

The Faunal Richness of Headwater Streams

Progress Report for the Period
January - June 1991

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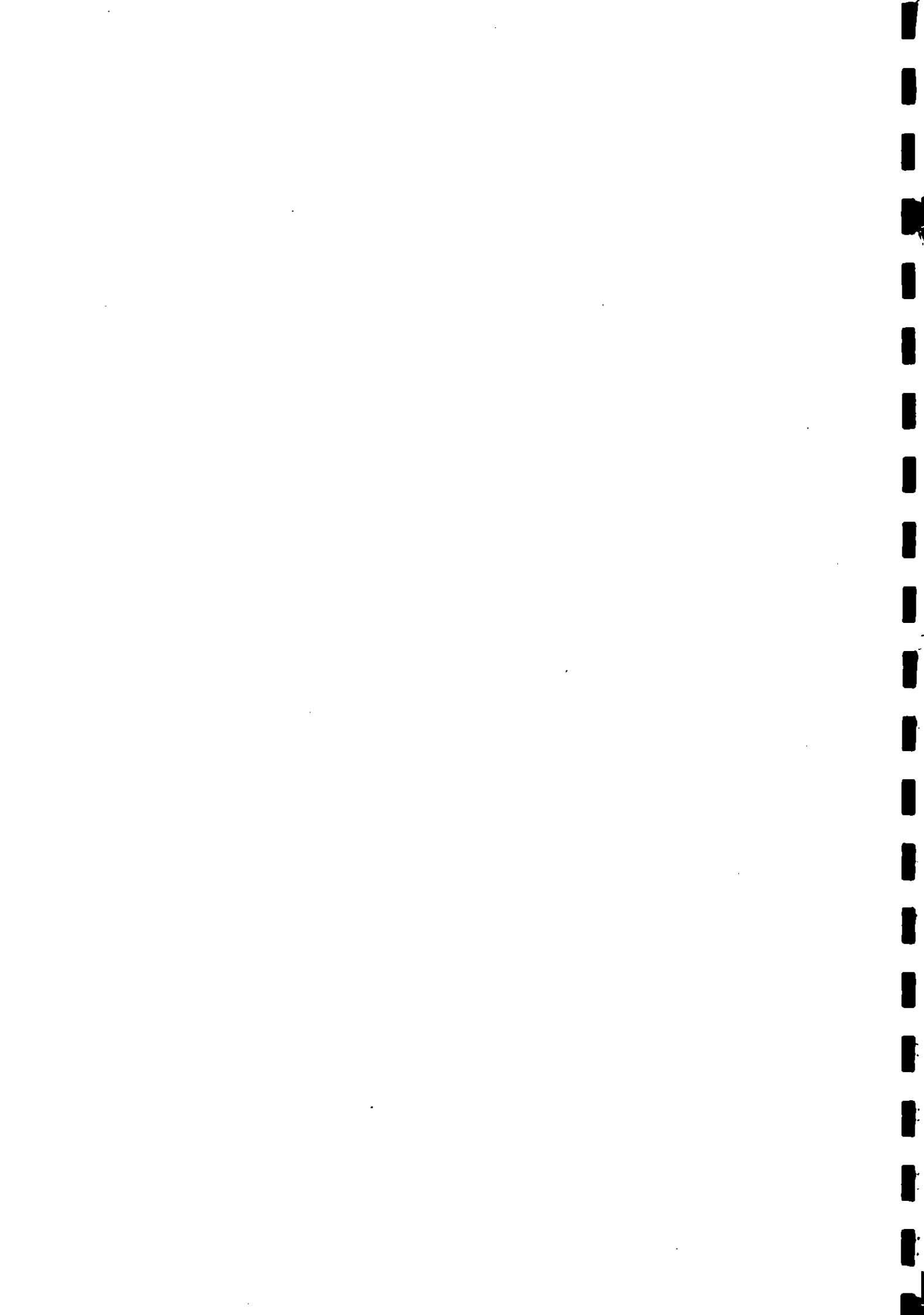
July 1991

Progress Report 242/3/Y



NRA

National Rivers Authority



1. TECHNICAL PROGRESS

1.1 Objectives

The complete work programme for this headwater stream study comprises four stages and is scheduled for the total period 1st October 1990 to 31st January 1995. This report covers the final three months of the first stage of the project and the first three months of the second stage.

The overall and specific objectives of each stage are detailed in the Project Investment Appraisal (PIA) which is Schedule 2 of the Memorandum of Agreement for Research Contract (ref:54015000) between the National Rivers Authority (NRA) and the Institute of Freshwater Ecology (IFE).

1.2 Work Programme

1.2.1 Stage 1

Stage 1 of the study was primarily a review of known data on macro-invertebrate assemblages in small streams. The work programme for this stage may be summarized as follows:

- Undertake a comprehensive search for existing macro-invertebrate data and planned surveys on headwater streams.
- Compile a report which collates and analyzes the information obtained.
- Use the results of the foregoing analyses, in consultation with the project leader, to select catchments and sites to fulfil the objectives of the subsequent stages of the project.

1.2.2 Stage 2

Stage 2 involves a field-based study of the contribution of individual streams to the total faunal richness of a set of selected catchments. The streams to be sampled should be of good environmental quality. The work programme is as follows:

Macro-invertebrate data

- Finalize the choice of sampling sites in consultation with the project leader.
- Undertake field sampling and laboratory processing of samples collected from headwater sites in each of three seasons (spring, summer and autumn) of a single year.
- Identify all taxa to the best achievable level (normally species).
- Identify taxa from other appropriate headwater samples, such as those collected during the 1990 NRA River Quality Survey and the DoE-sponsored Countryside Surveys of 1988 and 1991.

Environmental data

- Derive environmental data required for RIVPACS by field measurement or from cartographic sources. The latter should also be used to derive other topographical, geological, soil type and geographical information relevant to the project.
- In addition other habitat features or management practices which might explain the presence or absence of species should be noted.

Land use

- Carry out ground surveys of land use in the 1-km squares containing the sample sites.
- Utilize available satellite imagery of the whole study catchment to place the study sites in context.
- Undertake an assessment of current and historical farming/land-use practices from a variety of sources such as maps, parish records, planning records, aerial photography, MAFF Annual Agricultural Censuses and Farm Business Surveys.

The following text is sectioned in accordance with Schedule 1 of the research contract and outlines the progress made in meeting the scientific objectives within the prescribed project budget.

1.3 Progress Achieved

1.3.1 Stage 1

All items of the Stage 1 work programme were completed on schedule.

Review and reporting

A total of 851 sites from within the IFE data-set were reviewed for macro-invertebrate distribution data. Of these 98 were on first order streams, 141 were within 2.5 km of source and 282 were in discharge category 1 as defined for the 1975 Department of the Environment River Quality Survey. Data supplied by three NRA regions and available from 36 scientific papers in the public domain were also scrutinized for taxa having specific association with headwater streams.

A draft version of a report on the findings of the review was submitted to the Project Leader in mid-February 1991. It included the results of the review, a discussion of the findings in relation to other relevant studies and extensive tabulations of the analyses undertaken. The draft report was circulated to biologists in all ten NRA regions and attracted responses from most of those regions.

A final report on this stage of the project (Furse et al 1991) was then produced which incorporated many of the amendments or additions suggested by the NRA biologists and by the Project Leader. Sixty copies of this report were provided to the Project Leader for

circulation to a list of recipients agreed between NRA and IFE.

Catchment and site selection

The draft report also included a short list of catchments suggested by IFE as being suitable or sampling as part of Stage 2 of the project. Regional biologists were also asked to comment on these suggestions.

As a result of their comments and discussions between the NRA Project Leader and IFE staff at a Steering Group meeting of 18th February 1991, a short list of catchments for further sampling was drawn up. It was agreed that four of these be sampled, and that final selection be dependant on further discussions with NRA biologists in the regions containing the short-listed catchments.

The four catchments chosen were the Stour (Dorset), Lugg (Herefordshire), Cam (Cambridgeshire) and Derwent (Yorkshire). Each of the catchments, with the exception of the Cam, had previously been sampled by, or for, IFE and extensive species-level data were already held for these river systems. The catchments were selected to encompass as broad a range of agricultural land uses as possible.

At the same Steering Group meeting it was also agreed that the optimal number of headwater sites that could be sampled within the contract budget was 48, or 12 per catchment. In addition to the need to sample headwater sites in these catchments, IFE and NRA agreed that approximately eight samples should also be collected from further down the catchment at higher order sites. In this way a broader data base would be available for assessing the contribution of headwater sites to total catchment faunal diversity.

Of the 12 headwater sites to be sampled it was subsequently suggested by the Project Manager, and approved by the Project Leader, that seven of these be from first order streams and five from second order. All stream orders were standardized according to water-courses shown on the OS 1:50,000 "Landranger" series maps.

Individual sites within the four catchments were selected in the following manner. Each catchment was divided into a series of 12 geographic blocks based upon the sub-catchments of major tributaries of the nominate river, together with the headwaters of the nominate river itself. The distribution of first and second order sites between blocks was determined in advance of specific site selection using random number procedures.

A short list of at least two possible sampling sites per block was drawn up for each catchment. In view of the fact that sites sampled in this phase of the work were to be of good environmental quality, streams were chosen which appeared, on 1:50,000 maps, to have no major farm buildings or dwelling houses upstream of the sampling point. Other factors considered included background geology, proximity of sites within adjacent blocks and potential difficulties associated with subsequent land-survey work.

These lists were sent to biologists within each of the NRA regions containing a study catchment. The biologists, and sometimes the appropriate Pollution Control Officers, were then visited and their advice sought on individual site selection. The views of the staff of the

North York Moors National Parks Department were also sought for the Derwent catchment. Criteria such as water quality, water-course modification (dredging, re-alignment etc.) and access difficulties were then considered. Amongst these the need for good water quality was regarded as paramount.

Revised lists of a main and one or more reserve sites were then drawn up for each block in each catchment. For two catchments, the Stour and Cam, sites were wholly selected during the course of these meetings. In the cases of the Lugg and Derwent, NRA staff visited most or all of the selected main and reserve sites to assess their environmental condition. Clearly stressed sites were rejected and substitute sites selected and, in some cases, visited by NRA staff.

The higher order sites in each river system were selected to give a broad geographical spread of the major catchment tributaries and geological types. In general the selection included more third than fourth order sites, more fourth than fifth and so on. In this way the numbers of sites per order were in the same sequence as the number of water-courses per order. The exact numbers of sites of each type were dependant on the types of site within the catchment for which IFE already held appropriate data. Lists of these sites were also sent to the relevant local NRA staff for comment and a small number of subsequent amendments were made.

An inevitable number of minor exceptions to this general pattern of selection of headwater and higher order sites occurred for each NRA region. These are too trivial to be detailed here.

NRA staff provided considerable assistance in identifying and contacting landowners of the sampling locations in the Derwent and Lugg catchment. A small number of contacts with landowners in these catchments and all contacts in the Stour and Cam catchment were left to be made by the IFE survey team during their period of field sampling.

It was originally planned that all field sampling be undertaken by IFE. However, it became clear that a national biological survey of running waters being undertaken by NRA in 1991 would provide suitable sets of higher order samples that were collected in a totally compatible manner with the headwater samples. NRA regions were asked, and agreed, to make these samples available to IFE for the purposes of the headwater study.

1.3.2 Stage 2

The NRA Project Leader was kept informed of the site selection discussions between IFE and individual NRA regions. She was provided with copies of all significant correspondence with NRA Anglian, Welsh and Wessex regions and participated directly and extensively in the selection of the sites in the Derwent catchment.

The locations of all sites chosen for potential sampling were therefore made known to her in advance of sampling.

2. INTERIM RESULTS

2.1 Stage 1

Detailed results of the Stage 1 review have been well circulated in a NRA Research and Development Document (Furse et al 1991).

In very brief summary it was shown that a substantial number of taxa have specific associations with headwaters in their patterns of distribution. According to the criteria and definitions adopted in the report a list of 101 taxa with clear headwater affinities was drawn up. These were dominated by Coleoptera, Diptera and, to a lesser extent, by Trichoptera.

2.2 Stage 2

2.2.1 Headwater sites

Spring sampling for aquatic macro-invertebrates has been successfully completed. The sampling dates were as follows:-

River Stour catchment	: 29th April - 3rd May
River Cam catchment	: 6th May - 9th May
River Derwent catchment	: 14th May - 16th May
River Lugg catchment	: 20th May - 22nd May

Field survey teams were given the list of main and reserve sites for each block and asked to sample the main site if they were satisfied as to its general environmental quality. If they were not satisfied they were asked to apply the same criteria to the reserve site and to sample it if it appeared satisfactory.

In general the main sites proved suitable or, if not, the reserve site was normally satisfactory. If neither site was adequate the field team had been briefed on the main criteria for site selection and were given the freedom to choose replacement sites of the appropriate order and within the appropriate geographic block. If in doubt they were requested to contact the project leader for further advice.

These guidelines enabled suitable sites to be located comparatively easily for most blocks in most catchments. The exception was the Cam. Here a high proportion of main and reserve sites were completely dry and the field teams were obliged to find replacements. This task was extremely arduous since few streams were flowing anywhere near their upper reaches as marked on the 1:50,000 map. In some blocks the field team were obliged to sample whichever stream they could find flowing and this may have led to some of the sites being of poorer water quality than desirable for this stage of the study.

For a variety of reasons the originally agreed pattern of numbers and types of site to be sampled per catchment was varied in all but one of those catchments.

- At the request of the Project Leader 14, rather than 12, headwater sites were sampled in the Derwent catchment.

- One block in the Lugg catchment had two sites sampled by the field team because of uncertainty about which was the more suitable.
- The constraints on finding suitable sites in the Cam catchment led to more first and fewer second order sites being sampled than originally planned.

The full list of headwater sites sampled in spring in each catchment is presented at the end of this report (Appendix 1).

At a further Steering Group meeting, of 24th June 1991, the choice of sampling locations was discussed between the Project Leader and IFE staff members. Utilizing environmental descriptions of the sampling locations, site photographs and anecdotal information from field surveyors, the suitability of five sites on the Cam was questioned.

Subsequent sorting and identification of animals in these samples strongly indicated the sites to be of poor environmental quality. It was agreed, between NRA and IFE, that these sites at Thriplow, Caxton and Wellhead Springs (Appendix 1) should be dropped from the summer and autumn sampling programme. Replacements should be sought and sampled. However, sampling at Burwell and Ashwell was to be retained.

At the same meeting it was agreed that the retained Block 4 site on the Lugg should be Dunhampton Farm. The Pudleston Court site (Appendix 1) was therefore dropped.

2.2.2 Higher order sites

The full lists of samples requested from the NRA regions for each of spring, summer and autumn of 1991 are given in Appendix 2.

To date only Anglian NRA have sent all the required spring samples to the IFE. Approximately half of the requested Derwent samples were also received.

2.2.3 Countryside Survey sites

By the end of June a total of 30 of the 1988 and 231 of the 1990 Countryside Survey samples had been identified to species. Most of these were headwater sites of relevance to the present study. The samples are known to have confirmed and extended the list of "headwater taxa" presented in the Stage 1 report.

2.2.4 Environmental data

All the field-measured environmental data required for the 1991 headwater sites were collected at the time of biological sampling. It was not feasible, however, to collect alkalinity values in this season.

All map-related environmental data will be derived within the time scheduled in the contract.

Many ancillary habitat features, of the type defined in the project contract schedules, were noted and further details will be collected during the summer and autumn sampling.

2.2.5 Land use

No specific work on land use was scheduled for the first quarter of 1991-92. However, some preparations for the ground survey work were essential in this period.

It was originally assumed that this survey would be undertaken by an Assistant Scientific Officer on the IFE staff. After further consideration it has been considered desirable that the work should be carried out by personnel with more practical experience of this type of work. It was also recommended, by the leader of the 1990 Countryside Survey project, that two people be appointed for greater efficiency and also on health and safety grounds.

The post was advertised, directly by post, to members of the 1990 Countryside Survey field teams and attracted six applicants. From these Rebecca Dunn and Owen Smith have been appointed for the eight week period in July and August 1991.

In order to undertake the work, the surveyors need 1:10,560 (6") maps) of the 1-km squares containing the sampling sites. These maps show field boundaries and other de-limiting linear features.

NRA regions have been asked if they can provide these maps. To date Welsh, Wessex and Yorkshire have been able to do so and those from Anglian are promised.

3. WORK PROGRAMME FOR THE NEXT REPORTING PERIOD

The period covered by this section is 1st July-30th September 1991.

3.1 Biological and Environmental Sampling of Headwater Sites

- Summer biological sampling will take place on the retained sites on the Cam (9 sites), Derwent (14), Lugg (12) and Stour (12).
- Replacement locations for the three discarded Cam sites will be sought and sampled.
- Time variant and invariant physical features of the sites will be recorded on standard pro-formas. Water samples will also be taken at each site, filtered at the bankside and delivered to the IFE River Laboratory for alkalinity and nitrate determinations.
- Sorting and identifying of spring and summer headwater sites will begin.

3.2 Higher Order Sites

- It is anticipated that all outstanding spring samples from higher order sites will be delivered to IFE by the NRA regions. Some summer samples may also be received.

3.3 Countryside Survey Sites

- Sorting and identifying of Countryside Survey sites will continue.

3.4 Land Use

- Ground-truth surveys of land use in the catchments of each headwater sampling site will be undertaken, with the probable exception of any replacement sites on the Cam.
- River corridor surveying of the stream network upstream of the headwater sampling points will be undertaken, with the possible exception of any replacement sites on the Cam.

4. COST OF WORK DURING THE REPORTING PERIOD

The total cost of the work undertaken during the period 1st October 1990 and 31st March 1991 is very close to the sum detailed in the memorandum of agreement. Detailed costs have been made available to the NRA.

The cost of work undertaken in the first quarter of 1991-92 is not yet known. It will be made available to NRA as soon as possible but is likely to be in line with the Memorandum of Agreement.

5. ESTIMATE OF TOTAL COST OF WORKS

The estimated total cost of the works under each category of expenditure remain as listed in Section 10 of the PIA and Schedule 8 of the project contract. It should be noted that the listed figures are given on a cost increase basis with a base data of 1990-91.

The appointment of two temporary field surveyors (see Section 3 above), rather than the use of in-house staff, is likely to have little effect on the total budget but will lead to some adjustment of the input of other project team members. Pressures from other contract commitments have also led to some re-scheduling of staff input. These include the casual appointment of Mrs Angela Matthews at Scientific Officer level to help with processing, but not identification, of headwater samples. She is a former IFE employee with considerable experience of the sort of work required for this project.

Fuller details of the re-scheduling will be made available to NRA as soon as they are finalized. They will not affect the overall budget or the scope and extent of the work programme to be carried out.

6. ESTIMATE OF COSTS FOR THE NEXT REPORTING PERIOD

Costs for the next reporting period are expected to be in line with the anticipated cost-base adjusted budget.

7. FACTORS LIKELY TO AFFECT THE SATISFACTORY COMPLETION OF THE WORK

The work is well on schedule and it is anticipated that all major contract deadlines will be met. There are, however, a number of minor factors that may affect the work programme and the timing of specific tasks.

Firstly, the below average rainfall of the last few years may lead to some of the current headwater sites drying up. If significant numbers do dry then the sampling and processing time may be reduced. Conversely, if it is felt that these sites should be replaced, or that the missing seasons' samples should be acquired in 1992, then this will extend the time spent on these tasks.

Replacement of the three discarded Cam sites will pose similar problems. Appointing experienced land-use surveyors for the short period necessary to undertake ground-truth surveys of a small number only of additional sites will be particularly difficult.

Secondly, current indications are that time needed to take the aquatic macro-invertebrate samples was under-estimated. This can be adjusted for by re-allocating some laboratory tasks to lower grade staff. However, no tasks will be passed on to staff who do not possess the requisite skills to carry out the work efficiently and accurately.

Thirdly, any failure by NRA regions to provide the promised samples from higher order sites may necessitate IFE having to take replacement samples in 1992.

Fourthly, the exact combination of tasks to be carried out by the land-use ground survey teams is novel and it is difficult to assess the time required with any accuracy. It is possible that the work may not be completed in 1991 and that some sites may have to be sampled in 1992. This is not ideal because the adjacent land use may not be the same in 1992 as it was in 1991 when the biological samples were taken.

The proposed weekly schedule of field work for the rest of 1991 is as follows:

Catchment	Summer	Autumn
<u>Aquatic macro-invertebrate sampling</u>		
Stour	29th July-2nd August	21st October-25th October
Cam	5th August-9th August	28th October-1st November
Derwent	12th August-16th August	4th November-8th November
Lugg	19th August-23rd August	11th November-15th November
<u>Land-use ground survey</u>		
Stour	1st July-12th July	
Cam	15th July-26th July	
Derwent	29th July-9th August	
Lugg	12th August-23rd August	

Any significant alternations to these schedules or perceived difficulties in meeting contract deadlines will be notified to NRA at the earliest opportunity.

8. REFERENCE

Furse, M.T., Winder, J.M., Symes, K.L. and Clarke, R.T. (1991) The faunal richness of headwater streams. A review of existing information. National Rivers Authority Research and Development Document, No. 242/2/Y, 135 pp.

Appendix 1. The water-course and site names, national grid references and stream orders of the spring 1991 headwater sampling locations in each geographic block of four study catchments.

RIVER CAM

<u>Block 1 Lower Lodes</u>		<u>Stream Order 1</u>
Un-named watercourse	Burwell	TL 587 660
<u>Block 2 Upper Lodes</u>		<u>Stream Order 1</u>
Caundle Ditch	Teversham	TL 504 573
<u>Block 3 Cambridge Region</u>		<u>Stream Order 2</u>
Nine Wells Spring	Nine Wells	TL 460 542
<u>Block 4 Granta</u>		<u>Stream Order 1</u>
Un-named watercourse	Langley Wood	TL 605 419
<u>Block 5 Central Cam</u>		<u>Stream Order 1</u>
The Slade	Hadstock Common	TL 547 436
<u>Block 6 Upper Cam</u>		<u>Stream Order 2</u>
River Cam	Amberden Hall	TL 549 306
<u>Block 7 Fowlmere Region</u>		<u>Stream Order 1</u>
Hoffer Brook	Thriplow	TL 452 470
<u>Block 8 Bourn Brook</u>		<u>Stream Order 2</u>
Gascote Dean	Caxton	TL 296 584
<u>Block 9 Mel and Shep</u>		<u>Stream Order 1</u>
Un-named watercourse	Whaddon Gap	TL 343 461
<u>Block 10 Lower Rhee</u>		<u>Stream Order 1</u>
Arrington Brook	Arrington	TL 325 505
<u>Block 11 Mill</u>		<u>Stream Order 1</u>
Un-named watercourse	Wellhead Springs	TL 328 431
<u>Block 12 Upper Rhee</u>		<u>Stream Order 1</u>
Ruddery Spring	Ashwell	TL 279 403

RIVER DERWENT

<u>Block 1 Upper Derwent</u>		<u>Stream Order 2</u>
Biller Howe Nook Slack	Turf Rigg	NZ 916 007
<u>Block 3 Middle Becks</u>		<u>Stream Order 1</u>
Mill Beck	Bathingwell Wood	SE 822 638
Rowmire Spring Stream	Rowmire Plantation	SE 828 653
<u>Block 4 Lower Derwent</u>		<u>Stream Order 2</u>
Bishop Wilton Beck	Bishop Wilton	SE 802 554
<u>Block 5 Upper Becks</u>		<u>Stream Order 2</u>
Long Gill	Newgate Foot	SE 866 935
<u>Block 6 Middle Becks</u>		<u>Stream Order 1</u>
Halleykeld Spring Stream	Halleykeld Rigg	SE 939 860
<u>Block 7 Costa Beck System</u>		<u>Stream Order 1</u>
Un-named watercourse	Nab Farm	SE 860 951
<u>Block 8 Holbeck Group</u>		<u>Stream Order 1</u>
Marr's Beck	Rape Close Lane	SE 610 735
<u>Block 9 Seven System</u>		<u>Stream Order 2</u>
Bellymar Dike	Hartoft Rigg	SE 754 955

Appendix 1 (continued)

<u>Block 10 Dove System</u>		<u>Stream Order 2</u>
Gill Dike	Frost Hall	SE 642 987
<u>Block 11 Riccal Group</u>		<u>Stream Order 2</u>
Cowhouse Beck	Snaper House	SE 598 912
<u>Block 12 Middle Rye</u>		<u>Stream Order 1</u>
Mirefalls Gill	Rein's Wood	SE 566 853
Sledhill Gill	Yowlass Wood	SE 531 870
<u>Block 13 Upper Rye</u>		<u>Stream Order 2</u>
Wheat Beck	Dale Head	SE 496 950

RIVER LUGG

<u>Block 1 Frome</u>		<u>Stream Order 2</u>
Un-named watercourse	Great Wacton	SO 623 572
<u>Block 2 Lodon</u>		<u>Stream Order 1</u>
Un-named watercourse	Bredenbury	SO 603 558
<u>Block 3 Lower Lugg (East)</u>		<u>Stream Order 1</u>
Un-named watercourse	Barnstone Farm	SO 577 532
<u>Block 4 Central Lugg (East)</u>		<u>Stream Order 1</u>
Stretford Brook	Pudleston Court	SO 561 593
Un-named watercourse	Dunhampton Farm	SO 586 603
<u>Block 5 Lower Lugg (West)</u>		<u>Stream Order 1</u>
Un-named watercourse	Dinmore Manor	SO 490 503
<u>Block 6 Lower Arrow</u>		<u>Stream Order 1</u>
Newbridge Brook	Shoal's Bank	SO 394 494
<u>Block 7 Central Arrow</u>		<u>Stream Order 2</u>
Gladestry Brook	Cefnhir	SO 210 558
<u>Block 8 Upper Arrow</u>		<u>Stream Order 2</u>
Un-named watercourse	Glasnant	SO 182 508
<u>Block 9 Central Lugg (West)</u>		<u>Stream Order 1</u>
Un-named watercourse	Lower Lye	SO 407 672
<u>Block 10 Hindwell Brook</u>		<u>Stream Order 2</u>
Un-named watercourse	Crinfynydd	SO 176 602
<u>Block 11 Upper Lugg (East)</u>		<u>Stream Order 2</u>
Un-named watercourse	Hill House Dingle	SO 303 685
<u>Block 12 Upper Lugg (West)</u>		<u>Stream Order 1</u>
Un-named watercourse	Pen-Twyn	SO 187 729

RIVER STOUR

<u>Block 1 Upper Stour</u>		<u>Stream Order 2</u>
Un-named watercourse	Gasper	ST 763 335
<u>Block 2 Shreen Water</u>		<u>Stream Order 2</u>
Un-named watercourse	Woodlands Manor	ST 816 309
<u>Block 3 River Lodden</u>		<u>Stream Order 1</u>
Un-named watercourse	Cowherd Shute Farm	ST 858 239
<u>Block 4 River Cale</u>		<u>Stream Order 1</u>
Un-named watercourse	West Wood	ST 694 219

Appendix 1 (continued)

<u>Block 5 Caundle Brook</u>		<u>Stream Order 1</u>
Un-named watercourse	Lyon's Gate	ST 656 055
<u>Block 6 River Lydden</u>		<u>Stream Order 1</u>
Un-named watercourse	Alton Common	ST 717 047
<u>Block 7 Manston Brook</u>		<u>Stream Order 1</u>
Un-named watercourse	Twyford	ST 862 186
<u>Block 8 Fontmell Brook</u>		<u>Stream Order 2</u>
Un-named watercourse	Farrington	ST 846 152
<u>Block 9 River Divilish</u>		<u>Stream Order 2</u>
Un-named watercourse	Woolland	ST 782 069
<u>Block 10 Middle Stour</u>		<u>Stream Order 2</u>
Un-named watercourse	Okeford Fitzpaine	ST 801 105
<u>Block 11 Chalkstreams</u>		<u>Stream Order 1</u>
Gussage	Gussage St Andrew	ST 973 145
<u>Block 12 Lower Stour</u>		<u>Stream Order 1</u>
Un-named watercourse	Delph Wood	SZ 013 972

Appendix 2. Listings of higher order sampling locations for faunal comparison with headwater sites in the same catchments.

Stream Order	River Name	Site Name	NGR	NRA Code
RIVER CAM				
1	River Rhee	Ashwell Springs	TL 270 398	NRA 010544
2	Whaddon Brook	Whaddon Brook Road Bridge Whaddon	TL 359 465	NRA 010548
2	Black Peak Spr Str	Shepreth-Meld	TL 383 474	NRA 010552
2	Swaffam Bulb'k Lode	Swaffam Bulbeck Lode Br S.Bu	TL 554 635	NRA 010567
3	Mill River	Mill River Rd Br Shingay-Wendy Road	TL 321 475	NRA 010546
3	River Granta	Hildersham Ford	TL 545 485	NRA 010539
3	Bourn Brook	Fox's Bridge, Comberton	TL 383 548	NRA 010559
3	Reach Lode	Burwell Lode, Upware Lock	TL 537 698	NRA 010569
3	Bottisham Lode	B'sham Lode Village Br Nr Rail Line	TL 532 630	NRA 010566
4	River Rhee	Wimple, A14 Road Bridge	TL 334 485	NRA 010546
4	River Rhee	Haslingfield Road Bridge	TL 417 511	NRA 010555
4	River Cam	Hauxton Mill	TL 432 527	NRA 010535
5	River Cam	Grantchester Bridge	TL 438 549	NRA 010556
5	River Cam	Dimmock's Cote Road Bridge	TL 537 723	NRA 010565

The Ashwell Springs and Bottisham Lode samples are included as reserves. They may or may not be fully identified by IFE, depending on the suitability of the other sampling sites. Up to four other sites may also be designated as reserves.

RIVER DERWENT				
2	Scampston Beck	Scampston	SE 868 757	NRA 100 520
3	Whisperdales Beck	Low Dales	SE 958 922	No NRA no.
3	Hodge Beck	Hold Cauldron	SE 668 869	NRA 100176
3	Holbeck	Hovingham	SE 669 773	NRA 100178
3	Sails Beck	Allerthorpe Common	SE 743 476	NRA 100517
3	Bielby Beck	Hayton	SE 820 457	NRA 100374
4	Pickering Beck	Levisham	SE 816 911	NRA 100498
4	River Seven	Sinnington	SE 745 853	NRA 100266
4	River Seph	Laskill	SE 563 907	NRA 100264
4	Menethorpe Beck	Menethorpe	SE 768 676	NRA 100477

Appendix 2 (continued)

Stream Order	River Name	Site Name	NGR	NRA Code
RIVER DERWENT				
4	Spittle Beck	Braisthwaite Bridge	SE 727 624	NRA 100284
5	River Rye	Helmsley	SE 615 836	NRA 100258
5	River Rye	Nunnington	SE 664 794	NRA 100257

Samples from four of these sites (to be determined) will be designated as reserves. They may or may not be fully identified by IFE, depending on the suitability of the other nine sampling sites.

The Whisperdales Beck site is not a routine NRA site and will need to be sampled specially for the headwaters project. If this site proves unsuitable, on water quality criteria, it may be replaced by the Troutdale Beck at Little Hilla Green. The latter is a second order site at SE 944 898.

RIVER LUGG

2	Moreton Brook	U/S R.Lugg confl	SO 53374330	NRA 08E084
3	Back Brook	U/S R.Arrow confl	SO 30305700	NRA 08E100
3	Curl Brook	Pembridge	SO 39015747	NRA 08E099
3	Main Ditch	U/S R.Lugg confl	SO 50145973	NRA 08E102
3	Stretford Brook	Stretford	SO 44105528	NRA 08E094
3	River Loden	Stoke Lacy	SO 61874938	NRA 08E074
3	Hackley Brook	Noakes Bridge	SO 63355475	NRA 08E076
3	Tedstone Brook	Bromyard	SO 65725505	NRA 08E075
4	Hindwell Brook	Combe Bridge	SO 34536345	NRA 08E105
4	River Arrow	Broadward Bridge	SO 49785705	NRA 08E090
4	River Frome	Yarkhill	SO 61384270	NRA 08E068
5	River Lugg	Mordiford	SO 57003745	NRA 08E057

The Moreton Brook, Stretford Brook and River Arrow at Broadward Bridge samples are included as reserves. They may or may not be fully identified by IFE, depending on the suitability of the other sampling sites.

RIVER STOUR

3	Shreen Water	Colesbrook	ST 807 278	NRA 09T173
3	River Lodden	Gillingham	ST 815 261	NRA 09T175
3	Caundle Brook	Blackmore Ford Br	ST 675 097	NRA 09T204
3	Fontmell Brook	Fontmell Parva	ST 825 147	NRA 09T825
3	River Allen	Walford Mill	SU 010 006	NRA 09T008
4	River Cale	Five Bridges	ST 758 215	NRA 09T178
4	River Stour	Trill Bridge	ST 790 205	NRA 09T177
4	Caundle Brook	Warr Bridge	ST 733 143	NRA 09T201

Stream Order	River Name	Site Name	NGR	NRA Code
RIVER STOUR				
4	River Lydden	Berry Farm	ST 729 115	NRA 09T202
5	River Stour	Pleck	ST 765 176	NRA 09T332
5	River Lydden	Bagber Bridge	ST 765 157	NRA 09T023
6	River Stour	Spetisbury	ST 919 020	NRA 09T026

The Gillingham, Blackmore Ford Bridge and Berry Farm samples are included as reserves. They may or may not be fully identified by IFE, depending on the suitability of the other sampling sites.

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The Faunal Richness of Headwater Streams

Progress Report for the Period
January - June 1991

Institute of Freshwater Ecology

July 1991

Progress Report 242/3/Y