



A preliminary assessment of the status of the salmon stock in the River Usk for 2015

Summary: A preliminary assessment indicates that egg deposition will probably exceed the Conservation Limit in 2015 but that the Usk salmon stock will remain 'Probably at risk' of failing to meet its management objective. Actions are recommended, similar to those in 2013 and 2014, to address the decline, including changes in major abstractions and controls to reduce fishing mortalities.

1. Purpose

- 1.1 Each year Natural Resources Wales (NRW) uses catch returns from salmon rod licence holders to assess the current and likely future status of stocks in the Usk and other rivers. That assessment helps determine the need for management action.
- 1.2 Due to the time required to obtain and analyse licence returns, each year's assessment has taken until April to complete, contributing to the lack of an annual management response to the depleted state of stocks.
- 1.3 In November 2013, the Wye & Usk Foundation used catches recorded from major Usk fisheries to predict the rod catch declared to NRW and egg deposition for 2013 (Mawle 2013). That preliminary assessment accurately predicted a decline in the status of the Usk salmon stock to 'Probably at Risk', subsequently confirmed in April (CEFAS/EA/NRW 2014).
- 1.4 Similarly, in November 2014, the Foundation collated data from major Usk fisheries to predict the declared rod catch and the distribution of fish sizes. These were passed to Paul Greest and Ian Davidson of NRW who did a preliminary assessment five months in advance of that based on rod licence returns (Mawle 2014). As in 2013, the preliminary assessment proved accurate:
 - **Declared Rod catch:** Predicted: 395 (Range: 365-511); Actual: 421 (NRW/EA 2015) though a slightly lower figure was used for the actual assessment (CEFAS/EA/NRW 2015)
 - **Estimated egg deposition as % of the Conservation Limit:** Predicted: 82% (Range: 76-102%); Actual: 89%
 - **Stock status:** Predicted: 'Probably at Risk' in 2019 and negative trend (for all estimates); Actual: as Predicted.
- 1.5 This report provides similar predictions for 2015, again with the help of NRW, to provide a preliminary assessment of the status of Usk salmon stocks, once more enabling early initiation of management action.

2. Estimation of the declared rod catch and egg deposition in 2015

2.1 The annual rod catches of salmon at Upper Llangybi, Lower Llangybi (David Addams-Williams, pers. comm.), Llanover (WUF website and Simon Evans pers. comm.), Monkswood (Helen Harrison, pers.comm.) and Merthyr Angling Association's waters (Gary Davies, pers.comm.) have been combined and related to the annual catches declared by licence holders for the last five years. Together, the catches at these fisheries have comprised a large proportion of the Usk's rod catch from 2010-14, ranging from 35% in 2011 to 49% in 2010, with an average of 43%.

	U&L Llangybi, Llanover, Merthyr AA, Monkswood	Usk rod catch Declared to NRW by anglers	Sample as % of declared Usk catch
2010	284	580	49%
2011	250	707	35%
2012	483	1014	48%
2013	228	543	42%
2014	179	421	43%
2015	285	Predicted rod catch: 662	Previous 5yr Mean: 43%
	Range:	581-814	35%-49%

2.2 Applying that range and average to the 2015 catch at these fisheries indicates that the declared rod catch for 2015 from licence holders for the whole river will be between 581 and 814, and probably about 662. While a marked improvement on 2014, it is not a large catch, being only the third highest in the last five years.

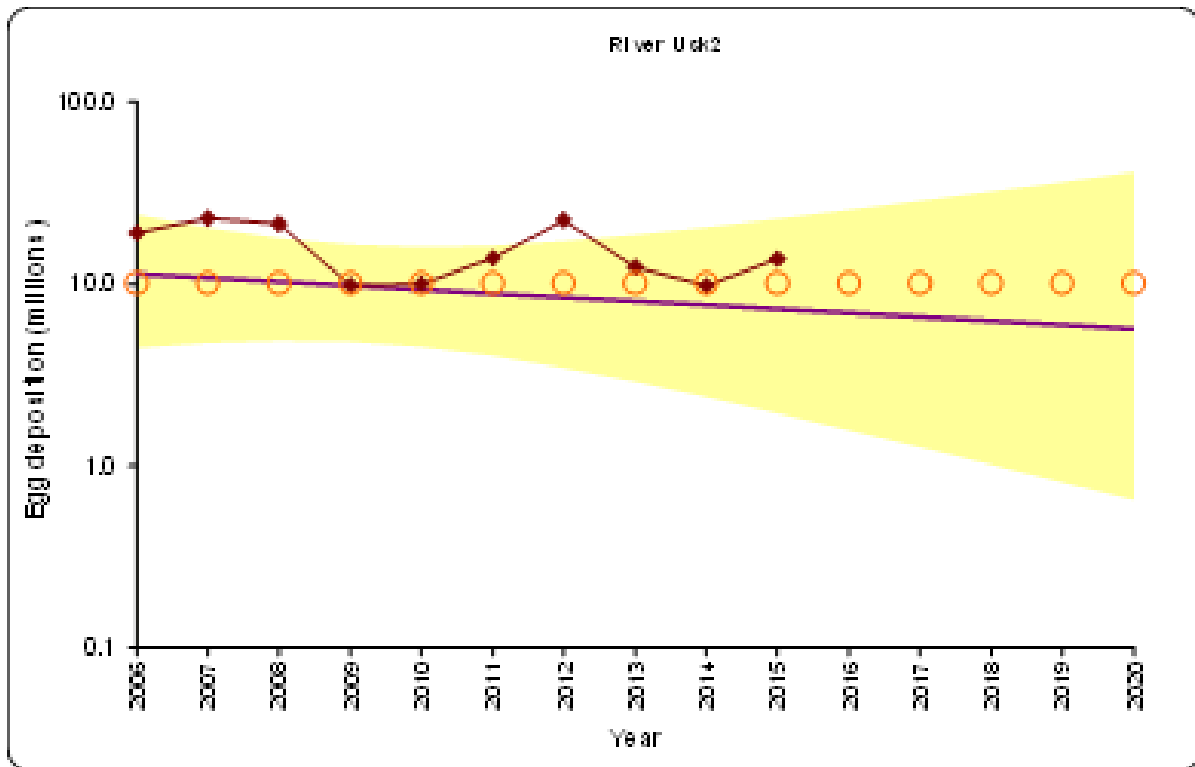
2.3 A sample of 117 rod caught salmon from Upper Llangybi, Merthyr Tydfil AA and Monkswood fisheries was used to characterise the weight distribution of salmon in 2015. The average weight of 9.0 lbs was lower than that of 9.8 lbs recorded from licence returns for 2014.

2.4 Using these data, and assuming that applying recent values for factors such as catch & release rate (77%) and exploitation (13% for grilse and 16% for multi-sea-winter fish), Paul Greest (NRW)(pers. comm.) has estimated that egg deposition in 2015 will be between 119% and 167% of the Conservation Limit.

2.5 The central estimate, based on a rod catch of 662, indicates egg deposition at 135% of the Conservation Limit, i.e. 13.7 million eggs. This compares to a Conservation Limit of 10.11 million eggs (Table 23 in CEFAS/EA/NRW 2015).

3.0 Assessment of stock status

3.1 NRW has also provided a preliminary stock assessment for this year and prediction for 2020 using the central estimate (as in 'River Usk 2' below) and also the range for egg deposition.



Note: Open red circles are the Conservation Limit; solid black diamonds are annual estimates of egg deposition; the trend line is the 20%ile for average egg deposition. To meet the Management Objective (i.e. exceeding the CL at least 80% of the time on average) the trend line should exceed the Conservation limit.

3.2 Regardless of whether the highest or lowest estimate of egg deposition is used for 2015:

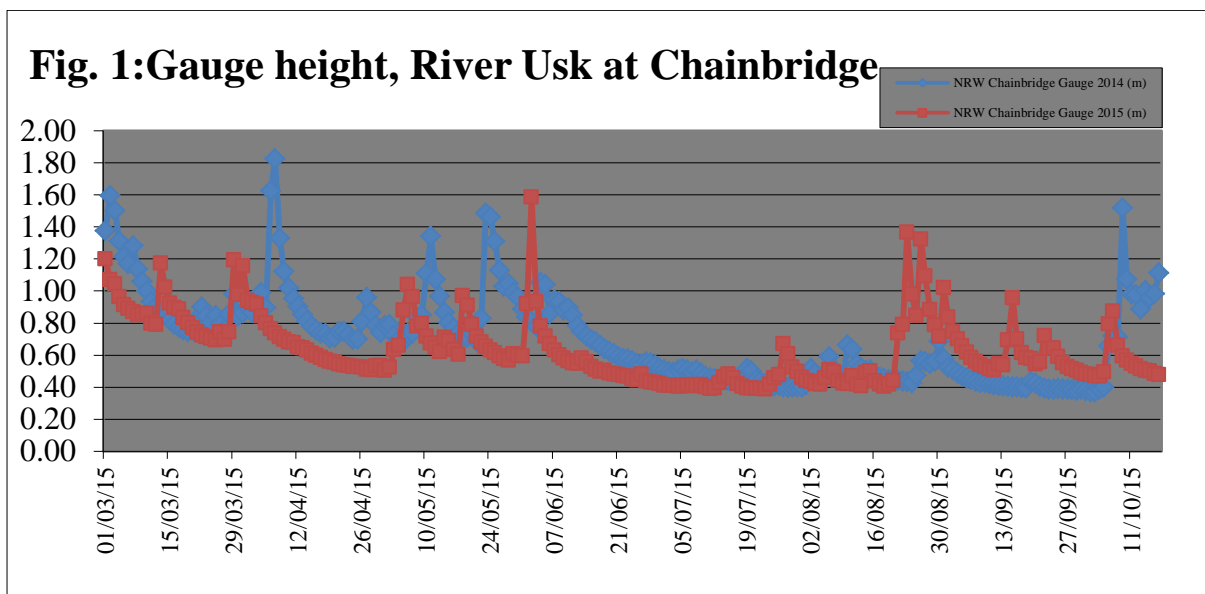
- Spawning is predicted to remain below the Management Objective.
- The trend for egg deposition is slightly negative (though not statistically significant)
- The Usk is assessed as 'Probably At Risk' in 2015 and predicted to be so in 2020.

The status of the salmon stock is therefore expected to remain unchanged when the assessment based on licence returns is completed in early April.

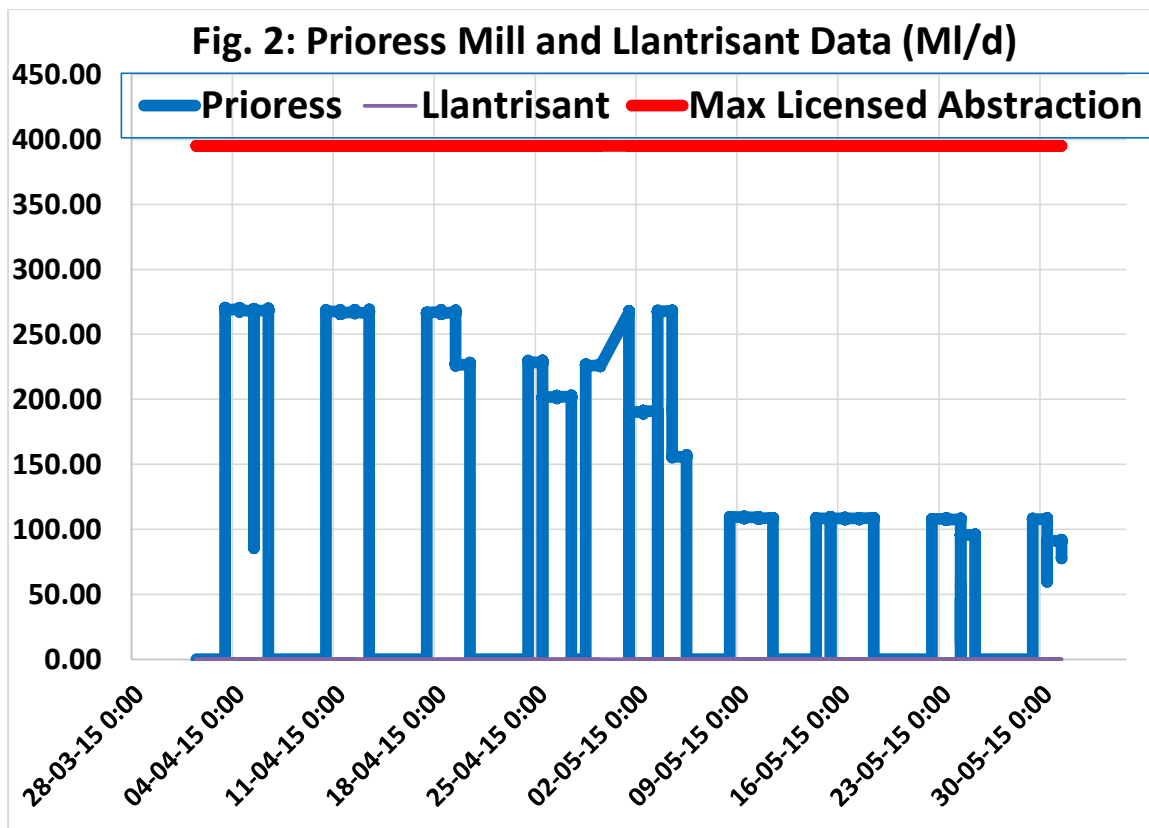
3.3 Flows in 2015 were generally lower than in 2014, as indicated by the heights on the gauge at Chainbridge in Figure 1 below. An important exception was late August and September, a key period for grilse migration. Also, Dwr Cymru/Welsh Water (DCWW) voluntarily restricted their abstraction at Prioress Mill in April and May to the weekend when they abstracted continuously over 24 hours and at less than the maximum licensed. Figure 2, provided by Gail Davies (DCWW), shows the abstraction pattern. Salmon had better opportunities to migrate in the spring as flows were left unabstracted for several days each week. Also there was no diurnal fluctuation in abstraction. The usual practice has been to abstract up to 25 percent of the flow at night when salmon, both adults and smolts, are most likely to migrate

at medium to low flows (i.e. less than ~0.7m at Chainbridge). DCWW is understood to have reverted to the previous pattern of abstraction in June though, as yet, 15-minute abstraction data have not been provided.

3.4 Insofar as rod catch is an indicator of the number of salmon migrating into and up the river, the changed abstraction regime with greater opportunities for migration may have contributed to the relatively high proportion of the rod catch taken in May. At Upper Llangybi Fishery, it was 19% of the annual catch and May was the only month this year when the catch exceeded the 10-year average. However, this is only one fishery. It will be interesting to see whether this pattern is repeated for the river as a whole when data from licence holders returns are available.



Data courtesy of NRW



Abstraction data at Prioress Mill in April and May 2015, courtesy of Gail Davies, Welsh Water

4.0 Juvenile abundance

4.1 The last detailed analysis of juvenile salmon densities up to 2013 (Sophie Gott, NRW 2014) found that about 1/3 of sites have densities of salmon fry or parr which were statistically significantly lower than would be expected (slightly more so in the case of fry than parr). This tends to support concerns about levels of egg deposition. Despite this, there were indications that where work had been done to improve access and/or habitat, juvenile salmon densities had improved, Simon Evans, WUF (pers. comm.).

4.2 Another year's data are now available and ranking 1+parr densities from 2004 to 2014 for 13 electrofishing sites (U001-U013), indicates that overall 2013 and 2014 are two of the worst years:

	2004	2005	2006	2007	2008	2009	2010	2011	2013	2014
Ranked years	3	7	4	5	9	1	2	6	10	8

Ranks from 1 (Highest) to 10 (Lowest)

5.0 The need for action

- 5.1 Under the EU Habitats Directive, action is required for the Usk to be in favourable condition, or moving towards it, in 2015 as a Special Area of Conservation under the Habitats Directive. The Usk salmon stock is of European importance and a primary reason for designation of the river. The Directive requires a precautionary approach to be taken. The last formal condition assessment of salmon in Welsh SAC rivers concluded that the status of the adult salmon run in the Usk in 2010 was 'unfavourable' (Milner et al, 2013). The current preliminary assessment indicates that the salmon feature will still be in unfavourable status in 2015 with no indication of improvement.
- 5.2 Under international guidelines for salmon stocks, agreed by the EU (NASCO 2009), managers should ensure *'that there is a high probability of stocks exceeding the conservation limits'*. NRW has set this probability at 80 percent. Only once since 2009, has the probability exceeded 50 percent. In other words, the Usk salmon stock has been persistently classed as 'Probably at Risk' of failing its management objective and there is no evidence that the status is improving.
- 5.3 Welsh Government policy, as described to the North Atlantic Salmon Conservation Organisation (NASCO, 2013), is that action should be sufficient for spawning escapement to:
- have a consistently positive trend;
 - be 'Probably Not at Risk' of failing the management target within 5 years; and
 - deliver the longer term goal, within 10 years, of being 'Not at Risk'.

6.0 Recommendations

- 6.1 **Outstanding environmental issues** affecting the salmon stock should be reviewed as a matter of urgency and prompt effective action taken to address them. This includes the impact of agricultural pollution and predation on smolts at obstructions.
- 6.2 **The impact of abstractions** on both smolt and adult salmon migration, as well as juvenile production is one such issue. An improved abstraction regime has been developed by the Wye & Usk Foundation to reduce this impact, working with the major abstractors, Welsh Water and the Canal & Rivers Trust, as well as NRW. This new regime has been endorsed by NRW. If these cannot be fully implemented now, for practical reasons, NRW should seek intermediate measures to reduce abstraction voluntarily, as a matter of urgency, to improve opportunities for migration and survival. The measures taken by Welsh Water in spring 2015 are one helpful option. Another option was suggested in 2014 by WUF to Welsh Water, that would not compromise supply, but as yet this has not been adopted.
- 6.3 **More effective fishing controls** should be introduced for the 2016 season to minimise the number of salmon killed by fishermen. While angling is not the reason for the depleted state of the salmon stock, appropriate controls could increase the number of salmon spawning by about 8 percent, several hundred fish, as outlined in Annex 1.

6.4 In particular, measures are needed to address the impact of spinning. Most of the salmon killed, intentionally or otherwise, by anglers on the Usk are caught by spinning. For example, of those declared on catch returns in 2013 (2014 data have not been obtained yet):

- 46% were caught by spinning (50% by fly; 4% on bait); and
- Only 56% of spinner caught salmon were released (84% for fly; 63% for bait).

These proportions indicate that two and a half times as many salmon are killed and taken by spinning as by fly fishing. Those anglers who do not comply with the law by making a return may exhibit different behaviour, so the disparity may be greater.

6.5 Furthermore fish caught on spinners, especially Flying Cs, are less likely to survive catch & release than those caught on fly. Gargan et al (2015) reported that only 55% of spinner caught salmon survived to spawn after release compared with 98% of those caught on fly. From 2000 to 2014, at Upper Llangybi Fishery on the Usk, the rate of mortal injury (11% of 245 fish) reported for salmon caught by Flying C was almost four times greater than for those caught on fly (3% of 854 fish).

6.6 Fishing controls could reduce related mortality in three ways:

1. Reducing the exploitation rate, i.e . the proportion caught;
2. Increasing the proportion of the catch released alive; and
3. Increasing the survival rate of released fish.

Options should be evaluated that will, with other actions, enable the shortfall in egg deposition to be met to deliver the requirements outlined in Section 5.3.

6.7 **Conclusion:** These recommendations are similar to those based on previous preliminary assessments (Mawle 2013, 2014). Since those assessments were been shown to be accurate, NRW should not delay further the implementation of measures on all fronts.

Guy Mawle, Wye & Usk Foundation

13 November 2015

References

- CEFAS/EA/NRW (2014). Annual assessment of salmon stocks and fisheries in England and Wales 2013. 152pp.
- CEFAS/EA/NRW (2015). Annual assessment of salmon stocks and fisheries in England and Wales 2014. 84pp
- Gargan, P.G., Stafford, T., Økland, F., Thorstad, E.B. (2015). Survival of wild Atlantic salmon (*Salmo salar*) after catch and release angling in three Irish rivers. *Fisheries Research* 161, 252–260.
- Gott, S. (2013). Usk Catchment 2013 Fishery Survey Report. Report TM/SE_A&R/14/18. Natural Resources Wales. 24pp
- Mawle, G.W. (2013). A preliminary assessment of the status of the salmon stock in the River Usk for 2013. Wye & Usk Foundation. 4pp.
- Mawle, G.W. (2014). A preliminary assessment of the status of the salmon stock in the River Usk for 2014. Wye & Usk Foundation. 7pp.
- Milner, N., Fraser, D., Webb, H., Lawrie, K., MacDermott, T. (2013). Condition assessments of Atlantic Salmon in Welsh SAC rivers, 2007-2012. CCW Contract Science Report 988. 191pp.
- NASCO (2009): NASCO Guidelines for the Management of Salmon Fisheries. North Atlantic Salmon Conservation Organisation, Edinburgh, Scotland, UK. NASCO Council Document (09)43. 12pp.
- NASCO (2013). NASCO Implementation Plan for the period 2013-18. EU–UK (England and Wales). 29 pp. http://www.nasco.int/pdf/2013%20papers/CNL_13_46.pdf

Annex 1: An estimate of the number of adult salmon killed by angling on the River Usk in 2015 and the impact on the number spawning

- Usk rod catch declared by licensed holders estimated in this report as: ~700
- Proportion of licences making a catch return: 58% across England and Wales in 2014
- Proportion of catch declared: ~80%, based on correction factors used by the EA/NRW and assuming that the proportion of catch return is 60%
- So the actual, as opposed to declared, rod catch for the Usk would be: $700/0.8 = 875$
- 77% of the catch was declared released in 2014. Assuming the same rate applies in 2015, the number of salmon declared killed by anglers will be: $700 \times 23\% = 160$
- NRW assumes that all undeclared fish are killed, i.e. $(875-700) = 175$
- NRW assumes that 20% of released salmon die before spawning: $700 \times 0.77 \times 0.2 = 110$
- If the natural mortality of uncaught salmon in the river before spawning is 10%, **the number of salmon killed by angling would be: $160 + 175 + (110/2) = \sim 400$**

- If the proportion of the stock caught by angling is ~15% (extant exploitation rate derived from River Dee in North Wales), **then the number of adult salmon running the Usk in 2015 would be: $875/0.15 = 5830$**

- The total number of salmon spawning with current angling mortality is: $((5830 - 445) \times 0.9) = 4850$

- **If all angling related mortality ceased**, but assuming a natural in-river mortality rate of 10% then **the additional number of spawning salmon would be: $(160 + 175 + 110) \times 0.9 = 400$**

- This would increase the number of salmon spawning by: $400/4850 = \sim 8\%$