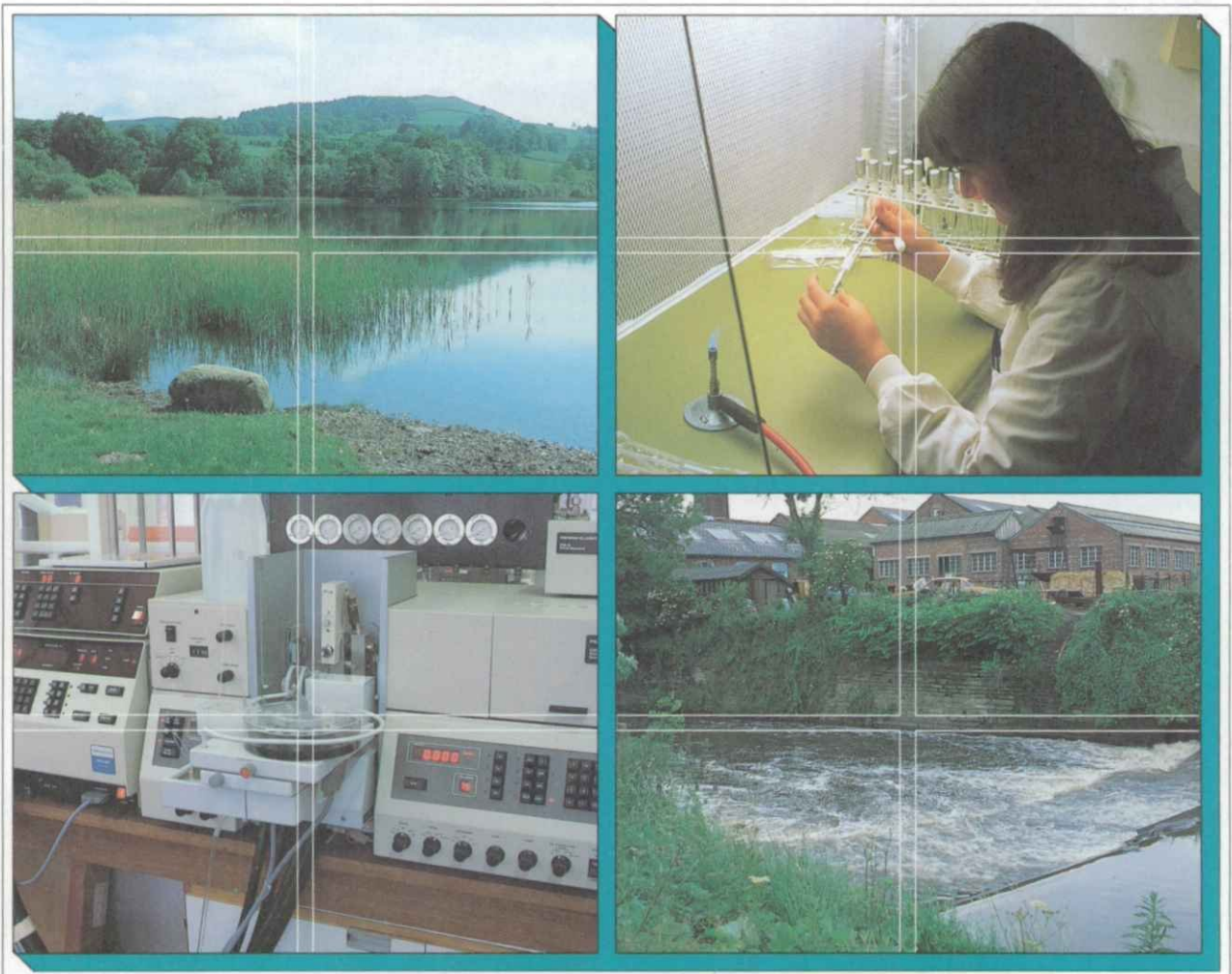


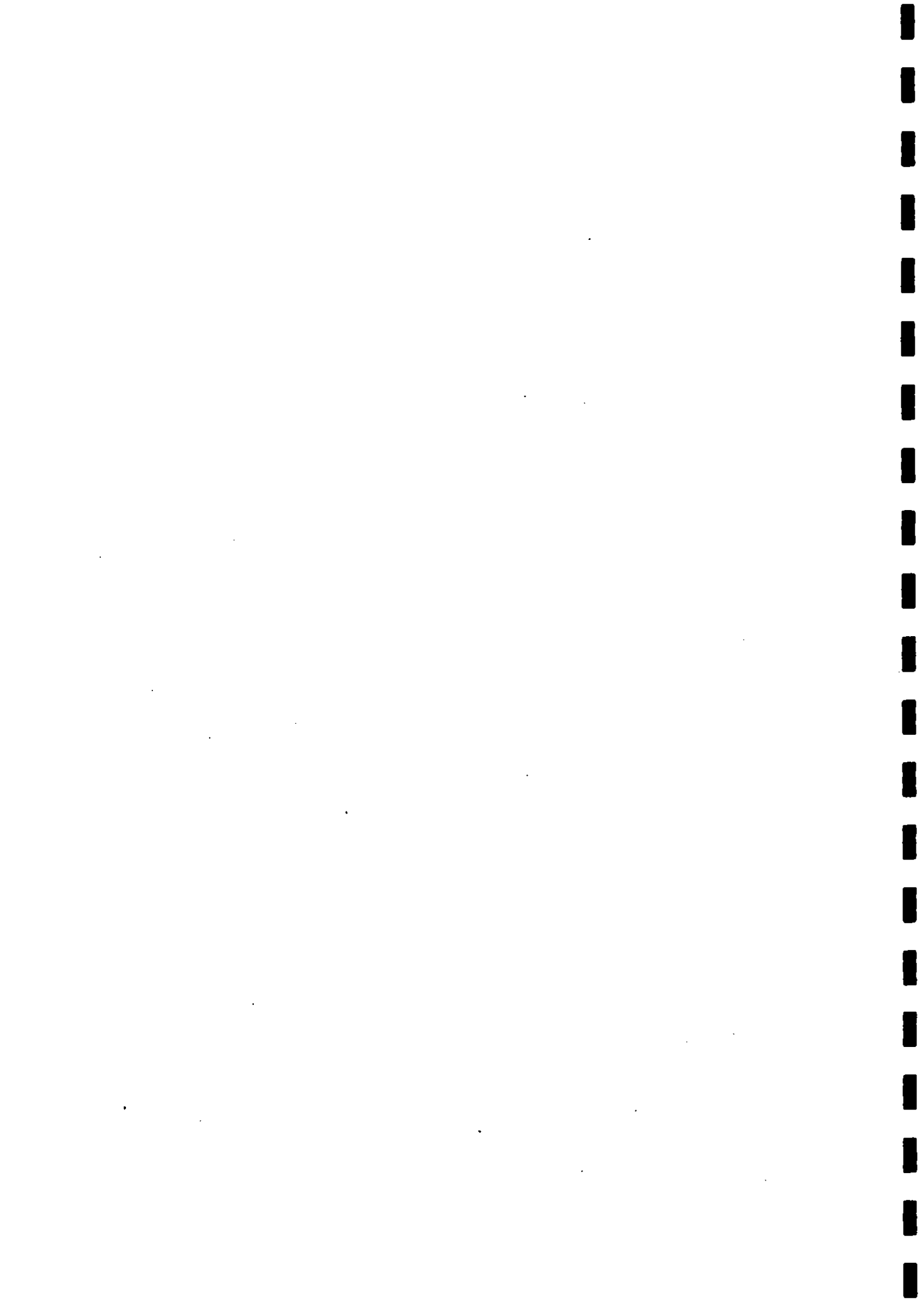
## IMPACT OF CRAYFISHERY ON THE RIVER THAME

Progress report for the period April - June, 1996

M T Furse, BSc  
A T Ibbotson, BSc, PhD, Grad IPM, MIFM  
G Tapia, PhD  
J M Winder, PhD

Report to : Environment Agency, Thames Region  
IFE Report Reference No. : T04073N7/4





# IMPACT OF CRAYFISHERY ON THE RIVER THAME

Progress report for the period April - June, 1996

M T Furse, BSc

A T Ibbotson, BSc, PhD, Grad IPM, MIFM

G Tapia, PhD

J M Winder, PhD

Project leader : M T Furse  
Report date : June 1996  
Report to : Environment Agency, Thames Region  
IFE report reference no. : T04073N/7/34

## INTELLECTUAL PROPERTY RIGHTS

## CONFIDENTIALITY STATEMENT

*"In accordance with our normal practice, this report is for the use only of the party to whom it is addressed, and no responsibility is accepted to any third party for the whole or any part of its contents. Neither the whole nor any part of this report or any reference thereto may be included in any published document, circular or statement, nor published or referred to in any way without our written approval of the form and context in which it may appear"*

Institute of Freshwater Ecology  
River Laboratory  
East Stoke  
WAREHAM  
Dorset BH20 6BB

Tel : 01 929 462314  
Fax : 01 929 462180



# 1 TECHNICAL PROGRESS

## 1.1 Objectives

This progress report covers the second three months of the main study into the environmental impacts of signal crayfish. The **overall** and *specific* objectives together with the methods of approach 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**

Detailed studies of microhabitats, macrophytes and macro-invertebrates of the three study reaches were carried out in May.

Single macro-invertebrate 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.

Micro-habitat surveys were undertaken for every trapping station at every site of each survey reach. Data were collected on standard pro-formas. The variables recorded were selected from those used for GQA and River Habitat Surveys and those shown to be related to the distribution of native crayfish, *Austropotamobius pallipes*, by Smith et al (1996).

#### **1.2.4 Crayfish population studies**

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 the previous Progress Report (Furse and Ibbotson 1996).

At each trapping site information has been collected on distance from the bank, depth, substratum and amount of macrophyte cover.

#### **1.2.5 Commercial fisheries statistics**

No information on commercial catch statistics have yet been provided to the IFE by the Environment Agency.

During June, the study reach selected as representative of a commercially fished section of river was intensively fished by the main commercial fisherman operating in the Thames catchment. Fishing took place at the same time as the experimental trapping being carried out by IFE for the purposes of the current study.

## 2 INTERIM RESULTS

### 2.1 Monthly captures

In each month from January to June a total of 90 traps have been set overnight at 30 trapping stations in each of three reaches on the River Thames. This represents a total of 540 trap nights in each reach. During this sampling programme a total of 1185 crayfish have been captured (Table 1). Of these 465 have been given date coded uropodal clips and 628 have been tagged with individually numbered streamer tags (Table 2).

More crayfish have been captured, in each month, in the reach outside the commercial fishery than in the reach which is commercially fished. 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 June (Table 1). The lower numbers in February are likely to be due to the severe flood conditions experienced that month. May is a time when the majority of crayfish moult and recently moulted crayfish remain inactive to avoid the threat of predation during a vulnerable period. This would explain the low numbers captured that month. Most of the crayfish have completed the moulting process by June and the juvenile crayfish have left the females by this stage. This combined with the increasing temperatures explains the increase in numbers captured in that month.

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 6.3cm was captured at this site (Table 1). Presumably, this crayfish has migrated from the nearest known concentration of animals in Thames approximately 2 km downstream and this may be part of a colonisation process. Its presence is not likely to have any impact on the flora and fauna at this site, however monitoring of this site needs to continue in the following months to see whether the population numbers increase to a level which is likely to lead to an impact.

Table 1. Numbers of signal crayfish captured 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
Total	939	245	1

## 2.2 Recapture of marked crayfish

Even though the proportion of marked crayfish recaptured each month is gradually increasing their numbers continue to be low (Table 2). During July fyke-style traps may be used to try and increase the number of specimens captured from reach 1, the unfished reach with the large population of crayfish. The recent fishing activity of the commercial fisherman at the fished site will have resulted in the removal of many of the tagged and clipped crayfish in this reach. Information on what was removed within the last few weeks is currently being sought from the commercial fisherman but some information will have been lost. This includes movement of the streamer tagged individuals, the numbers of clipped crayfish captured and basic information on population densities, growth rates, sizes and sex ratios.

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

Month	Cumulative number of crayfish clipped (C) or tagged (T)				Total number of clipped (C) and tagged (T) crayfish captured in each month as at 30/06/96			
	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
Jun	349	487	116	141	6	6	2	0

However, the Environment Agency has now agreed to fund closer monitoring of the catch of the commercial fishery and the IFE will contact with the commercial fisherman to try and set up this monitoring. This should ensure that information on commercial catches is not lost for the future.

All recaptures to date have been male crayfish. Now that the juveniles have left the females it is hoped that some female recaptures will be made in the following months.

## 2.3 Migration

Some information on the movement of crayfish is being obtained from the recapture of individually tagged crayfish. Movement has generally been very limited with 75% being recaptured within 20m of the site of original capture. The greatest distance travelled has been 100m in a downstream direction.



## 2.4 Size and sex ratios

Mean sizes of crayfish captured are consistently greater in the reach that is not commercially fished than in the reach that is fished (Table 3). This is probably a result of the activities of the commercial fishery which preferentially removes the larger animals. Disappointingly, the small traps have not taken many of the 1 year old crayfish. In order to follow the growth of the younger age classes experimental kick sampling will be carried out, during July, at selected sites in the two reaches with sizeable crayfish populations.

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	5.0 $\pm$ 0.78	4.7 $\pm$ 0.96	4.9 $\pm$ 0.85	4.5 $\pm$ 1.46	3.9 $\pm$ 0.57	4.3 $\pm$ 1.22	4.8 $\pm$ 0.96
Feb	5.2 $\pm$ 0.73	5.1 $\pm$ 0.73	5.2 $\pm$ 0.73	4.7 $\pm$ 0.75	4.5 $\pm$ 0.69	4.6 $\pm$ 0.73	5.0 $\pm$ 0.77
Mar	5.6 $\pm$ 0.68	5.4 $\pm$ 0.80	5.6 $\pm$ 0.69	4.7 $\pm$ 0.92	3.6 $\pm$ 0.29	4.4 $\pm$ 0.93	5.5 $\pm$ 0.78
Apr	5.8 $\pm$ 0.78	5.4 $\pm$ 0.81	5.7 $\pm$ 0.79	5.1 $\pm$ 0.93	4.2 $\pm$ 0.63	4.9 $\pm$ 0.95	5.5 $\pm$ 0.90
May	5.8 $\pm$ 0.76	5.7 $\pm$ 1.27	5.8 $\pm$ 0.97	4.5 $\pm$ 1.18	4.0 $\pm$ 0.70	4.4 $\pm$ 1.11	5.4 $\pm$ 1.20
Jun	6.0 $\pm$ 0.54	5.4 $\pm$ 0.66	5.9 $\pm$ 0.60	4.8 $\pm$ 0.92	4.4 $\pm$ 1.02	4.6 $\pm$ 0.98	5.5 $\pm$ 0.96

Sex ratios between the commercially fished reach and the unfished reach are very different. There has been a much greater proportion of males captured in the unfished reach (Table 4), which is probably a further impact of the commercial fishery removing males preferentially.

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	2.00:1	2.45:1
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
All	3.7:1	1.95:1	3.2:1

It is anticipated that, with increased catches occurring over the summer months and with the increased activity of the commercial fisherman, the bulk of the information on crayfish populations will be gathered over the next three months.

## 2.5 Macro-invertebrates

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

Reach 3 the reach supposedly without any species of crayfish, had greater species richness than either of the reaches with signal crayfish present. The full significance of this difference remains to be evaluated.

All three reaches supported populations of the locally distributed mayfly, *Ephemera vulgata* whilst the snail *Viviparus contectus*, which is rare in flowing water, was found at Reach 3.

As expected from the species richness data, the highest BMWP scores and number of scoring taxa were recorded for samples collected from reach 3. However, the ASPT values were, on average, lower in reach 3 than the other two reaches.

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

INDEX	REACH 1 (UNFISHED REACH)			REACH 2 (COMMERCIALY FISHED REACH)			REACH 3 (REACH WITHOUT CRAYFISH)		
	SITE 1	SITE 2	SITE 3	SITE 1	SITE 2	SITE 3	SITE 1	SITE 2	SITE 3
NUMBER OF SPECIES	14	22	19	17	22	16	27	32	36
NUMBER OF BMWP TAXA	12	16	14	13	14	13	21	23	25
BMWP SCORE	69	97	86	71	86	63	101	119	142
ASPT	5.75	6.06	6.14	5.46	6.14	4.85	4.81	5.17	5.68

## 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 maintained throughout the forthcoming quarter.

Sampling of macro-invertebrate assemblages and instream and riparian habitat features will be undertaken in either September or October according to river conditions.

The low return of tagged crayfish remains an important issue. However, plans to conduct tag retention and mortality rate trials using caged signal crayfish in flowing water channels at the River Laboratory will probably be shelved. It is thought unlikely that a license to undertake the study will be approved.

As a result of the Environment Agency agreeing to provide additional funding two other work programmes will begin during the period.

- 1) Commercial crayfish catches from Shabbington Island will be monitored for returns of tagged/clipped specimens. This work will require the co-operation of the commercial fisherman and this will be sought as soon as possible.
- 2) A repeat survey of the distribution of crayfish species in the Thame catchment will be undertaken in August. It is expected that this survey will be more reliable than the one previously carried out in November 1995 when native crayfish, *Austropotamobius pallipes*, are known to be relatively inactive and less prone to capture.

### 4 FACTORS 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. 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

A small number of traps were lost during the last two fishings. At present a reasonable supply of reserve traps is held but if losses continue in subsequent months then the Environment Agency will be asked to provide replacements.

## 7 OTHER MATTERS

It is understood that the Environment Agency's interest in the feeding of *Pacifastacus leniusculus* in the River Thame (Furse and Ibbotson 1996) is likely to be resolved by an in-house Agency study which IFe will support through the provision of specimens from their monthly trappings.

## 8 ACKNOWLEDGEMENTS

During the reporting period, scientific support for the project was provided by Mr John Blackburn. The authors are grateful for the advice on River Habitat Survey methodology provided by Dr Hugh Dawson.

## 9 REFERENCES

Furse, M.T. & Ibbotson, I.T. (1996) *The impact of crayfishery on the River Thame. A progress report for the Period January - March, 1996.* A Progress Report to the National Rivers Authority, Thames Region, 5pp.

Smith, G.R.T., Learner, M.A., Slater, F.M & Foster, J. (1996) Habitat features important for the conservation of the native crayfish *Austropotamobius pallipes* in Britain. *Biological Conservation* 75, 239-246

## DISTRIBUTION SHEET

To be completed by all Project Leaders completing commissioned research project reports. Please bind a copy of this distribution sheet as the final page in all internal (IFE) copies of the report.

1.	Title:	Impact of crayfishery on the River Thames . Progress report for the period April - June, 1996.	
	Authors:	M T Furse & A T Ibbotson	
	Report ref:	T04073N7/4	
	Master copy held by:	M T Furse	
	Report access code:	C	
2.	DISTRIBUTION LIST (A)-H) standard, I) other]		No.copies
			Date
A)	Contract customer:		5
B)	Director - Prof A.D. Pickering		1
C)	Asst Director - Dr J. Hilton (title page and abstract only)		1
D)	River Laboratory Library		1
E)	Windermere Library		1
F)	Diana Morton (title page only + no.pages for adding to publication list)		
G)	Project leader: M T Furse		3
H)	Other (list below and indicate no.copies in RH column)		
	1.	A T Ibbotson	1
	2.	J M Winder	1
	3.	G Tapia	1
	4.	J H Blackburn	1
Total number of copies made			15

### REPORT ACCESS CODES

- S**    **In strict confidence - restricted access** - Access to named customer(s) - (could be named restricted access individuals), IFE Directorate, Project Leader and all authors.
- C**    **In confidence - restricted access** - Access to customer, IFE Directorate, Project Leader, all authors, and IFE staff with permission of Project Leader.
- N**    **'Normal' access** - Access to customer and all IFE staff. Access to visitors and general public with permission of Project Leader.
- G**    **General access** - General access to anyone as required.

**Centre for Ecology & Hydrology** Institute of Freshwater Ecology  
Institute of Hydrology  
Institute of Terrestrial Ecology  
Institute of Virology & Environmental Microbiology

**Natural Environment Research Council**