and torching surveys during the five years 2010 to 2015 inclusive.
- The Mann-Whitney U test was used to determine if there was a significant difference between the medians of male and of female White-clawed Crayfish caught using standard survey methods during the five years 2010 to 2015 inclusive.
- The Kruskal–Wallis one-way analysis of variance was used to test if there was a significant difference between the carapace lengths of White-clawed Crayfish caught using standard survey methods during the five years 2010 to 2015 inclusive.

Results

Evidence of White-clawed Crayfish was found in all four of the sampled tributaries: albeit at different population abundances. No evidence of the American Signal Crayfish Pacifastacus leniusculus was found during the 2015 survey. All four watercourses were found to have a suitable combination of in-channel and bank-side habitat and sufficient flow conditions

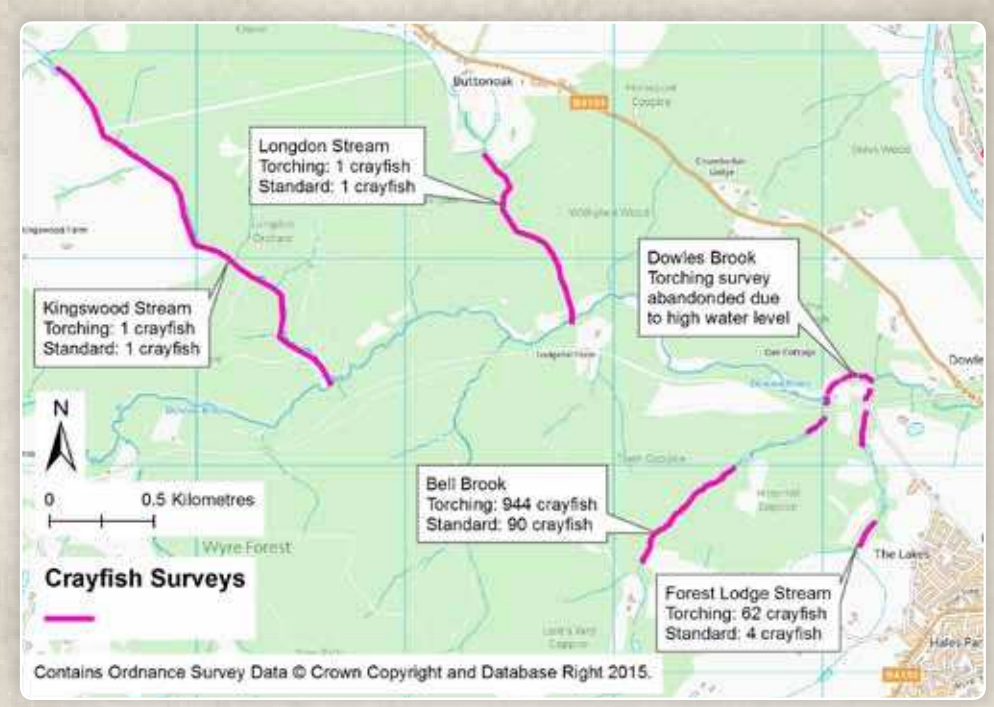


Figure 1: The location of the individual watercourses in the Wyre Forest showing the results of the 2015 survey.

to support crayfish. No evidence of crayfish plague or porcelain disease was found.

The 2015 survey results are displayed in Figure 1 and the details are described in the following text.

Bell Brook

In 2015 there was little observed change in White-clawed Crayfish habitat along Bell Brook. The watercourse continued to support excellent and abundant in-stream refugia and frequent inaccessible refugia in tree roots and between rocks in the bank. Water clarity was good with 100% bed visibility.

In 2015 there was an increase in crayfish observations made during both standard and torching surveys, Figure 2. The maximum count was of 944 (250 adults + 694 juveniles) White-clawed Crayfish recorded during one torching survey of Bell Brook: this being the highest count of all monitoring years to date.

In 2015 the standard survey and torching results showed the highest Catch Per Unit Effort (CPUE) across all years. Overall between 2010 and 2015 there has been a positive trend of CPUE based on both standard (range = 0.16-1.42) and torching (range = 3.03-10.49) survey methods, Figure 3. There has been a statistically significant difference between a) the standard CPUE during the six years 2010 to 2015 inclusive (t = 4.30654 One-tail, n = 5, P = <0.05); and b) the torching CPUE during the six years 2010 to 2015 inclusive (t = 6.89617 One-tail, n = 5, P = <0.05).

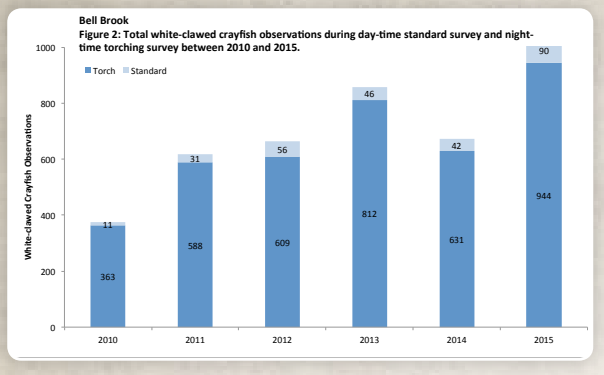
The population recorded in Bell Brook during the 2015 standard survey was a healthy mix of both adult and juvenile individuals with a range of carapace sizes, Figure 4 and Figure 5. The percentage of the population classed as juveniles (<25mm carapace length from tip of rostrum to junction of carapace and tail) was 64%. There is a significant difference in medians between the individual White-clawed Crayfish carapace lengths recorded during day-time standard surveys in Bell Brook over the survey years (H = 15.4122, DF = 5, P = <0.05 Kruskal-Wallis test).

Both male and female White-clawed Crayfish were present in Bell Brook in 2015: 77% were female (65 individuals) and 23% were male (19 individuals), Figure 6. Statistical analyses found that there was a significant difference in the proportions of male and female White-clawed Crayfish caught using standard survey methods during the five years 2010 to 2015 inclusive (Mann Whitney U test, P <0.05).

Forest Lodge Stream

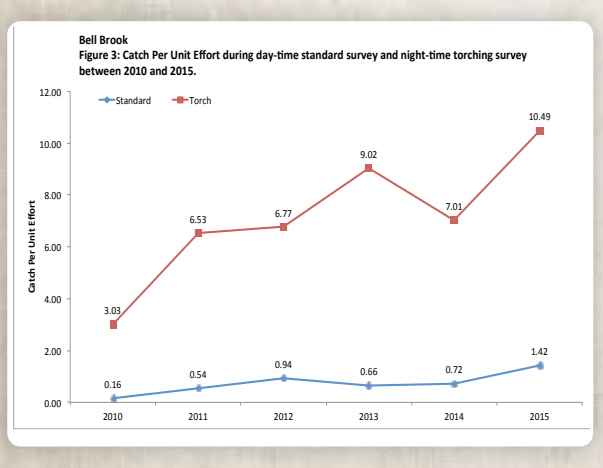
In 2015 there was little observed change in White-clawed Crayfish habitat along Forest Lodge Stream. Forest Lodge Stream continued to have abundant bank-side habitat (under-cut banks, large tree roots) and locally abundant in-stream habitat (boulders, cobbles, tree roots, debris dams). Large woody debris remained abundant in the upper reaches. Water clarity was good with 100% bed visibility.

In 2015, White-clawed Crayfish records continued to



increase with a maximum count of sixty-two White-clawed Crayfish (22 adults + 40 juveniles) recorded during one torching survey of Forest Lodge Stream, Figure 7.

The CPUE from the standard and torching survey showed an increase in population abundance in 2015, Figure 8. There has been a statistically significant difference between a) the standard CPUE during the six years 2010 to 2015 inclusive (t = 2.38387 One-tail, n = 4, P = <0.05); and b) the torching CPUE during the six years 2010 to 2015 inclusive (t = 3.42457 One-tail, n = 5, P = <0.05).

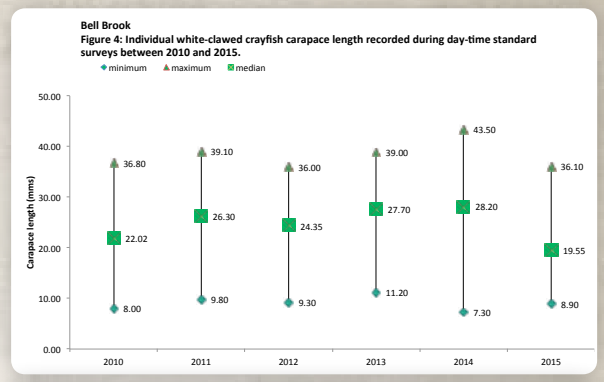


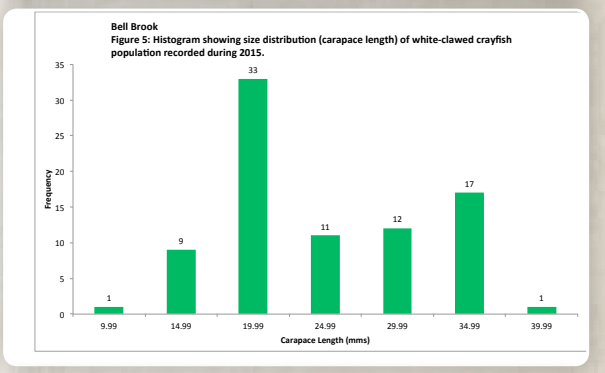
Male and female White-clawed Crayfish with a wide range of carapace sizes (between 22.3mm to 40.9mm carapace length) were present in Forest Lodge Stream in 2015. Three female White-clawed Crayfish (one juvenile and two adults) and one male adult were caught during the standard survey of 2015. 22 juvenile and 40 adult White-clawed Crayfish were recorded during the night-time torching survey.

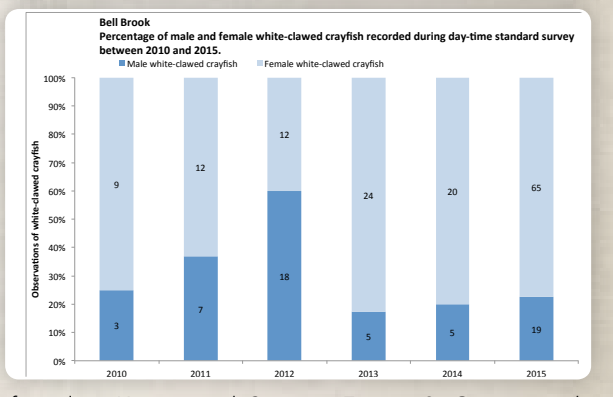
Kingswood Stream

Bankside habitat and in-stream habitat was very variable but overall the habitat was good to excellent. Water clarity varied with a bed visibility of between 20% and 90%.

A very low population of White-clawed Crayfish was







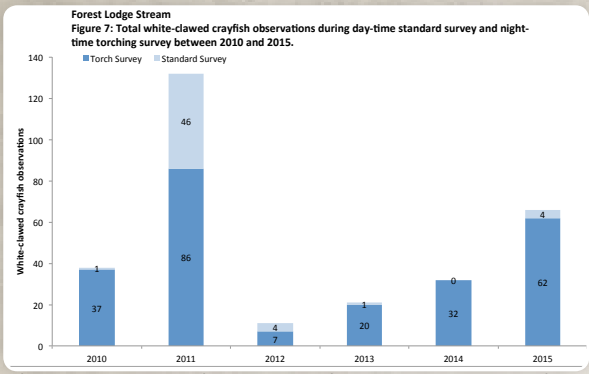
found in Kingswood Stream, Figure 9. One juvenile White-clawed Crayfish was observed but not caught during both the standard and torching survey: the observations were made in different survey patches.

The CPUE across the years is shown in Figure 10. There was no statistically significant difference between a) the standard CPUE during the six years 2010 to 2015 inclusive (t = 1.75127 One-tail, n = 4, P = >0.05); and b) the torching CPUE during the six years 2010 to 2015 inclusive (t = 1.72368 One-tail, n = 4, P = >0.05).

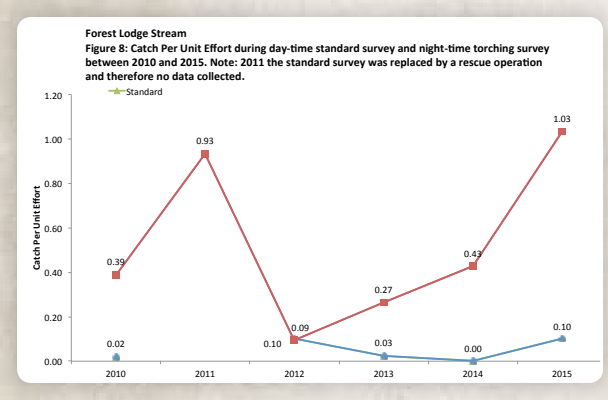
Longdon Stream

Longdon Stream had excellent in-stream and bankside habitat. Water clarity was good with 100% bed visibility.

Evidence of White-clawed Crayfish was found in Longdon Stream, Figure 11. One young adult female caught during the standard survey and one adult escapee from the night-time survey: both were recorded in Patch 3.



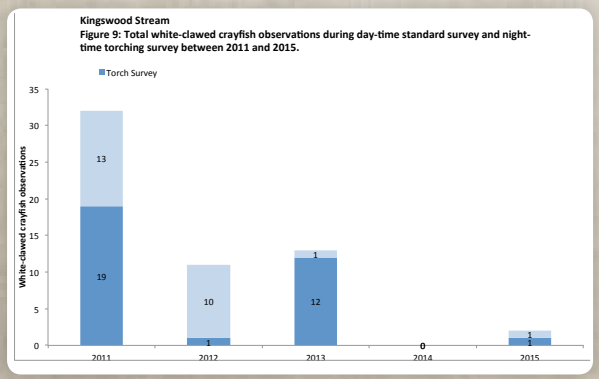
The CPUE across the years is shown in Figure 12. There was no statistically significant difference between the standard CPUE during the six years 2010 to 2015 inclusive (t = 1.50746 One-tail, n = 4, P = >0.05) but there was a statistically significant difference between the torching CPUE during the same six years (t = 2.14061 One-tail, n = 4, P = <0.05).

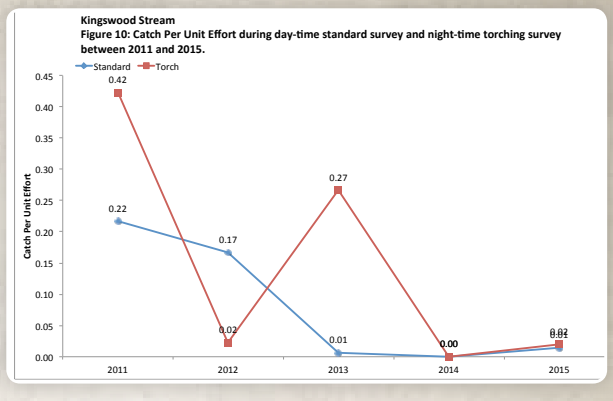


Discussion

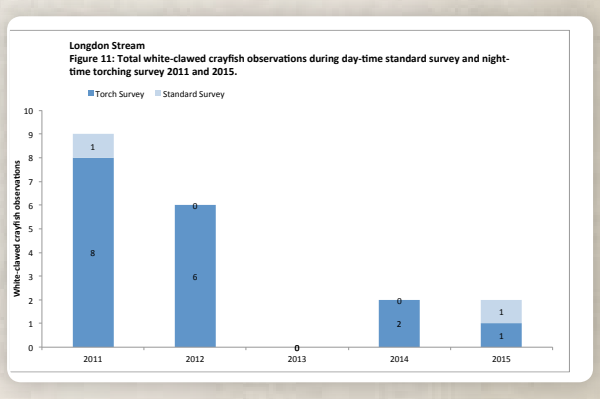
Overall, there was not much change in habitat suitability and crayfish populations. The 2015 results across all watercourses were positive with an increase in White-clawed Crayfish observations on previous years. It was encouraging that White-clawed Crayfish were recorded in all four streams and that no evidence of non-native crayfish was found in the same streams.

The highest density of White-clawed Crayfish remains that found in Bell Brook with the highest population of White-clawed Crayfish recorded during the monitoring

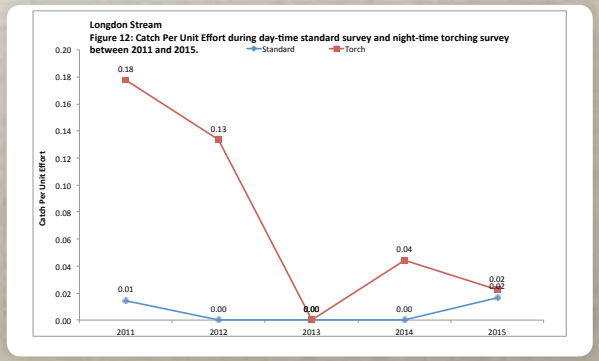




study to date. The population is healthy and stable with both male and female individuals of a range of sizes from juvenile to adult although the individuals that were caught and measured were smaller than in previous years. Statistically significant differences were found in CPUE (abundance), size and sex of all recorded White-clawed Crayfish in Bell Brook across all six years. White-clawed Crayfish were present in Forest Lodge Stream. Forest Lodge Stream supports a healthy White-clawed Crayfish population with the best CPUE of monitoring to date. The population appears to be increasing with both male and female White-clawed Crayfish present as both adult and



juveniles. Forest Lodge Stream has a narrower and deeper water channel than Bell Brook making survey work more problematic with different survey challenges. Significant differences in observations and carapace size across the years in Bell Brook and Forest Lodge Stream may be due to observer differences



(especially observer eyesight and agility) although this has not been tested!!

The very small White-clawed Crayfish population in Kingswood Stream and Longdon Stream continues to give cause for concern. Positive evidence of a White-clawed Crayfish population was found in Kingswood Stream and the presence of a juvenile suggests that at least one breeding male adult and one female adult should be present in the watercourse: a very low and struggling population. There was suitable habitat and evidence of White-clawed Crayfish was found in Longdon Stream although the population size remains very low. The monitoring study has still not found the reason for the low numbers of White-clawed Crayfish in Kingswood and Longdon Streams.

The variability between the standard and torching survey results demonstrates how hard it is to find crayfish (which is a nocturnal animal) using the standard daytime hand search method when the bankside habitat in the four watercourses i.e. tree roots and overhangs, provides such excellent daytime refugia. It is only when the crayfish leave the refugia at night-time to search for food that a more accurate indication of population abundance is realised.

The results clearly demonstrate that the White-clawed Crayfish population in the Wyre Forest fluctuates between the watercourses and across the years. It is very important to note that all the White-clawed Crayfish populations remain vulnerable to extinction. It is hoped that with the implementation and adoption of the Wyre Forest Management Plan that White-clawed Crayfish will be considered along with all the other management issues for the forest as a whole.

Water quality issues may be cause of the small White-clawed Crayfish population in Kingswood Stream and Longdon Stream: see Water Quality Of Four Wyre Forest Streams Containing White-clawed Crayfish Article in this publication. In addition, see Detecting The Presence Of White-clawed Crayfish And Signal Crayfish Using Non-Invasive Environmental DNA Within The Tributaries Of Dowles Brook In The Wyre Forest in this publication.

The programme of annual monitoring is planned to continue and it is envisaged that additional data collected in future years will more accurately reflect the population and strengthen and increase the robustness of the analyses.

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Signal Crayfish, Bell Coppice Roger Plant