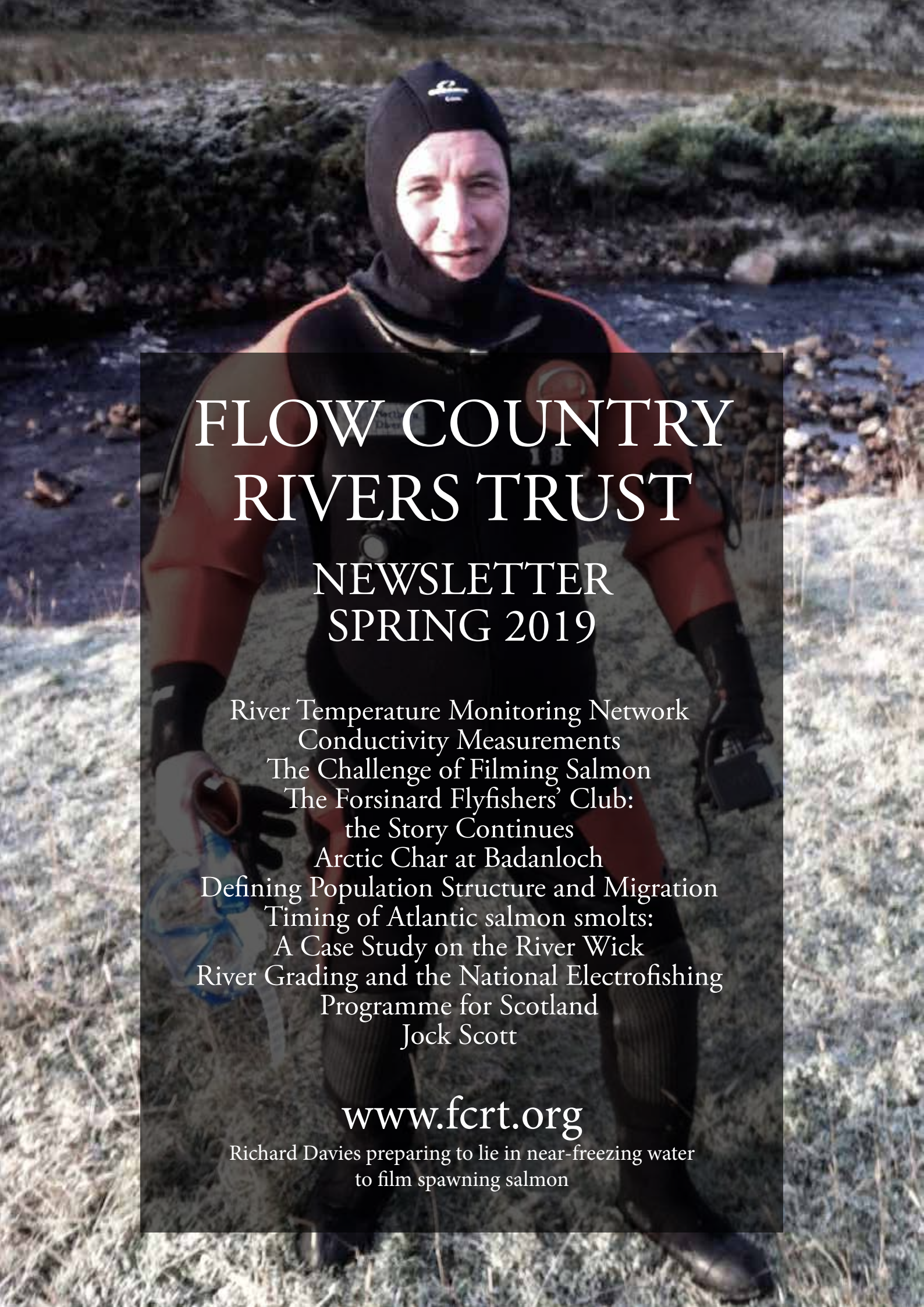

FLOW COUNTRY RIVERS TRUST

NEWSLETTER SPRING 2019

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www.fcrt.org

Richard Davies preparing to lie in near-freezing water
to film spawning salmon

IN THREE YEARS THE FCRT has built up a substantial track record by publishing reports on the Wick smolt tracking project, the coastal migration of salmon in the Pentland Firth, a full electro-fishing survey of the River Wester and a survey of electrical conductivity values in all the Trust rivers in Caithness & Sutherland. We have also been studying geology and the soils of our area to see what clues can be obtained to explain variation in our juvenile fish populations and are currently working on a possible link between conductivity and the biomass density of juvenile salmon.

We also look after part of the National River Temperature Network run by MSS. We have carried out several projects for inclusion in the environmental statements of wind-farm developers because it lets us visit remote places that might otherwise be neglected. We also intend to have an invasive species capability active next year. It turns out, therefore, that the answer to the initial question is, very simply, a lot. Our hope is that by doing this we can understand why the North's rivers are in such good heart and how we can keep them that way.

Other future work we are contemplating includes testing to see if any of our rivers are affected by acid flushes, insect surveys to assess our juvenile fish's food supply and a survey of the extent of shelly glacial tills in our area. We hope this will contribute to a cohesive understanding of the bigger picture in the longer term. We have a strict policy on archiving information. Once knowledge is gathered and recorded it is always there to be used, updated and revised.

As with all charitable bodies we are always seeking financial support. An application and gift-aid form are available under the home tab on our website.

John Mackay
Chairman

An electronic version of this Newsletter is available at www.fcrt.org

River Temperature Monitoring Network

ALAN YOUNGSON

IN 2014, THE River Temperature Monitoring Network was set up by Marine Scotland Science. Several rivers are involved but the only one in the Trust's area is the River Thurso. A set of 11 automatic temperature loggers is in place across locations ranging from the high catchment to the main river itself. These loggers record water temperature every 15 minutes throughout the year. The Trust's task is to service the Thurso loggers in spring and again in autumn by checking that they are still in place, downloading the recorded data and passing the computer files on to Marine Scotland Science.

It is hard to measure water temperature with consistent accuracy and a fisherman's thermometer will not suffice. Each logger is exactly calibrated in the MSS lab before being deployed in places where they cannot dry out, away from the river's surface, where the water mixes and inside reflective housings to shield them from direct sunlight.

An information sheet on the Scottish Government website describes the national programme and its aims (https://www2.gov.scot/Resource/0053/00537001.pdf). It is a long-term project and, obviously, the Trust should try to support it because everyone needs to know how global climate change and rising temperatures will affect stream ecology, and particularly fish populations. To add a bit more spice, it also seems that northern rivers like the Naver and Halladale are more at risk of extreme high temperatures than any other rivers in Scotland - as the information leaflet explains.

It takes some time – about four days each year – to look after the Thurso loggers but the immediate pay-off is that we get to see the temperature records as soon as they are downloaded. Normally, this is not really very interesting – water temperature just rises and falls each day in line with the changing seasons. However, 2018 was different because of the prolonged fine summer and offers a glimpse into a situation that may become more common in future.

The graph above shows the temperature record at Aimster near Thurso between February and November 2018. The maximum temperature each day regularly exceeded 20°C (or 68°F in old money) in late May and again throughout July - much more than in previous years. The maximum temperature recorded was 25°C (77°F). Each day, temperatures rose through the day to peak in late afternoon and then fell away to much lower values by around midnight.

Temperatures over 20°C are potentially harmful to salmon and temperatures around 25°C are potentially lethal. Yet the electric-fishing carried out by the Caithness Board later in the summer seems to show that juvenile salmon populations were unaffected by the high temperatures. This will need to be looked at more closely but, if true, it is reassuring. It may be that young salmon have coping mechanisms that can see them through short periods of unusually high temperature without harm.

Conductivity Measurements

ALAN YOUNGSON

THIS SUMMER'S drought did have an upside…… It was possible to measure baseline conductivity values for all the rivers in the Trust's area because their flows were so low!

Conductivity is a cheap and cheerful way of assessing calcium levels: calcium plays a crucial role in determining the productivity of streams and rivers. Without going into the details, calcium regulates acidity levels (ie. pH). When calcium levels are high, pH is controlled within limits that are favourable for salmon and all the other species that they depend on. Streams with low calcium levels are susceptible to higher acidity levels that can make life more difficult and, in extreme cases, can even kill eggs and fry.

River water starts off as precipitation (rainfall or snow). Precipitation is distilled in the atmosphere from water that evaporates from the Earth's surface and because it is distilled it does not contain materials like calcium. However, rainwater picks up calcium from rocks and soils as it trickles its way towards streams. The amount of calcium picked up depends on the route the rainwater takes, the amount of calcium in the material the water passes through and how long the water is in contact with it. In times of drought, the period of contact is prolonged and the conductivity of stream water then closely mirrors the chemical make-up of the local rocks, gravels and soils.

It turns out that these baseline values differ greatly between the rivers of the Trust's area. Conductivity is very high in the north and north-eastern rivers of Caithness but rather low in Sutherland and south Caithness.

There seem to be two reasons for this. The first is that most of the Caithness catchments run over sedimentary bedrocks with a relatively high content of calcium. Further west and further south the bedrocks are igneous or metamorphic and of low calcium content. Conductivity values reflect these differences because the mineral sediments in each catchment are partly derived from local bedrock that has been fractured by frost or wind or ground down over the aeons by rivers or glaciers.

The second reason is more obscure. As everyone knows, glaciers tend to flow from the mountains towards the sea. However, the position in Caithness was unusual during the last Ice Age since a glacier barged onshore along what is now the east Caithness coast. The glacier then ploughed north-westwards across the land area that lies to the east of a line roughly between Berriedale and Reay. The glacier smeared the Caithness landscape with marine debris that it had previously scoured from the floor of the Moray Firth. This material (till) contains sea-shells, or fragments of shells, and is therefore known as "shelly till". It is very rich in calcium and other minerals and this is probably why conductivity is so high in the rivers in the easternmost part of the Trust's area.

A report on the main findings of the baseline survey is available on the Trust's website (www.fcrt.org). In all, about 200 measurements were obtained, and all the local values are detailed in the appendix to the report for anyone who may be interested.

What now? Getting the baseline values was the difficult part because droughts in northern Scotland are so rare! Over the coming winter, the baseline conductivity values will be compared with the electric-fishing data gathered by the Northern and the Caithness Boards over the past summer. This may reveal the extent to which the hydrochemistry of catchments affects the density and growth of the young salmon they support.

In addition, yet more conductivity measurements will be made but this time under winter flow conditions. The intention will be to find out how conductivity fluctuates with river flow, how this affects pH values and how these patterns vary between catchments showing different baseline conductivity values. The purpose of all this is to try to understand more of what most affects the performance of local populations of young salmon so that they, at least, can be given the most appropriate support at a time when their parents seem to be in some difficulty.

Salmon in a sea pool - Caithness 2018
photo Richard Davies

The Challenge of Filming Salmon

RICHARD DAVIES

WHEN IT COMES to fishing and filming salmon, The Flow Country offers one critical thing difficult to find elsewhere; a relative abundance of wild adult salmon. But it's taken me half a lifetime to get there. The sense of excitement when you know you've just witnessed and recorded something new or beautiful is very much like catching a fish. The technical requirements of the filming I do often mean closer proximity to the fish than with a rod, so it becomes even more intimate. In a world dominated by statistics and data, it is worthy to observe nature for the pure joy of doing so and if you can share that with others, then all the better. Furthermore, a beautiful piece of film will last a lifetime and it just happens that Salmon is a species I am obsessed with recording and observing and the Flow Country happens to be one of the best places in Europe to do this.

As a teenager growing up in Wales on the banks of the Towy, daytime scouting was needed to find where the sewin (seatrout) were lying before venturing out at night: your mental picture of snags, lies and barbed wire fences was critical. On balmy summer days, I would climb trees and watch fish for hours, learning their behaviour, as well as pinpointing their location. It's where I learned that shouting or the frequent low flying Tornado jets did not spark much reaction in the big shoals of sewin lying in the upper tidal pools I fished. However, banging my foot against the tree or waving an arm would send them scurrying about in fear. Tread lightly and slowly on the riverbank. The fascination with observing fish behaviour is a habit that stuck. After leaving school I moved to Scotland, where I have lived, fished and studied salmon and sea trout for the last twenty-nine years.

Shifting from fishing and observing into filming happened slowly over several years and unintentionally to begin with. I wanted to document some of the amazing things you see as a ghillie on small intimate rivers. Things you just don't see on wide large waters. The Fhorsa on Lewis, where I worked, is quite extraordinary in that you sight fish for salmon over sand. The beauty of the location and access to a freelance BBC cameraman friend led me to writing and producing a documentary "Atlantic Salmon – A life on the edge." This focused

on fly fishing but ended with a scientific view on future salmon management needs. It was not without its frustrations and took seven years to make. The film concluded, back in 2003, that it was perhaps the expectations of anglers that needed managing as much as the salmon themselves. I think that still stands today to some extent. While documenting as much as possible, I developed a deeper affinity for the life struggles of the salmon. Possibly this was anthropomorphising, but I'm not ashamed of that. To respect your quarry is no bad thing.

Since then, technology has improved dramatically and prices have plummeted. When you think of the ubiquitous Gopro waterproof action cameras, which retail for around £200 to £300 and record many hours on a flash memory card, it is now so easy to get started. Video in both aerial and underwater technologies has become available to a hobbyist budget and this has opened it up to many. Thanks to my slow adventure into recording the journey of the salmon I am now a CAA approved aerial photographer, picking up work for TV and several estates. This came about because I had struggled for years to capture fish at sea. From the shore you only get to see the odd splash. I had worked out that, like off a bridge, you can see down into the sea much the same if you are directly above. But how to do that? For a decade this was not possible and then, around six years ago, the first drones became available and I knew I had to get one and learn how to use it in order to get the shots of salmon shoals swimming at sea that I'd wanted for years. For a year or two rain meant fish didn't linger at sea but then the summer of 2018 was particularly dry in The Flow Country and fish were stuck. I drove around the coast for two weeks until I got lucky and finally got the footage I wanted.

It would be great if some reading this were inspired to give filming the fish of the Flow Country a go. It isn't difficult but it does require dedication, focus and the right conditions, just like fishing. Fortunately, as a rule, the low and clear conditions, which are often terrible for catching fish, mean they are perfect for filming – provided there are fish present. Trout would be a challenge as well as sea trout. One I have yet to take up.

Salmon in Thurso Bay
photo Richard Davies

Fish Tails
photo Richard Davies

It adds something in anticipation to my fishing trips, knowing that I am going to be happy whether there is water or not. I think many would enjoy the challenge of trying to capture fish on camera. You don't need to go to the lengths I have of keeping a tank with eggs in or lying in a river in sub zero temperatures to capture fighting cock fish at spawning, for example. But to extend a gopro into a holding pool to see what is in there is fascinating. Just make sure you have permission and all your equipment is clean.

Most of my film work is in Scotland, although I travel all over Europe to capture interesting events in the life cycle and management of salmon. The skills learned organically in order to capture these events also come in useful in helping protect the salmon. Recently, a sad event of a huge sea lice outbreak on the fish farms in Loch Roag ultimately led to the deaths of hundreds of adult wild salmon. The wild fish, trapped in the sea due to low water, were covered in hundreds of lice and ultimately died. Because I had learned the techniques and bought the equipment for filming fish at sea from the air, I was able to fly out over the cages and photograph hundreds of farmed salmon showing the symptoms of sea lice infestation. I then took this, along with Corin Smith's in-cage footage, to the authorities and regulators so it could not be brushed under the carpet, as the aquaculture PR machine was attempting to do in the media. It helps to reinforce written evidence and create emotional connection to the problem with those in power, unsavoury as it is to watch suffering and dying fish. If ever there's anything happening that needs recording, make sure that if you can, you do. It could be invaluable and stops it from becoming an unprovable anecdote.

Sometimes though, there's great pleasure and positivity to be had in enthusing others about salmon. An example of this occurred this summer. My friend Anson MacAuslan posted a video clip on Facebook of aerial footage I'd taken, similar to the image above, of hundreds of salmon off Thurso. The last I saw, the video clip had been shared over 500 times and viewed over 60,000 times, with observers from all over the world in awe of the Thurso's health as a fishery. The power of good imagery on social media cannot now be underestimated: I was truly astonished at how many people had shared it.

We are a highly visual species. Over 30% of our cortex is dedicated to sight, compared to only 3% for hearing. Images create emotional connection and help "sell" better than any other medium. To attract fishers to Scotland good imagery is critical when we have to compete with the stunning Iceland, prolific Russia and the vast and beautiful Canada and beyond. We all remember the amazing things we've seen and by associating this with the Flow Country, it helps create the story we want to portray. Get out there and give it a go.

The Forsinard Flyfishers' Club: the Story Continues

REUBEN SWEETING

Aurelia Sweeting and Billie King with her first trout
photo Reuben Sweeting

WITH A YOUNG family of beach-loving children to keep amused over the holidays, my wife and I are somewhat at odds over what constitutes the perfect summer weather. Although, at least my eldest daughter, Aurelia, has been infected enough by the fishing bug to know already that trout don't like sunbathing! Thankfully a conflict of interests such as this generally means that there's normally someone happy within the Sweeting household, though I think it's fair to say, this happiness has been more than a little one sided this summer!

So while for most my apparent dislike of sunshine might seem ludicrous, perhaps spare a thought for those whose livelihoods are affected by prolonged adverse weather like we've experienced this season and much more importantly for the fish whose lives it so gravely affects.

Across the country, as rivers evaporated under bright blue skies and unrelenting heat to levels never seen before, the juvenile areas so crucial to fish stocks shrunk smaller and smaller. Loss of wetted area, high water temperatures, low oxygen levels and increased predation now all contributing to increased mortality levels.

And while the safety of our future stocks are clearly of the upmost importance, the financial implications can't be ignored. The value to the local economy of anglers, especially of visiting ones, is well known and massively important to much of Sutherland and Caithness. From hotels, self-catering cottages and B & B's to food stores, tackle shops and many more their benefit is felt permeating through the economy helping to spread the wealth in the process. These loyal followers of our Northern salmon rivers, who contribute so greatly in their pursuit of silver rewards, are only too aware that while fishing we are in the lap of the weather gods and as such will hopefully tolerate what for many has been a season to write off - though if faced with similar conditions too often I believe even the most loyal may question their allegiance. The financial blow experienced from such loss of clientele would be all too severe.

Now, hot weather usually stirs up people's interest in certain things, like ice cream and paddling pools! But this year, with all the silver chasers looking for alternative entertainment and keen to bend their rods into something, the Forsinard Flyfishers', now in our third year, have had our busiest season by far. Membership has grown steadily each year with word of the fantastically affordable fishing on offer drawing anglers in from far and wide, and with under 18's remaining free, it surely represents some of the best value entertainment available.

The lochs are clearly not immune to the torrid conditions which have blighted the rivers so badly, with many outflow burns drying up completely and several lochs being lost during the season to algae. But with over 40 lochs (13 of them with boats) to choose from, members old and new, have been able to enjoy some great and varied sport in the most glorious of surroundings. The highlight this season has been the sheer number of salmon anglers returning to what for most was where their angling adventures began as children, and returning with them their recollections of just how much they enjoy 'trouting'! The sheer excitement experienced during an action packed drift over frantic paced, free-rising trout is hard to beat and probably as much fun as you can have with a rod in your hand - certainly, no other fishing makes me smile more. While we all live in a world of ever increasing stress, pressure and costs I can't think of a better pastime to become immersed in. So, here's a little suggestion to help cope with modern life; go trout fishing, and while you're at it take the kids.

Reuben Sweeting at Gorkil, on the Halladale
photo Wes Kingston

Many of those who fished with us in 2018
have made arrangements to return this year.
All enquiries in regard to membership of the Club
should be directed to either the chairman,
Reuben Sweeting, on 07920 571026
or the secretary, Paul Byrne, on 07904 483085.
Emails should be directed to
forsinardflyfishers@gmail.com
www.forsinardflyfishers.co.uk

Arctic Char at Badanloch

BRIAN LYALL

BADANLOCH ESTATE is situated at the head of the River Helmsdale, with some 3,000 acres of Lochs. The Estate also has 5 SSSI's on it and is very much part of the Flow Country. The present family have owned the Estate from 1953 and are all keen fishers.

In the early 1970s the Estate starting building its own boats through the capable hands of Estate handyman Polson Mackenzie. The mould was bought from Rob Wilson tackle shop in Brora. At that time Rob was certainly a doyen of the fishing world in the north (a founder member of Brora angling club). Nine boats were made and all are still going strong. The biggest of the loch systems is the Badanloch, Nan Clar and Rhimsdale, situated 500 feet above sea level with five boats on it and being at the roadside is probably fished the most. The trout on this system vary greatly from the plentiful small black trout in Badanloch to the brighter coloured ones in Rhimsdale, from which the biggest fish caught since I have been here at Badanloch came – over 11lbs. Fish over 6lbs have been caught in the other two lochs.

Arctic Char are present in all the Badanloch lochs although not of any size, the best one being just under 1lb caught in Nan Clar in the 80's. At this time there was a gentleman from Brora, a Mr Sowerby, who used to catch eels with a Pyke net system, the net being set along the bottom and eels then following the net along to the trapping area. The problem for us was that the small Char would also get caught in it. Having gone out to check the nets with Mr Sowerby we regularly had Char but no other fish, not even a salmon as some thought was happening. Some of the eels were huge. After being packed in ice they were flown to London.

Arctic char from Iceland
Photo by V.

From the top of Ben Griam Mhor looking west towards Clebrig
Nan Clar is the nearest loch with Rhimsdale beyond it.
Photo Brian Lyall

There have also been Char about 6 oz. in size caught at the Dam (head of River Helmsdale) and odd ones in Loch Achnomoine, which is the top beat on the River Helmsdale.

Loch Coirenamang and Loch Druim, which are north of Ben Griam More and a good bit higher than the Badanloch water, have also got Char. These are the Char that are silver with a red line along the body and a few red spots. I believe that the Char are more bottom feeders so the flies that were catching them were more like "silver butchers, black pennels and the like", although it has been known to catch them later in the season on the top with the greased bob fly that we call Loch Ordies.

Loch an Fhearna which runs into the west end of Loch Badanloch is a nice round loch with a deep hole near the middle. I don't think a year goes by where someone has not caught a Char, again they are no bigger than half to three-quarters of a pound at best.

It would be a great help to our record-keeping if fishers would tell us if they catch any Char, however small. Over a period it's the records that tell the tale, not the folk.

The number to ring is 01431 831232
My email is brian.lyall@hotmail.co.uk

Defining Population Structure and Migration Timing of Atlantic salmon smolts: A Case Study on the River Wick

SUNNY BRADBURY

DESPITE A WEALTH of knowledge on almost all aspects of salmon biology and ecology, there is still much we can learn about the migrations and movements of these magnificent fish which inhabit our waters. We know that Atlantic salmon are capable of travelling vast distances across the ocean. Salmon populations from many rivers in northwest Europe migrate as far as the Labrador Sea, off the west coast of Greenland, a distance of over 3,000 kilometres. However, this ocean-wide journey is not without risk, exposure to a huge number of marine predators, fishing fleets and adverse environmental conditions. These animals put their life on the line for the feeding opportunities these high latitude seas offer. And for many it is worth the risk: they return after three or four years, well-fed and ready to spawn. Only the very fittest or most fortunate make it home to their natal stream.

The challenges associated with tracking salmon in the marine environment are many; manual tracking is almost impossible over these kinds of distances. Electronic tracking methods (such as Acoustic telemetry) are expensive and generally limited to coastal areas and narrow inlets. As such, much early research relied on mark and recapture studies of adult fish tagged in local rivers, and caught in offshore fisheries. It becomes apparent, however, that there are in fact many details of salmon migration within freshwater with which we are not familiar. Of course, knowledge of run

Mainstem antenna at Stepping Stones, Wick
Photo by Sunny Bradbury

timing is common place; there are few scientists or anglers who are unaware of when the smolts migrate or the adults return to their rivers. It is the bigger picture which is unclear; why does the behaviour of Atlantic salmon differ between rivers? What is responsible for the diversity of migratory strategies we see? And, how do we understand the mechanisms which control behaviour and ultimately migration?

There are so many exciting opportunities for studying salmon populations within our rivers, close to home. Through an integration of biotelemetry methods (PIT tagging) and genetic analysis we hope to get one step closer to answering some of these questions. We want to know how nuances of migratory behaviour differ between catchments, and within catchments. Do smolts from all parts of the river begin their migration at the same time? How does river structure influence run timing? And, what are the effects of these differences, if present, on conservation and management practices? We hope to increase our knowledge of the species' ecology, whilst increasing our capacity to successfully manage remaining natural populations.

A collaborative partnership hopes to shed light on the matter. The Trust has been working alongside the Rivers and Lochs Institute (RLI) and the Environmental Research Institute (ERI) of the University of the Highlands and Islands, as well as Durham University in a research project aimed at tagging and monitoring smolts as they migrate to sea through the River Wick. Parallel to the tracking aspect, a cutting-edge panel of genetic markers has been developed and will be used to map the genetic structuring of salmon stocks from two tributaries of the river. We hope that this novel set of markers will allow us to identify genetic structuring on a scale previously unmatched; allowing the identification of locally adapted populations and ultimately, better management of our stocks.

With advances in technology we are now seeing widespread application of next generation sequencing studies. These projects are capable of identifying population level genetic structuring at increasingly high resolutions and decreasing costs. We are in the final stages of screening genetic material from 200 smolts caught in the Wick last spring and hope that analysis of their genetic diversity yields some interesting insights into the nature of within-river migration timing. At this stage, analysis of the data is incomplete, however, we hope that the work carried out in Caithness will establish a foundation for similar projects in rivers across Scotland. Certainly there is potential for it to be used in a region-wide study of genetic structuring in the Highlands of Scotland, informing us not only of inherent genetic diversity, but also giving us a better picture of local adaptation and population-specific patterns of migration within our rivers. Hopefully studies such as these will bring us ever closer to understanding the species' ability to undertake these remarkable, trans-oceanic migrations for which they are renowned.

I wish to acknowledge the help and support received in my field-work from the Flow Country Rivers Trust, Wick Angling Association, the farmers for access and the electro-fishing team, Alan Youngson, John Mackay, James Ross and John Gunn.

eri environmental research institute

University of the Highlands and Islands Rivers and Lochs Institute

Durham University

FCRT

River Grading and the National Electrofishing Programme for Scotland

ALAN YOUNGSON

IN 2018, Marine Scotland (MS) introduced the National Electrofishing Programme for Scotland with the aim of getting information of high quality on the distribution and densities of young salmon in all of Scotland's rivers. The programme is described on the Scottish Government website[1]. Although MS designed the programme, the various Boards and Trusts were asked to carry out the necessary fieldwork. Each of the Northern and Caithness Boards was assigned 30 sites for electric-fishing, placing a considerable extra burden of summer work on those involved. Various parties shared the burden, but the Trust carried out work for both Boards, in Caithness and on the Borgie. One way or another the Trust team surveyed 45 sites in 2018 - a substantial effort!

It is quite likely that MS will suggest that the National Electrofishing Programme is repeated in 2019. It is therefore worthwhile to review the outcome of the 2018 programme to find out what was discovered, what lessons can be learned and, also, to recall important links between the National Electrofishing Programme and the MS River Grading exercise.

The River Grading exercise first sprang to local attention late in 2017 when MS issued assessments to cover the 2018 fishing season. MS used complex modelling techniques to grade rivers as 1, 2 or 3 based on catches reported for previous years. Restrictions were imposed on fisheries in rivers graded 2 or 3.

The grading system is a laudable attempt to classify the status of salmon populations on a river-by-river basis at a time when there is widespread concern about low marine survival rates, poor adult returns and failing catches. Despite this general malaise, the northern rivers seem so far to have held up rather well. It came as a surprise, therefore, to find that several of the rivers in the Trust's area received unexpectedly low grades for 2018 that were quite at odds with the perceptions of those on the ground. This mismatch was subsequently shown to result from an arcane error in the MS modelling process that discriminated against the northern rivers. The issue was resolved and, based on an improved version of the MS model, the gradings for the 2019 fishing season are now uniformly good.

This is undoubtedly a happy outcome for the North and it may even be valid. Yet, in truth, a grading system based on catches is not at all suited to assessing the status of the North's many small spate rivers where

The Carsgoe Burn near Thurso
photo Alan Youngson

The Chairman hard at work on the Bower Burn above Loch Watten
photo Alan Youngson

catches can fluctuate wildly from day to day depending on water and weather. Indeed, the limitations of using catch data for any of the North's rivers, large or small, were brutally exposed by the effects of the 2018 drought. More generally, radical imperfections still lurk within the improved version of the MS assessment model hidden within its workings. This means that continued local vigilance will be required to ensure that the rivers of the North are treated equitably in any new national grading exercise based on catches.

The obvious solution to many of the problems is to replace or temper assessments based on catches with assessment of juvenile populations. Juvenile assessment has particular advantages. After all, the river gradings for 2019 are based on catches made in the 2013-2016 seasons. This is history. The fish that were spawned in 2013 have hatched, grown, become smolts, gone to sea, returned as adults, spawned and died and nothing can now be done to alter the outcome. Many of the fish spawned in 2016 will leave their rivers early in 2019 and, again, it is now much too late to manage any problems.

By contrast, juvenile assessment looks forward and any evident shortfalls can be addressed by managing future fisheries or by other interventions. Indeed, this is the approach that fishery managers have developed over the years. The new National Electrofishing Programme differs only in stipulating that standard methods are applied uniformly across Board areas and by selecting survey sites more-or-less at random. Both these innovations raised matters of note in 2018, the first year of work.

Firstly, some inconsistencies in methods were identified among the various teams. The Trust will liaise with MS and the teams to ensure that these issues are addressed before any new programme starts.

Secondly, the random choice of sites meant visits to many unfamiliar places in the moors, bogs and farms of the North. Indeed, some of the sites were too remote or too hazardous to be practicable options and these were replaced. Other sites appeared unpromising at first but proved to contain unexpected riches. The picture above shows the Trust team on the Carsgoe Burn near the A9 just to the south of Thurso. The stream was small, shrunken by drought and poached by cattle. Sites like this would not normally be on the team's to-do list. Yet (single-pass) electric-fishing showed that the stream contained a minimum of 3.3 salmon fry and 0.4 trout fry per square meter - by far the greatest density recorded in the North.

For all these reasons, the National Electrofishing Programme is likely to fit in with the Boards' and the Trust's long-term interests. MS' overall national evaluation for 2018 is awaited and the Trust is currently preparing its own summary of work carried out in its area. It is to be hoped that the National Electrofishing Programme will continue and, if it does, the Trust should do its best to its support it, liaising closely with the Boards and proprietors to ensure that the obvious benefits of the work and its insights are fully shared.

1. https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/ElectrofishingProgramme

JOCK SCOTT

"Farewell Orri, the man who saved the salmon"

THUS DID *The Times* record the death of Orri Vigfusson, the tough, swack Icelander who died in August, 2017. Seeing what had happened to the herring stocks from over-fishing, he vowed to prevent the same happening to Atlantic salmon, which could easily have been the case after the discovery of the salmon's feeding grounds off Greenland and the development of cheap nylon nets. At the time of his death it was estimated that the measures he'd negotiated covered 85% of the Atlantic salmon's range. His was conservation on a heroic scale. Flags in Reykjavik flew at half-mast on the day of his funeral.

AN ITALIAN, Dr Piraino, has launched a project to defeat the menace of jellyfish, whose numbers have grown exponentially since the broadening of the Suez Canal in 2015. It's called Go Jelly and is based on the principle if you can't beat them, eat them. Fried jellyfish may not look great but they're a terrific source of protein and omega-3 fatty acids.

A fresh run grilse
photo Richard Davies

THE REV. SYDNEY SMITH (1771-1845) is reported to have said that 'no eel, in the well-sanded fist of a cook-maid, upon the eve of being skinned, ever twisted and writhed as an orthodox parson does when he is compelled by the grip of reason to admit anything in favour of a Dissenter.' Interesting that, about the 'well-sanded fist'.

IN AROUND1988, two historically-minded ladies, Jessie Macdonald and Anne Gordon put together a third edition of Down to the Sea: an Account of Life in the Fishing Villages of Hilton, Balintore & Shandwick. "Like everything else, prices of salmon have rocketed during the years. An old entry of 1784 in Lady Pitcalnie's account reads, 'Duncan Bain, for a salmon 6d.' As recently as 1935 it was possible to get a cut of salmon at Paterson's yard on a Saturday night for 9d to 1/- per lb., with much arguing as to who should have the middle cut and who the head. Nowadays it is more likely to fetch up to £2.00 per lb. early in the season.

"In 1965, lump fish, known as paddles, which are caught in the salmon nets and were considered of no particular value, suddenly took on a new importance. A Scottish firm, Johnstones, Montrose, and a Danish firm, began buying lumpfish roes at 1/- per lb. to make an imitation caviar. This exotic experiment apparently was a failure and the unlovely paddles' brief hour of glory ended after a year or two."We have remarked on the perils of jellyfish before and now do so again as news comes in of a jellyfish epidemic off the coast of Queensland with 'tens of thousands of people' seeking treatment for stings and miles of closed beaches. The stingers are called bluebottles, the killers Irukandji. Jellyfish breed in ways mankind has only dreamt of. Climate change is their best friend. They have few predators. In addition to tourism, fish farms, power stations and aircraft carriers are all at risk from what scientists are calling 'jellyfish apocalypse.'