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A review of the economic value of angling in Welsh rivers

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A review of the economic value of angling in Welsh rivers



Cover photograph: **One individual's value of high quality fishing in Welsh rivers:** this angler from London paid £425 in a charity auction for a single day's guided salmon fly fishing on the River Usk in June 2017. He paid almost as much for a second day on the River Wye in Powys. The funds went to the Wye & Usk Foundation which currently employs 17 people in rural Powys to help conserve and improve the indigenous fish and other wildlife in these two rivers. The angler landed seven salmon in his two days fishing; all were returned.

Acknowledgements

With thanks to John Gossage, Peter Gough and Dave Mee of Natural Resources Wales for their helpful comments.

Foreword

Guy Mawle has a distinguished record advising on fisheries and fishing issues. He was the project manager for two complementary reports commissioned by the Environment Agency on the *Economic evaluation of inland fisheries in England and Wales* that were published in 2007 (SC050026 SR1 & SR2).

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291119/sc_ho1207bnnv-e-e.pdf

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291117/sc_ho1207bnnw-e-e.pdf

Both reports were produced to a very high standard. The first analysed the welfare benefits of inland fisheries in terms of willingness to pay (in the context of total economic value). The second analysed economic impact in terms of Gross Value Added (GVA) and employment, whilst acknowledging

“Angling expenditure and associated employment are not particularly useful measures of economic impact, although such figures are often used for advocacy purposes.”

Of the original six objectives set, two were not pursued. These were:

(iii) provide updated estimates of the value of fishing rights for different types of freshwater fisheries

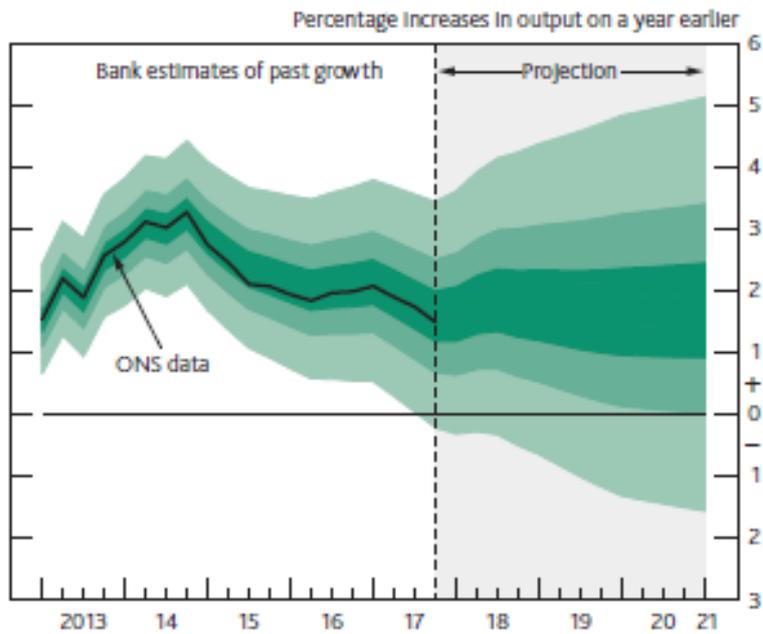
(iv) provide updated estimates of average anglers’ consumer surplus for different types of freshwater fisheries.

This technical advice report provides commentary on both omissions. It considers the economic value of angling in Welsh rivers, the best metrics for this, considers the context of angling with other, sometimes competing, uses such as canoeing, and makes recommendations for future monitoring.

Given the remit of this short technical advice note, Guy has produced an interesting literature review and provided insight into current research being conducted in England that has not yet been published. His thorough and comprehensive analysis will disabuse anybody who thought it possible to come up with a single figure that can adequately represent the economic value of angling on Welsh rivers.

The updated estimates in terms of GVA and employment are very small within the context of a Welsh economy producing £60b of GVA and employing 1.4 m people. Moreover, the margins of error associated with these official statistics are large, as is illustrated by Bank of England estimates of past and projections of future GDP. Nevertheless, angling may be more significant in a local context.

Chart 5.1 GDP projection based on market interest rate expectations, other policy measures as announced



The fan chart depicts the probability of various outcomes for GDP growth. It has been conditioned on the assumptions in Table 5.B footnote (b). To the left of the vertical dashed line, the distribution reflects the likelihood of revisions to the data over the past; to the right, it reflects uncertainty over the evolution of GDP growth in the future. If economic circumstances identical to today's were to prevail on 100 occasions, the MPC's best collective judgement is that the mature estimate of GDP growth would lie within the darkest central band on only 30 of those occasions. The fan chart is constructed so that outcomes are also expected to lie within each pair of the lighter green areas on 30 occasions. In any particular quarter of the forecast period, GDP growth is therefore expected to lie somewhere within the fan on 90 out of 100 occasions. And on the remaining 10 out of 100 occasions GDP growth can fall anywhere outside the green area of the fan chart. Over the forecast period, this has been depicted by the light grey background. See the box on page 39 of the November 2007 *Inflation Report* for a fuller description of the fan chart and what it represents.

Source: Bank of England *Inflation Report*, February 2018

NRW is committed to a place-based approach and will produce a series of Area Statements as required under Section 11 of the Environment (Wales) Act 2016. This process provides an opportunity for anglers to make their views known and to put forward relevant evidence.

The report makes three recommendations with respect to future monitoring, and these will be given careful consideration by NRW.

John Gossage, NRW Economist, March 2018

A review of the economic value of angling in Welsh rivers

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A review of the economic value of angling in Welsh rivers

Executive summary

This review for Natural Resources Wales (NRW) considers the economic values to the people of Wales derived from angling on Welsh rivers. It focusses on salmonid fisheries, principally those for salmon and sea trout and their value to fishery owners and anglers, key stakeholders, as well as to the people of Wales more widely, including angling's significance for the economy. It does not review the value of net fisheries or those values of the fish themselves that are unrelated to fishing. The legal requirements for information on the economic values associated with river fisheries are outlined.

Value to fishery owners

Much of the fishing on rivers in Wales is controlled by Welsh angling clubs. The capital value of river fisheries to their owners is reflected by the market value of fishing rights. The best indicator of the value of fishing rights on rivers where people fish for migratory salmonids is the average 5-year catch of salmon. The values of fishing for other types of fish are subsumed within this. For rivers without a salmon catch, value is estimated from the length of river and a price per metre though there will be wide variation reflecting other variables. The market value of fishing rights on rivers in Wales is updated to 2016 prices.

Stakeholder Group		Salmon & sea trout fishing in Wales	Non-migratory trout river fisheries in Wales	All river fisheries in Wales
Fishery owners	Market value of fishing rights (£M)	30	60	90

Value of river fishing to Welsh anglers

Anglers must value fishing on rivers by at least the amount they spend on it. Most will value it more highly. For anglers resident in Wales, this net value above costs, or consumer surplus, is relevant to NRW. Based on historical studies, the net value of all river fishing in Wales to Welsh anglers is estimated as £3 million annually, capitalised at £30 million. This suggests that half of Welsh anglers would be willing to pay an additional £30 or more a year; this may be an underestimate.

Significance for the economy

To indicate the economic activity supported by river angling in Wales, two key metrics are Gross Value Added (GVA), as a proxy for household income, and Full-Time Equivalent jobs (FTEs) as a measure of employment. These are annual metrics. When assessing impacts over the longer term, employment can be expressed in 'Person-years'. A large part of anglers' trip expenditure is made close to the river, so much of the economic activity supported will be in local, rural economies, depending on the degree to which goods and services are brought in from elsewhere.

Estimates are presented of household income (GVA) and jobs supported in Wales by anglers' expenditure on fishing in rivers for different types of fish in 2016, to one significant figure.

Type of river fishing	Anglers' Expenditure (£M)	Household Income (GVA)(£M)	Employment(FTEs)
Salmon/ Sea trout	10	5	200
Trout	20	9	300
Coarse	10	5	200
Total (All species)	40	20	700

These are based on the 2005 estimates adjusted by indices of changes in angling activity and corrected for inflation. Angling activity for salmon and sea trout is estimated to have fallen by 28 percent with little overall change since 2005 for other types of fishing. The scale of economic activity supported is similar to an estimate made for the Wales Coastal Path.

The economic impact of changes in angling activity will depend on the extent to which anglers switch their expenditure between different types of fishing and activities in Wales and elsewhere. Estimates are presented to indicate the economic impact of the total cessation of angling on Welsh rivers for salmon and sea trout; and for all types of fish. These assume that fisheries outside Wales are unaffected.

Economic activity in Wales by angling on Welsh rivers (2016 prices)	Annual Activity supported 2016	1. Annual Economic impact in Wales from loss of salmon & sea trout angling in Wales only	2. Annual Economic impact in Wales from loss of all river fishing in Wales only
Household income GVA (annual) (£M)	20	2	10
Jobs (FTE) (annual)	700	100	400

Visitors to Wales contribute much of the expenditure associated with fishing on rivers that supports income and employment within Wales. In 2005, about a third of all days fished were by visitors.

Comparison with other watersports

Studies of participation and economic activities of other watersports are rarely comparable. In some cases, they are also unreliable. Observations are offered on the usefulness or otherwise of individual studies. Estimates for tourism exclude regular local activity and will therefore understate activity and economic impacts.

Recommendations for monitoring

1. Use the rod licence database to monitor changes in the number of resident Welsh anglers and potential visitors from England.
2. Use the information on salmon licence catch returns, linked to the rod licence database, to monitor changes in the overall and seasonal use of individual salmon and sea trout rivers by local and visiting anglers.
3. Plan to commission reliable research within the next five years to provide detailed, up-to-date information on angling activity and expenditure within Wales, perhaps as part of a wider assessment of the value of fish and fisheries in Wales.

The economic value of angling in Welsh rivers

1. Scope

This is a review of relevant studies of economic values derived from angling on Welsh rivers to the people of Wales. It focusses on salmonid fisheries, especially those for salmon and sea trout and is provided for Natural Resources Wales (NRW) to meet the specification in Appendix 1.

This review does not cover wider, non-use, values of fish that are not derived from angling.

2. Context

2.1 Current issues relating to angling on rivers

Examples of issues where economic information is needed to aid decision making include:

- Wider access to inland waters for canoeing and other recreation, as proposed in a recent Welsh Government consultation (closed 30 September 2017): 'Taking forward Wales' sustainable management of natural resources'.
- The regulation of salmonid net fisheries and whether greater economic benefits might be derived from reducing net catch to sustain or improve rod fisheries.
- Competition for limited Government resources between marine and inland fisheries.

2.2 Legal requirements

NRW requires information on the economic value of angling to aid decision making in line with several legal duties.

Section (S.)3 of **The Well-being of Future Generations (Wales) Act 2015** (WFG Act) requires NRW and Welsh Government ministers to carry out sustainable development, defined by S.2 of the Act as:

'... the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainability principle ... aimed at achieving the well-being goals..'

Acting in accordance with the 'sustainability principle' is defined by S.5 as: *'in a manner which seeks to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs.'*

The seven well-being goals are defined in S.4 and include two that specifically refer to economic aspirations within Wales, i.e.:

- 'A prosperous Wales': the definition refers to a society which develops: *'... a skilled and well-educated population in an economy which generates wealth and provides employment opportunities...'*
- 'A resilient Wales': *'A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems but support social, economic and ecological resilience...'*

S.5 highlights the need for an integrated approach and other goals relate to social and cultural aspirations, including:

- ‘A more equal Wales’: ‘A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic background or circumstances).’
- ‘A Wales of vibrant culture ...’: ‘A society which promotes and protects culture, heritage ... and which encourages people to participate in ... sports and recreation’.
- ‘A Wales of cohesive communities’: ‘Attractive, viable, safe and well-connected communities.’

S.5 of the subsequent **Environment (Wales) Act 2016** requires NRW to pursue the ‘sustainable management of natural resources’ (SMNR) and apply ‘the principles’ thereof. S.3 of the Act defines SMNR reiterating requirements of the WFG Act. S.4 defines ‘the principles of sustainable management’ including: ‘to take account of:

- ... the benefits and intrinsic value of all natural resources and ecosystems;
- ...the short, medium and long-term consequences of actions;’.

In the **Natural Resource Body for Wales (Establishment) Order 2012**, S.8 places a general duty on NRW to have regard to costs and benefits in exercising powers, if it is reasonable to do so. For those duties derived from the **Environment Act 1995**, this largely reiterates the cost-benefit duty under S.39 of that Act. Although benefits are not defined in that Act, S.56 defines ‘costs’ as including: ‘costs to any person’, and the original guidance on that duty (Environment Agency, 1996) noted that distributional issues should be considered when comparing options for the exercise of powers.

The resources used to assess costs and benefits must be proportional to the decision under consideration. So, a full economic assessment is not required unless the impact of a decision is particularly large. A semi-quantitative estimate may be adequate, especially if this is being used, as is likely, in a multi-criteria analysis.

S.4 of the Environment Act 1995 also requires NRW ‘to take into account any likely costs’ in relation to the powers derived from that Act. That section also provides for Ministers to give guidance on the discharge of its functions. Such statutory **S.4 Guidance** was given by the Welsh Assembly Government in 2002 which presumably still applies to NRW’s powers and duties derived from the Environment Act, unless specifically superseded. Part 4.2(e) of that guidance relates specifically to NRW’s fisheries duty, i.e.

To maintain, improve and develop salmonid and freshwater fisheries, and in particular:

..... to enhance the contribution salmon and freshwater fisheries make to the economy, particularly in remote rural areas and in areas with low levels of income;

This guidance reflects the rural communities duty on NRW from S.7(1)(c)(iii) of the Environment Act 1995 ‘to have regard to any effect which the proposals would have on the economic and social well-being of local communities in rural areas.’ It is also reiterated in a consultation document on sustainable inland fisheries (NRW, 2013).

2.3 The wider value of inland fisheries

Economic value derived from angling is only part of the total economic value (TEEB, 2010) of fish and fisheries. For a full discussion, the reader is referred to Lawrence and Spurgeon (2007) who describe in their Chapter 3 the range of values, both use and non-use, associated with inland fish and fisheries. Their work also indicates that much of the value of salmon, at least, is not directly related to fishing.

They estimated the total economic value of protecting salmon stocks in England and Wales against a catastrophic (95 percent) decline. They derived this from a survey of people's willingness-to-pay an additional sum to avoid such a decline. Two-thirds of the population were willing to pay more and the average extra willingness to pay per household was £15.80 per year. Summed across households in England and Wales this gave a total of £350 million per year. Capitalised over 25 years, this amounted to £6 billion. They also found that a large part of this total value is not directly associated with fishing, but rather derives from reasons unrelated to fishing, particularly that '*The environment is important/ rivers are important*'. By comparison, the capital value of fishing rights for salmon angling across England and Wales, a key component of the value of angling, is an order of magnitude smaller, about £120 million (Radford et al, 2001).

It cannot be assumed that other individual species of fish are similarly valued, given the iconic nature of salmon.

3. The best metrics to reflect the economic value of angling

3.1 What information is needed

The legal context makes it clear that there is no single economic value for angling relevant to decision making. Ideally, NRW and Welsh Government need to know, for each management option related to any particular issue, who gains and who loses and by how much. So, specifically for angling, decision makers need information on the likely gains and losses to:

- key stakeholder groups, notably angling clubs and other fishery owners, and Welsh anglers; as well as to
- the wider population in Wales, including through the impact on economic activity, especially in rural communities.

Given its legal remit, it would be helpful for NRW to monitor change in the economic value of fisheries at a strategic level, as well as understanding the economic consequences associated with specific issues. It is also appropriate to have information for both the short and longer term. Ideally, metrics should be easy to understand and possible to update.

3.2 The value of angling to key stakeholders

3.2.1 The value to fishery owners of fishing rights

In Wales, fishing rights are property that can be owned separately from ownership of the river bank, though in many cases farmers and other landowners still own the fishing rights on their land. Rights are thus generally private though they are often controlled by local angling clubs, whether as owners or lessees. They may effectively be a recreational facility with permits to fish offered to the local populace and visitors. Fishery owners can either retain the fishing for their own use or, by charging anglers for permission through a lease or individual permits, generate an income.

The market value of fishing rights, either leased or purchased outright, is a measure of the value of fisheries to their owners over their costs. The capital value of fishing rights is a measure of the discounted future stream of benefit, net of costs, to the owners (Radford et al 2001).

3.2.1.1 Salmon and sea trout fisheries

Radford et al (2001) made the last economic evaluation of **the capital value of fishing rights** across England and Wales. They concluded that, if salmon were present, the key determinant for the fishing rights of a river fishery was the 5-year average annual rod catch of salmon. One would expect the catch of other species to be another determinant. Radford et al (1991) looked for a relationship between fishery value and the sea trout catch but as yet no such general rule has been demonstrated empirically. O'Reilly and Mawle (2006) suggested that given the similarity of the two species, anglers might value catching salmon and sea trout of a given size equally. Indeed, it is likely given the comparative rarity of large sea trout, that anglers may value such fish more highly than salmon. Anglers currently declare catching about thirteen thousand sea trout in Wales, over four times more than the number of salmon, assuming that half of the Wye's catch is in England (EA/NRW, 2017). Although the average weight of the sea trout caught was only 0.73kg compared to

over 4 kg for salmon, it seems likely that sea trout contribute significantly to the capital value of individual salmon and sea trout rod fisheries in Wales. However, on average, sea trout fishing, like that of fishing for brown trout or other species, is subsumed within the value indicated by the average salmon catch.

Radford et al (2001) suggested an average value of £8,400 per salmon in the 5-year average rod catch across England and Wales and noted that, taking account of inflation, this was consistent with their previous estimate in 1991. They indicated an average per salmon value of £9,950 for fisheries at 2001 prices for the Environment Agency's Welsh region. However, they also noted that such per salmon values change and that the rate of change may vary over time other than with inflation. Derek Bingham (2007) who comments on sales of fishing rights in Trout & Salmon magazine, quoted a Scottish estate agent as giving '*the ... value ... at £2,500-8,000 per fish*' and that this was well below some of the observed sale values of £12,000 paid in the early 1990s, the time of an earlier study in England and Wales (Radford et al 1991). A recent advertisement for one twelfth share in a fishery on the River Awe, suggests a value of £3,400 per salmon in the 5-year annual average catch (Strutt & Parker 2017), albeit with the local run of salmon at an all-time low (AST, 2017). It is possible that these observations in Scotland may not be comparable with fisheries in Wales, as much of Scotland is more remote from population centres.

Given the current concern about falling catches on many rivers in Wales, it is possible that the per capita value for salmon may fall as well as catch but, as yet, there is no evidence of this either way. One recent example in Wales is the sale in 2017 of two shares in the Upper Llangybi Fishery on the river Usk which indicates a value per salmon of £8,300 per salmon.

Although Radford et al (2001) applied a per salmon value to the average rod catch for their national evaluation, Radford et al (1991) had found that the marginal value per salmon at a fishery was not constant but varied with the level of the rod catch. Their results suggest that market values changed by 5.5 percent for a 10 percent change in the 5-year average annual rod catch.

If needed, annual values for leases or other forms of fisheries rental might also be useful though these could have significant costs associated with them. On the whole, lease values are not widely advertised, unlike sales of fishing rights.

3.2.1.2 River trout fisheries

Radford et al (2001) used the **length of a trout river fishery** to estimate the value of fishing rights. Significant determinants of price per metre were the width of the river and weight of fish caught per angler day, though they also included the proportion of wild, as opposed to stocked, trout in the catch as a variable. They estimated that the mean value in Wales for non-migratory trout fisheries was £21 per metre though with wide variation. They estimated that there were 2,258 km of riverine trout fisheries other than salmon fisheries in Wales.

Amounts paid annually to lease fishing rights could be used to indicate annual income to fisheries owners though owners may have significant costs which would need to be recognised.

3.2.2 The value to Welsh anglers

One might ask why angling has any net value to anglers given that they have substantial costs, including paying the fishery owner for permission and NRW for a rod licence. However, unless a fishery owner, or NRW, is able to extract all that an angler is willing to pay for his fishing, which is rarely practical, there will be such a net value called, in economic parlance, the angler's **consumer surplus** or **net willingness-to-pay**. Summed over all Welsh anglers this will provide a value to them of their fishing, in this case of fishing rivers in Wales. The Welsh Government and NRW are concerned primarily with what benefits the people of Wales, so presumably only the consumer surplus for Welsh anglers is relevant to decision making. While it may not involve the transfer of money, there is no doubt that it is a very real value representing the value of fisheries to anglers, a key stakeholder group. It is what they would lose if they were prevented from fishing. It could also increase if either fishing became cheaper or the quality of fishing improved. In the USA where the right to fish inland waters is public, so there is no market in fishing rights, anglers' consumer surplus is considered a key metric of the value of fishing.

The level of anglers' consumer surplus may be relatively high where fisheries are controlled by clubs. As noted by Radford et al (2001); *'as a generalisation, clubs seek to maximise the average consumer surplus of their members.'* In other words, clubs tend to minimise the costs relative to the benefits that their members receive. Mawle (unpublished) asked Welsh Water Authority fisheries officers to estimate the proportion controlled by clubs of the river length in their areas that offered angling for migratory salmonids. It ranged from only 10 percent on the Wye (partly in England) to 90 percent on some rivers on the South Wales coalfield. Overall, about half of the river length in Wales was controlled by clubs and this proportion has probably not changed greatly. Collins (pers.comm.) has compiled a list of 85 angling clubs controlling river fishing in Wales, reproduced in Appendix 3, and there may be a few clubs (e.g. Newport AA) not listed.

Anglers' consumer surplus has been estimated indirectly from anglers' behaviour (e.g. Radford et al 1984) and directly (e.g. Spurgeon et al, 2001). There are subtle differences in exactly what is being evaluated. Also, there are methodological difficulties with both approaches. Nevertheless, it is clear from both approaches that the value of angling on rivers to many anglers is substantial, over and above what it costs them to fish.

Radford (1984) used the travel cost approach to estimate the annual consumer surplus accruing to salmon and sea trout anglers on four rivers (Wye, Mawddach, Tamar and Lune). The Salmon Action Plan Guidelines (Environment Agency 2003) used these annual values capitalised by discounting at 6 per cent over 10 years. The ratio of consumers' surplus to capital value for the four rivers varied widely, i.e.

Ratio of river consumers' surplus (capitalised) to market value of fishing rights:

Wye	1:1
Mawddach	10:1
Tamar	20:1
Lune	2:1

To indicate the value of individual salmon rivers to anglers, the Salmon Action Plan Guidelines recommended using the smallest ratio, 1:1, as the most conservative. Spurgeon (1999) estimated the annual consumer surplus to anglers from the Lune salmon fishery to be *'in the order of £70,000 to £210,000 or greater; the 'best value' was £140,000 per year with a ratio of 1:3 relative to an annualised value to fishery owners of £400,000.* There is considerable uncertainty in these annual estimates, but it is reasonable to conclude that anglers' consumer surplus is substantial (Radford et al, 2001) and probably of the same order of magnitude as the market value of the fishing rights.

As NRW is primarily concerned with the value of river fisheries in Wales to Welsh people, an estimate of consumer surplus for all anglers is inappropriate. Spurgeon et al (2001) estimated anglers' consumer surplus, or net willingness-to-pay to maintain the quality of fishing at their 'regular site' in England and Wales, separately for game and coarse anglers and for different types of water body. For rivers, this equated to, on average, 17 percent of their trip expenditure for both game and coarse anglers. These estimates are specific to the angler's regular site, so anglers would probably be willing to pay more, perhaps substantially more, to maintain all river fisheries than for just their regular site. So these proportions would understate the value of all river fishing to anglers. For most Welsh anglers, their regular site will be in Wales, so their consumer surplus is estimated as 17 percent of their total trip expenditure to fish rivers in Wales.

Radford et al (2007) provide estimates of total trip expenditure for different types of fishing which can be broken down, as in Table 1, to indicate that some £12 million were spent on trips to rivers in Wales by Welsh residents. These estimates may be combined with the results of Spurgeon et al (2001) to indicate the likely magnitude of Welsh anglers' consumer surplus, for fishing rivers in Wales, see section 4.

Type of river fishing in Wales	Trip expenditure by Welsh residents on all freshwater fishing in Wales (£ million)	Proportion of Welsh residents' trips to rivers	Trip expenditure by Welsh residents to rivers (£ million)
Salmon & sea trout	3.1	100%	3.1
Trout	12.2	41%	5.0
Coarse	11.9	30%	3.6
Total	27.2		11.7

Table 1: Expenditure on river fishing for different species in Wales by Welsh residents, derived from Radford et al (2007) (not adjusted for inflation).

Another facet of the value of angling to anglers that may be relevant to some management issues is the **capital value of their equipment**, including specialist clothing and footwear such as waders, part or all of which might effectively be made redundant if they were obliged to stop fishing in Wales and there was no alternative venue available at an acceptable price. Radford et al (2007) estimated that non-specific (capital) expenditure, as opposed to trip expenditure, by Welsh anglers attributable to angling on inland fisheries in Wales amounted to £12.2 million annually. Some of the items purchased may have a short lifespan, a few years at most, but other expensive items such as rods and reels may have a much longer life. No estimate has been made of the loss to anglers that might

be associated with such capital equipment were angling to stop but given the scale of annual expenditure, it is possible that it could be substantial.

3.3 Wider values to the Welsh people of angling on Welsh rivers

Discrete from the economic activity angling supports in Wales, discussed in the next section, there will be other economic values to the Welsh people from angling on rivers.

For example, it is likely that a proportion of the public values angling as an activity in itself even if they don't fish themselves. Public attitudes to angling across England and Wales were generally positive and becoming more so, the last time they were assessed (Simpson & Mawle, 2010). Such values include bequest and existence values (Lawrence & Spurgeon 2007). The scale of such values has not been specifically documented for angling, though the heritage value of some historical and locally unusual methods of fishing for salmon and sea trout in Wales have been explored (Simpson & Willis, 2003). Angling itself has a long heritage. Even four centuries ago, Isaac Walton (1653) specifically describes angling techniques for salmon and trout and comments on the antiquity of angling as pre-Christian. Decision makers should be aware that these and other aspects of value are likely to exist in Wales, particularly where they are part of the local culture, even though they have not been quantified.

3.4 Economic activity

The economic values described so far, though reflecting different facets of value, may be added together within a total economic value. They do not always involve the exchange of money, though some do, notably those associated with obtaining the right to fish. Economic activity associated with anglers' expenditure is different and the metrics used to describe it should not be added to these other values. It is a different way of looking at the importance of angling to the people of Wales.

3.4.1 Income and jobs in Wales

As indicated in S.2.2, the Welsh Government has a well-being goal of generating wealth and providing employment opportunities in Wales. So metrics are needed to reflect how anglers' expenditure contributes to these.

The **Gross Value Added (GVA)** is an economic measure of the flow of goods and services in Wales and may be taken as a proxy for the annual contribution to household income. Radford et al (2007) describe GVA as the total annual income in the form of wages, income from self-employment, and profits accruing to households. A more specific definition is given in the glossary. The Office of National Statistics guidance (White, 2010a) on performance indicators for tourism identifies GVA as:

'Clearly of importance nationally, and particularly regionally as a measure of the performance... '.

Where an evaluation is at the level of the state, such as the United Kingdom, then Gross Domestic Product (GDP) might be a better metric as it takes into account taxes and subsidies as well as GVA (Brereton, 2006). An economic valuation of the Atlantic salmon in Canada provided estimates of its significance for income and GDP (Gardner Pinfold, 2011). However, the economic significance within Wales, or a part of Wales, is best indicated by GVA.

Estimates of GVA are derived from assessment of anglers' expenditure on fishing and applying multipliers appropriate to the economy in question. Expenditure itself is a crude, and potentially misleading, metric for the significance of angling for income and jobs. The significance for the Welsh economy of a pound (£) spent, in this case within Wales on a fishing trip to a Welsh river, will vary. It depends not only on the import content of the different items bought but also the knock-on effects of that expenditure on incomes within the economy. These indirect and induced effects are explained in Appendix 2, taken from Radford et al (2007).

The crucial metric used as an indicator of employment opportunities is **full-time equivalent (FTE)** jobs. The Office for National Statistics (ONS) guidance for tourism suggests that some indicator of seasonality is also useful (White, 2010a). Angling on Welsh rivers is mostly from March to mid-October, reflecting the legal fishing seasons for salmonids as well as the weather; its impact on employment will reflect this.

Radford et al (2007) provide a range of ratios for anglers' expenditure in Wales to indicate annual impacts on income (GVA) and employment (FTEs), with resident and visiting anglers considered separately and together, i.e.

- GVA generated in Wales per pound of local angler expenditure
- GVA generated in Wales per pound of visitor angler expenditure
- GVA per angler day
- Local angler expenditure necessary to generate one FTE.
- Visitor angler expenditure necessary to generate one FTE
- FTEs per thousand angler days

These might be applied to current estimates of annual angling activity, where available, to indicate the importance of rivers to the Welsh economy, assuming that the anglers' average expenditure per day on different types of angling has not changed significantly. A correction factor for inflation, such as the Consumers Prices Index (CPI), is needed.

It is worth stressing that these are annual impacts. For employment impacts, another way of expressing an impact on employment is in 'Person years'. Merely stating the number of FTEs can be misleading, if the timescale is not made clear.

The ratios include the direct, indirect and induced effects of anglers' expenditure on the Welsh economy and are therefore so-called Type II multipliers. The last study of the economic value of sea angling in England (Armstrong et al, 2013) also used Type II multipliers.

3.4.2 Measuring change

The level of **economic 'activity supported'** by angling as indicated by income (GVA) and jobs (FTEs) is not necessarily an indicator of what would be lost if angling ceased. Even in the short-term, some expenditure will be diverted to related activities. So, if salmon and sea trout angling ceased in Wales,

some expenditure would be lost but some would switch to fishing for other species in Wales or fishing elsewhere, assuming those opportunities remained unchanged.

Radford et al (2007) used the term '**economic impact**' for such losses and evaluated them for different types of fishing in Wales by asking anglers what they would do if angling for each type of fish were no longer available. For either salmon or trout fishing about half (52%) of anglers' expenditure in Wales would be lost, though most would be lost if all types of angling in Wales ceased. The proportion of visitors' expenditure that would be lost was greater at 56% than that of residents at 47%.

Evaluation of a particular management decision should therefore take into account which fisheries would be affected, inside and outside of Wales. Not all change need be negative. So, for example, Mawle and Peirson (2009) used the results of Radford et al (2007) to estimate gains in income and employment in Wales that would result from an extra 1000 days fishing by anglers visiting Wales to fish for different species.

Such subtleties in evaluation are not generally available for other competing activities (e.g. canoeing, sea fishing). So overall estimates of household incomes (GVA) and employment (FTEs) supported by angling may be the most useful strategic indicators of the scale of potential change to aid decision making. This is particularly true of potential losses, given the uncertainties about the diversion of expenditure that could offset the impact of change.

3.4.3 Local economic effects

Given its remit, NRW may also need to consider how local rural economies are affected. As a river catchment is the unit of management for migratory salmonids, it would be useful to have metrics that reflect the economic activity associated with angling on individual rivers. Indeed, the Salmon Action Plans completed in 2004 by the Environment Agency under a ministerial direction include estimates of annual angler expenditure for individual rivers as a crude indicator of associated economic activity (Environment Agency, 2003).

Justification for this comes from a study of anglers' trip expenditure when fishing the Afon Teifi in Dyfed which indicates that the majority of their expenditure was within 25 miles of the river for both local and visiting anglers (Spurgeon et al, 1999). This study also indicated that there might be significant expenditure by non-fishing family members linked to Teifi anglers, equating to about 45 percent of anglers' trip expenditure within 25 miles of the river.

Expenditure close to the river is likely to have greater significance for the local economy than for the economy of Wales as a whole. One reason is that there is a greater likelihood of reduced expenditure within the local economy, if the activity were to cease. Nonetheless, the import content of goods and services is crucial. If it is high, local economic benefits may be small relative to expenditure. An exposition on economic effects by Radford et al (2007) is included in Appendix 2.

3.4.4 Visitor activity

Anglers staying in local accommodation will generally contribute far more per day's fishing than those on day trips. This is recognised by the Office for National Statistics guidance on performance

indicators for tourism, recommending a focus on the number of 'staying visitors' whether Domestic or InBound and their expenditure (White, 2010a).

While specific surveys may have to be commissioned to assess the number of staying and other visitors linked to all types of inland fishing, it may be possible to regularly monitor angler origins and visitor activity for salmon and sea trout fisheries in Wales from existing data sources. Those travelling long distances are most likely to be staying visitors.

4. Best estimates for the best metrics

Caveat: To avoid giving a false impression of precision, the best estimates in this section are rounded to one significant figure.

4.1 The value to fishery owners of fishing rights

4.1.1 Salmon and sea trout fisheries – current value

The market value of fishing rights on rivers in Wales with a salmon catch can be estimated from catches declared on catch returns to NRW/EA by rod licence holders. Table 2 shows the declared catches from 2012 to 2016. To provide a better estimate of the catch in Wales, half the catch from the river Wye has been removed as being caught in England. The catches in England and Wales on the Dee and Severn, which also cross the border, are assumed to balance. Catches are corrected for under-declaration.

	Declared catch to NRW/EA for NRW Wales	Declared catch to NRW/EA for River Wye	Declared salmon catch in Wales: half of Wye catch removed	Correction factor for catches declared to NRW	Corrected salmon catches in Wales
2012	4740	1034	4223	1.19	5025
2013	3224	819	2815	1.18	3321
2014	2162	439	1943	1.22	2370
2015	3636	828	3222	1.36	4382
2016	3137	1020	2627	1.30	3415
5-year mean	3380	828	2966		3703

Table 2: Salmon rod catches in Wales from 2012 to 2016 based on catches declared on rod licence catch returns to NRW and the Environment Agency (EA/NRW, 2017).

Applying a value of £8,000 per salmon to the 5-year average catch of indicates that the fishing rights on salmon and sea trout rod fisheries in Wales may currently be worth about £30 million to their owners. This compares with previous estimates of £48 million (Radford et al 1991) and £42 million (Radford et al 2001); prices are contemporary with the studies. Even without corrections for inflation and catches on border rivers, these indicate a drop in the value of migratory salmon fisheries in Wales in the last quarter of a century due to a lower average salmon catch.

4.1.2 River trout fisheries – current value

Assuming that:

- all other river fisheries in Wales are trout fisheries;
- the length is unchanged since Radford et al’s 2001 estimate; and
- the average value has risen by 36 percent since their estimate in line with the CPI to £27/metre;

then fishing rights on Welsh rivers without migratory salmonids would now be worth about £60 million at 2016 prices.

4.1.3 What if?

As indicated in Table 3, the total market value of fishing rights on the rivers of Wales is about £90 million. This is a capital not an annual value and a measure of the loss to their owners if angling on rivers ceased in Wales. If only salmon and sea trout fishing ceased, the loss would be less than £30 million, their market value, as these rights would have residual value for trout and other species.

Stakeholder Group		Salmon & sea trout fisheries in Wales	Non-migratory trout river fisheries in Wales	All river fisheries in Wales
Fishery owners	Market value of fishing rights (£M)	30	60	90

Table 3: The market value of fishing rights on rivers in Wales based Radford et al (2001) updated to 2016 prices by the CPI; estimates are to one significant figure.

The stocks of most, if not every, salmon river in Wales are depleted (Cefas/EA/NRW 2017). Were they to be restored to meet their management objective, the gain in value to fishery owners would be substantial. If the potential increase in catch were known, this could be evaluated, either using the value per salmon caught or, perhaps more theoretically rational, using the elasticity of 5.5% change in value for a 10% change in catch identified by Radford et al (1991). However, given the uncertainties about many aspects of such an evaluation, using a single value per salmon may be an acceptable approximation.

4.2 The value to Welsh anglers

4.2.1 Current value

The ratio of consumer surplus to trip costs, of 17 percent, identified by Spurgeon et al (2001) for game anglers (i.e. when fishing for salmonids) across England and Wales enables a minimum estimate of the net value of Welsh rivers to Welsh anglers. Annual trip costs identified by Radford et al (2007) for Welsh anglers fishing on Welsh rivers were £15 million at 2016 prices (adjustment by CPI). If the anglers' consumer surplus is 17 percent of this, it amounts to about £3 million a year. Capitalised by a factor of 10, assuming a Treasury discount rate of 3.5 percent (Khan & Greene, 2013) over 12 years, gives a net present value of rivers in Wales to Welsh anglers of about £30 million. This will be a minimum value as it is site specific rather than for all river fisheries. As indicated in Table 4, it is the same order of magnitude as that suggested for salmon rivers in the SAP Guidelines (Environment Agency, 2003) (i.e. equivalent to the market value of their fishing rights) though that is for all anglers not just Welsh residents.

Stakeholder Group		Salmon & sea trout fishing in Wales (from SAP Guidelines, EA,2003)	All river fisheries in Wales (see text for derivation)
Welsh Anglers	Annual Consumer surplus (£M)	-	3
	Capitalised Consumer surplus (£M)	-	30
All anglers	Capitalised Consumer surplus (£M)	30	-

Table 4: Annual and capitalised estimates of the value of river fisheries to Welsh anglers, net of their costs, to one significant figure.

As a reality check, it is worth considering how much this extra willingness-to-pay may amount to per angler. In 2016, there were 43,319 unique rod licence holders resident in Wales (NRW, pers. comm.). Not all will fish on rivers and of those that do, not all will fish exclusively on rivers (Simpson and Mawle (2001); Radford et al (2007) estimated that only 41 percent of their days fished in Wales were on rivers. The proportion of anglers who fish at some time on a river will be greater than this. Assuming that around 60 percent fish on rivers, that equates to about 30,000 anglers, to one significant figure. A total annual consumer surplus of £3 million indicates that, on average, river anglers would be willing to pay about £100 extra each year to maintain the quality of their regular river fishing sites. This average sum will not be typical of individual anglers, as the distributions of expenditure and willingness-to-pay are usually highly skewed, with a small proportion of people willing to pay large amounts compared to the majority. As such the median is a better indicator of what is typical. Spurgeon et al (2001) report a median equating to 5 percent of trip expenditure for game anglers, compared to the average of 17 percent. That indicates that only half Welsh river anglers would be willing to pay £30 or more extra per year to protect their regular river fishing site. The estimate seems reasonable.

4.2.2 What if?

The capitalised value may be used as an indicator of the scale of loss in net value to Welsh angler over the medium term, about a decade, while the annual figure indicates the short-term impact of total loss. Changes in the value to anglers may be estimated as in proportion to changes in the number of trips though such estimates will be crude.

4.3 Economic activity in Wales

4.3.1 Currently supported

The economic activity associated with angling tourism in Wales was stated by NRW (2013) to be £148 million in 2005, though the source of this estimate is not indicated. In 2017, Lesley Griffiths, Welsh Minister for the Environment, speaking in the Senedd referred to the value of fishing to the Welsh economy as £38 million. The latter probably derives from research announced in 2015 (Visit England, 2015) that estimated tourist spend (not GVA) on fishing trips in Wales as £38 million. Neither figure relates specifically to inland fisheries.

Although standard definitions of tourism include domestic day trips, White (2010b) defines a tourist visit as one that is outside the ‘usual environment’ thus excluding visits to any place that he/she goes to ‘regularly and frequently even if this place is away from his usual residence.’. The definitions used in the latest surveys of Day Visits for Visit Wales are similar (Kantar TNS, 2017). Many anglers fish ‘regularly and frequently’ as part of their normal routine and close to home. In South Wales, half of rod licence holders had a river offering fishing for salmonids within 3 miles of home (Simpson and Mawle, 2001). As such, estimates for angling related tourism will presumably exclude much regular and frequent angling activity close to home and will understate the economic benefits from angling as a whole.

In a report to the National Assembly, Nautilus Consultants (2000) made estimates of game and coarse angling activity in Wales, associated expenditure and the jobs supported. However, these estimates were based on limited survey evidence and, for game angling at least, were unrealistically low. Also, this study preceded much of the successful marketing campaigns by Environment Agency Wales and the Wales Tourist Board promoting angling in Wales (Beaufort Research, 2005), and the Environment Agency as a whole promoting angling more generally in both England and Wales.

The latest and most comprehensive estimates for all angling activity on rivers in Wales are from Radford et al (2007) for 2005. These can be used to estimate the proportion of all anglers’ expenditure in Wales on fishing rivers as indicated in Table 5.

Species fished for	2005 Days Fished on River (000s)	2005 River Expenditure (£M)	2005 GVA/ angler day (£)	2005 River GVA (£M)	FTE/ 1000 angler days	2005 River FTEs
Salmon/ Sea trout	175	12	30	5.3	1.5	263
Trout	313	17	22	6.9	1	313
Coarse	287	8	13	3.7	0.59	169
Total	775	38		16		745

Table 5: The number of days fished on rivers by all anglers, their expenditure in Wales and the income (GVA) and employment supported in Wales in 2005, derived from Radford et al (2007).

These estimates of angling activity are over a decade old and should be reviewed in the light of more recent data. One indicator of fishing effort for salmon and sea trout is the number of Environment Agency(EA)/ NRW salmon rod licences sold for angling in England and Wales. Table 6 shows that these fell by 12 percent overall from 2005 to 2016, though sales of annual licences, which generate the greatest activity, only fell by 8 percent.

Rod licence sales	2005	2016	Change
Salmon: short-term	10170	8023	-21%
Salmon: annual	23870	21992	-8%
Salmon: all	34040	30015	-12%

Table 6: Sales of short-term and annual rod licences for England and Wales for 2005 and 2016 (Cefas/EA/NRW, 2017).

The Environment Agency collects annual data for NRW on days fished for salmon or sea trout each year through catch returns from those who hold salmon rod licences. Despite it being a legal requirement, not all licence holders make a return. In 2003, a correction factor of 1.2 was used for days fished in the Salmon Action Plans (Environment Agency, 2003). This was greater than the factor of 1.1 applied to catches as some anglers declared their catches but not the days fished. Since 2003, the proportion of anglers making a return has fallen so a larger correction is required. A correction factor of 1.30 was applied to catches declared for 2016 (Cefas/EA/NRW 2017), so assuming that the under-declaration of fishing effort still needs to be greater, a correction of 1.4 might be applied for 2016. Using these correction factors on the declared number of days fished indicates that fishing effort in ‘Wales’ for salmon and sea trout fell by 28 percent from 84k in 2005 to 61k in 2016. This value for ‘Wales’ is likely to be slightly greater than for the actual country as it includes all days fished on the rivers Wye and Dee though not the Severn. Even the estimate for 2005 is about half that indicated by Radford et al (2007). Which is more accurate is unclear; there will be errors in both estimates. Here, the corrected days fished from catch returns are used as an index of angling activity for salmon and sea trout in Wales and the reduction of 28 percent applied to the 2005 estimate of Radford et al (2007). This indicates that 130k days were fished for salmon and sea trout in Wales in 2016.

There are no alternative estimates for fishing effort for other species in Wales. However, rod licence sales do not indicate a similar fall in angling activity. Sales of rod licences, required for fishing in either England or Wales, were only 2 percent lower in 2016 than in 2005, though as shown in Figure 1 they have been greater in between.

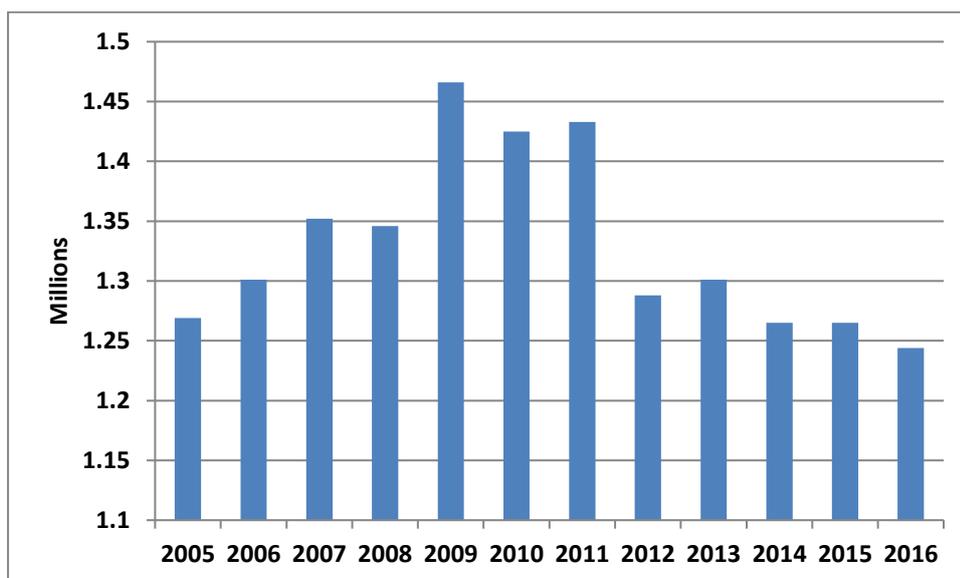


Figure 1: Sales of rod licences for fishing in England and Wales from 2005 to 2016 (Source: Environment Agency and NRW).

The Environment Agency commissioned a survey of angling and associated economic activity by English anglers in England in 2015 (RPA et al, in prep.). This found a substantial drop in angling on rivers compared with the survey for 2005 with major reductions in angling activity for migratory salmonids and coarse fish. In contrast, they found an increase in angling activity on rivers for non-migratory trout and grayling. Given the prevalence of trout and grayling fishing in Welsh rivers, compared to angling for non-salmonids, it is unclear how angling activity for species other than salmon and sea trout may have changed. Consequently, angling activity on Welsh rivers for non-migratory trout, grayling and non-salmonids is assumed here to reflect the slight reduction in rod licence sales, i.e. only a 2 percent fall since 2005.

Expenditure and income (GVA) estimates need to reflect increases in prices since 2005 so have been adjusted by the Consumer Price Index (CPI), a factor of 1.27 to 2016 prices (ONS, 2017). The adjustment is made to 2016 prices to be compatible with the last information on fishing activity but the subsequent rise to 2017 is insignificant, less than 3 percent.

Table 7 gives best estimates for the household income (GVA) and employment in Wales supported by angling on rivers in Wales. Estimates are given to only one significant figure. Given the uncertainties, it would be misleading to suggest any significant change from the 2005 estimates, other than that a drop for salmon and sea trout fishing seems probable.

Type of river fishing	Anglers' Expenditure (£M)	Household Income (GVA) (£M)	Employment (FTEs)
Salmon/ Sea trout	10	5	200
Trout	20	9	300
Coarse	10	5	200
Total (All species)	40	20	700

Table 7: Estimates of household income (GVA) and jobs supported in Wales by anglers' expenditure on fishing in rivers for different fish species in 2016; rounded to one significant figure.

It is possible that the economic impact associated with angling activity is, to some extent, underrepresented by these estimates. Firstly, it is possible that the expenditure on permits may not have been fully assessed by Radford et al (2007) who asked anglers to indicate their average permit costs per trip. This enabled accurate allocation of permit costs to particular types of fishing. However, it seems possible from the results of the 2015 survey in England, which asked for annual and day permit costs separately, that some expenditure on annual permits or club membership may have been missed in the 2005 survey.

Secondly, these expenditure estimates do not include all expenditure associated with an angling trip that was not directly related to angling. Spurgeon et al (1999) estimated the value of salmon and sea trout angling on the Afon Teifi to the local community. As shown in Table 8, they estimated that on trips from home that included fishing the Teifi for salmon and sea trout, anglers and their families spent almost a third as much again as was spent directly and indirectly on angling.

Type of expenditure	Within 25 miles of Teifi (£/yr)
Direct and indirect	570k (69%)
Additional	260k (31%)
Total for salmon and sea trout	830k

Table 8: Summary of total expenditure relating to angling for salmon & sea trout on the Teifi from Spurgeon et al (1999).

Not all such additional expenditure should be attributed to angling, if the primary purpose of the trip was not angling. In 2004/5, a Wales Tourist Board campaign promoting angling in Wales, included a 'Fishing Wales' magazine. Beaufort Research (2005) in an assessment of the campaign found that for two-thirds of those who had taken a holiday in response, fishing was the 'main reason for the holiday'. If this applies more widely to visiting anglers, it would be reasonable to attribute a significant part of this 'Additional' expenditure to angling as well.

Notwithstanding some degree of under-estimation, the estimates in Table 7 do indicate the scale of the income and jobs supported in Wales by angling on Welsh rivers. They are very similar to the estimates of the economic impact of the Wales coastal path in 2011/12, which '*brought an estimated £32 million to the economy which can be considered as £16.1 million of GVA, an estimated 730 person-years of employment.*' (Comley & Mackintosh, 2013).

4.3.2 What if?

Whilst indicating strategic importance, knowing the amount of ‘economic activity ‘supported’ by angling is not particularly helpful to NRW in making specific decisions. What is required is knowledge of how jobs and income would change under different options. The estimates of ‘economic impact’ provided by Radford et al (2007) can be used to indicate losses in income and jobs in Wales associated with the loss of:

1. salmon and sea trout fishing in Wales; and
2. all river fishing in Wales.

Radford et al (2007) recognised that if salmon and sea trout fishing were stopped in Wales, then some anglers would switch their activity to other species within Wales, while others, particularly visitors, would switch their angling activity to waters outside Wales. They argued that only the latter would hit income and jobs in Wales and estimated this ‘economic impact’. For income (GVA), the annual ‘economic impact’ of a cessation of salmon and sea trout fishing in Wales was £2.7 million, half of the ‘economic activity supported’ of £5.3 million.

They also estimated the ‘economic impact’ as loss of income (GVA) and jobs in Wales if all angling on inland waters ceased in Wales. Again it was assumed that some activity would switch to outside Wales if fisheries there were unaffected. Under this assumption, the ‘economic impact’ was two thirds of the ‘economic activity supported’. To obtain a crude estimate of the economic impact if only river fishing were lost, the proportion of fishing days made to rivers in Wales (i.e. 45 percent) may be applied to the overall economic impact for each species. This may overstate the loss as it is likely that if river fishing were stopped, some angling activity would switch to lakes and other still waters, or the sea.

The 2005 estimates of economic impact are updated in Table 9, by applying the ratio of economic impact: the economic activity supported from Radford et al (2007) to the 2016 estimates in Table 7, of household income (GVA) and employment (FTEs) supported by angling for each type of fish.

Economic activity in Wales by angling on Welsh rivers (2016 prices)	Annual Activity supported 2016	1. Annual Economic impact in Wales from loss of salmon & sea trout angling in Wales only	2. Annual Economic impact in Wales from loss of all river fishing in Wales only
Household income GVA (annual) (£M)	20	2	10
Jobs (FTE) (annual)	700	100	400

Table 9: The annual economic impacts on household income (GVA) and jobs in Wales if: 1. Salmon and sea trout angling stopped, in Wales; and 2. All angling on rivers stopped in Wales; rounded to one significant figure.

Given its remit NRW may also want to know the economic impact of increasing angler activity through restoration of salmonid fisheries and better marketing of angling opportunities. If stocks of

salmon and sea trout are restored, as on the river Wye, and marketing of angling opportunities revived for angling on rivers, then angling tourism would contribute more to jobs and income in Wales, especially in rural areas. There is little doubt that demand still exists as apparent from the increase in salmon angling activity on the Wye over the last decade as catches have improved.

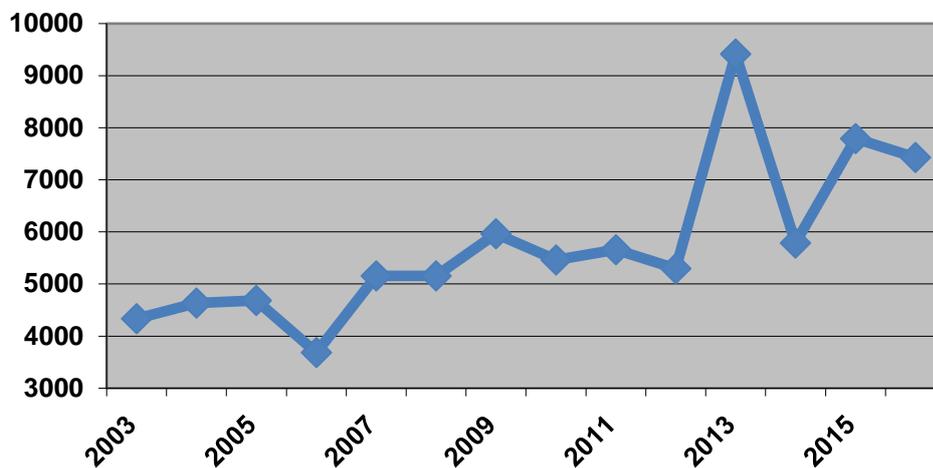


Figure 2: Days fished for salmon on the River Wye as declared on rod licence catch returns; Source: Environment Agency annual fisheries statistics (e.g. EA/NRW, 2017).

The gains indicated by Mawle & Peirson (2009) for an additional 1000 visitor days to Wales for angling, with additional household income (GVA) updated to 2016 prices using the CPI (ONS, 2017), are given in Table 10. Of course, there would be additional economic benefits from renewed activity by Welsh anglers.

Economic activity in Wales from angling on Welsh rivers (2016 prices)	Gain of 1000 visitor days for salmon/seatrout	Gain of 1000 visitor days for river trout
Extra Income (GVA)	£40,000	£50,000
Extra Jobs (FTE)	1.4	1.6

Table 10: Additional household income (GVA) and jobs in Wales derived from an additional 1000 days fished by anglers from outside Wales.

The concerns of underestimation of economic activity supported by river angling, discussed in the previously sections, also apply to the estimates of economic impact presented in this section.

4.4 Visitor activity

In 2005, anglers from the UK fished three-quarter of a million days on Welsh rivers; a third of these, 270k, were by anglers visiting Wales from England (Radford et al (2007). Fewer than half of one

percent of these visitor days were recorded from Scotland or Northern Ireland. Anglers from outside the UK were not included in the survey. It is not clear how many international visitors there are. About half of 1 percent of rod licence holders in 2015/16 did not have a postcode in England or Wales (EA, pers. comm.). However, the rod licence system was not designed to accommodate people without a UK postcode and it is likely that for some visitors the address recorded would have been a temporary UK address rather than home address. Radford et al (2007) found that visitors came from all over England with most days fished derived from adjacent regions, the North West and West Midlands, as shown in Figure 3.

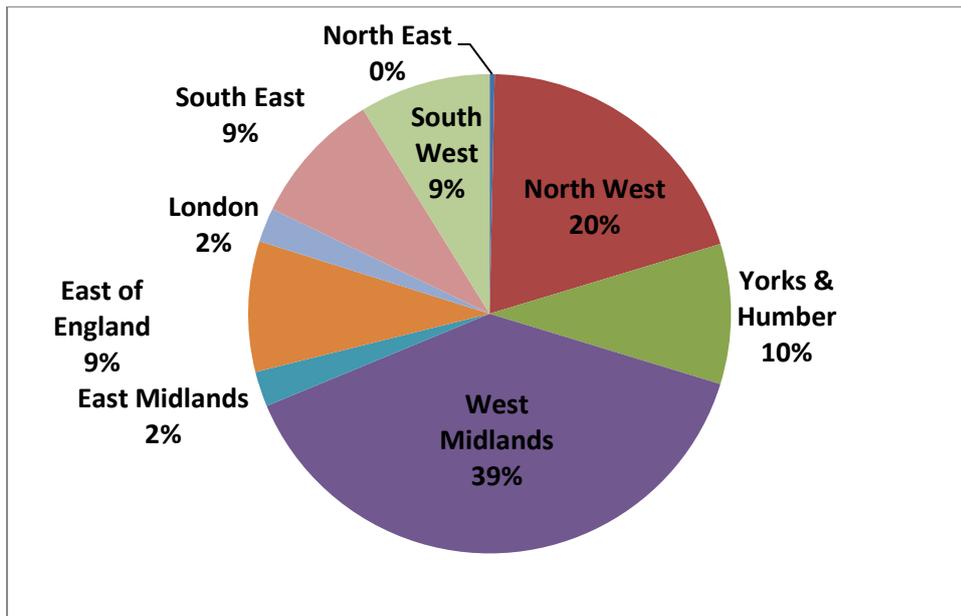


Figure 3: The origins of 270k days on rivers in Wales in 2005 fished by anglers from different English regions: derived from Radford et al (2007).

Many, probably most, of these days fished by visitors will be day trips. There are no estimates of the number of river anglers who make trips from home involving an overnight stay in Wales, (i.e. 'staying visitors'), whether visitors or by Welsh residents, or how many days fishing this comprises.

5. Comparisons to canoeing and other water sports

The information about participation and associated economic values for inland fisheries is far more detailed and comprehensive than for most other water sports. As such, it will be difficult for NRW or Welsh Government to make valid comparisons between activities related specifically to river fisheries. Though estimates may be available for angling, comparable estimates are rarely available for competing activities. A key reason for this is that anglers are required to hold a rod licence. The rod licence database not only provides minimum figures for the number of participants on inland waters but also information on anglers' origin, age, and licence type, and type of fish sought. It is therefore a cost-effective sampling tool for surveys.

5.1 Participation

Arkenford (2016) has conducted annual **watersports participation surveys** in the UK on behalf of boating and other organisations since 2005. They include participation estimates for both angling and canoeing, and in 2016 give a separation between freshwater and sea fishing. These estimates are not reasonable, at least for freshwater angling. The 2016 survey gives the total number of UK participants over 16 in freshwater angling to three significant figures at 352k. This estimate may be imprecise, in which case three significant figures are misleading; more likely it is inaccurate, i.e. biased. That it is too low is clear from EA/NRW rod licence sales for England and Wales that year, shown in Appendix 4. Excluding Junior licences indicates that there were 871k licence holders over 16 years old. From previous years' data, less than 1 percent of licence holders come from outside the UK. While it is likely that about 10 percent of licence holders did not actually fish in 2016, based on the proportion recorded by Simpson & Mawle (2001), that still leaves 780k UK residents who did fish in freshwater in England or Wales. This is more than double the Arkenford estimate. Furthermore, that takes no account of angling in Scotland or Northern Ireland, or of unlicensed anglers. The latter probably comprise a large proportion of the people who go freshwater fishing in a given year even if they account for relatively few days fished (Simpson & Mawle, 2010).

The 2016 estimate for the number of UK anglers, sea and freshwater, of 1,120k is close to that recorded in previous Arkenford surveys and within the precision of the 2013 estimate of 1,035 (Min. 933k to Max.1,138) (Arkenford 2013). That suggests that there is a persistent methodological problem with the Arkenford 'Watersports Participation' surveys rather than just sampling variance, i.e. imprecision. It would therefore be unwise to rely on even the relative levels of freshwater angling and boating indicated by these surveys.

A further indicator that the Arkenford surveys are inaccurate is comparison with the Sport England Active People Survey 7 results for 2014, reproduced in Table 11. While these relate to a slightly larger age group, the number of people coarse fishing every month and only in England is almost twice the Arkenford estimate for the whole UK for any level of activity or type of freshwater fishing in 2016.

Activity	No. of people (14+) participating monthly	Percentage of the adult population (14+)
Coarse fishing	632,800	1.4
Game fishing	155,800	0.4
Sea fishing	245,900	0.6
Canoeing	133,300	0.3

Table 11: Average monthly participation in fishing and canoeing in England, October 2012-October 2013 from the Sport England, 2014, Active People Survey 7 (from Comley & Mackintosh, 2013).

The **2014 Outdoor Recreation Survey for Wales** (NRW, 2015) adopted different techniques to survey the Welsh population. It also had a large sample size of almost 6000 respondents to give good precision. The results of the survey are deemed official statistics. The survey aimed to provide insights not only into current activity levels by Welsh residents but also factors limiting participation. However, there is no separation between sea fishing and fishing on inland waters, let alone rivers. Similarly, there is little disaggregation of other water sports, other than into motorised and non-motorised.

Of the Welsh population over 16 years old, 11 percent had been fishing in the last year, similar to previous surveys in 2011 and 2008. A similar proportion, 10 percent, had participated in all non-motorised waters sports. There was a level of unsatisfied demand for both, with 3% wanting to fish more often and 4% wanting to do more water sports of any description. The questionnaire was ambiguous about whether angling was to be considered a water sport and it is likely that some respondents considered it was. So the unsatisfied demand for watersports may include some demand for angling. The main reason for lack of participation was being too busy.

Latent demand for both fishing/angling and canoeing/kayaking was also reported by the **Active Adults Survey 2014 State of the Nation**, with a similar proportion of men, 9 percent, wanting to do more of the two activities (Sport Wales, 2014).

5.2 Economic activity

Visit Wales commissioned **Miller Research** working with the Wales Activity Tourism Organisation to estimate the importance of outdoor activities to the Welsh economy (White and Smith, 2014). Angling was not included so there is no direct comparison with the watersports, including canoeing, covered by the survey. Also, there is no separation of coastal activity from that on rivers or other inland waters, or amongst watersports in general. Lastly, as social media was used to provide a sample, the conclusions will have been compromised to some degree; this view is also noted in the Reconomics review by Comley & Mackintosh (2013). The research provides estimates of average expenditure per trip for non-walkers, both for day trips and for overnight stays. Miller Research also suggest multiplier values that might be appropriate for different types of expenditure by residents and visitors to Wales. These estimates might give some indication of changes in economic activity associated with any additional watersports activity on rivers. In view of the sampling problems these will probably be unrepresentative and exaggerated so should be treated with caution.

Estimates of **attributable spend on domestic tourism**, including day trips, by activity in 2015 were made for different sports in England, Wales and Scotland, commissioned by the respective tourism agencies (Visit England, 2015). These are shown in Table 12. They indicate that ‘Fishing’ generated more tourist expenditure in Wales than ‘Watersports’, in contrast to England. Again, there is no separation by watersport or by location. Also note that ‘tourism’ will not include all activity (see comments on definitions of day trips in S.4.3.1 above).

Activity	Wales	England	Wales: England
Golf	£22m	£256m	9%
Fishing	£38m	£131m	29%
Watersports	£23m	£204m	11%
Cycling/ Mountain biking	£54m	£319m	17%

Table 12: Estimates of attributable spend on domestic (within the UK) holidays and day visits by activity and destination (£m) from Visit England (2015).

In summary, there is very limited information available about:

- the demand for (willingness to pay relative to costs) canoeing; and
- additional economic activity in Wales generated by, increased access; as well as
- the scale of the impact of wider access on angling activity.

As such it is impractical to estimate the economic benefit to Welsh canoeists (their additional consumer surplus) or the gain to the Welsh economy from their additional expenditure. If there were a substantially negative impact on angling activity on rivers, the estimates in Table 9 indicate the potential scale of impacts on the jobs and household income (GVA); Table 3 and 4 indicate the scale of loss in the net value to fishery owners and Welsh anglers respectively. These tables indicate total losses, either annual or capitalised. In reality, losses are likely to be partial.

6. Monitoring changes in the economic value of angling on Welsh rivers

Rod licence sales to Welsh residents can provide an index of the number of angling participants in the country. However, the significant changes to the types and prices of licences offered from 2017 make comparisons with previous years difficult. These changes include free licences for Juniors (12 to 16-year olds) and a rolling 365-day licence from the day of purchase. For compatibility with earlier years the Environment Agency should be asked to provide the number of unique anglers holding each type of licence at any time within a given financial year, from 1 April. Ideally this should be provided for each Area of Wales, i.e. North, South East and South West.

Similar statistics would be useful for England, especially for those areas adjacent to Wales, from where many anglers come to visit Welsh fisheries.

If angling activity per licence holder stays the same, the number of unique licence holders of different types will provide an index of angler days fished by different sectors of the Welsh population. However, the annual angling activity per licence holder may well change as a result of the changes in the licence structure, and perhaps other reasons.

For non-migratory trout and coarse licence holders, there is little alternative than to periodically survey licence holders. There is no need for a large survey, provided the survey technique used is robust to avoid significant bias. Adequate precision can be obtained for many parameters with a hundred respondents per Area, as were obtained in the 2001 survey of licence holders (Simpson and Mawle, 2001).

For salmon licence holders, the number of anglers fishing each river and the number of days they fish on each river is already reported in the annual fisheries statistics for each river based on anglers' catch returns (e.g. EA/NRW, 2017). These parameters could also be provided separately for Welsh residents and visitors to Wales. Indeed, it should be relatively straightforward to obtain annual data for the angler origins by each NRW or EA Area, and the level of fishing effort coming from each. Given the proposed further restrictions on angling from 2018, such monitoring could indicate the scale of impact on angling activity and the balance of impact for each river between:

- Local Welsh residents (from that Area)
- Other Welsh residents (from other Welsh Areas) and
- Visitors to Wales (with some further breakdown they might be used as an index for 'staying visits').

One problem could be the effectiveness of the catch return system which has declined in recent years. The proportion of anglers making returns needs to be improved, also the accuracy of those returns, especially fishing effort, needs to be checked and, if necessary, improved.

The catch return has for some years recorded the number of days fished 'before' and 'after' (it should be 'from') the 16 June by river. That information could be used to provide seasonal information on fishing effort, by local and visiting anglers, and therefore when benefits accrue to the local economy and local anglers.

If NRW and Welsh Government wish to have more reliable information on anglers' expenditure on different types of fishing in Wales as well as activity, and therefore the significance of angling on rivers and other waters to the people of Wales, then periodic surveys will be needed. Historically, the Environment Agency (2008) indicated that it would do this every five years. However, that was at a time when better funding was available due to high licence sales and income. A subsequent survey of economic activity associated with inland fisheries in England has only been done in the last two years (RPA, in prep.). That survey indicates significant changes in the types of fishery visited in England. Similarly, there has also been a recent socio-economic study to underpin angling development and marketing in Ireland to address a deficit in recent, in-depth information (Tourism Development International, 2013).

Given the political objectives indicated by the recent Welsh legislation linked to sustainable development and the environment, it may be advisable to plan to obtain similar information about angling in Wales, if not the wider values of fish and fisheries, within the next few years. It should be remembered that market values and economic activity associated with angling only represent part, perhaps a small part, of the economic benefits to the Welsh people from inland fisheries.

It may also be useful to update information on the balance of inland angling activity across the border with England to help in the allocation between the two countries of income raised by rod licences.

Recommendations for monitoring:

- 6.1 Use the rod licence database to monitor changes in the number of resident Welsh anglers and potential visitors from England.
- 6.2 Use the information on salmon licence catch returns, linked to the rod licence database, to monitor changes in the overall and seasonal use of individual salmon and sea trout rivers by local and visiting anglers.
- 6.3 Plan to commission reliable research within the next five years to provide detailed, up-to-date information on angling activity and expenditure within Wales, perhaps as part of a wider assessment of the value of fish and fisheries in Wales.

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Glossary of terms and abbreviations

With acknowledgements to definitions in Radford et al (2017) and Lawrence and Spurgeon (2017).
See also: <http://www.teebweb.org/resources/glossary-of-terms/>

Bequest value: The value that people place on knowing that future generations will have the option to enjoy something.

Capitalised value: The present value of the stream of future annual values to a given time horizon, each discounted at a specified rate.

Coarse fish: non-salmonid fish such as chub, pike and roach, including grayling

Consumer surplus: The difference between the amount paid for a good or service and the maximum amount that an individual would be willing to pay, also called net willingness-to-pay.

CPI, Consumer Price Index: see ONS (2017)

Economic activity supported: Economic activity such as household income (measured by GVA) and employment (measured in FTEs) resulting from all the combined direct, indirect and induced effects associated with the change in anglers' expenditure resulting from the loss or gain in angling opportunities.

Economic impact: Economic activity such as household income (measured by GVA) and employment (measured in FTEs) resulting from all the combined direct, indirect and induced effects associated with anglers' expenditure.

Existence value: The non-use value that people place on simply knowing that something exists, even if they will never see or use it.

FTE: Full-time job equivalent

Game anglers: Those fishing for salmon, sea trout and brown trout.

GVA, Gross Value Added (GVA): Measurement of annual household income in the form of wages, profits, rents and income from self-employment (Radford et al, 2007).

Office for National Statistics (2016) defines GVA as: *'...a measure of the contribution to gross domestic product made by an individual producer industry or sector. The gross value added generated by any unit engaged in production activity can be calculated as ... the sum of the factor incomes generated by the production process.'*

'GVA can be compiled using the income approach. This sums all income generated by production activity (factor incomes) and includes employment income ..., self-employment income ... and profits...'

NRW: Natural Resources Wales

Person years of employment: The number of FTEs employed multiplied by the number of years the employment lasts.

Net Present Value: The capitalised value of a stream of future net benefits, that is the discounted value of future benefits net of costs.

Salmonid: includes salmon, sea trout and brown trout.

Total Economic Value: The sum of all the relevant use and non-use values for a good or service.

WG: Welsh Government

Appendix 1: Specification for the review

The economic value of angling in Welsh rivers

Overall:

Undertake a concise review of relevant studies of economic values derived from angling on Welsh rivers to the people of Wales. Focus on salmonid fisheries, principally those for salmon and sea trout.

Specifically:

1. Recommend the best metrics to reflect the value of angling to fishery owners and anglers, and the wider population particularly impact of angling related expenditure on jobs and income.
2. Provide best estimates of the current total values of such metrics based on available studies, indicating, where possible, how such values might change in response to changes in, or a total cessation of, these types of angling activity in Wales.
3. Identify, in general terms, who the fishery owners and anglers are, i.e. which segments of the population they come from. Also, indicate key components of anglers' expenditure, especially that of tourist anglers, to identify which types of business are the key beneficiaries.
4. Recommend metrics on river fisheries, meaningful to decision makers in NRW and Welsh Government, that can be compared to other sectors, competing for resources including salmonid net fisheries, canoeing, and sea fisheries.
5. Advise on possible ways to monitor changes in the economic value of angling on Welsh rivers using existing data collection systems (e.g. catch recording) where possible.

Appendix 2: Angler expenditures and their direct, indirect and induced effects.

Excerpt from: Radford et al (2007):

1.3.2 Regional expenditure and its direct, indirect and induced effects

The full effect on regional income and employment of each (gross or net) pound of angler expenditure depends, among other things, on what the angler purchases and the strength of the direct, indirect and induced effects. These effects are explained below.

The direct effect on a region is simply the increase in local income and employment arising from initial angler expenditure. Through a combination of taxation and the purchase of supplies from outside, a proportion of this initial expenditure will be immediately lost to the region, and can be ignored. However, a proportion of angler expenditure will remain within the area. It is this proportion which creates the direct effect. For example, the direct employment effect of angler expenditure on, say, accommodation is simply the proportion of employment in hotels that is dependent on angler expenditure. The direct income effect of angler accommodation expenditure is the wages and profits paid by hotels to households in the region.

Some categories of expenditure have a minimal direct impact. For example, only about five per cent of spending on petrol has a direct effect locally; 95 per cent 'bounces off' through tax, duty and the purchasing of inputs from outside. In contrast, angler accommodation expenditure has a strong direct effect. The composition of angler expenditure is thus important in determining the magnitude of the direct effect on regional incomes and employment.

Indirect effects can arise from the direct effect. For example, a hotel may purchase butcher supplies from within the region. This supports the wages of the local butcher's staff, the butcher's own income from self-employment and perhaps the rent charged by the shop owner. It also contributes to employment in the butcher's shop. These effects are known as first round indirect effects.

Further indirect rounds can be considered. The butcher may purchase some of his supplies from a local abattoir, thereby supporting the wages of abattoir staff and the abattoir's profits. This also contributes to employment in the abattoir. There will be further rounds of, albeit successively smaller, indirect effects. For example, the abattoir may purchase livestock from local farmers, who in turn may purchase building services from local companies. The combined impact of direct and indirect effects is modelled by "Type I" multiplier analysis. Among other things, this analysis calculates the total Type I household income in the region (measured by gross value added or GVA) and regional employment (measured by full-time equivalents or FTEs) dependent on the fishery.

Both the direct effect and every round of indirect effects increases household incomes in the region in the form of wages, profits, rents and income from self-employment. Thus, the income of a diverse range of households in the region will be increased as a result of angler spending (such as hotel workers, hotel owners, butcher's staff, the butcher, butcher's landlord, abattoir staff, owners of the abattoir, farm workers, the farmer, building workers and so on). In each spending round, a proportion of these regional income streams are spent on goods produced within the region, creating further increases in regional income and

employment. This is the induced effect. "Type II" multiplier analysis incorporates these induced effects, enabling estimation of the corresponding Type II total income effect (Type II GVA) and Type II total employment (Type II FTEs). In this report, we only record the outcome of the Type II analysis.

Appendix 3: List of angling clubs providing access to river fishing in Wales, compiled by Dave Collins.

River fishing in Wales: 85 angling clubs

1. North Wales: Clubs (28)

Bala and District AA
Bangor on Dee Salmon AA
Betws y Coed AC
Bryn y Pys AA
Cambrian AA
Capenhurst Angling Club
Ceiriog Fly Fishers
Cerrigydrudion AA
Corris and District AA
Corwen and District AC
Dolwyddelan AA
Dolgellau AA
Dwyfor AA
Glaslyn AA
Hoylake Flyfishers
Llangollen Maelor Angling
Llanrwst AC
Ogwen Valley AA
Plas Madoc Fishing Association
Prince Albert AS
Pwllheli and District AA
Rhyl and St Asaph AA
Rossett and Gresford Fly Fishers Club
Seiont, Gwyfai and Llynfi Fishing Society
Upper Tanat FC
Vale of Clwyd AC
Warrington AA
Wirral Game Fishing Club

2. South Wales: Clubs (29)

Aberdare and District AA
Afan Valley AC
Caerphilly and District AA
Clwb Godre'r Mynydd Du
Crickhowell and District AS
Cwmbran AA
Ffynon Taff AC
Garway Fly Fishers Club
Glamorgan Anglers Club
Glyncornel AA
Glynneath and District AA
Gwaen Cae Gurwen AA
Gwent AS
ISCA AC
Islwyn and District Anglers
Llanbradach AC
Llynfi Valley AA
Merthyr Tydfil AA
Monnow and District AA
Neath and Dulais AC
Ogmore AA
Osprey Fly Fishers Association
Pencoed and District AA
Pontardawe and Swansea AS
Pontarddulais and District AA
Taff Bargoed AA
Tawe and Tributaries AA
Tregate AC

Upper Rhondda AA

3. Powys: Clubs (10)

Brecon AS
Caersws AA
Groe Park and Irfon AC
Llanbrynmair and District AC
Llandrindod Wells AA
Midland Flyfishers
Montgomeryshire AA
Rhyader and Elan Valley AA
Sirhowy AC
The New Dovey Fishery Association

4. Carmarthenshire, Pembrokeshire and Ceredigion: Clubs (18)

Aberaeron Town Angling Club
Abergwili Angling Club
Aberystwyth AA
Ammanford & District AA
Carmarthen Amateur AA
Carmarthen and District AC
Cross Hands and District AA
Llandeilo AA
Llandovery AA
Llandysul Angling Association
Llangadog AA
Llanilar AA
Llanybydder AA
Nevern AA
Pembrokeshire Anglers Association
Teifi Trout AA
Tregaron AA
Whitland AA

Appendix 4: Rod licence sales data for 2016/7 for England and Wales (EA/NRW pers.comm.)

Table A4.1: No. of EA/NRW rod licences sold to residents of Wales and outside Wales

<i>Salmon</i>	Wales	England and beyond
Disabled	311	591
1 day	587	5468
8 day	127	1957
Full	2,429	8758
Junior	308	1208
Senior	1,655	6565
Upgrade Disabled	3	10
Upgrade Full	73	139
Upgrade Junior	2	6
Upgrade Senior	19	81
Total	5,514	24,783
<i>Coarse & trout</i>		
Disabled	2,137	37831
1 day	16,334	350650
8 day	1,550	48841
Full	19,475	511742
Junior	2,244	48357
Senior	5,994	168938
Total	47,734	1,166,359
All licences	53,248	1,191,142

Table A4.2: No. of unique licence holders in 2016/17 resident in Wales and outside Wales:

Wales	England & beyond	Total
43,319	961,714	1,005,033

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