Appendix 12-H Fish and Crayfish

12-H.1 Fish

Summary

- A general fish survey was undertaken in May 2006 by Pisces Conservation Ltd on four small streams that would be crossed by the Scheme.

- A total of 10 fish species were found, indicating high species richness for a geographically close set of small stream habitats.

- Two of the streams, Powdermill and Decoy Pond, were trout nursery waters with good densities of trout smolt.

- Watermill Stream was a typical cyprinid/eel/perch water with a rich fish fauna notably different from that of Powdermill.

- Powdermill held abundant lamprey ammocoetes. These specimens could be either brook or river lamprey or a mixture of the two. Because of declines in the abundance and distribution of both the river and brook lamprey these species have been given some legal protection. They are listed in annexes IIa and Va of the Habitats Directive, Appendix III of the Bern Convention and as a Long List species in the UK Biodiversity Action Plan.

- General advice on methods of working and operation to avoid or minimise impacts on fish are presented.

Introduction

8A.1.1 This report gives data on the fish species and their densities in the streams and ditches in the path of the Scheme. The sampling work was undertaken by Pisces Conservation Ltd over a 2 day period in late May 2006, during a notably wet period when the streams and ditches were well filled with water.

Methods

8A.1.2 Quantitative electric fishing was undertaken at four sites at Combe Haven, Watermill, Powdermill and Decoy Pond streams on the 24th and 25th of May 2006. At each site a 25m reach was isolated by stop nets (where required) and electric fished in an upstream direction. All of the fish captured were identified to species, and standard lengths were measured to the nearest millimetre. Systematic fishing of the sites was repeated 3 times as the number of fish captured for all the abundant larger species declined with each successive pass along the chosen stretch. Repeated sampling allowed removal trapping methods to be used to estimate population density. The captured fish were subsequently released alive. Populations were estimated using the commercial software package *Removal Sampling (Pisces Conservation Ltd.)* to calculate population size using Zippin's method. This method assumes a constant probability of capture.

8A.1.3 The positions of the sites are shown in Figure 12-H.1.

8A.1.4 Site 1 (Figure 12-H.1 & Figure 12-H.2) was situated on the Combe Haven, a small, flowing, ditch about 1 m in width, which was heavily overgrown with herbaceous plants. The streambed was muddy and water depth rarely exceeded 30cm, with the exception of deeper pools immediately above and below the footbridge.

8A.1.5 Site 2 (Figure 12-H.1) was situated on the Watermill Stream close to the point where the stream was crossed by a footbridge. This stream was a man-made drainage ditch with steep parallel banks about 4m wide with a soft mud substrate. Water depth exceeded 1m in places, and flow was barely detectable. Because of the width and depth of this stream, each bank was individually fished, giving a total of 6 passes along a 25m section.

8A.1.6 Site 3 (Figure 12-H.1 & Figure 12-H.3) was situated on Powdermill Stream, a small flowing stream between 1 and 2m in width which was heavily overgrown with herbaceous plants and some trees. The channel was deeply cut, with a bank height of up to 2m. The substrate was predominately gravel, with occasional muddy sections.

8A.1.7 Site 4 (Figure 12-H.1 & Figure 12-H.4) was situated on Decoy Pond Stream a small flowing stream between 0.5 and 1 m in width. This stream had cut a channel more than 2m deep, and in places there were small waterfalls with deeper pools more than 75cm deep. The normal depth was less than 30cm. The stream was bordered with herbaceous plants and trees on one side, and a field of barley on the other.

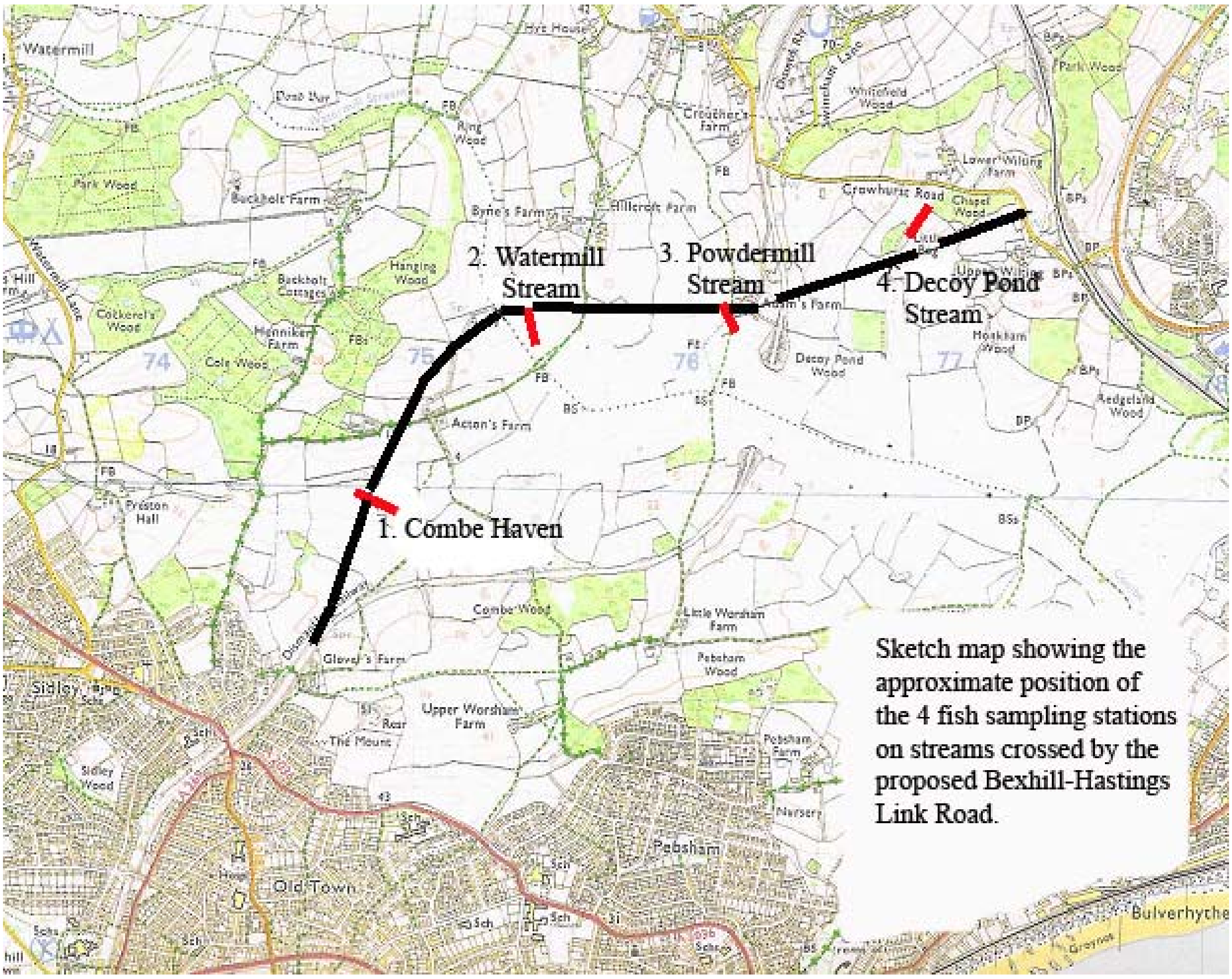

Figure 12-H.1 Sketch map showing the approximate position of the 4 sites that were electric fished in May 2006. The approximate line of the Scheme is shown in black.

Figure 12-H.2: Combe Haven Stream during electric fishing.

Figure 12-H.3: Powdermill Stream during electric fishing. The fisherman is just starting an upstream sweep and is standing directly in front of the stop net.

Figure 12-H.4: A close-up photograph of the Decoy Pond Stream. This picture does not show the height of the banks.

Results

8A.1.8 The results for each stream are presented in turn.

Combe Haven Stream

8A.1.9 The only fish species caught at this site was the 3-spined stickleback, *Gasterosteus aculeatus* (Table 12-H.1). Sticklebacks are too small for electric fishing to offer a high efficiency of capture and it was therefore impossible to reliably estimate population density. The calculated density was about 0.5 individuals per square metre, but it is likely that the true value is 1 or more individuals per square metre of water surface. Some of the stickleback caught were mature and in breeding condition.

Table 12-H.1: Fish species statistics for Combe Haven Stream. The first number in each column is the total number recorded on each sweep of a 25 m section. The second number in bold is the average standard length in mm.

Species Name	Scientific name	Sweep 1	Sweep 2	Sweep 3
Stickleback	*Gasterosteus aculeatus*	4, **33.75**	5, **39.2**	4, **38.25**

Watermill Stream

8A.1.10 The six species of fish recorded during the survey are listed in Table 12-H.2. This stream can be characterised as a typical lowland cyprinid water. The silver eel, *A. anguilla*, had the highest recorded biomass for any fish at this site. Numbers for all species were too low to allow accurate estimates of fish density.

Table 12-H.2: Fish species statistics for Watermill Stream. The first number in each column is the total number recorded on each sweep of a 25 m section. The second number in bold is the average standard length in mm.

Species Name	Scientific name	Sweep 1	Sweep 2	Sweep 3
Pike	*Esox lucius*	1,**26**	0, **0**	0, **0**
Perch	*Perca flavescens*	0, **0**	1, **71**	0, **0**
Stone loach	*Noemacheilus barbatulus*	0, **0**	1, **45**	0, **0**
Roach	*Rutilus rutilus*	1, **109**	1, **70**	1, **86**
Chub	*Leuciscus cephalus*	4, **38**	0, **0**	1, **35**
Eel	*Anguilla anguilla*	4, **375**	0, **0**	0, **0**

Powdermill Stream

8A.1.11 The six species of fish recorded during the survey are listed in Table 12-H.3. This stream can be characterised as a lowland trout-lamprey nursery (see Figure 12-H.5). Brown trout, *Salmo trutta*, smolt density was approximately 0.2 individuals per square metre of water surface. The most abundant fish in this section were lamprey. It is difficult to distinguish between river, *Lampetra fluviatilis*, and brook lamprey, *Lampetra planeri*, ammocoetes in the field, so possibly one or both of these lamprey species was present. Lamprey are difficult to sample quantitatively, and it is notable that the number caught did not decline between sweeps. Further, at the end of the third sweep 10 lampreys were found retained in the lower stop net. The minimum lamprey density for this stretch was 0.88 lamprey late ammocoetes per square metre water surface. It is likely that the true density would have been above 1 individual per square metre of water surface.

Table 12-H.3 Fish species statistics for Powdermill Stream. The first number in each column is the total number recorded on each sweep of a 25 m section. The second number in bold is the average standard length in mm.

Species Name	Scientific name	Sweep 1	Sweep 2	Sweep 3	In Stop net
Gudgeon	*Gobio gobio*	4,**90.5**	4, **87**	2, **87**	
Lamprey	*Juveniles indet.*	3, **113**	4, **115**	5, **122**	10
Stone loach	*Noemacheilus barbatulus*	1, **77**	1, **45**	0, **0**	
Roach	*Rutilus rutilus*	0, **0**	1, **128**	0, **0**	
Brown trout	*Salmo trutta*	5, **133**	0, **0**	0, **0**	
Eel	*Anguilla anguilla*	3, **212**	0, **0**	0, **0**	3

Decoy Pond Stream

8A.1.12 The two species of fish recorded during the survey are listed in Table 12-H.4. This stream is a trout nursery. Brown trout, *Salmo trutta*, smolt density for individuals > 50 mm SL was approximately 0.4 individuals per square metre of water surface. Trout smolt belonging to a number of year classes were observed ranging in size from 21 to 124 mm SL.

Table 12-H.4 Fish species statistics for Decoy Pond Stream. The first number in each column is the total number recorded on each sweep of a 25 m section. The second number in bold is the average standard length in mm.

Species Name	Scientific name	Sweep 1	Sweep 2	Sweep 3	In Stop net
Stone loach	*Noemacheilus barbatulus*	1, **77**	1, **45**	0, **0**	
Brown trout	*Salmo trutta*	8, **106**	1, **22**	1, **21**	3

8A.2 Discussion

8A.2.1 Ten fish species were recorded, which was an unexpectedly high species richness given the small size of the water bodies sampled, and the relatively restricted nature of the habitats on offer. Powdermill and Decoy Pond streams were brown trout nursery waters with populations of trout smolt appearing in good condition. It was also notable that Powdermill Stream, which was the only stream to offer substantial areas of gravel substrate, also held a large lamprey ammocoete population. In contrast to these two habitats, Watermill Stream was a slow flowing deeper water with a lowland cyprinid/eel/perch community. It is because the study area offers waters holding both salmonid/lamprey and cyprinid/eel/perch communities that total fish species richness was high. The only one of the sampled habitats holding few fish species, Combe Haven Stream, was a ditch, which offered high quality habitat for sticklebacks.

8A.2.2 The study sites held typical fish faunas for southern English streams and all of the species caught have been previously recorded from waters in this part of England.

8A.2.3 From the conservation viewpoint the species found in this survey that require the greatest consideration are the lampreys. Because of widespread declines in the abundance and distribution of both the river and brook lamprey these species have been given some legal protection. They are listed in annexes IIa and Va of the Habitats Directive, Appendix III of the Bern Convention and as a Long List species in the UK Biodiversity Action Plan. In addition, the continued health of the trout population will also be of importance to anglers. Also of conservation interest was the observation during electric fishing of a crayfish, which was probably the native white-clawed crayfish, *Austropotamobius pallipes* in the Powdermill Stream.

Minimising and mitigating impacts of road construction and operation on fish

Fish clearance and relocation

8A.2.4 When bridging streams there is often a requirement to divert short sections of streams resulting in the need to relocate the fish. As many as possible of the fish living within the section should be removed alive and placed in another section of river. Care must be taken to ensure that the displaced fish survive capture and transportation and are subsequently able to survive in their new location.

8A.2.5 Electric fishing should be used to clear the area of fish. This must be undertaken following the Environment Agency code of practice for safety in electric fishing operations. This requires the use of approved electric fishing equipment with a current test certificate and staff that have undertaken training and been certified competent. The clearance team should consist of at least four people, two electric fishers and two workers to care for the captured fish and transport them to the new site. The stretch of river to be cleared should be divided into sections by stop nets and each section cleared systematically. A removal sampling approach should be taken, with the number and species of fish caught on each sweep recorded. Each section must be electric fished several times until a sweep occurs in which no fish larger than 10cm is caught. Electric fishing is inefficient for small species such as minnows, lamprey ammocoetes and sticklebacks so it is inappropriate to specify that sweeps should be undertaken until no further fish are caught. Only two members of the team may be in the water at any one time and a third member of the team must be by the control box on the bank to activate the emergency stop button. The work area must be checked to ensure that non-involved people are kept clear. Fishing must stop immediately if any animals or unauthorised people come within 5 m of the electrodes.

8A.2.6 Ideally, an in-stream holding facility should be used, in an area where the captured fish will not be affected by the electric fishing. Aeration should be provided if the fish are to be stored out of the stream for more than 10 minutes. Fish removed from the stream must be reintroduced downstream as soon as possible. They should be released as carefully as possible to reduce damage and care should be taken to choose a spot where they can be released without suffering high predation losses while recovering. If the channel can be drained this should be done gradually by closing off the upstream end of the section. The pools left should be checked for fish, which, if found, should be removed using the methods outlined above. If the pools are small a simple netting and removal will probably suffice.

Control of on-site pollution to protect fish

8A.2.7 There are many activities during construction that can potentially impact surface and ground waters on the site. Bulleted below are those activities most likely to impact the aquatic environment.

- fuelling, delivery and storage
- surface drainage from site
- on-site facilities (sanitary/welfare)
- on-site storage of chemicals
- culvert and pipe construction
- work on river bank and in the watercourse
- wheel washing
- dewatering
- pumping
- concrete truck washout
- concrete plant

8A.2.8 As little 'grey' drainage water as feasible should be released from the site. The practice must fully comply with BS6031 (Code of Practice for Earthworks - concerning the general control of site drainage).

8A.2.9 Where public sewer systems are available and an arrangement has been made with the local water company, drainage water should be discharged to the sewer system.

8A.2.10 Hardstanding areas should be used for all plant maintenance and washing off. Wastewater from these areas should pass through an oil interceptor and settling tank system. These hardstanding areas should be remote from any drain or watercourse. Disposal of effluent from vehicle washing containing detergent should be via a foul sewer or sealed tank. Water released from this area should be of sufficient quality to meet any of the relevant Discharge Consents.

8A.2.11 The layout of the site and facilities should be designed to minimise the risk of pollution reaching the groundwater or watercourses. Any potentially polluting activities should be at least 10 metres from any watercourse. Potentially polluting substances, where stored on site, must be kept to the minimum level required to complete the work in progress. On-site storage of chemicals, fuels, etc. should be checked regularly and any container found to be leaking removed to a suitable handling facility. Bunding capable of containing 110% of the maximum volume of stored liquid should be constructed around storage areas wherever possible.

8A.2.12 Run-off from sites should, where appropriate, pass through settlement tanks or pools before discharge. Sampling to ensure water quality prior to discharge should be carried out when appropriate.

8A.2.13 Particular attention should be paid to any on-site concrete batching plants to ensure that no cementitious materials enter the drainage system.

8A.2.14 The site should be kept clean and tidy. There should be as little broken ground left exposed to the elements as possible. If areas are to be left open for long periods of time, erosion control methods such as geotextiles, cover crops or contour drainage should be implemented.

8A.2.15 Effluent water from concrete batching plants, bentonite plants, grout mixing plants and concrete washing should be recycled within the process or passed via a settlement tank to a foul sewer, soak-away or sealed tank.

8A.2.16 Refuelling is a potentially polluting activity. It must be carried out as far away as feasible from any watercourse or drain. Best Practice Means, for both fixed pump sites and mobile refuelling, should be adopted. These include:

- The positioning of sites for refuelling away from sensitive receptors and areas,
- The construction of containment and bunding (capable of containing 110% of maximum volume of stored liquid),
- A regular inspection routine, with maintenance and repair as appropriate,
- Dispensing nozzles with automatic shut-off and lockable flow controls which lock when not in use
- Provision of spillage kits, locks and other suitable security devices,
- Refuelling area should be paved with an impervious surface and drained. Drainage from the area should pass through an oil interceptor and settling tank system prior to discharge,

- Fuel bowsers and stores should be as far as possible vandal-proof.

Operations on or near rivers

8A.2.17 Fording or work in rivers by vehicles should not be allowed without the prior agreement of the Project Manager and the Environment Agency. Only essential activities should be carried out in relation to the construction of culverts, bridges and associated works. Any work in or around watercourses should be carried out in a manner that reduces the impact of the work on the watercourse. Special attention should be paid to the environments that depend on water to survive, including marshes, ditches, streams and fisheries.

8A.2.18 Culverts should be constructed without water flowing though them. They should then be brought into use before the closure of the existing culvert. Submersible electric pumps should be used for moving water where appropriate.

8A.2.19 Operations should take place so that they do not limit, reduce or restrict flow at the highest flow periods (September to March). Care should be taken to reduce (1) the erosion of the channels, their banks or margins and (2) changes in sedimentation levels.

Flood defence

8A.2.20 The work on site should be performed in such a way as to minimise the effect on the flow of the watercourse at high flows. Care should be taken when working in areas close to the floodplain, watercourse or river to ensure that the flow of floodwater is not impeded. The operation of field and land drains should not be impeded. Where flood defences have to be altered or have been damaged, they should be made good as soon as it is feasible. Any rubbish or materials that are likely to float should be stored in areas that are unlikely to flood.

Timing of the work

8A.2.21 To avoid impact on the fish in the river, work must be carried out when the fish are least sensitive to silt and disturbance. There are likely two discrete breeding seasons for the various fish species found in these small streams. Trout will breed in November or December, depending on the local stock of fish. The presence of small 20-25 mm SL O-group fish in May suggests that these trout do breed in late autumn. The coarse fish will breed mainly between February and June. Most coarse fish have sticky eggs that they attach to the surface of stones or weed. At this stage of their life cycle these fish are very vulnerable to blanketing by silt. Within a few weeks of hatching the fish are more able to cope with moderate silt levels. Spawning of lampreys occurs when water temperature reach 10 to 11 C which is often in March to April.

8A.2.22 To minimise the effect of the construction on fish, their breeding seasons would therefore suggest that in-river and bank-side work should be performed between July and September.

Restructuring of the channels

8A.2.23 Should restructuring of channels be required the following points should considered.

Creating a salmonid habitat

8A.2.24 To make a stream suitable for trout the following are desirable:

- A steady constant flow of cool low-sediment water must be maintained throughout as much of the year as possible.
- Pool and riffle sequences. The variation in depth is important as it allows the trout to use the clean gravels in the riffles for breeding and feeding and the deeper water for resting.
- Bank-side and marginal vegetation. The cover provided by vegetation is important to allow trout to rest in safety.
- Bends in the river. The bends create differential water currents, leading to deep undercut banks on the outside of the bend and shallow gravel banks on the inside. Undercut banks give protection for the fish, niches for older solitary fish, and add heterogeneity to the environment; shallow areas provide shelter from predation for smaller and juvenile fish.
- Clean gravel with little silt is essential for the breeding of trout. The clean gravel also provides good feeding grounds for the trout.
- In-stream macrophyte growth (for instance water-crowfoot, *Ranunculus* sp., and water-starwort, *Callitriche* sp.) provides both food and protection in the river. Healthy development of these species requires that the river is not heavily shaded by overhanging trees.

Creating a habitat for coarse fish

8A.2.25 To make a stream suitable for coarse fish requires fewer, and easier to create, features than a trout stream.

- Deeper and slower-flowing than the salmonid stream.
- Bank-side and marginal vegetation. Plenty of reedbeds and trees, allowing fish shelter in the stream margins.
- Bends in the river. The bends create differential water currents, leading to deep undercut banks on the outside of the bend and shallow gravel banks on the inside. Undercut banks give protection for the fish, niches for older solitary fish, and add heterogeneity to the environment; shallow areas provide shelter from predation for smaller and juvenile fish.
- The riverbed is usually consolidated gravel and/or silt; due to the lower current velocities, it will tend to have a considerably greater accumulation of silt than the stream suitable for salmonid fish.

Impacts following the opening of a road

8A.2.26 It is inevitable that a busy road crossing small streams will damage the flora and fauna of the streams. However, good management can minimise this impact. Three areas are of greatest concern, (1) the use of salt in winter, (2) the flow of pollutants from the road surface into the streams and (3) the dumping of rubbish, garden waste etc.

Figure 12-H.5: Lamprey and brown trout smolt caught in the Powdermill Stream, May 2006.

12-H.2 Crayfish

Summary

- Crayfish surveys were undertaken in June and July 2006 on two small streams that would be crossed by the proposed Bexhill-Hastings link road. This work was undertaken because a small Crayfish which had some features of the White-clawed Native Crayfish, *Austropotamobius pallipes*, was inadvertently caught while electric fishing in May 2006.

- A total of 7 Crayfish with a wide size (age) range were found in the Powdermill Stream under stones. No Crayfish were caught in the Watermill Stream.

- The 3 mature individuals that could be reliably identified were all Signal Crayfish, *Pacifastacus leniusculus*.

- While the native White-clawed Crayfish, *Austropotamobius pallipes*, may be present in the Powdermill Stream, it is clear that this water holds a population of the invasive alien Signal Crayfish, *P. leniusculus*. The White-clawed Crayfish is declining throughout southern England and this decline is attributed to the introduced Signal Crayfish, which is a competitor and carries a fungal disease to which the White-clawed Crayfish has little resistance. The hope had been expressed that this stream held an isolated population of White-clawed Crayfish safe from disease and competition. This is not the case. The presence of the Signal Crayfish in Powdermill Stream makes it unlikely that a strong population of White-clawed Crayfish is present. We can therefore conclude that Powdermill Stream is unlikely to be an important habitat for the White-clawed Crayfish. A general fish survey was undertaken in May 2006 by Pisces Conservation Ltd on four small streams that would be crossed by the Scheme.

Introduction

12-H.2.1 This report presents the findings from a Crayfish survey undertaken in June and July 2006 in the Powdermill and Watermill streams which are in the path of the proposed Scheme. The work was undertaken after the accidental capture of a Crayfish in the Powdermill Stream in May 2006 while electric fishing. This Crayfish (shown in Plate 1A) had characteristics similar to those of the protected native White-clawed Crayfish, *Austropotamobius pallipes*. However, it was a small specimen with missing claws and, as species identification was difficult, the images of this specimen were sent to two Crayfish experts for their opinion. Both thought it was possible that this specimen was a White-clawed Crayfish (see attached correspondence in Annex 12-H.1).

12-H.2.2 It was therefore decided to undertake a survey to ascertain if Powdermill and Watermill streams held populations of the native White-clawed Crayfish and secondly, discover if the invasive North American Signal Crayfish was present. Because of the isolation of the catchments of these streams from other water bodies, there was the possibility that an isolated White-clawed Crayfish population had survived in these streams.

Methods

12-H.2.3 Sampling for Crayfish was undertaken on Watermill and Powdermill Streams on 29th and 30th June and 20th July 2006. The positions of the sampling sites are shown in Figure 12-H.6, and pictures of the Streams in Plate 2. Site 1 (Plate 2A) was situated on the Watermill Stream close to the point where the stream was crossed by a footbridge. This stream was a man-made drainage ditch with steep parallel banks about 4m wide with a soft mud substrate. Water depth exceeded 1m in places and flow was barely detectable. Because of the width and depth of this stream it was only possible to use trapping methods. Site 2 (Plate 2B, C) was situated on Powdermill Stream, a small flowing stream between 1 and 2m in width which was heavily overgrown with herbaceous plants and some trees. The banks were deeply cut, with a bank height of up to 2m. The substrate was predominantly gravel, with occasional rocky and muddy sections. The depth and flow in this stream allowed hand searching to be undertaken.

12-H.2.4 In June, baited traps (Figure 12-H.7) and manual survey methods were used, while in July only a manual survey was undertaken. The sampling protocol followed the methods of Peay (2003). In June, 8 baited traps were placed overnight at about 10m intervals in the Watermill Stream (Plate 2A). In the Powdermill Stream, 4 baited traps were placed overnight in areas of deeper water more than about 20cm deep. Manual searching of the Powdermill Stream was carried out in June and July. In June a length of stream of about 150m was searched; in July this was extended to about 300m. It was not possible to manually search the Watermill Stream because of the depth of the water and the muddy substrate.

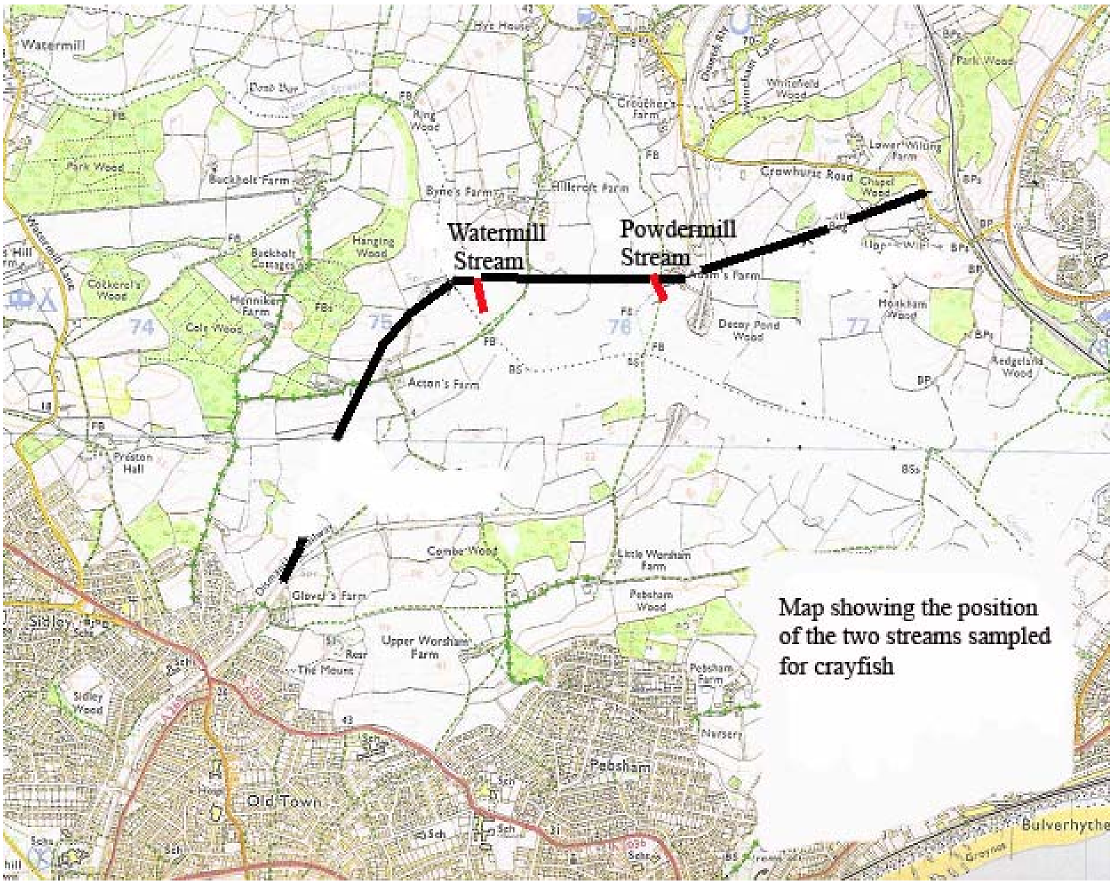

Figure 12-H.6: Map showing the approximate position of the sites that were electric fished in May 2006. The approximate line of the Scheme is shown in black.

Figure 12-H.7: Photograph of a baited and tagged Crayfish trap.

8B.3 Results and Discussion

Watermill Stream

12-H.3.1 No Crayfish were captured in the Watermill Stream.

Powdermill Stream

12-H.3.2 No Crayfish were captured in the Powdermill Stream in June. However, the trapping effort was insufficient as two of the traps were removed from the water during the night.

12-H.3.3 During manual searching in July, 7 Crayfish were captured; a further two large individuals were seen, but evaded capture. All the captures and observations were made in a 50m stretch of the stream close to Adam's Farm, and shown in Plate 2B. This reach of the stream was generally shallow, flowed steadily and offered many rocks and objects for Crayfish to hide under. Further, it was not overgrown with vegetation like many reaches of this stream (see Plate 2C) offering ideal conditions for manual searching. Two large and one small adult (Plates 3 and 4) Signal Crayfish, *Pacifastacus leniusculus*, were caught. Their identification was confirmed by Dr Stephanie Peay, a Crayfish specialist. The wide size range of the capture from large adults to recently born young (Plate 4) indicated that the stream held a healthy population. The small number of individuals captured probably reflects the difficulty of searching much of the stream.

12-H.3.4 While it is not possible to state that the native White-clawed Crayfish, *Austropotamobius pallipes*, is not present in the Powdermill Stream, it is clear that this water holds a population of the invasive alien Signal Crayfish, *P. leniusculus*. The White-clawed Crayfish is declining throughout southern England and this decline is attributed to the introduced Signal Crayfish, which is an effective competitor and carries a fungal disease to which the White-clawed Crayfish has little resistance. The hope had been expressed that this stream held an isolated population of White-clawed Crayfish safe from disease and competition. We now know this is not the case. The presence of the Signal Crayfish in Powdermill Stream makes it unlikely that a strong population of White-clawed Crayfish is present. We can therefore conclude that Powdermill Stream is unlikely to be an important habitat for the White-clawed Crayfish.

8B.4 References

Peay S (2003). Monitoring the White-clawed Crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Plates

Plate 1 Small crayfish captured from the Powdermill stream. A. The original specimen caught while electric fishing and thought possibly to be a white-clawed crayfish. B. Dorsal of a small signal crayfish. C. Ventral of signal crayfish

Plate 2 Habitats in the Powdermill and Watermill streams surveyed for crayfish. A, the reach of the Watermill stream that was sampled by trapping. B, the reach of the Powdermill stream holding crayfish. C, sampling in a section of the Powdermill Stream with high vegetation cover which was difficult to search effectively.

Chelae smooth with a bright red ventral surface.

No spines on shoulders of carapace

Characteristic white patch on dorsal surface of chelae.

Rostrum with smooth parallel borders

Bluish-brown to reddish-brown in colour

Plate 3 Adult Signal Crayfish, *Pacifastacus leniusculus* (Dana) caught in the Powdermill Stream, near Hastings, Kent, showing diagnostic features.

Plate 4 Images of crayfish caught in the Powdermill stream showing the wide size (age) range present.

Annex 12-H.1

Letter from Stephanie Peay

Dear Robin

This is very exciting indeed. I can't remember the rivers in that area in any detail - it's a long time since I lived in Brighton, though I did work across the border in the Kent Rother catchment a year or two ago.

It looks as though it's a stream with a relatively small catchment and of course calcareous in that area. This means there is a possibility that there aren't any Signal Crayfish present. If that's so, you have found a potential "Ark" catchment. There is one in Kent at the moment, the Seabrook Stream, and this might be similar. This does not rule out the road, but it certainly makes the stream potentially important for conservation at more than county level, I would say it is definitely regionally important - IF it's free from Signal Crayfish.

So I think HA should get a thorough survey done, though you may need help from EA fisheries people - does anyone have ponds or fish farms in the area that could potentially have been stocked with Signals? Note that these Wealden streams are difficult to survey for Crayfish. You will have to concentrate on vigorous poke-and-net in submerged swags of tree roots and in leaf litter and small woody debris, plus intensive trapping with fine-mesh traps (minimum 10 traps per site). If it's clear enough water and access is OK, night-viewing may be more effective than trapping, especially if done in late August. Note that in this case, the aim is primarily to (briefly) reconfirm presence of White-claws, but equally importantly, to give some confidence that there aren't Signal Crayfish present.

Note that with road schemes in that area cuttings may have a significant impact, or embankments over dry coombes, through interception of groundwater, which can affect baseflow further down gradient, so please make sure the ecology and water teams are covering this issue thoroughly (groundwater is a topic that is sometimes not well covered on road schemes, alas).

Make sure if the scheme does have any effect on flow in individual streams (e.g. by diverting intercepted flow from one sub catchment to another) that someone does depth discharge calculations. The Crayfish will almost all be using the banks in those streams. So if you have a steep-sided, U-shaped channel, if the water level falls below the "upright" part of the U, the wetted width suddenly reduces and leaves Crayfish having to crawl out into refuge-less mid channel, where they are vulnerable to predation. This has been a big issue in recent years in Kent and Sussex Weald, due to over abstraction of groundwater, combined with natural droughts and movement downstream of the perennial head of Wealden streams.

Anyway, I'll leave you to it - hope it goes well. Do let me know how you get on as I am very hopeful that this might be a suitably isolated population.

Best regards

Stephanie

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Letter from David Holdich

Subject: Crayfish id.

To: Richard Seaby <richard@irchouse.demon.co.uk>

From: david.holdich <david.holdich@ntlworld.com>

Reply-To: david.holdich <david.holdich@ntlworld.com>

Date: Wed, 12 Jul 2006 10:09:45 +0100

Richard

It is difficult to be 100% certain as the photos don't really show any of the key features! However, I am pretty sure that they are natives. You should be able to tell from the id. booklet I sent you.

Check the shape of the rostrum and run your finger down the side of the carapace where the first junction is. There should be a really sharp spine there. If in I doubt you will have to send me a specimen.

Best wishes

David