Environment Agency

monitoring salmon and sea trout in the River Tyne

River Tyne index report

Report two - 2005

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We would like to thank all the local angling associations, landowners and many private individuals who have given their support and commitment to our fisheries monitoring programme on the River Tyne. Special thanks are due to the Tyne and Wear Passenger Transport Authority (TWPTA), without whose support we would not be able to carry out much of the work described in this report. We would also like to thank Northumbria Water Ltd for the use of their facilities at Riding Mill and Sharpes of Aberdeen for their generous sponsorship of the angler logbook scheme. Finally, we must express our gratitude to the Centre for Environment Fisheries and Aquaculture Science (CEFAS) and to our colleagues for their invaluable technical advice and guidance with many aspects of our work.

We hope you will all continue to lend your support to our monitoring work on the Tyne in the future.

Foreword

Welcome to the second edition of the River Tyne index report. In this report, we describe details of the monitoring work we carried out for salmon and sea trout stocks during 2005 and compare the results to those of previous years. We also briefly describe some other developments relating to the Tyne salmonid fishery.

Please note that this report covers only the salmonid fishery - the reason that the Tyne is designated as an 'Index River'. The report is not intended to be a comprehensive account of the environmental state of rivers in the Tyne catchment.

The report is designed to stand alone, removing the need to refer back to earlier reports for background information.

A glossary explaining the technical terms we have used can be found on page 40.

We hope you find the report informative, interesting, and enjoyable. Please contact us if you would like further information on any of the topics featured. Our contact details and sources of information are listed on page 39.

Graeme Warren
Northumbria Area Manager

December 2006

Executive Summary

1. In October 2003, the Environment Agency initiated an intensive programme of fisheries monitoring on the River Tyne. Its primary objective is to identify any effects of the construction of a second Tyne Tunnel on salmon and sea trout stocks.
2. This report details the findings from monitoring work carried out during 2005, the second year of the study, results which also feed into our national programme of 'index river' monitoring. We also describe other related developments in the Tyne catchment.
3. Anglers declared catches of 3,591 salmon and 1,724 sea trout in 2005. The catch of salmon was the second highest on record while that for sea trout ranked the sixth best. Catch and release figures were slightly up on the previous year.
4. The commercial net fishery of the north east coast declared catches of 8,987 salmon and 18,733 sea trout in 2005, continuing the trend of lower catches of both species evident since the 2003 drift net fishery buyout.
5. Returning adult salmon deposited an estimated 66 million eggs in the Tyne catchment in 2005. Far exceeding the 'conservation limit' for the river, this maintained the upward trend in target compliance evident since 1994.
6. Logbook anglers reported overall catch rates of 0.07 fish per hour for salmon and 0.06 fish per hour for sea trout, both of which were marginally down on 2004 figures but high in comparison with other index rivers in 2005. April produced the highest catch rates for salmon and August for sea trout. The lower North Tyne between Wark and Watersmeet produced the highest catch rates for both species. In the case of logbook anglers, catch and release rates were slightly down on 2004 figures.
7. The Riding Mill fish counter recorded 32,918 upstream fish counts in 2005. Although down on recent years, this was above the long-term (1997-2004) average, indicating that the trend of increasing numbers of fish returning to the river is continuing. Counter data revealed the effect of river flow, water temperature and tidal regime on fish movement, as well as clear seasonal differences in the time of day fish migrated.
8. Data collected by the fish video system at Riding Mill indicated salmon formed the bulk of fish passing upstream over the counter before mid-July. Sea trout began to show at the end of May and outnumbered salmon from mid-July until mid-November. Thereafter, neither species was dominant.
9. Trapping operations at Riding Mill, combined with data from other activities (for example angler scale sampling programme) provided information on 489 adult fish during the course of the year. Results indicated the vast majority (more than 90 per cent) of salmon caught by anglers in the lower river prior to July were two-sea-winter (2-SW) fish. One-sea-winter fish (grilse) then formed the bulk of fish sampled until October, after which neither age class predominated. Most (more than 60 per cent) of sea trout sampled were 'maiden' fish, spawning for the first time.

10. Smolt trapping operations at Riding Mill during the spring of 2005 produced a catch of almost 5,000 fish, with a ratio of three to one in favour of salmon. Catches indicated the bulk of smolts migrated through Riding Mill between the end of April and final week in May, with three distinct peaks in activity within that period. Scale sampling showed that the vast majority (90 per cent) of smolts were two years of age. Mark-recapture experiments indicated that greater numbers of salmon but fewer sea trout migrated than in 2004. However, the margins of error on these estimates are wide and, in both years, significant numbers may have migrated during spates when the trap was not operating. Additional trapping carried out in the autumn of 2005 found evidence of significant downstream migrations of salmon and sea trout parr at that time of the year.

11. Around 130 dead fish, mainly salmon, were recovered from the upper part of the estuary during the summer. Low levels of dissolved oxygen, coupled with high-water temperatures and disease outbreak amongst fish debilitated by the conditions, are thought to be the main factors responsible for the deaths.

12. Tracking studies undertaken by CEFAS showed estuary residency of adult fish to vary from less than one day to 80 days and from less than a day to over seven days for smolts. Adult fish demonstrated a clear preference for migrating upstream through the estuary during a flooding tide, while an ebbing tide was preferred by the emigrating smolts.

13. Electric fishing surveys carried out in the summer of 2005 indicated that populations of juvenile salmon in the Tyne catchment to be stable or increasing but that trout have declined in recent years, at main river sampling sites in particular.

14. Fish counter information, combined with rod and, in particular, net fishery declarations would suggest that more adult fish are escaping to spawn since the drift net buyout in 2003. It is too early to identify effects on production of juvenile fish.

15. Other important developments for the Tyne fishery in 2005 were the introduction of a new 'intelligence driven patrol system', to combat illegal fishing activity in the Northumbria area, and the completion of the design phase of the proposed fish pass on the River Derwent. This year also saw the inauguration of the Tyne Rivers Trust - a registered charity working to promote the health of the River Tyne and its tributaries in partnership with statutory and other bodies.

Introduction

The River Tyne supports an exceptional migratory salmonid fishery. It has produced the largest rod catch of salmon of any river in England and Wales every year since 1997 and has ranked in the top five for sea trout in all but one of those years. Against a background in which stocks of game fish in many of our rivers have been under threat and declining, populations on the Tyne have shown massive improvements since the 1970s. Stocks on the Tyne are special, valuable and nationally important.

In order to meet our responsibility for the management and enhancement of salmon and sea trout stocks we analyse rod and net catch returns and carry out electric fishing surveys. Since 1996, we have also operated a fish counter on the Tyne at Riding Mill to enable us to estimate the number of adult fish passing upstream.

In 2003, our existing range of monitoring activities was augmented by the additional work required to identify any impacts the construction of a second Tyne tunnel might have on fish stocks. To be built alongside the existing tunnel at Howdon, this scheme has the potential to create water quality problems caused by the civil engineering works. Our work, in conjunction with a parallel water quality monitoring programme, and with controls on working practices, will help to ensure that both the Tyne's salmon and sea trout stocks and the fisheries they support are protected.

The approach is to gather a baseline of reliable information on the status of the salmon and sea trout populations before the construction takes place and compare this with an assessment of stocks after construction to assess the nature and extent of any impact. Originally scheduled for 2006/7, the in-river phase of the tunnel construction is now not anticipated to take place before the winter of 2009/10. This delay follows a Public Inquiry into the scheme in 2003 and a subsequent legal challenge to the Secretary of State's decision giving approval for construction in July 2005. As a result, the fisheries monitoring will now involve a greater period of pre-construction monitoring, in addition to that during the works and for a three-year period post-construction.

The Tyne and Wear Passenger Transport Authority (TWPTA), the tunnel developer, is funding this enhanced level of fisheries monitoring, which is being carried out in collaboration with CEFAS. As part of the mitigation package, the TWPTA is also providing funding for both a programme of stocking and habitat improvement work on the Tyne (such as a fish pass at Hexham).

The tunnel investigation, and the additional benefits this work has brought (for example improved fish trapping facilities and improvements to Riding Mill counter), provided the opportunity for the Tyne to join the rivers Dee, Lune and Tamar in becoming a designated, Environment Agency, 'index river'. This means the Tyne is now part of a longer-term national programme of fisheries monitoring developing a wider understanding of game fish rivers in England and Wales to better inform their management.

Information gathered from monitoring is also passed onto the North Atlantic Salmon Conservation Organisation (NASCO) and the International Council for Exploitation of the Seas (ICES) - international bodies providing guidance on the conservation of Atlantic salmon.

Objectives of fisheries monitoring

Second Tyne tunnel monitoring programme

The principal aims of this work are to:

- monitor the size and timing of the 'runs' of both returning adult fish and migrating smolts;
- establish the structure and composition (species, length, weight, age, condition, etc.) of these runs;
- relate the observed patterns of fish migration in freshwater to environmental factors (e.g. river flow and water temperature);
- monitor the movements and behaviour of adult fish and smolts migrating through the estuary (carried out by CEFAS);
- undertake routine patrols of the estuary for fish carcasses in order to identify the scale and nature of any mortalities;
- operate an angler logbook scheme and analyse catch returns to assess effects on the recreational (rod) and commercial (net) fishery interests of the Tyne;
- utilise other relevant data available within our organisation (such as electric fishing surveys) as appropriate
- develop other monitoring initiatives to complement the above.

Index river monitoring programme

Index monitoring on all four designated rivers involves the recording of:

- adult run size, composition and timing
- spawning escapement
- year class strength
- juvenile abundance
- smolt run size, composition and timing
- catch, catch rate or catch per unit effort (CPUE) and exploitation in rod and net fisheries.

For the Tyne, the tunnel monitoring programme generates much of this information. Additional resource demand will, therefore, remain minimal for the foreseeable future, unless the scope of the work is widened.

In general, similar techniques are used on each of the four index rivers to produce these common outputs. However, the scope of the work varies between participants for resource and other operational reasons. On the rivers Dee and Tamar for example, tagging programmes are underway to estimate salmon smolt survival and marine exploitation by the marine fisheries, work that is carried out in collaboration with CEFAS. Examining marine survival in this way is not necessary for the tunnel investigation and, therefore, this work is not undertaken on the Tyne.

Reporting

These reports are produced on an annual basis. In this second report, we present stock and fishery statistics for the 2005 calendar year and highlight related developments, including stocking figures from the Kielder Hatchery and the work of our fisheries enforcement department. The effect of the partial buyout of the north east coast drift net fishery in 2003 on stocks of game fish in the Tyne is also discussed.

Copies of Tyne index river reports are supplied to anglers taking part in the logbook scheme, angling organisations, riparian owners and others with an interest in the Tyne fishery. They are available through our website, the details of which can be found on page 39.

Monitoring projects

1. Rod and net catch returns

Background

All anglers are required to provide us with a catch return giving details of the number, size and species of the migratory fish they have caught, as well as the date and location of capture. This information provides a useful indication of the numbers of salmon and sea trout returning to the river, as well as the performance of the rod fishery. Because rod catches have been reported for many years, the information provided by anglers allows a comparison of historical rod catch data with catches in recent years.

As with all our game rivers, we issue licences and make bylaws to control the pressure on the fishery. The main bylaws currently in force on the Tyne require:

- a close season for salmon and sea trout from 1 November to 31 January (inclusive);
- all salmon caught between 1 February and 15 June to be returned to the water with the minimum of injury to protect the nationally endangered 'spring' salmon (bylaw introduced in 1999 and next due for review in 2008);
- all sea trout caught between 1 February and 2 April to be returned;
- fishing for salmon and trout before 16 June restricted to the use of artificial fly or lure;
- restrictions on fishing times and locations, for example distances from dams, weirs and artificial obstructions.

Commercial fishermen are also required to make catch returns. Fishing takes place off the north east coast both by drift netting, where a net is deployed at sea to intercept returning fish, and by nets fixed from the shore, known as 'T', and 'J' nets because of their shape. Although these fisheries catch fish originating from many rivers on the eastern coast of Britain, the total catch declared acts as a general indicator of salmon and sea trout stock levels.

In addition to licensing the net fishery and operating local bylaws about when, where and how netting can take place, there is a further mechanism by which we seek to conserve stocks through reductions in fishing effort. A Net Limitation Order was placed upon the fishery in 1993, involving the elimination of licences that are not renewed. In addition, a partial buyout of the drift net fishery in 2003, brokered by us and funded by Department for Environment Food and Rural Affairs (Defra) and private contributions culminated in a 77 per cent reduction in the number of licences we issued (see page 32 for further details).

Rod catch returns

The Tyne rod fishery declared catches of 3,590 salmon and 1,724 sea trout in 2005. The catch of salmon ranked second highest on record, surpassed only by the 4,122 fish declared by anglers in 2004, while for sea trout it ranked the sixth highest, behind the catch of 2,525 declared in 1998. Catch and release rates were marginally up on 2004 figures, with anglers releasing 57 per cent of salmon and 47 per cent of sea trout they caught, compared to 54 per cent and 42 per cent, respectively, the previous year. A comparison of the rod fishery declarations in 2005 with those of previous years is shown in figures 1 and 2.

Figure 1. Declared salmon rod catch 1952 to 2005

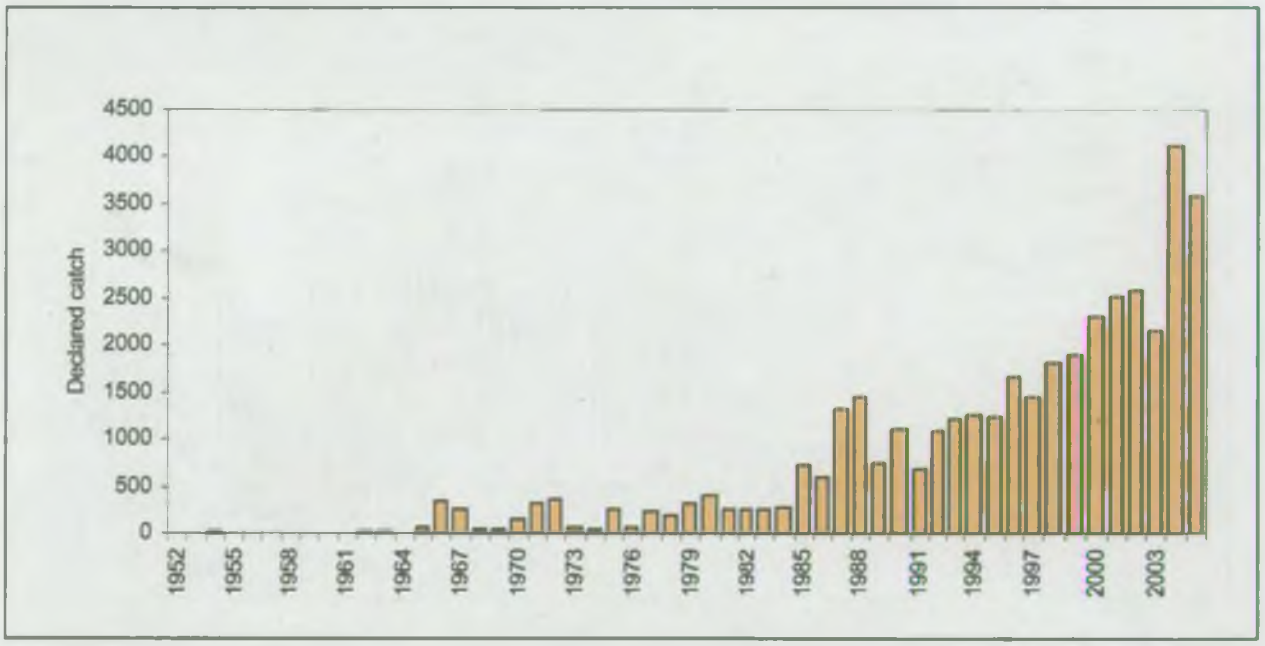
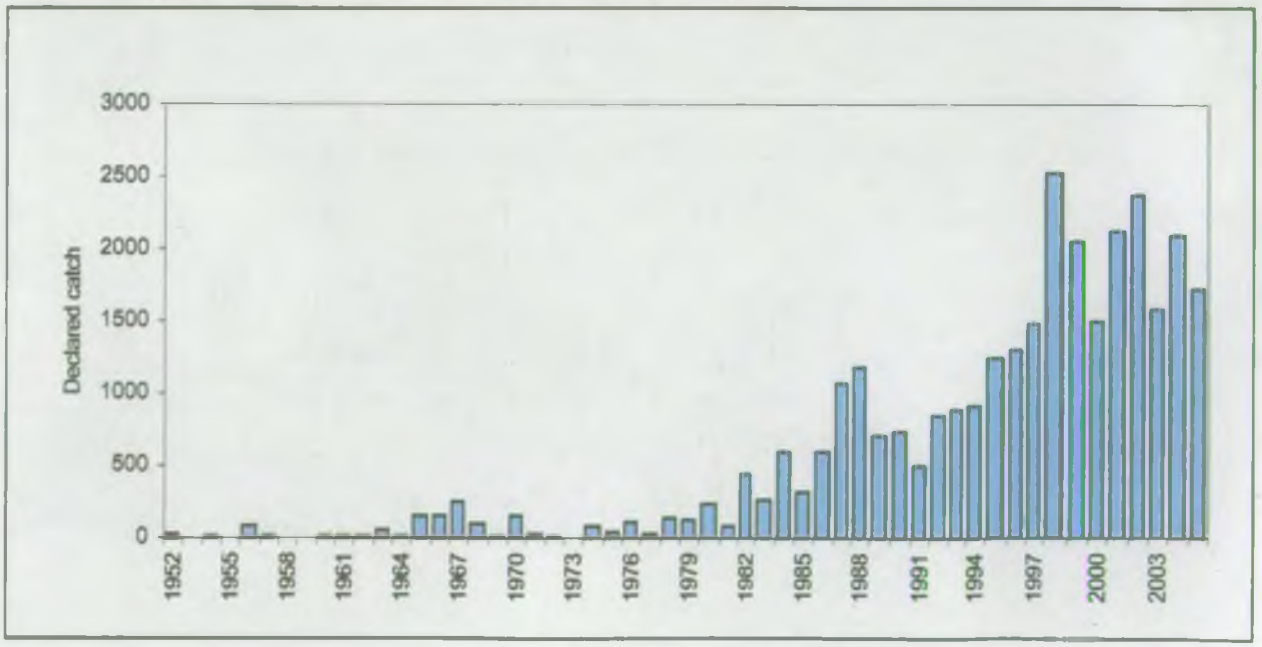


Figure 2. Declared sea trout rod catch 1952 to 2005



Net catch returns

The commercial net fishery of the north east coast declared catches of 8,987 salmon and 18,733 sea trout in 2005. Representing decreases of 18 per cent and five per cent, respectively, on 2004 declarations, this continues the trend of lower catches of both species evident since the drift net buyout in 2003.

A comparison of the net fishery declarations in 2005 with those of previous years is shown in figures 3 and 4.

Figure 3. Declared salmon net catch 1952 to 2005

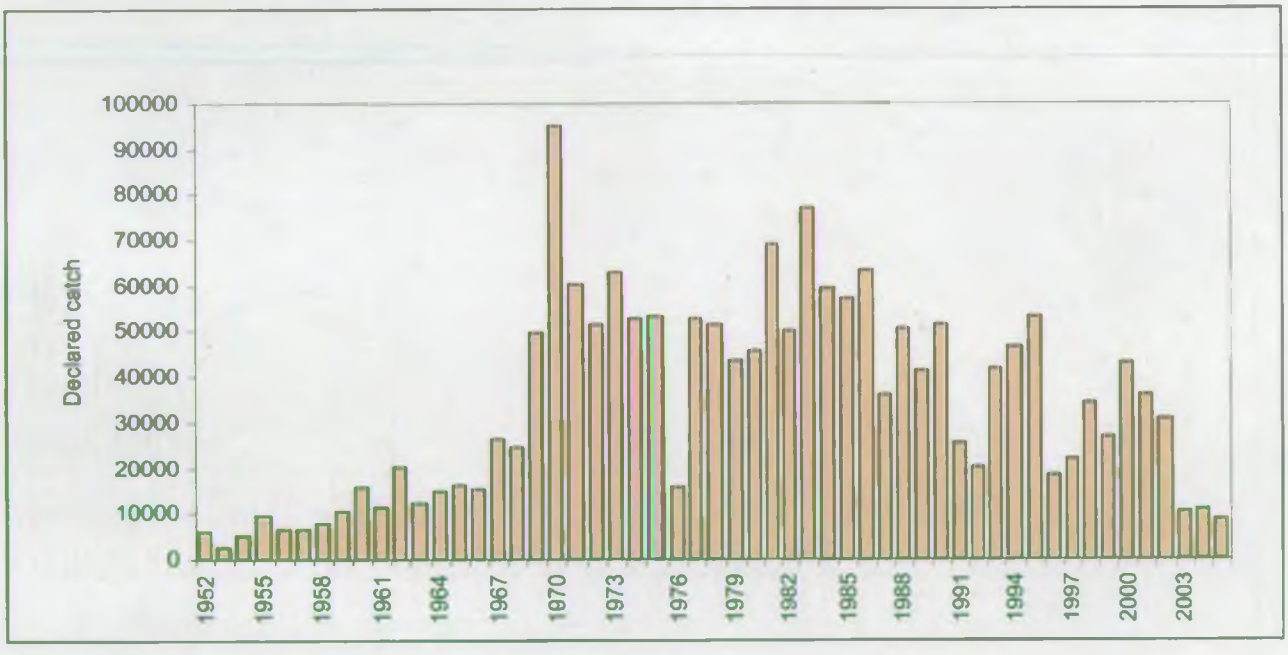
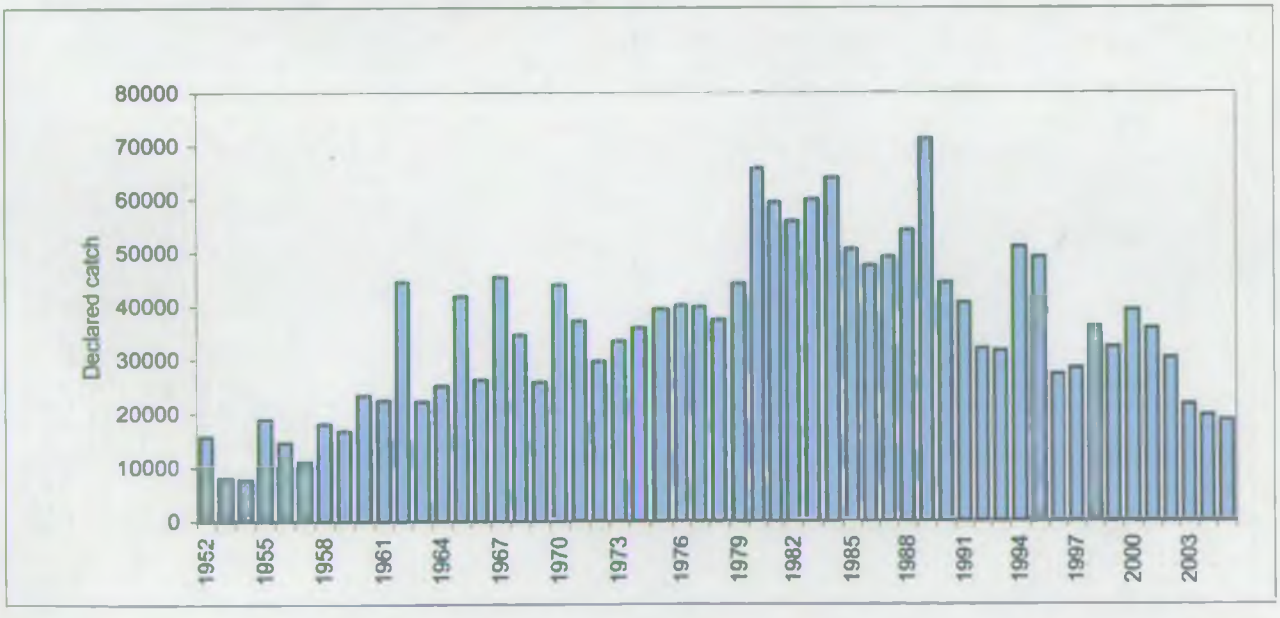


Figure 4. Declared sea trout net catch 1952 to 2005



2. Angler Logbook Scheme

Background

In 2004, we introduced an angler logbook scheme on the Tyne in order to collect a baseline of more detailed information on the performance of the rod fishery. The aim is to compare this information with that obtained during the in-river and post-scheme phases of the tunnel construction to identify any effects of the development on the rod fishery. The data gathered is also used in a wider context for more effective management and conservation of salmon and sea trout stocks in the river.

The scheme uses a modified version of our standard game fishing logbook. Anglers taking part are asked to record the details of each fishing trip they make. This includes where, when and for how long they fish, the number of each species of fish caught, the size and condition of the fish and the fishing conditions. Blank days are also to be recorded, as is the number of fish returned to the river post-capture.

Results

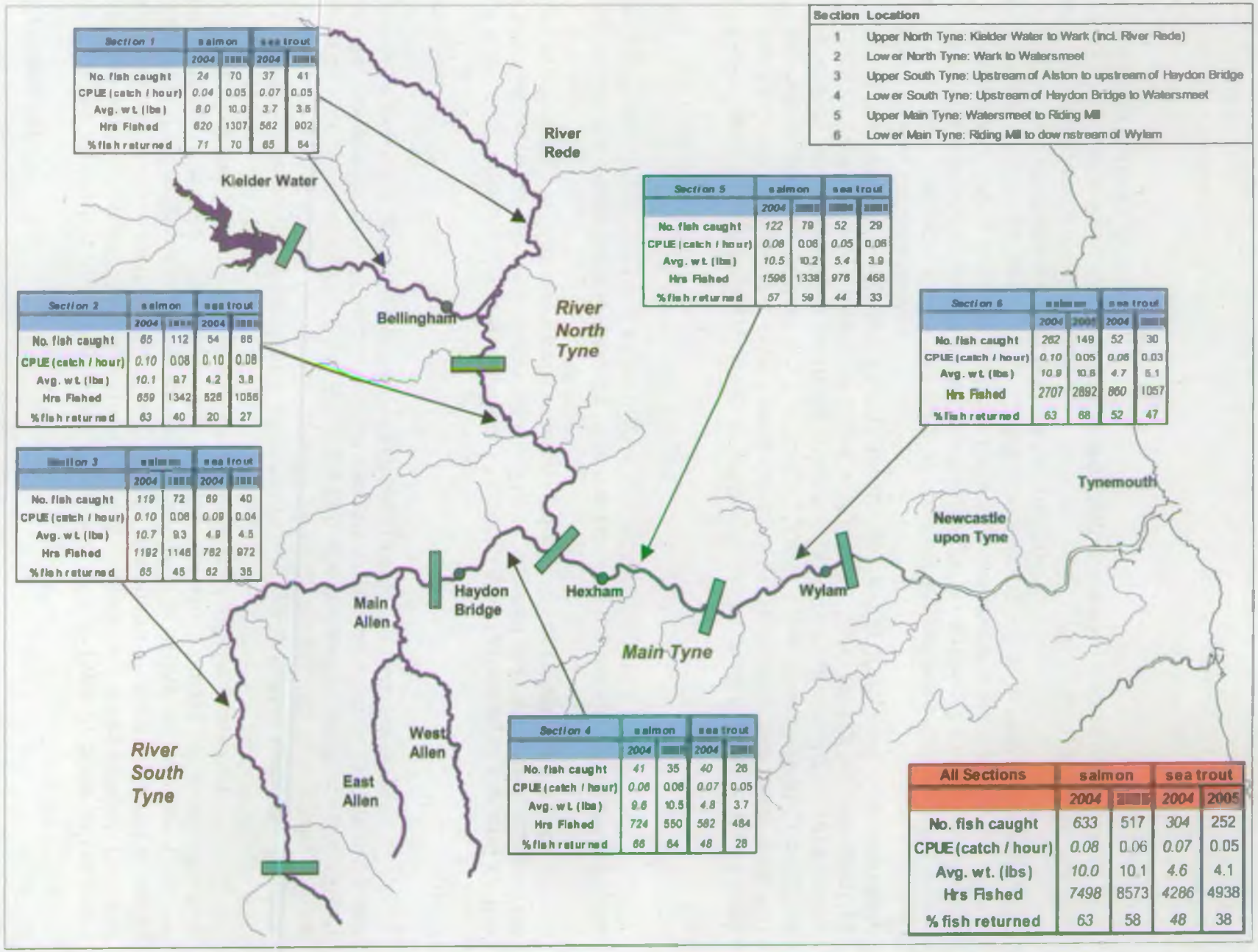
Of around 225 issued, anglers returned 112 completed logbooks at the end of the 2005 season (a 50 per cent return rate). These showed that they had caught 769 fish, of which 517 (67 per cent) were salmon and 252 (33 per cent), sea trout.

Figure 5 summarises the main results from the scheme to date while Figure 6 shows the catch rate or catch per unit effort (CPUE) by month.

The main findings were:

- Catch rates were marginally down on 2004. Overall CPUE for salmon was 0.06 fish per hour (compared to 0.08 fish per hour in 2004) and for sea trout, 0.05 fish per hour (compared to 0.07 fish per hour in 2004). This is equivalent to catching a salmon for every 17 hours spent fishing (every 12 hours in 2004) and a sea trout for every 20 hours (every 14 hours in 2004). [Catch rates of logbook anglers fishing the rivers Dee (Welsh) and Tamar for salmon in 2005 were both markedly lower at 0.03 fish per hour].
- As in 2004, the most productive part of the river for catching fish was the lower North Tyne between Wark and Watersmeet (such as section 2 in figure 5), which showed a CPUE of 0.08 fish per hour for both salmon and sea trout.
- Similarly, April had the highest CPUE for salmon, of 0.08 fish per hour, and August for sea trout - a CPUE of 0.09 fish per hour.
- The average estimated weight of salmon was similar to 2004, at 10.1lbs compared with 10lbs, but sea trout were slightly smaller, averaging 4.1lb against 4.6lb the previous year.

Figure 5. Catches and catch rates of logbook anglers in 2004 and 2005



Section 1	salmon		sea trout	
	2004		2004	
No. fish caught	24	70	37	41
CPUE (catch / hour)	0.04	0.05	0.07	0.05
Avg. wt. (lbs)	8.0	10.0	3.7	3.5
Hrs Fished	620	1307	562	902
% fish returned	71	70	65	64

Section 2	salmon		sea trout	
	2004		2004	
No. fish caught	65	112	54	86
CPUE (catch / hour)	0.10	0.08	0.10	0.08
Avg. wt. (lbs)	10.1	9.7	4.2	3.8
Hrs Fished	659	1342	526	1056
% fish returned	63	40	20	27

Section 3	salmon		sea trout	
	2004		2004	
No. fish caught	119	72	69	40
CPUE (catch / hour)	0.10	0.06	0.09	0.04
Avg. wt. (lbs)	10.7	9.3	4.9	4.5
Hrs Fished	1192	1148	782	972
% fish returned	65	45	62	35

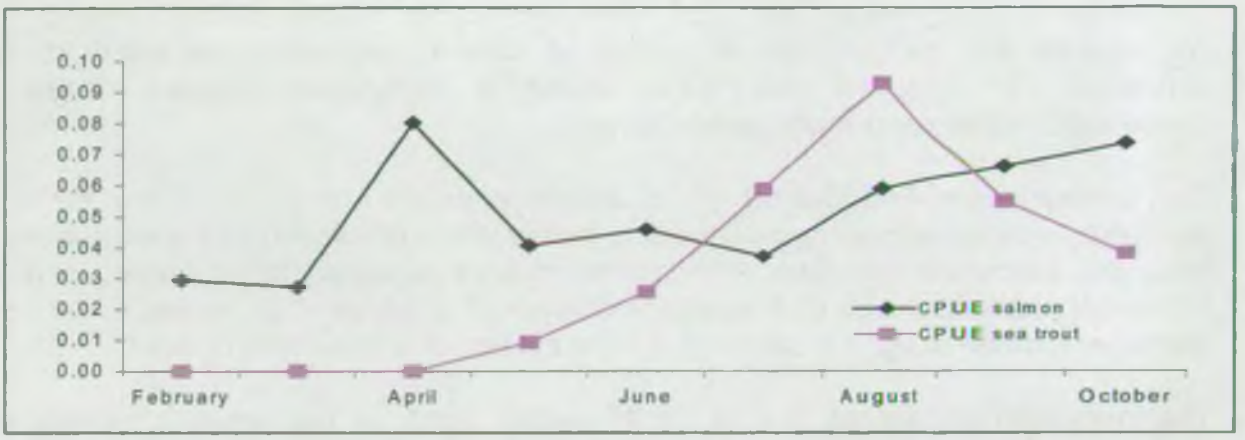
Section 4	salmon		sea trout	
	2004		2004	
No. fish caught	41	35	40	26
CPUE (catch / hour)	0.06	0.06	0.07	0.05
Avg. wt. (lbs)	9.6	10.5	4.8	3.7
Hrs Fished	724	550	582	484
% fish returned	66	64	48	28

Section 5	salmon		sea trout	
	2004			
No. fish caught	122	79	52	29
CPUE (catch / hour)	0.08	0.06	0.05	0.06
Avg. wt. (lbs)	10.5	10.2	5.4	3.9
Hrs Fished	1596	1338	976	468
% fish returned	57	59	44	33

Section 6	salmon		sea trout	
	2004	2005	2004	
No. fish caught	262	149	52	30
CPUE (catch / hour)	0.10	0.05	0.06	0.03
Avg. wt. (lbs)	10.9	10.8	4.7	5.1
Hrs Fished	2707	2892	860	1057
% fish returned	63	68	52	47

All Sections	salmon		sea trout	
	2004		2004	2005
No. fish caught	633	517	304	252
CPUE (catch / hour)	0.08	0.06	0.07	0.05
Avg. wt. (lbs)	10.0	10.1	4.6	4.1
Hrs Fished	7498	8573	4286	4938
% fish returned	63	58	48	38

Figure 6. Catch per unit effort (CPUE) of salmon and sea trout in 2005 by month



- Proportionately, fewer fish were returned to the river compared with 2004. Anglers released 58 per cent of salmon and 38 per cent of sea trout they caught in 2005 compared to 63 per cent and 48 per cent, respectively, the previous year.

- As in 2004, the highest rates of catch and release for both species were recorded on the upper North Tyne (such as section 1 in figure 5), with 70 per cent of salmon and 64 per cent of sea trout being released. The lowest rates of catch and release were recorded on the lower North Tyne, with 40 per cent and 27 per cent, respectively, returned.

We are very grateful to Sharpes of Aberdeen, the logbook scheme sponsor, all the anglers and angling clubs that took part in the logbook scheme in 2005. If you would like to be involved in future, further information can be found on page 39.

In addition to receiving a copy of the results, anglers returning completed logbooks are entered into a prize draw for top quality fishing tackle, in 2006, donated by The Orvis Company, Sharpes of Aberdeen and Frasers of Gateshead. Winner of the prize draw for the 2005 season was Mr Ian Shuttleworth from Stanhope who won a Sharpes 13 ft double-handed salmon rod.

3. Salmon egg deposition

Background

We assess the performance of stocks of salmon, expressed as levels of egg deposition, in England and Wales using a compliance scheme based on conservation limits and management targets.

The conservation limit, set at *11.25 million eggs* for the Tyne, is the minimum desirable level of salmon egg deposition, below which levels should not be allowed to fall. We calculate this from the catchment area available for spawning and the biological characteristics of the returning stock of adult fish (for example sex ratio, average number of eggs produced by a female fish of a given size or age).

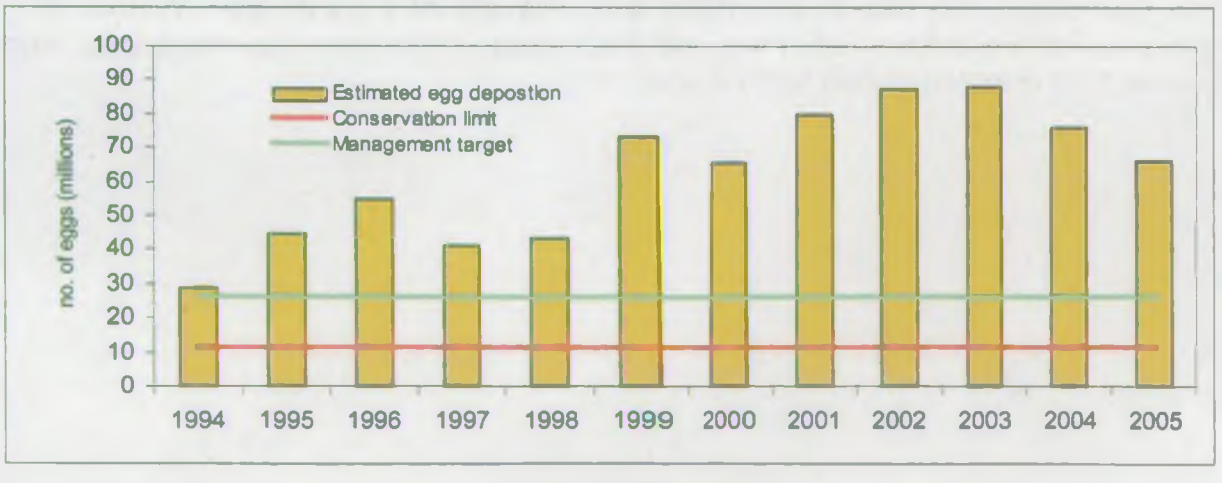
The management target, set at *26.15 million eggs*, is the level of salmon egg deposition needed to ensure our objective of exceeding the conservation limit is achieved most (that is 80 per cent) of the time. We estimate this from the variability in egg deposition for the last 10 years.

We assess compliance against these targets each year by estimating the number of eggs deposited by salmon surviving to spawn. This we derive from the declared rod catch and estimates of the levels of angler exploitation (that is the proportion of stock caught, allowing for fish returned).

Results

After allowing for losses to the net and rod fishery and other natural sources of mortality, it is estimated that returning adult salmon deposited in the region of 66 million eggs in 2005. As figure 7 shows, this exceeded the conservation limit by 588 per cent and the management target by 264 per cent. This level of spawning activity continued the upward trend of target compliance evident since 1994.

Figure 7. Salmon egg deposition estimates 1994 - 2005



4. Fish counter

Background

Our fish counter on the Tyne is situated at Riding Mill, approximately 11 kilometres upstream of the tidal limit at Wylam. In virtually continuous operation since installation in June 1996, the counter provides an indication of the combined number of adult salmon and sea trout passing upstream to spawn. It also provides information on the timing of fish migrations, which we can then relate to environmental factors such as river flow, water temperature and tidal cycle.

The raw data produced by the counter is routinely validated to give a more accurate indication of the number of fish passing upstream. This involves analysing the signals or 'trace data' corresponding to the individual 'ups', 'downs' 'and 'events' recorded by the counter and, where appropriate, making adjustments.

In general, no allowance is made for those periods when the counter is non-operational, e.g. when essential maintenance work is being carried out. Exceptions are during periods when one or both of the sluice (radial) gates immediately upstream of the counter are raised to trap returning adult fish (see Section 6). In these instances, a daily count can be extrapolated from the catch itself. [*Note: although it is known that some fish (e.g. large salmon) are able to bypass the counter when the gates are raised by ascending the adjacent spillway, the number involved is considered small in relation to the overall size of the run*].

Since the counter was installed, the annual upstream count (salmon and sea trout combined) has ranged from 15,219 recorded in 2000 to 48,668 in 2004. The peak monthly count is usually recorded in October.

Results

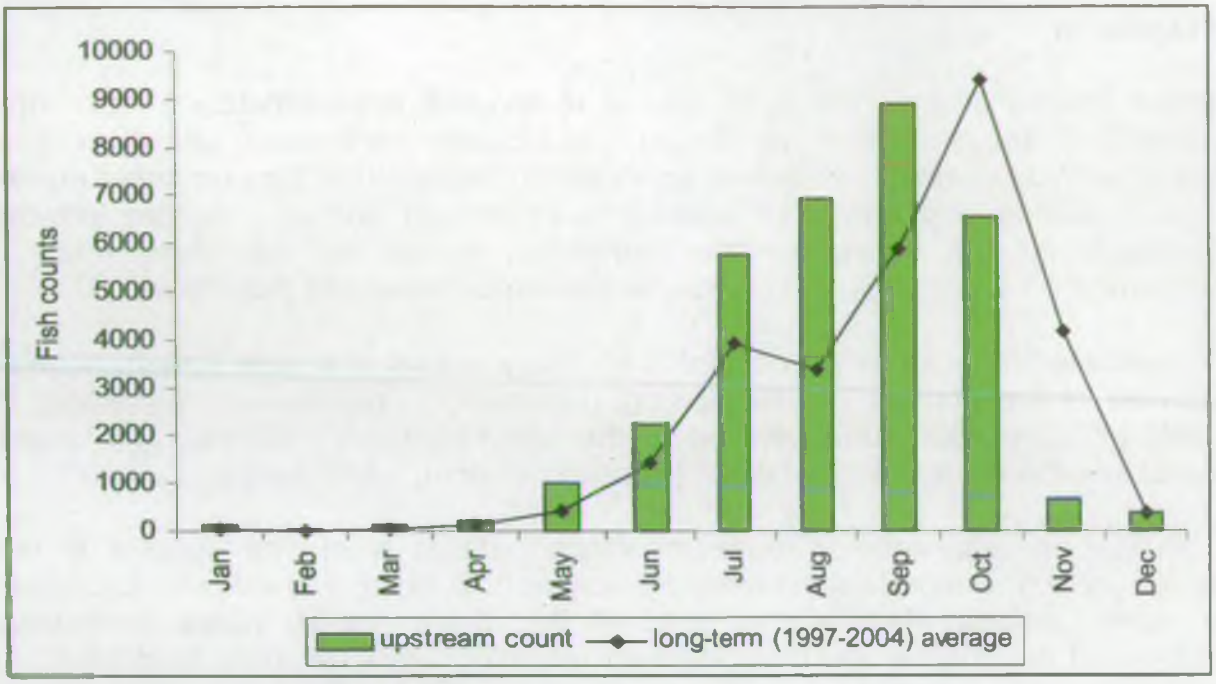
The counter was operational throughout 2005 and counts are available for 363 out of a possible 365 days.

Upstream counts

The total validated upstream count for 2005 was 32,918. Although lower than recorded in 2003 and 2004 (by 25 per cent and 32 per cent, respectively), this was higher (approximately 10 per cent) than the long-term (1997-2004) average of 25,984 counts and ranked the fourth best on record. Historical fish counter data is shown in Table 1 (Appendix I).

Figure 8 compares monthly counts recorded in 2005 with their long-term (1997-2004) averages. Totals for January through to September were all above average, notably August, which ranked the highest on record. However, counts for October, November and December fell markedly below - the main reason why the total for the year fell short of totals in recent years.

Figure 8. Monthly upstream counts recorded by Riding Mill fish counter in 2005



Patterns of fish movement

There was evidence of environmental factors triggering fish movement during 2005, acting either independently or in combination.

Counts indicated river flow to be the primary trigger for migration, with the more significant 'runs' of fish tending to occur during periods of increasing or decreasing flows rather than on the flow peaks.

Counter data also showed the influence of both river temperature and tidal regime on fish movements - some examples can be seen figures 9 and 10 (Appendix 2). During the winter months, counts tended to correlate closely with periods of elevated water temperatures: 6°Centigrade appearing to be the threshold above which fish movement would occur. There was also a tendency for the larger runs of fish to occur on spring tides: fish are known to take advantage of these large increases in tidal floodwater to migrate from the estuary into the freshwater.

The time of day fish migrated upstream over the counter is shown in figure 11 (Appendix 3). Broadly speaking, this followed a similar pattern to that observed in 2004, which was as follows:

- **January**, **February**, **March**, **November** and **December** - fish movement was greatest during daylight hours (we are unclear why this happens but it may be that, under high flow conditions, fish are more readily able to overcome the counter weir during the daytime).
- **April** – migration occurred mainly at night, with peaks in activity between 6pm and 7pm and from 2am to 3am (no obvious explanation).

- **May through to August** - predominantly nocturnal activity (this is consistent with the low river flows that prevailed at the time and the known preference for fish to migrate upstream during the hours of darkness under such conditions).
- **September** and **October** - no clear pattern.

Counter efficiency

Although information from our fish video indicates the counter to be sufficiently accurate at low flows to determine the numbers of fish migrating, assessing its performance under higher flow conditions has proved problematic, largely because of the poor visibility. In 2005, we carried out a trial with a sonar system known as 'DIDSON', as an alternative way (to video for example) of providing information on the accuracy of the counter under a greater range of flow conditions. Initial results were encouraging and we plan to continue this work.

5. Fish video

Background

An underwater fish video system has been in operation at Riding Mill since October 2003. Information from the video is used to identify by species the fish passing upstream over the fish counter and to provide additional biological information on returning fish (for example, on fish size and condition). It is also used for validation purposes, as it enables us to see what proportion of the fish passing upstream is actually registered by the counter.

The system consists of six side-view underwater cameras, positioned immediately upstream of the fish counter weir, linked to a digital video recorder. The viewing area in front of the cameras is illuminated by overhead infrared lights to capture images of the fish migrating upstream at night without alarming them. An example image captured from the video can be seen in Appendix 6.

In addition to providing real-time information, the system has been configured to capture simultaneously the images from all the cameras (for a period of 20 seconds) each time an 'up' or an 'event' is registered on channel 4 of the counter. These recordings of fish passing through channel 4 are then reviewed alongside the corresponding files from the counter and the fish observed are identified to species.

Characteristics such as shape of the tail, narrowness of the wrist of the tail and the position of the jawline in relation to the eye are used to distinguish between salmon and sea trout. Size, external markings and behavioural traits (for example, fish's position in the water column) are also used to identify the fish.

Results

The video system was operational throughout 2005 except during the short periods when the radial gates were raised to trap returning adult fish.

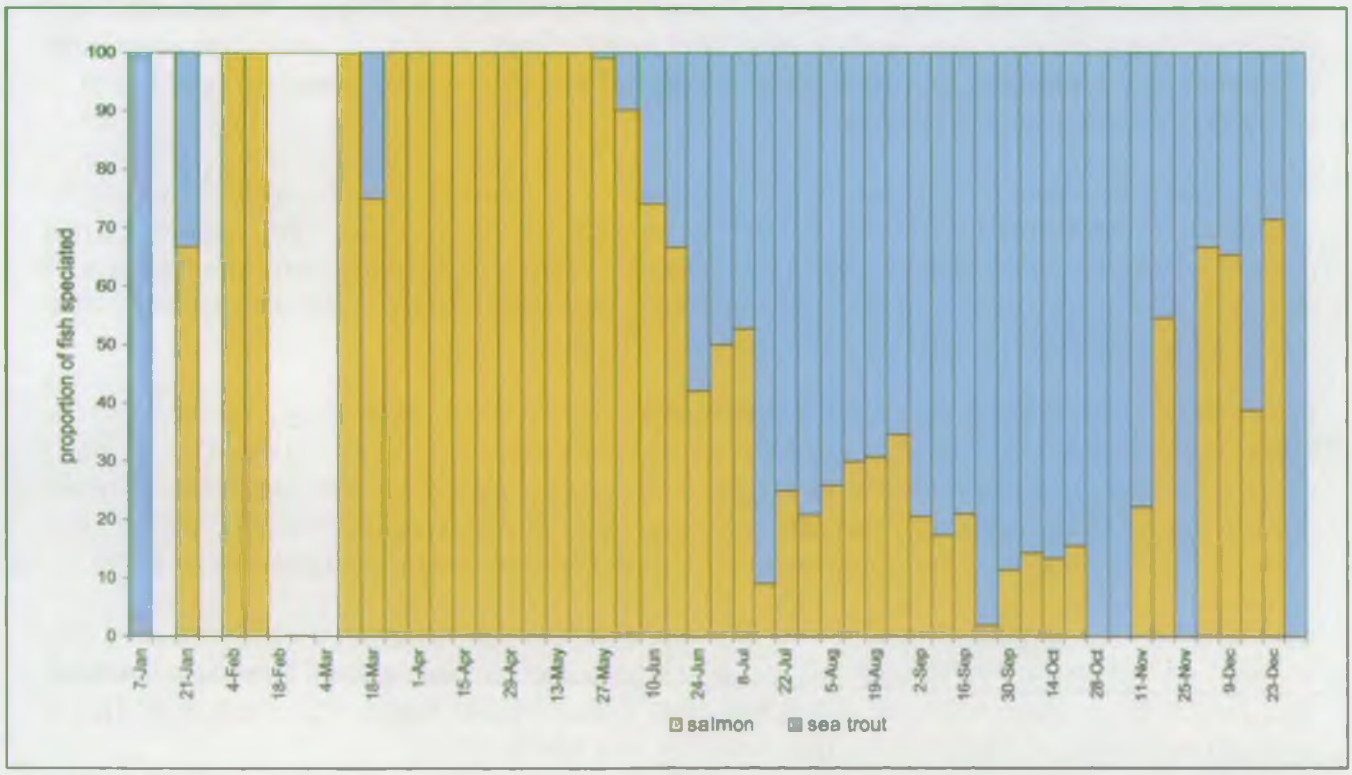
Species composition

In all, 1128 adult fish - 551 salmon and 577 sea trout - were identified from images collected by the video during the course of the year, equivalent to 3.4 per cent of the total upstream count for the year. This compares with 2.5 per cent in 2004.

Figure 12 provides a breakdown of the relative proportions of salmon and sea trout observed on the video each week. The main findings are:

- January to mid-February – **mainly late spawning sea trout**
- March, April and May – **mainly fresh run salmon** (a few sea trout from the previous spawning year also observed during the third week in March)
- June to mid-July – **salmon dominant** but sea trout begin to feature in progressively greater numbers
- mid-July to mid-October - **sea trout outnumbered salmon** and were the only species observed during the final week in October and first in November
- remainder of the year - **neither species dominated**

Figure 12. Fish species migrating upstream over the fish counter in 2005



Note: Gaps in data correspond to periods when no fish were observed and/or when zero counts were recorded by counter. Results for period January to June are based upon reviewing all images recorded by the video. Sub-sampling strategy, based on identifying 10 fish a day, adopted for the remaining months (i.e. when larger numbers of fish are migrating upstream).

Overall, the composition of the returning run of fish observed moving upstream over the counter was broadly similar to 2004. However, the sea trout run did appear to reach Riding Mill later in 2005 – sea trout were not seen on the video until 28 May but formed around half of the fish observed in April 2004.

We use the observed trends in the relative proportions of salmon to sea trout to monitor changes occurring within each species over time. Further information, such as on the accuracy of the counter, as well as on fish behaviour in its vicinity, is required however, before video data can be used to portion the counts recorded by the counter to species and estimate reliably the numbers of salmon and sea trout passing upstream. In particular, we need to identify the extent to which the counter channel overlooked by the cameras is used by each species under differing flow conditions.

6. Adult fish sampling

Background

To obtain reliable information on the returning 'run' of salmon and sea trout in the Tyne, we operate a fish trap within the fish pass at our Riding Mill facility. This trap supplies vital information on the age, size and general condition of the fish, data we use in conjunction with that from our counter and fish video.

Trapping enables us to monitor changes occurring in the structure and composition of the stock, and will ultimately be used, together with information from the other elements of the programme, to determine any impact the tunnel scheme has on salmon and sea trout stocks.

The fish caught are measured, weighed and their condition, such as incidence of disease, damage from predators and marks from fishing nets, recorded. Scale samples are taken to age the fish, to identify separate year classes within the returning population. To enable us to track their subsequent movements, the fish, once processed, are 'floy-tagged' before being returned to the water (see page 39 for details on how to report captures of tagged fish). We anaesthetise the fish (in clove oil) to keep them calm during the examination procedure, which takes but a few minutes to complete.

The trap is operated for a few days each month from June through to December, when large runs of salmon and sea trout are occurring. Information from other data sources is used to support and complement the information we gather from trapping, including:

- a scale sampling programme involving anglers fishing near Riding Mill
- analysis of seasonal fish deaths in the estuary and lower river (see Section 8)
- fish tagged by CEFAS for the fish tracking element of the monitoring programme (see Section 9)
- fish caught during the broodstock collections for the Kielder Hatchery
- ad hoc scale sampling, for example, from poaching or pollution incidents

Results

489 adult fish were sampled during the course of the year - 304 salmon and 185 sea trout. Trapping operations accounted for 174 fish and the angler scale sampling programme provided 92, the bulk caught by anglers during the spring. The remainder were mostly adult fish carcasses collected from the estuary during the summer.

Table 2 (Appendix 4) provides a breakdown of the numbers and relative proportions of each species sampled in 2005, together with information on fish size. Salmon sampled ranged between 3 lb. and 33 lb., sea trout, from 1 lb. to 17 lb.

Fish ageing results are presented in Table 3 (Appendix 5). The main findings were as follows:

Sea age - salmon

In keeping with the known profile of the run, salmon caught by anglers before July were predominantly (92 per cent) 2-SW fish with a few 3-SW individuals (six per cent) and a single 1-SW or grilse (two per cent). Both grilse and 2-SW fish were recorded in July. However, the number of fish sampled by anglers was insufficient to provide a reliable basis to assess the composition of the run. Grilse was the only sea age group recorded in scale samples submitted by anglers for August and they also predominated in September. Here again though, the sample size was small. Unfortunately, no samples were received from anglers to allow us confirm the ages of the fish they caught in October.

Results for fish tagged by CEFAS were generally consistent with these findings, as were those obtained from our trapping operations at Riding Mill. Most of the salmon (89 per cent) trapped in June were 2-SW fish and grilse was also the predominant (71 per cent) age group recorded during the trapping operation at the beginning of September. [The August trapping operation was cancelled due to high flows]. Too few fish were trapped in October, November and December to provide a robust sample. However, both grilse and 2-SW fish were recorded during this period.

The age composition of dead salmon recovered form the estuary was similar to that observed in previous years. Of the 52 fish that could be aged, most (88 per cent) were 2-SW fish, followed by 1-SW fish (10 per cent) and a lone 3-SW specimen (two per cent). Older, larger fish are thought to be more susceptible to stresses induced by poor water quality conditions in the estuary, hence the bias towards 2-SW and older fish, with grilse underrepresented.

Sea age - sea trout

Results for sea trout reflected the known tendency for fish from north east rivers not to return until after their first winter at sea. Between 66 per cent and 86 per cent of sea trout trapped each month in 2005 were 'maiden fish', spawning for the first-time, 87 per cent of which were returning after spending one year at sea. The remainder had spent two years at sea.

Similarly, most (84 per cent) of the fish tagged by CEFAS during 2005 (the only other significant source of information) were also maidens.

The maximum number of spawning marks recorded from the scales of sea trout sampled in 2005 was three, the largest of which weighed just over 9 lbs (the larger fish sampled had fewer spawning marks).

River (smolt) age – salmon and sea trout

Over 90 per cent of adult fish sampled had migrated to sea after spending two years in freshwater. The exceptions were salmon tagged by CEFAS in August, the bulk of which (71 per cent) had migrated after one year in the river. This disparity may be due to the relatively small number of fish involved.

We will continue to identify and develop our sources of data on returning adult fish in order to provide larger and more representative samples in future. This is important if we are to gather a reliable baseline of information on the structure and composition of the run before the tunnel construction begins. If you would like to take part in the angler scale-sampling programme, further information can be found on page 39.

7. Smolt trapping

Background

In 2004, we began trapping smolts at Riding Mill using a rotary screw trap. Our purpose is to gather information about the size and composition of the smolt 'run' and to understand better the patterns of downstream migration - a phase of the life cycle that had not been studied in detail since the early 1930s. Specific objectives of this work are to:

- determine the temporal pattern, species and age composition of smolts emigrating from the Tyne in relation to environmental factors such as river flow and water temperature;
- obtain information on the size of the Tyne smolt runs in order to identify between-year differences in smolt output from the river;
- provide salmon and sea trout smolts to CEFAS to monitor the patterns of fish migration in the Tyne estuary.

In addition to operating the trap during the spring of each year, it was also operated during the autumn of 2005 to investigate further anecdotal reports of autumnal migratory activity of juvenile salmon and sea trout on the Tyne.

The fish we catch in the trap are identified to species and their general condition is noted. A sub-sample of the day's catch is taken, measured for length and a proportion scale sampled to reveal the age of the migrating smolts.

The number of fish caught in the trap represents only a small portion of the total number migrating in a period. Consequently, we carry out 'mark-recapture' experiments to estimate what proportion is being caught and hence the total number of each species passing downstream. This involves dye-marking a proportion of the smolts we catch, releasing them upstream and then noting how many are recaptured in the trap.

We normally check the trap for fish twice a day. Exceptions are during periods of high river flows, when it has to be attended to more frequently in order to clear debris, and towards the end of the season, when it may only be checked once a day as catches diminish.

Results

Spring trapping

Trapping took place between 5 April and 27 June 2005. Adverse river conditions prevented the trap being operated from 6 to 10 am and between 15 and 20 of April, giving 70 days trapped out of a possible 81 within the period. Consistently low catches experienced during the preceding weeks led to trapping ending for the season on 27 June.

Trap catches

A total of 4,813 smolts were captured, of which 3,698 (77 per cent) were salmon and 1,115 (23 per cent) sea trout. Comparative figures for 2004 were 5,535 smolts - 3,467 (63 per cent) salmon and 2,068 (37 per cent) sea trout.

Smolt size and age

On average, salmon captured measured 12.5 centimetres in length and sea trout, 15.9 centimetres. Smolts captured in 2005 were, on average, approximately one centimetre larger than their 2004 counterparts.

Scale samples taken indicated that:

- all smolts were migrating to sea after one to three years spent in the river;
- most (89 per cent) of the salmon migrating were two year-old, followed by one year-old (nine per cent) and three-year old (two per cent);
- the majority (93 per cent) of sea trout were also two year-old, followed by three-year old (six per cent) and a lone one-year old individual (one per cent);
- higher incidences of two-year-old smolts were migrating than in 2004, when 67 per cent of salmon and 78 per cent of sea trout sampled were fell into this age group (this may, in part, account for the size difference).

Studies carried out elsewhere (such as on rivers Dee and Wye) indicate that there has been a general shift towards the production of younger smolts in recent years.

Run timing

Figures 13 and 14 detail trap catches in relation to river flow and water temperature. The pattern of migration was broadly similar to that observed in 2004. Most (more than 70 per cent) of the smolts were captured over a 30-day period between 27 April and 26 May, with three distinct periods of more intense smolt activity evident around 28 April (when 233 smolts were captured), 3 May (753) and 25 May (341).

The pattern of catches suggested smolt activity began to increase once water temperatures rose above 10° Centigrade (as measured at the Bywell gauge approximately one kilometre d/s). Peak migration then occurred during flow events, with the larger catches invariably recorded the night immediately following a rise in river level.

Figure 13. Numbers of salmon smolts captured at Riding Mill, spring 2005

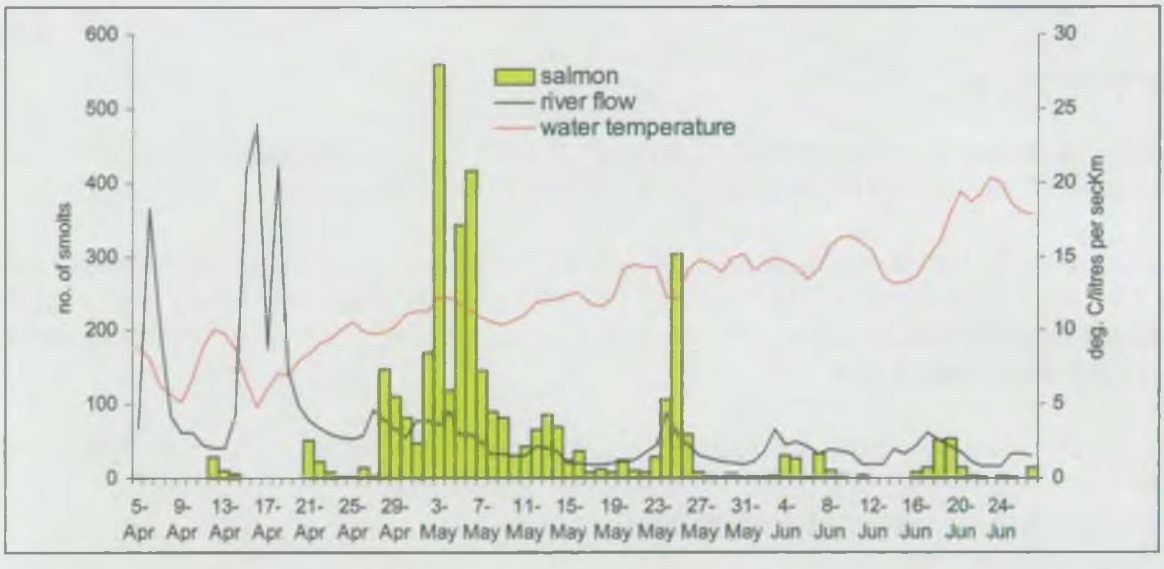
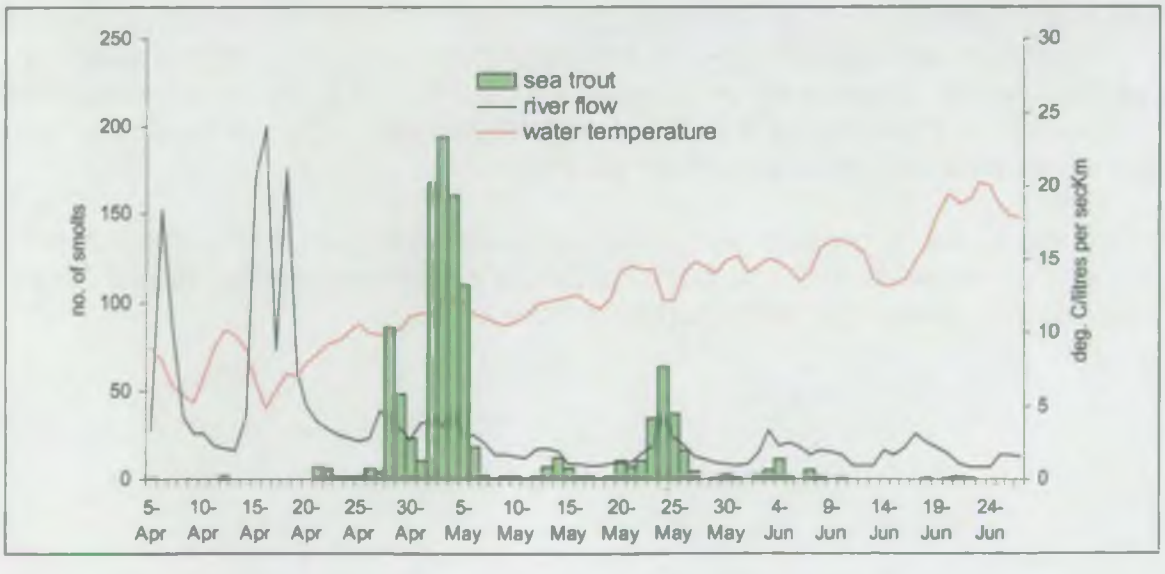


Figure 14. Numbers of sea trout smolts captured at Riding Mill, spring 2005



Mark-recapture

Based on mark-recapture data, we estimate that 177,358 salmon smolts (margin of error: 106,458 to 323,113) and 66,170 sea trout (30,703 to 179,604) migrated during trapping operations in 2005. Comparative figures for 2004 are 121,686 salmon and 60,372 sea trout.

Because of the trap downtime in April, we are not able to estimate the numbers migrating over the likely entire duration of the run. However, by comparing estimates for more discrete periods (for example, weekly or bi-weekly) we can build up a picture of the numbers likely to be migrating and identify any trends occurring. This may also provide further clues as to why smolts are migrating at particular times of the year, for example, due to changes in river flows and river temperatures.

By marking greater numbers of smolts in future, we hope to make our estimates more robust.

Autumn trapping

The trap was operated continually between 9 and 28 September 2005, after which high water levels prevented any further trapping from taking place.

Fifty-five juvenile fish were captured, of which 53 (96 per cent) were salmon and two (four per cent) sea trout. The majority (40 salmon and one sea trout) was caught during a flow event at the end of the trapping exercise on 28 September, immediately prior to the trap being taken out.

From their external appearance and other characteristics (for example, milt expression), the fish were judged to be either:

- sexually mature precocious male parr
- maturing male parr
- immature parr.

Downstream movement of juvenile salmon in the autumn and winter has been reported on a number of other UK rivers, for example Girnock Burn in Aberdeenshire. These 'migrations' are associated with a variety of factors such as maturity and food availability. In the absence of any evidence to the contrary, we assume that those fish migrating the Tyne during the autumn period remain in the river until the spring when they form part of the run of smolts for that year.

Although there are at present no plans to operate the trap during the autumn in future, an investigation into the patterns of parr migration in the Kielder Burn is planned for 2006 (see page 36 for further details).

8. Fish mortalities

Background

Although substantial water quality improvements in the Tyne Estuary have allowed the continued recovery of populations in the Tyne, during periods of sustained hot and dry weather, returning adult salmon can die in estuary and lower river.

We carried out investigations for the Tyne Estuary Group (TEG) in 1995 and 1996, which concluded that deaths were caused by low dissolved oxygen (DO) in the estuary. It was considered that high temperatures accentuated this problem and low tidal range creating a layering effect in the water column, which has been worsened further by past dredging of the upper estuary. Subsequent water quality improvements (notably to Howden sewage treatment works) have helped to alleviate the situation somewhat such that wet years like 2004 have been free of mortalities. However, they continue to occur in hot and dry years.

Kielder releases have been used to attempt to move ailing salmon out of the danger areas. The 1996 TEG report concluded that releases from Kielder reservoir could not be used to improve dissolved oxygen within the estuary, as the volume of water required to improve water quality (double the maximum 50 cumec release) could not be sustained without substantially lowering the level of the reservoir. Examination of data from Riding Mill counter also indicates that releases from Kielder do not appear to stimulate migration to anything like the extent that natural spates do. Thus, they may not be effective in preventing salmon deaths. We also need to take into account the potentially adverse impacts that such releases may have on the wider ecology of the Tyne catchment, particularly the upper North Tyne.

Results

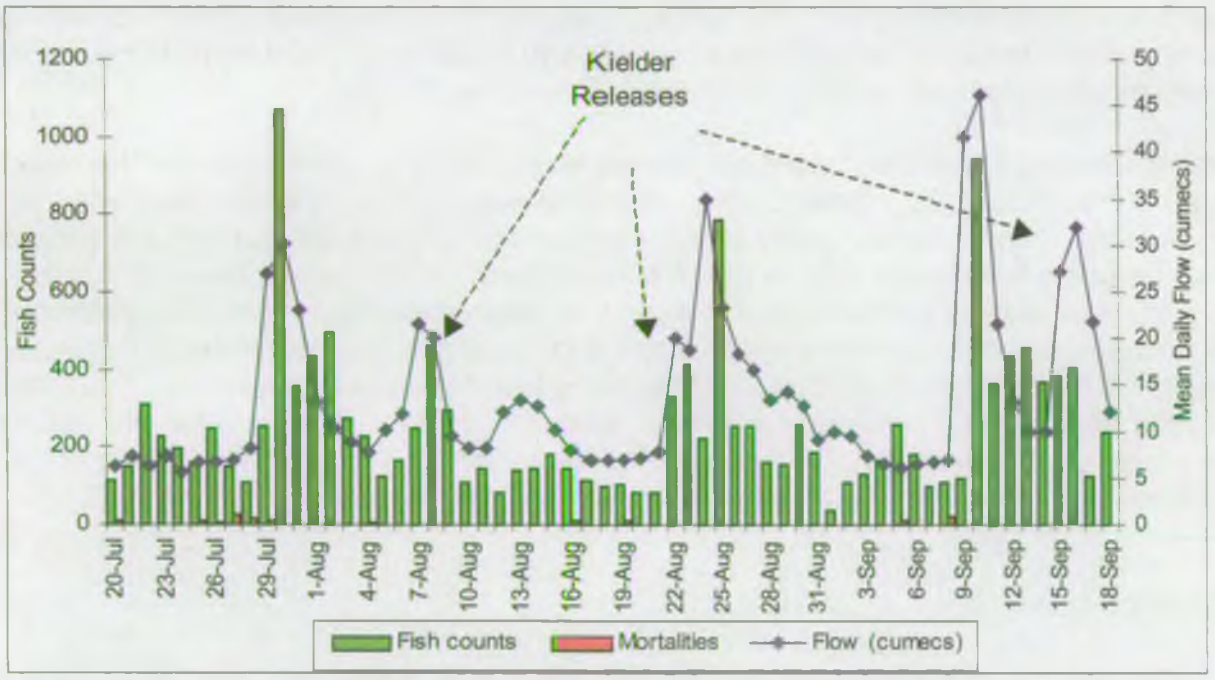
Between the 14 July and 9 September 2005, a total of 134 adult fish carcasses (122 salmon, 10 sea trout and two unidentified) were collected both from the estuary below Wylam, and above the tidal limit, notably the Hexham area. In common with previous years, most of the fish that died were 2-SW hen salmon in the 10-15 lb size range.

The total mortality is estimated to be in the region of 250-300 fish, as not all the fish that died were reported and some were unable to be recovered safely. Thus, the deaths appear not to have been on the same scale as on some previous occasions - 917 dead fish were collected in 1995, 879 the following year and 1,182 fish in 2003.

We carried out regular patrols of the upper estuary from the bankside during the summer. A programme of fish carcass removal was initiated to monitor the situation and determine the scale of the mortality. In an effort to alleviate the problem, three releases were made from Kielder reservoir. As on previous occasions, these were timed to coincide with spring tides to maximise the likelihood of encouraging fish out of the estuary.

Figure 15 shows the number of upstream counts recorded by the Riding Mill counter and the number of dead fish collected in relation to river flow during the period. This supports previous observations about the effects of releases on fish movement. The natural flow event at the end of July prompted the single greatest movement of fish through Riding Mill, with 1069 upstream counts recorded. On the other hand, the Kielder release at the beginning of August appeared to trigger a smaller increase in fish movement, with a peak daily upstream count of 462 recorded on the eighth of the month. The figure also shows that despite the mortalities, many fish were able to return to the river during the summer, and the deaths represent a small proportion of the total number of returning adult salmon.

Figure 15. Upstream fish counts in relation to river flow, summer 2005



Please continue to report any dead, dying or distressed fish by calling our 24 hour emergency hotline on 0800 807060. With your help, we will continue to monitor seasonal salmon deaths, and where necessary mitigate for losses by increasing the level of salmon stocking from the Kielder Hatchery.

Beginning in 2006, we are undertaking a study that will provide information on fish movements in relation to natural flows and Kielder releases. The effects of releases on fish mortality will also be investigated. Results from the study will be available to the public.

We will also work closely with anglers to gain a better understanding of the number and distribution of fish deaths on the Tyne.

9. Fish tracking

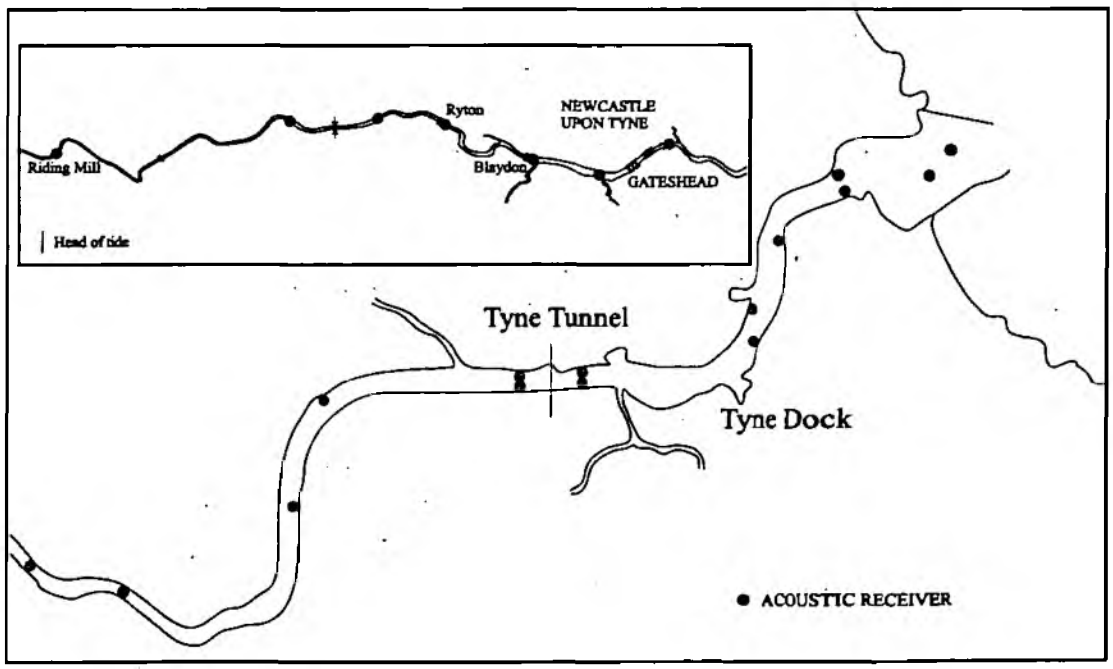
Background

In October 2003, CEFAS commenced the 'River Tyne Crossing Salmon and Sea Trout Tracking Programme'. The overall aim of this study is to assess the potential impact on migratory salmonids of the construction of a second Tyne Tunnel. Specific objectives are to:

- monitor the movements of returning adult salmon and sea trout and smolts emigrating the Tyne;
- describe the movements of adult and smolt salmon and sea trout in relation to environmental factors such as tidal cycle, river-flow and agreed water quality parameters. In particular, to identify the timing of fish passage through the estuary, the speed and duration of estuarine passage, the location of sections of the estuary used as rest or holding areas and any differences between the movements of salmon and sea trout;
- identify any effects of the construction of the tunnel on the established patterns of salmon and sea trout migration.

The study area extends from the mouth of the estuary at Tynemouth to Riding Mill. Fish movements are monitored using an acoustic telemetry system consisting of coded acoustic transmitters and strategically positioned acoustic receivers (15 in no.). Figure 16 shows where these receivers are located in relation to the tunnel development near Howden. During the main in-river works phase of the tunnel construction, it is also planned to carry out active tracking of tagged fish from a boat to provide a more detailed picture of their patterns of movement and behaviour.

Figure 16. Locations of acoustic receivers in the estuary



All adult fish are caught by commercial netsmen operating T-nets under licence close to the estuary mouth, while smolts come from our trapping operations at Riding Mill. Individual fish are anaesthetised and a coded acoustic transmitter is surgically implanted inside the fish. They are then allowed to recover fully from the tagging procedure before being released at the site of capture.

Results

Results from the first two years of the tracking programme (i.e. October 2003 to October 2005 inclusive) are as follows:

Adult fish

Of 123 adult fish (69 salmon and 54 sea trout) tagged, 63 (51 per cent) passed through the tunnel construction site and migrated upstream through the estuary. Of these, 48 (76 per cent) subsequently migrated past the tidal limit at Wylam and entered the freshwater section of the Tyne. Findings were:

- estuary residence of adult fish was variable, varying between less than one to 80 days;
- adult fish migrate upstream through the estuary predominately during a flooding tide;
- further tracking of individual fish in freshwater revealed a wide distribution of these fish within the Tyne catchment during the spawning period.

Smolts

Of 120 smolts (62 salmon and 58 sea trout) tagged, 90 (75 per cent) subsequently entered the estuary and emigrated out into coastal waters. Findings were:

- freshwater residency (post-tagging) of individual fish varied between eight hours and two weeks (mean five and a half days)
- estuary residency was less variable, from less than one day to over seven days (mean two days)
- smolts emigrated out of the estuary predominately during an ebbing tide.

Fish will continue to be tagged each year prior to the construction of the tunnel. Their subsequent movements will be monitored using the acoustic tracking system and patterns of migratory behaviour related to environmental conditions.

The number of fish tagged during the construction year of the tunnel will increase to 120 smolts and adults. This will ensure that sufficient data is gathered during this period to enable robust statistical analysis to be performed, and the question of whether the construction of the tunnel has an effect upon the established patterns of salmon and sea trout migration addressed.

10. Electric fishing

Background

We commenced a programme of annual surveys of juvenile salmonid populations for each of the major salmonid watercourses in the Northumbria area in 1991. The objectives of this programme are to establish baseline data on the distribution and status of juvenile salmonid populations and to determine and monitor the natural variability within these populations over time.

These annual surveys provide information on the temporal and spatial distribution of juvenile salmonid stocks, an index of stock abundance, and an assessment of the extent to which spawning and nursery areas for juvenile salmonids are being utilised.

Fisheries Classification Scheme

The national Fisheries Classification Scheme (FCS) has been developed to classify fisheries survey results. It uses a scale of fish abundance from A to F, according to the densities of young fish (0+) and older fish (>0+) that are recorded during these surveys. Sites that achieve an A, B, or C grade are considered above average, and those sites where no fish are recorded are graded F.

Results

In the summer of 2005, twenty-one core sites that are fished on an annual basis were surveyed on the main River Tyne, North Tyne, River Rede and South Tyne. Of these sites, five are inaccessible to migratory salmonids, so no natural salmon production occurs. Two of these sites, the Kielder Burn and the Scaup Burn, are used as nursery areas for salmon stocked from Kielder Hatchery, so although they are above Kielder dam, which forms an inaccessible barrier to migratory salmonids, salmon are often recorded there. Figure 17 summaries the main findings.

Salmon

- The greatest density of 0+ salmon in the Tyne catchment was found on the **North Tyne at Newton**, closely followed by the **River Rede at Greenchesters**. Both these sites were ranked 'A' according to FCS indicating they fall within the top 20 per cent of all sites in England and Wales. Throughout the catchment, only three sites that had access to migratory salmonids had no 0+ salmon present.
- Excluding the stocked burns, the highest density of more than 0+ salmon was recorded in the **Tarset Burn**, historically a very productive area for salmon. At three of the sites that had access to migratory salmonids, no more than 0+ salmon were found.

Trout

- There was a decline in recorded trout densities across the Tyne catchment, particularly on the main river sites. Twelve of the 21 sites had no 0+ trout recorded in 2005. The greatest density of 0+ trout was found on the **Tarset Burn**, closely followed by the **River Rede at Experimental Farm.**

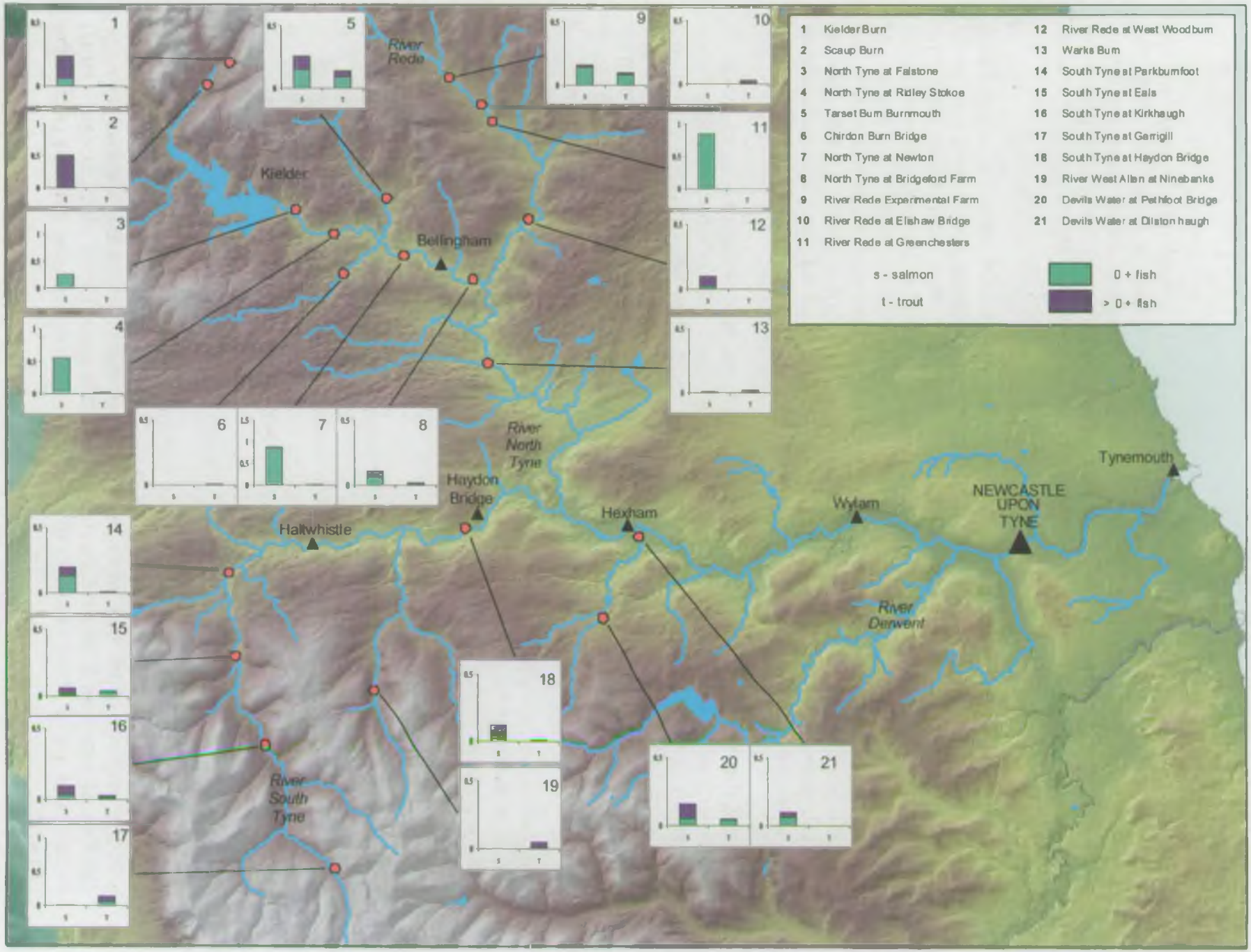
- The greatest densities of more than 0+ trout were found on the **South Tyne at Garrigill** and on the **Tarset Burn**. Five of the sites surveyed had no greater than 0+ trout. Densities were, on average, lower than in previous years.

Fisheries Classification Scheme

- The FCS rankings for both salmon and trout reflect these lower densities with only 20 per cent of sites being classified as average or above (grades A-C). This compares to 2004 when more than 60 per cent of the sites sampled were classified as average or above.

These results indicate that widespread recruitment of both salmon and trout continues to take place throughout the Tyne catchment. The abundance of salmon remains high at the majority of sites, and is within the annual variation previously observed. The lower than average trout densities recorded may be due to heavy flooding, particularly in the South Tyne catchment, in January 2005, which may have washed out sea trout redds. However, salmon populations have not been similarly affected, and the lower trout populations may be a response to other factors.

Figure 17. Densities (no. per metre squared) of salmon and trout, summer 2005



Special issue

Effect of drift net buyout in 2003

Since 1993, there has been a policy to phase out coastal mixed stock salmon fisheries in England and Wales as existing licensees retire. In December 2000, the government offered up to £750,000, subject to matching funds from interested parties, to launch compensation arrangements designed to accelerate the phase-out of mixed stock fisheries on a voluntary basis, with particular emphasis on the north east coast fishery.

Ultimately, the scheme was based on funding of nearly £3.4 million of which £1.25 million came from the Government, and 52 licensees signed agreements with North Atlantic Salmon Fund (UK) to permanently relinquish their licences in return for payments of agreed sums. As a consequence, 16 drift net licences were issued in 2003, 2004 and 2005 compared with 69 in 2002 (down 77 per cent). The number of drift net licences issued for the north east coast has therefore been reduced by 89 per cent since 1992. The remaining drift nets in 2005 took a catch of 5,607 salmon. This compares with 5,921 in 2004, 5,511 in 2003 and 27,685 in 2002; the catch in 2005 is thus 80 per cent lower than that in 2002.

Some of the netsmen who relinquished their drift net licences were able to remain in the fishery by switching to inshore T- or J- nets, which are known to exploit a higher proportion of local salmon and particularly sea trout. The salmon catch by T/J nets rose from 3,295 in 2002 (41 nets) to 5,096 in 2004 (55 nets), an increase of 55 per cent. In 2005, the catch fell to 3,380 salmon from 54 nets. The overall net catch on the north east coast has therefore fallen from 30,980 in 2002 to 8,987 in 2005 (down 71 per cent).

The reduction in netting effort in the North East region appears to have had a substantial beneficial effect on salmon runs and catches in local rivers. On average, the Tyne count in the three years since the buy-out (2003-05) has been 41,883 fish, representing an increase of 98 per cent on the mean count in the five years prior to the buy-out (21,152 fish).

It should be noted however that fish numbers passing through Riding Mill have substantially increased in all months since 2003 including months outside of the netting season (June to August). This implies that some of the increase may be attributed to natural variation. After good catches in 2004, salmon rod catches in 2005 were again above average in all of the rivers in the North East region. The salmon rod catch for the Tyne in 2005 was 3,591, the Coquet 1,130 and the Wear 971.

On average, declared rod catches of salmon in North East rivers (including fish released) has been 55 per cent higher in the three years since the buy-out compared with the average of the five years before the buy-out. In contrast, however, average catches of sea trout in North East rivers are a little lower (down nine per cent overall) in the three years since the buy-out compared with the five-year average prior to the buy-out.

It should be noted that the improvement in salmon catches and escapement in north east rivers may reflect both reduced levels of exploitation in the net fishery. This is due to the drift net buy-out, and possibly favourable flows and good angling conditions in some years. It will not yet, however, reflect increased production, since any increase in juvenile production from enhanced escapement from 2003 onwards will not be reflected in the grilse run before 2006.

Adapted from the 'Annual Assessment of Salmon Stocks and Fisheries in England and Wales 2005 – preliminary assessment prepared for ICES, April 2006'

Other news

1. Salmon stocking

A salmon stocking programme began on the Tyne in 1981 to compensate for the loss of spawning area brought about by the construction of Kielder Reservoir. This involves stocking a minimum of 160,000 hatchery-reared juvenile salmon into the river and its tributaries each year. Stocking has since been extended, first to mitigate for losses in the estuary arising from poor water quality during dry summers and second, as a precautionary measure for any impacts of the second Tyne Tunnel construction.

The fish are stocked either as 0+ (young of the year) in the autumn or 1+ (over-wintered) fish in the spring. Areas with good nursery habitat but supporting relatively low densities of wild juvenile salmon, as determined from electrofishing fisheries survey data, are selected as stocking locations.

560,000 hatchery-reared juvenile salmon were stocked into the Tyne catchment in 2005. Table 4 details the number of salmon stocked at each stocking location.

Table 4. Stockings from the Kielder Hatchery in 2005

Location	Spring	Autumn
	1+	0+
North Tyne	30,000	135,000
River Rede	10,000	85,000
Kielder Burn	10,000	40,000
South Tyne	30,000	110,000
Main Tyne	30,000	80,000
Total	**110,000**	**450,000**

2. Kielder Burn smolt trap

Salmon that we stock into the Kielder Burn, a tributary of the North Tyne above Kielder, subsequently migrate downstream and are intercepted by a trap before reaching the reservoir (see Appendix 6). They are then transported by road to a release point below reservoir dam from which they can resume their seaward migration.

Ranching smolts in the burn in this way serves both to increase the production capability of the Kielder Hatchery and make best use of the habitat available. This habitat has been inaccessible to returning adult fish since the reservoir was built. Those that survive to return to the river as adults augment the stock of wild fish and contribute to overall levels of egg deposition.

Sea trout smolts are also captured in the trap. Since there is no access for returning adult fish and none have been stocked, these can only be the offspring of the resident wild brown trout that exist in the burn. This is a good example of a 'landlocked' population of non-migratory brown trout producing migratory offspring, that is sea trout.

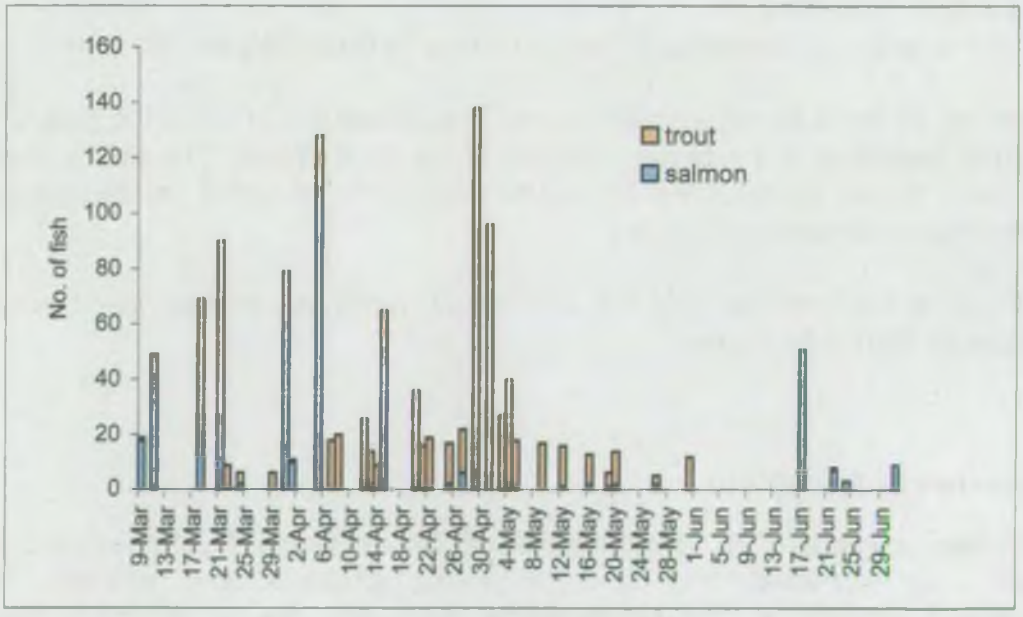
Fish that originate from the Kielder Burn have their adipose fin removed to allow them to be identified (see Appendix 6). From reports of recaptures of these fish as returning adults, we are able to evaluate their contribution to salmon stocks as a whole. For example, we estimate the catch of 2,470 salmon in the trap in 2003 generated in the region of an additional 120 returning adult fish for the Tyne fishery in the years that followed. It is estimated that those salmon that survived to spawn deposited around 370,000 eggs.

Catch data from the Kielder burn trap is used to optimise the timing, numbers and distribution of salmon stocked to the burn. Recaptures of Kielder Burn fish in the smolt trap at Riding Mill also allow us to examine their in-river survival and migration rates.

Trap catches in 2005

Between 9 March and 1 July 2005, a total of 439 salmon and 762 sea trout were caught in the trap and subsequently transferred below the reservoir. As figure 18 shows, the bulk of the fish were captured during the first half of the trapping period.

Figure 18. Numbers of salmon and trout trapped on Kielder Burn, spring 2005



The catch of salmon smolts was markedly down on the numbers recorded in previous years, when catches of over 3000 salmon were relatively commonplace (for example, 3,350 caught in 2004). In contrast, the catch of sea trout smolts was on a par with totals from previous years (for example 779 caught in 2004).

Amongst the more likely explanations for the relatively low catch of salmon smolts in 2005 are that:

- large numbers were able to evade capture by by-passing the trap during flow events,
- migration was triggered outside the trapping period. [*Historically, the trap has only been operated in the spring, as this was the period smolt migration was likely to take place*].

As part of a wider study into determining the most efficient way of utilising the Kielder Burn facility and further optimising the stocking regime, it is planned to investigate these and related issues in depth. This work will begin in 2006.

Recaptures of Kielder Burn fish in 2005

Twenty-five adipose fin-clipped salmon from previous stockings of the burn were reported during the course of 2005. These were:

- fourteen were captured on the North Tyne during broodstock collections for the hatchery in November;
- nine were caught by anglers fishing the North Tyne above Wark during the summer;
- one was caught by an angler fishing the main Tyne in August;
- one captured on the fish video passing through Riding Mill in August.

Three adipose fin-clipped sea trout were also recaptured in 2005, as follows:

- two adult sea trout were caught during the broodstock collections on the North Tyne in November;
- one smolt was recorded in the smolt trap at Riding Mill in late May

The pattern of recaptures was similar to that observed in previous years, with the bulk of fish recorded in the upper reaches of the North Tyne. The ability of salmon to imprint and home to the area in which they were released as smolts has been demonstrated in studies elsewhere.

If you catch a fish that has had the adipose fin removed, please report your capture to us here at Tyneside House.

3. Fisheries Enforcement

In 2005, we introduced a new 'Intelligence Driven Patrol System' to enable us to prioritise our workload and become more effective and efficient. Fisheries enforcement officers in our Northumbria area are playing a major role in the development of a new intelligence database at a national level.

During the course of the year, we received intelligence reports from all major stretches of the river, a number of its tributaries and the immediate coastal area. Based on the information received, we carried out 127 'red' (high priority) patrols and 84 'amber' (medium priority) patrols in the Tyne catchment. Additionally, six surveillance operations were carried out on specific targets or target areas.

There were five major incidents on the Tyne in the period. Of these, three arose as a direct result of surveillance operations and patrols and a further two from reports of illegal activity in local coastal areas. In all cases, the offenders were found guilty and fined up to £300 and ordered to pay costs of as much as £1300. Fish and equipment seized during a poaching incident on the Tyne can be seen in Appendix 6.

Other activities our officers undertook during the course of the year included:

- visits to all fish dealers throughout the catchment in order to enforce salmon and sea trout selling legislation;
- rod licence 'blitzes', combined with routine visits to all game and coarse fisheries. These showed a licence evasion rate of between two and three per cent compared with a national average of five to seven per cent. [Rod licence enforcement in our area as a whole continued to show effective deterrence, with one of the lowest offence rates in England and Wales];
- co-operation with agencies such as Sea Fisheries Committees (North Eastern and Northumberland) and the Tweed Commissioners, with comparatively greater operational activity than in 2004 and good successes reported;
- working closely with the local police constabularies and adding to the exchange of information between both parties;
- working with fisheries, clubs, organisations and other individuals to ensure that we achieve our goals for angler participation in our area;
- discussions with CEFAS regarding the possible movements of non-native fish between fisheries in our area.

4. River Derwent fish pass

Final designs for the proposed fish pass at Derwenthaugh, which will allow salmon and sea trout access to the lower River Derwent as far as Ebchester approximately 17 kilometres upstream, were completed in 2005. A number of options for providing fish passage over Derwenthaugh Weir were considered by consultant engineers Babtie Brown and Root. After careful appraisal, a Larinier super-active baffle single pass, together with an elver channel to allow for eel passage was identified as the preferred option.

The detailed fish pass design has been produced, and was given provisional approval by our national fish pass panel in June 2005. The preferred location of the pass is in the centre of the weir.

Discussions have taken place with Gateshead Council, the Tyne Rivers Trust (see page 38), local angling interests and others to develop options for construction of the fish pass. These have included an initial consideration of how Gateshead Council's proposals for a mini-hydropower turbine on the same weir might be incorporated into the fish pass project.

Work will continue in 2006 to identify the necessary funding to construct the fish pass, and develop opportunities for salmon and sea trout angling in the lower Derwent, with our project partners.

5. Inauguration of Tyne Rivers Trust

Launched in March 2005, the Tyne Rivers Trust is an independent charity which aims to improve the environment of the Tyne catchment. During 2005 they began the process of consultation to bring together the huge amount of knowledge and interested parties on the Tyne to create an '*action plan*' for the future. Launched in September 2006, this plan will be a blueprint for the actions required to maintain and improve the fishery, recreational value and access throughout the catchment.

The Tyne Rivers Trust's work will promote sustainable management of the Tyne catchment for social, economic and environmental benefits for the region.

For more information, and to put forward your comments, please visit the Trust's website at www.tyneriverstrust.org.

Further Information

1. Visits to Riding Mill

We regularly hold open days at Riding Mill fish monitoring facility to give people the opportunity to see the facilities and to learn more about the monitoring work on the Tyne. If you would like an invitation, please contact us on the number below.

2. Website details

You can download additional copies of this report, obtain more information on Riding Mill, view fish counter data or request an angler logbook from our website **www.environment-agency.gov.uk/regions/northeast** (follow the links for regional issues and fisheries).

3. Useful contacts

If you would like to:

- report captures of floy tagged and fin-clipped fish
- order an angler logbook
- obtain information on submitting scale samples

please contact us at the address or number below.

Environment Agency
Ecological Appraisal Team
Tyneside House
Skinnerburn Road
Newcastle Business Park
Newcastle
NE4 7AR
Tel: 0191 2034287

If you see dead, dying or distressed fish please call our 24 hour emergency hotline on 0800 807060.

To book a place on a future open day at Riding Mill please contact our external relations team on 0191 2034176.

To check which bylaws apply to where you are fishing please call us on 08708 506506.

To report captures of fish carrying a yellow floy tag (i.e. fish tagged for the tracking study) please contact CEFAS at the address below:

CEFAS
Salmon and Freshwater Fisheries Team
Lowestoft Laboratory
Tel: 01502 562244

Glossary

1SW: One sea-winter. A fish that has spent a single winter at sea before returning to freshwater to spawn. Salmon spending one winter at sea are known as grilse.

2SW: Two sea-winter. A fish that has spent two winters at sea before returning to freshwater to spawn. Salmon spending two (or more) winters at sea are also known as multi-sea-winter fish (MSW). These fish comprise the spring run.

Broodstock: Returning adult salmon removed from the river before spawning to provide eggs/sperm, to produce fish reared in a salmon hatchery.

Catch return: A declaration made by an angler or netsman detailing the number of salmon and sea trout they have caught.

CEFAS: The Centre for Environment, Fisheries and Aquatic Science, an executive agency of Defra. Involved with salmon research and data collation at national and international levels.

CPUE: Catch Per Unit Effort. A measure of the amount of time (effort) required on average to catch a fish.

Defra: Department for Environment, Fisheries and Rural Affairs. Responsible for promoting sustainable development and for all aspects of environmental, rural, farming and food production policy.

Drift net: A net used in the north east coast commercial fishery comprising of a single sheet of netting without bags or pockets and of a total length not exceeding 550 metres. They must be shot from a boat, and attended at all times.

Electric fishing: A survey method for assessing fish populations where an electric current is passed through the water. This attracts and then stuns fish, enabling them to be counted and examined before being returned unharmed to the river.

Exploitation: Removal of fish through both legal and illegal methods – includes angling, netting and all forms of poaching.

Escapement: The number of fish remaining after exploitation.

Fecundity: The total number of eggs produced by one mature female.

Fry:	Juvenile life stage where the young salmon becomes free-swimming and actively hunts for food. Also known as 0+ (less than 1 year old) or young-of-the-year fish.
ICES:	International Council for the Exploration of the Seas. The mission of which is to collate, research and report data on the international status of salmon stocks.
J-Net:	A type of fixed net used in the north east coast commercial fishery. J nets are fixed nets in the shape of a letter J, consisting of a single sheet of netting without bags or pockets, not exceeding 370 metres in total length measured along the headropes.
Maiden fish:	A fish returning to freshwater to spawn for the first time.
Migratory fish:	In the context of this report, salmon and sea trout.
NASCO:	International organisation established under the Convention for the Conservation of Salmon in the North Atlantic. The objective of the organisation is to contribute through consultation and co-operation to the conservation, restoration, enhancement and rational management of salmon stocks subject to the Convention taking into account the best scientific evidence available to it.
North Atlantic Salmon Fund:	An international private sector organisation formed in 1987 to end damaging management practices and advance environmental standards to protect wild Atlantic salmon.
Parr:	Juvenile life stage, following fry, where the fish exhibit characteristic parr marks/bars as dark vertical stripes upon their flanks. Also known as 1+ fish (more than 1 year old).
Recruitment:	The addition of new individuals of a given age to the fish population, e.g. the number of 0+ fry produced from one year's spawning.
Rotary screw trap:	A floating trap used to intercept smolts on their seaward migration.
Run:	The number of adult salmon ascending, or smolts descending, a given river in a given year.
Redd:	A nest of fish eggs covered with gravel. Newly excavated redds appear as light-coloured, regularly shaped circular or oval areas that contrast with the normally darker substrate. These remain visible for a few months before their surface becomes recolonised by algae growth.

Smolt: Life stage between freshwater parr and seawater adult phase, where parr undergo a process of pre-adaption to a saltwater environment. As a part of this process, smolts acquire a characteristic silver appearance, similar to adult salmon, prior to migration down river and out to sea.

Spring run: Those fish returning to the river before mid-June and protected by byelaw (generally larger, 2 sea-winter salmon).

T-Net: A type of fixed net used in the north east coast commercial fishery. The net is in the shape of a letter T, comprising a single sheet of netting with one or more bags or pockets, a headpiece up to 92 metres long and a tailpiece up to 230 metres long, anchored to the beach.

TWPTA: Tyne and Wear Passenger Transport Authority. Body elected from the Metropolitan Borough Councils comprising Tyne and Wear to ensure that Tyne and Wear has a fully public transport system that meets the needs of people who live and work in and travel through the area.

Year class: The population of salmon resulting from one year's spawning.

Appendix 1

Table 1. Upstream counts recorded by Riding Mill fish counter, 1996 -

	JAN	FEB	MAR	APR	MAY	JUN	JUL
1996	-	-	-	-	-	338	1010
1997	25	4	43	180	381	889	3808
1998	2	22	27	31	363	1107	3131
1999	0	8	23	91	243	538	2027
2000	4	3	32	231	535	815	1816
2001	0	1	24	134	430	1577	3823
2002	36	0	9	95	349	529	2599
2003	1	5	30	81	325	2002	6005
2004	145*	*	96	297	752	3943	8112
2005	127	30	126	211	1028	2229	5746

* denotes counter non-operational for part or all of the month

- 2005

AUG	SEP	OCT	NOV	DEC	TOTAL
1082	7935	8276	564	24	19229
2814	7152	12053	7314	183	34846
3001	6433	12391	2280	764	29552
2735	3478	7856	2889	12	19900
2142	3769	4859	851	162	15219
4209	5640	5065	1184	117	22204
2594	4571	5491	2561	52	18886
4142	7398	14066	9242	766	44063
5267	8454	13649	6946	1007	48668
6917	8924	6559	660	361	32918

Appendix 2

Figure 9. Upstream counts in relation to river temperature

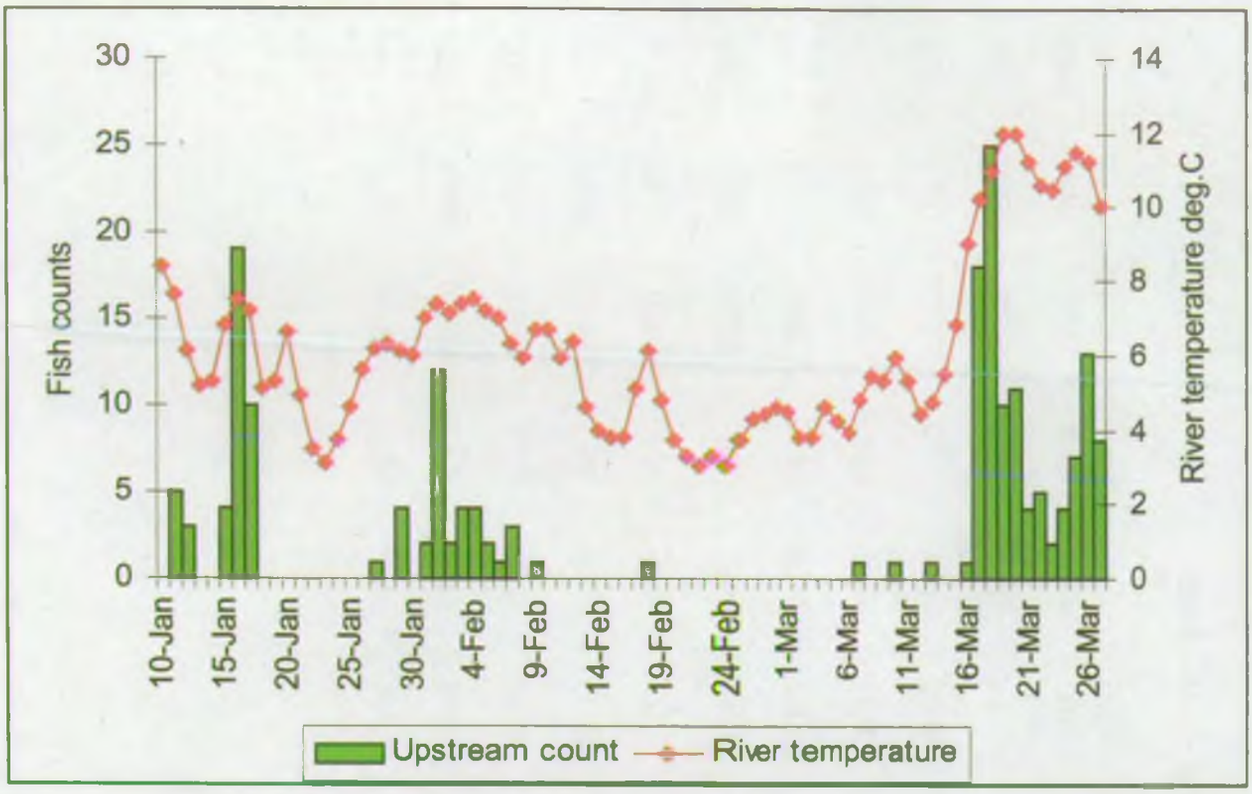
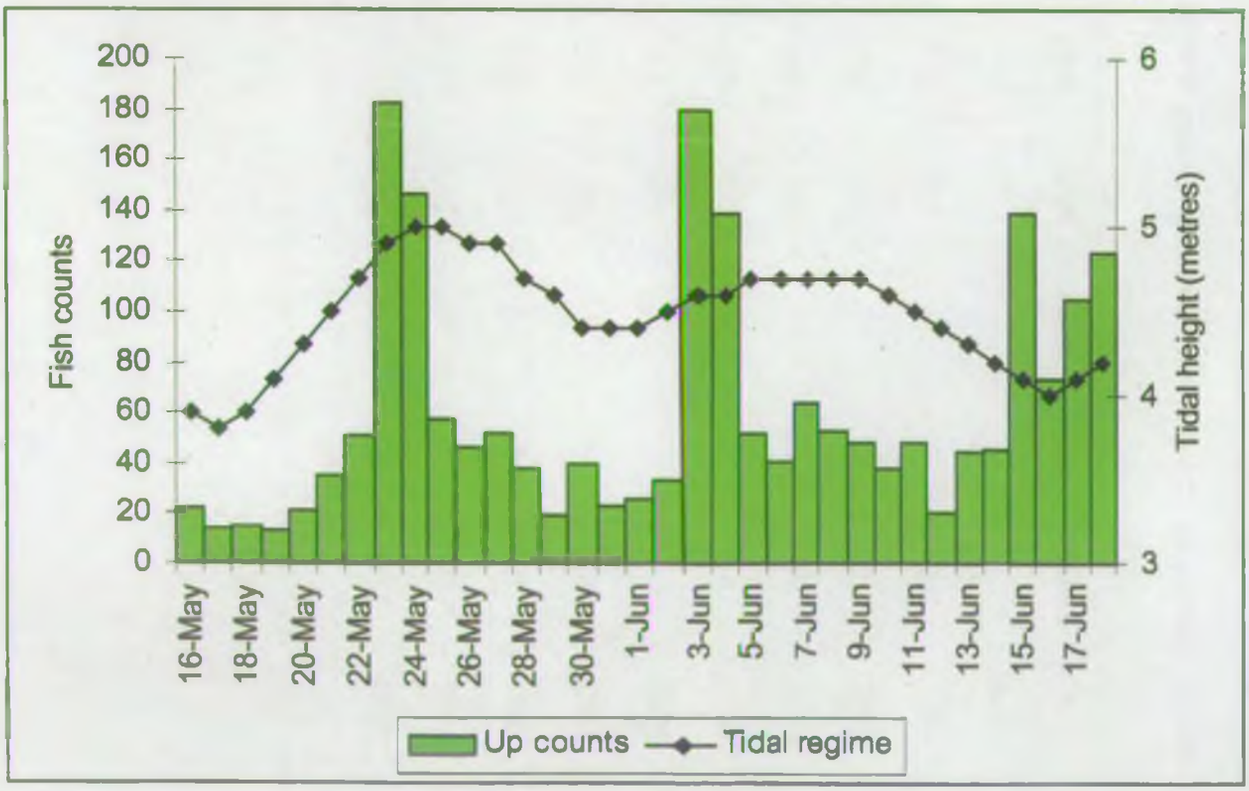
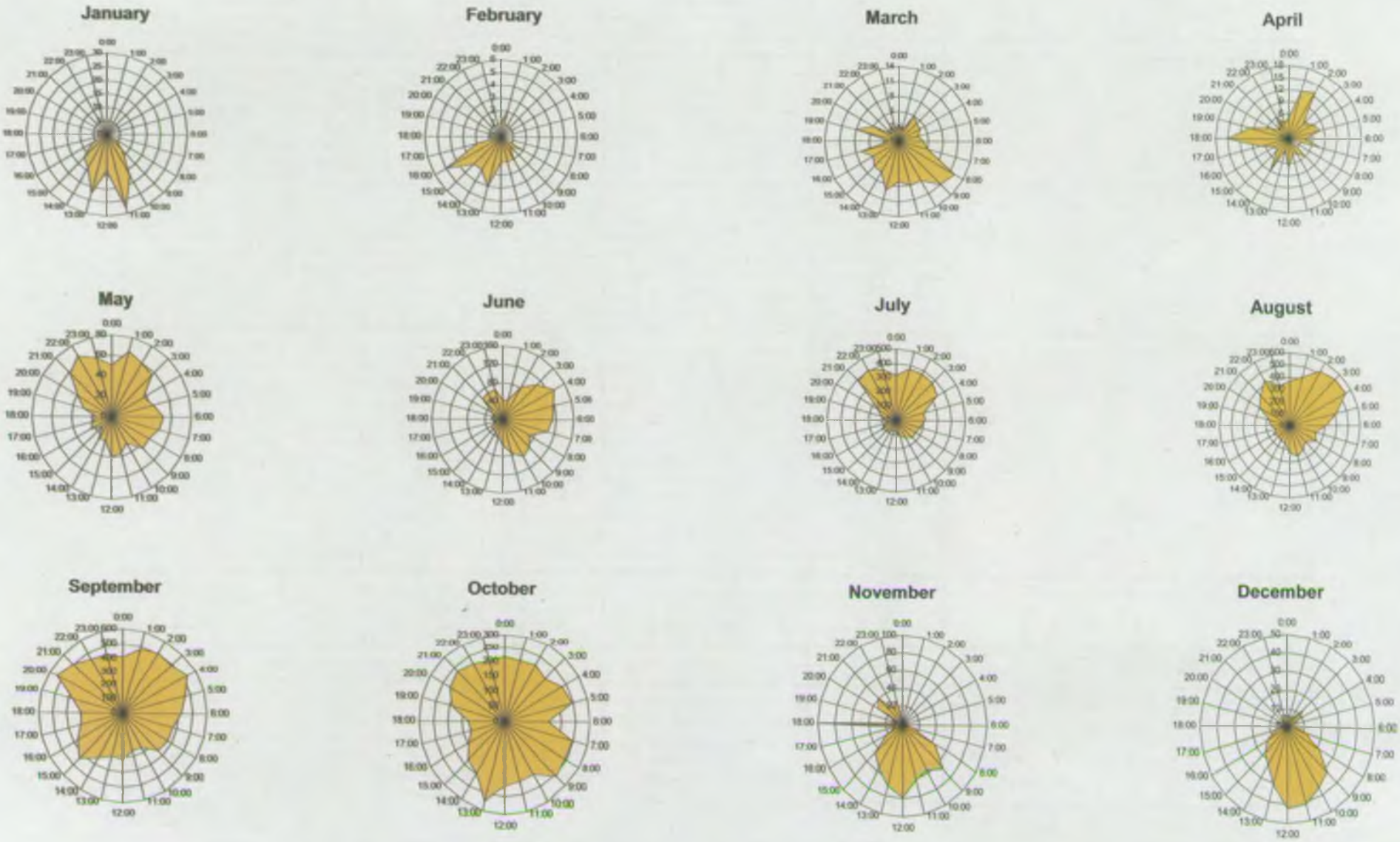


Figure 10. Upstream counts in relation to tidal regime



Appendix 3

Figure 11. Timing of fish movements over Riding Mill fish counter in 2005



Appendix 4

Table 2. Adult salmon and sea trout sampled during 2005 by data source

		Fish sampled				Fish length (cm)						Fish weight (lbs)					
		salmon		sea trout		salmon			sea trout			salmon			sea trout		
Data source	Month	No.	%	No.	%	min.	max.	mean	min.	max.	mean	min.	max.	mean	min.	max.	mean
Trapping activities at Riding Mill																	
	June	9	35	17	65	51	84	75	44	63	52	3.2	14.0	10.2	2.0	6.1	3.3
	July	1	3	39	98	58	58	58	41	71	52	4.6	4.6	4.6	1.6	8.9	3.4
	September	17	45	21	55	60	86	71	35	73	56	5.3	15.4	8.8	0.9	9.6	4.1
	October	3	8	35	92	64	94	77	50	68	57	6.4	20.2	10.8	2.9	7.8	4.5
	November	3	18	14	82	80	85	82	51	70	56	12.3	14.8	13.1	3.1	8.4	4.3
	December	4	27	11	73	72	83	76	45	60	53	9.1	13.9	10.6	2.2	5.2	3.4
Angler scale sampling programme																	
	March	11	100	0	0	n/a	n/a	n/a	n/a	n/a	n/a	8.0	30.0	13.8	•	•	•
	April	35	100	0	0	n/a	n/a	n/a	n/a	n/a	n/a	6.0	24.0	12.0	•	•	•
	May	14	100	0	0	n/a	n/a	n/a	n/a	n/a	n/a	9.0	33.2	13.4	•	•	•
	June	6	100	0	0	n/a	n/a	n/a	n/a	n/a	n/a	10.0	16.0	13.3	•	•	•
	July	2	50	2	50	n/a	n/a	n/a	n/a	n/a	n/a	6.3	11.5	8.9	2.3	13.0	7.6
	August	12	75	4	25	n/a	n/a	n/a	n/a	n/a	n/a	3.5	12.0	6.9	4.0	11.0	8.3
	September	5	83	1	17	n/a	n/a	n/a	n/a	n/a	n/a	7.0	14.0	10.0	8.0	8.0	8.0
CEFAS tracking work																	
	January	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
	February	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
	March	2	100	0	0	74	76	75	•	•	•	9.9	10.6	10.2	•	•	•
	April	19	100	0	0	67	86	76	•	•	•	7.2	15.4	10.8	•	•	•
	May	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
	June	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
	July	7	50	7	50	78	96	85	54	64	56	11.4	21.5	14.9	3.6	6.3	4.3
	August	7	64	4	36	62	85	72	52	72	60	5.8	14.7	9.0	3.3	8.9	5.3
	September	0	0	5	100	•	•	•	58	63	60	•	•	•	4.7	6.1	5.2
	October	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
	November	1	25	3	75	88	88	88	51	63	56	16.5	16.5	16.5	3.2	6.3	4.2
	December	No fish tagged				•	•	•	•	•	•	•	•	•	•	•	•
Fish mortalities																	
	July	74	94	5	6	55	98	79	46	89	65	3.8	22.7	11.9	2.3	16.8	6.7
	August	18	100	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	September	30	86	5	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Broodstock collection (23rd November)																	
	November	16	64	9	36	68	93	79	53	67	59	7.7	19.2	12.0	3.5	7.4	4.9
Other (e.g. ad hoc scale samples, poaching incidents)																	
	April	1	100	0	0	75	75	75	•	•	•	10.1	10.1	10.1	•	•	•
	May	1	100	0	0	75	75	75	•	•	•	10.1	10.1	10.1	•	•	•
	August	1	50	1	50	64	64	64	82	82	82	6.5	6.5	6.5	13.0	13.0	13.0
	September	4	67	2	33	58	87	73	33	47	40	4.5	16.0	9.9	1.0	2.5	1.8
	December	1	100	0	0	97	97	97	•	•	•	22.2	22.2	22.2	•	•	•

Notes:
1) August trapping operation cancelled due to high river flows. 2) Not all fish tagged by CEFAS at Tynemouth would have been of Tyne origin (i.e. destined for another river). In addition, month of capture may not represent the month of river entry, as it may take several weeks or more for the fish to subsequently enter the freshwater. 3) Some fish weights/lengths based on estimates.

Appendix 5

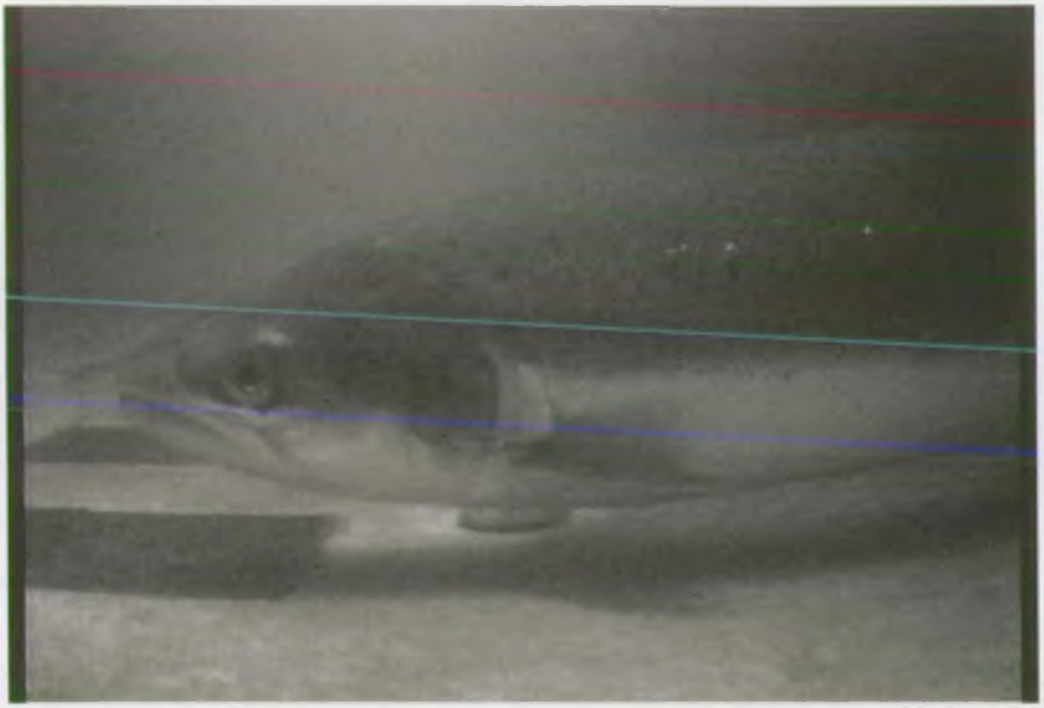
Table 3. Ages of adult salmon and sea trout sampled during 2005 by data source

		Salmon												Sea trout									
		smolt age						*sea age*						*smolt age*						*sea age*			
Data source	Month	1	%	2	%	3	%	1-SW	%	2-SW	%	3-SW	%	1	%	2	%	3	%	Maiden	%	PS	%
Trapping activities at Riding Mill	June	0	*0*	9	*100*	0	*0*	1	*11*	8	*89*	0	*0*	0	*0*	16	*94*	1	*6*	12	*71*	5	*29*
	July	0	*0*	1	*100*	0	*0*	0	*0*	1	*100*	0	*0*	1	*4*	25	*89*	2	*7*	29	*73*	11	*28*
	September	3	*18*	14	*82*	0	*0*	12	*71*	5	*29*	0	*0*	0	*0*	11	*100*	0	*0*	13	*68*	6	*32*
	October	1	*33*	2	*67*	0	*0*	2	*67*	1	*33*	0	*0*	0	*0*	31	*91*	3	*9*	23	*66*	12	*34*
	November	0	*0*	2	*100*	0	*0*	0	*0*	3	*100*	0	*0*	0	*0*	12	*100*	0	*0*	12	*86*	2	*14*
	December	0	*0*	4	*100*	0	*0*	3	*75*	1	*25*	0	*0*	1	*9*	9	*82*	1	*9*	9	*82*	2	*18*
Angler scale sampling programme	March	2	*18*	9	*82*	0	*0*	0	*0*	10	*91*	1	*9*	*	*	*	*	*	*	*	*	*	*
	April	1	*3*	33	*94*	1	*3*	0	*0*	33	*94*	2	*6*	*	*	*	*	*	*	*	*	*	*
	May	2	*14*	12	*86*	0	*0*	1	*7*	12	*86*	1	*7*	*	*	*	*	*	*	*	*	*	*
	June	0	*0*	6	*100*	0	*0*	0	*0*	6	*100*	0	*0*	*	*	*	*	*	*	*	*	*	*
	July	0	*0*	1	*50*	1	*50*	1	*50*	1	*50*	0	*0*	0	*0*	2	*100*	0	*0*	1	*50*	1	*50*
	August	2	*15*	11	*85*	0	*0*	12	*92*	1	*8*	0	*0*	0	*0*	4	*100*	0	*0*	1	*25*	3	*75*
	September	2	*40*	3	*60*	0	*0*	3	*60*	2	*40*	0	*0*	*	*	*	*	*	*	0	*0*	1	*100*
CEFAS tracking work	March	0	*0*	2	*100*	0	*0*	0	*0*	2	*100*	0	*0*	*	*	*	*	*	*	*	*	*	*
	April	1	*5*	18	*95*	0	*0*	1	*5*	18	*95*	0	*0*	*	*	*	*	*	*	*	*	*	*
	July	0	*0*	6	*100*	0	*0*	0	*0*	7	*100*	0	*0*	0	*0*	5	*100*	0	*0*	6	*86*	1	*14*
	August	5	*71*	2	*29*	0	*0*	5	*83*	1	*17*	0	*0*	0	*0*	4	*100*	0	*0*	2	*50*	2	*50*
	September	*	*	*	*	*	*	*	*	*	*	*	*	0	*0*	3	*100*	0	*0*	5	*100*	0	*0*
	November	0	*0*	1	*100*	0	*0*	0	*0*	1	*100*	0	*0*	0	*0*	3	*100*	0	*0*	3	*100*	0	*0*
Fish mortalities																							
	July	4	*8*	46	*92*	0	*0*	7	*10*	59	*88*	1	*1*	0	*0*	3	*100*	0	*0*	2	*40*	3	*60*
Broodstock collection (23 November)																							
	November	awaiting results						awaiting results						awaiting results						awaiting results			
Other (e.g. ad hoc scale samples, poaching incide	April	0	*0*	1	*100*	0	*0*	0	*0*	1	*100*	0	*0*	*	*	*	*	*	*	*	*	*	*
	May	0	*0*	1	*100*	0	*0*	0	*0*	1	*100*	0	*0*	*	*	*	*	*	*	*	*	*	*
	August	0	*0*	1	*100*	0	*0*	1	*100*	0	*0*	0	*0*	n/a	n/a	n/a	n/a	n/a	n/a	1	*50*	1	*50*
	September	0	*0*	4	*100*	0	*0*	3	*75*	1	*25*	0	*0*	n/a	n/a	n/a	n/a	n/a	n/a	1	*100*	0	*0*
	December	0	*0*	1	*100*	0	*0*	0	*0*	1	*100*	0	*0*	*	*	*	*	*	*	*	*	*	*

Notes:
1) **Maiden** refers to a sea trout of either sex that has returned to the river for the first time after migrating to sea as a smolt. 2) **PS** denotes a sea trout that has spawned at least once. 3) Excludes results for fish with unreadable scales (or parts thereof) and from those from which no scale samples were taken.

Appendix 6

Salmon captured on the fish video at dusk



Smolt trap on the Kielder Burn (built in 1996 as part of the Northumbria Rivers Project)

Adipose fin-clipped adult salmon

Catch of Tyne salmon, illegal nets and other equipment seized by fisheries enforcement officers

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