

My local river, the Usk, is famous for its wild brownies. In the middle and lower reaches, half the trout that I've caught over the last seven years have been over 31cm (12 inches) with only 1 in 20 measuring 23cm (9 inches) or less. So where are the little ones? They're in the tributaries, and the small streams that feed the tributaries.

In the 1990s, Dave Bembo looked at the life cycle of Usk brown trout for his doctoral research. Four tributaries and their feeder streams were electrofished, as well as the main river Usk adjacent to each tributary. The tributaries, rarely more than 10 metres wide, were dominated numerically by trout less than two years old. Trout in the main river were mostly older than this, as reflected in my catches. Dave operated a trap on one tributary, recording a major migration to the main river in April and May by trout mostly in their third year (2+). So, as in many if not most rain-fed rivers, the tributaries are used as nursery areas while most adult fish spend the fishing season in the main river before migrating back upstream to spawn in the autumn.

Even within the tributaries, the age and size of the trout reflected stream size. Feeder streams less than 2.75m wide held trout mostly in their first year (0+) and some in their second (1+). In contrast, 0+ densities were much lower in main stems of the tributaries where fish in their second year (1+) were relatively more abundant.

To assess the importance of feeder streams for trout production, Dave followed the example of Nigel Milner when working on the Conway. He calculated the total number of 0+ and 1+ trout in the small feeder streams from the fish densities he found in his survey and the area of accessible feeder streams in each tributary system. As on the Conway and elsewhere, the feeder streams provided a fifth or more of the wetted area of the tributary systems. What's more, because of higher densities, Dave reckoned that the small feeder streams produced the majority of 0+ trout as well as a significant proportion of the 1+ trout in the Usk tributary systems.

So the trout populations of the Usk, and probably your river if it's not a chalkstream, depend on conditions not only in the main river but its tributaries and their small feeder streams, as well as, in the words of the Water Framework Directive, the 'connectivity' between them. To protect and improve your stock of wild trout, you may need to look beyond your fishery. To quote the King James (well almost): 'Lift up thine eyes to the streams, whence cometh thy trout'.



A wild brownie from the lower reaches of the Usk

Small streams are beautiful

Guy Mawle considers the importance of tiny tributaries to our river trout fisheries

CHANGING CLIMATE

Small streams can be marginal habitats, susceptible to drying out in periods of dry weather or becoming too warm. The chances of them doing so are probably increasing. Elliott and Elliott² make this clear in their paper looking at the temperature requirements of *Salmo trutta* and the likely consequences of climate change. Young trout prefer a temperature of about 9 or 10°C and start to die when the water temperature exceeds 22°C for a sustained period. They don't survive long at all if it exceeds 26°C. Sections of some streams already exceed these temperatures in hot summers.

Not surprisingly, more trout in streams die during droughts and those that survive don't grow so well. So there may be consequences for the stocks downstream a few years later. By that time, many of us

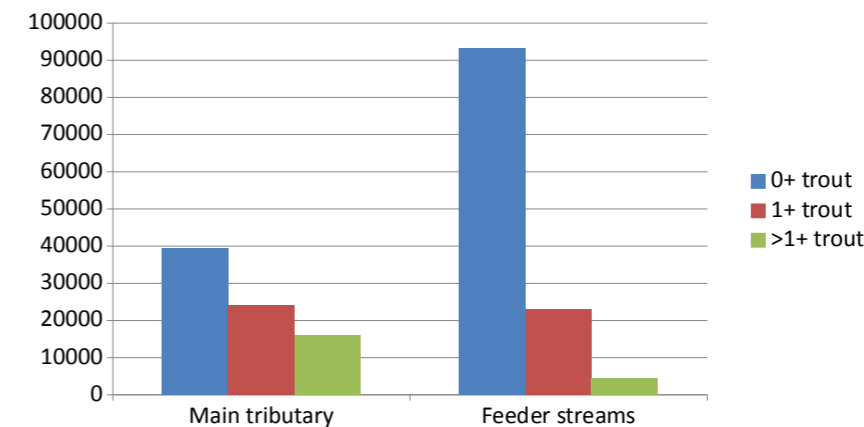
have forgotten all about the drought and may be wondering why our trout fishing isn't so good. For example, how much did the hot, dry summers in 2002 and 2003 contribute to the crash in anglers' sea trout catches across England and Wales in 2006? According to the Met Office website, the highest temperature ever recorded in England or Wales was in 2003.

The Catchment Research Group at Cardiff University³ looked at historical survey data for juvenile salmonids in tributaries of the Wye, the Usk's neighbour. They found a strong link between hot, dry summers and the reduced abundance of juvenile trout.

Of course, trout stocks do bounce back from droughts but it's more difficult if hotter and drier summers become more frequent. And that's what the UKCP09



In 2012, Environment Agency Wales granted a licence to abstract up to two thirds of the flow from this feeder stream in the Usk catchment



Total numbers of trout of different ages in Main tributary and Feeder stream habitat, summed for four Usk tributaries (data from Bembo 1992)

climate projections suggest. Even by the next decade, it is likely that summer maximum temperatures in most parts of the UK will have increased by, on average, more than a degree and average summer rainfall will have fallen by up to 20 per cent. Note that word 'average'; the extremes will be worse. There is much uncertainty about these projections, and the average summer climate could be worse or better for trout though it does seem that extreme conditions will become more common. For more detail, have a look at <http://ukclimateprojections.defra.gov.uk>

It may not be just the temperature in summer that we need to worry about as climate changes. And it is changing. Trout eggs are more sensitive than fry or parr to higher temperatures, with 13°C being critical. Elliott and Elliott comment: "If winter stream temperatures in Southern Britain and Ireland continue to increase at their present rate, then they will soon exceed the lethal temperature for egg development in *Salmo trutta*."

BANKSIDE VEGETATION

Defra has been promoting adaptation to climate change. One initiative relevant to trout is 'Keeping Rivers Cool' by the Environment Agency and partners, as flagged in the Trust's autumn newsletter. This guidance, written by Rachel Lenane⁴, is available from the Agency's website and highlights the importance for trout of protecting small streams.

Vegetation on the bank helps to moderate extremes of temperature creating a more stable environment. Shading streams can reduce both the mean and maximum temperature in summer by 2 to 3 degrees on average. The Agency suggests that there is a balance to be struck between the benefits of shading to regulate temperature and allowing light through for primary production in the stream. It currently recommends that about half the stream should be in dappled shade, though on chalkstreams only about 30 per cent should be shaded, to benefit in-channel weed growth.

The Agency suggests that small headwater streams, less than 5 metres wide, benefit most from shading and recommends that these be fenced on both banks to keep stock out. While the subsequent natural regeneration of vegetation may be sufficient in some places, the Agency also recommends planting belts of trees between 2 – 5m wide in suitable positions along the bank. Of course, as many Trust members will be aware, there are wider benefits from riparian vegetation including:

TROUT HABITAT

- Slowing floods
- Control of erosion from stream banks
- Shelter for trout from predators
- Food for fish and for invertebrates from leaf litter

MICRO-HYDROPOWER

Given the laudable 'Keeping Rivers Cool' initiative to adapt to climate change, it is bizarre that the Environment Agency is also licensing the construction of new dams and the severe abstraction of flows from trout nursery areas for hydropower. As the Agency said in its 2011 consultation on its Hydropower Good Practice Guidelines⁵: *Poorly designed, schemes may create depleted flows, damage and reduce the extent of habitats, and block the passage of species along rivers.*

Embarrassingly, the Agency's guidelines do, in the view of many concerned with fish conservation, result in some potentially damaging schemes, trivial for hydropower, being licensed. They are seemingly at odds with the UK Technical Advisory Group's recent recommendation⁶ for flows to maintain even 'moderate' status under the Water Framework Directive. For example, one scheme on a stream feeding an Usk tributary has recently been granted impoundment and abstraction licences. The lowest flows should be protected, flowing through a notch in a new dam. However, up to two-thirds of the stream can be abstracted at higher flows, the water being returned to the stream 700 metres downstream. Adult trout need good flows to ascend such a stream to spawn in the autumn. Such a long depleted reach will make this more difficult, especially as the stream is comparatively steep with some obstructions. There will also be the new dam to pass at the end of it, albeit with a 'fish easement'. That fish easement and the protected flow past the dam depend on the notch in the dam remaining unobstructed by logs or other debris. Doubtless the over-burdened local Environment Agency staff will find time to check this doesn't happen. Another concern is that the reduced flow in the depleted reach will reduce its quality as habitat for young trout. Ironically, this small stream is one of those surveyed by Dave Bembo in 1989 and 1990 when he highlighted the importance of small streams for trout populations.

As a result of concerns expressed by the Wye & Usk Foundation and the local angling club, the Environment Agency did make additional concessions to protecting the trout. Nonetheless, approving such schemes seems strangely at odds with its duty 'to maintain, improve and develop trout fisheries'. It also seems to fly in the face of the Powys Biodiversity Action Plan

for *Salmo trutta*: Target 2 of which is to: *Maintain and restore all areas of juvenile habitat that have become unfavourable or inaccessible.*

Did you know that *Salmo trutta* is now a priority fish species in the UK's Biodiversity Action Plan? There's more information at: <http://jncc.defra.gov.uk>

Of course, this is only one stream amongst many, but hydropower is subsidised and promoted in the area as a way to make money. So there will be more proposals for hydropower schemes locally with the risk of a cumulative impact.

Reacting to criticism, the Environment Agency consulted on its guidelines back in September 2011. Many fisheries and conservation organisations responded, including the WTT and the Angling Trust. As I write in January, the Agency has launched yet another consultation, due to close in April. No doubt the WTT will respond again. This time the Agency is consulting on options for revised river flow and water abstraction standards. It is also seeking views on when any changes, if adopted, would be introduced. Revised guidelines, hopefully more rational, should be issued in 2013. The new consultation document and the Agency's summary of responses to the previous consultation can be found on its website.

If you think that a hydropower scheme may affect your river, there's a guide to objecting on the WTT's website. If you are not already a member of Fish Legal, you might consider joining in case you need legal support for this or other fishery problems (before the problem arises, of course!). Fish Legal recently won a major case for an angling club opposing a hydropower scheme on the Trent.

OTHER PROBLEMS

Of course, extremes of climate, lack of riparian vegetation, and hydropower are not the only issues that can damage small streams as nursery areas for trout. Many are obstructed by weirs and culverts when pipes, roads or forestry tracks are put over them. Excessive sediment from poor land management, including farming and forestry, can block up gravels. Organic pollution from farms can effectively wipe them out as has happened at least twice on the stream I live next to. The list goes on but I fear I may be teaching grandmothers how to suck eggs.

The Water Framework Directive is a major driver for Government to fund work on our rivers. Many do not have the required 'good ecological status' because of depleted fish stocks, including trout. Of course, we



Poor land management is a huge problem. Silt washed from a wheat field this winter into the headwaters of a feeder stream of a lower Usk tributary

may not be concerned about compliance with European legislation *per se* but we do want good stocks of wild trout. The same lesson applies: look after all the habitats needed by our 'non-migratory' trout, including the small streams and keep the routes between them open. 🐟

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