

# **IMPACT OF CRAYFISHERY ON THE RIVER THAME**

**R&D Progress Report for the period  
1st July - 30th September 1996**

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Report date : September 1996  
Report to : Environment Agency, Thames Region  
IFE report reference no. : T04073N7/5

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# 1 TECHNICAL PROGRESS

## 1.1 Objectives

This progress report covers the third quarter of the main study into the environmental impacts of signal crayfish. The **overall** and *specific* objectives of this study are as included in the original tender document.

- **to assess the environmental impact of signal crayfish on an area of the River Thames between Cuddesdon Mill and Stadhampton.**
- *to determine the environmental impact of signal crayfish on the flora and fauna of the River Thames.*
- *to establish the likely effects of the fishery on native crayfish populations.*

## 1.2 Methods of approach

The method of approach being adopted for assessing the environmental impacts of signal crayfish in the River Thames includes the following elements:

- to undertake detailed studies of the microhabitats, macrophytes and macro-invertebrates of three separate study reaches of the River Thames: a reach containing the commercial fishery, a reach outside the commercial fishery which supports a population of signal crayfish and a reach which has no crayfish present.
- to conduct a detailed study of crayfish populations, if any, in each of the three study reaches.
- to determine the distribution of crayfish at each site in relation to the distribution of microhabitats.
- to undertake mark-recapture experiments in order to estimate population sizes and growth rates of native and alien species.
- to collate the commercial fishery statistics for the impact reach.
- to report promptly to the Environment Agency on the findings of the study.

### **1.3 Outputs produced.**

No specific outputs were produced during the survey period but the work programmes undertaken during the reporting period are outlined in the following sections

#### **1.3.1 Macro-invertebrate and micro-habitat surveys**

Macro-invertebrate assemblages of the three study reaches were sampled in September.

Single samples were collected from each site in each of the three study reaches. Samples were collected by three minutes active pond-netting in the manner used in the 1995 General Quality Assessment (GQA) of the England and Wales.

#### **1.3.2 Crayfish population studies**

Standard crayfish trapping was undertaken at each site in each month. All specimens were sexed and measured and either tagged or clipped for mark/recapture purposes. Field procedures were as detailed in previous Progress Reports. At each trapping site information was collected on distance from the bank, depth, substratum and amount of macrophyte cover.

Kick sampling for juvenile specimens was also undertaken in the unfished and commercially fished reaches 1 and 2 respectively over the three summer months. This method was introduced in response to the low captures of these animals in traps

In order to obtain better estimates of population size an additional, intensive trapping and marking programme was undertaken in July and September at site 1 of reach 1, the unfished section. More details are given in section 2.2.

By arrangement with the commercial fisherman, and following additional funding from the Environment Agency, monitoring of commercial catches at Shabbington Island (including Reach 2) began in September (see section 2.3).

The additional Agency funding also enabled a second distribution survey to be completed in August. The purpose was to ascertain whether there were native crayfish still present in the Thames catchment. Approximately 60 sites were visited and test trapped but no native crayfish were found at any sites. The results of this survey will be the subject of a separate report to be completed shortly.

#### **1.3.3 Commercial fisheries statistics**

Negotiations have taken place between the IFE and the main commercial fisherman in the area of study and it is expected that the requisite information will be forthcoming (see section 2.3).

## 2 INTERIM RESULTS

### 2.1 Monthly captures

The monthly trapping programme has continued throughout the summer months and as at the end of September a total of 2,062 crayfish have been captured by this method (Table 1). Of these 936 have been given date coded uropodal and pleopodal clips and 925 have been tagged with individually numbered streamer tags (Table 2).

The pattern of more crayfish being captured in the reach outside the commercial fishery than in the reach which is fished continues. However, the numbers captured in each reach have been very variable, with low numbers apparent in both February and May followed by an increase in numbers in all the summer months (Table 1). The higher temperatures from June onwards have contributed to the increased activity and increased captures.

Table 1. Numbers of signal crayfish captured during routine monthly trapping in each month at each of three reaches on the River Thames

Month	Reach outside commercial fishery	Reach of commercial fishery	Reach without signal crayfish
January	251	21	0
February	92	30	0
March	154	13	0
April	166	49	0
May	50	23	0
June	226	109	1
July	204	148	0
Aug	188	103	0
Sept	175	58	1
Total	1506	554	2

Until June no crayfish had been captured in the reach which was selected for having no crayfish. However in June one male crayfish with a carapace length of 63 mm was captured at this site and another capture was made in September (Table 1). Presumably, these crayfish have migrated from the nearest known concentration of animals in Thames approximately 2 km downstream and this site probably represents the upstream boundary of their current distribution. Their presence in such low numbers is not likely to have any impact on the flora and fauna at this site, however monitoring of this site will continue to the end of the project.

Numbers of juveniles captured by hand-netting have not yet been analyzed.



## 2.2 Recapture of marked crayfish

The numbers of tagged and clipped crayfish recaptured, during the monthly trapping, at each site remained low during the reporting period (Table 2). This was despite the high number of tagged and clipped animals present in the population. Therefore in the months of July and September a special effort was made to capture and mark as many specimens as possible on the top site of Reach 1. It is anticipated that this will result in a more accurate estimate of population biomass at this site. A larger number of traps were used and set at high density in this 200m of river. By concentrating on this short section of river it was hoped that a larger proportion of the population could be captured, tagged and recaptured. The increased effort at this site will continue over the closing months of the contract and the results reported in the final report.

Table 2. Cumulative numbers of signal crayfish clipped and tagged in each month, together with numbers of recaptures as at 30 September 1996

Month	Cumulative number of crayfish clipped (C) or tagged (T)				Total number of clipped (C) and tagged (T) crayfish caught each month.			
	Reach outside commercial fishery		Reach of commercial fishery		Reach outside commercial fishery		Reach of commercial fishery	
	C	T	C	T	C	T	C	T
Jan	83	83	20	20	--	--	--	--
Feb	83	158	20	43	0	0	0	0
Mar	142	253	20	56	0	1	0	0
Apr	219	342	48	77	6	3	0	1
May	240	371	61	87	2	1	2	0
June	349	487	116	141	6	6	2	0
July	455	580	167	177	4	5	1	1
Aug	503	686	237	210	3	4	0	0
Sept	669	686	267	239	4	6	1	0

Recapture of tagged fish in the commercially fished reaches has continued at a very low rate over the summer (Table 2). This will have been the result of the high fishing pressure on this site removing the greater proportion of the tagged crayfish. The commercial fisherman has been retaining the tags from any captures he has made and this information is being collected from him.

All previous recaptures of clipped and tagged animals had been male, but over the summer

months several recaptures of both clipped and tagged females were made.

### **2.3 Monitoring of commercial fishery**

The commercial fisherman had been very active over the early summer months at the Shabbington Island site. This had resulted in a dramatic decline in the catches at this site in the later months. In response to this the commercial fisherman reduced the effort put into fishing the site, in turn reducing the opportunity for these catches to be monitored. However, overnight fishing was completed in the presence of an IFE representative on two occasions. This was done in an attempt to collect more detailed information on the recapture of tagged crayfish, population density, growth rate and migration. However, even on these two visits, very few tagged crayfish were recaptured.

Commercial fishing has now ceased. Information is held by the commercial fisherman which details the weight of catch taken from Shabbington Island on each visit. This has been promised to the IFE and should be collected shortly. This data will be appraised as soon as it is received to see if it is possible to estimate the density of crayfish at the Shabbington Island site. However, as crayfish are removed from the site they will migrate into the low density area, from neighbouring high density areas, making interpretation difficult. There is some evidence for this migration from tagged recaptures held by the commercial fisherman. At an early stage of the fishing season up to 35% of the tagged crayfish captured had come from the high density unfished site downstream.

### **2.4 Migration**

Migration of the crayfish seems to be highly variable. Some recaptures have been made more than 6 months after tagging at exactly the same position as they were tagged. As described above, others have been captured in a different reach from the one they were tagged in, demonstrating migration of more than 500m from the site of tagging in a relatively short period of time.

### **2.5 Size and sex ratios**

The mean size of crayfish captured in the reach that is not commercially fished remains higher than in the commercially fished reach (Table 3). This is probably a result of the activities of the commercial fisherman who preferentially removes the larger animals.

The mean sizes presented in Table 3 exclude the juvenile specimens collected by hand netting. These data remain to be analyzed.

In both August and September there was a reversal in the sex ratio of crayfish captures (Table 4). Catches normally dominated by males became dominated by females in these months. Overall the ratio of male to females captures continues to be higher in the reach outside the commercial fishery.

It is expected that catches will decline over the coming months as the females start to carry eggs and the temperatures decline. The first 'berried' female was observed during captures in October.

Table 3. Mean carapace length (cm) (CL)  $\pm$  sd of male and female signal crayfish captured in an unfished reach and a commercially fished reach in each month.

Month	Reach outside commercial fishery			Reach of commercial fishery			All
	Male	Female	All	Male	Female	All	
Jan	5.2 $\pm$ 0.78	4.9 $\pm$ 0.96	5.1 $\pm$ 0.85	4.7 $\pm$ 1.46	4.1 $\pm$ 0.57	4.5 $\pm$ 1.22	5.0 $\pm$ 0.96
Feb	5.4 $\pm$ 0.73	5.3 $\pm$ 0.73	5.4 $\pm$ 0.73	4.9 $\pm$ 0.75	4.7 $\pm$ 0.69	4.8 $\pm$ 0.73	5.2 $\pm$ 0.77
Mar	5.8 $\pm$ 0.68	5.6 $\pm$ 0.80	5.8 $\pm$ 0.69	4.9 $\pm$ 0.92	3.8 $\pm$ 0.29	4.6 $\pm$ 0.93	5.7 $\pm$ 0.78
Apr	6.0 $\pm$ 0.78	5.6 $\pm$ 0.81	5.9 $\pm$ 0.79	5.3 $\pm$ 0.93	4.4 $\pm$ 0.63	5.1 $\pm$ 0.95	5.7 $\pm$ 0.90
May	6.0 $\pm$ 0.76	5.9 $\pm$ 1.27	6.0 $\pm$ 0.97	4.7 $\pm$ 1.18	4.2 $\pm$ 0.70	4.6 $\pm$ 1.11	5.6 $\pm$ 1.20
Jun	6.2 $\pm$ 0.54	5.6 $\pm$ 0.66	6.1 $\pm$ 0.60	5.0 $\pm$ 0.92	4.6 $\pm$ 1.02	4.8 $\pm$ 0.98	5.7 $\pm$ 0.96
July	5.9 $\pm$ 1.02	5.8 $\pm$ 0.73	5.9 $\pm$ 0.92	4.8 $\pm$ 0.89	4.4 $\pm$ 1.00	4.6 $\pm$ 0.95	5.3 $\pm$ 1.11
Aug	5.6 $\pm$ 1.05	5.7 $\pm$ 0.84	5.7 $\pm$ 0.92	4.2 $\pm$ 1.05	4.1 $\pm$ 0.97	4.2 $\pm$ 1.01	5.2 $\pm$ 1.21
Sept	6.3 $\pm$ 0.74	5.8 $\pm$ 0.67	5.9 $\pm$ 0.73	4.8 $\pm$ 1.10	4.2 $\pm$ 1.13	4.6 $\pm$ 1.14	5.6 $\pm$ 1.04

Table 4. Sex ratio (M:F) of signal crayfish captured in an unfished reach and a commercially fished reach of the River Thames in each month.

Month	Reach outside commercial fishery	Reach of commercial fishery	All
January	2.48:1	1.63:1	2.40:1
February	2.83:1	2.00:1	2.58:1
March	6.7:1	2.25:1	5.9:1
April	5.9:1	4.5:1	4.8:1
May	1.63:1	3.6:1	2.04:1
June	4.8:1	1.48:1	3.0:1
July	1.58:1	1.14:1	1.38:1
Aug	0.63:1	1.15:1	0.79:1
Sept	0.58:1	1.32:1	0.71:1
All	2.01:1	1.45:1	1.83:1

## 2.6 Macro-invertebrates

All macro-invertebrate samples are being identified to species. This is a more detailed level of identification than agreed in the contract and the additional costs are being borne by the IFE. This process will be completed in October.

Family level data are already available and confirm the finding of the May survey that the greatest taxon richness occurred in reach 3 (Table 5). This reach was selected as the control section where crayfish appeared to be absent at the beginning of this study. Although signal crayfish have now begun to colonise this reach they are still only present at very low densities.

Table 5 The BMWP index values derived from macro-invertebrate samples collected from each site in each study reach during May and September 1996

INDEX	MONTH	REACH 1 (UNFISHED REACH)			REACH 2 (COMMERCIALY FISHED)			REACH 3 (REACH WITHOUT)		
		SITE 1	SITE 2	SITE 3	SITE 1	SITE 2	SITE 3	SITE 1	SITE 2	SITE 3
No. OF BMWP TAXA	MAY	12	16	14	13	14	13	21	23	25
	SEPT.	12	13	19	13	14	10	23	16	24
BMWP SCORE	MAY	69	97	86	71	86	63	101	119	142
	SEPT.	58	65	106	70	73	44	121	77	125
ASPT	MAY	5.75	6.06	6.14	5.46	6.14	4.85	4.81	5.17	5.68
	SEPT.	4.83	5.00	5.58	5.00	5.21	4.40	5.26	4.81	5.21

Whilst biodiversity is highest in Reach 3, there is no evidence from the Average Scores per Taxon (ASPT) values (Table 5) that this reach has better water quality than the other two reaches with large populations of signal crayfish.

The reasons for the differences in the macro-invertebrate data, including local habitat variation, will be explored in the final project report.

## 2.6 Micro-habitats

No analysis of the micro-habitat data has yet been undertaken.



### **3 PLANS FOR THE NEXT REPORTING PERIOD**

Regular monthly sampling of the crayfish populations of the three study reaches will be completed during the forthcoming quarter.

Additional pond-netting for juvenile crayfish and extra trapping of older specimens at site 1 of Reach 1 will continue in order to try and obtain more reliable population estimates.

Commercial catch statistics for Shabbington Island, during 1996, will be obtained from the principal fisherman.

Full analyses of crayfish catch statistics, growth rates and population estimates will begin

Identification of macro-invertebrate data to species level will be completed.

River Habitat Survey data collected in May will be collated and analyzed.

Production of the draft final report will be started.

A report detailing the findings of the distribution survey conducted in August will be completed.

Discussions will be initiated with the Environment Agency about the future of the research programme.

### **4FACTORS WHICH MAY AFFECT THE ATTAINMENT OF ANY TARGETS OR TIMESCALES.**

The work is currently on schedule and it is expected that targets and timescales will all be met.

### **5 FINANCE**

The work conducted to date has been generally within budget. This budget includes the additional funding of £5,719 provided by the Agency to enable commercial catches to be monitored and a second distribution survey to be completed.

A financial summary for the reporting period and end-of-year out-turn may be obtained from the IFE Finance Office approximately two months after the end of the period/financial year in question.

### **6 REASONS FOR ANY LIKELY UNDER OR OVERSPEND OF BUDGET**

Whilst the work programme remains within the total budget of the project the balance of expenditure on the two additional items is likely to vary from expectation. The timing of the release of extra funding allowed few opportunities to monitor commercial catches before the fisherman stopped for economic reasons. In contrast greater effort has been expended on the distribution survey to greatly increase the number of sites visited in comparison with the November 1995 survey.

## **7 OTHER MATTERS**

A study of the diet of signal crayfish in the Thame is being conducted internally by the Thames Region of the Agency. During the current reporting period, IFE were pleased to undertake additional sampling in order to assist with the provision of specimens for this study.

Following discussions between the Agency Project Leader, Julie Bywater and Dr Anton Ibbotson (IFE), the Institute provided a costing for identification and analysis of the stomach contents in case the Agency wished to use this route to complete the investigation.



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