



Atlantic Salmon Trust
Summer Journal 2007



40th Anniversary
Special Edition

Research
Restore
Sustain

WHAT IS THE TRUST?

- Founded in 1967, the Trust is an Atlantic-wide, UK based organisation which champions the wild salmon and sea trout – it does not represent any body, only the fish themselves.
- Works for the conservation and restoration of wild salmon and sea trout stocks to a level which allows sustainable exploitation
- Is an independent, registered Charity, with a small staff, which receives no Government funding

WHAT DOES THE TRUST DO?

- Conducts and supports marine and freshwater research
- Gives practical advice on the management of fisheries and rivers
- Gives independent advice to governments, international and national authorities and to commercial enterprises
- Co-ordinates activities with other conservation, environmental, fishery, heritage and wildlife agencies and organisations
- Holds and supports seminars and workshops to investigate specific issues
- Publishes high quality reports and booklets to inform and educate

WHAT ARE THE TRUST'S CURRENT ACTIVITIES AND PRIORITIES?

Promoting, taking part in or supporting:

- Research into the survival of salmon at sea
 - Restoration of wild salmon and sea trout stocks, especially on the West Coast of Scotland and the Islands
 - Reduction of interceptory nets
 - Improvement of fish farming codes of practice
 - Reduction of mammal and bird predation
 - Improving river habitats and water quality
- Improving all aspects of our education, information and communications roles.
- Playing a proactive part in all management committees and legislative fora.

Patron

HRH The Prince of Wales

President

The Duke of Westminster

Chairman

Sir Robert Clerk

Vice Chairman

Lord Guernsey

Research Director

Dr. Richard Shelton

Executive Director

Major General Seymour Monro

Deputy Director (Finance & Scotland)

& Company Secretary

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40th ANNIVERSARY YEAR – PROGRAMME

JANUARY

16 Seminar, Kenmore: "More to the Tay than meets the eye"

26 Special edition Winter Journal published

FEBRUARY

5 Postal Auction Day

MARCH

15 Board Meeting – Edinburgh

APRIL

4 Honorary Scientific Advisory Panel Meeting – Edinburgh

MAY

JUNE

4-8 NASCO Conference
15 Special Edition Summer Journal published
16 Cheffins' Auction Day (AST/GCT) – Perth
19 Members' Meeting and Board Meeting – Edinburgh
29-1 July GCT Scottish Fair, Scone

JULY

27-29 CLA Game Fair, Harewood

AUGUST

3-4 Highland Field Sports Fair, Moy

SEPTEMBER

18-21 AST/GCT Conference, Southampton: "Freshwater Habitat Management for Salmonid Fisheries"

OCTOBER

3 Board Meeting – Edinburgh
17 AST/NASCO Presentations – "Salmon at Sea", Edinburgh

NOVEMBER

20 Anniversary Dinner – Fishmongers' Hall

DECEMBER

11 AGM & Members Meeting – Fishmongers' Hall



The Trust's 40th Anniversary is being marked by committing even more funds to research projects, through sponsoring important seminars and holding a major fund-raising dinner.

Significantly, as the leading non-government supporter of NASCO's 'Salmon at Sea' project, the Trust has pledged £50,000 towards this project for each of the next three years. It has also recently become the proud owner of a trawl net which has already been put to good use on a brief research cruise by the Marine Institute of Ireland.

As important as conducting or supporting research into the lives of salmon and sea trout is the passing on of the knowledge gained. This is what we did in Kenmore in January and will be doing at Southampton in September and Edinburgh in October – announcements are in this Journal.

In this second Special Anniversary Edition we have again included some historical pieces alongside the scientific articles.

We are also delighted and honoured to have a foreword from our Patron who has always been a very strong supporter of the AST.

Seymour Monroe, Editor

Please note that articles do not necessarily reflect the Trust's views. Advice and guidance is always available from the Trust's staff.

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JOURNAL DATES

Winter Edition:
Contributions by 20th November
Published late January

Summer Edition:
Contributions by 1st May
Published late June

Photographs:

Covers:

Gilbert van Ryckevorsel, Marine Institute Ireland

Other photographs:

David Hay, John Webb, Marine Institute Ireland, Scottish Fisheries Protection Agency and Mike Page

The Patron's Foreword



CLARENCE HOUSE

As Patron of the Atlantic Salmon Trust, I am delighted to be able to pay my own tribute to this remarkable organization on its fortieth anniversary. Milestones of this sort present an opportunity to reflect on all that has been achieved so far and to consider what contribution the Trust should continue to make to the conservation of fish, and particularly the Atlantic salmon and the sea trout.

The Trust was set up in 1967 to increase the research effort on salmon and sea trout stocks in order to improve the management of wild fisheries. The Trust has always been an independent charity and has been almost exclusively self-funding. This is a most impressive record which has allowed it to act and to give advice in an unbiased way. It has worked assiduously with Governments, non-Government organizations, research establishments, universities and individual scientists and fishery managers on the basis of the best available scientific advice and with complete impartiality. The Trust speaks only for the good of the fish themselves.

Over the years, in more tangible terms, the Trust has led and supported a host of scientific projects and held or sponsored many symposia and conferences. These have invariably resulted in the spreading of knowledge and included the publication of numerous 'blue books' and other works for the benefit of a very wide audience. In particular, I remember opening the Second International Atlantic Salmon Symposium in 1978 which led to the formation of the North Atlantic Salmon Conservation Organisation, NASCO, in 1984. This major international body, in its turn, has achieved a tremendous amount Atlantic-wide through inter-Government agreements and actions to conserve salmon. Recently it has launched the 'Salmon at Sea', or SALSEA, project to find out more about the lives of salmon in the oceans. It is fitting that the Atlantic Salmon Trust is the leading NGO in this crucial endeavour.

Whether it is at sea or in fresh water, these incredible fish are under constant threat. The threat may be man-made pollution, disturbance, fishing, the adverse side-effects of fish farming, water abstraction or obstructions to the salmon's passage to their spawning grounds. It may also be in the shape of natural predators or the effects of flooding or low water. Climate change and global-warming may also be affecting the distribution of feed in the seas which, in turn, affects the survival and well-being of the salmon as it migrates to its feeding grounds and then back to its native river to spawn. This is why the SALSEA project and other marine research is so important.



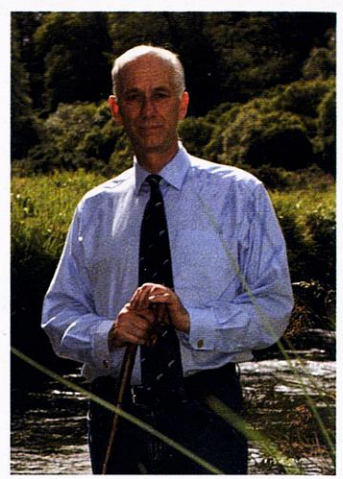
We need to know even more about these magnificent fish and thus how to tackle these myriad threats in a sensitive and effective way. Although there have been some encouraging signs in the past two or three years, the fact remains that despite all the efforts which have been made internationally and nationally over the past thirty years or so, the numbers of fish returning are still well below historic levels. This is why critical scientific research and well-advised practical management of our rivers and the fish they contain must continue.

Like so many people, I have spent countless happy hours on a river. There is a certain idyllic magic about the calming sights and sounds of water and wildlife. They are a special gift to be treasured and we must encourage future generations to appreciate them too; to fish and to play their part in conserving fish stocks and looking after our rivers, lochs and lakes, never forgetting that fisheries are also a vital part of the rural economy.

The Atlantic Salmon Trust has depended upon generous benefactors and donors since its foundation and the work it does today is as important as it has ever been. Its research and restoration projects are vital to ensure healthy stocks and to allow sustainable exploitation of wild fish in the long term. I can only commend the Atlantic Salmon Trust's outstanding efforts over these past forty years and urge you to support its continuing valuable work, alongside other like-minded organizations, for the benefit of our wild salmon and sea trout today and in the future.

Charles

From the Chairman



Robert Clerk

When I spoke at the Salmon and Trout Association's Dinner at the end of last year I reflected upon the significant changes that have taken place in the status of wild salmon stocks since the establishment of the Atlantic Salmon Trust forty years ago. In passing I highlighted some of the Trust's achievements and the fact that over this period of time our understanding of the biology of salmon and sea trout has greatly advanced, as has the quality of management of many salmon fisheries. It now seems appropriate, mid way through our 40th anniversary year, to look ahead and try to anticipate the way in which the Trust's resources are likely to be applied in the years to come.

At times it is all too easy to be complacent and think that after a period of difficulty our salmon stocks are in good health. In May of 2006, after a strong upturn in the number of early running fish returning to many rivers, coupled with a policy of catch and release being readily adopted by the majority of anglers, there was a feeling of optimism about the future of UK salmon fisheries. Then came the poorly conditioned grilse of last summer, and now a disappointing start to the season of 2007. Looming above all this is the spectre of *Gyrodactylus salaris* and the catastrophe that occurs when it gets a foothold in any river. We are not out of the woods yet.

Many people will have heard one of Professor Chris Todd's eloquent talks earlier this year summarising his recent work upon the sampling of grilse returning to native rivers, and all will have been

concerned by his findings. The appearance of many so called 'skinny grilse' in substantial numbers last season, in most if not all salmon fisheries, has provided the wake-up call to alert us to a trend that has been established for some time but which hitherto has gone largely unnoticed.

Whilst the increased incidence of poorly conditioned grilse may be due to a rise in the winter sea surface temperature in the central Norwegian sea, and thus largely beyond our control, we need to establish if there are other influences contributing to this alarming trend and what measures fishery managers should adopt to compensate for the reduced reproductive capacity of the affected populations. There would seem to be a strong case in some rivers for encouraging the catch and release of grilse, in particular well conditioned hen fish, to ensure that the maximum possible spawning potential of the system is achieved. This year the Atlantic Salmon Trust is providing funding for research projects to support and complement Chris Todd's important work in this field.

Although it is always dangerous to accept the most obvious explanation for the appearance of 'skinny grilse', namely that it is simply the result of starvation at sea brought about by rising winter sea temperatures – there are other but less obvious explanations which are being examined, including increased sensitivity to pathological conditions. Furthermore, it is not only to the sea that we should be looking anxiously but also to the

freshwater habitat where extremes of low flow, flood or high water temperature can threaten ova, juveniles or adult fish. It would seem to me that the impact of climate change upon the strength of salmon and sea trout stocks, and indeed those of other fish species, may well be one of the major issues that will exercise the minds of fisheries scientists for years to come.

Turning to more immediate matters, if in the last 40 years we have considerably increased our knowledge and understanding of the biology of salmonids in their freshwater environment then it would be good to have as our objective the achievement of the same result for the marine phase of their life cycle in the 40 years that lie ahead. In recent months an opportunity has arisen for the Atlantic Salmon Trust to have a pivotal role by funding the employment of a scientific co-ordinator who will drive forward the international marine research project promoted by NASCO. Through this initiative, the SALSEA project, we believe that it will at last be possible to field the resources needed to carry out extensive research at sea, and in this way to understand why it is that in recent years of the populations of smolts that migrate to sea only about half as many return as adults as did 15 to 20 years ago. The prospect of the SALSEA project getting off the ground in a meaningful way is very dependent upon EU funding, and we firmly give our support for this application which we hope will be successful.

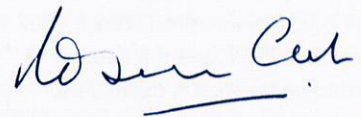
In this our 40th anniversary year we have taken a bold decision to increase substantially our annual expenditure upon grants to fund research.

Recent research supported by the Atlantic Salmon Trust has led to significant progress being made in the separation of salmon stocks through DNA sampling. I am optimistic that within the next few years it will prove possible to identify from genetic material the region or even the river of origin of fish taken in mixed stock fisheries. Where hatcheries are used to support natural juvenile recruitment it will become possible to ensure that broodstock can be selected with particular characteristics, such as return to fresh water early in the fishing season, so that stock enhancement can be managed with sharper focus than at present. Additionally, it is likely to become

possible in the not too distant future to identify the origin of fish that have escaped from fish farms.

In this our 40th anniversary year we have taken a bold decision to increase substantially our annual expenditure upon grants to fund research. We are able to do so only on account of the many generous donations we receive from our supporters, including those who donate and bid for fishing lets each year through our annual auction. Our income has risen year by year to record levels, and I am confident that in the current year we will see this rise still further. I hope that in the 40 years that lie ahead fisheries biologists, supported by the

Atlantic Salmon Trust, will learn as much about salmon and sea trout as has been learnt in the past 40 years, and that this new knowledge can be put to good use through even better management of our salmon and sea trout fisheries. I know that I and my colleagues on the Board of the Trust, together with our hard working and committed staff, will be doing our very best to see that this is brought about.



HIGHLAND FIELDS SPORTS FAIR 2007



Attractions include

- Fisherman's Corner • Clay Shooting • Rifle Shooting
- Gundog Tests • Archery
- Bubbles the Clown • Pipe Band • Trade Stands
- Falconry Display • Catapults • Try a Gun

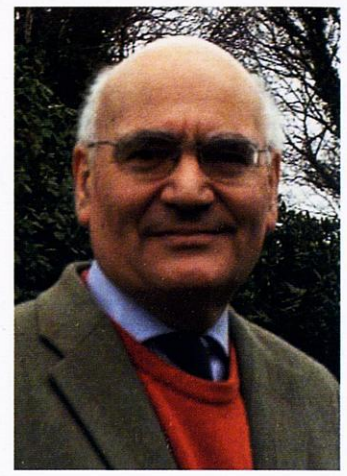
A GREAT DAY OUT FOR ALL THE FAMILY

MOY HALL, INVERNESS

Friday 3rd and Saturday 4th August

10.00am - 5.00pm

ADMISSION: Adults £8.00, under 16s FREE



Ivor Llewelyn, Deputy Director, England & Wales

Salmon Stocks in 2006

CEFAS and the Environment Agency have recently published their annual report of the state of salmon stocks and fisheries in England and Wales. Key elements of the report are summarised below:

- The total salmon catch in 2006 was 32,500 fish, of which 19,000 were taken by rods and 13,500 by nets (these are still provisional figures).
 - Catches by rods fell by 11% compared with 2005; however, rod licence sales were down 20%, and the number of days fished by anglers down 21%. The report attributes these reductions to poor angling conditions between June and September: nearly all rivers were well below their average flows and July was the hottest on record, with water temperatures of 25° to 26°C (above the lethal limit for salmon) on some rivers. Overall, the report says that over the past nine years the annual rod catch has fluctuated between 11,500 and 27,300 fish without any evident trend. Despite the poor conditions the 2006 catch was above the 5 year average.
 - 56% of all rod caught fish were released.
 - The declared net catch was 19% below that of 2005. Net catches in 2006 were about half the average of the previous five years, largely due to the partial buy-out of the North-East Coast drift nets, although there have also been substantial reductions in netting effort in the South-West as well. Overall, the number of licensed nets and fixed engines fell by a further 7% in 2006.
- Stock levels on individual rivers are assessed by the Environment Agency against Conservation Limits (CLs), which define the minimum spawning stock size needed to ensure the conservation of salmon stocks; they therefore set threshold below which the number of spawners should not fall. Compliance with CLs is assessed using all available data, including trends in egg deposition. The report states that only 11 rivers in England and Wales had a high probability (more than 95%) of meeting their CLs in 2006, 28 rivers (40%) had a more than 95% probability of failing to meet their CLs, while the remaining 25 rivers fell between a pass and a fail. For 2011 the report estimates that 20 rivers have a high probability of failing, 10 a high probability of passing and that 34 will fall in between. It concludes that the majority of salmon stocks in England and Wales remain in a depleted state.
 - This conclusion is borne out by ICES assessment of the pre-fishery abundance (defined as the number of salmon alive in the sea on 1st January in their first winter at sea) for each country. ICES estimate that for salmon from rivers in England and Wales, pre-fishery abundance has fallen by over 60% since the 1970s. However, reduced exploitation in distant and home water net fisheries, and increased use of catch and release within rivers, has meant that the number of fish returning to home waters is estimated to have fallen by 45% and the number of spawners by 25%. In other words, reduced levels

of survival at sea seem to have been partially offset by reductions in numbers of salmon caught and killed.

Future Legislation

Since the announcement last December (reported in the previous edition of the Journal) that measures implementing the Warren report would be introduced as secondary legislation, there has been silence from the Government. We understand, however, that Defra is finding it more difficult than it expected to use the Legislative and Regulatory Reform Act to make changes to current legislation, and may need to find alternative legislative routes. To what extent this could delay the timetable for introducing the new legislation remains to be seen.

Sheep Dip

There is also little to report on this front. There was a further meeting of the stakeholder group, which the Trust attended; at this it became clear that the Environment Agency remains to be convinced that Cypermethrin dips can be used without unacceptable risks to the environment, and that the Veterinary Medicines Agency will need time to carry out a thorough evaluation of all the risks involved before any recommendation is made to Ministers. In the mean time the marketing authorisation for the sale of Cypermethrin dips remains suspended.

Scotland, Ireland and International



The AST's Rotary Screw Trap – Balgy

Seymour Monro, Executive Director and Neil McKerrow, Deputy Director (Finance and Scotland)

SCOTLAND

Legislation and Fisheries Forum

The Aquaculture and Fisheries (Scotland) Bill was passed by the Scottish Parliament on 1st March and Royal Assent was received on 5th April. The Bill went through Parliament with little alteration which was due in large measure to the confidence MSPs had in the Fisheries Forum and its Steering Group and their preparation work on the Bill.

The Forum Steering Group is now working on a key document, "The Strategic Framework for Scottish Freshwater Fisheries". Issues such as future fisheries management and research priorities are to the fore and a draft of the document will be circulated to AST Members in June or July. The next meeting of the full Forum is on Tuesday 25th September in Glasgow.

Netting

As was briefly reported in the last Journal, the Strathy Point mixed interceptory nets will not be released for commercial netting by the Scottish Executive from the end of the 2007 season. However, as they are situated at the mid-point on the north coast of Scotland and therefore catch fish destined for both the west and east coast rivers of Scotland – and further afield – there is a strong argument for maintaining a research capability. Indeed much of the key work being undertaken by Professor Chris Todd of St. Andrew's University has involved Strathy catches as well as North Esk fish. The AST, along with others, will investigate how this research capability could be fulfilled in future.

Meanwhile we continue to press for a reduction in exploitation in Scotland's remaining mixed stock fisheries.

Gyrodactylus salaris (Gs)

The AST attended a two-day exercise to test the Scottish Gs Contingency Plan in February. As a result the Plan will be further refined. Since then there has been a high-profile launch of a new Executive-led publicity campaign to raise awareness of the potential disaster which would be caused if Gs were to reach our waters. Fishery organisations are fully behind the campaign and a copy of the latest leaflet is enclosed in this Journal. The Scottish Executive has been engaged in meetings with seaport and airport authorities to try to raise the awareness of travellers and staff. More leaflets may be obtained from this office or direct from the Scottish Executive.

Aquaculture

The review of the Tripartite Working Group Restoration Sub Group has been completed. The recommendation is that the core team of the Sub Group (AST, SNH & FRS) should become part of the Management Group. This would streamline the TWG structure and ensure that restoration issues are at the heart of the process.

John Webb, the Trust's Biologist, conducted a visit to Norwegian and Scottish aquaculture hatcheries along with a SE Fish Health Inspector. They examined procedures and practical handling and have produced a report which should lead to a number of improvements, thus reducing the risk of the import of disease. This report was timely as the Scottish Salmon Producers Organisation has been conducting its own internal review. We continue to voice concern about the significant number of farm escapes. There is a worrying increase in the number of farmed fish being seen in rivers.

The genetic consequences of interaction between farmed and wild fish are dire.

Spring Fishing Report 2007

Andrew Graham-Stewart,
AST PR Consultant

At the time of writing (May 15th) the season to date on Scotland's spring salmon rivers has been disappointing, although there is little doubt that the weather (notably a prolonged dry spell for most of the country during April and early May) has been a contributory factor. Of the big four rivers, catches on the Dee held up best (slightly below the five year average with fish well spread out as far up as Braemar and beyond), whilst the other three struggled; the actual state of the runs is difficult to determine, although interestingly the counter on the Ettrick registered numbers that were normal for the time of year.

On the north Highland rivers, catches to the end of April were generally down by some 50 per cent (sometimes more) on the ten year averages; very low water conditions (more akin to a mid-summer drought) were experienced. There was some welcome relief in terms of rain in early May with strong runs and excellent catches in many systems (including the Naver, Helmsdale and Cassley) in the second week.

IRELAND

Slaney River Trust Conference 18th-20th February

A most successful conference on Salmon Stock Restoration and River Trusts was held at Bunclody. Coming in the wake of the drift net closures this was an excellent moment for the 180 delegates to take

NASCO: Governments pressed to give more support for SALSEA through provision of research vessels and equipment.

stock and debate the best way forward for wild fish and River Trusts in Ireland.

“Stop Now” to “Salmon Watch Ireland”

The highly effective campaigning group – “Stop Salmon Drift Nets Now” has evolved into a new organisation “Salmon Watch Ireland”.

The organisation will work for the restoration of salmon abundance and focus on a number of key issues at any one time.

“Irish anglers are well represented by their Federations; what seemed to us to be important was to have an organisation to stand up for the salmon and its future” said its Chairman, Niall Greene, a member of the AST.

Mixed Stock Coastal Fisheries

The Loughs Agency has recently decommissioned 128 nets in the Foyle area. This means that the coastal nets have been completely closed and that 80% of the nets in Lough Foyle have also been closed.

INTERNATIONAL

24th Annual Conference of the North Atlantic Salmon Conservation Organisation (NASCO), Bar Harbor, Maine, USA, 4th-8th June.

Continued commercial netting for salmon, the impacts of fish farming on wild stocks, the urgent need for research into the life cycle of salmon at sea, and the setting of commercial fishing quotas, were the main issues addressed at the recent meeting of NASCO.

During the meeting, the Non Governmental

Organisations (NGOs) – including the AST – enjoyed unprecedented involvement in proceedings. In particular, they used the open forum debate during a special session covering research into salmon at sea (SALSEA) to press Governments for greater commitment towards funding vital marine research programmes. The provision of research vessels and equipment is needed for the coordinated research cruises scheduled to start in 2008.

On commercial netting for salmon, NGO Chairman, Chris Poupard, paid special tribute to the Republic of Ireland for their decision to close the drift net fishery operating around their coast. “This is exactly the type of commitment we believe that Government parties should be developing in their fishery management Implementation Plans, and we call on those with continued commercial netting activities which target mixed stocks of salmon to set specific timescales for closure of these fisheries.”

Each Government delegation had submitted an Implementation Plan prior to the meeting, setting out programmes for the management and conservation of wild Atlantic salmon, and the ecosystems necessary for their support, in their respective countries. The NGOs urged that the principal issues covered during the meeting were adequately addressed in all the NASCO Parties' Implementation Plans.

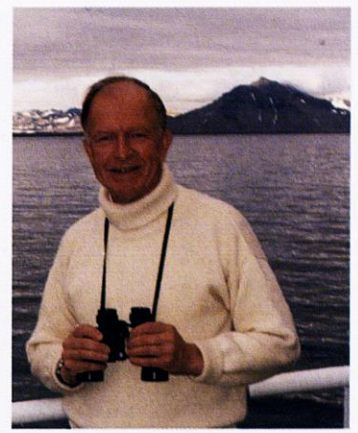
The impacts of Aquaculture continue to cause major concerns amongst NGOs, and further evidence was produced during the meeting of the ongoing danger to wild salmon stocks from disease and parasite transfer; and the dilution of natural gene pools through interbreeding of escapee

farmed and wild salmon. The NGOs called for all Parties to work towards establishing mechanisms, including tight regulatory controls, aimed at achieving sustainable fish farming operations within their home waters. Where this was not possible and aquaculture continued to impact wild salmon and their habitats, fish farming operations should cease.

A subsistence quota of just 20 tonnes for 2007 was set for the fishery at West Greenland and, while once again no quota was agreed for the Faroe Islands, the Faroese continued in the spirit of salmon conservation by stating their intention to retain the moratorium on salmon fishing in home waters this year.

Other issues covered during the meeting included the continuing loss of salmon habitat in many countries, the sword of Damocles threat hanging over many countries from the lethal parasite, *Gyrodactylus salaris* (Gs), and, in particular, the cross-border movement of live salmonid fish which presented the most likely means of transferring Gs between countries.

In summary, Chris Poupard said, “This has been the most vibrant NASCO meeting in its 24 year history, and one in which the NGOs have had significant influence over important issues of salmon management and conservation. In particular, the NGO mantra this week has been to call for Governments to commit fully to addressing all the significant problems still facing wild Atlantic salmon in their natural habitats, and to funding the research programmes necessary to support the future health of Atlantic salmon populations throughout the Northern hemisphere. That most certainly includes the vital SALSEA programme.”



Dr. Richard Shelton, Research Director

Brief summary of 2007/08 HSAP approved projects and Marine Research

Celtic Sea Trout Programme – £5,000

Sea trout are among the most important migratory fishery resources in the rivers entering the Irish Sea and Western English Channel. The purpose of this award is to support the setting up of a collaborative research and monitoring programme to establish the status and improve the management of this important fish.

Moray Firth Seals – 2nd year £500

An additional award has been given to assist with the administrative costs of this project, the outcome of which is vital to the control of seal predation in rivers, estuaries and certain coastal sites.

Marine Project – 2nd year Thin Grilse £7,090 + £4,000

Recent fishing seasons have seen an increase in the prevalence of thin, poorly-conditioned fish among the salmon returning to our rivers. The problem is largely restricted to parts of the grilse run and especially the early part. Grilse are salmon which have been triggered to mature and return after one winter at sea. The trigger is the rate of change of day length but the fish responds to it only if, at the time, it is accumulating enough surplus energy as fat from its food. On the face of it, therefore, a thin, early-returning fish is a contradiction in terms.

What lies behind the problem is currently being investigated by Professor Christopher Todd of the University of St. Andrews and Julian MacLean and his colleagues at the FRS Freshwater Laboratory. They have analysed the condition of grilse returning to netting stations at Strathy Point on the

north coast of Scotland and the River North Esk in relation to sea temperature in the Norwegian Sea. The fat composition of the fish was measured using instrumentation supplied by the Atlantic Salmon Trust. Results so far show that there is a strong statistical correlation between unusually warm sea temperatures in the central Norwegian Sea in mid winter and the occurrence of emaciated grilse.

One possibility is that the raised sea temperature has affected the supply of crustaceans and small fishes available to the grilse in their last months at sea. In other words although earlier in their lives there was quite enough sea feeding for maturation to be triggered, the supply suffered a sharp interruption later on. Another, perhaps less likely, possibility is that the raised winter temperature in some way made the fish more susceptible to pathological conditions like pancreas disease which is known to occur among cage-cultured salmon and affects the fish's ability to process its food. Rather little is known about the transmission and prevalence of disease among fish at sea but during 2007, FRS scientists will be screening returning salmon for pathogens and parasites.

In the meantime, the AST has granted Professor Todd an additional £7,090 to enable him and his collaborators to look more closely into dynamics of fat accumulation in returning grilse with a view to identifying what has really gone wrong when grilse become emaciated. Further analysis of longer term data will be undertaken by Dr. Philip Bacon of the FRS Freshwater Laboratory with the help of the biometrician, Dr. Stephen Palmer. A grant of £4,000 has been granted by the AST to support the participation of Dr. Palmer.

Sampling at Sea £14,000

Although much can be learned from the study of returning fish, it is easy to forget that these are merely the lucky survivors.

Getting to grips with the dangers that salmon face at sea requires that we join them out there. Accordingly, the AST has purchased a surface trawl for use during the SALSEA programme. The trawl was tested successfully off North West Ireland this May during sea trials aboard the newly-commissioned Irish research vessel, "Celtic Explorer". Smolts of both salmon and sea trout were sampled successfully, as were adult sea trout. The research cruise was led by Dr. Niall Ó Maoiléidigh of the Marine Institute, Galway with the support, ashore of Dr. Ken Whelan, President of NASCO. Their report follows:

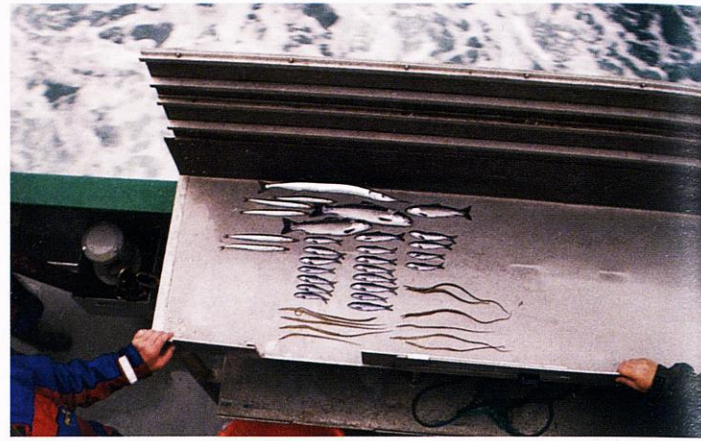
MI/AST Post-Smolt Experimental Research Cruise – May 2007 Niall Ó Maoiléidigh and Ken Whelan, Aquaculture and Catchment Management Services, Marine Institute, Newport Co. Mayo.

Scientists believe that a major proportion of the mortality at sea occurs in the early post-smolt migration period. Therefore knowing the migration routes and timing of migrations will greatly enhance our ability to understand the underlying factors along that route which may significantly affect survival. In order to do this we must be able to find salmon at sea. In May 2007, the Marine Institute of Ireland funded under Ireland's National Development Plan (NDP) and the Atlantic Salmon Trust organised a short directed exploratory research cruise using a new pelagic trawl net designed by Norwegian scientists for post-smolt fishing and manufactured by Swan Net-Gundry in Donegal.

The scientific party, comprising Dr. N Ó Maoiléidigh, Nigel Bond and Robert Bunn of the Marine Institute and Dr. Paddy Gargan of the Central Fisheries Board, left Killybegs on the 8th of May 2007 on board the RV Celtic Voyager skippered by Captain Fergus O'Hare. The first fishing of the net



Celtic Voyager's crew and AST flag.



Part of their catch.

took place that evening at 2000 hrs with the new net being towed into and out of Killala Bay, Co. Mayo on the west coast of Ireland for about two and a half hours. Although no salmon smolts were captured, one sea trout smolt and one adult sea trout were taken along with a small number of very small mackerel which was very encouraging. The Celtic Voyager continued south to the Aran Islands to resume fishing the next day. Following some modifications, the net was shot and hauled four times between the Aran Islands and Galway Bay during the 9th and 10th of May and captured 9 salmon post-smolts in total.

The Celtic Voyager returned to Killala Bay to attempt another trawl in the area where the large numbers of salmon smolts migrating from the River Moy could be expected and therefore provide a good opportunity to optimise the efficiency of the new net. Under the direction of Rob Bunn of the Marine Institute's Fisheries Science Services, transducers were attached to the net opening and optimum operation was estimated. This was later confirmed as 19 salmon post-smolts were taken in a single haul on the 11th of May.

As weather was favourable, the Celtic Voyager continued directly north of Malin Head and west of the Island of Mull that night. Fishing the following day on the 12th of May produced 11 salmon post-smolts initially, then four in a subsequent haul and finally 25 post-smolts in the last trawl of the evening. The Celtic Voyager steamed further north the same night reaching just west of the Island of Lewis by the morning of the 13th of May. The net was shot four more times between the 13th and 14th with a total catch of four salmon post-smolts in this general area.

The Celtic Voyager returned to Killybegs on the 12th of May having captured 72 salmon smolts for further analyses including

stomach content analyses, lipid content for condition, sex ratios, growth and crucially for genetic studies to ascertain the region or even the river of origin of these fish. Simultaneously, data were recorded on position, towing speed, temperature, wave height, wind speed and salinity by the Celtic Voyager which will help to describe the conditions encountered by post-smolts on their migrations. It has now been proven this it is technically well within our capabilities with trawls such as this, to capture post-smolts at sea consistently and to use new genetic profiling methods to identify region or even river of origin of samples taken. It is by merging information from these studies with the ongoing assessment of the freshwater and marine ecology of salmon that the distribution and migration patterns of many stocks will be better understood. Given the tenuous and continuing deterioration in many salmon stocks, a directed larger scale internationally co-ordinated marine survey would provide much needed information on factors which may be affecting the marine survival of our Atlantic salmon.

Lochs workshop – £1,000

The important contribution that lochs make to migratory fish production is poorly understood and difficult to study. Possible approaches were discussed at an AST Workshop organised by Alan Youngson of the FRS Freshwater Laboratory and held at Aviemore on April 26th.

Southampton University – Centre for Salmonid Research – £5,000

The purpose of this award is to support the establishment of a Salmonid Research Centre on the south coast of England based on a group of otherwise independent research workers within the University of Southampton – a major centre of excellence for aquatic and oceanographic research.

Managed Habitats for Salmon and Sea Trout – £7,400

This award is designed to support a critical evaluation of the effects of bankside management on salmon and trout populations. The work is being led by the Game Conservancy Trust.

Geographical Origin of Sea Trout – £4,000

This innovative project will evaluate the latest techniques in scale microchemistry as a clue to the natal origins of sea trout.

Tweed – Recolonisation Processes and Patterns – £2,000

Re-colonisation of parts of the catchment previously denied to upstream migrants has played a large part in the improvement of the Tweed as a salmon river. This project aims to establish the genetic and behavioural basis for re-colonisation in this system.

River Invertebrate Monitoring – £5,000

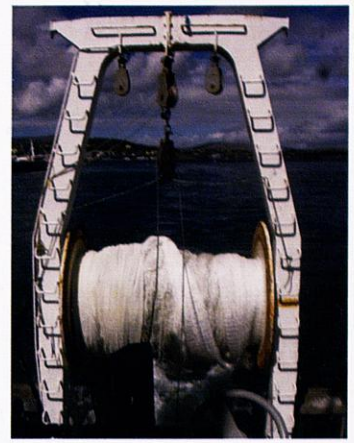
The health of fly life in face of intensive agricultural spraying and other practices continues to be a cause for concern. This initiative by the Riverfly Partnership seeks to improve current detail and knowledge of the overall health of aquatic invertebrate populations in Great Britain.

Orkney Sea Trout – 2nd year £1,000

The results of the first part of this study showed just how limited is the distribution of juvenile trout of likely migratory origin in Orcadian burns. This further award helps to finance a follow-up study.

Kenmore Seminar – January 16th

This seminar, entitled, "There's more to the Tay than meets the Eye" was organised by Alan Youngson of the FRS Freshwater Laboratory to mark the beginning of the Atlantic Salmon Trust's 40th Anniversary activities.



The AST trawl net.

Dr. David Summers, Director of Fisheries for the Tay spoke on the current status of the river and its salmonid resources and on the part research plays in the effective management of Great Britain's largest rivers.

Dr. Eric Verspoor of FRS Faskally emphasised the importance of understanding the roles, eg. nature and nurture in controlling the diversity of the Tay's fish populations and David Stewart, also of FRS Faskally, showed how some of this diversity was expressed in terms of different run-timings. His colleague, Iain McLaren illustrated best practice in catch and release.

All agreed that the most concerning account was that of Professor Christopher Todd of St. Andrews University whose results (on the "thin grilse" problem) are

expressed elsewhere in this edition of the Journal.

The seminar ended with a showing of the Trust's DVD, "At Sea with the Atlantic Salmon" and a demonstration by Alan Youngson of a hydro-acoustic survey of Loch Rannoch in Perthshire.

Books and Research Report

Three extremely important new publications are introduced towards the rear of the Journal on page 43. The Trust has been closely involved with the two books: "The Atlantic Salmon" and "Sea Trout". Both should become invaluable 'bibles' to all those involved in salmon and sea trout fisheries management.

The third publication is an excellent FRS Research Report "Hatchery Work in support of Salmon Fisheries" by Alan

Youngson of the Freshwater Laboratory. This too, is a highly commended addition to the fisheries management library.

Honorary Scientific Advisory Panel Awards

Every year the HSAP considers applications for awards towards research and restoration projects. As you may see from the first half of this 'Research' article, awards are available for a wide variety of projects and the sums given are not insignificant. Invitations to apply for awards are sent out in November to those on our list.

The HSAP normally sits in early April. Application forms are available to anyone either from the Trust's office or, in due course, on the Trust's website (www.atlanticsalmontrust.org).



Atlantic Salmon Trust 40th Anniversary Presentations in association with The North Atlantic Salmon Conservation Organisation



*"Salmon at Sea" To be held on 17th October 2007 at
The Royal Society of Edinburgh*

'Salmon at Sea Day'

The fate of salmon at sea continues to be one of the principal concerns of salmon scientists and the fishery managers they advise. Much has been achieved in recent years to improve our understanding of what happens to salmon between leaving our shores as smolts and returning as adults to sustain the fisheries and to provide the "seed corn" for the next generation of fish.

This joint seminar under NASCO and AST auspices and which will be held at The Royal Society of Edinburgh, brings us up to date on the current status of marine research and looks ahead to the forthcoming international SALSEA Programme which begins in earnest, in 2008.

There will be a number of invited guests.

Applications for tickets will be welcome and full details will be circulated to Members and associated organisations by letter or e-mail. Details will appear on the Trust's website (www.atlanticsalmontrust.org)





Atlantic Salmon Trust 40th Anniversary Conference

in association with The Game Conservancy Trust
and the University of Southampton



International Conference on Freshwater Habitat Management for Salmonid Fisheries

To be held on 18-21 September 2007, University of Southampton, UK
www.salmonidhabitat.com

Salmon and trout habitat management conference

The Atlantic Salmon Trust is holding an international conference on "Freshwater habitat management for salmonid fisheries" in September which fisheries managers, scientists and anyone with an interest in the subject are invited to attend. The meeting is to be held at the University of Southampton on September 18-21, and is being organised jointly with the University and The Game Conservancy Trust as part of the AST 40th anniversary programme.

The main aim of the meeting is to review freshwater habitat management techniques to identify those which have worked and those that need further investigation.

There has been a considerable amount of habitat management and remedial work undertaken in recent years on streams and to benefit stocks of salmon and trout, and the fisheries dependent upon them. Techniques used have been very varied and include both within-channel work and bankside and wider catchment management. While many of the approaches used have been very successful and cost effective, other actions have been disappointing or have even had detrimental impacts. Such controversies will be aired and discussed at our conference. Problems have arisen from the lack of definition of the exact aims of the management activity, failure to work in sympathy with the natural environmental conditions and a lack of sufficient monitoring of effectiveness and sustainability.

Review papers from keynote speakers will be presented by leading experts from the UK, Europe and North America, but there is also time and space allocated for presentations and posters on case studies and specific techniques.

Two field trips are planned as an integral part of the Conference, to view management work on the contrasting chalk streams and New Forest sea trout streams. These will include riverbank visits to the Leckford Estate on the Test and Heale House on the Avon, sites not normally accessible to the public.

In addition to presented papers there will be poster displays and trade stands, and an active social programme. The papers presented at the Conference will be published in book form, and all delegates will receive a copy.

Southampton is a thriving city with excellent communications including an international airport with direct flights from Amsterdam, Brussels, Paris and throughout the British Isles. By rail it is just one hour from London, and it is well served by motorway.

Full details and booking forms are available from the Conference website (www.salmonidhabitat.com) or from Dr. Nick Sotherton,
The Game Conservancy Trust,
Fordingbridge,
Hampshire SP6 1EF.



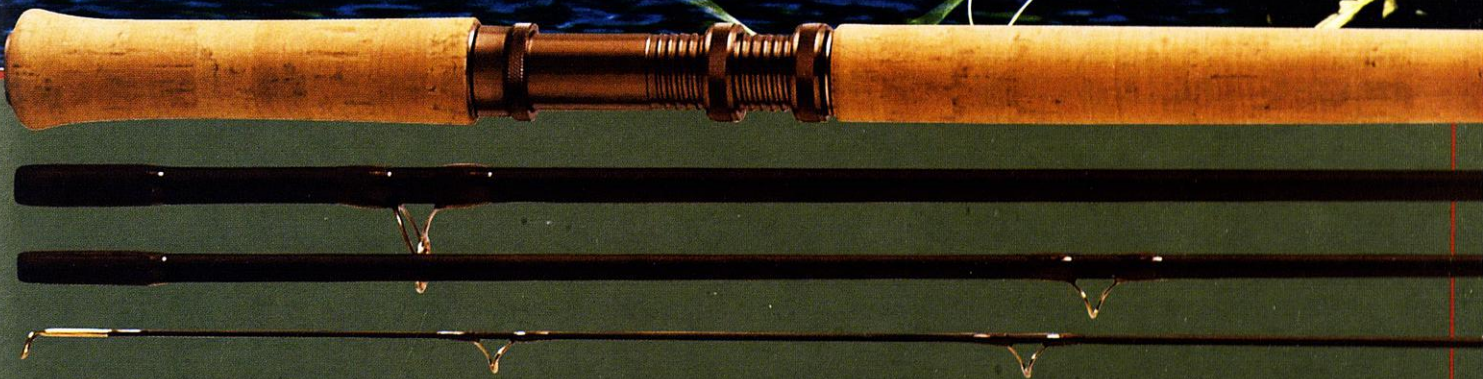
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Photographer:
Thomas Wolfe



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40th Anniversary Vignettes

1. "The Trust goes to Brussels"

Derek Mills, Member of AST and former Chairman of the Honorary Scientific Advisory Panel (HSAP)

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2. The Conception of NASCO

Derek Mills

page 14

3. Chairman's Thoughts

Lord Nickson, KBE, Vice President of AST and Chairman 1988-1995

page 15



"The Trust goes to Brussels"

The Working Group on Fisheries in the European Parliament held a special meeting on Atlantic Salmon in Brussels during July 1983, when a number of us presented our views on the problems facing the conservation of salmon. Those attending included Gerry Hadoke, Director of the Trust, Gordon Bielby (South-West Water Authority), Graeme Harris (Welsh Water Authority), Tom Cross (Salmon Research Trust of Ireland), Noel Smart (Salmon Net Fishing Association of Scotland) and myself. There were also two salmon netsmen representing the North-

east England drift-net fishery and a netsman from Ireland. Salmon experts from other countries were also present, as were many members of the European Parliament with particular salmon interests.

My presentation was entitled '*Problems and Solutions in the Management of Open Seas Fisheries for Atlantic Salmon*'. This was later published as one of our Blue Books. All our contributions were circulated in the language of each member nation in the European Parliament. It was strange seeing one's writing in Greek!

I highlighted three open sea fisheries that needed either stricter control or closing. These were the North-east England and Irish drift-net fisheries and the illegal Scottish drift-net fishery. The latter is now closed but, in 1982, a year prior to our meeting, thirty-seven drift-nets up to 1500 metres in length were confiscated by the River Tweed Commissioners and the Government's fisheries protection service. As one might imagine, there was fierce opposition from the two North-east England drift-net fishermen, who were seated just behind me, to any control of their fishery. They received some support from Joyce Quinn, their local MEP.

However, three MEPs supported our cause, namely Winnie Ewing, Bob Battersby, MEP for the region around Hull, and Jimmy Provan, our man from north-east Scotland.

After our presentations there was plenty of time to discuss matters with both our own MEPs and those from other countries. Having visited both Greenland and the Faroes in previous years, I singled out those representing these countries and had a useful discussion. A constructive talk was had with Jonathan Motzfeldt, the Prime Minister of Greenland, who was fiercely loyal to Eskimo culture and traditions and wanted an early end to EEC membership. He thought that some suggested changes to the quota system presently in force would be useful.

I could not leave Brussels without a visit to nearby Mont. St. Jean, close to the town of Waterloo, the site of our last confrontation with the French. The subsequent entente cordiale and our joint concern for the salmon led to a mutual agreement that the next International Salmon Symposium in two years time would be in Biarritz at which our President, His Grace the Duke of Wellington, would preside.

Derek Mills

The Conception of NASCO

NASCO is now 23 years old but it is not generally known what an important role the Atlantic Salmon Trust played in its conception. The Trust could almost be called its sire. It all came about at the Second International Atlantic Salmon Symposium held in Edinburgh in 1978 and organised by the Atlantic Salmon Research Trust (the original title of the Atlantic Salmon Trust) and the International Atlantic Salmon Foundation (now the Atlantic

Salmon Federation). Two papers in this Symposium really set the scene for what was to become an historic event in salmon conservation, culminating some years later in the formation of the North Atlantic Salmon Conservation Organisation. These were: *The future of the Atlantic salmon – an international issue* by Donald McKernan, and *International Law and the United Nations Law of the Sea Conference in relation to Atlantic salmon* by A.J. Aglen. These complementary papers both

recommended an *International Convention for Atlantic salmon* and in the Final Discussion and Resolution chaired by the Lord Hunter (Chairman of the well-known Hunter Committee) Gerry Hadoke, the Trust's Director at the time, said that the two bodies sponsoring the symposium (ie. ASRT and IASF), should sponsor a resolution calling for an international convention. The Directors of both the ASRT and IASF endorsed this view. Donald McKernan then read out a draft resolution

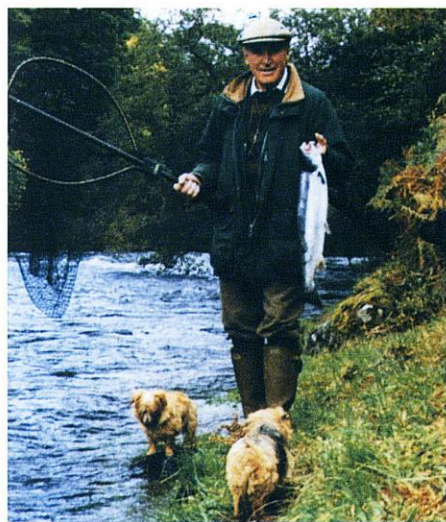
that called for an International Convention with provisions to (1) ban fishing for Atlantic salmon beyond 12 miles, (2) to provide for co-operation among all countries in conservation, regulation and enforcement measures and (3) provide a forum for international co-operation in

research and the exchange of data on Atlantic salmon.

In 1982 the North Atlantic Salmon Conservation Organisation was established under the Reyjavik Salmon Convention. Two years later, in January 1984, the

Organisation held its inaugural meeting at the old Royal High School buildings in Edinburgh and the Atlantic Salmon Trust held a reception for its delegates at the Archers' Hall – a christening celebration for its baby!

Derek Mills



Chairman's Thoughts

AST – Years 10 to 30 – 1977-1996

I spent a nostalgic morning recently at our new offices in Perth, with the kind assistance of Jenny Sample, going through Council Minutes and Progress Reports for the period covering my own active involvement with the Trust.

What, the Director asked me, were the issues then and how do they compare to today's?

Two differences stand out.

The Trust, it seems to me, sought then to be all things to all men, involved in every issue affecting salmon conservation and salmon management, the ultimate

independent fount of wisdom on everything. As a result our objectives were perhaps too widely drawn and our resources too thinly spread. As other organisations have grown in competence and authority in their particular areas of expertise and influence, and Salmon biologists become widely employed locally, we have rightly been able to concentrate our resources on funding research where we perceive the threats to be greatest.

Secondly, we saw the major threats to the salmon as man made or at least under the power of man to control. Reading my first Chairman's foreword in 1989, or my opening address to the Fourth International Symposium in New Brunswick in 1992, some of the issues which I sought to highlight are still with us like hardy perennials, but real progress has been made on others, allowing them to drop down the priority list. Today the more sinister and perhaps ultimately much more serious effects of nature itself through climate change and increased mortality at sea through starvation loom larger; the causes are more difficult and more expensive to identify and solutions harder to envisage.

What then were the main issues twenty years ago?

On drift netting, both legal and illegal, and interceptory commercial fishing, both on

the high seas and round our coasts great progress has been made, but efforts finally to eliminate the surviving fisheries must and will continue.

In 1987 our Director, John Mackenzie, visited Norway to hear about the ruination of over thirty famous Norwegian salmon rivers due to *Gyrodactylus salaris*. Can it really have taken twenty years for Government to prepare an action plan for prevention and containment should the worst occur here?

The evil effects of fish-farming on wild salmonids were fully recognised and are no less today than they were then; to sea-lice infestation, genetic adulteration due to escapees, the growth of industrial fishing for prey species to provide fish meal, we must now add the threat from the potential introduction of Gs itself through the transportation of farmed smolts to a Scottish industry now dominated by Norwegian business interests.

Predation by seals and sawbills were high on the agenda then. They still are!

A plea to quantify the economic benefits of salmon angling to rural communities, and for scientists to recognise that salmon management should aim at restoration of former abundance to achieve viable fisheries capable of funding conservation rather than minimum stocks for species survival, has been widely recognised.



Two chairmen in a boat: David Clarke (left) and David Nickson.

The burning topic twenty years ago of dealer licensing and carcase-tagging for illegally caught, or rod caught fish, sold by anglers to pay their rents, has been largely outdated by the decline in poaching and the welcome and rapidly growing ethic of "catch and release".

Habitat improvement and the increase in spawning and nursery areas was a key issue on which great progress has been made on many rivers.

The decline in our seabird colonies and their disastrous breeding success due to lack of food, mainly sandeels, was identified as an issue that gave us common ground with the ornithologists. Perhaps too little has been made of identifying our concerns with this formidable lobby group.

These then are the topics that stand out in my mind but perhaps the Director in this fortieth year might permit me space for a few more personal memories outside the scope of his original brief!

Alec Mackenzie, a distinguished Glasgow accountant, the elder brother of the "Red Admiral" Rufus, and no relation to the "Little Admiral" John, invited me to lunch in the Western Club in Glasgow in the mid 1960s to hear about plans that Rufus had, with others, to found a new organisation for salmon conservation. Subsequently the Atlantic Salmon Research Trust was born in 1967; (the minutes show that it was only after much argument that the word "Research" was dropped from the title in 1979).

I attended the 2nd Symposium in Edinburgh in 1978 to listen among others to the wisdom of Alec Home. The origins of NASCO can be traced directly back to the resolutions from this symposium, and by 1984, as Vice Chairman of the AST,

I had the privilege of hosting a reception for NASCO at Archers Hall.

Shortly before this, John Mackenzie had lunched with me at my office at Holyrood, now the site of the Scottish Parliament, to see what openings there might be for a retiring sailor in Scotland. We discussed salmon and by happy coincidence David Clarke's ambition to move the Headquarters of the Trust from Farnham to Scotland, when Gerry Hadoke retired as Director, was about to be realised.

No one loved the Trust more or did more for it than David. It is sad that he is not with us to celebrate our 40th anniversary. When he first became involved in 1978 as Chairman of the Appeal Committee, with Jean Cormack as his most effective fundraiser, the Trust's annual income was £12,000 and its capital a mere £30,000. When John Moran and I took over as Vice Chairman and Chairman respectively in 1989, with John Mackenzie by then well established at the bridge of his new ship, we inherited an annual income of £70,000 and a capital fund of over £600,000.

On succeeding Rufus as Chairman in 1983 David presented the Trust with the famous caravan, a feature at so many game fairs, though not, I suspect, much loved by a succession of Directors and their wives who had to tow it behind their cars on busy summer roads!

In 1984 he persuaded his great friend Pat Wills to provide funding to purchase Moulin as the Trust's Scottish base at Pitlochry. This served us well for twenty years.

Shortly afterwards Pat Wills and William Gordon Cumming with David's encouragement founded and funded the Atlantic Salmon Conservation Trust

(Scotland), a charity with the express purpose of buying out Scottish coastal nets. I had personally hoped that this was a role that AST itself might pursue. At the time I remember being opposed to the adoption of what I saw as such a confusingly similar title by this new organisation. In retrospect it seems that David's decision to keep the two organisations quite separate was a wise one.

In 1981 the Trust's annual auction started and in 1985 David had persuaded Christies to sponsor an evening at Hopetoun that raised £23,000 and where the Poet Laureate, Ted Hughes' salmon poem "The best worker in Europe" was launched. In 1984, thanks to our President The Duke of Wellington, a fund raising dinner attended by HRH Prince Charles was held at Apsley House.

These are just a few of David Clarke's generous legacies to the Trust. His last was to leave to the Trust in his Will his priceless collection of rare fishing books, which those of us lucky enough to have stayed at Erpingham will know were his pride and joy, and which can still be seen in the A K Bell Library, Perth today. We should always remember the debt of gratitude the Trust owes to David Clarke.

It seems no time since we celebrated our Silver Anniversary in 1992, as always thanks to the generosity of Fishmongers, with a gathering including two of the original Trustees, The Duke of Devonshire and the Marquis of Landsdowne, of which Malcolm Windsor said "he had never seen so many influential people in the Salmon world gathered in one room". No doubt we shall enjoy the company of an even more distinguished gathering in Fishmongers on November 20th this year.

David Nickson



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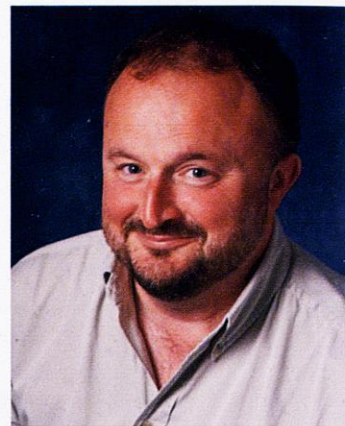
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What does the AST Biologist do?



John Webb, AST's Field and Research Biologist

Reflections on twenty years of research supporting the development of science-based fishery management.

Many regular readers will recall the series of 'biologist's reports' in the Trust's *Progress Report* and *Journal* publications. To mark the organisation's 40th Anniversary, I have been asked to look back and recount just a few of the main projects in which the Trust's biologist has been involved over the past twenty years and briefly take the opportunity to comment on the significance of the work.

I was appointed on 1st October 1986, and my first main project involved radio-tracking adult salmon in the Aberdeenshire Dee. Led by researchers from the Marine Laboratory in Aberdeen, the study was one of the first of its kind to be undertaken in Scotland – and part of a wider ongoing programme of work investigating the behaviour of salmon returning to Scottish rivers.

Daily tracking excursions along the river provided a unique and privileged series of insights into each fish's movements. The work focused particularly on recording movements in relation to factors such as changes in flow, the time of day and behaviour at tributary junctions. However, as a keen angler, my interest was inevitably drawn towards also gaining further insights by addressing questions such as which



AST Biologist John Webb giving training in catch and release techniques to ghillies on the River Spey.



AST Biologist John Webb inspects a fish caught in the Red Point bag net fishery near Gairloch, on the West coast of Scotland. Note the deformed dorsal fin and the full tail. Scale reading indicated that the fish had been lost from culture soon after transfer to seawater as a smolt.



A mixed catch of wild and escaped farmed salmon at the Red Point coastal net fishery near Gairloch, Western Scotland.

pools were most frequently used, where fish lay and their reactions to flies, fly-lines, boats and anglers wading down a pool!

As the numbers of fish tagged increased, so more patterns of behaviour could be refined and the spawning positions of individually identifiable fish directly related to their date of return to the river. Indeed, by plotting out the tracks of all the fish involved, a simple model of the relationship between the distribution of spawning areas of fish of different sea age and run timing (i.e. river entry) began to emerge. The significance of these important relationships is discussed later.

Over the following two years, a further programme of more detailed tracking work began on the River Tay where monitoring focused on the influence of regulated flows on movement upstream from the estuary and the behaviour of fish ascending to the hydro electric dam at Pitlochry. The findings at Pitlochry dam were instrumental in the subsequent decision to reinstate the screen array on the dam's powerhouse tailrace to keep fish out of the draught tubes.

The autumn and early winter heralds the beginning of the spawning season, and by as early as mid-October new patterns of activity soon began to emerge. The behaviours were quite unlike anything recorded earlier in the year.

Many of the males were recorded moving regularly up and downstream over several kilometres. In contrast, the movements by females were less frequent and more limited in extent.

These differences were obviously of interest and were subsequently investigated as part of a more detailed study on salmon spawning behaviour conducted on the Girnock burn – a small upper spawning tributary of the river. Three seasons of field-based work (using a combination of tracking and bankside observation) on the Girnock resolved the differences between male and female behaviour over the spawning period. Male behaviour was shown to be dominated by a more or less continuous effort to seek out ovulated females by 'commuting' between spawning areas. Multiple spawning was prevalent and some males spawned with a number of females. In contrast, female movements were much more limited – and often focused on just one or two areas of suitable gravel.

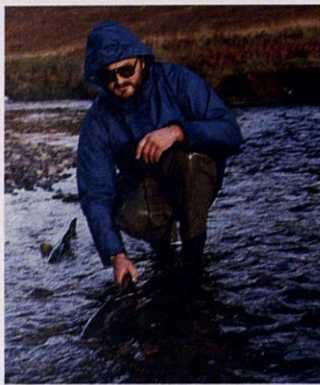
By observing the distribution and behaviour of all of the spawners in the burn on a daily basis, the study also served to shed light on some of the factors that influence the timing and distribution of egg deposition in upland streams – a key factor controlling patterns of habitat uptake by the resulting fry.

The genetic implications of the observations on spawning behaviour were not fully understood until the completion of a further collaborative study on spawning success. Led by Stirling University, the study focused on resolving the various mating outcomes in the burn over three spawning seasons by DNA profiling the adults and the eggs in the resulting redds. Multiple spawning was found to be prevalent – with up to six redds created by a single female and a single adult male covering up to seven different hens. Pairs were therefore not monogamous and

redd superimposition ('over-cutting') was common. For good measure the study also revealed that 40-50% of the eggs had been fertilised by mature parr! Wild redds therefore contain much more diverse genetic material than would result from a single pair mating alone.

Taken together, these studies have provided a series of new and valuable insights into the biology of the species and have contributed to our current understanding of the existence, distribution and functioning of salmon populations: the critical drivers that underpin both the seasonal character and productivity of fisheries. Crucially, this new paradigm is now beginning to influence key aspects of current resource management philosophy, by increasing management's focus on the protection of key populations and their groupings through targeted conservation, and the use of more complex mating systems (that mirror natural spawning) in hatcheries.

The late 1980s saw a very rapid expansion in the production of farmed salmon off the Scottish West coast. Over the same period, there was also increasing concern among wild salmon interests about the numbers of escapes that were being caught in rivers and the potential threats posed to wild populations. The early spring of 1989 saw the accidental loss of 184,000 fish from a marine farm in Loch Eriboll, in North West Scotland, and during the following summer, significant numbers of escapes were being caught in the nearby River Polla. This situation presented researchers – including the AST's biologist, with a unique and timely opportunity to monitor the behaviour of large numbers of adult escapes in a Scottish river.



1989 AST Biologist John Webb releasing radiotagged wild and farmed salmon in the River Polla, Sutherland.



Springtime on the River Teign (Devon).



Salmon tails: wild or farmed?

(answers: The upper tail is a fish that has recently been lost from a sea cage. The middle tail is a wild fish. The lower tail is a smolt release fish: note the lack of fluke tips)

Research began on the Polla in the late summer of 1989. Wild salmon and farmed escapes were distinguished by their morphology (particularly fin damage) and scale growth patterns, supported by tissue carotenoid pigment analysis. And by drawing on the tracking and observation techniques developed previously, radio-tagged salmon of both groups and both sexes were monitored before and during spawning. Bankside observations were also undertaken of untagged and tagged wild and farmed fish over the same period.

Despite the difficulties of working in such a remote and climatically challenging area of Scotland, two years of intensive field-studies on the Polla yielded some of the first clear evidence that escapes enter rivers; construct redds and spawn in areas used by their wild counterparts. Wild and farmed salmon were also observed spawning together.

Following the completion of spawning, groups of eggs and fry were carefully sampled from redds along the length of the river. The samples obtained were then screened in the laboratory for the presence of canthaxanthin, a pigment that is rare in wild fish but that had been fed to the farmed fish whilst being grown in seawater. During the process of sexual maturation the pigment is translocated from the muscle tissues to the developing eggs in females and to the skin in males. The detection of canthaxanthin in the pigment load of a fish (or its eggs) captured in the wild is therefore indicative of it having escaped from sea cages.

The use of canthaxanthin as a discriminatory marker in the pigments of excavated eggs served to confirm the results of the behavioural studies the previous autumn and produced unequivocal evidence that farmed escapes were capable of both spawning and producing viable progeny.

The findings from the Polla investigation seemed pretty conclusive. However, because of the unique character of the river and the circumstances that led to fish entering the river, a number of questions remained about how representative the findings were likely to be. There was still, therefore, a pressing need to obtain a more detailed overview on the distribution and prevalence of escapes over a larger geographical scale.

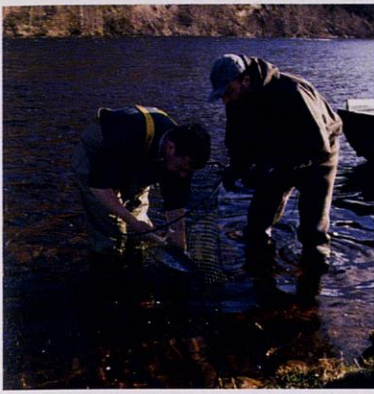
To this end, pigment, scale and morphology criteria were applied to samples taken from fish caught at a number of coastal, estuary and river fisheries around the country. Analysis of the resulting data demonstrated that escapes had been detected in many of the groups sampled. However, frequencies tended to be highest on the West coast – particularly near the centre of the marine production zone. In contrast, on the East coast, reared salmon were not detected or detected at very low frequencies.

Finally, in an effort to increase our knowledge of the geographical extent of spawning by escapes, work began in the spring of 1991 to obtain samples of newly emerged fry sampled from the lower reaches of 16 rivers between the Cree and the River Carron (Kyle of Sutherland). Using the pigment screening methods

developed on the Polla, fry of escaped farmed female origin were subsequently detected in 14 (88%) of the rivers sampled – with an average frequency of 5.1%. However, because not all the female escapes carried canthaxanthin and the contributions of male escapes remained undetected, all of the values of juvenile prevalence were likely to be an underestimate of occurrence. In a final twist, the proportions of hybrids (naturally produced crosses between salmon and trout) among the same samples suggested that escaped farmed females were more likely to hybridise with wild trout than their wild cousins.

This important follow-up work clearly indicated that in late 1990 spawning by female escapes was extensive – and eggs of farmed origin were being deposited in rivers well away from the area used for marine rearing.

Arguably, this series of closely interlinked research projects on escaped farmed salmon constitutes one of the most important and influential areas of research that the AST has been involved with. From the outset, this project attracted considerable interest among policy makers, fishery proprietors, managers, anglers and other research groups. The profile of the Trust and its work was further raised as national and international media interest grew and following the publication of numerous newspaper and magazine articles. Furthermore, many of the resulting outputs have served to inform a number of International conferences on the impact of escapes and supported the development of aquaculture management policy in the UK and elsewhere.



Catch and release training on the River Spey.



The River Polla, Northwest Scotland.

By about 1997 interest in the prevalence and behaviour of escapes had waned and attention moved back towards the question of how salmon in rivers are organised and the potential implications for management. Together with concerns about escapes, the early 1990s had also heralded a dramatic increase in the rate of decline in catches of spring running salmon – one of our most important and economically valuable fishery assets.

Prior to the emergence of this problem, fisheries management and the concept of 'protection' of stocks (particularly in Scotland) had relied more or less upon the control of poaching, ensuring migratory access and an assortment of hatchery-based support strategies. However, suddenly, and for the first time since perhaps the height of the UDN outbreak, managers were faced with a new and challenging spectre of a dramatic decline in the numbers of a single but economically critical group of returning fish. Not only did this new phenomenon have the potential to threaten the economic future of a major component of both the angling and net fisheries, but because the numbers of fish were heading towards such low levels, levels of egg deposition were judged as being critical – raising the risk (had key smolt outputs began to decline) of storing up even greater problems in the future.

By the mid-nineties there was increasing evidence that too few spring salmon were returning to many UK rivers to continue to support the traditional exploitative fishery – whilst at the same time protecting levels of spawning and juvenile production. The need for a precautionary approach

to management of spring salmon became overwhelming and managers and policy makers faced the potential dilemma of either being forced to close fisheries or allowing catch and release angling against a background of many uncertainties (and concern amongst many proprietors and anglers) regarding levels of survival among the fish released.

The lack of information on the behaviour and survival of spring salmon released by anglers required a head-on response. Consequently, in early 1996, the AST, together with the Dee Fishery Board and the Scottish Executive began a new programme of work on catch and release based on the River Dee.

The resulting programme of work was not without a significant element of risk – as many anglers and ghillies remained convinced that the fish would simply die from the experience of being played and released and drift downstream! Fortunately, however, the results of the radio tracking suggested the contrary: fish that were treated with care resuming 'normal' migratory behaviour quite quickly after release and rates of survival to spawning could be quite high (80%+). This important but preliminary study therefore concluded that catch and release probably represented a biologically acceptable means of allowing angling to continue whilst numbers of spring salmon remained critically low.

Despite the early success of the preliminary work on the Dee, it was important both to increase the numbers of fish tagged and extend the work to other rivers. To this end, in 1996 the Trust's

biologist with the support of the FRS Freshwater Laboratory began a rolling programme of training ghillies on a number of Scottish rivers to handle safely and apply Floy tags to live fish that were being returned by anglers. Despite many hundreds of fish being tagged and released, only small numbers of fish were subsequently reported recaptured or dead.

The results of this work – together with similar studies undertaken elsewhere did much to diffuse one of the most difficult and contentious areas of the catch and release debate. Furthermore, through the Trust's timely support of targeted research, training and education, the Trust has played a key role in the development of a pragmatic and economically sustainable salmon management tool on many UK Rivers.

Much of this work would not have been possible without the generous support of a very wide spectrum of donors over the years.

There has always been a long and productive collaborative research relationship between the Trust and fishery scientists at the Scottish Executive's freshwater and marine laboratories and also with Boards' and River Trusts' fishery scientists.

The Trust has been extremely fortunate to have enjoyed the provision of office space and other facilities at the Scottish Executive Marine Laboratory in Aberdeen.

Genetic Studies in Loch Feochan Rivers

Dramatic new insights for salmon management from the analysis of DNA

Dr. Caroline Thompson and Dr. Eric Verspoor, Fisheries Research Services, Freshwater Laboratory
Alan Kettle-White, Argyll Fisheries Trust

In 2006 the AST funded an unique, ground breaking study of the genetics of Atlantic salmon in Loch Feochan, on Scotland's West Coast near the town of Oban (Figure 1). The study of the small Dunach net fishery (Figure 2) and its three rivers, the Euchar, Feochan Bheag, and Nell/Lonan (Figure 3) represents one of the first practical applications in Scotland of new DNA technology to answer practical management questions. The funding made possible an analysis of molecular DNA variation to provide insight into the relative contributions made by the Loch's rivers to the fishery, still prosecuted annually at the head of the Loch. However, not only has the work delivered useful information for managing the fishery, it has also provided valuable new insights into the extent to which the salmon in small West Coast Scottish rivers are structured into multiple distinct breeding populations.

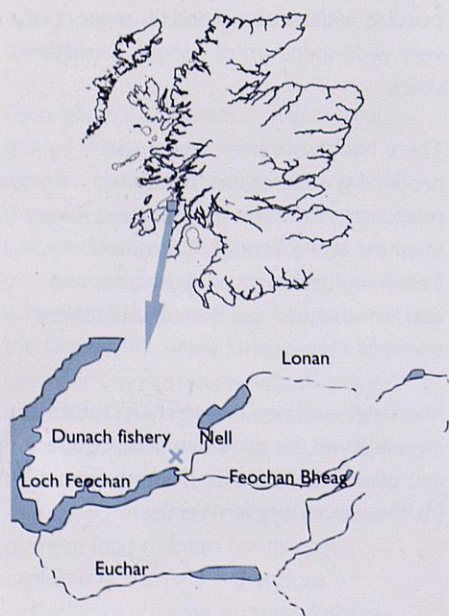


Figure 1 The location of Loch Feochan on Scotland's west coast and its rivers and fishery.

Simultaneously, the work has provided a valuable exploration of the potential for gaining critical management information on the sizes of these breeding populations and levels of fisheries exploitation. A good understanding of these two issues is crucial to the effective management of salmon stocks, providing a measure of their "health" and helping managers to set sustainable levels of exploitation.

This study builds on a steady stream of advances in molecular biology and statistical analysis, and was carried out collaboratively by the Argyll Fisheries Trust and the FRS Freshwater Laboratory in Pitlochry. It set out to answer two basic questions. The first being "To what extent are the Atlantic salmon in the rivers around Loch Feochan organised into distinct breeding populations?" If the rivers had different breeding populations which were sufficiently genetically differentiated at the DNA locations (loci) analysed, then it would be possible to address the second question "From which rivers are the salmon caught in the Loch's fishery derived?" If the answer to the first question was that the rivers had separate breeding populations, then the answer to this second question was needed to inform decisions on the most appropriate management of the exploitation of the river stocks by the fishery.

In addition to these main questions, the study set out to answer a number of secondary questions. These were: *Was there any evidence that some of the fish caught in the fishery were of farmed origin? Could the analysis of the genetic variation also provide reasonable estimates of the numbers of breeders in each of the populations identified? Could the estimates of numbers of breeders be used to determine the levels of exploitation of each population by the fishery?* According to recent

developments in population genetics theory, the answer to these questions should be "Yes". However, what is often possible in theory turns out to be difficult to achieve in practice!

With the help of The Nell & Euchar River Improvement Association, juvenile salmon were collected in 2005 from six locations in three rivers (Figure 4), each fish was anaesthetised and a small piece of caudal fin removed, after which fish were revived and returned to the river. The fin clips were stored in coded vials with preservative and were then sent to the Freshwater Laboratory for genetic typing. Fin clips from salmon caught in the Dunach fishery in 2005 and 2006 were also collected along with their weights and lengths. DNA was extracted from the fin clips and each fish characterised for genetic variation at 15 locations in its genome known to show differences between salmon where they derive from different populations. Altogether 411 juvenile and fishery-caught adult salmon were genetically typed.

After genetically typing the fish, a statistical analysis was undertaken of the differences in the frequencies of variants within and among the samples of juveniles. These differences were found to be substantial among the locations sampled, demonstrating that the juveniles collected from each of the locations belonged to discreet breeding populations. Thus it was possible to conclude from the analysis that, not only did the salmon in the Loch's three rivers belong to different populations, but the salmon stock of the Euchar was composed of at least three distinct populations and the stocks of the Lonan/Nell of at least two populations. Furthermore, the division of the stocks appeared to be related to the physical



Figure 2 The net fishery on Loch Feochan at Dunach (Photo credit: A. Kettle-White).



Figure 3 The Rivers of Loch Feochan. Clockwise from upper left: the River Nell, the Feochan Bheag, Loch Scammell on the Euchar, and the lower Euchar.

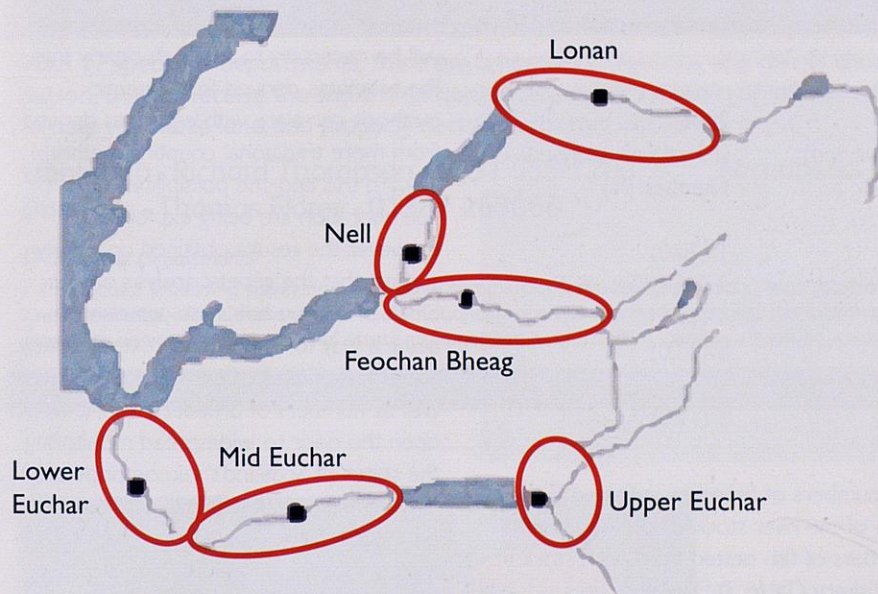


Figure 4 Sampling locations and proposed structuring of the Feochan river stocks into breeding populations.

division of salmon habitat in rivers associated with the presence of freshwater lochs on the Euchar and Lonan/Nell, and also a substantive but passable barrier downstream of the loch on the Euchar.

More intensive analysis of the genetic variation among individuals within the samples was also informative. The numbers of genetic variants in a sample and their patterns of association are determined by the numbers of parents from which the population is derived. Statistical analysis of such genetic data for each sample can provide a range of values within which there is a 95% likelihood of the number of parents which produced the population occurs. In studies of many species of freshwater fish it has been found that the actual number of parents is substantially less than the numbers of adults observed, due to the varied mating success of individuals. The estimates obtained by this analysis in the Feochan are set out in Table I and are in reasonable

accord with the numbers that might be expected in rivers the size of the three analysed, based on studies elsewhere in Scotland. Though empirical assessment of the accuracy of the estimates is needed, the results obtained strongly suggest that the genetic method may not only be possible in principle, but that it may actually be able to provide a quicker and more cost-effective way of estimating numbers of

spawners than using tags or traps. Though this estimate includes mature male parr; if an adjustment is made for their contribution, the method has the potential to provide a way of estimating spawning escapement and monitoring and how it changes over time either by repeated sampling or the use of archived samples.

The genetic differences among the breeding populations in the Feochan rivers proved to be large enough to determine from which of these rivers the salmon caught in the Dunach fishery were derived. Using differences in the frequencies of genetic variants it was possible to assign each of the fishery-caught adults to its most probable population of origin. The probable success of this statistical method was tested by removing each juvenile from the river samples, one at a time, and blindly assigning it to its most likely population of origin. Almost three-quarters of fish were assigned to the correct river, and over 60% to the correct population within each river.

When the assignment method was applied to adult salmon from the fishery whose origins were unknown, it was found that the majority of the fish could be confidently assigned and that, of these, most were of

Table I Estimates (with 95% confidence limits) of the numbers of breeders for the different genetic populations in the Feochan rivers.

River	Population	Number of Breeders	95% Confidence Limits
Nell / Lonan	Nell	118	97-148
	Lonan	43	39-48
Feochan Bheag	Feochan Bheag	105	87-130
Euchar	Lower	98	82-121
	Mid	85	75-97
	Upper	34	31-38

Only a decade ago the possibility of doing these things was difficult to conceive.

Table 2 Estimates of the numbers and proportions of salmon in the Dunach fishery which came from the different Feochan populations

Population	2005	2006
	(76 salmon analysed) Number (%)	(25 salmon analysed) Number (%)
Nell	6 (7.9)	1 (20.0)
Lonan	9 (11.8)	4 (16.0)
Feochan Bheag	15 (19.7)	4 (16.0)
Lower Euchar	13 (17.1)	5 (32.0)
Mid Euchar	23 (30.3)	8 (4.0)
Upper Euchar	10 (13.2)	3 (12.0)

Euchar stock (~50% over the two years) rather than from the stocks of the more geographically proximate Nell and Feochan Bheag rivers (Table 2). This was true in both 2005 and 2006, though in 2006 the sample from the fishery was small and the estimate of the proportional stock contribution is likely to be less accurate.

Interrogating the genetic character of the salmon in the fishery in more detail, no evidence was found of salmon in the fishery with genetic types which might suggest they were of farm origin. Consistent with this view, the estimated numbers of breeders which produced the fish caught in the fishery in 2005 was 337, slightly smaller than the total number of breeders estimated for all the breeding populations in the rivers (Table 1). The disparity in numbers may be because of natural year-to-year variation in the number of breeders, or that fish originated from a few smaller populations in the upper tributaries that were not sampled.

With the results of the analysis, the exploitation rates for each of the rivers entering the Loch could be estimated using

the numbers of breeders indicated for each of the river stocks and the indicated numbers of fish netted from each stock in the fishery (Table 3). The estimates obtained are in the range which might be expected and suggest that the populations of the Euchar are the most exploited overall and that populations in the upper reaches of the Lonan, and Euchar are generally more impacted than downstream populations. Given the novelty of this approach, before such methods can be

Table 3 The proportion of the estimated numbers of breeders in each population, based on the juvenile samples collected, estimated to be taken in 2005 by the Dunach fishery.

Population	% Nb in 2005 catch sample
Nell	4.1-6.2
Lonan	18.6-23.0
Feochan Bheag	11.5-17.2
Lower Euchar	10.7-15.9
Mid Euchar	23.8-30.5
Upper Euchar	26.0-32.1
Σ Feochan	19.0-22.5

considered for widespread application, it will be necessary to establish clearly that the estimates derived from genetic methods correlate with estimates derived from more traditional counting methods. Toward this end, the possibilities for such corroboration are being explored. However, the results obtained do clearly suggest that the genetic analysis of the DNA of salmon holds the promise of being a way for simply and cost-effectively deriving estimates of exploitation rates as well as numbers of breeders. If so, it would open the door to widespread monitoring the status of Scotland's salmon populations and estimating levels of exploitation, not only in net fisheries, but in recreational angling fisheries as well.

The Feochan study has demonstrated the potential of using the analysis of a salmon's DNA to provide information essential to effective salmon management which is difficult and costly to obtain by conventional methods. Such analyses could also be used to identify individual fish and can be used as a replacement for physical tagging in traditional mark and recapture studies to estimate the census size of a salmon stock. They can also be used to discriminate stocked and wild fish and in the future, if recent work is borne out, they may even be able to identify farm fish in the wild and levels of their interbreeding with wild populations. Only a decade ago the possibility of doing these things was difficult to conceive. But as this important AST-funded project illustrates, the analysis of salmon DNA provides an important source of insights which can help in the fight to save Scottish salmon stocks.



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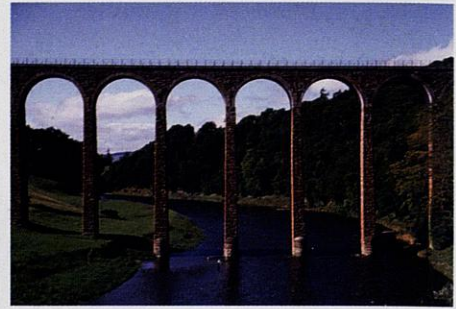
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A Century of Salmon Scale Reading



River Tweed

Dr. Ronald Campbell, Biologist, The Tweed Foundation

During the last three years or so we have been gradually and with increasing certainty realising that a study of the scales of the salmon yields a most valuable addition to our knowledge of the fish's life

This is how W. L. Calderwood starts his chapter on scale reading in his famous 1907 book, "The Life of the Salmon", which was one of the first "popular" accounts of such work. His explanation, in his sonorous Edwardian style, of how age can be read from scales is as good now as it was then:

... while summer feeding and growth is in progress the lines or ridges on the scales are added in greater numbers than at other times, and that between the ridges the spaces are greater, and that while the more moderate feeding of winter is in progress the ridges are few and close together. The result is that each summer and each winter leaves its indelible trace on the scale.

Or as we would put it in our hasty, modern, way: scales increase in size as fish grow, and their growth rings are more numerous and wider apart during faster summer growth than during slower winter growth.

Salmon scales are therefore a personal ID card, carrying the life-history of the fish around with it and once they could be read, many old and acrimonious disputes about the salmon were brought to peaceful conclusions. As the stresses and starvation of spawning leave a very noticeable mark on scales, one of the first revelations from scale-reading to the scientists and anglers of the day was the fact that salmon were not long-lived and regular, annual, spawners as had been widely assumed up till then. It was actually this erroneous idea that lay behind the

protection given to kelts in 1857 (although kelt survival does appear to have been better before the arrival of the disease *Furunculosis* with Rainbow Trout imported from Denmark in the 1920's) As Calderwood explained the new knowledge and its implications:

The study of the scales has prominently called attention to the infrequency of spawning amongst heavy fish. It comes as a surprise, for instance, to learn that very many of the large spring fish of the Tay – fish almost invariably about 20lb in weight – have never spawned ... From the study of the scales alone do we gain this information as to the infrequency of spawning, and the consequent benefit to our stock of salmon in preserving most religiously the breeding fish which enter our rivers.

So what can be read from a salmon scale? Firstly, an indication of the run to which it belongs – Spring, Summer or Autumn. A Spring Salmon is a fish that left its feeding grounds and stopped growing in Winter, and so has a tight band of winter-type growth rings at the edge of its scales (Photo A). A Summer fish leaves the feeding grounds in Summer and so has summer-type or "open" growth at the edges of its scales (B), while an Autumn fish again has the winter-type or "closing" growth of the approaching Winter around the edges of its scales (C). This makes the scales of Spring and Autumn fish look the same, as both have winter growth at the edges of their scales. As some very early Spring Salmon come in Autumn, to be sure of identification, other information from a fish is needed, particularly its colour and the development stage of its gonads. An Autumn-arriving Spring Salmon is not going to spawn for 10 to 12 months after

it arrives in the river and so has small ovaries or milt sacs. An Autumn fish proper however, is going to spawn very soon after its return to the river and so has these organs well developed.

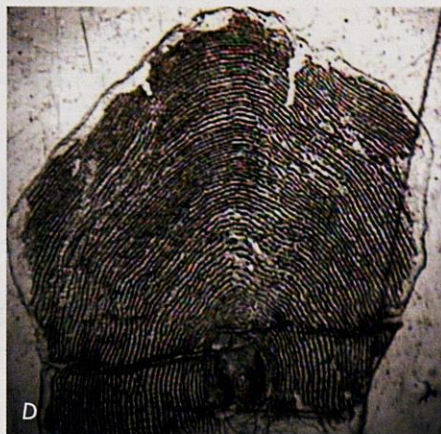


(A) The scale of a Spring Salmon: There is darker band at the edge made by the growth rings being closer together during, the last, Winter, months of feeding before it returned to the river. The band made by its first Winter in the sea is about half way through the scale.



(B) The scale of a Summer fish – here the lighter, more open growth rings run right to the edge as it stopped feeding and growing in summer.

The time spent in the river is also apparent. As salmon do not feed in freshwater they nourish themselves by re-absorbing body tissues, including scales. The part of the scale showing the growth rings



(C) A scale from an Autumn grilse – here there is again a dark band at the edge formed as growth slowed down (closed) with the approach of Winter. As such, it looks the same as the scale of Spring fish.

is actually the root of the scale which is embedded in a socket in its skin; the other, featureless, part is what protrudes through the skin and gets worn away. The root of the scale is where re-absorption takes place, turning its smooth edge ragged and eroded – and the longer the fish has been in freshwater, the more erosion to the root there is. Photographs A, B and C show very fresh fish, with perfectly smooth edges to their scale roots, but photograph D above is of a salmon caught 224 days after it was tagged in the estuary.

If a fish does manage to get back to sea after spawning and start growing again, new material is laid down at the scale root, but the old ragged edge remains as a scar, known as the "spawning mark" or SM (photo E, above) and it was the rarity of fish showing such marks that changed the hitherto accepted view of Salmon as multiple spawners a century ago.

The whole history of a salmon is carried in its scales, not just its time at sea. The same principles apply to the growth of Fry and Parr as to adults: slower growth and tighter

bands of growth rings in Winter and faster growth and wider and more open bands in Summer. The freshwater age, the number of winters spent in the river before migration as a Smolt can therefore be read as well as the marine age (although they do not show up so well in the photographs as scales are thicker in the centre). Salmon scale age readings are therefore double, the freshwater and sea ages separated by a dot: a 2.1 fish is one that was two winters in the river before migrating, and one winter in the sea before returning, a 3.2 fish was a three year old smolt that returned after two winters in the sea and so on. It is usual to refer to the number of Winters, as these are the bands that are counted, but as salmon begin their sea life in the Summer, a Winter band also marks the completion of a full year.

A Summer fish, with open, summer-type growth at the edges of its scales is described as having "plus" growth i.e. that it remained at sea and grew after its last Winter (=full year) in the sea and is notated as .1+ or .2+ "open", depending on the number of sea winters. An Autumn fish also has plus growth beyond its last full year but the rings at the edge will be tighter together or "closing", as its growth rate slowed with the onset of the next Winter; and it would be referred to as .1+ or .2+ "closing".

Scale-reading is part of the regular monitoring work of many fisheries management organisations and at the Tweed Foundation boatmen at major beats have been paid to collect scales from each fish killed since 1991 to build up a long-term



Barry Wright, the Tweed's scale-reader. On the right is the press used to make impressions of scales onto clear plastic for reading – such impressions are cleaner than the original scales. The digital microscope is in the centre with a scale on its screen beside it.

What we are having to “unlearn” in our turn in 2007 therefore is the assumption that all salmon are the same and that they can be mixed around in hatcheries and stockings.

data series on the sizes and ages of Salmon that make up the Tweed's stocks. This work has recently gone high-tech, with a computerised database for the results and digital scale-reading equipment from which images (such as those shown here) can be saved into the database along with the other data. A part-time staff member has also been taken as the Tweed's scale-reader – Barry Wright is a local angler with a Biology degree from Aberdeen University. The value of such long-term data series has been shown again this year with the concern over the numbers of small Grilse that were caught last season. The key question with all such issues is whether they are a “one-off” or part of a long-term trend and from the Tweed's scale-reading database it was quickly established that there is, indeed, a long-term trend towards smaller Grilse, traceable back

to the late 1990's at least. The regret, is as always, that the data series is not longer – if a continuous, systematic, series of Tweed scale-readings stretched back to Calderwood's day, there would be clear record of the changes in sizes and of sea and smolt ages of the fish, through Spring and Autumn phases and a century of climatic changes to help us follow longer term trends, ignore short term “blips” and predict the future. However, a start has been made.

A century on from the revelations of scale reading, we are in a similar dawn of new understanding because the other ID document that salmon carry around with them, their DNA, can now be read. This information tells us of their relationships with one another and of the groups to which they belong. It is now clear that

genetically distinctive populations of salmon can live within the same river system, each “strain” adapted to the local environmental conditions of the area in which they grow up – and to which they return to spawn, thus conserving their adaptations through “in-breeding”. What we are having to “unlearn” in our turn in 2007 therefore is the assumption that all salmon are the same and that they can be mixed around in hatcheries and stockings. Doubtless as the genetics revolution continues, we will have more assumptions to unlearn, but as Calderwood and his contemporaries found a century ago, new knowledge is better than old assumption.

Editor's note. This was first published in the March 2007 edition of “Trout & Salmon” magazine and is reproduced here with the kind permission of the Editor.



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CEFAS – supporting the management of salmonid, eel and freshwater fisheries

Ted Potter and Andy Moore
Centre for Environment, Fisheries and Aquaculture Science
Lowestoft Laboratory, Suffolk

History

The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) was formed as an Executive Agency of the Ministry of Agriculture Fisheries and Food (MAFF) (now the Department of Environment, Food and Rural Affairs (Defra)) in 1997, but its origins date back to the beginning of the 20th Century. At that time the Marine Biological Association established a small fisheries laboratory in Lowestoft, one of the major North Sea fishing ports, to carry out fisheries investigations under a programme drawn up by the recently formed International Council for the Exploration of the Sea (ICES). There has been a fisheries laboratory in Lowestoft since that time, and research facilities have also been operated at a variety of other locations, including Conwy, Burnham-on-Crouch, London and Weymouth.

In the late 1940s it was agreed that research should be undertaken by the Inspectorate of Salmon and Freshwater Fisheries. To this end, a laboratory was established in London, to study the composition, distribution and fluctuations in stocks of salmon and migratory trout in rivers in England and Wales. The laboratory operated in the basement of the MAFF building in Whitehall Place before transferring, mainly to the Lowestoft site, around 1980. A second laboratory working on issues relating to salmonids was opened in Weymouth in 1969, principally to investigate the outbreak of Ulcerated Dermal Necrosis that was decimating many wild salmon stocks.

The Fish Diseases Laboratory has since established a worldwide reputation for its research and monitoring of fish diseases both in the marine and freshwater environment. It also has responsibility for

monitoring in relation to the various European Union water quality Directives and controls on the imports of live fish.

CEFAS now has a staff of about 550, with over 400 scientists providing a comprehensive range of research, advisory and training services in fisheries science and management; environmental monitoring and assessment; and fish and shellfish health, hygiene and cultivation. The organisation's primary role continues to be to conduct monitoring and research to underpin the scientific advice provided to Government Departments. However, CEFAS has increasingly undertaken work for a range of other customers, including other public sector clients in the UK, such as the Environment Agency (EA) and the Defence Evaluation and Research Agency, the European Commission, UN Agencies and foreign governments, along with a number of private sector clients, including companies in the oil, gas, aggregate extraction, construction and aquaculture industries.

Advising on salmonid and freshwater fisheries management

In England and Wales, Defra and the Welsh Assembly Government have overall responsibility for salmonid and freshwater fisheries within their respective areas of jurisdiction. They are jointly responsible for setting the statutory framework under which salmonid stocks and fisheries are managed, and the Secretary of State and the National Assembly for Wales have statutory responsibilities to consider the acceptability of all new fishery regulations and fishing licence duties proposed by the EA in England and Wales respectively, and can approve or reject them with or without a Public Inquiry. In support of this,

Cefas provides advice on the status of migratory salmonids, eels and freshwater fish stocks; the effects of fisheries and other factors upon them; and the regulation of fishing activities, including the efficacy of proposed byelaws and Net Limitation Orders.

The UK also has obligations to the European Union, for example in relation to the European Habitats Directive, and international obligations in bodies such as the North Atlantic Salmon Conservation Organisation (NASCO) and ICES to protect salmon stocks and to contribute to their management in international waters. Defra takes the lead for the UK on policy matters in these areas, and CEFAS represents England and Wales in the development of scientific advice on the international management of salmon and eel fisheries, seeking the involvement of the EA where appropriate. For example, CEFAS, working closely with the EA, has played a major role in the development of methods used by ICES to assess salmon stocks and fisheries, both nationally and internationally, and provide catch advice to NASCO. CEFAS has also collaborated with EA scientists on the procedures used to set conservation reference levels for salmon stocks which are as far as possible compatible with the needs of international reporting as well as river-specific fishery management.

Defra works closely with the EA on the management of salmonid and eel fisheries at the policy level, and CEFAS and EA scientists liaise on underpinning monitoring and assessment to support these functions. The EA is responsible for organising many of the programmes to monitor stocks in freshwater, while CEFAS has taken the lead

Of particular interest has been the impact of the sheep dip insecticides on the freshwater stages of the salmon and trout.

in co ordinating and organising microtagging programmes to estimate levels of exploitation of salmon stocks from England and Wales in specific fisheries, such as those at West Greenland, Faroes and off the Irish coast, and to monitor marine survival. CEFAS and the EA share the results from these studies for use in the management of salmon stocks and publish a joint annual assessment of salmon stocks and fisheries.

CEFAS also provides advice to Defra on a wide range of other factors that may affect salmonid, eel and freshwater fish stocks, including piscivorous birds and the introduction of non-indigenous fish species.

Conducting supporting research

In support of its strategic aims, Defra funds a programme of research on salmonids, eels and freshwater fisheries, which is undertaken by CEFAS and other research contractors. The programme is co-ordinated with the EA's own research programme by the Defra/EA Fisheries R&D Liaison Group, and is used to identify and investigate problems, to develop policy options, implement solutions and to assess their effectiveness. The programmes are divided into three themes: monitoring and assessment, biological processes, and methods. Much of the work undertaken by CEFAS falls into the second category and relates to factors affecting the production of migratory salmonids.

For example, over the past 20 years CEFAS has undertaken a range of novel studies investigating the effects of diffuse freshwater contaminants on salmonids. The research has focused primarily upon the impact of pesticides derived from

intensive agriculture and freshwater aquaculture on salmonid reproduction and migration. Of particular interest has been the impact of the sheep dip insecticides on the freshwater stages of the salmon and trout. Environmental levels of both diazinon and cypermethrin have been shown to interfere with the salmon's sense of smell, affecting the ability of male fish to detect the pheromones released by females, which are important in synchronising spawning physiology and behaviour. The sheep dip pesticides have also been shown to reduce fertilisation rates and embryo survival, and delay the timing of emergence of alevins from the spawning gravels. The majority of these effects occur when the salmon are exposed to levels of the contaminants that occur routinely in the environment, and sometimes at permissible concentrations.

CEFAS has also shown that other sensitive life history stages of the salmon are affected by diffuse contaminants. For instance, exposure to environmental levels of the herbicide atrazine modified the run-timing of smolts, reduced their survival in saltwater, and reduced their sensitivity to odours considered important to homing. This research has further highlighted that conditions in freshwater can have a significant impact on the salmon once they migrate to sea.

For more than 25 years, CEFAS has been at the forefront of the development and deployment of tracking and telemetry systems to monitor the behaviour of migratory fish species. CEFAS has studied the movements of adult salmon and sea trout on their spawning migrations through coastal waters, estuaries and freshwater, and smolts as they emigrate from

freshwater into coastal areas. Other studies have included investigations of the effects of barrages and dredging activities on fish movements, and have assisted in providing advice on fisheries and other activities that affect stocks. Currently CEFAS is using telemetry techniques to investigate the impact of freshwater contaminants on the distribution and behaviour of smolts once they enter the marine environment. These collaborative studies between CEFAS and the Marine Institute at Newport (R. of Ireland) highlight the close association and shared interests of Government laboratories in addressing the problems relating to salmon in the sea.

A range of ecological studies has been undertaken to identify bottlenecks in the production of juvenile salmonids, and early work demonstrated the importance of siltation in limiting egg and embryo survival. Follow-up studies showed that gravel could be cleaned to remove silt and restore the quality of spawning habitats, but this was expensive, and the benefits often persisted for only a few years. Further investigations demonstrated the utility of stream-side incubators to avoid production bottlenecks at the embryonic stages, and showed that river channel modification could be used in some areas to maintain improvements in spawning gravels following cleaning.

More recently the focus of the ecological research has turned to the potential impact of climate change on the freshwater environment and, in particular, on how changes in flow and temperature regimes may influence and modify fish populations. Integrated field and laboratory-based experiments are beginning to provide information that will allow the development of models to forecast how



The Laboratory at Lowestoft. Photo reproduced with permission of Mike Page.

climatically driven changes to the estuarine and freshwater environments may affect salmonid fecundity and egg survival, information that will be important in managing stocks in a changing environment.

CEFAS also has a growing programme of research on non-salmonid species. For example, the decline in the recruitment of European eel over recent decades, and the consequent requirement to develop eel management plans for all waters that would historically have supported eel populations, has led to an expansion of the research on this enigmatic species. The immediate requirement for managing eels is to develop methods for setting targets for silver eel escapement and for estimating the actual production levels from river basins. This year CEFAS has begun studies of the effects of habitat characteristics in freshwater and estuaries on eel abundance in order to improve the models used to assess the status of eel populations.

The introduction of non-native fish species can have adverse impacts on resident fish populations and freshwater ecosystems.

CEFAS has therefore developed a risk analysis framework in order to produce risk profiles for any non-native fish species that may be introduced into UK waters, either accidentally or intentionally. These assessments will underpin management decisions on controls on the importation, keeping and release of these species. Changes in the freshwater environment as a result of climatic events may also increase the geographic range of many non-native species and their success in competing with existing fish populations. CEFAS is therefore continuing to develop risk assessments and models to determine the potential distribution of these introduced fish within a changing environment and find the most appropriate methods of containment or eradication.

The future

The adoption of the precautionary approach and moves towards an ecosystem approach to management by most fisheries management organisations in recent years has increased the reliance on scientific knowledge to support management decisions. The studies

described above are part of an on-going programme of research at CEFAS to investigate factors controlling or limiting the production of salmonids, eels and other freshwater fish species and to ensure that fisheries management is based upon sound principles and backed by high quality science.

The future is likely to see increasing pressures on freshwater, estuarine and marine habitats from human activities and climate change. At a time when research funding is tending to decline, this constitutes a real challenge to the scientific community. It also highlights the need to support the advancement of scientific skills to address these problems, ensure the best co-ordination and co-operation between research institutes and with funding agencies, and to communicate research results widely with stakeholders and other interested parties. Studies of these species represent only a very small part of the work of CEFAS, but operating within such a large and diverse organisation provides great benefits in sharing ideas and knowledge between scientists with a wide range of skills and interests.

A Brief History of the FRS Freshwater Laboratory

Dr. Richard Shelton, AST Research Director and Director of the Freshwater Laboratory Faskally, 1982-2001

The Atlantic Salmon Trust is forty years old this year but in the April of next year the FRS Freshwater Laboratory will celebrate its Diamond Jubilee. The Laboratory had its genesis in the fertile mind of the late Dr. John Berry of Tayfield in Fife, a keen all round sportsman and large bore wildfowler and a distinguished veteran of both The Royal Highland Regiment (The Black Watch) and military intelligence.

By the end of the Second World War, Dr. Berry was biologist to the North of Scotland Hydro-Electric Board. At that time, he proposed that a programme of research be put in hand to study the mechanisms underlying the improved growth rates enjoyed by brown trout living in newly-created reservoirs. By February 1948, The Scottish Home Department and the North of Scotland Hydro-Electric Board set up a Supervisory Committee for Brown Trout Research under Professor (later Sir) Maurice Yonge to establish a Brown Trout Research Laboratory and to supervise a programme of research into the factors affecting the number, size and growth of brown trout in Scottish waters of varying types and into measures for improving the stock.

The Brown Trout Research Laboratory began life in April 1948 when the earliest stages of the Brown Trout Research Scheme were put in hand at Faskally near Pitlochry by Mr. Kenneth Balmain. Mr. Kenneth Pyefinch, who was to be the first Officer-in-Charge, took up his duties on 1st July and the first independent laboratory accommodation (a former wartime barrack block divided into five work rooms) was occupied on 26th August.

The end of the first phase of the Laboratory's existence was marked, in 1960, by the publication of Kenneth Pyefinch's monograph 'Brown Trout in Scotland' a popular summary of the large number of scientific papers and reports on the ecology of trout and their habitats produced by the staff since 1948. Dr. Berry, as a key member of the Supervisory Committee, played a large part in over-seeing this work. Its principal conclusions were that the long term productivity of trout populations was primarily dependent upon the underlying geology and surrounding land use, and that the enhanced trout growth temporarily seen in newly-flooded impoundments could not be sustained in an economically-viable way by the addition of lime or artificial fertilisers. However, the ecological insights gained at that time laid the foundations for the trout habitat improvement techniques now widely used by fishery managers throughout the British Isles.

As the years passed, research on salmon began to play an increasingly large part in the work of the Laboratory. By 1957 it was renamed the Freshwater Fisheries Laboratory and the following year was taken over as an integral component of The Scottish Office's fisheries research organisation. By then, the work of the Supervisory Committee had come to an end. Dr. Berry nevertheless remained in regular touch with the work of the Laboratory he effectively founded. On 10th July 1998, he marked over half a century's support and encouragement by donating his personal copy of his doctoral thesis to the Laboratory's library. His handwritten inscription reads as follows –

"In commemoration of the 50th Anniversary of the opening of the Laboratory, and as a token of my admiration for the achievements of the staff throughout, I am presenting my own personal 'working' copy of my doctoral thesis on 'The Freshwater Development of *Salmo salar*'."

Although the present day responsibilities of the Freshwater Laboratory (its name since 2001) extend far beyond those envisaged 50 years ago, the requirement to provide soundly-based advice on the status of salmonid and freshwater fisheries, and the populations and environments upon which they depend, is as strong as ever.

By combining the detailed results of investigations at its own monitored sites with those of the increasing numbers of biologists employed by Fishery Boards and Trusts, the Laboratory is able to provide a more comprehensive account of Scotland's migratory fishery resources than ever before. The records of catches from rivers and coastal waters are no longer a mystery because we now know what lies behind them and the natural and man-made changes in the environments in which the fish reproduce.

As in Dr. Berry's day, descriptive accounts, however well executed, are insufficient on their own as a basis for management action, carefully-focused study of the forces which drive the populations on which the fisheries depend are also essential. At its unique facility at Almondbank near Perth, the Laboratory houses the largest experimental flume in Europe, a natural, gravity-fed river in miniature where the dynamics of populations can be unravelled



Offices and library at Faskally.

and the effects of competition and predation studied in more detail than is possible in the open. Adult salmon are also held at Almondbank, including some of the recovered kelts used to augment depleted early-running populations of the Tay whose far-sighted Ghillies' Association helped pay for the enormous tanks in which they are held.

The Laboratory has also pioneered the application of the latest techniques in molecular genetics to salmon and trout research, work which already informs our understanding of the effects of escaped farmed fish on wild gene pools and the vital importance of using local material in stocking exercises. It is hoped that it will soon be possible to use genetic analysis to determine the freshwater origin of salmon

sampled at sea as part of developing investigations into the underlying reasons for their lowered survival as the Norwegian Sea warms up.

For many years, the FRS Freshwater Laboratory has been one of the Atlantic Salmon Trust's most important research partners. "Lang may its lum reek".



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15 years of salmon and sea trout monitoring on the River Dee, North Wales

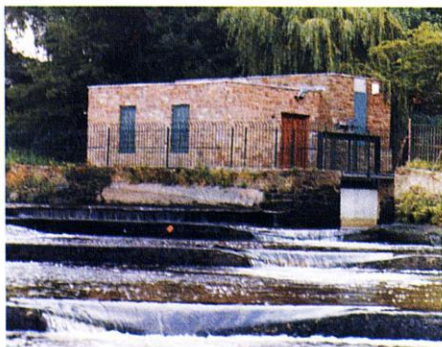
Ian Davidson and Richard Cove, Environment Agency.
Winners of the AST's Award for Contribution to Science 2006

Introduction:

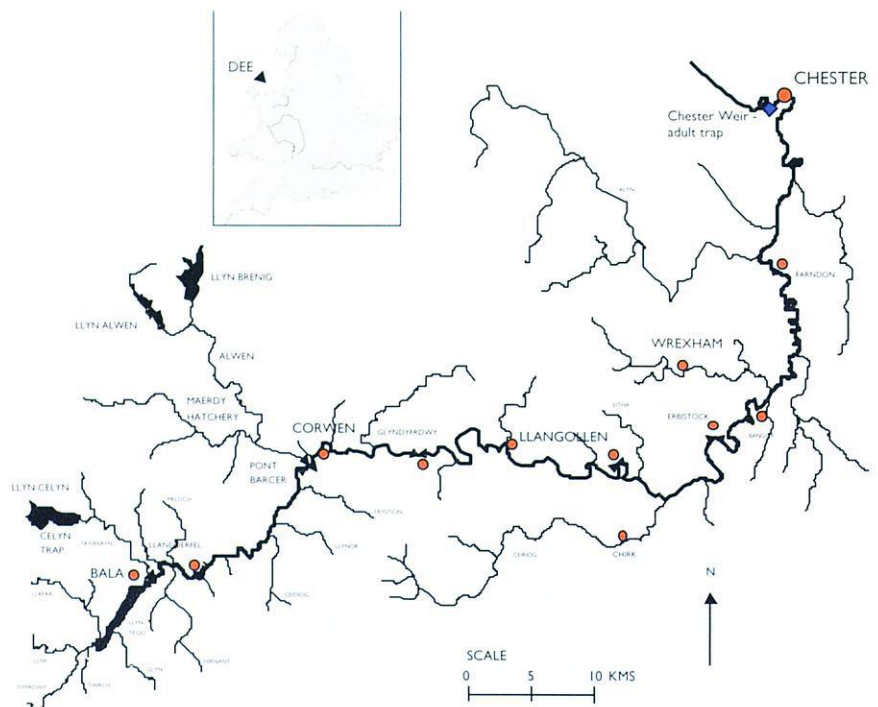
In 1991, the Welsh Region of the National Rivers Authority began a long-term monitoring and research programme for salmon and sea trout on the River Dee, North Wales.

The Dee programme arose from a general recognition that improvements in the management of migratory salmonids required the collection of better information on stock and fishery performance. This included obtaining measures such as adult run size and composition, year class strength, rod and net fishery exploitation, etc., all of which were targeted through a series of 'monitoring objectives' defined at the outset for the Dee study.

A number of factors was considered when selecting the Dee for development as a monitored (Welsh) salmon river – not least that the river supported one of the largest salmon fisheries in England and Wales (E&W) with average net and rod catches of around 1,000 and 500 fish, respectively, and a run that was known to contain a relatively high proportion (20-30%) of multi-sea winter fish. In addition, there were also significant cost advantages associated with developing an existing



Chester Weir fish trap.



River Dee catchment showing location of Chester Weir fish trap.

head-of-tide hydrometry and former fish counting facility at Chester Weir as an upstream adult trap.

Today, the Dee – along with the Test, Itchen, Tamar, Lune and Kent – is among the longest running of six 'monitored river' programmes run by the Environment Agency, each of which reports annual 'returning stock estimates' (RSEs) for salmon to ICES (International Council for the Exploration of the Seas). (A seventh river in E&W – the Frome – run by the Centre for Ecology and Hydrology with support from the Environment Agency – also reports RSEs to ICES.)

The Dee is also one of three rivers (along with the Tamar and Lune) which have been developed as 'index' monitored rivers for salmon and sea trout following a national

review of the Environment Agency's fisheries monitoring programme in 2000. (This review also identified the Tyne as a fourth potential index river.) The index rivers are distinguished by having adult trapping programmes from which biological data (e.g. age, size, sex composition) can be routinely collected for both salmon and sea trout (collection of this type of information in E&W is now almost entirely confined to these rivers). These data have a number of common applications, among them the partitioning of RSEs into species, age and year class components – allowing changes in population structure, growth and survival to be tracked through time.

Individually, each river within the index programme has similar aims and objectives. Collectively, inclusion of more than one



Large sea trout at Chester Weir.

river in the programme (numbers will always be small because the high running costs involved) provides a more representative and robust data set to help inform and direct management of migratory salmonids across E&W.

Components of the Dee programme:

The Dee programme involves a number of monitoring activities which target different stages of the migratory salmonid life cycle. Some of the main activities are discussed below.

Adult trapping at Chester Weir

As already indicated, a key component of the Dee programme is the upstream trapping of adult fish at Chester Weir. Year-round (but not continuous) trapping at this site produces average catches of around 1,200 salmon and 2,800 sea trout annually and so provides a wealth of biological information as well as serving as an effective screening device e.g. for returning Coded Wire Tagged (CW Tagged) fish.

Many of the fish trapped at Chester are tagged to estimate run size using mark-recapture methods. This is necessary because Chester trap is a partial trap (i.e. is not able to catch the entire run of fish – even if this were desirable).

In the case of salmon, run estimates rely on the reporting of (Floy) tagged and untagged fish by anglers fishing upstream of Chester – this is facilitated by a logbook and tag reward scheme. (Detailed catch and fishing effort data are collected via the logbook scheme which also serves as a means of feeding-back results to 400-500 anglers whose participation in the Dee programme is so vital to its success.)

For sea trout, run estimates depend on the recovery of ('Visible Implant') tagged fish back at Chester Weir one year after tagging. This occurs because few sea trout are caught by Dee anglers but as sea trout, unlike salmon, return to spawn in numbers over subsequent years they are available for recapture at Chester trap.

Run estimates at Chester have averaged around 5,700 salmon and 9,800 sea trout over the last 15 years (79% of the latter comprising whiting). Numbers of salmon and older sea trout have remained relatively stable over this period. However, the abundance of whiting sea trout has increased markedly in recent years – although the reasons for this increase remain unclear.

In addition to providing run estimates, angling recaptures of salmon tagged at Chester Weir are also used to derive exploitation rates on the run as a whole and on individual run components – including grilse and multi-sea winter fish and separate monthly entrant groups. Tag reporting rates for this purpose are unlikely to be 100%. However, assuming reporting rates have been reasonably consistent year-on-year, tag recaptures have been used to explore exploitation patterns (e.g. in response to byelaw changes – such as the national measures in place in E&W to protect spring salmon).

Juvenile electrofishing surveys:

To evaluate changes in the abundance and distribution of juvenile fish, extensive electrofishing (EF) surveys have been carried out as part of the Dee programme since 1992. These target over 80 fixed sites (including several on the main river and major tributaries) and adopt a low-effort survey technique of timed 5-minute fishings in predominantly riffle and run habitats.



Salmon and trout fry sampled by electrofishing.

This approach followed the use of similar survey techniques on the River Bush, N. Ireland where resulting indices of salmon fry abundance were found to correlate well with estimates from quantitative EF surveys and with estimates of smolt output.

Timed 5-minute survey data have been used to generate 'production' indices for juvenile fish for use in reach and sub-catchment management. Relationships between whole catchment production indices and numbers of adult spawners are also being explored, as are associations between temperature based growth predictions and the observed size of juvenile trout and salmon. The latter is part of a continued effort to explore the effects of past and possible future climate change

on the growth and age structure of pre-smolts in the Dee catchment.

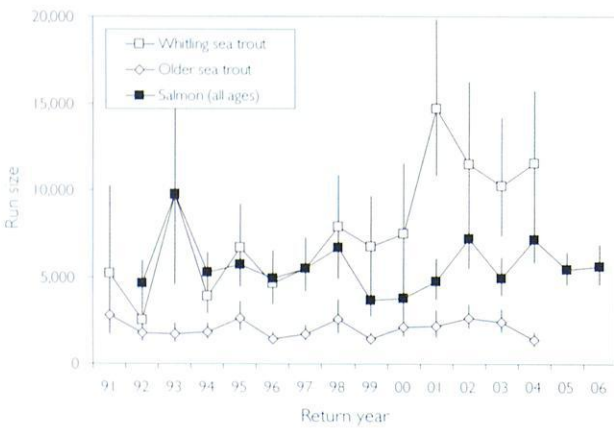
Smolt trapping and CW Tagging

Wild salmon (and sea trout) smolts have been captured and CW Tagged on the Dee (with varying degrees of success) since 1993. This collaborative programme (with the support of CEFAS) has been undertaken specifically to evaluate (i) return rates to Chester Weir (smolts to adults) and (ii) exploitation of Dee salmon

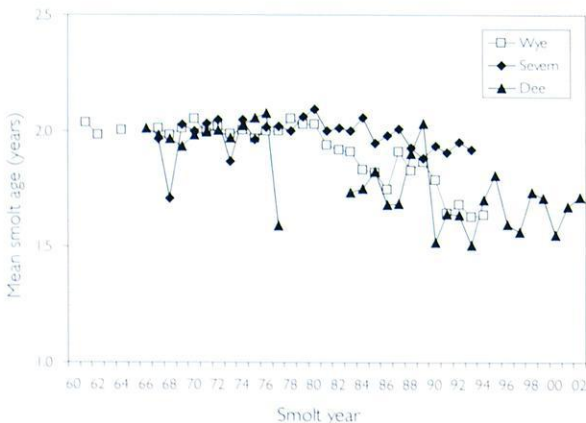
in the Irish coastal fishery. (The latter has relied on an extensive screening programme for CW Tagged fish in Irish ports carried out by the Marine Institute.)

Currently, wild smolts are captured on the Dee using Rotary Screw Traps (RSTs) at two sites – on the Ceiriog (a lower catchment tributary) and on the lower main Dee at Worthenbury, with the aim of tagging 4,000-6,000 salmon smolts each year.

In the past, CW Tagging has also been used in to evaluate the effectiveness of a longstanding mitigation stocking programme for salmon. The latter has been in place since the mid-1960s to compensate for habitat loss following the construction of a headwater reservoir (Llyn Celyn) as part of the Dee flow regulation scheme. However, only since the start of the trapping programme at Chester has it been possible to estimate return rates for stocked fish.



Annual run estimates for salmon and sea trout at Chester Weir, 1991-2006 error bars indicate 95% confidence intervals.



Changes in mean smolt age for salmon on the Wye, Severn and Dee, 1960-2002.

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With the closure of the Irish drift net fishery announced for 2007 it is anticipated that up to 5,000 more grilse may return to E&W homewaters, with rivers in the south and southwest expected to benefit the most.

Recoveries of CW Tagged fish at Chester Weir indicate average return rates of around 4% for wild salmon smolts and 9% for wild sea trout smolts – the latter from fish which have mainly arrived back as whiting (i.e. have spent only a few weeks in estuarial or coastal waters). Provisional results for hatchery-reared salmon parr and smolts indicate much lower return rates (<1%) compared to their wild contemporaries.

Run-reconstruction modelling has been used to estimate the exploitation of wild Dee salmon in the Irish coastal fishery with estimates from recent years being around 2%.

The equivalent estimates from monitored rivers elsewhere in E&W (Tyne, Wear, Test, Tamar and Taff) suggest higher exploitation rates in the Irish fishery of ~10% for stocks returning to rivers in the south and southwest.

With the closure of the Irish drift net fishery announced for 2007 it is anticipated that up to 5,000 more grilse may return to E&W homewaters, with rivers in the south and southwest expected to benefit the most.

Future of the Dee programme:

Appraisal of the Dee programme after 15 years indicates that it has achieved many of its initial monitoring objectives – providing basic but rarely obtained data on which exploratory analyses and modelling depend (e.g. estimates of run size and exploitation; the collection age, size and other biological statistics; etc.).

There are many instances – some touched upon here – where the data generated have been used to good purpose. For example, in aiding understanding of biological process; in developing generic assessment methods and modelling tools (e.g. linked to Conservation Limit compliance procedures); and in evaluating management practices both on the Dee and more widely (e.g. examining the benefits of stocking programmes; reviewing the effectiveness of spring salmon byelaws).

With 15 years of annual data points (but fewer complete generations of fish), the Dee data can be and have been used to explore trends in population structure and

dynamics. Recent work has focused on examining relationships between numbers of adult spawners and indices of juvenile recruits, and on exploring variations in the age and growth of juvenile and adult fish and the influence of environmental factors. (The latter making use of past catch, scale and other data from the Dee extending back to 1900s.)

Long term, intensive and relatively expensive monitoring programmes – such as that on the Dee – will never be common place, but generate unique and important data. To help realise their full value it is essential that programme objectives remain aligned to the needs of fisheries management, that best practice is adopted, and that outputs are disseminated and applied as widely as possible. Advances in computing power and the development of increasingly sophisticated modelling tools should greatly facilitate the latter process. By addressing each of these areas, there is a good chance that the monitoring programme on the Dee will continue for some years to come.



Rotary screw traps at Worthenbury on the main River Dee.

News from the ACA



Fighting for pure waters.
Making polluters pay.

Mark Lloyd, Executive Director, The Anglers' Conservation Association

The Anglers' Conservation Association (ACA) is a unique organisation which uses the law to prevent pollution, and claims compensation on behalf of its members for any damage caused to their fisheries. It can act for fishing clubs, riparian owners and factors: indeed, anyone who owns or leases water for fishing. Since 1948, it has recovered millions in damages for its members, won thousands of cases, and lost just three. It takes on water companies, negligent farmers and multinational corporations who pollute rivers with equal zeal.

The ACA has now formally extended its remit to the whole of the UK. From 15th March 2007, the opening of the trout fishing season in Scotland, the organisation has been offering the same unique protection north of the Border as it has provided to angling clubs, fishery and riparian owners in England, Wales and Northern Ireland for the last 59 years. It will also extend its campaigning and lobbying role to include issues of particular relevance to Scotland.

A Scottish advisory group has been formed to support and guide the ACA's operations, but the ACA's work in Scotland will, for the time being, be managed by the legal and administrative teams at ACA HQ. The ACA's highly experienced in-house lawyers will prepare cases in the same way that they do in England and Wales, but as in Northern Ireland, they will appoint agent solicitors to take cases to court. Gillespie McAndrew, an Edinburgh law firm with great experience of litigation, will be working in partnership with the ACA to take cases through the Scottish legal system for the time being. Once a sufficient number of new members has been recruited, the organisation intends to appoint a full time lawyer and general

point of contact based north of the Border.

This move will extend the power and influence of the organisation and create a significant deterrent to polluters and anyone else who damages the water environment throughout the UK.

The ACA has already identified a number of potential cases which it will take on for angling clubs and river owners. These include slurry pollution on a tributary of the River Irvine and chemical pollution on the River Ugie. The priority is to take on and settle one or two relatively simple cases rapidly in Scotland to demonstrate to anglers and polluters alike that it means business. We are particularly keen that clubs and owners sign up before they actually suffer damage to their fisheries, rather than us getting a flood of new members all of whom have ongoing problems for us to deal with, which would clearly not be sustainable.

Club and owner membership is rather like an insurance policy – annual membership of the Association for these organisations can be as little as £50 a year; but the costs for the ACA of taking on a case can reach £20,000. Equally, some settlements in the past have seen hundreds of thousands of pounds in compensation being paid to fishing owners for damage to their waters, all because they paid £150 a year in membership. In 2006, the ACA secured £50,000 in damages for a weir which flooded out salmon pools on the River Eden.

As well as the more traditional cases against polluters, such as sewage works, rogue farmers and industrial sites, the ACA has a track record of taking on difficult issues. South of the Border, the

organisation has taken and won a case against a rainbow trout farmer for damage to a wild brown trout fishery caused by escapees – the potential for action over escapees in Scotland should therefore not be lost on fish farmers. The ACA has also already threatened to take immediate legal action against anyone recklessly or negligently introducing *Gyrodactylus salaris* to Scotland. In other words, the ACA will hit the ground running.

As the organisation relies almost entirely on the support of its members through subscriptions and donations, a major recruitment drive has been kicked off to ensure that as many individual anglers, clubs and proprietors as possible are aware of the benefits of ACA membership and the need to support the organisation with subscriptions. Scottish individual and club/riparian owner leaflets are freely available from the ACA; you will find an example of the individual leaflet enclosed with this Journal.

Members of the Anglers' Clearwater Association, the Scottish branch which was separately active until a few years ago in Scotland, will be invited to rejoin the ACA (UK). Life members of that organisation will be offered honorary life membership of the ACA, but encouraged to make a donation to help fund this expansion.

For more information, please visit www.a-c-a.org telephone 01568 620447 or e-mail admin@a-c-a.org



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Fishy Dishes



Caterers to the Honorary
Scientific Advisory Panel

Jemima Strickland

Barbecues

Everyone loves to barbecue, even those people who stay firmly away from the oven during most of the year, migrate towards a barbecue and grab the tongs. Everyone loves to see the fire licking the coal or the wood, see it burning the edges of the sausages and watch the turning efficiency of the head chef.

Man first cooked on an open fire and barbecuing certainly brings out the primeval instincts, as everyone tends to discard the knife and fork, quite frequently the plate and allow ketchup to drop to the floor: Crumbs and ketchup splodges on

the ground are all part of the great barbecue experience, it even allows the family pets to get involved without being checked.

The art of barbecuing depends upon many different aspects. The weather will always play a part. Torrential downpour will push too many guests inside squashed around the dining room table whilst barbecuing is finished in the garage. Wind will make lighting the barbecue a tricky operation and will constantly alter the heat. The wind, however, will gently waft barbecue aroma across the garden, over the fence, across the road and entice all your friends

within a mile radius. A sunny day will help to define and strengthen the traditional images of a lazy afternoon with friends.

So remember to light your barbecue in plenty of time for the heat to reach a suitable temperature. Remember to start cooking in plenty of time, so everyone gets to eat. Finally, remember to brush the grills on top of the barbecue with some oil otherwise you will find food will stick, often resulting in bad presentation because you have left half the tasty crunchy outer layer stuck to the barbecue.



Trout Wrapped in Bacon

This recipe is incredibly simple and easy to prepare.

Ingredients:

4 trout, cleaned and gutted
1 tbsp plain flour, seasoned
8 rashers of streaky smoked bacon
2 tbsp olive oil
Juice of 1/2 a lemon

Pat dry the trout with some kitchen paper so they are quite dry. Roll the fish in the seasoned flour and wrap the streaky bacon tightly around the fish. Stretch the bacon out thinly using the back of a kitchen knife to make them stretch that much further around the Trout. Depending on the size of your catch it is a good idea to have more streaky bacon around just in case you need it.

Brush the wrapped trout in some olive oil and cook on a medium to hot barbecue for 10-15 minutes, turning once. Try not to be tempted to turn frequently because it might dislodge the bacon and ruin your finished piece of art.

Serve immediately, drizzled with some lemon juice.

Serves 4

Trout Kebabs

This recipe does not need to be limited to trout fillets: try using cubes of salmon or other oily fish.

Ingredients:

4 trout filleted
2 small red onions cut into wedges
2 tbsp chopped parsley
4 tbsp dry white wine
3 tbsp olive oil
Juice of 1 lime

Thread each trout fillet carefully onto a skewer. Make sure the skewer goes up through and back down several times, so the trout is secure. Place a red onion wedge at the end.

Mix together the parsley, white wine, olive oil and lime juice. Pour it over the trout fillets, cover and put in the fridge to chill for at least 30 minutes.

When you're ready to cook, remove the trout kebabs and place on a hot barbecue for 10-15 minutes. Turn occasionally and baste with the remaining marinade.

Serves 4

Smoked Salmon with potato farls, lemon and crème fraiche

Not exactly utilising the barbecue but would make a fabulous starter. Smoked trout could also be used.

Ingredients:

280g smoked salmon
100g crème fraiche
1 lemon, zest and juice
8 potato farls
Some rocket leaves for decoration

Mix together the crème fraiche, lemon zest and add some black pepper.

Place the potato farls on a medium barbecue and gently heat through.

Place the farls on 4 plates and divide the smoked salmon between them as well. Drizzle over some lemon juice and then a good dollop of the crème fraiche mixture. Serve with some rocket leaves. You could even use some salmon caviar to give the dish a really sophisticated look.

Serves 4





King James VI Business Centre, beside the Tay

AST's NEW ADDRESS

Atlantic Salmon Trust
Suite 3/11
King James VI Business Centre
Friarton Road
Perth
PH2 8DG

Tel: 01738 472032

Fax: 01738 472033

People

We sadly remember the untimely death of Lord David Balgonie who died in an avalanche on 14th February in France. He was a wonderful countryman and much respected and loved highland Laird. He had been a long-time supporter of the Trust through his generous donations to the Annual Postal Auction. He was elected a Member of the AST in 2006.

Gordon Brown, the head of the Freshwater and Aquaculture Division of the Scottish Executive Environmental and Rural Affairs Department is leaving the civil service after 40 years. He has been a most wise and constructive holder of this important post. He chaired the Fisheries Forum and its Steering Group with authority and fairness and much of the credit for the smooth passage of the Aquaculture and Freshwater Fisheries Bill is due to him. He has set in motion the discussions on a 'Strategic Framework for Scottish Freshwater Fisheries'. We wish him well.

Trevor Hastings took over as Director of the Freshwater Laboratory at Faskally in April – and as an aside, we are delighted that the Lab is staying at Faskally! Trevor comes from the Health Division of the Marine Laboratory at Aberdeen.

We congratulate Orri Vigfússon, an AST Member, on receiving the prestigious Goldman Environmental Prize, established in the USA in the 1990s, for his very significant contributions over many years to the conservation of the Atlantic salmon through his work with NASF.

Finally we thank Gersham Kennedy for all his support to the HSAP over many years

and welcome Walter Crozier and Chris Todd to the Panel.

Annual Postal Auction

The final, final calculations have yet to be completed for this years' Auction. It was the first time we tried some 'on-line' bidding and this was generally a success and many lessons have been learned. It looks as though the final gross total of bids will come to £54,500. This is a tremendous sum and nearly equals our best total ever in 2005. We are extremely grateful to all the donors and to all the bidders for their generosity.

Move to Perth

The office staff and contents of Moulin moved to the King James VI Business Centre, Perth, in the first week of March. We are now able to watch the thousands of fish making their way up the Tay past the harbour! Camouflaged hides are being built to deal with misplaced seals, cormorants and mergansers! Do come and see us; we're close to the motorway interchange at the southern end of Perth (M90/A85). Just head for signs to the re-cycling plant off the A90 and then turn right at the river!

AST Leaflet

The updated version of the AST Leaflet has just been produced. Copies will be available on the Game Fair Stands and from our office. No fishing hut should be without one!

Atlantic Salmon Trust Publications

Salmon Stocks: A Genetic Perspective
N.P. Wilkins

Salmonid Enhancement in North America
D.J. Solomon

Salmon in Iceland
Thor Gudjonsson and D. Mills

Atlantic Salmon Facts
D. Mills and G. Hadoke
(Revised May 2003 by R.G.J. Shelton and J.B.D. Read)

The Atlantic Salmon in Spain
C.G. de Leaniz, A.D. Hawkins, D. Hay and J.J. Martinez

Salmon in Norway
L. Hansen and G. Bielby

The Automatic Counter – a Tool for the Management of Salmon Fisheries
A. Holden
(Report of a Workshop held at Montrose, 15-16 September 1987)

A Review of Irish Salmon and Salmon Fisheries
K. Vickers

Water Schemes – Safeguarding of Fisheries
J. Gregory
(Report of Lancaster Workshop)

Genetics and the Management of the Atlantic Salmon
T. Cross

Acidification of Freshwaters: The Threat and its Mitigation
R. North

Strategies for the Rehabilitation of Salmon Rivers
D. Mills
(Proceedings of a joint Conference held at the Linnean Society in November 1990)

Salmon Fisheries in Scotland
R. Williamson

The Measurement and Evaluation of the Exploitation of Atlantic Salmon
D.J. Solomon and E.C.E. Potter

Scottish Freshwater Fisheries Management Report

The Scottish Freshwater Fisheries Management Report is produced by the Association of Salmon Fishery Boards (ASFB), Rivers and Fisheries Trusts of Scotland (RAFTS) and the Institute of Fisheries Management (Scotland) (IFM). Recognising the fact that many are confused about which organisation is doing what in Scottish freshwater fisheries, and in an attempt to co-ordinate all our work better, the intention of this report is to try and condense, in one document published 3 times a year, all the news and information that those with an interest in Scottish freshwater fisheries might wish to have access to in as digestible and condensed form as possible. This will complement the new Scottish Freshwater Fisheries Management website – www.sffm.org.uk which is being developed and which will become the virtual fisheries centre for information about Scottish freshwater fisheries management issues.

ASFB/RAFTS/IFM would be very happy to send hard or emailed copies of this report to any supporters of the Atlantic Salmon Trust who might have an interest in receiving the report. This will be done free of charge. All that is required is for you to register your name by sending an email, calling or writing to the following address:

Andrew Wallace
ASFB, 2 Hill Street, Edinburgh EH2 3JZ
Tel: 0131 226 4955
Email: a.r.wallace@btinternet.com

Salmon in the Sea and New Enhancement Strategies

edited by D. Mills £30.00

(Proceedings of the 4th International Atlantic Salmon Symposium, St. Andrews, New Brunswick, June 1992)

Surveying and Tracking Salmon in the Sea

E.C.E. Potter and A. Moore

Salmon in the Dee Catchment: The Scientific Basis for Management

A. Youngson

(Proceedings of a one day meeting held at Glen Tanar House, 13 October 1994)

Spring Salmon

A. Youngson

Enhancement of Spring Salmon

edited by D. Mills

(Proceedings of a one day Conference held at the Linnean Society of London 26 January 1996)

Water Quality for Salmon and Trout

J. Solbé

(second, revised edition)

Salmon Fisheries in England & Wales

W. Ayton

The Industrial Fishery for Sandeels

A.D. Hawkins, J. Christie and K. Coull

The Interpretation of Rod & Net Catch Data

edited by R.G.J. Shelton

(Proceedings of a Workshop held at the Centre for Environment, fisheries and Aquaculture Science, Lowestoft November 2001)

Predation of Migratory Salmonids

(Assessment of a Workshop held in Edinburgh on 11-12 April 2000, made by the Chairman, Professor Fred Last OBE)

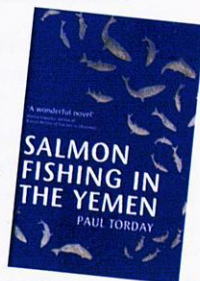
All publications are free except where indicated. Postage will be charged for packages over £5.

Salmon Fishing in the Yemen

by Paul Torday

This hugely amusing and clever novel is now available from the AST at a discounted price.

Paul Torday, a Trustee of the Tyne River's Trust and a supporter of the AST will be speaking at the AST's Conference Dinner on 20th September.



Trust Shop

Books (a percentage of the sales of books and the DVD come to the AST)

The Salmon Rivers of the North Highlands and Outer Hebrides (signed)

1st Reprint. Andrew Graham-Stewart £35.00

The Longshoreman (signed)

Richard Shelton £12.00

McSalar

Michael Martin £4.00

Richard Waddington 1910-1999

Autobiography

Richard Waddington £18.00

Upon a River Bank (signed)

Derek Mills £9.95

Occasional Salmon

Neon Reynolds £9.50

The Fox and the Orchid

Robin Page £5.00

Atlantic Salmon – an Illustrated Natural History

Roderick Sutterby and Dr Malcolm Greenhalgh £25.00

Trout, Salmon and the Evening Rise.

The Barometric Breakthrough
Andrew. Bett £19.95

Northern Tails – an Icelandic Fishing Odyssey

Adrian Latimer £14.50

DVDs:

DVD – 'Atlantic Salmon, a life on the edge' (incl. p&p) £18.00

DVD – 'At Sea with the Atlantic Salmon' (incl. p&p) £10

AST TIES (dark or mid blue)

Silk £10.00 Polyester £5.00

Posters and Postcards

"Salmon Recognition"

Posters £3.00

Postcards (A5 size) 50 pence

"Life Cycle of Atlantic Salmon"

Posters £3.00

Postcards (A5 size) 50 pence

"Threats to Salmon"

Posters £3.00

Poems

"The Best Worker in Europe"

Signed by Ted Hughes, with drawings by Charles Jardine £100.00 (incl p&p)

"Lines from Euston

(by one who is not going)"

by A.M. Harbord £5.00 (incl p&p)

Prints

"The Junction Pool, River Tweed"

by Shirley Carnt £20.00 Extra copies of the AST's Journal, leaflets and car stickers are available free.

Extra copies of the AST's Journal, leaflets and car stickers are available free

To order, contact

Jenny at the Trust's office:

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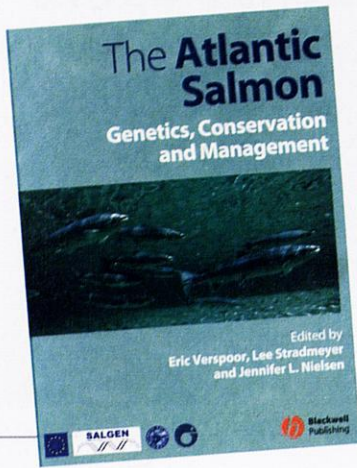
King James VI Business Centre,

Friarton Road, Perth PH2 8DG.

Tel: 01738 472032 Fax: 01738 472033

e-mail: jenny@atlanticsalmontrust.org

Books and Reports



The Atlantic Salmon – Genetics, Conservation & Management

edited by Eric Verspoor, Lee Stradmeyer and Jennifer L. Nielsen 500pp

ISBN 978-1-4051-1582-7

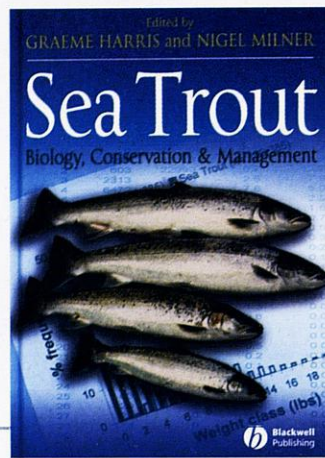
Blackwell Publishing

Foreword by Malcolm Windsor, Secretary of NASCO

In January 2003 I attended a SALGEN symposium entitled 'Genetics and the Conservation of Atlantic Salmon' held in Westport, Ireland. I did so with a certain amount of trepidation since, as a mere physical chemist, I have to admit that on several occasions during my 20 years as Secretary of NASCO I have left meetings confused and somewhat intimidated by genetic terminology and theory. Moreover, on a number of occasions, particularly when discussing the genetic impacts of cultured salmon on the wild stocks, geneticists appeared to be diametrically opposed in their views and I could not always grasp why!

The SALGEN symposium, however, was different. First, the symposium convenors had given clear guidance to all contributors that their presentations should be comprehensible to resource managers and others who may have no genetic knowledge. This they achieved to a very large extent. Second, this was the first time, to the best of my knowledge, that a three-day international symposium had been held which was devoted to understanding of the genetics of the Atlantic salmon and the implications for the conservation and management of the species. Third, it was clear from the presentations that this understanding has increased dramatically in recent years and that there is now more common ground between geneticists.

The contributions from the symposium have now been collated in this book which reviews the biology of the Atlantic salmon and its genome, considers our understanding of the



population genetics of the species and, finally, examines the major management issues from a genetic perspective. These issues include fisheries exploitation, salmon farming, stocking and ranching and habitat management. There is also a very valuable chapter on gene banking of endangered populations.

Sea Trout – Biology, Conservation & Management

Edited by Graeme Harris and Nigel Milner 499pp

ISBN-13: 978-1-4-51-2991-6

ISBN-10: 1-4-51-2991-3

Blackwells Publishing

Preface by the Editors

This volume contains the proceedings of the 'First International Symposium on the Biology, Conservation & Management of Sea Trout', held in Cardiff in July 2004. The aim of the Symposium was to assemble and discuss new knowledge and understanding of the biology of sea trout and the science and management of its fisheries. This was required because much has changed since the last scientific workshops on sea trout in Wales and in Scotland in the late 1980s and since ICES started progressing sea trout work on an international level in the mid-1990s. The Symposium attracted contributions from 12 different countries, revealing a wide range of fishery problems and a variety of opportunities and circumstances within which management and science are carried out. The chapters in this book convey this and we have tried through the editorial process to retain the variety of styles and approaches rather than try to apply overly prescriptive structures. The diversity of approaches and data reflects the subject itself.

The book structure is straightforward. An introductory section sets the scene historically, identifies some key features of sea trout and raises some of the major topics to be dealt with. The main body of chapters is divided into the four themes of the Symposium: (1) Stocks



and Fisheries; (2) Genetics and Life History; (3) Population Dynamics, Ecology and Behaviour and (4) Managing Stocks and Fisheries. A concluding chapter brings together the common threads with recommendations for the future science and management. Finally, the Symposium produced a 'Declaration' (always a risky activity) which was drafted by the organising committee and widely circulated at the time. We hope this will offer some milestones against which to judge progress at future Symposia and specialised workshops on sea trout.

Hatchery Work in Support of Salmon Fisheries

Fisheries Research Services 21pp

ISSN: 0308 8022

Introduction by Alan Youngson

Hatcheries have received a mixed press in recent years. The superficial attractions of hatchery work are clear in that large numbers of progeny can be easily generated at low cost from modest numbers of spawners. On the other hand, in many circumstances it is much less clear that any net gain is likely to result over leaving fish to spawn naturally.

The following report is intended to list all the main biological arguments relevant to the hatchery issue and an attempt has been made to present the facts in an accessible, non-technical style. In Section 4, operational guidelines consistent with the biological background are suggested for planning and hatchery practice. The arguments are grouped under generic headings each of which is completed with a synthesis. All of the statements can be supported, and most can be supported with original sources, although these have not been cited in the present document because of their technical nature. Likewise, each of the arguments can be expanded considerably although this has not been done here, in line with the same aim of providing a non-technical document for public use. Even then, this report is quite lengthy and this reflects the wealth of background information that is available for consideration.

Financial and Fundraising Review

A year of great progress in grant assistance and fundraising support – but there is more to be done!

Neil McKerrow, Deputy Director (Finance)

OUR CASE FOR SUPPORT

Record funding and direct support initiatives in 2006-07, but we urgently need to increase our project funding and we need YOUR help!!

- 1 **The Atlantic Salmon Trust is the only charitable body exclusively devoted to research and restoration of wild salmon and sea trout stocks on a national and international basis.**
- 2 **The Atlantic Salmon Trust** liaises, supports, and provides advice on an independent, scientific and practical basis to governments, national authorities, wildlife and environmental organisations, as well as still-water and river proprietors, managers and biologists.
- 3 **The Atlantic Salmon Trust** funds numerous research projects in the UK and Ireland, and in international marine waters. It participates in international initiatives and research.
- 4 **More funding** is desperately needed now to support worthwhile marine and freshwater projects. These are reviewed by the Trust's Honorary Scientific Advisory Panel, whose expertise is widely acknowledged.

THE YEAR 2006-07 IN REVIEW

In Summary

Record income from individual donations, regular gift-aided contributions and Auction proceeds, assisted the Trust hand out the highest level of grant support in its history. Only expenditure on the Marine SALSEA project was below expectation, solely on account of the lack of available ship time made available for continuing exploratory research. However, the Trust was pleased to be able to fund the acquisition of specialised trawl net gear which has been loaned to the Irish Marine Institute for sea trials in anticipation of the major SALSEA works.

And in more detail –

Our Income

As reported at the Half Year, regular gift-aided contributors increased in number and value, and we were fortunate to benefit from a similar increase in donations. While the number of donors increased, we are particularly grateful to a number of generous individuals whose donations have enabled the Trust to encourage future project research with greater confidence levels in its ability to provide financial assistance in the future. All told, contributions and donations increased by 45% over the year.

The Annual Postal Auction introduced several innovations this year, including an experimental electronic component by which the website could be used for the submission of bids. This successfully introduced a significant number of new bidders to the Auction process, and led to a record sum being raised towards the Trust's work.

These three sources of income – the Auction, regular gift aided giving, and donations generated 82% of the Trust Income. Our investments performed well, and accounted for 15% of our Income received. The balance comprised purchases of books, posters, DVDs and other items by members and supporters at Game Fairs.

Our Expenditure

Direct Expenditure on Conservation activities increased by 18%, and Direct Project Support and Grant Assistance for Research increased by 40%. Recipients included the Game Conservancy Trust, University of Wales, Bangor; Eden Rivers Trust, SULA Diving Orkney, Universities of Wales, Cardiff and St. Andrews, Environment Agency and Liverpool University, the Slaney River Trust, Fisheries Research Station, Faskally and Association of Rivers Trust, Kyle of Sutherland DSFB, and Marine Research under the SALSEA Project.

In addition, considerable management time was committed to representing the interests of the wild salmon in forums and committees where issues, legislation, protocols, planning or contingencies were being appropriately discussed in government, environmental, conservation or fisheries bodies. Finally, as always, the expert work and advice of our Biologist, John Webb, was freely given to a variety of projects and fisheries biologists, as well as continuing input to the West Coast TWG Restoration Project in partnership with Scottish Natural Heritage.

Advertisements

If you would like to advertise in the next issue of the Journal, please contact Neil or Jenny at King James VI Business Centre by Telephone on 01738 472032 or by Fax: 01738 472033 or email: jenny@atlanticsalmontrust.org by 20 November.

Quarter, Half and Full page sizes available.

The new Financial Year

The Year has already got off to an exciting start with over ten projects being approved or conditionally given the go ahead following review by the Trust's Honorary Scientific Advisory Panel which met at the Royal Society of Edinburgh in early April. Recipients include Southampton University, Game Conservancy Trust, University of Wales, Bangor, Tweed Foundation, Wye and Usk Foundation, Kyle of Sutherland DSFB, the Riverfly Partnership, SULA Diving (Orkney), St. Andrews University, Fisheries Research Services, Faskally and the West Argyll Fisheries Trust.

Additionally, the Trust has organised a series of seminars and conferences which began in January with the Tay Seminar at Kenmore, to be followed by the joint AST/GCT Conference at Southampton University in September on 'Freshwater Habitat Management for Salmonid Fisheries', and a joint NASCO/Atlantic Salmon Trust Marine Presentation in Edinburgh in October. Full details appear elsewhere in the Journal.

The Trust is organising a major fundraising Dinner in November, of which members will have already received details, and it is hoped that proceeds will go some way towards assisting further research into the poor physical condition of returning grilse to many Scottish rivers experienced during last summer and the overall marine project.

At the end of last year, the Trust relocated its offices from Moulin in Pitlochry, to the King James VI Business Centre in Perth, where two rooms have been rented. Though this move will increase our office running costs, these are greatly ameliorated when account is taken of future investment

income released from the old office, reduction in time and cost of travel to meetings and operational benefits of transition from an environment which we had substantially outgrown to a more modern office environment.

YOUR SUPPORT – PLEASE!

You can help us by making a Gift Aid Donation, no matter how small. Some examples of current costs and projects are given below:

£15,000 – cost of a privately hired research vessel in North Atlantic for one day

£10,000 – major research project on salmon genetics or predator/ wild fish interaction

£5,000 – research project on river restoration or fish farming impact on water system

£1000 – practical advice or training by the Trust's Field Research Biologist over 2/3 days

£300 – one day's practical advice on river bank management

AS A SUPPORTER

You can help us in one of a variety of ways:

Make a Donation by Gift Aid

The form is on the facing page.

The Trust can reclaim Income Tax. Higher Rate Tax Payers can obtain the benefit of additional relief.

Donations can be made by single donation or by Banker's Order.

Make a gift of shares to the Trust

You can claim Income Tax relief on their value, and will be exempt from any Capital Gains Tax charges.

Sponsor the Trust or a specific project

Many of these are covered in the 'Research' section..

For fuller details of projects please call Seymour Monro, Dick Shelton or Neil McKerrrow.

Make a legacy to the Trust

Bequests to charities

Giving a Legacy – Your Will could express a donation in various ways, eg. The gift of a specific sum of money, a gift of specific assets (such as shares), or a gift of all or a specific part of the balance of your estate once all other legacies (eg. to the family) are taken account of. This is known as the 'residue'.

Bequests to charities are deducted from the total value of the estate before the calculation of any inheritance tax therefore reducing the total inheritance tax payable.

If you would like to leave a legacy to AST by changing your Will please consult your legal and financial advisors.

Some families invite friends to leave the Trust donations in memory.

If you would like to leave a legacy to the Atlantic Salmon Trust please contact our Financial Director, Neil McKerrrow, who will be very pleased to advise further.

Being a Supporter will secure you a copy of the Journal which is produced twice a year, as well as access to publications and research findings. Above all, you can be sure in the knowledge that you are assisting a most worthwhile cause.

PLEASE DONATE – AND ENCOURAGE OTHERS TO DO SO!!

Leaflets and other publications can be supplied for fishing huts and beats!!

Gift Aid Declaration and Banker's Order Form

If you would like to support the Atlantic Salmon Trust, you can help us by making a cash donation or setting up a Banker's Order. Please complete the Gift Aid Declaration and parts A or B

THE ATLANTIC SALMON TRUST – GIFT AID DECLARATION

PLEASE COMPLETE IN BLOCK CAPITALS, EXCEPT FOR SIGNATURES

Title	Forename(s)	Surname
Address		
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I would like the Atlantic Salmon Trust (Registered Charity Nos 252742 and SCO37902) to treat as a Gift Aid Donation this and all donations I make from the date of this declaration until I notify the Trust otherwise.		
Signature	Date	

EXPLANATORY NOTES:

- You must be a taxpayer to make a valid Gift. The total of income tax and capital gains tax payable by you in each year must be at least equal to the tax recoverable on all your Gifts.
- For every £1 donated under Gift Aid, the Atlantic Salmon Trust can recover a further 28p.
- Higher rate tax relief can be claimed by you on Gift Aid Donations.
- A Declaration can be cancelled at any time by notifying us. It must cease if you no longer pay tax.

A. Cash donation. I enclose a cheque in the sum of £ _____ made payable to the Atlantic Salmon Trust

B. To make a series of donations, which will be of great help in allowing the Trust to budget for work in future years, please complete the Banker's Order below.

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Please pay to BANK of SCOTLAND, 76 Atholl Road, Pitlochry PH16 5BW (80-09-41) for the credit of		
THE ATLANTIC SALMON TRUST LIMITED (Account No 00890858) the sum of £ _____ (_____ pounds)		
on the _____ day of _____ 20____ and a like amount on the same day each month/quarter/half year/year		
(delete as appropriate) (a) until I give you notice in writing OR (b) for a total period of _____ years.		
Account to be debited A/c No	Account name	
Signed	Date	
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PLEASE RETURN THIS COMPLETE DOCUMENT TO THE ATLANTIC SALMON TRUST, 3/12 KING JAMES VI CENTRE, FRIARTON ROAD, PERTH PH2 8DG.

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As at 1st June 2007

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Association of Salmon Fishery Boards
(ASFB)

Association of Rivers Trusts (ART)

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North Atlantic Salmon Conservation
Organisation (NASCO)

North Atlantic Salmon Fund (NASF) (UK)

Rivers and Fisheries Trusts Scotland
(RAFTS)

Salmon & Trout Association (S&TA)



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