19th April 2014

Dear Corrie Davies,

Re: A consultation on NRW's salmon stocking, third party salmon stocking and the future of NRW's hatcheries

Please see below our response to the above consultation. For the clarity, I have deleted the introduction to your consultation questionnaire from the beginning to above Question 1. The remainder of your document remains as was. My comments are included in blue ink for ease of reference.

Q1. Do you agree or disagree with the definition of effectiveness used for the review and with the conclusion that there is little evidence available to demonstrate that mitigation and enhancement stocking is effective? If you believe you have evidence, please provide it.

No I do not, in fact I think the way this question is posed is offensive and misleading, in that in your reference to the Dee fishery you unaccountably fail to mention the results of the paper produced by Turnpenny Horsefield Associates. " Llyn Tegid Sluices" dated April 2013, in which they quite clearly state that greater than 95% of the smolts released above the lake, in other words the whole of the mitigation stocking, suffer fatality, in Llyn Tegid by pike and avian predation. They recommend the simple expedient of introducing the mitigation stock below Llyn Tegid Sluices. Your figures are therefore misleading, if taken "at face value".

If the percentage returns are re calculated on the basis that effectively only 5% of the mitigation stock are actually introduced to the river, then the return rate is considerably higher than that quoted and likely to be in the region of 2% of the smolts that survive to enter the Dee system below the sluices.

The following is a quote relating to the River Spey *"we know from 2013 and historic tagging studies that fish destined for the Spey are caught in nets deployed on both the north and east coasts of Scotland, and probably further afield."* That being the case, what relevance is your bold assertion that so few of stock fish return. There is no

allowance for fish that return elsewhere nor for fish lost to nets. We also know that anglers under report catches, by as much as 30%.

The Environment Agency's own and latest "2012 Salmon Stock Assessment" finds that it is anticipated that in 2013 **Wales: 50%** of rivers are outside the “at risk” category.
In that same paper ONLY the Tyne and Wear in England and Conwy in Wales are expected to be **"not at risk" in the year 2017**, these are **all stocked rivers.** I suggest that by accepting the recommendations of Turnpenny Horsefield Associates, that the Dee could soon be added to that list, and that by making some simple adjustments to the hatchery breeding process, the intelligence and survival rates of smolts could be much improved. The introduction of modern innovations such as DNA analysis and the use of "chipping" is known to also improve the quality of hatchery reared fish, as outlined below.

Potential environmental impacts of salmon stocking

There has been considerable debate regarding the impacts of stocking hatchery reared salmon into the wild. There is a wide ranging scientific literature based upon studies carried out in North America and parts of Europe on several salmon species and in a number of specific locations. It is possible to draw a number of broad conclusions about the potential impacts of releasing hatchery reared salmon into rivers that already have viable wild populations.

There is increasing and compelling peer-reviewed evidence that:-

a) Hatchery reared fish have lower survival to adulthood than
wild fish of the same age,
b) Hatchery fish that survive to adulthood have lower fitness than wild fish,
c) The presence of hatchery reared fish in wild populations can reduce wild population fitness.

This evidence has accumulated in Europe mainly over the past 5 to 10 years or so, although evidence for species of Pacific salmon – some with very similar life history strategies to those of Atlantic salmon – has been quite regularly reported over the past 20 years or more.

There are also studies in the scientific literature that demonstrate in some cases that stocking can result in less significant, but still negative, population effects. This therefore creates uncertainty around quantifying or predicting the degree of potential impact of stocking in any particular river.

The presence and extent of impact could be influenced by a range of factors, including environmental and hatchery effects and stocking management decisions. Whilst this uncertainty in the literature is reflected in the conclusions of the review, it is also this uncertainty that means it is difficult to predict how we can mitigate for or avoid potential harm..

The review concludes that there is now enough evidence available on potential impacts and concerns about effectiveness to influence a substantive change to our existing salmon stocking programme.

Q2: Do you agree or disagree that there is enough evidence available to influence a substantial change to NRW's existing salmon stocking activity?

Not entirely, no, but I do believe there is enough evidence available to warrant the implementation of some recent low cost modifications to the present stocking regime to reflect recent findings. For example, this abstract from The *Canadian Journal of Fisheries and Aquatic Sciences*, 2013, 70(9): 1386-1395, 10.1139/cjfas-2013-0147, states:

"Low survival of stocked fish has been associated with fitness declines of the captive reared fishes because of genetic domestication and unnatural rearing environments. The effects of broodstock origin (wild or captive) or rearing method (standard or enriched) on survival and migration of hatchery-reared Atlantic salmon smolts (Salmo salar) were investigated in the Tornionjoki River using radiotelemetry. Smolts that were reared with enriched methods had a twofold increase in survival (~38%) compared with smolts that had been reared in a standard hatchery environment (~19%). Nature-caught smolts had highest survival (~57%). Smolts from enriched rearing had a higher initial migration speed than fish from standard rearing. Initial migration speed during the first 3 km was positively correlated to survival probability after 290 km for hatchery fish. There was no clear effect of origin on survival or migration speed. The results of this study show that enriching the rearing environment with methods easily applicable to large-scale production promotes smolt survival and migration speed during river migration, which is imperative for stocking success".

Following these minor modifications to the stock rearing process, plus the release of bred fish into more acceptable locations such as, in the case of the Welsh Dee, say a few hundred metres below the Llyn Celyn Sluices, perhaps more investigation would reach a different conclusion to that currently propounded.

Salmon stocking on Rivers designated as Special Areas of Conservation under the Habitats Directive (92/43/EEC).

Atlantic salmon is listed within Annex II of the Directive.
Several of the rivers on which salmon stocking programmes exist are designated under this legislation, including the River Dee, River Wye, Afon Teifi, Afon Tywi, Afon Eden (A tributary of the Mawddach) and Afonydd Cleddau. Some are designated specifically for their wild salmon populations whilst in others salmon are noted as present, although not as a primary reason for designation.

The Habitats Directive is transposed into domestic legislation through the Conservation of Habitats and Species Regulations 2010 (the Regulations). These Regulations require that any plan or project not directly connected with or necessary for the management of the Special Area of Conservation (SAC) must be subject to an Appropriate Assessment. Our review shows that stocking of salmon is not an activity undertaken for the management of the SAC and should therefore be subject to an Appropriate Assessment. Through this assessment it must be demonstrated beyond reasonable scientific doubt that plan or project will not adversely affect the integrity of the designated site.

Some of the recent scientific literature demonstrates that stocking hatchery-reared salmon can potentially result in adverse impacts on the long term population fitness of wild salmon populations. There is a lack of clear evidence that negative impacts can be avoided, and our review therefore concludes that it cannot be demonstrated beyond reasonable scientific doubt (to the certainty required by the Regulations) that stocking salmon will have no adverse effect on the integrity of any site designated for a wild salmon population. This conclusion applies equally to all our own stocking and all third party stocking on the relevant SACs.

Q3: Do you agree or disagree with our interpretation of the Habitats Directive as it may apply to all our own and third party salmon stocking on rivers designated under this legislation?

I neither agree or disagree, but I do think that the assumptions upon which you base your conclusions are fundamentally flawed, as stated above. I think you are "cherry picking" research that supports your argument, whilst apparently disregarding research outcomes that support a contrary view. I also believe that this "cherry picking" is designed to facilitate a cost cutting exercise and represents a "cop-out" by the very organisation charged with the protection and enhancement of our environment.

European Commission Guidance on Management of Natura 2000 sites

Paragraphs 6(1) and 6(2) require that, within Natura 2000, Member States:

1. Take appropriate conservation measures to maintain and restore the habitats and species for which the site has been designated to a favourable conservation status;

With regard to 1 above: given that the documentation produced by the Environment Agency, namely 2012 Salmon Stock Assessment, states quite clearly that only three rivers in England and Wales, namely the rivers Tyne, Wear and Conwy are forecast to be “not at risk” by the year 2017 and stocking of salmonids takes place on all three of these rivers. Further, the fact that the return rate for stocked fish in the Welsh Dee is substantially skewed, as stated in the Turnpenny Horsefield Associates Report, by the almost complete loss of all stocked fish above the Llyn Tegid Sluices. Compliance with their suggestion that were stocked fish introduced below those sluices, the Dee may also be reclassified as "not at risk" by 2017.

Regardless of the theories put forward by researchers: most of which relates to species other than salmo salar, and to the Americas, and much of which pre dates more recent papers many of which put forward methods of improving return rates for stocked salmonids, I think current facts speak far louder that academic assumptions or postulations: properly managed stocking of our rivers is successful and the projections for the Tyne, Wear and Conwy speak for themselves.

2. Avoid damaging activities that could significantly disturb these species or deteriorate the habitats of the protected species or habitat types.

In response to 2 above. If the Tyne, Wear and Conwy are to be exemplars of the effectiveness of stocking, then properly managed stocking would not be in contravention of this requirement

3. Several guidance documents have been produced that are linked with issues of concern under the BHD

With regard to item 3 above, Links between the Water Framework Directive and Nature Directives

The following is a quote copies from the guidance.

(e.g. CIS Guidance Document No. 2, 4, 12, 13 and 20), but no guidance so far has addressed the specific questions related to the implementation of WFD in Natura 2000 sites.

Ecosystem Approach and Cost-Effectiveness

The Welsh Government has asked NRW to apply the Ecosystem Approach to all our decision making. One aspect of this requires us to consider and regulate the environment and its health as a whole rather than dealing with individual aspects separately. We also need to take into account the Ecosystem Services (the wider benefits to people and society) we gain from our activities including that relating to salmon, salmon stocking and all other approaches to salmon management. This is partly why we have undertaken this review of existing salmon stocking.

Mitigation salmon stocking could be considered as a classic single sector response to a problem, in that although there are clearly multiple issues acting to reduce the population of salmon, we have intervened at the end of the process in a direct way and substituted the functionality of the environment with an alternative system (a hatchery).

Whilst the aims of mitigation stocking are clearly laudable, they reflect our understanding of the species and the environment into which hatchery-reared salmon are stocked that pertained in the 1960s. Recent evidence regarding effect, potential impacts on wild populations, the relative effectiveness of this activity and new policy including environmental designations and the ecosystems approach mean that NRW is now re-examining the desirability of this activity.

Salmon are in their own right a high value ecosystem service. Their existence in a river is of cultural, economic and ecological importance. They are also used to provide information about a whole range of other benefits, because of their dependence upon a high quality environment. Society extrapolates from the existence of salmon to draw conclusions about the quality of water, a lack of pollutants, and the way the wider landscape functions. Salmon is quite rightly considered to be an indicator species because of the services it provides and in turn relies upon, and because they are so easily recognised and understood by society.

NRW, like all publically funded organisations, has a limited amount of resource it can use and it must choose the best way of using those resources. One of the ways we can do this

is by comparing the total benefits to society from salmon that arrive in the river from a hatchery, against the total benefits gained when salmon are recruited naturally in the river and assisted to do this by making improvements to water quality, physical habitat quality or removal of obstructions.

If we use our resources to make improvements to water quality and physical habitat for salmon, we know that we also achieve other benefits alongside the increase in salmon numbers, such as erosion control, and increased biodiversity. These additional benefits are achieved through the mechanism of the environmental improvements required to increase numbers of salmon. They will benefit the full range of species in the river and enhance and improve processes such as nutrient management and habitat connectivity, assist in the adaptation to climate change, and can potentially reduce drinking water treatment costs. None of these addition benefits can be gained from hatchery generated salmon.

Our review concludes that whilst salmon stocking following an extinction event in an effort to restore a functional population is consistent with an Ecosystem Approach (providing the reason for the extinction is dealt with before or at the same time as stocking), both enhancement and ongoing mitigation stocking are not.

Our review also concludes that alternative measures (such as habitat restoration) are likely to be more cost effective at safeguarding wild population fitness and productivity than stocking. Improving and increasing the amount and quality of suitable spawning habitat will provide additional ecosystem benefits that do not have potential negative impacts to wild populations associated with them. The environmental improvements required to achieve the restoration of the spawning and juvenile habitat are also more likely to contribute to achieving favourable conservation status for other designated species and habitats.

There is a significant opportunity to develop an approach to mitigation that will provide multiple benefits to the Welsh environment and to all those that have a stake in ensuring salmon numbers are increasing or stable.

Q4. Do you agree or disagree that mitigation and enhancement stocking are not consistent with an Ecosystem Approach?

I agree that enhancement stocking is not consistent with such an approach, however the same cannot and must not be said for mitigation stocking.

I believe the paper generally used supporting the NRW's postulation that stocking is potentially harmful as a conservation measure is "The balancing act of captive breeding programmes: salmon stocking and angler catch statistics" by K.A.YOUNG of Natural Resources Wales, Cardiff. Yet in the very first paragraph of this report K.A. Young states "a potential Captive breeding programmes can help conserve species " The very documentation produced by Natural Recourses Wales states that " it is anticipated that in 2013 **Wales: 50%** of rivers are outside the "at risk" category, which means that **the remaining 50% are "at risk**". At risk of what if not at risk of local extirpation or extinction? It would seem that K A Young is supportive of mitigation stocking, and as such I suggest such stocking is consistent with an Ecosystem Approach

Q5 .Do you agree or disagree that it would be more cost effective for NRW to improve habitats and thereby secure further reductions in mortality of wild fish as an alternative form of mitigation to stocking?

I do not agree that it would be more cost effective, nor do I agree with the assertion that stopping stocking will reduce wild fish mortalities. I am of the opinion that both are essential, as it would seem is K A Young (see response to Q4 above). I believe this proposal will prove to be a classic example of “penny wise being pound foolish” in the fullness of time.

The Rivers Trusts are currently implementing a number of habitat improvement schemes, all of which are most welcome and urgently required, and all of which will make substantial improvements to habitat as well as provide access to further spawning sites. However these improvement schemes are funded by Capital Grants, with no follow up Revenue Funding for maintenance, without which the long term benefit of most will be lost with the passage of time, and a relatively short time at that. It must however be conceded that currently the maintenance of the new works is being achieved, but the revenue stream is being cut as the rate of deterioration of fencing and the like will increase with the passage of time. It is imperative that a Revenue stream be established to fund future maintenance.

This question refers to cost effectiveness and in so doing highlights the NRW's motivation for carrying out this consultation. I predict that, regardless of the views expressed by "stakeholders" the NRW is determined to close its hatcheries primarily as a cost saving exercise and is seeking some level of “scientific” justification for doing so.

The Environment Agency was well on its way to establish a meaningful "working relationship" with many of its stakeholders including many of the angling fraternity, this proposal will potentially put that hard won progress back considerably.

There is also a question over designating habitat work as a legal substitute for the mitigation stocking included in several agreements/statutory instruments resulting from loss of spawning habitat. If the stocking of juveniles into a river is specifically included in any mitigation agreement I would challenge any assertion that this can legally be replaced by habitat work. Where there is no legal commitment to actually placing juvenile fish in the various locations then it might be argued that habitat work could mitigate for lost spawning but there must surely be a need to demonstrate that the numbers of additional juveniles resulting from this work is equivalent to the number of fish previously stocked before it could be accepted as a viable alternative policy.

Recommendations

From the evidence available, the review concludes that on-going mitigation and enhancement salmon stocking deliver relatively poor outcomes for NRW and salmon populations, particularly given the lack of evidence for effectiveness and the evidence for potential impacts to wild salmon population fitness and productivity. It also concludes that

the findings of the review regarding the effectiveness and potential impacts of salmon stocking are equally applicable to any stocking undertaken by third parties.

It concludes in addition, that stocking delivers fewer additional ecosystem services when compared with other measures we could take and advocate others to take and that NRW should focus it's efforts and resources on habitat restoration, particularly removing obstacles to migration and improvements to the quality and extent of spawning and juvenile habitat.

The review makes four recommendations that are highlighted below;

1. That NRW should bring all our own on-going mitigation, population re-enforcement and enhancement salmon stocking in Wales to an end, This includes all third party stocking on rivers designated under the Habitats Directive for their wild salmon populations. A further component of this includes the development of a realistic and practical timetable for bringing all other third party salmon stocking in Wales to an end, and a start to the process of working and consulting with stakeholders and co-signatories to relevant agreements to put in place suitable alternative mitigation measures instead of stocking. Future restoration stocking should not be ruled out if needed, however there is currently no identified need for this in Wales.

2. In addition, given the benefits to salmon and the wider environment from a range of habitat restoration measures, NRW should work with all interested parties to further develop and focus effort on this approach, in particular on removing barriers to migration and increasing the quality and extent of spawning and juvenile habitat available in our rivers. There is a significant opportunity to develop an approach to mitigation and enhancement that will provide multiple benefits to the Welsh environment and to all those that have a stake in ensuring salmon numbers are increasing or stable.

3. It also recommends that in light of the recommendations above, NRW should reduce its hatchery capacity. Taking into account the patterns of hatchery ownership and the capacity and track record for working on other freshwater issues, it is recommended that operations at the Mawddach and Maerdy hatcheries are brought to an end as soon as practicable.

4. The final recommendation is that NRW should consolidate any residual salmon culture (whilst changes to agreements are negotiated and concluded) at Cynrig and carry out further work to assess the feasibility of adapting the site for additional freshwater and fisheries research capacity. In parallel, NRW should investigate the potential for partnerships with Welsh academic institutions or other research bodies for developing and funding work at Cynrig.

Q6. **Do you agree or disagree with the recommendation that NRW should bring all our own mitigation and enhancement stocking in Wales to an end and work with others to end all salmon stocking in Wales? What would you regard as a practical timetable for achieving this? Should we include sea trout in this recommendation?**

I strongly disagree that mitigation stocking should cease, as well as disagreeing with the proposal to end all such stocking in Wales. I do however feel, that when the majority of Welsh rivers are deemed to be "not at risk" that this proposal could then perhaps be reconsidered. The loss of Welsh hatcheries would potentially remove any capacity to respond to a disaster such as pollution wiping out the population of a river. Even the continuing operation of Cynrig is hardly satisfactory given the difficulties of safely transporting brood fish from and to remote areas.

The majority of the learned papers suggest that salmonids in various reaches of river catchments possess separate and distinct traits that protect the species from natural catastrophes, which may potentially wipe out the whole species in a catchment. These traits are embedded in the genes of the fish. I believe that Natural Resources Wales has a duty to maintain that diverse gene pool, in so far as it is practicable. I also believe that I have made an argument with sufficient cogency to warrant the abandonment of this proposal until such time as the natural stocks of salmonids in the majority of Welsh rivers are at least classified as "not at risk". To do so in advance of that condition is putting the future of Welsh salmo salar seriously "at risk".

I also believe that if a majority of fishing interests on a catchment wish to stock and are prepared to build, fund and operate a hatchery they should be allowed to do so and the NRW's intent to stop this activity is not so much science based as a strategy to avoid a situation that potentially proves their own arguments unsustainable.

Q7. Do you agree or disagree that NRW should focus its efforts and resources on improvements to habitat? What mitigation and enhancement measures would you suggest NRW and partners adopt as an alternative to stocking?

I agree that the NRW should put more effort and resources into habitat improvements, together with appropriate maintenance programmes to ensure that this occurs, but not use all its resources in this way. Current mitigation programmes should be maintained and enhanced, and further research carried out into improving the efficacy of mitigation stocking by the use of modern technology as postulated by the University of Edinburgh as follows:

Genetic chip will help salmon farmers breed better fish ***Date:*** February 13, 2014 ***Source:*** University of Edinburgh ***Summary:***

Atlantic salmon production could be boosted by a new technology that will help select the best fish for breeding.

Dr Ross Houston, of The Roslin Institute, said: "Selective breeding programmes have been used to improve salmon stocks since the 1970s. This new technology will allow the best breeding fish to be selected more efficiently and accurately, particularly those with characteristics that are difficult to measure such as resistance to disease"
Dr Alan Tinch, director of genetics at Landcatch Natural Selection, said: "This development takes selective breeding programmes to a whole new level. It is an extension to the selective breeding of salmon allowing more accurate identification of the best fish to create healthier and more robust offspring."

Q8. Do you agree or disagree that NRW should reduce its hatchery capacity and investigate the feasibility of adapting the Cynrig facility to develop a broad-based freshwater and fisheries research facility for Wales, in partnership with other interested bodies? We would particularly welcome suggestions from relevant organisations about potential collaboration opportunities at Cynrig.

I disagree for all the reasons stated above. I am also concerned that part of a consultation document on the future of Welsh hatcheries should "particularly welcome suggestions from relevant organisations about potential collaboration opportunities at Cynrig", which implies that the outcome is pre determined. I believe that, were it not for the fact that to abandon Cynrig would result in large site restoration costs, you would be closing that hatchery as well and not seeking to offset the costs by seeking partners.

General Comments:

During the LFAG consultation meeting we were advised that it was acceptable to make a general comment on this paper, mine are as follows:

It appears from the manner in which this discussion document has been presented that managers minds have been made up and that the outcome is pre determined, however in the hope that this is a misconception on my part I offer the following comments.

All of the paperwork included with or referred to as part of the consultation package makes a convincing case that the introduction of hatchery bred fish into a thriving wild population of salmonids is counterproductive. I would not presume to argue with the either the credentials or the conclusions of the learned papers, however I do argue with the relevance of the information to the present state of the salmon stocks in the rivers of Wales.

All the learned papers make it quite clear that there is a place for the introduction of hatchery reared fish, indeed K.A. Young states "potential Captive breeding programmes can help conserve species ". Salmon stocks are, according to NRW's own research and published papers, classified as "at risk" or "potentially at risk" in the region of <50% of Welsh rivers. At risk of what? At risk of extinction! At risk of extinction because the levels of egg deposition is insufficient to secure the future of the species. Under these circumstances captive breeding programmes MUST be used to help conserve the species.

I live in the hope that financial expedience on behalf of either the Welsh Government or Natural Resources Wales, both of whom are servants of the Welsh people, will not result in the eventual extinction of salmo salar from the rivers of Wales. I should not like that accusation or indeed that possibility on my conscience, and hope the same will apply to those responsible for coming to the final conclusions following this consultation process.

Your hopefully

Allan Cuthbert