The PISCATORIAL SOCIETY
Founded 1836

Developing & maintaining world class chalk stream fishing

A long tradition of evidence-based fisheries management

The Society's research and development programme is a critical component of our fisheries management operation, and its results shape the fishing experience we offer our members.

This has always been part of the Society's DNA ...

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Summary

First reports of the Society's engagement with matters scientific was through the activities of its members. Frank Buckland in particular was a scientist and expert on fish culture, responsible with Francis Francis for the introduction of brown trout to the Antipodes. He also drafted the 1878 Act that imposed the coarse fishing close season that stands today.

The 20th century

After WW1 the Society tried to improve fisheries on the Lambourn and Kennet, both in poor postwar condition - constructing a fish hatchery, adding iodine to a lake to boost fish growth and reintroducing native white-clawed crayfish to the Lambourn and snail and shrimp to the lake as fish food. We used catch returns and scale readings to evaluate and optimise the effects.

Between 1932 and 1950 experiments with various stocking regimens demonstrated the importance of habitat in retaining the stocked trout and maintaining their condition.

This resulted in stocking of fry and yearlings which had better survival rates.

Until the 1970s, there was heavy stocking of both brown and rainbow trout in our rivers, and a fishery manager wrote "A ruthless and continual battle will be waged against pike, and useless weed rooted out....".

There was little scientific input in this period apart from Col Hammond Davies's pioneering work in electro-fishing – used to remove coarse fish, a major focus of our fisheries management at that time.

By 1975 these approaches were seen to have failed and the Society moved to the Wylye and Avon and re-engaged with the research needed to improve fisheries. We sponsored a PhD which concluded that competition between trout and grayling was insignificant, leading to a halt to the culling of grayling in our waters in 1989 and the proactive development of the grayling fisheries we have today.

On the Avon we improved access and river flows, thus reducing siltation and, in the 1990s we began fishing one bank only, using tree planting on the other, both for shade and to cool the waters, and retaining more bankside vegetation for food and cover. Our electrofishing and catch returns showed the beneficial effects for self-sustaining populations of wild trout and grayling.

In the current century we have been increasingly involved with research to benefit our fisheries management and restoration projects.

The 21st century

The Wylye grayling study, set up in 2003 by the Society, the Grayling Research Trust and the Game and Wildlife Conservation Trust, has continued ever since. It measures age and size of grayling (and now trout) at six sites on our Wylye fishery and supplies the longest data series for this fish internationally. The results have been published and have informed the way we manage our fisheries to promote trout and grayling growth and survival.

We researched tagged stocked yearling trout after in-river supplementary feeding was banned in 2008 and showed that without in-river feeding these fish disappeared within 18 months.

We now only stock our Avon fishery, and part of the Anton with adult fish. We are currently studying the survival of these fish in the Avon using tagged trout in partnership with the Environment Agency.

We have been monitoring water quality for years, providing invertebrate data from kick sampling to the Riverfly Partnership and the WildFish SmartRivers project, and our work on the Anton feeds chemical testing data into the Angling Trust's "Water Quality Monitoring Network". Further monitoring, to keep abreast of changes in flora and fauna and the impacts of climate change, continues.

Restoration work has continued on the Avon and Wylye, but our most ambitious project, on five miles of the Anton, is being evaluated by research supervised by the University of Southampton and part funded by the Society. The PhD study examines the effect of large woody debris; the response of trout and grayling to the restoration; the rate of colonisation of the new river channel by both fish and macroinvertebrates and the impact of increasing habitat heterogeneity on biodiversity.

The results of this study are required to support investment into future chalk stream restoration projects, and its importance is borne out by the funding of two further PhD studies on the next phases of our Anton restoration, by the Test and Itchen Catchment Partnership.

Our fisheries management practices have developed in line with what we have learned from research, and our keeper team has long experience of putting the results into practice, which has put us in good standing with all the agencies involved in the chalk river environment.

Our commitment to improving the value of the waters we lease, and our promotion of wild fishing has led to our acquisition of the Grange fishery, the Anton fishery and Western Court – our main aim is to deliver world-class fly fishing for our members, and R&D provides our toolkit.

Prof John Dart

The 19th Century

POLITICAL INVOLVEMENT IN FISHERIES, CONSERVATION AND FISH CULTURE

The Society's engagement with angling's bigger picture - politics, fish and fishery conservation - stretches back deep into the mid-19th century when much of our fishing was centred on the Thames.

This was in part due to the notable members who had been attracted to join the Society at that time.

Among these, Francis Francis was both an influential fisherman, being Angling Editor of The Field, and an exponent of fish culture.

Together with Frank Buckland, he donated the brown trout ova, from the Itchen and elsewhere, that resulted in the first introduction of brown trout to Tasmania in 1864, where they thrive today, and

Francis Francis

from where they were sent to New Zealand, and thence to mainland Australia.

Frank Buckland, originally a surgeon, became the foremost fisheries scientist and conservationist of his time, and the Buckland Professorship and Lectureship continues to this day.

He was deeply involved in conservation work, restocking the Thames with salmon, serving on four commissions of fish and fishing, and working with the ground-breaking Thames Angling Preservation Society (TAPS). Both he and fellow Society member Henry Cholmondeley-Pennell, were HM Inspectors of Salmon Fisheries.

In this period, and until the 1890s the

Frank Buckland

Society had representatives on the TAPS, the National Fish Culture Association and the Central Association of London Anglers, among others.

Frank Buckland was tasked by the Sheffield MP Anthony Mundella with the drafting of the Freshwater Fisheries Act (the "Mundella Act") of 1878 which, for the first time – and controversially – imposed the close season for coarse fish that stands today.

Henry Cholmondeley-Pennell

Society meeting 1878

Further reading:

Hammond, P.M., The Book of the Piscatorial Society 1836-1936. 1936, 26 College Street, London EC4: The Piscatorial Society.

Ritchie, J., The Australian trout : its introduction and acclimatisation in Victorian waters. 1988, Melbourne, Victoria: The Victorian Fly-Fisher's Association.

1900 - 1936

EARLY EXPERIMENTS IN FISHERY RESTORATION, TROUT STOCKING AND SURVIVAL

By the start of the 20th century the Society had started to move away from the Thames and take fishing on the Lambourn and Kennet, and – after World War I – the Anton and Test, with the realisation that it was possible to improve some of these waters that had been largely derelict.

Guided by its Fisheries Sub-Committee, the Society undertook mud removal on the Lambourn and Anton (with variable success) and constructed a fish hatchery at Shaw Lake (fed by the Lambourn) which we had reconditioned. Other experiments included adding iodine to Shaw Lake to boost fish growth, the re-introduction of native white-clawed crayfish to the Lambourn and snail and shrimp to the Lake as fish food. Effort was also put into reducing the numbers of coarse fish, using traps.

Society meeting room, Bedford Hotel, London, 1915-1955

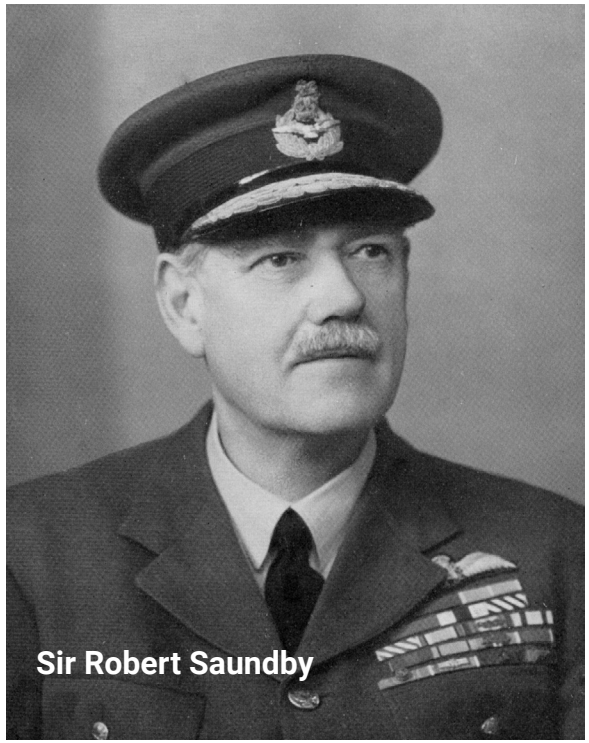
In addition, we explored the methodology of trout culture and stocking – studying the effect of stocking different year classes using both catch returns and, to a lesser extent, scale readings to establish the growth rates and ages of the stocked fish after release.

For example, between 1932 and 1950, we experimented with various stocking regimes, including the transplanting of

two-year-old trout from the Anna and Wallop Brooks into the Test and from the Lambourn into the Kennet. We also operated a hatchery to restock waters with fry from own brood fish. Perhaps surprisingly, the Society President during this period, Sir Robert Saundby, although a great admirer of the stocked rainbows of Chew and Blagdon, described the stocking of large hatchery fish into chalk steams as "costly, ineffective and even dangerous".

Results were indeed mixed and it was realised that if the habitat was poor the stocked trout, in both the Kennet and Test, rapidly left to find better homes. In the Lambourn 11-to-12-inch stocked fish failed to thrive and became known as "Lambourn gaspipes", whereas fry and yearlings survived better.

Around this time we were pleased to hear that "Thanks of the experimenters are due to Members of the Society who have so cheerfully allowed their property to be made the subject of experiment." Our continued enthusiasm for relevant research produces similar accolades today.


Sir Robert Saundby

Further reading:

Hammond, P.M., The Book of the Piscatorial Society 1836-1936. 1936, 26 College Street, London EC4: The Piscatorial Society.

Sir Robert Saundby – Graham Waterton, Journal 143, Autumn 2019

1936 – 1975

LEARNING FROM THE FAILURE OF HEAVY TROUT STOCKING AND THE WAR AGAINST "COMPETING" SPECIES

The Society's records from 1936-1941 were destroyed in an air raid, although little could be done during the War. After 1945 fishing was focused on the Lambourn, Abbotts Barton (Itchen) and on the Kennet including a stretch at Hambridge, just below the Lambourn confluence, where a fishing lake was created.

Society member C Stratton Gerrish became well known for his writing and activism around the protection of river environments, and in 1948 helped found the Anglers' Conservation Association (now Fish Legal and part of the Angling Trust).

Early electro-fishing

However, this period up to 1970 now makes rather depressing reading, with heavy stocking of both brown and rainbow trout in the rivers and removal of coarse fish promoted, in part, by the appointment of a fishery manager who wrote "A ruthless and continual battle will be waged against pike, and useless weed rooted out....".

In stark contrast to the interwar years, when science and experimentation thrived in the Society, the only recorded scientific input during these years was Col Hammond Davies's pioneering work with the use of electro-fishing, a technique that had only just become practicable and which was used to remove coarse fish. The war on pike continued unabated and between November 1963 and December 1964, 1,711 pike, 1,170 grayling, 1,103 coarse fish and 508 eels were removed.

It is really surprising that it had not yet been realised that much of this ongoing effort was a waste of time. Indeed, the war against coarse fish continued in 1969 when the lake at Hambridge was treated, to remove all coarse fish, with Rotenone, an insecticide highly toxic to fish.

Continuing problems with the fisheries, demonstrating the failure of the prevailing approach to stocking at that time eventually led to our move to the Wylye with purchase of the fishing at Heytesbury, followed by the acquisition of leases on the Wylye waters as we know them today. In 1975 we also acquired the leases for our Avon fisheries – and these moves marked the opening of a new chapter in the Society's engagement with fisheries research.

Further reading:

Multiauthor, The Second Book of the Piscatorial Society 1936-2000. The Piscatorial Society History. 1999: The Piscatorial Society.

Reynolds, J.B. and J.C. Dean, Development of Electrofishing for Fisheries Management. Fisheries, 2020. 45(5): p. 229-237.

The Danger of Dredging – *C Stratton Gerrish, Intranet library*

A stretch of the Kennet before dredging

The same stretch after dredging.
A = original bank level;
B = original riverbed

1975 – 2000

RESEARCH INTO FISH INTERACTIONS, THE START OF SUCCESSFUL RIVER RESTORATION AND THE CHANGE IN FISHERIES MANAGEMENT TO ENCOURAGE WILD FISH

Realising that the wholesale removal of grayling and coarse fish from trout waters did virtually nothing to improve trout fishing, we sponsored a University of Reading PhD to investigate competition between trout and grayling. Fishing was suspended on a stretch of the Lambourn at Bagnor for three years to permit the research (we fished the Lambourn until the mid-1980s).

The resulting thesis, "A study of competition between trout Salmo trutta and grayling Thymallus thymallus in the River Lambourn, G. C. Bellamy, P. University of Reading. Department of Applied Zoology 1983" suggested that there was no significant competition between the two species – subsequently supported by other studies. This work led in 1989 to a halt in the culling of thousands of grayling on our waters, and the proactive development of the grayling fisheries we enjoy today.

We still culled pike but – to investigate – we sponsored a study, published in the Journal of Fish Biology, and eventually stopped the practice.

Stocking

Stocking continued with fry and yearlings, and a few "target" fish, together with in-river winter feeding. Thin fish in poor condition were not infrequent.

The Itchen at Abbots Worthy was treated as a put-and-take fishery, given the lack of natural spawning, but on the Wylye and Avon the aim was to supplement wild fish stocks. When we acquired our water on the Upper Test in 1995 it had been stocked with rainbows and browns of 5-6 lb. By 1982 catch and release was adopted by the Society and the use of barbless hooks was encouraged to improve the survival of the wild trout population.

River restoration

We began improving access to the Avon with the addition of chalk to the banks. We also removed the hatches at Moor Hatches and Normanton to improve flow, reduce siltation and naturalise the river.

These works delivered clear benefits to fishers and prompted the development of our strategy of fishing only one bank on most waters, accompanied by tree planting on the other bank (for shade) and the retention of more bankside vegetation on the fishing bank. This approach enhances the habitat for self-sustaining populations of wild trout and grayling, as our monitoring (and catch returns) showed.

Further reading:

A pike management strategy for a trout fishery – *RHK Mann, Journal of Fish Biology*

After 2000

LARGE SCALE RIVER RESTORATION, LONG TERM FISHERIES RESEARCH, AND MORE APPLIANCE OF SCIENCE

Serious river restoration

Similar restoration has been undertaken to deal with the adverse effects of past over-management (dredging and straightening for drainage and defence) on the Wylye at Boyton and Stockton.

Currently our most ambitious project to date, on the Anton, is increasing the length of the fishery, providing backwaters and wetlands to increase habitat diversity for all wildlife and native plants. The is delivering both a superb environment to fish in and, as our initial restoration on Beat 6 has shown, some first class fishing.

This restoration is being closely monitored by research to provide hard data establishing the effects of all this work on all fish (not just trout and grayling) in terms of size, growth and recruitment. In addition, the research is studying sedimentation, water quality and the hydrodynamics – including the effects on the water table. These data are needed as the effects of such restorations have not been measured for chalk streams and, for the funding of future projects, hard data – as opposed to perceptions - are needed, especially when financial support for this sort of work is hard to attract.

Over-management on the Middle Test – all bankside vegetation has been cut down to allow continuous casting along the whole stretch on both banks

The yearling study

2008-2011

For many years numbers of fisheries, including the Society's, stocked rivers with yearling trout and fed them in the winter. It was thought that a large proportion of these fish quickly became "naturalised" in the wild, and that they therefore made a significant contribution to the trout population available to anglers.

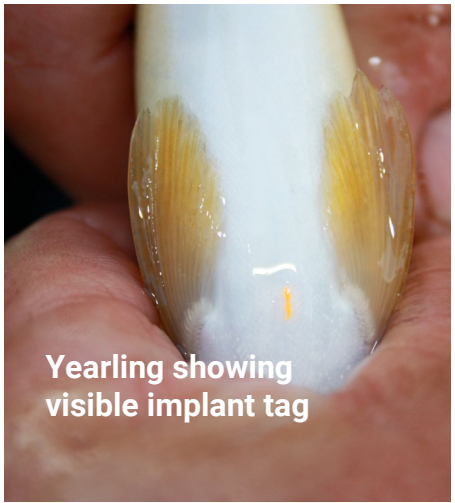
However, in 2008 the Environment Agency and Natural England clarified their position on in-river supplementary feeding of trout in the Wessex and Hampshire areas (including the Hampshire Avon, the River Test and River Itchen) with the following statement: "Unless consent is granted, in-river feeding is an offence under Section 85 of the Water Resources Act 1991. This activity would currently not be granted consent by the Environment Agency. This position is supported by Natural England."

Of course, we immediately set out to examine the factual basis for this ban, and our study began with 300 hatchery-reared triploid (infertile) yearlings, tattooed for identification using Pan-Jet dye marks. In year two we saw that these dye marks faded and so from 2010 we moved to Visible Implant Elastomer tags which had good retention rates and were inserted under the skin on the belly side of the fish with a different colour used for each year.

To check progress, we carried out quantitative electro-fishing surveys in October 2008, three months after stocking, and thereafter at 12-month intervals. Over the period of the study we released 1,200 tagged yearlings, and we found that

- Only 72 of the 1,200 yearlings (ie 6%) remained at each site after three months (range at each site: 0% to 32%)
- After 15 months only 0% to 0.5% remained (just two fish)
- After 27 and 39 months no yearlings were present at any of the survey sites.
- A large proportion of the yearlings captured were in poor condition and of a reduced weight when compared to wild fish of a similar length. Several

Recaptured yearling showing disease



Yearling showing visible implant tag

exhibited predator damage (possibly cormorant or heron) and/or secondary infection.

So, even our limited study revealed that there is sufficient evidence to suggest that stocking with yearlings, without in-river feeding, provides a very poor return. And, while the specific cause of such significant losses is still unclear, evidence from elsewhere suggests it is most likely due to several factors, such as the genetic variability of wild trout, which is necessary for optimal adaptation to their environment.

This is substantial even within one catchment and greater than that of stocked trout even when bred from stock taken from the same catchment. Other factors include an increase in intra- and inter-species competition leading to starvation and/or migration and high levels of predation and/or physical damage and disease – or a combination of all of these.

With that evidence to hand, we stopped stocking yearlings, but we continue with regular stocking of our Avon fishery (and part of the Anton) with 1–2lb adult trout.

The Society is participating in a current EA study on chalk stream stocked female triploid brown trout with several aims including: their residency and dispersal from their release site; survival; ascertainment of their genetic status as diploid or triploid and their diet.

Yearlings released

Further reading:

Comparison of patterns of genetic variability in wild and supportively bred stocks of brown trout, Salmo Trutta – Griffiths, Bright et al. 2009, Intranet library

The history, science and future of stocking, Kyle A Young, Intranet library

Environment Agency brown trout stocking project, Intranet library

Woody debris and more

In the past woody debris (WD) was cleared from our rivers because it was seen as a nuisance – impeding fish migration, reducing river flow, promoting flooding, creating a hazard to navigation, and interfering with fishing. Traditional management therefore involved regular 'stream cleaning' to completely remove wood from the channel. However, this became controversial in 2017, when we had started to retain in-river trees and later deliberately felled large trees (as on the Anton beat 6) as an economic and natural method of pinching the river in. This work was designed to increase flow rates and provide clean gravel around the trees along with scouring to provide deep water cool refuges. It was also intended to offer a silt trap, protection from predators and a substrate for colonisation by insects and plants.

Given the lack of any scientific studies of the effect of WD in chalk streams, we conducted a review of findings other river systems (and trout species), which in summary indicates that:

- The effect of WD use on brown trout, in the wide variety of rivers studied, is considered positive, but not unequivocally.

- In smaller chalk streams with relatively high flow rates, it is likely that WD will enhance the retention of trout and increase population sizes – although this might not work in periods of low flow or over-abstraction.

- The effect may be greater in stretches with a high flow rate, possibly due to enhanced scouring and alterations in flow that result.

Restoration work on the Upper Test

Restoration work on the Wylye

• For trout species in general the effect of WD is an order of magnitude greater than that of engineered in-stream structures (EIS), quite possibly because it is often used in streams with high flow rates, unlike EIS which are more often placed in rivers with lower flow rates.

• The effect of WD may increase trout populations by as much as 88% although the effect on individual trout size, growth and survival may be small.

• The effect of WD on fish (numerous species), macrophytes (plants in the river) and macroinvertebrates (eg shrimp and fly-life) was beneficial overall both for richness and diversity as well as for population abundance and biomass.

• It's likely that WD provides a year-round benefit to brown trout when compared to the seasonal growth of in-stream macrophytes such as Ranunculus, providing cover and a food source through all fish life stages. WD may also provide added stability in high gradient areas susceptible to macrophyte washout (root scouring) during extreme flood events and extended periods of macrophyte recovery.

We concluded that there was a need to carry out high quality research into the effect of river restoration methods (introduction of WD, channel and depth restoration, re-meandering and fencing off livestock) on brown trout in chalk streams. We said that this would require a pre-modification assessment of the upstream catchment, water quality, macrophyte, macroinvertebrate and fish diversity and population, together with monitoring of these variables for several years after the restoration. And that is exactly what we've been doing on the Anton.

Further reading:

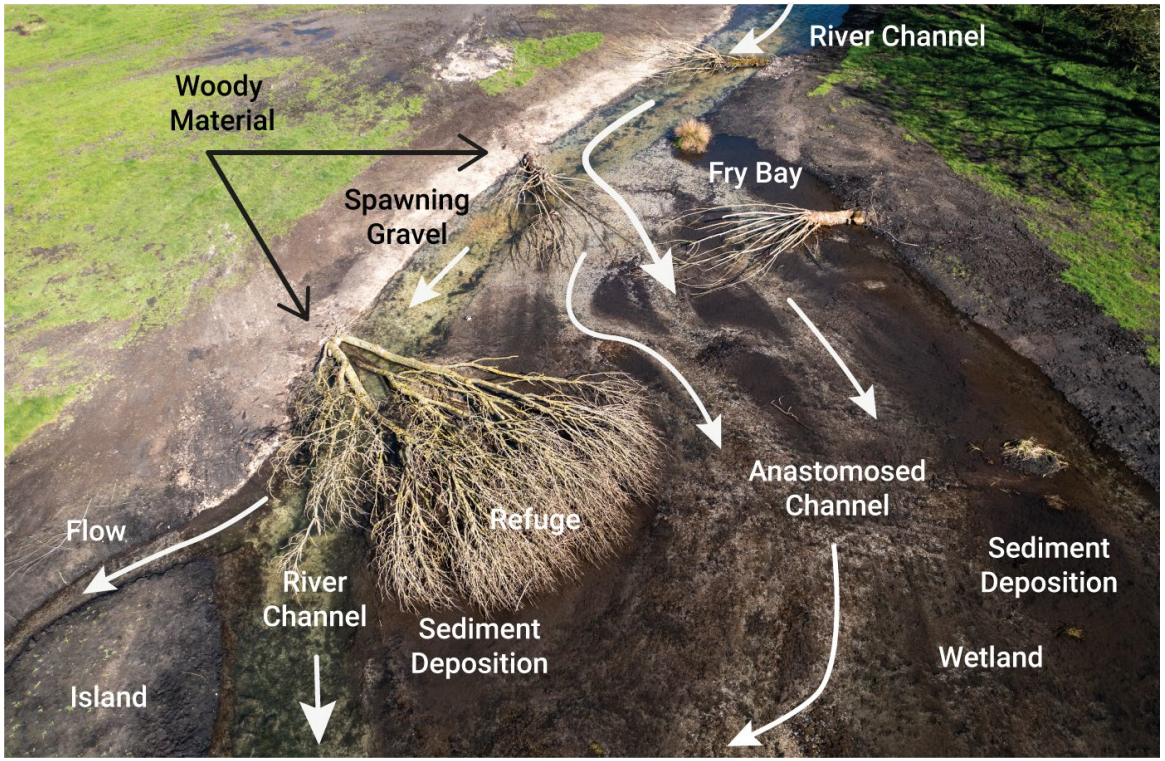
Sievers, M., R. Hale, and J.R. Morrongiello, Do trout respond to riparian change? A meta-analysis with implications for restoration and management. Freshwater Biology, 2017. 62(3): p. 445-457.

Stewart, G.B., et al. Does the use of in-stream structures and woody debris increase the abundance of salmonids. CEE Review 2006. 05-006, 1-84.

Kail, J., et al., The effect of river restoration on fish, macroinvertebrates and aquatic macrophytes: A meta-analysis. Ecological Indicators, 2015. 58: p. 311-321.

Woody debris in chalk streams – *John Dart & Bob Wellard (online library, Scientific Papers)*

The Anton project



The Anton project is the largest and most comprehensive chalk stream restoration project in England, costing around £15 million in total. The overall objective of this part of what is now recognised as a National Chalk Stream Strategy "Flagship" Project is to deliver a phased approach to river restoration, assisting natural river processes, to meet the challenges of a changing climate, and to provide opportunities to improve drought and flood resilience on approximately five miles of the Lower River Anton.

Our work on the lower half of the river, a major Test tributary, extends from a short distance downstream of Goodworth Clatford to its confluence with the Test and coincides with the re-naturalisation of the upper half of the Anton in and around Andover.

The project has adopted a catchment-based approach to re-naturalisation as opposed to the more common practice of piecemeal work on isolated stretches of river – which then continue to be affected by upstream habitat, water quality, fluctuations in water levels and pollution. Our aims and

objectives here align with those of the Environment Agency's Test & Itchen Catchment Partnership (TICP) and the core principles of the CaBA Chalk Stream Restoration Strategy (2021) and Implementation Plan (2022).

Partnership

The project brings together a wide range of stakeholders including landowners, the Test & Itchen Catchment Partnership (TICP) (co-hosted by Wessex Rivers Trust and Hampshire & Isle of Wight Wildlife Trust with a significant proportion of funding being provided by Southern Water. This combination of complementary specialist expertise and local knowledge has enabled the Project Steering Group to define a clear strategy and a comprehensive plan of action designed to address key issues currently affecting the health of the Lower River Anton. Implementation of Phases 1 and 2 was carried out by the Society and Cain Bio-Engineering (CBE).

Scientific rigour

Integral to the programme as a whole is a PhD study (by Hannah King), funded by the Society and the University of Southampton, which underpins our "proof of concept" approach. It investigates the physical, chemical and ecological changes in detail as the project develops. A second PhD starting in 2024 focuses on changes in hydrogeology, temperature and climate. Hannah's first year of research was completed in September 2023 – a Before and After Impact study evaluating the effects of the restoration on two very different sections of the river. These are the Beat 6/Phase 1 restoration, carried out by our Keeper Team in October 2021, and which introduced 27 whole trees and large woody debris structures designed to narrow the overwide stretch to increase flow velocity and clean spawning gravels whilst improving habitat diversity in the resulting meanders. The second site is the restoration of Beat 8/ Phase 2 at the upstream end of the Westfair carrier, carried out in early 2023, which created a new channel and wetland. The control site is Beat 1 at Fullerton and the research comprises five studies:

1. Macroinvertebrate (eg ephemerids, caddis, gammarus) colonisation of the new chalk stream river channel created at Beat 8 (Phase 2), to describe the colonisation and stabilisation of this population over time.

2. Habitat complexity of a braided channel and associated macroinvertebrate and fish diversity. This will evaluate the relationship between habitat heterogeneity and biodiversity by comparing the macroinvertebrate and fish community composition of the new braided chalk stream channel (Beat 8/ Phase 2) and that of the established, single channel control site at Beat 1.

3. Measuring the effect of the new river channel and wetland restoration at Beat 8/Phase 2 on thermal buffering (keeping instream temperatures within ranges tolerable to wildlife), increas-

ingly important as rising temperatures associated with climate change threaten the viability of our salmonid populations. Fish and invertebrate thermal tolerance data across different life stages will be used to assess the value of the Beat 8/ Phase2 restoration for aquatic animals.

4. “Is Plant Awareness Deficiency (formally known as Plant Blindness) Limiting River Restoration Progress?” Public support for chalk stream river restoration is part dependent on the public’s awareness of what a healthy river should look like, of which the diversity of instream and bankside plants are the most recognizable feature. This study quantifies the chalk stream botanical knowledge of focus groups engaged with the river Anton restoration project to understand factors related to their willingness to learn about chalk stream plants.

5. Measurement of the salmonid response to a chalk stream restoration. This is designed to understand both the population level and individual responses of grayling and brown trout to the 2021 Westover Beat 6 restoration project. Population size and average length-weight relationships are being quantified. In addition, the movement and growth of transponder tagged fish is being evaluat-

ed over the three-year period.

This is study is at an early stage and more results will be available in the Journal as the work progresses.

Connecting the new channel

Further reading:

Chalk stream Restoration Strategy – *Catchment Based Approach*

(Anton Project) News Update Sept 24, *intranet library*

Reports will continue to appear in the Journal and in the intranet library as well as in scientific publications as the project progresses

A completely new river channel

Catch & Release

Releasing a trout

Catch and Release (C&R) was proposed and adopted by the Society on the Wylye and Test to eliminate unsustainable wild fish harvesting from these rivers and, while C&R caused a lot of controversy at the time, the need for it was recognised by most members if wild fish populations were to be maintained.

A good summary of the rationale for our C&R policy is available in Journal 136 Spring 2016 where it says: "The Wylye, which in 2007 was the Society's only wild trout fishery, typically produced 400–700 trout to rods each season. While the kill rate on the Wylye was small in number (35–75) it was probably targeted at the larger 3+ and 4+ year classes.

"Based on calculated assumptions of the trout population of the Wylye the fisheries management team believed it to be 'unlikely that the number of fish killed in the higher exploitation years was sustainable'. Meaning that these higher kill years were most likely to be damaging the recruitment and subsequent fishery performance – as well as impacting individual angler expectation and their fish catches during the latter part of the season".

Further reading:

Fishery Manager's Report – Bob Wellard, Journal 136 Spring 2016

Catch and Release – Tom Fort, Journal 122 Spring 2009

Identifying wild & stocked trout, Richard Sankey & Stuart McTeare *(online library, Scientific Papers)*

Effects of fishing pressure on trout and grayling - John Dart *(online library, Scientific Papers)*

The Wylye grayling study

Honorary Life Member Robin Mulholland was instrumental in setting up this study as a partnership between the Piscatorial Society, the Grayling Research Trust and the Game and Wildlife Conservation Trust in 2003.

It has continued ever since, measuring age and size for grayling (and now trout) at six sites on our Wylye fishery and has thus supplied the longest data series for this fish internationally. Studies based on this research have appeared in prominent fisheries research journals. One study focusing on factors determining grayling survival was published in 2021 and the other linked study on factors affecting growth in 2022. These studies employ complex ecological modelling techniques and the findings, with their implications, are probably most easily summarised thus:

Low flows in winter	Reduce egg hatching success and juvenile survival
Low flows in summer	Reduce survival of sub-adults and mature but not juvenile grayling
High flows in winter	Increase juvenile survival
High flows in summer	Reduce juvenile survival
High air temperature	Lowers juvenile and subadult survival; increases juvenile growth
High aquatic plant cover	Reduces survival of juvenile and subadults; reduces annual recruitment by reducing availability of spawning gravels
Invertebrate biomass (food)	Subadult and adult growth are positively influenced by invertebrate biomass, a finding consistent with the influence of invertebrate biomass on subadult survival, whereas the effect is weakly positive for juvenile survival and weakly negative for adult survival.
Trout abundance	Trout abundance is positively associated with sub-adult grayling abundance. Juvenile growth is negatively influenced by juvenile trout abundance. By contrast, adult and subadult trout abundance has no effect on adult or subadult growth.

So, overall, extreme changes in river flows are poor for grayling survival overall but with effects that are different for different age classes. This demands promotion of a diverse habitat with meanders and backwaters to provide a heterogenous flow environment. Appropriate fisheries management mitigation measures include: Continuing pressure to limit abstraction of water for public supply during low flow periods to ensure that flow is not reduced by more than 10% during summer/autumn and 15% in winter (restrictions in place on the River Wylye since 2018).

Identifying areas in the river favoured by grayling and maintaining these as "grayling recruitment zones" by habitat maintenance including:

• Retaining impounded reaches, which may be lost with restorations aimed at promoting trout, which have 'naturally' limited growth of macrophytes due to deep water or shading by the canopy.

• Increasing suitable foraging habitat for young grayling by maintaining or introducing bankside shading to limit seasonal growth of macrophytes.

• Increasing canopy cover by a program of south bank tree planting and/or adjusting the management of existing trees to reduce macrophyte cover while providing shade to alleviate high summer temperatures.

• Increasing pressure on polluters to reduce sediment and nutrient input into the upper Wylye reaches (phosphate stripping is being increased by the Warminster sewage treatment works).

We manage our grayling fishing according to the knowledge we have gained from this work – which will continue, especially as we need to monitor the effects of climate-change-induced increases in water temperature to which grayling are highly sensitive.

Further reading:

Marsh, J.E., et al., Density-dependence and environmental variability have stage-specific influences on European grayling growth. Oecologia, 2022. 199(1): p. 103-117.

Marsh, J.E., et al., Medium-term environmental changes influence age-specific survival estimates in a salmonid population. Freshwater Biology, 2021. 66(8): p. 1530-1545.

How a Changing Environment Affects Grayling – John Dart, Jessica Marsh & Bob Wellard Journal 147 Autumn 2021

A Brief History of Grayling Conservation in the Piscatorial Society – Robin Mulholland, Journal 148 Spring 2022

How Environment and Competition Affect Grayling Growth at Different Life Stages – John Dart, Jess Marsh & Bob Wellard, Journal 149 Autumn 2022

The stocked trout study

The Society is participating in an Environment Agency study on chalk stream stocked female triploid brown trout, with several aims including; their residency and dispersal from their release site; survival; ascertainment of their genetic status as diploid or triploid and their diet.

Further reading:

Environment Agency brown trout stocking project, *Intranet library*

Lahnsteiner, F. et al – Triploid brown trout, Salmo trutta, develop functional gonads with age and are able to interbreed with diploid counterparts. Journal of Fish Biology, 2024

Chalk stream flora and fauna

Ranunculus

Chalk streams are among the most bio-diverse of the UK's rivers. They provide some of the most globally rare and vitally important habitats for many wild fish species, including Atlantic salmon, brown trout, grayling and lamprey. As well as fish, many of our chalk rivers support populations of otters, water voles and kingfishers, among a whole host of other important species. The Wildlife and Countryside Act 1981 provides them with legal protection and grants them special conservation status, which means it is illegal to harm, disturb or kill these animals in the wild without a specific

licence.

Many of our chalk streams have also been heavily modified by man and are impacted by an industrial legacy of canalisation, siltation, ditching and the building of many barriers with watermills, sluices and hatches. Agriculture, urban development and water abstraction, along with pollution from wastewater and sewage, farming and road runoff are all having an impact on ever-declining numbers of native species.

The Piscatorial Society is committed to halting this decline. Our strategy therefore aligns with the National Chalk Stream Strategy (2021) and Implementation Plan (2022), which provides a comprehensive, up-to-date analysis of the issues threatening chalk streams in England – how ecological pressures are assessed and regulated. It also includes multiple pragmatic recommendations to bring about the ecological recovery and good health of our chalk streams.

Chalk rivers are also characterised by their species-rich macrophyte communities, dominated by water crowfoot (Ranunculus). Traditionally, river keepers have carefully managed this plant to provide favourable conditions for angling, to control water levels and reduce flood risk.

However, a national decline in Ranunculus, coupled with the apparent deterioration in the condition of chalk rivers prompted their UK Biodiversity Action Plan (BAP) status. A significant component of the BAP requires the maintenance of the Ranunculus community.

Fauna

The issue of swan grazing on Ranunculus has been a controversial subject since the early 1970s. Where herds of non-breeding swans congregate, they can deplete Ranunculus beds by over-grazing, reducing structural and biological habitat diversity. The associated loss of weed-dependent invertebrates and cover for fish has made swans unpopular at times.

Mute swans

Water vole

However, protection applies to all wild swans, including the iconic mute swan (Cygnus olor), the whooper swan (Cygnus cygnus), and other species found in the UK.

Working alongside Natural England and members of the Wiltshire Fishery Association Swan Action Management Project (SWAMP) the Society has been actively involved in monitoring the number of swans in the Avon catchment for many years and through a carefully managed licensed process we now have a relatively stable population of swans, which has helped to reduce damage in most areas.

Otters have made a huge comeback in recent years, a success story we are proud to have taken part in. While otter numbers undoubtedly have an impact on stocked waters – creating predator honey pots through over stocking of trout, often the case on more commercially run waters – we are mindful to reduce this impact by only stocking a relatively small number of fish in degraded habitats of a size and biomass in line with Environment Agency permits.

Most recently we have seen the introduction of beavers…

Further reading:

Chalk stream Restoration Strategy – *Catchment Based Approach*

Mute swans and ranunculus – *Game & Wildlife Conservation Trust*

The Beaver study

Beavers play a valuable role in the ecosystem – building dams and ponding water, and creating critical habitat for other species – which is why they are often referred to as ecosystem engineers. Since they have now arrived on the Wylye we need to know about their impact on fish migration and how will this affect our fishing.

Being used to living with changing patterns of fauna, we're not anti-beaver but we are definitely pro-fish. We are therefore interested to see what difference they could make and perhaps find opportunities to exploit them to the benefit of wild fish recruitment and fishing. It's a complex issue, with polarised views on several fronts, which is why our approach is to look for facts.

Beaver dam in small stream entering Loisach river, Germany

Although we know quite a lot about how beavers modify riverine environments and enhance natural capital in upland catchments with high-gradient rocky rivers and streams (as in Scotland), we don't know much about how they will affect slow flowing lowland and often groundwater-fed streams like the Wylye.

We are therefore one of several groups co-funding a PhD study "Investigating the influence of beaver landscape modification on fish communities in Southern England."

Much of what beavers do is beneficial to biodiversity and human activity, by flood attenuation and the creation of rich habitat. However, the impacts of beavers on agricultural land use through localised flooding, and fisheries, through altering spawning habitats and impeding migration, have been areas of concern.

Our study

This new project investigates knowledge gaps evaluating the effects of beavers on water quality, flows in our abstracted systems, changes in water temperature, the effects on multiple species of fish in beaver impacted areas and the implications for fisheries management of the resulting ecosystem changes. Comparison with other sites will provide "before" and "after" data on their impact.

In the US, researchers have gone further, with the building of artificial beaver dams (Beaver Dam Analogs) in strategic locations, to influence beavers to build dams where people want them to be built...

This project, along with our current work on the Anton, keeps the Society at the forefront of fisheries restoration nationally with the benefits that accrue from our involvement with all the public and private organisations engaged in the development and regulation of freshwater fisheries.

Further reading:

Leave it to beavers – *Amanda Monthei, Patagonia*

Beaver Trust

Beaver

Environmental monitoring

Without compelling scientific evidence in this field, we can only offer opinions, so we take this seriously and understand the need for continuous and consistent data production – from logging water temperatures to continuing the Wylye grayling study.

Water quality monitoring is undertaken by many angling clubs and other water users, as citizen science projects. We provide regular data for the Riverfly Partnership, but we concentrate our efforts on the WildFish "SmartRivers" citizen science project.

Our keeper team has undertaken the training (kick sampling technique, specimen collection and storage) required to participate in this, and we are responsible for eight sampling points across our waters (on the Anton, Avon, Alre and Wylye).

Samples are processed to species level by Aquascience Consultants analysts, to identify both short- and long-term pollution events and trends including: chemical pressure; phosphorous pressure; organic, sediment and flow pressures as well as invertebrate abundance. Crucially, these data are accepted by the Environment Agency as meaningful measures of the effects of pollution.

Our information is shared with the Test and Itchen Catchment Partnership and other organisations to help inform discussions about potential improvements on the ground.

And while data from the Anton Restoration Project may already be playing a part in helping to remove nutrient loading and improve flows in the Anton, we really need several more years' research to reach robust conclusions.
Any significant stressors will of course be flagged and, hopefully, acted upon by the Environment Agency with follow-up surveys, including sondes (in-river sensors) as recently seen on the Avon at West Amesbury.

We keep abreast of developing techniques in this field, such as sondes and automated samplers (requiring remote analysis) and will deploy them as they become sufficiently robust and affordable.

Further reading:

Online library – Environment > Monitoring & Surveys

Kick survey work

Kick survey work

Kick survey work

Analysis to species level

Climate change resilience

We are witnessing at first-hand the effects of climate change and our fishing is pretty much guaranteed to be disrupted by more frequent extreme events of floods and droughts.

Almost all of our restoration project work this century has focused on drought resilience, which typically involves pinching-in overwide channels with large trees and woody material - to provide suitable conditions for Ranunculus to thrive (improved flow velocities >10 m3/s stimulate weed growth early in the year). While we have seen some improvements in river ecology and wild fish communities in many areas, prolific weed growth (and weed cutting) presents additional challenges in high water years. In 2022 it was low water and high temperatures that caused concern. Conversely, in 2023

Flooding on the Wylye

and 2024 heavy rain and exceptionally high river levels really created serious problems.

If we are to continue to provide an excellent fly-fishing experience for our members, we need to be agile and embrace the challenges ahead. We need to ensure our rivers can function more naturally in floods and droughts, and take every opportunity to future-proof them against a rapidly changing climate.

We need to identify vulnerable areas and look for opportunities to improve them.

We cannot predict the weather, but we do know it is likely to be extreme.

One year of flooding followed by four years of drought might be acceptable but two consecutive years of flooding, without any form of intervention, presents the kind of challenge we need to prepare for – especially since it may be several years before we see large-scale projects being funded and delivered on waters other than the Anton.

We have used the Anton as a laboratory - the research work we have undertaken and sponsored there is providing invaluable evidence on which to base our climate resilience strategy and the fisheries management approach we take on all our fisheries.

Further reading:

2024 Annual Fisheries Report

Drought conditions on the Wylye

World-class fly fishing

Our fisheries management practices are continuously shaped and developed by the information we derive from the research in which we are involved. And while we're at home with the science and the theory, we also have long experience in putting it into practice, with a highly skilled and committed fisheries team on the ground 365 days a year.

And we are engaged with all of it – the river profile, the streambed, the banks, the water, the plants, the animals, the habitat, the food chain, the climate, the fish…

Our approach puts us into long-term working relationships with a wide range of partners: fisheries groups, farmers' groups, fishing organisations, government agencies and environmental bodies. We all learn from each other. Unsurprisingly, Society members, who see at first hand the results of all the R&D work, maintain a keen interest – through postings in the online library, expert presentations at Society meetings, articles in the Journal, intranet forum debate, workshops, the comprehensive Annual Fisheries Report and three specialist member groups.

All this gets noticed. Particularly in recent years, we have been approached by fishery owners who appreciate our commitment to improving the value of the waters we lease and who see us as a particularly credible partner in, for example, attracting funding to reshape a landscape. While these have not all fitted with our own development plans, our commitment to evidence-based fisheries management played a vital rôle in our acquisition of the Grange fishery, the Anton fishery and Western Court.

Which is really the point – as a Society our main aim is to deliver world-class fly fishing for our members, and R&D provides our toolkit.

Fisheries team walkover surveys keep our eye on the ball

River Wylye in great condition

Research & Development

A long tradition of evidence-based fisheries management

Research and writing by John Dart, John McGill, Bob Wellard and David Watson. Images by Clem Booth, John Dart, Nick Gooderham, Dick Hawkes, John McGill and Bob Wellard. Design by Nathalie Jamois at Abricot

The PISCATORIAL SOCIETY
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