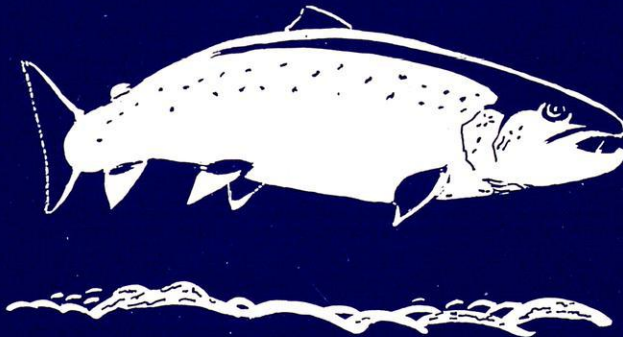




ATLANTIC SALMON TRUST

# PROGRESS REPORT

June 1990



The Atlantic Salmon Trust  
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Patron:

HRH The Prince of Wales

#### COUNCIL OF MANAGEMENT

President:	The Duke of Wellington
Vice Presidents:	Vice-Admiral Sir Hugh Mackenzie Mr. David Clarke
Director:	Rear Admiral D. J. Mackenzie
Deputy Director:	Captain J. B. D. Read, RN
Secretary:	Mr. M. O'Brien
Treasurer:	Mr. Peter Tomlin

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Vice Chairmen:	Lord Moran Sir Ernest Woodroffe
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#### INVITED REPRESENTATIVES OF OTHER ORGANISATIONS

ASF (USA)	Mr. J. F. Cullman 3rd
ASF (CANADA)	Mr. L. G. Rolland
AIDSA	Ambassador Claude Batault
RASA	Mr. Richard Buck
BFSS	Major General J. Hopkinson
ASDSFB	Mr. Robert Clerk
SPEY TRUST	(A Representative)
FISHMONGERS	Viscount Leverhulme Mr. John Bennett

## HONORARY SCIENTIFIC ADVISORY PANEL

Gordon Bielby, B.Sc. (South West, National Rivers Authority)  
W. J. Ayton, B.Sc., M.Sc. (Welsh, National Rivers Authority)  
M. M. Halliday, Ph.D. (Joseph Johnston & Sons Ltd.)  
G. Harris, Ph.D. (Welsh Water plc.)  
G. J. A. Kennedy, B.Sc., D. Phil. (Department of Agriculture for Northern Ireland)  
E. D. Le Cren, M.A., M.S., F.I.Biol., F.I.F.M.  
D. H. Mills, M.Sc., Ph.D., F.I.F.M. (Department of Forestry and Natural Resources, Edinburgh University)  
I. Mitchell, B.Sc. (Tay Salmon Fisheries Co. Ltd.)  
K. Whelan, B.Sc., Ph.D. (Salmon Research Agency of Ireland, Inc.)  
J. Solbe, B.Sc., C.Biol., F.I.F.M., M.I.Biol. (Unilever Research)  
D. Solomon, B.Sc., Ph.D., M.I.Biol., M.I.F.M.  
J. Browne, M.Sc. (Department of the Marine, Dublin)  
Professor Noel P. Wilkins, (Department of Zoology, National University of Ireland)  
Sir Ernest Woodroffe, B.Sc., Ph.D., F.Inst.P., F.I.Chem.E.  
J. S. Buchanan, B.Sc., Ph.D., C.Biol., M.I.Biol. (Scottish Salmon Growers Association)

Observers: K. O'Grady, B.Sc., Ph.D., M.I.F.M., F.L.S.  
(National Rivers Authority)  
A representative from the Department of Agriculture and Fisheries for Scotland

## INTERNATIONAL CONSERVATION ORGANISATIONS WITH WHICH THE TRUST IS IN CONTACT

France: Association Internationale de Defense du Saumon Atlantique  
Belgium: Belgian Anglers Club  
Ireland: Irish Game Fish Protection Federation  
Norway: Jeger of Fiskerforbund and Laksen of Oslo  
Sweden and Scandinavia: Theodor Dalensson, Scandinavian Atlantic Salmon Group  
Spain: Asturian Fishing Association of Oviedo  
U.S.A.: Restoration of Atlantic Salmon in America Inc.  
Canada and U.S.A.: Atlantic Salmon Federation

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## CHAIRMAN'S REPORT

It was with the greatest pleasure that we learned that Her Majesty the Queen had made our President, The Duke of Wellington, a Knight of the Garter. I am sure that all the Council of Management and our friends and supporters, will join me in offering him our heartiest congratulations.

The Summer Progress Report is published as usual at a time of high expectation for most salmon anglers, with the more productive summer and autumn months ahead even for those who have been fortunate enough to have had the thrill of a fresh springer or two during the first half of the season. Indications are that on some rivers, notably the Brora and the Tay, there has been a very much better spring run than in recent years.

Meantime the work of the Trust continues. The major topic of the many burning issues has been what is widely known as the Icelandic Initiative owing its origins to the inspired and dedicated work of Orri Vigfusson. We now await the discussion of this issue at the NASCO meeting in June. The Trust has supported the prospect of a buy-out of the Faroese longline fishery from the outset and have been present at all meetings in London, Oslo and elsewhere.

Our position is clear:-

1. Any buy-out must be long-term and if possible permanent. A "one-year" buy-out is not an option.
2. It must be supported, monitored and enforced by Governments; in short it requires the backing of NASCO to make it effective.
3. The funding from the UK must represent a fair proportion in relation to total catch to other countries and must be raised from those who stand to benefit most - the proprietors and tenants of salmon fishings.

It is hard to quantify the benefit to our rivers, but it is clear that if the Faroese were at one time catching in excess of 500 tonnes a year, they could well do so again. Predominantly, they are catching multi sea winter fish (i.e. salmon, not grilse). If this fishery were to cease, this means that at a cautious estimate more than 31,000 extra salmon a year, mostly spring or early summer fish, could return to British waters. This compares with a total annual rod catch of 130,000, three quarters of which came from Scotland.

The AST has agreed to lead an appeal, should this be necessary, with the support of and on behalf of all other salmon conservation bodies. I am delighted to say that my predecessor David Clarke has agreed to act as Chairman of the appeal committee, and contingency plans are being prepared. Discussions with the Charity Commissioners have made it clear that such an appeal cannot be regarded as charitable under English law. We will therefore be taking advice with a view to setting up a separate company to deal with the appeal in whatever way seems most appropriate and efficient.

Should an appeal be launched the funds will be required urgently and I exhort all who have the interests of the salmon at heart to support it generously. The estimated requirement could be of the order of £2 million. More details are given on page 27.

We await with impatience and anxiety the Governments decision on the phasing out of the north east coast drift net fishery. There is no possible legitimate argument for the long term continuation of this fishery which is indiscriminate, interceptory and depends upon a principle of taking fish which is environmentally harmful and internationally condemned.

We were delighted that the Scottish Office announced in March that from April 1st all new fish farm development on land and in fresh water were to be subject to planning permission. They reacted quickly to the pressure and arguments that this Trust and others have brought to bear. Indeed it was only in the January 1989 Progress Report that my letter to Lord Sanderson was published. All the recommendations in this letter have been accepted. We are pleased and grateful.

The case for making the east coast of Scotland an aquaculture free zone before further risks to the 70% of wild salmon stocks which originate there occur, is increasingly strong. It was enhanced by one of the recommendations of the International Conference at Loen, in Norway, attended by the Director which said "zones free of aquaculture could be established near stocks which are designated for conservation reasons or are threatened".

The Crown Commissioners are responsible for granting permission for marine fish farm development. Concern continues to be widely expressed over their policies and arrangements for approvals and appeals.

The Trust has been working closely with the Salmon and Trout Association and others to produce an Angling Code of Practice and intends to print this prominently in future Progress Reports once it is agreed and published.

The abandonment by the Government of the salmon dealer licensing proposals in the 1986 Salmon Act was a disappointment. All efforts must now be concentrated with the co-operation and agreement of the fish farming industry and producing a viable scheme for carcass tagging. We are glad to learn that the Association of Scottish District Salmon Fishery Boards have set up a committee to work at this and the Director has been co-opted as a member.

As always at this time of year, we look forward to seeing supporters and friends of the Trust during the summer at the Game Fairs and Shows.

Thank you for all of your continued interest and support.

Sir David Nickson



## DIRECTOR'S REPORT

This has been a busy six months and the salmon scene is full of excitement at the moment. As the Chairman has said, the Government move on planning for fresh water fish farms is very welcome. There is still much to be done and the outcome of the Agriculture Committee's investigation into fish farming is awaited with interest. I hope the "mad cow disease" diversion will not delay its publication.

The increase in the number of fishings being sold for timeshare is giving rise to concern in many quarters. A particular worry is the fact that many local fishermen and local clubs are finding that fishing that used to be available to them is no longer available. I would urge all the new owners to think carefully of the desirability of making provision for locals to be allowed to fish, either after a certain time of day or even for one day a week. Timeshare is not necessarily a bad thing provided that the management of the river is not allowed to suffer. I welcome the draft code of practice for managers that will hopefully be part of the angling code of practice referred to by the Chairman.

The Scientific Panel had a very successful meeting in London in April. The most important work is that of John Webb on the Polla. This was described in the last Progress Report and a full report will be included in the December 1990 Report. He has shown that farmed fish and wild fish are interbreeding and that the eggs are hatching. It will be very interesting to see how many more fish farm escapees enter the River Polla this year.

The Trust is criticised from time to time as being too Scottish orientated. I hope that the reports from the NRA regions will show that we enjoy close relations with the NRA, and take a considerable interest in the English and Welsh scene.

I attended a symposium at Loch Maree concerning sea trout, and the apparent collapse of many sea trout fisheries in Ireland and the west of Scotland. A sea trout action group has been set up in Ireland and the Trust has subscribed towards it. There were calls for a similar organisation to be set up in Scotland. I pointed out that the Atlantic Salmon Trust had a mandate to look after sea trout and had in fact organised a symposium in 1984 on the subject. I gave all those attending a copy of the Blue Book "The Biology of the Sea Trout". The Department of Agriculture and Fisheries for Scotland is looking at the position on the west coast of Scotland and the Trust is standing by to help if there is anything we can do.

As the Chairman has said the Trust caravan will be at the Game Conservancy Scottish Fair, at Scone Palace; the Royal Welsh Show; the Game Fair at Margam Park and the Highland Field Sports Fair, at Moy. The Trust is most grateful for the donations received from the organisers of shows we attend, and in particular to the Country Landowners Association Charitable Trust, whose magnificent donation of £4,000 helped towards the setting up of the Polla project.

Finally, it was with great sadness that we heard of the death of my predecessor, Gerry Hadoke. An obituary by Derek Mills follows my report. Gerry was a great help to me and I personally will miss his council very much.

D. J. Mackenzie

## OBITUARY

### GERRY HADOKE

It is with considerable sadness I have to record the death of Gerry Hadoke at his home in Bourton-on-the-Hill on 23rd February. His modest and unassuming nature belied the amount he did for the Institute of Fisheries Management and the Atlantic Salmon Trust and, indeed for salmon conservation generally and, sadly, his presence at meetings and behind the scenes is going to be missed for a long time to come.

He was one of four brothers and was brought up in the great Irish tradition. He went to the Portora Royal School in Enniskillen, going on to read for his first degree at Trinity College, Dublin. He was a great rugby man, although, in his typically modest way, he was the first to admit he was never good enough to play for his country. The Second World War saw him in military service with the Royal Artillery. After leaving the army he joined the Colonial Service and served in Nigeria for some 12 years.

On 23rd September, 1957, Gerry started what was to be a notable career with the Foyle Fisheries Commission, firstly as its Chief Executive Officer and then, from 1st April, 1962 after re-organisation, as its Secretary. He realised the importance of both the scientific basis and socio-economic aspects for rational fisheries management. He commissioned an eminent Canadian scientist, P. F. Elson, and an economist, A. L. W. Tuomi, to examine the existing system for the conservation, management and development of the fisheries of the Foyle Area and to make recommendations. Their Report, New Basis for Rational Management, published in 1975, has thanks to the efforts of Gerry, become a classic. Gerry, three years earlier, had already produced a subsequently much-quoted report on The Salmon Fisheries of the Foyle Area which was accepted for the degree of Master of Science in the Department of Economics at Queen's University, Belfast.

He was a great supporter of the Institute of Fisheries Management in its formative years and was one of the first members of Council on which he served from its inception in 1969 to 1977. He and David Cragg-Hine were instrumental in setting up the Northern Ireland Branch of the Institute in 1972. He attended the annual study courses regularly and was one of the first members of the Institute to be elected a Fellow.

Gerry retired from the Foyle Fisheries Commission in April, 1979 and



shortly afterwards was appointed Director of the Atlantic Salmon Research Trust, later to become the Atlantic Salmon Trust. Over the next five years he was tireless in drawing the attention of the EEC, governments and international bodies to the plight of the Atlantic salmon. He was responsible along with his counterpart in the then International Atlantic Salmon Foundation, for arranging visits by Trust representatives to Greenland (1980) and the Faroes (1982) and for Greenland and Faroes fishery representatives to visit the United Kingdom. He had close contacts with the EEC and arranged a most successful hearing on Atlantic salmon problems at the European Parliament in Brussels in 1983. He negotiated successfully for the Trust to have observer status at the International Council for the Exploration of the Sea and, for two years, at the Council of Europe's Committee of Nature Management. During NASCO's formative period he did much to draw attention to the need for a joint salmon management plan. The Trust was present at the first NASCO meeting and has had observer status ever since. He made sure the scientific advisory panel was alive and productive and did much to ensure the success of the publications now referred to as the "Blue Books". Although Gerry officially retired from the Trust in December, 1984, he continued to be involved in committee meetings, in the arrangement of Workshops, in gathering ideas for subjects for blue books and keeping in touch with his successor, Rear Admiral John Mackenzie. Only two days before his sudden death he attended a meeting of the Council of Management in London and was arranging for a workshop to be held in his beloved Dublin in 1991, sadly he won't be there.

His wife Hylda, for whom Gerry cared for most devotedly during her period of poor health in the last few years, died just thirteen days after Gerry.

Derek Mills

\* \* \* \* \*



NRA NORTH WEST - REGIONAL REVIEW 1989/90

FISHERIES

Regulation and enforcement

Although 1989 was a poor season for angling due to sustained low flows these conditions presented an ideal opportunity for poachers to take advantage of those fish which did enter the river. Many good cases were obtained and these included searches of hotels and domestic premises which have become an integral part of our activities in recent times, particularly since the Salmon Act 1986 came into force. It is an unfortunate consequence of anti-poaching activities that staff are subject to both verbal and physical abuse. Several instances occurred on the River Derwent in West Cumbria and caused the bailiff to be hospitalised.

Two new Fishery Protection vessels were acquired as replacements for older vessels. The larger of these two boats meets a need to patrol further off-shore to the limits of our jurisdiction where there has recently been an increase in activity.

To assist the bailiffs in their difficult work there was a continuation of internal training sessions which serve to keep bailiffs aware of new developments and to develop the many skills associated with their task. During the year bailiffs were involved in physical fitness training sessions which included personal survival in water. All new appointees are being screened for fitness and required to maintain their fitness to an appropriate and agreed standard as a condition of service. Uniforms for bailiffs were introduced during the year after consultation with staff to ensure that their practical requirements were met. As well as fulfilling a requirement under the Police & Criminal Evidence Act 1984 in respect of stopping vehicles it is hoped that uniformed staff will be less prone to assault.

A revised set of Fishery Bye-laws was approved by the Minister. Probably the most significant change concerned the removal of the statutory close season for freshwater fish and eels on stillwaters. Bye-laws were also promoted by Cumbria Sea Fisheries Committee following discussions and the consent of the Authority, these Bye-laws will provide significant additional protection to migratory salmonids in coastal waters. Unfortunately discussions with North Wales and North Western Sea Fisheries Committee have yet to produce an agreed set of Bye-laws.

Restocking

The region's salmonid restocking programme was further assisted by the establishment of two new hatchery facilities on the River Eden and River Ribble systems. An additional trapping facility was installed on the River Lune. In excess of two million ova were laid down, most to be stocked out as fed fry but at least fifty-thousand will be reared on to a size where they can be microtagged. In addition to the manipulation of wild populations of freshwater fish there was

continued production of fish at Leyland Coarse Fish Farm, particularly riverine species. A new depot was established in Cheshire and there are extensive facilities on this site to enable fish to be held or grown on.

### Monitoring

Fisheries construction projects continued and saw the completion of a combined fish counter/fish pass/fish trap on the River Lune. This facility has been used for validation studies of the new generation resistivity fish counters. Further projects included a fish counting installation on the River Leven and a fish pass to circumvent a weir on the River Bela.

Extensive monitoring of fish populations by electrofishing and netting survey took place.

## **NRA - SEVERN TRENT REGION**

### **FISHERIES**

#### Enforcement

Law enforcement absorbed substantial resources in the effort to prevent poaching, byelaw infringement and licence evasion. Fisheries staff challenged approximately 30,000 anglers which resulted in over 500 prosecutions for fishing without a licence and about 200 for other offences. Two Gloucestershire salmon poachers were caught setting illegal nets in the estuary and were fined £2,000.

#### Monitoring

The programme of scientific survey work appraised fish populations over 100 rivers and canals for various purposes including fishery management requirements, reports of poor fish stocks and the impact of water quality changes. Whilst most fish were caught by electric fishing or netting, some surveys used echo sounding and this technique continues to be developed. The major investigation into the alleged decline of the fisheries of the lower reaches of the rivers Severn and Avon continued. Work has indicated that over-winter fry survival and densities of adult fish throughout the year have improved considerably. A similar study commenced on the lower River Trent and preliminary findings show that spawning success, fry survival and angling catches have been excellent, despite the highest angling pressure ever recorded on the middle reaches of the river.

Acidification as a result of coniferous afforestation remains a threat to the headwaters of the River Severn. The monitoring of water chemistry and fish populations of the salmon spawning grounds of the upper River Severn was continued. Strategies on liming the worst affected reaches were further developed following a six week study tour to Scandinavia and the United States which was awarded to one of the fisheries scientists by the Atlantic Salmon Trust.



## Fish Mortalities and Disease

The fisheries department responded to the incidence of fish disease and mortality. At least 278 adult salmon died in the Severn estuary when high temperatures combined with low flows and spring tides. On the River Derwent a major pollution resulted in the loss of up to 20,000 coarse fish and 100,000 fry. Spring viraemia of carp, however, did not cause the problems encountered in the previous year.

## Development

Following extensive preliminary research, a salmon pass was installed at Ashford Weir on the River Teme, thus opening up more the 50 km of spawning habitat and providing potential for additional runs of 2,000 adult fish.

## Fish Rearing

Fish rearing continued with 5,000 salmon fry being stocked out from the hatchery at Clywedog. Arrangements for continued use of the facilities at Clywedog have been made with Severn Trent plc who have taken over the cage rearing of trout for the reservoir fishery. The coarse fish unit at Calverton met its target by reaching full production with an output of 106,000 two year old chub, dace and barbel valued at £50,000. Considerable improvements to the rearing unit have also been made with the installation of a new feeding system and redesign of the pond aeration system.

## **NRA SOUTH WEST REGION**

### **FISHERY REHABILITATION - RIVERS TAW AND TORRIDGE**

The NRA has announced a package of measures designed to rehabilitate fish stocks in the River Taw and Torridge.

The rehabilitation package is designed:

To increase the escapement of wild fish and improve their numbers by a natural production and to provide a suitable habitat in the spawning and nursery areas.

Taw and Torridge licensed salmon netmen have agreed that in return for a compensation scheme - funded by the NRA - they will cease fishing from 1990 to 1996 inclusive.

The netmen fully support the package. The Net Limitation Order, due for renewal in January 1991, will be reapplied for to cover a five year period retaining the current 14 licences.

Limitations are also proposed on rod catches.

Voluntary bag limits have operated in recent years, but mandatory bag limits will be sought. The Authority is to make by-laws under Section 36 Salmon and Freshwater Fisheries Act 1975.

The Authority will continue its vigorous enforcement policy to ensure

that estuary fish are not exploited by illegal fishermen.

Corridor surveys are also being undertaken to determine where improvements can be made to spawning and nursery areas by the removal of trash dams and the rehabilitation of spawning gravels.

The Authority will be actively monitoring improvements in fish stocks. Juvenile censuses will be undertaken annually on the Rivers Taw and Torridge.

In addition to these fisheries measures, the package also includes proposals to improve water quality and safeguard water resources within the catchment.

This year the start of a three year investigation into the effects of changes in land use and other environmental factors on river quality and fish stocks in the River Torridge.

This survey - jointly funded by NRA and MAFF - is designed to produce a conceptual model, recommendations and guidelines for future management of river quality and salmonid fisheries within the Torridge catchment.

#### ESTUARY CLOSURE BY-LAWS

Detailed observations by NRA staff over three years and a year's close monitoring of catches in the Tamar estuary revealed a very substantial illegal salmonid fishery in the guise of sea fishing. It was established that salmon, sea trout and under-sized bass were the target fish and that there was no viable sea fishery in the estuary.

The Devon Sea Fisheries Committee at the request of the NRA South West made the by-law enabled by the Salmon Act 1986 which was confirmed in March. Apart from licensed eel fykes, salmon seines, landing nets and sand eel seines in the Yealm estuary, all other netting is prohibited.

#### SALMON POOL FISHERY RIVER EXE

The Authority has bought the netting rights at the historic Salmon Pool Fishery in the Exe in Exeter.

The £60,000 purchase has enabled the NRA to end netting in the pool downstream of St. James weir at the tidal limit. This will ensure a greater escapement of salmon by relieving the pressure on fish at this vulnerable point, about 500 additional salmon will be able to run the river.

The owner has retained the rod fishery but over 700 years of netting has come to an end.



## NRA THAMES REGION - THAMES SALMON REHABILITATION SCHEME

### Salmon Run 1989

After a record monitored catch of 323 salmon in the Thames in 1988, nearly 300 of which were recorded in the upstream trap of Molesey weir, great things were expected in 1989. The numbers and types of fish stocked together with encouraging evidence of parr survival in the tributaries suggested that a run of up to 600 grilse could be expected, however, this did not turn out to be the case.

The first salmon were found in the trap in mid-June and over the next month 13 2SW salmon together with the first few grilse were tagged and released. Unfortunately, the anticipated large run of grilse did not materialise and the catch quickly fell off. In the critical third quarter of the year from July to September only 45 fish were monitored compared to the record of 266 fish in 1988. In addition to the low numbers, the condition of the fish which did arrive at Molesey gave cause for concern. The fish had clearly been subjected to a delayed and arduous passage through the tideway and lower river, and this was reflected in their stale appearance.

In view of the poor water quality and adverse environmental conditions which persisted throughout the normal period of the grilse run, it is perhaps surprising that any fish managed to ascend the river. In common with other rivers the drought conditions seriously delayed the runs of fish at best, and at worst they were completely excluded. Extremely low flows presented a reduced stimulus for migration and a lack of dilution of the major London sewage effluents, resulting in depressed levels of dissolved oxygen. Additionally water temperatures reached unprecedented levels, peaking at 27 degrees centigrade a level at which severe stress and mortalities are likely. The worst of these conditions was throughout late August and September when the statutory Thames flow measured at Teddington was reduced from 200 to 60 million gallons per day. As the navigation lock accounted for all of this, the weir was virtually dry for a month and fish passage clearly impossible.

The capture of relatively stale grilse resumed at Molesey in October when conditions slightly improved, and the final trap catch for the year rose to 91 fish. Amongst these was a fish of 21lbs - the largest yet captured. This total was increased by the capture of several other fish by electrofishing downstream of Teddington Weir where many fish had chosen to reside. The total count for the year was a rather disappointing 132 which probably represented only a proportion of the run arriving at the outer estuary.

### Salmon Run 1990

To date (May 8th) five salmon have been recorded. Although it has been presumed that some early fish are present each year and occasional sightings have been reported, two of these are the first authenticated spring fish of this era in the Thames. The largest fish was a male of 6.6 kg. and examination of the scales confirmed that it was indeed a spring salmon.



### Juvenile Stocking 1990

All adult fish returning are still thought to be derived from the release of juvenile salmon into the freshwater part of the catchment. These stock-fish are largely obtained from commercial sources however, we are now in the process of undertaking a large scale rearing operation. Returning adults will be retained in future and their progeny, together with other wild-origin stock when available, will form the bulk of our stock requirement. This is currently in the region of 300,000 ova but will increase to a figure in the region of 500,000 in future.

To date this year approximately 80,000 fish have been stocked and the final total for the year will be in the order of 130,000 parr and smolts. Approximately 14,000 of the smolts have been specifically marked, many of them by microtagging, to provide important information on the effects of different rearing and stocking procedures. Interesting recaptures of tagged fish in the high seas fisheries are also reported each year : 4 of the 16 English and Welsh microtags returned from the Faroese fishery for 1988/89 proved to be of Thames origin.

### Juvenile Salmon Trapping

Following concern at the possibility of migrating smolts being lost into potable water abstraction channels, particularly in years of low flow, a trap and experimental diversion facilities have been installed at a typical channel in the lower Thames. The trap is situated over 100 metres down the channel and consists of an inclined louvre-type screen which deflects entrained fish into a trapping structure. Initial work confirmed that the loss of smolts into the many abstraction channels was on a large enough scale to be of concern. We are now, therefore, investigating the potential of light and bubble screens to deter smolts from approaching the critical area in the vicinity of the channel mouth.

In 1989 experiments used identifiable batches of smolts with the three possible combinations of screens and subsequent trap catches showed that the exclusion of smolts was indeed possible. At the bubble screen, inspection revealed smolts being visibly startled and moving rapidly away, thus avoiding the powerful abstraction flow. Further trials are due to be undertaken this year and, subject to satisfactory results, it is hoped that we shall be able to definitively state the efficiency of such behavioural screens.

### Thames Salmon Trust

Steady progress has been achieved by the Appeals Director of the Trust, Major John Hyslop, in his efforts to attract sponsorship and direct funding. On the main Thames, 6 fish passes have now been constructed and a further 7 have been funded and designed : 3 of these should be constructed during 1990. This leaves a further 9 weirs which will need passage facilities and negotiations are currently well underway for the sponsorship of two of these. Further passes will also be required on many of the Thames tributaries which contain the potential spawning and nursery grounds, and it is most encouraging that progress is also being made in this area.

The attraction of more funding is most important as fish pass construction is only the first stage of our ambitious programme. The identification, assessment and improvement of the freshwater habitat will be a lengthy and expensive process, but is clearly of great importance if successfully returning adults are to spawn productively.

## NRA - WELSH REGION

### ENFORCEMENT

A core of 60 full-time bailiffs, reduced from 69 in 1988, supported by casual and honorary staff is responsible for anti-poaching work in the region.

Although 1989 was an atypical period for angling and poaching due to low water levels the Fisheries staff were encouraged by a number of notable convictions reflecting the concern of many magistrates and judges for the serious harmful effects of illegal fishing. Such successes are illustrated by the following examples:

- i) of two defendants fined £1,000 each at Caernarfon Crown Court one received a further suspended sentence of 9 months imprisonment and their boat and equipment was confiscated;
- ii) a ghillie found guilty of illegally netting on the River Usk had his equipment confiscated, was fined £1,750 and had costs of £4,138 awarded against him;
- iii) two men were sentenced to 3 months and 14 days imprisonment respectively after netting on the River Tawe. Their vehicle and equipment including wetsuits were confiscated;
- iv) a man who claimed to bailiffs that poachers from Bridport had taught him to use nets on the River Wye was fined £950 and had his net, dinghy and three salmon confiscated by magistrates at Tintern;
- v) vehicles used by poachers on the River Dee were confiscated by courts in two cases along with substantial fines and prison sentences.

A successful prosecution for handling fish which had been taken illegally showed the benefit of the Authority's awareness campaign aimed at people trading in salmon and sea trout. It was apparent that magistrates took notice of the fact that the defendant had received an Authority leaflet explaining the law with regard to the sale of salmon and sea trout when considering their verdict and fines of £800 on three charges were the result.

A subsidiary company of Dwr Cymru Welsh Water, Aquanorse, which farms salmon in Milford Haven, was successfully prosecuted for failing to obtain NRA consent for the introduction of fish to its rearing cages.

An enforcement training module has been developed and implemented for bailiff recruits.



## IMPROVEMENT AND DEVELOPMENT

The provision of passes to help migratory salmonids traverse obstacles, particularly weirs, has formed an important aspect of improvement work. A pass and trap on the Panteg Weir on the River Tawe was successfully completed. A similar pass and trap on the Radyr Weir on the River Taff near Cardiff was constructed as part of the fisheries monitoring programme financed by the Cardiff Bay Development Corporation. Plans for a pass on the Treforest Weir, also on the River Taff, were passed to MAFF for approval. The Taff is a river of particular importance to the Authority with its migratory fisheries recovering substantially from the effect of industrial pollution.

Following a massive fish mortality in December 1987 on the Rivers Llynfi and Ogmore a project group was convened to co-ordinate the rehabilitation of fish populations financed from an out of court settlement of £200,000 by the polluter. A four year programme introducing 45,000 1+ salmon and 62,000 1+ sea trout, continual monitoring and survey work and fish access improvements form part of the plan.

## CATCH DATA

The continuous low river flows discouraged salmon and sea trout from entering most rivers and angling catches were significantly smaller than in previous years. At the time of writing full analysis of catch returns has not been completed but initial results suggest that 5,000 salmon and 12,000 sea trout were taken in the rod fishery.

The commercial fishery suffered similarly with approximately 4,000 salmon and 5,000 sea trout reported compared with 5,124 and 6,799 respectively in the previous year.

Low water conditions also appeared to be responsible for reduced numbers of fish in the spawning streams. Sea trout spawning was probably less than 50% of the normal level.

## INVESTIGATIONS

Salmon and sea trout tracking studies on the Usk Estuary and Tywi catchment continued to provide valuable information on fish movements in relation to environmental variables. The investigations are of national strategic importance, the data enabling resources to be effectively targeted to areas of greater effect in safeguarding and improving fisheries.

Over 50,000 salmon and 25,000 sea trout parr and smolts were microtagged and released into Welsh rivers. Adult recaptures last year from tagged fish released in previous years totalled 117 of which around 50% were recorded from distant water fisheries. Homewater recaptures were reduced compared to 1988, probably as a result of overall depressed catches due to the drought.

A number of tidal barrage schemes under construction or active promotion in the Region have implications for migratory fisheries. Construction of a tidal barrage on the River Tawe commenced in February 1989 incorporating a 'folded' pool and traverse fish pass and fish trapping facilities. Negotiations for a programme of water

quality and fisheries monitoring were begun with Swansea City Council, the barrage promoters.

The Cardiff Bay Barrage Bill, enabling construction of a total exclusion barrage across the Taff estuary continued its progress through parliament. Detailed discussions were held with the promoters regarding fish passage and trapping facilities within the barrage and a fisheries monitoring programme to include tracking, tagging and trapping studies (will be funded by the promoter). A minimum level of mitigation will be implemented, irrespective of whether any damage to fish stocks as a result of the barrage can be demonstrated and funded by the barrage promoters.

#### NEW THREAT AS FARM POLLUTIONS FALL

Damage to Welsh rivers by animal waste slurry running off farmland have increased, despite an encouraging drop in farm pollution launched today (April 4th, 1990).

And some farms which have diversified into cheese making and milk bottling are overloading their waste disposal systems and causing serious problems.

National Rivers Authority scientists say these growing concerns are part of a generally much improved picture on farming pollution, but there's no cause for complacency.

"Some farms are now carrying out food-industry type processes which produce very polluting effluents," said Bob Merriman, pollution control manager for the South Western division of NRA Welsh Region.

"Proper systems must be installed to manage these new processes without giving rise to pollution. We much prefer to work with the farmer to ensure a satisfactory system is installed, rather than deal with problems after they have arisen".

The report "Water Pollution from Farm Waste 1989" shows a substantial fall in incidents recorded in the Welsh region of the NRA from 567 in 1988 to only 354 in 1989 and this follows a similar fall in England.

"This is extremely good news" says Bob Merriman, a co-author of the report. "Especially encouraging is the large reduction in silage effluent incidents, which went down from 101 to 18, with many farmers now being more aware of the dangers posed by silage effluent.

"Let's not be complacent however; everyone in the industry must recognise the influence of the very dry summer which reduced silage effluent and yard water in particular".

"These figures clearly show the benefits of wilting silage and reducing the influence of rainfall on contaminated yard areas". "Our message is therefore quite simple," adds Bob Merriman. "Wilt silage if at all possible and install and maintain an effective clean water separation system".

"Whilst farmers cannot control the weather, it is possible for them to



control the eventual quantities of farm waste very effectively by installing clean water separation systems".

"This is all the more important with legal controls on farm effluent structures due to come into force this summer".

#### NRA - WESSEX REGION

Regular patrols using the Authority's new fisheries boat were made along the Somerset and Avon coasts during the year. This enforcement work supported by land-based operations was aimed at preventing the illegal exploitation, by both drift and fixed nets, of salmon in the Bristol Channel. A successful prosecution against two persons was taken during the year and fines of £750 and £350 with costs of £250 and £150 respectively were imposed by the Court.

The fourth year of a five year study has been completed on the River Avon Hampshire where salmon are being radio tagged when netted in the Harbour entrance at Mudeford, released near to point of capture and their movements tracked and recorded in the riverine environment. The extremely dry year in 1989 gave seasonal variation to the study, which was welcomed although somewhat extreme, and will show migration patterns against a low flow situation of considerable duration. The study seeks to identify the importance of river flows on salmon migration in the River and is linked to a possible water resources development scheme where additional water might be abstracted from the lower River. Fish were also tagged on the River Frome.

The Authority completed the second year of its Juvenile Salmonid Monitoring Programme which is part of a national initiative being undertaken by a number of NRA Regions. Thirty-five sites on rivers and streams in Wessex were surveyed using electro fishing apparatus and fish caught were counted, measured and weighted.

Rod catch figures for salmon in 1989 are not yet available. The Commercial salmon catch was a total of 539 fish which includes 124 fish which were tagged and subsequently released into the River Avon (99) and River Frome (25) systems.

#### NRA YORKSHIRE - REPORT OF ACTIVITIES ON THE RIVER ESK DURING THE 1989 SEASON

##### NRA Staff Activities 1989

Everyone will have been aware of the near drought conditions which prevailed during the large part of the Summer in 1989. The very low river flows provided little attraction for migratory fish and, whilst some sea trout braved the river after the few bouts of rainfall which did occur, salmon were not to be seen until the rod fishing season was virtually at an end.

The lack of significant numbers of fish was obviously noted by the poaching fraternity as well and increased levels of illegal fishing did not come to our attention until October.



From October onwards through to the years end the staffing commitment in anti-poaching patrols was considerable and the Fisheries Inspectors were required to work for long hours over several periods.

Once salmon had entered the river reasonable numbers were observed on the spawning redds. Spawning activity continued to late in the year, some fish were seen cutting redds in mid December and a run of salmon was noted in January. These fish were observed to spawn once they arrived up-river. Interestingly such late breeding activity was not unique to the River Esk. Staff from the Northumbrian Region recorded fish on the redds in the Tyne at the end of December.

Effort expended by NRA staff:

River and Tideway: 2940 man-hours  
Sea Fishery: 590 man-hours

Nets recovered: 53 nets  
22 Sea Trout recovered and returned alive  
30 Sea Trout removed dead  
0 Salmon

#### PROSECUTIONS FOR 1989

8 offenders who were reported during the 1988 season were brought to court during 1989. The prosecutions resulted in a total of £1,250 imposed in fines and £700 awarded in costs. The highest fine for a single offence was £150. Four of these offenders had been reported by officers of the Police Force.

17 people were reported for fisheries offences on the river and in Whitby harbour as a result of operations during 1989. In addition 10 people were reported on the North Sea principally involving alleged offences of closed period netting. To date 5 offenders have been prosecuted for 10 offences. Fines have totalled £1,050 with a total of £180 awarded in costs. The highest fine imposed was £300 for the offence of attempting to foul-hook fish.

#### SUPPLEMENTARY MANPOWER

The decision was taken, in the light of lower levels of threatened violence towards Inspectors in recent years, to discontinue the use of security personnel for the 1989 season. In the event this did not lead to any serious difficulties or unduly unpleasant incidents but the employment of such operatives will be kept under review season by season.

The part-time, call-in bailiffs have continued to be used as and when necessary. Their contribution to our operations has added up to a further 112 man-hours.

The Police Force were again very active in preventing illegal fishing and apprehending poachers during 1989. Local officers gave invaluable assistance to the Fisheries Inspectors and local task forces were also involved during the season.

## FISHERIES MANAGEMENT

### a. Stocking

All the salmon parr for stocking to the River Esk are to be provided from the NRA Northumbrian Region hatchery at Kielder. The three parties who provide funds for this exercise have each agreed to raise their contributions by £100. With this additional money at least 10,000 parr will be provided all of which will be microtagged.

### b. Surveys

The three year, rolling programme survey of the River Esk fishery took place during September 1989. This incorporated the investigations required for the national Juvenile Salmonid Monitoring Programme. The Authority's biologists carried out a survey of the Murk Esk system following a fish mortality in November.

### c. Fish Mortalities

5 fish mortalities have been recorded within the Esk catchment in the past year.

One of these, in a small beck at Danby, was suspected to have been caused by toxic pollution, possibly of agricultural chemicals. No specific source was identified. 3 trout of about 9" were recorded lost.

In the other four instances the cause appears to have been acid run-off. Dead fish were reported after the becks had their first significant spates following the long dry spell. This is a typical situation where an episode of depressed pH can be expected. The biggest losses of fish occurred in the Murk Esk and in Baysdale Beck.

#### Summary:

<u>Date</u>	<u>Water</u>	<u>Fish Lost</u>	<u>Cause</u>
1/11	Beck at Danby	3 trout 9"	Toxic polln.
13/11	Murk Esk	50+ trout 2-8" 4 sea trout 3-4lb	Acid runoff
13/11	Danby Lodge Beck	3 trout 3-8"	Acid runoff
30/12	Commondale Beck	20+ trout 2-4"	Acid runoff
30/12	Baysdale Beck	60+ trout 2-4"	Acid runoff

Surveys were carried out on several of these becks following the mortalities to assess the extent of damage to the fish stocks and effects on the invertebrate communities.

### d. River Esk Fisheries Action Plan

The current situation regarding the maintenance and improvement of the

Esk fishery has been discussed at recent officers meetings. These discussions have lead to the formulation of an action plan, which will be implemented as soon as resources allow.

\* \* \* \* \*

THE LAW OF GAME, SALMON AND FRESHWATER FISHING IN SCOTLAND  
(by Stanley Scott Robinson)

A review by D. J. Mackenzie

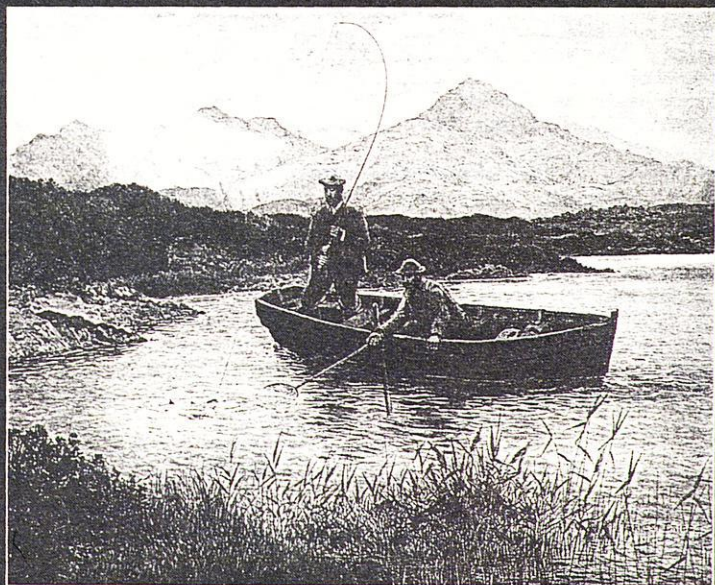
Stanley Scott Robinson's book "The Law of Game, Salmon and Freshwater Fishing in Scotland" fills a gap much needed, especially on the law relating to fishing. As he rightly points out, it is a pity that the 1986 Salmon Act was not used to consolidate the law. However, this is where the book is so valuable as it draws together all the necessary references in one place.

This work will be of immense value to all those who have dealings with the law, especially Clerks to District Fishery Boards and Fishery Managers and Factors. It is, as all books of reference are, expensive but nevertheless it will save precious minutes and will soon recoup the £55! As a complete layman in legal affairs, I find it well laid out, easy to understand and with a good index.



*Stanley Scott Robinson*

**The Law of  
Game, Salmon  
&  
Freshwater Fishing  
in Scotland**



*Butterworths*  
*Law Society of Scotland*

## THE GAME CONSERVANCY TRUST WILD BROWN TROUT RESEARCH PROJECT

The Game Conservancy is conducting a questionnaire-based survey of the current status of brown trout and sea trout (Salmo trutta) stocks in the British Isles as a follow-up to a successful pilot study carried out in 1988 (Freshwater Biology (1989) 21, 125-133). As many readers will be aware there has been considerable concern over the disastrous declines in sea trout catches over the past two years in both north-west Scotland and in the west of Ireland. Catches have fallen so low on several famous fisheries that the tourist income derived from visiting anglers has been severely curtailed. It is now well known that many wild brown trout populations in south west Scotland, down the English Pennine hills and across into north west and central Wales have also declined sharply. In this case it is possible to ascribe the damage to the effects of long-term acidification of upland water catchments. In the case of the more recent sea trout population crash the cause(s) are unknown although many possible reasons have been suggested. It is important that the geographical extent of the declines in both wild brown trout and sea trout is now established for the whole of the British Isles so that the current status of Salmo trutta stocks can be assessed. This survey will have important implications for water quality assessments of both still and flowing waters since trout are a good indicator species of water purity (especially with respect to acidification and eutrophication). I would, therefore, be most grateful if all persons who are able to provide information from either angling catches of trout or scientific fisheries survey data would fill in the following questionnaire and return it to me, Dr. N. Giles, at:

The Game Conservancy, Fordingbridge, Hampshire, SP6 1EF.



.....

Please complete the following questionnaire if you can provide information on the current status or any historical trends in abundance of brown trout (including sea trout) in British waters.

Address

State approx. size of water  
and type (lake/river/stream)

If so ... how many fish are stocked?

Do you have any information on trout stock abundance or rod catch records available from fishing log books, or other sources?

Over what periods do your records run?

Please return to: Dr. N. Giles (Brown Trout Project)  
The Game Conservancy  
Fordingbridge  
Hampshire

A day out for all the family !



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# Scottish Fair

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*In aid of Blackcock research*

**Entry - Adults £5**  
**Children under 14 FREE**  
*(accompanied by an adult)*

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*Supplied by Justerini & Brooks Ltd.*

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- Cross country go karts
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## HIGHLAND FIELD SPORTS FAIR

3rd & 4th August, 1990 at MOY, by INVERNESS

The Royal Welsh Agricultural Society Ltd.  
Cymdeithas Amaethyddol Frenhinol Cymru Cyf.



Patron / Noddwr: HER MAJESTY THE QUEEN

President / Llywydd: Mr. JOHN E. TUDOR, C.B.E., B.V.Sc., M.R.C.V.S., J.P.

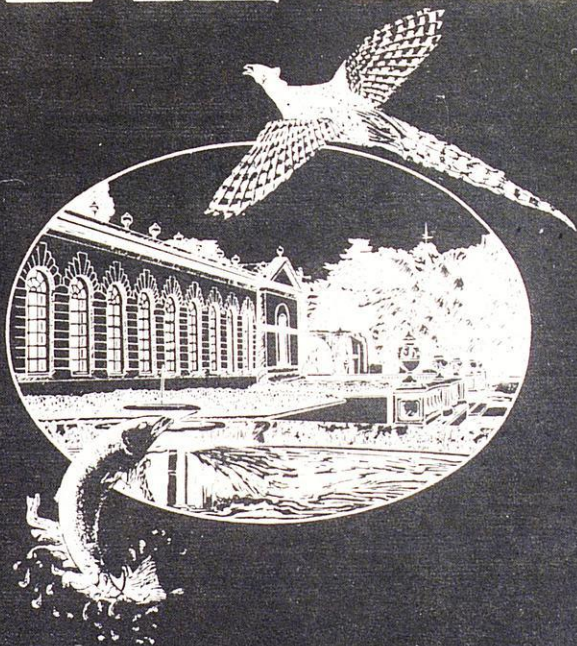
ROYAL WELSH SHOW / SIOE FRENHINOL CYMRU

LLANELWEDD, BUILTH WELLS: JULY / GORFFENNAF 23, 24, 25 & 26, 1990





# GAME FAIR



## MARGAM PARK PORT TALBOT AUGUST 2, 3, 4 1990

Adults

£7.00 (daily)

Children Under 14

FREE

Car Park

FREE

Caravan Site Available

## ICELANDIC INITIATIVE

At the Helsinki meeting of NASCO in June 1990, the NASCO Council discussed the principles involved and agreed to set up a working party to look at the Icelandic Initiative to buy out the Faroese and Greenland quotas. The following is a draft leaflet which the Trust is preparing to issue as a "warning order" once there are clear prospects for a successful agreement.

### BRING BACK MORE SALMON TO BRITISH WATERS - THE PURCHASE OF THE HIGH SEAS FISHING QUOTAS NEEDS YOUR SUPPORT

An initiative to buy out the high seas salmon-fishing quotas allocated to the Faroes and Greenland was launched in 1989 by Mr. Orri Vigfusson, Chairman of the Icelandic Laxafelað Angling Club. It received immediate support from groups representing owners, anglers and commercial interests, and he set about obtaining international backing from other countries with Atlantic salmon stocks.

Representatives of national conservation organisations met in Oslo in December 1989 and agreed on the need to take the opportunity offered by the low price of salmon. Since then, developments have been encouraging. The Faroese fishermen have agreed to the principle of compensation for not fishing their quota. There have also been meetings with Greenland salmon fishermen - although these were hopeful, agreement is likely to take longer. However, the Faroes buyout is an immediate possibility, which must not be allowed to slip from our grasp.

Government departments in the United Kingdom and in Ireland can make no promise of financial support, although the Norwegian Government is proposing to contribute to their national share. Fund-raising in this country is therefore needed, and is being organised on behalf and with the full support of the Association of Scottish District Salmon Fishery Boards, the Salmon and Trout Association, the Scottish Anglers National Association, the Atlantic Salmon Trust and all Salmon Conservation organisations in the United Kingdom. This leaflet explains the proposed buyout and what it will mean to British salmon stocks. Read on to see why your help is justified.

### BUYING OUT THE QUOTA - YOUR QUESTIONS ANSWERED

- Q. What is the quota?
- A. The North Atlantic Salmon Conservation Organisation (NASCO) sets limits for fishing on the high seas feeding grounds off the Faroes and West Greenland. The current quota for the Faroes runs for the three years 1989-91, and amounts to 1,790 tonnes (i.e. 597 tonnes per year).
- Q. What does a quota buyout really mean?
- A. By paying compensation to the Faroese salmon fishermen not to fish their national quota, no salmon will be taken anywhere within the 200 mile zone around the Faroe Islands. This



compensation will be based on a proportion of the value that the catch would have fetched.

- Q. How can we be sure that they will observe the agreement and not fish? Some Danish fishermen are apparently already fishing illegally there under flags of convenience - is there not a chance that such poaching might increase?
- A. The Faroese Government already patrol their waters, and there is surveillance by other nations in the general area. The question of illegal fishing is being taken up positively by NASCO and the relevant governments.
- Q. How many fish are likely to be saved?
- A. Precise figures are difficult to determine, but existing quotas allow for catches of, Faroes 142,000 fish - West Greenland 275,000 fish. If the Faroese fishery is bought out, the saved fish destined for the UK would be in the order of 31,000. If the Greenland quota is bought as well the figures will be substantially higher.
- Q. What would this mean to catches in our rivers?
- A. This is very difficult to calculate as not enough is known of exploitation rates, but a figure of between 6% - 18% seems the likely benefit.
- Q. What sort of fish will they be?
- A. The salmon returning will be multi sea winter fish, larger than the average grilse, and most likely spring or early summer fish.
- Q. Will our rivers really benefit from these extra fish, or will they be taken by the interceptory fisheries off the north-east of England and the north-west of Ireland?
- A. No doubt some will be taken by these fisheries, although some spring fish should enter our rivers before their season begins. However, once we have reached agreement on the quota purchase, we can highlight even more strongly the need to close these interceptory fisheries.
- Q. How is the cost of the quota purchase to be divided between nations?
- A. For the Faroes quota, the proposed UK share is 22%, with 17% to Ireland (Norway bears the heaviest cost). The UK proportion of a Greenland buyout has not yet been set, but should be smaller.
- Q. What about quotas after 1991? Can this be a permanent agreement?
- A. Quotas will continue to be negotiated through NASCO for succeeding years, but the proposed agreement will include the right to buy out these quotas on similar terms.
- Q. So will we need to raise funds every year?



- A. No, the aim is to raise a capital sum which will be invested to cover the cost of compensation payments for each quota period as it comes up. We have to take the future buyout of at least part of the Greenland fishery into account.
- Q. Right, now what is it all going to cost?
- A. The target figure is £2 million.
- Q. Are other organisations involved?
- A. We are asking all organisations concerned with the Atlantic salmon to help raise the money. Contributions may be sent to them or direct to "International Atlantic Salmon Appeal".

**THIS IS YOUR CHANCE TO INVEST IN THE FUTURE OF OUR SALMON  
PLEASE, WILL YOU CONTRIBUTE?**

International Atlantic Salmon Appeal  
Moulin  
Pitlochry  
Perthshire PH16 5JQ

or paid to

Bank of Scotland  
76 Atholl Road  
Pitlochry  
Perthshire PH16 5BW

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\* \* \* \* \*

The following are extracts of Hansard, dated 12th June, 1990. Mr. Dalyell attended a conference at the Loch Maree Hotel, on 18th May, at which the Director was present. It is pleasing to note that the Atlantic Salmon Trust's work is acknowledged.

**Mr. Dalyell:** To ask the Secretary of State for Scotland if he will make a statement on his co-operation in fisheries research with experts in the west of the Republic of Ireland.

**Mr. Lang** [holding answer 11th June, 1990]: Scientists of the Department of Agriculture and Fisheries for Scotland keep in close touch with scientists and fishery managers from the Salmon Research Trust of Ireland at Burrishoole and the Department of Marine in Dublin about their respective research programmes. There is also frequent

contact with counterparts from the Republic of Ireland in various working groups of the International Council for Exploration of the Sea or meetings of other international organisations.

**Mr. Dalyell:** To ask the Secretary of State for Scotland what study he is making of habitat erosion and fish spawning.

**Mr. Lang** [holding answer 11th June, 1990]: Some of the effects of habitat erosion on fish spawning are well understood. For example, bankside erosion is known to cause loss of cover for parr and adults, loss of terrestrial food organisms from bankside vegetation and silting up of spawning gravel downstream.

The effects may result from over-graving, intensive bankside activity by anglers and changes in flow regime. The latter can have several causes including land use changes or exceptional rainfall in catchments or changes in drainage, planting or clear-felling in forestry. Research has shown that such changes can be minimised by adopting good management practices.

A study of the effects on salmonid fishes of changes in drainage patterns following afforestation is currently being undertaken by scientists from the Freshwater Fisheries Laboratory at Pitlochry in co-operation with the Forestry Commission, the Institute of Freshwater Ecology and the Atlantic Salmon Trust. A study of the effects of clear-felling on salmonid fishes is also in progress with Forestry Commission help.

Extensive surveys of the distribution of juvenile salmonid fishes have recently been undertaken by freshwater fisheries laboratory staff. These surveys give an important indication of the success of salmon spawning in different areas of Scotland.

**Mr. Dalyell:** To ask the Secretary of State for Scotland what study he is making of the impact of seals round the mouths of fishing rivers in dry summers on sea trout entering the rivers to spawn.

**Mr. Lang** [holding answer 11th June, 1990]: There has been no specific study of the impact of seals at the mouths of fishing rivers although some work has been done on the diet of seals in the Moray Firth. A series of papers has been produced as a result of this and other research on seals commissioned by DAFS and the results will be published over the course of the next 18 months.

**Mr. Dalyell:** To ask the Secretary of State for Scotland what study he is making on Loch Eriboll of the inter-breeding between wild and farmed salmon, and if he will make a statement on the results.

**Mr. Lang** [holding answer 11th June, 1990]: In February 1989, a large number of growing salmon escaped from fish farm sea cages in Loch Eriboll in northern Scotland as the result of a single accident. By August it had become clear that escaped farmed fish were entering the nearby River Polla with the native run of wild fish. Scientists from the Department of Agriculture and Fisheries for Scotland supported by the Atlantic Salmon Trust, the University of Stirling and the Scottish Salmon Growers Association, studied the spawning of wild and farmed fish in the river.



The movements of radiotagged fish were monitored and it was established that wild fish and farmed escapees could be distinguished by appearance and by pigment analysis of samples of muscle taken from fish of both types. All the fish entering the river were sexually mature and farmed fish of both sexes were observed to spawn. All the females captured towards the end of the year had become spent. Farmed and wild fish were observed to cross. Wild fish were distributed throughout the river's length at spawning but the distribution of farmed fish was more restricted. Farmed fish of both sexes tended to spawn especially in the lower reaches of the river. This tendency was particularly marked in the case of females, by pigment analysis of eggs sampled from redds located throughout the river's length. Farmed females tended to spawn later than wild ones. Farmed females cut redds on areas of spawning gravel on which redds had previously been constructed by wild fish.

The results of the study were presented at an international symposium in Norway in April 1990, to consider "Interactions between Cultured and Wild Atlantic Salmon". Full details of the study have been submitted for publication in the scientific literature.

Study of the River Polla will be continued this year to determine whether farmed salmon enter the River Polla again and, if they do so, whether last year's findings may be generalised between years at the same site. Further studies are being performed to establish whether escaped farmed females spawned in the Rivers Hope, Strathmore and Dionard which flank the River Polla to the east and west, respectively. Pigment analyses will be performed on eggs and alevins sampled recently from both rivers. In addition, with the Queen's University of Belfast, it is intended to test whether observations of the crossing of farmed and wild fish can be confirmed using genetic "fingerprinting" techniques to establish the parentage of juveniles.

**Mr. Dalyell:** To ask the Secretary of State for Scotland if he will give his Salmon Advisory Committee a remit to concern themselves with sea trout.

**Mr. Lang** [holding answer 11th June, 1990]: We have no plans to do so. The Salmon Advisory Committee already has a very substantial programme of work to complete on Atlantic salmon.

**Mr. Dalyell:** To ask the Secretary of State for Scotland what study he is making of fish-bearing pathogens.

**Mr. Lang** [holding answer 11th June, 1990]: Scientists at the Department of Agriculture and Fisheries for Scotland's marine laboratory investigate the causes of pathological conditions in wild and farmed fish in Scotland and carry out research on the detection of pathogens and the diagnosis and prevention of infectious diseases in fish.

This research provided the basis for advice to my right hon. and learned Friend on the use of his powers under the diseases of fish legislation and to district salmon fishery boards, fish farmers and fishermen to help them prevent or minimise the effects of diseases in farmed fish.

**Mr. Dalyell:** To ask the Secretary of State for Scotland what research



is being undertaken on the marine phase of sea trout life-cycles.

**Mr. Lang** [holding answer 11th June, 1990]: Research has been undertaken by the Scottish Marine Biological Association on the movements and feeding behaviour of sea trout in sea lochs in Argyll. This will be followed up by a coastal sampling programme in north west Scotland to obtain additional information on seasonal diets, insights into the distribution of the sea trout and material for parasitological and microbiological examination. The work will be undertaken by scientists from the Department of Agriculture and Fisheries for Scotland's marine and freshwater fisheries laboratories, in co-operation with local fishermen.

\* \* \* \* \*

The following is reproduced from the Tweed Foundation Newsletter, with their permission.

#### **FISHERMEN & 10TH COMMANDMENT**

(by H. P. Younger - Murray, Beith & Murray)

I wonder if any of your eyes were drawn, as were mine, to the recent press reports of the decision in the English case of Lovett and Wark Farms Ltd. -v- Fairclough and Others. For those who did not read the reports, the case concerned the right of the owners of the Scottish beat of North Wark to fish a pool in the river Tweed known as Jeffrey's Pool from the north side. On the face of it it looked as if the proprietor of the fishings on the English side (Miss Lovett) had a slim chance of succeeding, since the pool had been fished from the north side by the owners and tenants of North Wark for as long as anyone could remember. Indeed the present Lord Home recollected fishing the pool before 1920, at which time the fishings on the southern bank, South Wark, were owned by the Earl of Tankerville whose family had owned the Wark estate in England for several centuries. A statement from Lord Home which spoke to his family's lengthy ownership of the North Wark fishings was lodged in Court in support of the Scottish claim, but in the end it did not assist the case of the North Wark Syndicate, since Miss Lovett was able to prove that the boundary between Scotland and England ran to the north of Jeffrey's Pool and thereby satisfied the Judge that the whole bed of the pool lay in England. The case was decided in Miss Lovett's favour.

The importance of the nationality of the bed of the pool stems from the fact that in Scotland a title to salmon fishings is invariably based on a Scottish Crown Charter. The fishing rights granted by the Charter are by nature only exercisable in Scotland and probably only in the particular Country specified in the Charter. They do not extend to the territory of another Country. The North Wark Syndicate as holders of a Scottish title therefore have no legal right to fish in parts of the River Tweed lying in England. Conversely Miss

Lovett's title is based on an English Crown Grant and she has no legal right to fish in Scotland.

Oddly enough the fixing of the national boundary along a line to the north of Jeffrey's Pool was settled by a case in 1774 involving the then Lord Tankerville and the then Lore Home. This raised an interesting question since, if the boundary was fixed to the advantage of the Tankervilles, why did the Home family continue to fish Jeffrey's Pool from the north side until they sold the North Wark fishings in 1961.

In his judgement in the Lovett case, Mr. Justice Mummery also made clear that the North Wark Syndicate could not even stand on Scottish soil and cast over the English boundary into Jeffrey's Pool. If you fish on any one of the lower beats of the Tweed where the national boundary runs down the centre of the river, you need not however be too concerned that in consequence of this decision a boat from the opposite bank will row out and cut your line as it crossed the middle line of the river. The peculiarity of the Lovett case is that the whole of the bed of Jeffrey's Pool lies in England. If the situation had been reversed, the winners would very probably have been the North Wark Syndicate and, in fact, on doing some research for this article I found that in the case of Milne and Home -v- Smith in 1850, Messrs. Milne and Home, the owners of the salmon fishings at Paxton in Scotland succeeded in preventing the tenant of the fishings on the English bank, a Mr. Smith, from fishing over the middle line of the river. The case is a Scottish one and the then Lord Justice Clerk of the Court of Session took a dim view of Mr. Smith's actings as you will see from the following excerpt from his judgement:-

"there is nothing in the physical aspect of the river which can possibly prove that a river originating in and running through the greater part of its course in Scotland, can cease to belong in part to Scotland, when it comes to touch the opposite bank in England for the latter part of its course....when the respondent then, comes to fish in the half of the River which adjoins Scotland, he is exercising a right within Scotland. To do this he has no title whatever. He has no right under the law of Scotland. He is simply a trespasser, invading the territory of Scotland for the purpose of spoil."

It seems, however, that it is the exception rather than the rule for a pool to lie wholly on one or other side of the national boundary. In the main, opposing proprietors have only a share of each pool and therefore the laws of both countries acknowledge that opposing proprietors may reach some kind of accommodation which permits them to fish across the national boundary for their mutual benefit. The nature of the agreement is personal, however, and therefore, if for any reason opposing proprietors fall out, each would have to restrict their activities to their own half of the river. This is extremely unlikely to be in the interests of either.

If you are wondering whether the decision in the Lovett case has any effect on parts of the Tweed which lie wholly within Scotland, the answer is firmly in the negative. There was considerable doubt about the true situation for many years, but this was largely resolved by the case of Fotheringham -v- Passmore in 1984 which was finally settled by the House of Lords. In essence their Lordships held that the true principle applicable to fishing for salmon by rod and line in Scottish



rivers where the opposite banks are in different ownerships is this:- Each proprietor is entitled to stand on his own bank, or to wade out to the limit of his property in the bed of river (the middle line) and to fish as far across the river as he can by normal casting or spinning. He may also anchor a boat at any point on his own side of the middle line and cast from it towards the opposite bank provided that he does not do it in a manner which not only annoys and prejudices the opposing proprietor, but also brings no benefit to himself.

There are many beats which physically cannot be fished at the same time by fishermen from opposite sides of the river and therefore in Scotland proprietors tend to reach an accommodation for their mutual benefit. This might mean that they fish a particular pool exclusively on alternate days or parts of days. If at any stage opposing proprietors are unable to reach agreement as to the method by which their fishings can most effectively be utilised, the final remedy available to disgruntled proprietors is for them to make an application to the Scottish Courts for regulation of their rights. If the Court accepts that regulation is necessary, it will set down the regulations under which the proprietors involved may exercise their fishing rights.

I have strayed somewhat from Miss Lovett's case during the course of this article, but I hope that I have made the point that in general fishings are best regulated by informal agreement between opposing proprietors, especially in Scotland where a proprietor is entitled to fish from the very extremities of his property into the water of his neighbour.

#### **THE TRUST AND THE EUROPEAN PARLIAMENT** (Report by the Deputy Director)

The Atlantic Salmon Trust is a member of the UK section of the Federation of Field Sports Associations of the EEC (known as FACE) which has an office in Brussels, and represents the interests of country sports to the European Commission and to the Parliament. Through the auspices of FACE, the Trust was invited to address an Intergroup of the European Parliament on the subject of Atlantic Salmon Conservation in Europe. Intergroups are all-party associations of MEPs interested in a particular subject, and the intergroup concerned was that dealing with Field Sports, Fisheries and Conservation, which is chaired by Sir James Scott-Hopkins.

Accompanied by Major General John Hopkinson, Director of the British Field Sports Society and Chairman of FACE(UK), I went to Strasbourg to talk to the Intergroup on 5th April. The meeting was constrained by time, and I was told that I could only speak for a maximum of eight minutes, although there might be time for questions. However, there would also be the opportunity to meet a number of MEPs before and during lunch on the day, and this proved to be most useful.

In the event, the meeting was well attended, and my brief presentation resulted in some twenty-five minutes of interested questions. The last direct contact that the Trust had with the Parliament was when Alex Prichard, my predecessor, spoke to its Fisheries Sub-Committee,



at the time when the Parliament was considering a resolution by Joyce Quin on the need for European action in the field of salmon conservation. I therefore concentrated on reviewing the action (and lack of action) on this resolution, which was adopted by the Parliament in 1987, and on recommending where MEPs should now concentrate their efforts. I was able to hand out a summary aide-memoire, which will go to all members of the Intergroup, together with the minutes of the meeting and the full text of my representation. The text of this aide-memoire is attached to this report.

Obviously, the importance of any contact of this nature depends on the possibility of following it up. I have been invited to approach the Fisheries Sub-Committee in the same vein, and this is in hand. Furthermore, the Chairman of the Intergroup is interested in investigating a European tagging scheme, and we will be keeping him in touch with current UK initiatives in wake of the collapse of dealer licensing. Overall, I assess this as having been a useful opportunity to make the Trust's case at a European level, which promises the opportunity to influence EEC action on salmon conservation, and affords the chance for continued direct involvement both with the Parliament and with the European Commission.

## THE ATLANTIC SALMON - A EUROPEAN STRATEGY

### AIDE-MEMOIRE

The wild Atlantic salmon is a fish that is part of the natural heritage for the European countries that have a western coast. A fresh water fish, which spends a part of its life feeding and growing at sea before it returns over thousands of miles to its native river to spawn, the salmon is a resource to be properly managed and guarded. To its country of origin, the salmon is a magnificent example of wildlife, a commercial source of food, a provider of unparalleled sport, and an economic generator of income through the revenue brought in (often to depressed regions) by salmon angling and its associated tourist spending. All these aspects must be balanced, and this demands an international approach to the conservation of a fish whose homing instinct gives each nation its own natural stock. Unrestricted fishing at sea attacks that stock indiscriminately, and fails to make full economic use of a valuable natural resource.

### Previous activity in the European Parliament, and resulting action.

In 1987, the Parliament passed a resolution introduced by Ms. Joyce Quin. It contained twenty-five clauses, of which the most significant aspects were

a. The need to halt fishing of stocks of mixed origin - the application of quotas under NASCO controls high seas fishing, but there is still too much legal and illegal fishing in coastal and deeper waters.

b. The need for an EC study of salmon stocks and factors affecting fishing in the Community - the Atlantic Salmon Working Group of ICES is providing valuable information.

c. The case for implementation of one provision of the Reykjavik Convention (which called for no new or increased fishing without the agreement of every country whose stocks would be affected) within the Community - this has not happened.

d. The requirement for urgent measures to suppress illegal fishing - which is still rife and needs international action.

e. A recommendation for EC funding to improve and co-ordinate national salmon fisheries inspectorates - despite some progress, much needs to be done.

f. A proposal to study the control of fishing (by monitoring of landings, examining a licensing system, considering a tagging scheme) - little progress; some national tagging schemes exist, but international harmonisation of control and tagging measures is needed.

g. Emphasis on the problems of pollution and man-made obstacles in rivers - despite progress there remains a need to counter estuarial pollution and to overcome the barriers threatened by major barrage schemes.

#### Developments since 1987

The most significant international developments have been:

a. In the UK, the establishment of a National Rivers Authority, which will strengthen the implementation of the 1986 Salmon Act in controlling legal fishing and poaching.

b. The drastic increase in illegal fishing off the Irish coast, reaching out to 50 miles offshore. In addition, there has recently been an increase in high seas fishing by re-flagged vessels not subject to the NASCO convention.

c. The massive growth of salmon-farming, with the attendant risk of transmission of disease and of genetic contamination of wild stocks through interbreeding between wild fish and escaped farm stock. This has been highlighted by continuing advances in genetic studies.

d. The need to agree adequate controls on the movement of live fish into and within the Community after 1992 in order to avoid the spread of disease - draft proposals by the Commission are under national examination.

e. The Icelandic initiative to provide compensation for the Faroese and West Greenland high seas salmon fishermen in order for them to forego their quotas.

#### The need for action

The principal actions needed are:

a. International co-operation to suppress illegal fishing



at sea.

b. Action to ensure that fish farms act to prevent genetic contamination of wild stocks by escaped fish.

c. Formal support for the Icelandic initiative to reduce high seas fishing.

**REVIEW OF CURRENT LITERATURE ON SALMON RESEARCH AND DEVELOPMENT**  
(by Dr. Derek Mills, Department of Forestry and Natural Resources,  
University of Edinburgh.)

**LIFE AT SEA**

1. Postsmolt Atlantic salmon in the Labrador Sea. D. G. Reddin and P. B. Short. International Council for the Exploration of the Sea. CM 1989/M:9.

In order to learn more about the existence, abundance and distribution of postsmolt Atlantic salmon in the Labrador Sea, exploratory fishing was carried out with surface-set gill nets in the Labrador Sea in early autumn of 1987 and 1988. In total, there were 468 salmon of various sea ages captured, of which 207 were postsmolts. The high catch rates compared to catch rates at Greenland suggest the populations of postsmolts in the Labrador Sea may be large. River of origin, as indicated by attached Carlin tags and river age distribution from scale reading indicate that postsmolts from Maine to Labrador were caught.

**SALMON STOCKS**

1. Monitoring salmon stocks in the North Esk, Scotland. W. M. Shearer and D. A. Dunkley. International Council for the Exploration of the Sea. CM 1989/M:6.

The population dynamics of the Atlantic salmon of the North Esk have been intensively studied since 1964. Investigations have included studies on the densities of parr in headwater streams by electro-fishing, estimates of annual smolt production by mark-recapture and the enumeration of returning adults by mark-recapture and automatic fish counting. In addition to these census data, biological sampling programmes have been undertaken to determine age compositions at each of these life stages. Since 1981 those adults which avoid capture in the lower reaches of the river have been counted at the automatic fish counter at Logie some 6 km. from the sea.

This report is a concise account of the invaluable work carried out over the years on the North Esk.

2. Data on Dutch fisheries on salmon (1863-1957) and trout (1886-1986) in the River Rhine. S. J. De Groot. International Council for the Exploration of the Sea. CM 1989/M:17.

As part of the "Ecological Rehabilitation of the River Rhine" programme a literature survey was carried out on the anadromous fish



species presently and at one time inhabiting the rivers Rhine and Meuse systems. Data on salmon and trout catches for a period of over 100 years are given and the fluctuations in catches discussed. The causes for the decline of salmon and trout and the possibility of their being reintroduced are considered.

#### MORPHOLOGY

1. Report of the Second Atlantic Salmon Scale Reading Workshop, Aberdeen, Scotland, 12 - 14 October 1988. W. M. Shearer. International Council for the Exploration of the Sea. CM 1989/M:7. The objectives of this workshop were to establish guidelines for computerised scale reading, to develop new parameters for recommendations of the previous Workshop.

2. Identification of reared and wild salmon by external morphology, size of fins and scale characteristics. R. A. Lund, L. P. Hansen and J. Torbjorn. 1989. NINA Forskningsrapport 1: 1-54. (English abstract and summary).

Three morphological characteristics may be used individually to classify salmon as having their origin in fish farms:

- bud fin (fins worn down to a cartilage-like hump where the rays are not visible) on dorsal and pectoral fins.
- shortened gill covers such that the gills are visible when the covers are normally closed.
- snout/jaw deformation.

Salmon may otherwise be classified as being of reared origin when:

- Two or more parts of the body show wavy rays on dorsal or pectoral fins or rounded tail lobes.
- one body part is observed with the above-mentioned defects and the number of pigment spots below the lateral line (from behind the gill cover to the proximal edge of the dorsal fins) is greater than 15 (valid for the silvery stage of the fish).

Newly-escaped farmed salmon may be identified with near 100% precision by the above-mentioned criteria, while only 35% of recaptures of hatchery-reared smolts could be classified correctly by these criteria.

Dorsal, pectoral and tail fins of harvestable salmon from farm enclosures were significantly shorter than those of wild salmon.

#### PARASITES

1. Atlantic salmon Salmo salar from the Baltic Sea found to show resistance against the monogenean Gyrodactylus salaris. T. A. Bakke, P. A. Jansen and L. P. Hansen. 1989. Proceedings of the XIV Symposium of the Scandinavian Society for Parasitology.

Hatchery-reared salmon fry, native to the River Neva (draining into the Baltic Sea) and the rivers Alta (Northern Norway) and Lone (Western Norway) (draining into the eastern Atlantic Ocean), were experimentally exposed (two weeks) to salmon infected with Gyrodactylus salaris from the river Drammenselv (Southern Norway). The level of resistance was assessed by weekly counts of the number of G. salaris on anaesthetised fish. In the tests the numbers of

parasites increased steadily on the Norwegian salmon but declined on the Baltic fish after initial increase.

## SPAWNING

1. An analysis of the gravels used by spawning salmonids in Ireland. R. D. Fluskey. 1989. Irish Fisheries Investigations, Series A (Freshwater) No. 32.

Samples of gravel from 79 sites selected for spawning by Atlantic salmon, 9 selected by sea trout and 13 within spawning areas but known to be unused by spawning salmonids were analysed. For comparison reported data on 81 samples from sites used by Pacific salmon were similarly analysed. No significant difference was found between the range of gravel distributions used by salmon and that used by sea trout. The range used by Pacific salmon was found to be wider than that used by Atlantic salmon.

## EXPLOITATION

1. The effect of ocean fishing on the salmon run in Laxa i Adaldal, Iceland, in 1989. T. Tomasson. Report VMST-N/89017. Institute of Freshwater Fisheries, Northern Division.

The data presented in this report indicate that the ocean fisheries of Atlantic salmon in 1988-89 may have had a pronounced effect on the catches of 2SW salmon in the River Laxa in 1989. However, the absence of tag returns from ocean fisheries from the 1982-85 tagging experiments, as well as the deviation from the grilse:salmon relationship, indicates that the exploitation of Laxa stock in the ocean fisheries is variable between years.

## MOVEMENTS

1. The movements of adult Atlantic salmon in the River Tay. John Webb, 1989. Scottish Fisheries Research Report No. 44.

The movements of radio-tagged salmon ascending the Tay in 1987 were followed in 1987. Forty-four fish were caught and tagged with radio transmitters and released from net and coble fishing stations in the upper freshwater reaches of the estuary. Twenty-two fish were subsequently tracked within the main river and its lower tributaries. River entry was recorded over a range of seasonal flows. Earlier entrants showed a greater penetration of the river catchment than later ones. Tributary entry and subsequent penetration often coincided with tributary flows.

2. The movements of adult salmon within the River Spey. Robert Laughton, 1989. Scottish Fisheries Research Report No. 41.

Between April and August, 1988, 24 salmon caught in the net and coble fishery in the lower Spey were tagged with radio transmitters and released. Three fish returned downstream after making major upstream movements. Those entering early in the season moved rapidly through the lower beats and within 10 - 12 days had reached Grantown (74.9 km. upstream) where they settled in for the duration of the summer. In contrast, those fish tagged in August remained in the lower reaches, often close to the point where they were released.



3. Migratory and reproductive behaviour of female adult Atlantic salmon, Salmo salar L., in a spawning stream. Bagliniere, J. L., Maisse, G. and Nihouarn, A. 1990. Journal of Fish Biology, 36, 511-520.

Migration and spawning behaviour of eight adult female Atlantic salmon were analysed by radio-tracking in relation to the degree of sexual maturity in a spawning tributary of the River Selune. All the fish migrated upstream until reaching their spawning site. The daily migration rate up to this site was inversely correlated with the length of the female. Spawning occurred in all fish at the same time when the water temperature increased dramatically. Spawning lasted 1-10 days. After spawning, females quickly moved downstream a short distance and then stayed in approximately the same location until death.

4. The behaviour of adult Atlantic salmon ascending the rivers Tay and Tummel to Pitlochry Dam. Webb, J. 1990. Scottish Fisheries Research Report No. 48.

Over the period 25th April to 8th July, 1988, 42 salmon were both radio tagged and yellow Floy tagged, and released into the upper estuary of the River Tay, below Perth. Thirty-three of the 42 tagged fish were tracked as far as Almondmouth or higher, the others being recaptured at netting stations or by rods. Twenty two of the fish were tracked to areas within the River Tay and its tributaries, the Lyon, Isla, Ardle and Shee. The remaining 11 fish ascended the lower Tummel to the area of Pitlochry dam.

After the initial release the fish generally undertook a sustained period of upstream movement and eventually stopped within a series of pools in the lower reaches of the main river between the head of tide at Scone and the Tay/Isla confluence at Islamouth. The initial period of sustained activity took place over a range of seasonal flows and times of day. Fish entering the river early in the day normally continued to migrate upstream in daylight to the fish halt. When the fish entered the river later in the day, migratory activity continued through the evening into the hours of darkness. A second phase of activity occurred after the first stop. In the absence of significant increases in discharge above the seasonal norm, subsequent movement tended to be confined to both crepuscular and nocturnal periods.

Ascent of the lower Tummel and subsequent approach to the dam by the 11 fish occurred over a range of discharges from the dam resulted in disruption of the general pattern of migratory behaviour recorded within the middle reaches of the Tay. The passage of tagged fish from below the dam to the loch above was subject to a range of delays. Two aspects of the behaviour of the fish may account for these delays: (i) a tendency for fish to remain within the tailrace, as a result of the direct influence of the main generating discharge, which emerges some distance from the fish pass entrance and (ii) a tendency for fish to enter the lowest chamber of the fish pass without continuing to ascend. Five of the 11 fish successfully ascended the fish pass and entered the upper tributaries, Garry, Tilt and Errochty. Five of the remaining 6 fish were recorded moving more than 10 km. downstream and not returning to the dam. From observations on fish entering the draught tubes during periods of single turbine operation and reduced hydro-electric power generation, it is suggested that these fish were



in a distressed state and may have died subsequently.

## GENETICS

1. Genetic protein variation in farmed Atlantic salmon in Scotland: comparison of farmed strains with their wild source populations. A. F. Youngson, S. A. M. Martin, W. C. Jordan and E. Verspoor. 1989. Scottish Fisheries Research Report No. 42.

Levels of genetic variation in 12 Scottish strains of farmed Atlantic salmon have been assessed by determining allele frequency variation at six polymorphic enzyme loci. The strains differed genetically from each other, and overall they differed from a representative group of wild Scottish populations. In the nine comparisons which could be made, strains also differed genetically from the specific source population from which they had originally been derived.

## SALMON RANCHING

1. Salmon ranching experiments in the River Imsa: effect of timing of Atlantic salmon (Salmo salar) smolt migration on survival to adults. L. P. Hansen and B. Jonsson, 1989. Aquaculture, 82, 367-373.

Based on tag returns it was demonstrated that survival was highest for fish released in the spring, at the same time as natural smolts leave the river. In autumn and winter the survival to adults was poor. This suggests that there is a "window" of migration which gradually closes in late summer. The authors' hypothesis is that the behaviour of fish will change with time of release and that this will result in heavy predation at times other than spring.

## NORWEGIAN MEETING ON IMPACT OF AQUACULTURE ON WILD STOCKS

(by the Director)

I attended an international symposium on "Interaction Between Cultured and Wild Atlantic Salmon" at Loen in Norway from 23rd - 26th April, 1990. This was a most interesting conference, and it brought together scientists from most of the salmon producing countries. A summary of the meeting was made by Dr. Windsor, the Secretary of NASCO and extracts of the conclusions are reprinted below. It is hoped that all interested in conserving the wild salmon will take note of the recommendations. In Scotland the Trust considers it essential that the east coast rivers are kept free of aquaculture and the Trust is calling for an aquaculture free zone to be established.

## CONCLUSIONS AND RECOMMENDATIONS

### 3. GENERAL CONCLUSIONS

3.1 For about 10,000 years the salmon has been largely undisturbed except by fishing and other environmental changes, mainly in the last 200 years. There is now a new threat. Native Atlantic salmon are now outnumbered by salmon of cultured origin. Large

numbers of farmed fish have escaped and are entering salmon rivers. It has been documented that in some Norwegian rivers over half of the adult salmon are of farmed origin in the spawning season.

- 3.2 There is firm evidence that escaped cultured fish do migrate, do enter freshwater, and we have some evidence that they do spawn with wild fish. Thus unintended and accidental interactions between wild and farmed fish are already occurring.
- 3.3 There are still gaps in our knowledge of the impacts of the genetic, disease and environmental interactions between wild and farmed salmon and these are outlined in the following sections. It is very important that these gaps in our knowledge be filled by undertaking appropriate national research, communicated through international co-operation. However, such research will take many years to complete and if the international community awaits the firm conclusion of this work the changes, which are potentially irreversible will have already taken place. Therefore the approach to this problem should be precautionary. On the evidence available to date it should be assumed that there is a real risk to the native salmon until it is proven that there is no such risk.

#### 4. OCCURRENCE AND BEHAVIOUR OF CULTURED SALMON

##### 4.1 Experiments in North Atlantic waters suggest that:

- (a) immature farmed fish released into a river as smolts will return there but when transferred to another river before release will return to that river and not to their river of origin;
- (b) farmed smolts which escape from a sea site tend to return to the general area of the sea site but are essentially "homeless" due to lack of experience. At maturity they will enter adjacent rivers on an uncertain basis, but few return to their hatchery of origin. However, straying rates and distance increase the later they escape from the sea site;
- (c) fish released at later stages from sea sites in winter show considerably increased straying rates and there are seasonal variations in the survival of such fish;
- (d) farmed fish may enter rivers later than the wild fish and their behaviour differs. They spend less time in the rivers. Due to later spawning by farmed fish they can overcut redds made by wild fish;
- (e) escaped farmed fish are now occurring in increasing numbers on the spawning grounds of salmon in a number of North Atlantic countries. Observations suggest that they reproduce both with each other and with wild fish although reproductive success has yet to be shown. Biochemical studies are required to establish hybridisation occurs;
- (f) reared salmon may have less reproductive success than the wild fish.



- 4.2 Deliberate experimental releases of genetically distinguishable cultured fish into a river with a native salmon stock may provide the most effective means of defining the extent of genetical and ecological interactions between these fish of genetically different background. It is recommended that such experimentation be undertaken, although the need to find appropriate markers and the difficulty associated with such experimentation were stressed.

## 5. GENETIC IMPACTS

- 5.1 Variations in life history parameters exist between and within different river populations. Some of these variations are interpreted as adaptations. These traits include morphology, migration patterns and developmental timing. The details of the adaptations need to be clarified by appropriate genetic studies, and by empirical studies of controlled introductions.
- 5.2 There is evidence that fish produced in hatcheries may show marked changes in fitness. Interactions can therefore be damaging to the wild stocks and one solution might be to make the cultured salmon unfit for survival to breed in the wild. To prevent potential negative genetic effects of farming on wild stocks, more information is needed on the genetic and biological structure of farming broodstocks. There is also a need to recognise the direction of selection in smolt production units, to ensure that change is minimised. Long-term biological and genetic (population and quantitative) monitoring is needed for cultivated stocks.
- 5.3 There is empirical evidence that releases of hatchery fish have resulted in genetic changes in wild populations. This evidence has stimulated the production of theoretical models which suggest that, where intrusions of farmed fish are as massive as already observed in some instances, the characteristics of native stocks could become extinct after only a few generations. There is a need to further develop the scope and complexity of such models, and to test them experimentally.
- 5.4 In the light of the concerns expressed at the meeting all steps should be taken to conserve the genetic diversity of natural stocks. The best solution is conservation of the wild stocks through rational management and conservation of their natural environments. The establishment of gene banks is also supported. Improved techniques (for example the cryopreservation of embryonic tissue) for the establishment and operation of gene banks is strongly recommended.

## 6. DISEASES AND PARASITES

- 6.1 The conditions of farming can favour the outbreak of disease and the transmission of pathogens increasing the risk of infections being passed between wild and cultured fish. Good husbandry and health management of farmed fish are therefore of great importance, and appropriate controls are desirable.
- 6.2 The movement of fish from one locality to another except under carefully controlled conditions poses the risk of introducing

parasites and new diseases or strains of diseases to which local fish are adapted, as probably was the case with the introduction of *Gyrodactylus salaris* in Norway. In this case the parasite causes a great problem and has almost completely wiped out some salmon stocks. In the light of the evidence produced at this meeting it seems clear that moving salmon except under carefully controlled conditions, is a highly undesirable practice and should be minimised.

- 6.3 There is full support for investigations on the transmission of diseases and parasites between wild and cultured stocks. A major goal should be control of disease in salmon farms.

## **7. IDENTIFICATION OF CULTURED FISH**

- 7.1 Although methods of identifying fish which have escaped as adults are adequate it is recommended that research be intensified into improved methods for identifying all life stages of cultured fish and their progeny.
- 7.2 To gauge the scale of the problem it would be valuable for all countries catching salmon to monitor the incidence of fish of farmed origin in their catches and runs. Where large scale escapes of farmed salmon are known to have occurred experiments should be encouraged on the occurrence, behaviour and reproductive success of such fish.

## **8. CONTAINMENT**

- 8.1 In general, steps should be taken to reduce escapement and reduce the number of farmed fish in spawning populations. Aquaculture operations should be located on the basis of minimising impacts on the wild stocks, and careful attention should be paid to the design and operation of culture units. The maintenance of healthy natural populations will help in resisting the impact of escapes. The deliberate release of surplus or diseased stock should be prevented.
- 8.2 In view of the impossibility of eliminating the escape of farmed fish, ways must be found to reduce their impact on wild populations. There is a need for the development of cheap, effective and safe methods of sterilisation that do not compromise the economics of farming so that escaped farmed fish do not enter rivers to breed.
- 8.3 The development of codes of practice used by the farming industry, which would include measures to minimise escapes and their potential impact on wild stocks, is to be encouraged. For examples, zones free of aquaculture could be established near stocks which are designated for conservation reasons, or are threatened. Measures such as emergency netting or trapping of escaped fish could be included. Guidelines on methods of preventing the development of inbred strains could also be prepared.



## JUVENILE SALMON SURVIVAL IN THE GIRNOCK BURN

(by David W. Hay)

Fish populations in spawning tributaries vary each year. Both the number of adult salmon and, to a lesser extent, the number of juveniles alters with time. In order to obtain a realistic picture of typical survival it is necessary to study a population of fish over a number of years.

At the Girnock Burn, a tributary of the River Dee in Aberdeenshire, the number of juvenile salmon living in the stream has been measured for over 20 years by electric-fishing. All young fish leaving the stream were counted in a fish trap near the mouth of the stream. Adult salmon ascending the stream to spawn were caught in another fish trap and released above the juvenile trap to spawn. The majority of adult salmon spawning in the Girnock burn are small two sea-winter fish which average 700 millimetres in length. A female salmon of this size lays approximately 5,000 eggs. Redd counts were carried out to check the distribution of eggs in the stream. The following analysis looks at the likely fate of these eggs. The figures quoted are typical although the actual numbers vary from year to year.

The hatching rate of naturally spawned salmon eggs is thought to be high. Experiments carried out on the Lui, another tributary of the Dee, where redds were covered in fine mesh revealed an average of 94% survival to emergence. The major reason for the death of eggs is thought to be low dissolved oxygen levels in the redd. In most streams and rivers however salmon choose to spawn in gravel with a high percolating water flow thereby avoiding this problem. In our typical redd therefore only 300 of the 5,000 eggs fail to emerge as alevins.

In the next few weeks the largest mortality at any time in the salmon's life cycle occurs. In the months of May and June, as the young fish disperse from the redd site and start feeding, only 8% (range 5-14%) of them survive in a fully stocked stream. This mortality is density dependent. That means that in years when young fish are abundant a higher proportion of them die than in years when they are scarce. Thus of the 4,700 alevins which emerged from the redd only 360 of them survive to the 0+ parr stage that summer.

From now on in the life cycle of the salmon the mortality rate slows down. Of the 360 0+ parr found in the stream the previous summer 140 remain one year later. All of the 220 fish missing have died of starvation or predation as it is too early in the life cycle for any of them to have emigrated from the stream. This represents a proportional survival rate of 39% (range 28-53%).

As the 1+ parr reach the next autumn the first migrants start to leave the stream. Seven of them head downstream to the main river although they will not go down as far as the sea until the following spring. Tests on these fish have shown that they are not salt-water tolerant at this stage. A further nine of the fish will migrate downstream in the spring as 2 year old smolts. When the summer electric-fishing census was done it revealed that 63 of the 1+ parr from the previous year had died. About half of each parr year-class dies every year. The reasons for death are thought to include starvation, predation and disease but it is difficult to estimate the deaths caused by each as

they are interrelated. For example starving fish may be more likely to be affected by diseases and both starving and diseased fish may be more likely to be caught by predators.

As the 2+ year old parr enter the next autumn the major emigration from the stream commences. Fourteen of them leave the stream in the autumn and 20 of them the following spring as 3 year old fish. This is the typical age of a Girnock smolt. However in richer and warmer streams the smolting may occur at an earlier age just as in poorer or colder streams it may occur later.

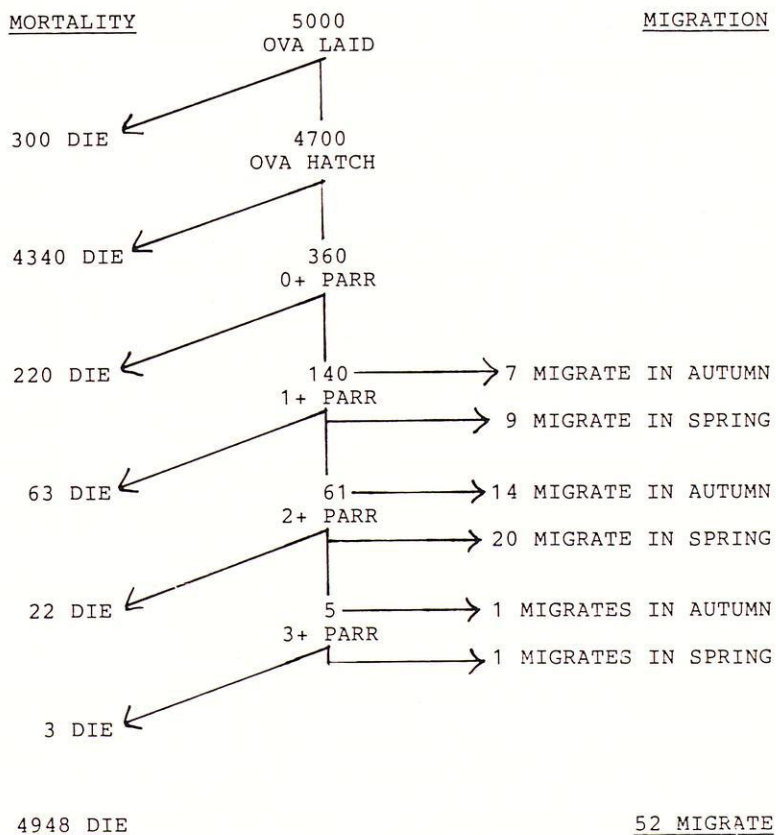
The following summer only five of the original fish are still alive in the stream. One each of them emigrates in the autumn and spring and the remaining three die.

Of the original 5,000 eggs, 4,948 die at some stage. This may seem wasteful but at each stage selection will have taken place ensuring that only the fittest survive. The 52 young fish heading downstream for the sea represent the 1 in 100 which were best suited to growing and surviving in that environment.

Of the large numbers of fish who die it must be remembered that the great majority die very early in the life-cycle. In fact 88% of the total mortality occurs in May and June in the first year of their life. This is the stage of the life-cycle where Man most commonly intervenes. Hatchery programmes normally introduce extra fish at this stage. However unless the hatchery reared fry are placed in regions where wild fish are very scarce or non-existent they are likely to suffer the same high mortalities. If however the introduced fish are spread thinly over long stretches of stream their survival has been shown to improve greatly with a reduction in density dependent mortality. As many as 50% of the introduced fish can survive when planted at low densities in virgin streams.



FATE OF 5,000 SALMON OVA IN THE GIRNOCK BURN  
(ie the average number of eggs laid by one salmon)



(88% of total mortality occurs between hatching (MARCH) and summer 0+ (JULY))

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HEREBY COVENANT with THE ATLANTIC SALMON TRUST  
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I will pay ANNUALLY to the said Trust for such  
charitable purposes of or connected with the Trust  
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for the time being in force leave in the hands of

the Trust a sum equivalent to (ii) £.....

(..... pounds) such sum to  
be paid from my general fund of taxed income so  
that I shall receive no personal or private  
benefit in either of the said periods from the  
said sum or any part thereof.

IN WITNESS WHEREOF I have hereunto set my hand and  
seal this

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"Will There Be a Salmon Tomorrow"	- 16 mm film
"Salar's Last Leap"	- 16 mm film
"The Salmon People"	- Video (VHS)
"Irish Salmon Harvest"	- Video (VHS)
"Managing Ireland's Salmon"	- Video (VHS)
"Salmon Tracking in the River Dee"	- Video (VHS)

Films and videos may be obtained from the Trust for private showing by Clubs, Fishery Managers, etc. A donation to AST funds is required in return.



