Agenda item 6.1
For information

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The policy relating to hatchery and stocking activities in Wales – managing risks and benefits

(Peter Gough, Principal Fisheries Advisor, Natural Resources Wales)

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Summary

In 2013 Natural Resources Wales undertook a review of stocking programmes for Atlantic salmon and sea trout in Wales. We concluded that stocking was inherently risky to wild populations, largely ineffective, and did not support new priorities for the sustainable management of natural resources. Stocking programmes were therefore brought to an end in 2014, and the financial resource re-invested in initiatives to restore rivers to higher levels of ecological quality.

Our decision took account of important principles of risk and the precautionary approach, as later included in new Welsh legislation, and was intended to protect sustainability and productivity of wild salmon and sea trout stocks in Wales.

This paper and the accompanying presentation set out the background to this transformation.

1. Introduction

Natural Resources Wales (NRW) is a Welsh Government sponsored body, created in 2013 by merging the roles and responsibilities of three predecessor bodies (Environment Agency Wales, the Countryside Council for Wales and Forestry Commission Wales). Our principal roles are as advisor to Welsh Government on matters relating to the environment and natural resources; regulator of a broad set of environmental permits and licences; statutory consultee to a broad range of planning applications; and management of approximately 7% of Welsh land including waters, forestry estates, national nature reserves and other designated sites.

Our role includes delivery of fisheries statutory objectives and duties on which the following statutory advice from Welsh Government is particularly relevant. NRW is required:-

- To ensure the conservation and maintain the diversity of freshwater and migratory fish and conserve their aquatic environment
- To enhance the contribution migratory and freshwater fisheries make to the economy, particularly in remote rural areas and in areas with low levels of income
- To enhance the social value of fishing as a widely available and healthy form of recreation
- To contribute to the aims and objectives for freshwater fisheries management (as described by the Welsh Government's fisheries strategy).

Recent legislation in Wales underpins these roles, and includes the Environment (Wales) Act 2016 that enshrines the principles of the 'sustainable management of natural resources' (SMNR) throughout the way that we work. Of particular relevance is the need to take account of ecosystem resilience and in particular ecosystem diversity, connectivity, condition and adaptability. The Act requires us to take action "that promotes the achievement of that

objective" and, conversely, not to take action "that hinders the achievement of that objective".

Further, the Wellbeing of Future Generations (Wales) Act 2015 requires public bodies in Wales to "improve social, economic, cultural and environmental well-being in accordance with the principle of sustainable development".

From this we draw our vision for the management of our salmon and sea trout resource that states:-

- Fisheries of Wales are iconic and highly valued
- Fish are valued as an important natural resource for Wales and are to be managed within sustainable limits
- The status of Welsh fisheries is an indicator of the health and resilience of the natural resources of Wales
- Fisheries contribute to viable, vibrant communities in Wales

2. Status of salmon stocks in Wales

There are 23 principal salmon rivers in Wales, including 3 rivers that cross the border with England. The performance of our stocks has deteriorated significantly over the past few decades, as it has largely throughout the geographic range of salmon populations. Our most recent assessment is that 20 of our 23 stocks are predicted to be at risk of failing to achieve their management targets in 2021.

Salmon support the designation of 6 *Natura 2000* sites in Wales and the last report in 2013, sets out the status of Atlantic salmon in the United Kingdom as 'Unfavourable-Inadequate', because both population and future prospects were assessed as inadequate, especially in Wales and England. Further recent declines in stocks mean that it is now very likely that we will see further decline in the population and future prospects of salmon, and deterioration in Conservation Status to 'Unfavourable-Bad' in the 2019 reporting cycle. It is therefore important that we explore and implement available management actions to prevent further deterioration and where possible reverse it.

Our management principles and associated decision structure for fishing controls for salmon fisheries requires us to urgently achieve zero exploitation for stocks deemed 'At Risk', and to restore stocks to a lower probability of failure within 5 years for stocks deemed 'Probably at Risk' of failing to achieve their management targets.

3. Brief history of salmon stocking in Welsh rivers

From the early 20th century there are records of salmon stocking programmes in Welsh rivers. With the exception of rivers damaged by the industrial revolution, most stocks were performing well at that time, however as in other countries a general perception appears to have been that rivers could be improved to greater levels of productivity through operation of a catchment hatchery and stocking programme. Additionally, the construction of upland impounding reservoirs often resulted in an offsetting regime in the form of compensatory stocking of salmon (but for no other species).

The interest and support for salmon stocking appears to have been widely popular amongst anglers and fishery owners, who were presumably anxious to undertake management actions

to improve their fisheries and to implement what was then good contemporary management action. It is however clear that these initiatives were largely un-informed by:-

- Any clear and specific objective of a stocking programme,
- The negative impact of removing wild spawners from rivers and the failure to account for this and offset it,
- Any evidence of results, through the widescale failure to monitor the outcome of stocking,
- Any understanding that there are differences in stocks between rivers that reflect local adaptations to local factors and that there is a need to conserve these,
- Any uncertainty that the popular characteristics of one rivers stock, e.g. a spring run, could not be created in another by stocking,
- Any consideration of the selective pressure of artificial handling, crossing strategies and rearing protocols of juvenile fish,
- Any recognition of comparative performance of wild and hatchery fish.

Although commitment to hatchery programmes varied over the years for a range of reasons, there were still until 2014, 7 salmon hatchery and stocking programmes in Wales:-

Summary of most recent stocking programmes in Wales

River Catchment	**N2K Site?***	**Reason for stocking**	**Approximate number of salmon stocked each year**
Dee	Y	Reservoir offsetting programme	100,000 (0+ parr and smolts)
Seiont	N	Local compensation scheme	300 smolts
Mawddach	Y	Pollution response programme	1 “tank full” of fish
Cleddau	Y	Reservoir offsetting programme	15,000 smolts
Tywi	Y	Reservoir offsetting programme	6,000 smolts
Taff	N	River impoundment mitigation and stock restoration	50,000 (0+ parr)
Wye	Y	Reservoir offsetting programme	100,000 (0+parr)

* sites designated under the EC Habitats Directive(Council Directive 92/43/EEC)

4. Review of stocking programmes

Following the creation of NRW, reviews of certain areas of work were undertaken to ensure that they were delivering value for the environment and the economy. This included a review of operations at the 3 NRW hatcheries and the 7 stocking programmes extant at that time. The policy reasons for stocking adopted by NRW's predecessor organisation were:-

- Mitigation stocking, where the reasons for damage could not be reversed
- Stocking as part of a programme of research or investigation
- Stocking for restoration of extinct stocks.
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Stocking was not deemed acceptable for enhancing a stock (also known as ranching) beyond the natural carrying capacity of a river system.

The review consisted of three discrete areas:-

4.1 Legal basis for programme

In the case of 3 of the 7 programmes, NRW has obligations to provide or contribute towards mitigation measures for historic damage to fisheries. However, review of the legal commitment to provide mitigation for lost habitats due to reservoirs revealed that in all cases the requirement for mitigation by stocking was not obligatory. Alternative means of delivering mitigation could, with agreement, be adopted.

4.2 Review of practice

Unfortunately, the widespread failure to objectively and effectively monitor outcomes of stocking programmes was generally also the case in Wales. All of the programmes in Wales were small, on an international scale, and it was deemed likely that the adult returns generated would also be very small making monitoring difficult, and probably ineffective.

However, it was evident from past programmes intended to restore populations following their extinction in the industrial revolution that stocking could produce adult returns to initiate restoration. This was demonstrated by sparse catch returns but also, on the River Taff, an intensive programme to monitor adult returns.

We concluded that:-

- stocking juvenile salmon and, to a lesser extent, sea trout into rivers often yielded adult returns but that success was highly variable, was not guaranteed, and did not offset risk, and that
- in some cases stocking played an important part in triggering restoration of salmon stocks from extinction.

4.3 Review of scientific evidence

The evidence considered by NRW consisted of:-

i. Literature review of published and grey-literature.

   NRW undertook a comprehensive review of evidence related to stocking of salmon and sea trout. There is a relatively large literature for salmon but little for sea trout, however it was concluded that the principles of stocking of juvenile anadromous salmonids, were common for the two species (and probably also for certain species of Pacific salmon).

ii. Ongoing research, consultations and discussion with research academics.
   NRW worked in partnership with the University of Swansea on a set of projects to explore the relative fitness of hatchery-reared salmon, and implications for receiving stocks.

iii. Outcome of the Atlantic Salmon Trust conference on salmon stocking held in Glasgow in 2013.

   NRW attended and debated contemporary evidence for the risk and benefits associated with stocking programmes and noted the subsequent scientific consensus on stocking.

5. Key points of evidence

All evidence was considered against the overall objective of our review and the new emerging principles of SMNR, risk management and a precautionary approach to environmental management, to each of which NRW is committed.
We noted the following matters for concern:-

- Declines in salmon stocks are evident across all Welsh rivers, whether they have been recently stocked or not. The Cleddau received the highest stocking, on the basis of comparative catchment size, but showed the greatest decline in stock status.
- Removing adults from the wild for use as hatchery broodstock reduces the production of wild, fit and adapted juvenile fish.
- Selection of mates for crossing in hatcheries generally cannot take account of the natural spawning destination of fish. The artificial crossing decisions result in crosses highly unlikely to have occurred naturally. This over-rides natural mate selection processes, placing at risk factors that preserve and protect genetic variability and adaptations and natural disease resistance.
- The hatchery environment ensures high survival of juveniles, but with minimal and different selection pressures to those of the wild environment. Research at Swansea University has shown that hatchery fish differ markedly to wild fish in terms of morphology and behaviour and that this reduces their fitness to survive in the wild.
- There is a rapid mortality of hatchery salmon after stocking. Most monitoring also shows that hatchery fish have higher rates of marine mortality than wild fish.
- Work at Swansea University has shown that in the River Taff programme 62% of hatchery pairings resulted in no adult returns at all.

- Even though the numbers of surviving adults derived from hatchery releases may be low, any subsequent contribution to wild spawning represents a risk to population fitness.

We compared this to the literature for wild salmon where:-

- There is a relatively low rate of survival of eggs and early fry life stages.
- Later juvenile life stages and adults show relatively high survival in comparison.
- Natural selective pressures result in fit and adapted individuals.
- This contributes to a high population fitness and resilience.

We also considered what this means for any Habitats Regulations Assessment of stocking plans and projects:-

- Stocking is not a necessary part of *Natura 2000* site management.

- The balance of evidence is that ongoing stocking programmes would undermine the aims and objectives of the EC Habitats Directive (or is at best neutral).

- For designated N2K rivers (5 of 7 stocked rivers in Wales), it is not possible to reconcile stocking plans with the required absolute conclusion of "no adverse effect" on site integrity.

- Our overall objective is most important: protect sustainability and productivity of wild salmon and sea trout stocks in Wales.

The consensus of evidence considered was clearly that intervention of artificial stocking programmes introduced risk to the over-riding objectives for wild stock management that are implicit in the philosophy of SMNR.

6. Public consultation

Following our evidence review, and noting the strong and often polarised opinions and views of those stakeholders who supported stocking as a management tool, NRW elected to launch a formal consultation. This ran for a period of 12 weeks and was intended to seek evidence that might further inform the background to our conclusions. We received 112 responses, 77% of which were from individual anglers and the remainder from organisations including academic institutions and NGOs with interests in rivers, their ecology and angling potential.

Individual anglers who responded generally favoured ongoing stocking, whilst other bodies generally supported our conclusions. The most controversial elements were the equivocal nature of the overall evidence base drawn from studies over the past 40 years or so, and the proposed end to mitigation actions through stocking.

No single study addressed the combined matters of need, benefit, risk, and environmental outcomes that we sought to address. Nonetheless it was notable that the more recent studies provide increasingly persuasive evidence of risk to population fitness.

We note that the balance of evidence is increasingly towards recognition that the risks of stocking are incompatible with an approach that seeks to secure the principles of SMNR. We

believe that in order to secure our objective of sustainability in our wild stocks of fish, we cannot take the risks associated with intervention by an artificial stocking programme. Instead we should focus on achieving conditions that conserve local adaptations and therefore maximise smolt production and stock resilience.

We support the views supported by many attendees at the 2013 Atlantic Salmon Trust conference on salmon stocking and summarised in a subsequent consensus by Young *et al* (2014):

> "Where the integrity of wild salmon is a management priority, stocking hatchery fish into wild populations is unlikely to contribute to management objectives.".

NRW also adopted the logic that, if stocking was not compliant with contemporary management principles underpinning what is not referred to as SMNR, then a decision to cease stocking should be applied in all cases.

The position of NRW was that the risks associated with stocking and the potential compromise to the principles of sustainability were sufficient to confirm our proposals to end stocking. Since that decision, contemporary evidence continues to grow and our conclusion is that this invariably supports our decision to cease potentially damaging hatchery operations and to pursue other alternative more effective management actions.

NRW continues to support the role of salmon stocking as part of any justified research and investigation programme, and will continue to consider it as an option to restore stocks from any catastrophic loss where natural recovery is deemed unlikely.

This view was agreed and the proposal to end stocking was adopted by the NRW Board in October 2014.

7. Alternative mitigation programmes

The decision to cease stocking was not taken on the basis of cost, although the benefits in relation to costs were considered to be very poor given the perception of environmental risk associated with the programmes.

Nevertheless, in recognising certain enduring obligations to mitigate for damage to fisheries arising from historic impoundment schemes, NRW made the commitment to re-invest financial resources in new river restoration programmes. These schemes, debated and agreed with catchment partners, consist of river restoration projects tackling such matters as migratory barriers and riparian habitat quality.

8. Overall conclusions

- Our guiding ambition is to secure "Sustainable and productive wild salmon and sea trout stocks in Wales".
- We reviewed stocking programmes and recent and contemporary literature on the benefit and risk of stocking programmes, and took advice from those involved in research in this area.
- We concluded that stocking programmes were often ineffective and represented risk to local adaptations and stock resilience.
- Our public consultation provided no new evidence to support a different conclusion

- We therefore ceased salmon and sea trout stocking programmes in Wales and will not normally permit any scheme proposed by third-parties.
- Instead we are re-investing our resources in 'Alternative mitigation' programmes that will deliver broader and more sustainable benefit:
  - A range of approaches including removing barriers and improving stream habitats.
  - Adopting an ecosystem approach, delivering broader environmental benefit under the principles of SMNR.

Reference

Kyle A. Young, Colin Adams, Andy Ferguson, Carlos Garcia de Leaniz, Stephen Gephard, Neil Metcalfe, Phil McGinnity, Ted Potter, Tom Reed, Ian Russell, Jamie Stevens & Eric Verspoor. (2014).
A scientific consensus on salmon stocking. Consensus statement following AST Symposium on salmon stocking, Glasgow 2013.