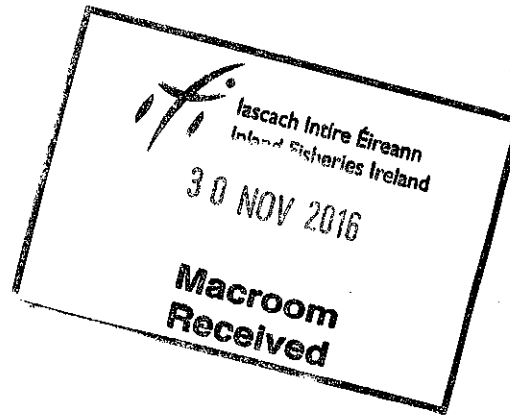


Culdee,
The Pier,
Annaghdown,
Co. Galway.

27 October 2016



Policy Review
Inland Fisheries Ireland
Sunnyside House
Macroon
Co. Cork.

**Re : Submission from Lough Corrib Trout Angling Federation
on 'Public Consultation – Pike Management in Brown Trout Fisheries'**

Reference Docs :

- Lough Corrib Brown Trout & Pike Policy Document 2016 (Oughterard Anglers & Boatmen Association)
- Lough Corrib Trout Angling Federation Policy on Angling Development 2016
- IFI Brown Trout Policy 2014
- IFI Pike Policy 2014.
- National Strategy for Angling Development.

A Cara,

As Chairman, I am writing to you on behalf of Lough Corrib Trout Angling Federation, representing the 13 Trout Angling Clubs of Lough Corrib comprising of Annaghdown Angling Club, Ballindiff Angling Club, Braithreacht Angling Club, Commercial Angling Club, Cornamona Angling Club, Garda West Angling Club, Galway & Corrib Angling Club, Oughterard Anglers & Boatmen Association, Collinamuck Angling Club, Moycullen Angling Club, Headford Angling Club, Cong Angling Club and Kilbeg Angling Club.

Notwithstanding this submission each of the Clubs will be making their own views known to the Review Group.

It is universally acknowledged that Lough Corrib is the best wild brown trout fishery in Ireland and probably the best in Europe.

We believe that maintaining and improving the status of Lough Corrib as a world class wild brown trout fishery should be the guiding principle for the continuing management of the lake.

Lough Corrib Trout Angling Federation was established with the aim of protecting the interests of it's Member Clubs in the well-being of the lake and improving the angling

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facilities for all anglers. This involves trout stream development / improvement, stream enhancement and protection of the lake as a wild brown trout and salmonid fishery. In some respects this correlates with the recently published National Strategy for Angling Development by the IFI. While the aims and objectives of both organisations are ultimately the same, there are some differences in approach. The purpose of this Policy document is to set out the Federation's approach to achieving it's own aims and how we might co-ordinate the overall improvements needed to maintain and improve the angling facilities our Member Clubs and for all anglers, including visiting anglers and non-club anglers. The Federation is aware that this Policy will not satisfy all Members but it is intended to set out the parameters within which we might work with as many interested parties as possible including IFI and OPW. In legislation, these two bodies are tasked with the responsibility for the protection, management and conservation of Ireland's inland fisheries and sea angling resources. For many years the Federation and it's predecessor has worked with IFI / Western Fisheries Board at local level through financial support from individual Clubs, labour from Club Members and the provision of materials from Clubs, which unfortunately does not appear to have been fully appreciated. In addition, the Federation gratefully acknowledges the tremendous support and input from the Clydagh Foundation and Jeremy Harmon. All this was given with no strings attached and in a spirit of co-operation. It is the intention of the Federation to continue this co-operation with the IFI.

At a recent Meeting of the Federation Liaison Committee the following matters were proposed as the main thrust of the Policy :

1. Efforts will be made to have Lough Corrib recognised under the EU Habitats Directive, Annex I & Annex II, as a Wild Brown Trout and Salmonid Fisheries.
2. The Federation will place particular importance on Stream Development, Enhancement and Protection as the essence of maintaining and improving fish stocks for the benefit of Anglers. This may be progressed by co-operation with IFI or through direct involvement of Clubs in their own specific areas. The input of individual Anglers and Clubs over many years must be recognised by IFI. The Federation will work with the local IFI Staff in drawing up a progressive programme of works and through Cairde Loch Coiribe will contribute to these works through affordable finance and labour.

Extracts from IFI Brown Trout Policy 2014 Document

"Brown Trout Policy Review Group Management Recommendations

1. Executive summary.

Brown trout are one of the very few indigenous fish species in Ireland. Geographically, they are widespread, being found in every catchment in the country.

In socio-economic terms, this fish species is very important, being highly regarded as an angling species by both Irish and tourist anglers alike. Because of its temperate climate and the shallow productive nature of its lakes, Ireland is the only country in Western Europe where lakes can support large trout stocks, which provide a unique angling opportunities for fly fishermen. The relatively poor fish fauna in Ireland compared to other European countries means that Irish waters generally have a high capacity to support brown trout populations in the absence of many competitor and predatory fish species found in other European waters.

2. Scope and objectives.

The Brown Trout Policy Review Group were charged with the generation of recommendations that would ensure the long-term sustainable management of this resource from both a conservation perspective while still retaining the socio-economic value of this resource to the community. The group did so in the knowledge that the trout's greatest piscivorous predator, the pike, also had a socio-economic value in some of the larger lake trout fisheries.

5. Policy recommendations.

5.1.3 *Seek the inclusion by the EU of Irish brown trout stocks in the Annex I or II species list of the Habitats Directive. On-going genetic studies of this species are illustrating the rich diverse nature of these stocks in Ireland and showing that the trout populations in our larger rivers are complex stocks entirely reliant on recruitment from their tributary sub-catchments. Failing the introduction of such a measure, consider the designation of the more important trout waters as National Heritage Areas (NHAs). The group feel strongly that wild Irish trout stocks be recognised and respected formally in law under the Fisheries Acts.*

5.1.4. *Consider the designation of specific rivers and lakes as managed wild brown trout fisheries. The inference here is that these waters would be managed to optimise brown trout stocks. In some instances (not all) this would recognise the validity of pike management programmes, the necessity for different regulations in relation to pike angling (see Section 5.4) and the particular sensitivity of such waters to organic pollution problems. The available IFI survey data base would place the following specific waters in this category: Lakes – Loughs Leane, Inchiquin, Corrib, Mask, Carra, Cullen, Conn, Melvin, Sheelin, Ennel, Derravaragh, Arrow, Inchiquin and Loughrea Lake.*

Rivers – Certain sections of many catchments which are known by IFI personnel to support quality brown trout stocks. For example, the Clare, Black and Robe Rivers in the Corrib, the Suir in Munster, the Liffey in Leinster and many more.

5.4. *Management of pike populations in designated managed wild brown trout fisheries. The review group feel that some changes are desirable in relation to current policy on this issue. The following proposals are made:*

1. *The group accept the science in relation to the necessity for controlling pike stocks in*

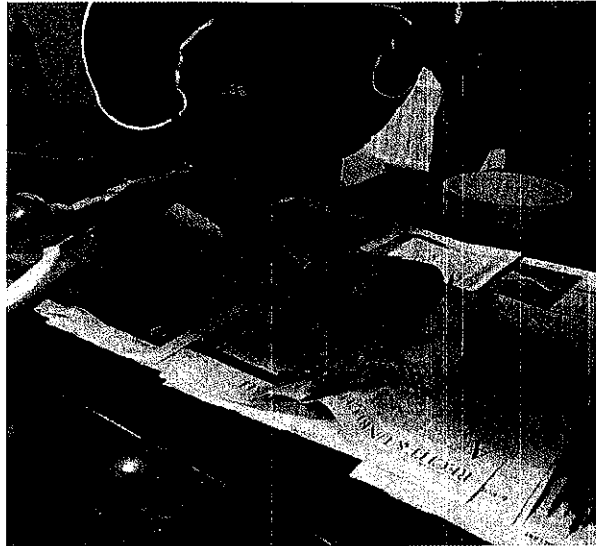
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“designated managed wild brown trout fisheries” – a list of these waters has been provided above in Section 5.1.4. Scientific evaluation has shown that, currently, pike management is not necessary in a few of the aforementioned waters – Loughs Derravaragh and Ennel. This is an irrelevant issue currently in relation to Loughs Leane and Melvin where no pike are present. In accepting the science there is a recognition that IFI have to undertake pike removal exercises in the aforementioned waters.”

While being selective in the above Extract, the Federation would accept much of the above but feels that the implementation of many of the Recommendations has been tardy and put on the long finger much to the frustration of our affiliated Club Members. The fishing returns over the last few years of brown trout and salmon on Lough Corrib (including it's feeder systems) have deteriorated and cannot be explained by terms such as “cyclical” or “unfavourable weather conditions”. We contend that the presence of pike in the lake and the feeder systems have much to do with this situation.

We point out to the Review Group an article published in the Connaught Tribune dated 18 November 2016 by Danny Goldrick (Copy attached) titled “ Predatory Pike Wipe Out Fish Stocks on Local Lakes” in which he draws on his experience over many years of the takeover of some of the feeder system rivers and smaller lakes by pike in fisheries which were renowned as brown trout and salmon waters in days gone by. These pike were illegally introduced into the System (e.g. Owenriff River System). It is imperative that these pike be greatly removed if the previous existence of trout and salmon is to be restored. On a recent Pike Competition run by Lough Corrib Trout Angling Federation on the Owenriff River System, with Section 59 Authorisation, one of the pike caught had a fine salmon stuck in it's gullet with spawn spilling out (Photo attached).





The Federation feels it would be beneficial if a serious survey of trout & pike presence in the Owenriff System (on the upper reaches of the river including the lakes). This would provide clear and irrefutable evidence of the total imbalance which is evident to Federation Member Clubs. We are of the opinion that this imbalance should not be tolerated and must be addressed immediately to ensure the spread of pike (predator species) from that system does not become irreversible.

The introduction of the Bye-law 805 (2006) placing restrictions on the taking of pike from Irish lakes was probably a necessary evil at the time, but, while relevant in some fisheries, may be counter-productive when applied to Lough Corrib and we feel the Bye-law should be lifted / eased on the lake.

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We therefore ask that this Fisheries Bye-law No. 805, the conservation of pike law, be lifted in wild brown trout fisheries, including Lough Corrib. We feel that this Bye-law in its present form is too sweeping so as to take into account the needs of a managed salmonid fishery.

It is widely accepted that pike control is an essential tool in the management of a wild brown trout fishery. From the most recent pike study of consequence carried out on Lough Corrib, in 1996 & 2012, it was asserted that an unmanaged pike population would account annually for approximately 255,000 trout of 30-35cm. The 1996 Study led to the reintroduction of gill netting on the Corrib in an effort to control the pike population. This gill netting and new methods of electrofishing coupled with the cropping of pike by anglers seems to be doing the job of managing the pike population effectively.

However the introduction of the pike conservation bye laws, firstly in 2005 and amended in 2006 led to a serious reduction of the cropping of pike by Anglers and this has led to an increase in the pike population in the lake and has had detrimental effects on Coarse Angling Businesses around Lough Corrib. Many of these businesses have closed and the Pike Angling Tourists have no longer look on holidays to this area as enjoyable. The reason for this is the restrictions placed on Pike Anglers regarding the current bag limit and size.

In 2009 and 2010 anglers reported a serious lack of trout in the 30-35cm size, and reported seeing good numbers of smaller fish. These smaller fish were noted in 2009 but did not seem to translate to keepable size trout in 2010. This is very similar to the observations made by anglers in 1995 and 1996 and the conclusion of the 1996 report was that pike predation was the reason for this due to the preference of pike to feed on trout in the 30-35cm range.

Recent gill netting results for 2006 -2010 on Corrib have shown a mean weight of pike of almost 1.2 kg. This represents an increase of 20% in the mean weight of pike caught during gill netting in the 1968- 1983 period. This would indicate that the population of pike in Corrib is growing and this is most likely due to the over regulation of pike angling.

While there was obviously a need to bring in Pike Conservation Bye-laws to prevent the over exploitation of pike in recognised pike fisheries, there is no evidence to suggest that there was any need to protect pike stocks in managed wild brown trout fisheries. It would actually seem to be counter-productive as it led to the removal of an effective tool for selective predator control.

During the time when there was no angling regulation regarding pike on Corrib, anglers were able to assist in the pike control programme by removing larger pike from areas where the stock seemed to be getting too large. Anglers were efficient in removing some of the larger hen fish from specific areas, which we feel was a helpful exercise. The average size of pike being removed by gill netting, 1.2 kg would represent a hen fish capable of producing approximately 8,000 eggs, in stark contrast to this a large hen of 100 cm is capable of producing over 200,000 eggs.

Therefore we assert that the selective removal of larger hens at certain times of the year was very helpful in keeping down the number of juvenile pike entering the lake.

Billy Kavanagh (Chairman) Michael Ryan (Secretary) Brendan Ferguson (Treasurer) (2016)

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It would appear that the introduction of these Pike Conservation Measures on a managed wild brown trout fishery is of no benefit.

It would appear on every level to be counter-productive as the tourism sector has experienced a serious decline, not only from game anglers but more interestingly from pike anglers also.

It would appear that continental pike anglers feel that they are being over regulated and have voted with their feet. Kingfisher, the most significant German Fishing Tour Operator has observed a fourfold decrease in its Irish bookings since the introduction of the 2006 Bye-law.

This is reflected in a serious reduction of bookings for winter pike fishing among guest houses around the Corrib.

We feel that this Pike Conservation Bye-law needs to be revisited with regard to managed wild brown trout fisheries. As there are only a handful of recognised wild trout fisheries of consequence in Ireland, we feel that they should be exempted from this bye-law. There are numerous pike fisheries of note throughout Ireland, capable of producing quality pike angling and we feel that a properly controlled pike population on Corrib will still draw pike anglers as the lake has a lot more to offer the visitor than just catch returns.

We hope you will revisit these Regulations and change the anomaly that exists regarding protecting pike in a system where they need to be controlled.

A further concern of the Federation is the decline of the pearl mussel population on the Owenriff River System

We would like to highlight the importance of salmonoid hosts in the life cycle of the freshwater pearl mussel which is protected under EU law (if Ireland doesn't protect the pearl mussel, the country is wide open to serious fines etc). The char has already disappeared, the cause not known but could it be the prevalence of pike ? is the Brown Trout next on the list ?

Another massive concern is the danger to the local economy should our game fishery become a mixed fishery. The importance to the local economy of trout fishing cannot be over-stressed and should not be under-estimated. This importance is associated with Jobs, Business, Tax Revenue from native and visiting game anglers. Fishing Tackle Shops, Ghillies, B & Bs, Entertainment Industry, Restaurants, Hotels and Angling Centres right around the lake would be devastated beyond repair.

Ireland has only a small number of brown trout fisheries, the bulk of which are in the West of Ireland and Lough Corrib is the most important. We are fast getting to the situation of having to mount a "Save our Lake" campaign with the intention of protecting Lough Corrib and it's native Brown Trout species. Instead of being the envy of Europe we could quite easily become the joke of Europe.

Lough Corrib Trout Angling Federation has no problem with pike angling either in the lake itself and it's feeder systems but the pike population must be controlled. In general terms, the

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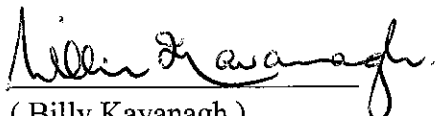
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majority of pike anglers reside and fish in the north midlands and Leinster and they fish to their hearts content. The Federation is concerned with Lough Corrib as a brown trout fishery and wish to keep it as such. We agree totally with the submission of Oughterard Anglers & Boatmen Association and fully endorse this well researched, presented and well-thought out document.

Much of the scientific data arrived at by IFI recognises the importance of controlling the pike, which is a supreme predator and this data has enabled IFI to justify the use of gillnetting as a control measure. IFI policy in this control mechanism must be the backbone of the control and must not be influenced by the Pike Lobby who have little or no scientific evidence to support their stance. Pike lakes should be pike lakes but brown trout fisheries must remain as such and must be protected and enhanced in order to prevent an invasion of predatory species.

As Lough Corrib Trout Angling Federation, representing 13 affiliated trout angling Clubs around the lake, we would like to see :

- A continuation of gill-netting and on-going removal of pike from the lake.
- The exclusion of Brown Trout Fisheries from the limitations of the Pike Regulations, a move which could potentially improve the economic well-being of those who promote and market Lough Corrib as a pike-fishing destination.
- A return of the Owenriff River System to a total brown trout system. All pike should be removed from the system and have it returned to it's previous eminence for salmon and trout.
- A continuation into the future of the removal of the invasive species vegetation which has had such detrimental effects in recent years.
- Lough Corrib designated as a salmonid and trout fishery included by the EU in the Annex I or II species list of the Habitats Directive.
- A continued engagement between IFI and the Federation in river enhancement and development for the betterment of Lough Corrib as a brown trout fishery. The Federation and it's Members are Stakeholders and very active Stakeholders and we would expect to be given the same respect as we afford IFI. Neither party has a monopoly on angling knowledge or experience.
- The status quo remaining in relation to catch & release. Some Clubs operate this in major Competitions but smaller Clubs weigh-in fish. These weigh-ins are governed by the bag limits imposed by law. Fish weighed-in do not have any effect on trout stocks.


(Billy Kavanagh)

Chairman, Lough Corrib Trout Angling Club.

Recreational angling tournaments: participants' expenditures

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Abstract

Keywords: expenditure, angling, tournament.

1. Introduction

Tournaments are a common feature of recreational angling. In North America alone there are an estimated 25-31,000 competitive fishing events annually (Schramm Jr et al., 1991; Kerr and Kamke, 2003) and as many as one-in-five anglers participate in fishing tournaments (Petchenik, 2009). In the UK up to a quarter of angling club members cited competitive angling as an important reason for joining an angling club (Brown et al., 2012), while in Ireland there were in excess of 280 competitive angling events during 2013 (O'Reilly, 2014). Angling tournaments serve a number of purposes. From an angling perspective, like all competitive sports, they help improve participants' skill levels. Angling clubs organise competitions as a fund raising initiative, though in many instances entry fees are returned to participants as prizes. Fishing competitions can also be used as a mechanism for social cohesion or community development and particularly to enhance off-season tourism (Brown et al., 2012). Fishing tournaments are also organised as commercial enterprises, especially in the United States, where there is also a professional angling league tour.

Many studies have considered the economic impacts of recreational angling (e.g. Agnarsson et al. (2008); Lawrence (2005); Lew and Larson (2012); Raguragavan et al. (2013); Hutt et al. (2013); Yamazaki et al. (2013); Melstrom et al. (2015)). Studies estimating national level expenditures include Toivonen et al. (2004), which reports angler expenditures in five Scandinavian countries, including Iceland, ranging from US\$ 23–281 million per annum. Per annum angler expenditures in Ireland total €555 million (TDI, 2013), £112 million in Scotland (Radford et al., 2004) and at least £2.4 billion in England and Wales (Radford et al., 2007; Armstrong et al., 2013). Little is known specifically about angling tournaments and their contribution to total angling expenditure. Angling tournaments entail relatively short periods of intense activity, usually within a small geographic area, and consequently their economic impact can be quite significant in the local economy. A comprehensive understanding of tournament participants and their expenditures would be practical information for fishery managers or angling clubs seeking to raise funds or for communities attempting to boost local economic activity or to develop facilities.

Sainaghi (2012) review the wider literature on consumer expenditures in hospitality and tourism in general and remark on the low volume of research, not to mention research on angling tournaments. However, a number of studies have examined expenditures on sports, including in Ireland (Eakins, 2016), Spain (Lera-López et al., 2011; Lera-López and Rapún-Gárate, 2005) and the United States (Dardis et al., 1994). Among the findings are that spending is higher among men, the more highly educated, and those with higher incomes. Expenditure levels vary depending

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Table 1: Descriptive statistics of variables used in empirical models

Variable	Mean	Standard Deviation	Minimum	Maximum	Description
<i>TripExp</i>	733.59	663.85	30	4,515	Total trip expenditure, €
<i>TravelExp</i>	191.22	223.06	0	2,050	Trip travel expenses, €
<i>FoodBedExp</i>	318.15	315.88	0	2,135	Food & accommodation expenses, €
<i>AnglingExp</i>	224.22	232.88	0	1,880	Angling related expenses, €
<i>CompDays</i>	3.36	1.97	1	7	No. days in angling tournament
<i>OnSite</i>	0.46	0.50	0	1	Dummy=1 if respondent recruited on-site
Tournament type:					
<i>Game</i>	0.18	0.38	0	1	Game species tournament
<i>Coarse</i>	0.37	0.48	0	1	Coarse species tournament
<i>Pike</i>	0.10	0.30	0	1	Pike tournament
<i>Sea</i>	0.36	0.48	0	1	Sea angling tournament
Angler's home:					
<i>Ire</i>	0.67	0.47	0	1	Ireland, incl. Northern Ireland
<i>GB</i>	0.29	0.46	0	1	Great Britain
<i>Else</i>	0.04	0.19	0	1	Elsewhere
Accommodation type:					
<i>Bed1</i>	0.14	0.35	0	1	Hotel
<i>Bed2</i>	0.27	0.44	0	1	Guest-house, B&B
<i>Bed3</i>	0.24	0.43	0	1	Self catering/Rental
<i>Bed4</i>	0.05	0.22	0	1	Hostel/camping/caravan
<i>Bed5</i>	0.30	0.46	0	1	Stayed with friends or returned home
<i>Distance</i>	285.52	276.71	5	1,250	Road distance travelled (miles)
<i>Income</i>	46,902	29,895	12,000	175,000	Annual pre-tax household income, €
<i>Fulltime</i>	0.72	0.45	0	1	Working full-time=1, 0 otherwise
<i>Group</i>	0.37	0.48	0	1	Dummy=1 if respondent attended as part of a group

During estimation π_j is specified as $\pi_j = \exp(\theta_j) / (\sum_{s=1}^{C-1} \exp(\theta_s) + 1)$ to ensure that the estimated mixing probabilities π_j satisfy the basic properties of a probability: $0 \leq \pi_j < 1$ and $\sum_{j=1}^C \pi_j = 1$.

2.4. Explanatory variables

Irrespective of model estimated we use a number of explanatory variables to explain anglers' expenditure. Among those we include is income on the supposition that anglers with high incomes have the means to spend more, though empirically this is not always found to be the case (e.g. Tavares et al. (2016)). We also include a dummy variable indicating whether the angler was in full-time employment. A significant estimate on the parameter for this variable would suggest that it is the stage in life (i.e. working versus retired or student) that may be as relevant in explaining expenditure levels as items such as income. Following Weagley and Huh (2004), who find that retirement leads to increasing levels of leisure expenditures, a negative coefficient might be anticipated on this variable.

Two-thirds of the angler sample are resident on the island of Ireland and the majority of the balance are from Great Britain. Given the substantial variation in travel distances we expect differences in expenditures across anglers by country of origin, especially in travel costs, but there may also be differences in the other categories of expenditure.

While some angling expenses will be similar across target species, they need not equal so we include dummy variables for target species (i.e. game, coarse, pike and sea) to allow for this variation in the model estimates. We have no *a priori* expectation on the relative magnitude of these coefficients, though there is evidence that spending among non-tournament game anglers in Ireland is higher than coarse anglers (Curtis and Stanley, 2016).

Two factors that are likely to be very important in distinguishing between expenditure levels are the accommodation type and the duration of the angling tournament. Staying in a hotel for a 7-day tournament is likely to cost more than camp-site accommodation for a 1-day tournament. In the first set of models estimated we include the number of days in the competition as an explanatory variable, whereas in the second set of models we define the dependent variable as expenditure per competition day. We control for five accommodation types, as described in Table 1, and include them in the regression models as interaction variables with anglers' country of origin. The interaction terms will enable us to determine whether expenditure on different accommodation types substantially differs by angler country of origin.

Previous research suggests that group size has an important effect on daily expenditures but there is no definite pattern. Wynen (2013) find that there is a higher propensity to spend as tourist group size increases up to a certain point, after which the opposite is the case. On the other hand García-Sánchez et al. (2013) find that expenditure is higher among tourists travelling alone or in small groups and suggest that there are scale economies in the group size. We include a dummy variable indicating whether the angler participated in the tournament as part of a group to investigate whether there is a group effect on expenditure.

Age is frequently included as an explanatory variable to allow for variation in preferences. In analyses of tourist expenditure a range of effects were found, including evidence of an inverted U-shape relationship (García-Sánchez et al., 2013) and that younger compared to older tourists were higher spenders (Cini and Saayman, 2014). In the case of sports expenditure neither Eakins (2016) in the case of Ireland nor Lera-López et al. (2011) find a significant effect of age on expenditure. When included in the models estimated here age is also found not to have a significant effect on expenditure.

The dataset was collected by on-line survey with 46% of the sample recruited during a number of prestigious competition events. The angling tournaments where on-site recruitment occurred were not selected randomly nor were the anglers selected randomly. We include a dummy variable, *OnSite*, to investigate whether any selection biases may exist within the data.

in angling related expenditure among other target species/country of origin categories compared to sea anglers. Previous research on expenditure among anglers in Ireland has indicated that game anglers spend substantially more than coarse anglers (Curtis and Stanley, 2016) but this result combined with the similar finding from the AFD equation suggests that coarse tournament anglers travelling from abroad, particularly Great Britain, are highest spenders by a considerable margin. Much of the angling expenses that arise within a tournament, as well as AFD expenses, will occur within the geographic locality of the tournament and it is reasonable to conclude that coarse angling tournaments with a high proportion of international participants are likely to have the greatest economic impact on the local economy on a per angler basis.

A single equation OLS expenditure equation is also reported in Table 2 for comparison. While the R^2 statistic is relatively high, the single equation approach does not reveal as much information. For instance, the OLS model does not attribute much explanatory power to accommodation type, which is implausible. The OLS results illustrate the potential miss-specification error associated with using a simple model to explain expenditures.

3.2. Mixture model estimates

For the mixture models the dependent variable was specified as expenditure per day. For comparative purposes the OLS results are also reported. The estimation of a mixture model for AFD expenditures was problematic. In the instances where estimation was feasible a practical interpretation of the results was difficult. Our consequent conclusion is that AFD expenditures are not best explained by means of a mixture model and we do not report estimation results. For the mixture models we assumed normal distributions and present results for 2 and 3 mixture distributions for angling related expenses. The model with the lowest Akaike Information Criterion (AIC) or Bayesian information criterion (BIC) is usually preferred. Based on AIC either model is equally probable, whereas a 2-mixture model has stronger support based on BIC in the case of angling expenditures. Estimates of models with 4 component mixtures did not converge.

Results for angling expenditure are reported in Table 4, where the estimated mixing probabilities are 0.82 and 0.18 for the 2-mixture model compared to 0.79, 0.14 and 0.07 in the 3-mixture model. Irrespective of model the larger grouping represents approximately 80% of respondent anglers and their respective coefficient estimates are broadly similar between the two models, i.e. coefficients on *Game* and *Coarse* are between €53–56 and those on *Sea* and *Pike* are slightly less, between €44–46. The balancing 20% is split between one or two further groups depending on whether the 2- or 3- mixture model is preferred. What is most noteworthy in these models is the difference in the magnitude of coefficients on target species between groups. In the 2-mixture model the larger grouping (i.e. 82% of sample) spend €53 per trip on game angling expenses compared to €180 by the second group. In the 3-mixture model the second and third groups spend €209 and €123. Depending on the selected model (i.e. 2 or 3 mixtures) the majority of game anglers (i.e. 80% approx) could be termed as ‘low’ spenders, whereas there is a second or possibly third category of game anglers that spend substantially higher amounts on angling expenses. Across the other target species there are similar differences in expenditure. For sea angling the range of expenditure varies between €46 and €156, with a smaller range for pike angling, between €46 and €109. The coefficient for coarse angling was not significant in the 2-mixture model, though the 3-mixture model suggests that there is also a small proportion of anglers that spend substantially higher than the average on tournament angling expenses.

In the SUR models the estimated coefficient on the *OnSite* variable in the angling expenses equation was not statistically significant, suggesting that angler recruitment on-site at a small number of prestige tournaments did not introduce bias. The same *OnSite* variable in the mixture models is significant for the minority high expenditure anglers, which suggests that the high-expenditure anglers may be more prevalent among the anglers that were recruited during a small number of events to participate in the online survey.

The OLS estimates for angling expenditure are also reported in Table 4 and they broadly match the coefficient estimates of the majority grouping in the mixture models. Relying an OLS model would not have unmasked the heterogeneity associated with angling-related expenditure at tournaments.

One conclusion from the analysis is that among tournament anglers there is an 80/20 split between 'low' and 'high' spend anglers. The minority 'high' spend anglers spend up to 4 times as much as the more common regular angler. One might expect that angling expenditure is higher at more prestigious tournament events, which we find also, but the 'high' spend 20% minority occurs across all tournament types.

In separate analysis the striking result is that tournament coarse anglers visiting Ireland, predominantly from Great Britain, spend substantially higher than other anglers irrespective of target species or angler country of origin. This result was unexpected and it is difficult to provide a rationale for why this is so. Further data and research is necessary to determine whether the result is unique to the current dataset or more widely applicable.

The analysis also considered expenditure on accommodation, food and drink (AFD) as a single category of expenditure investigating whether total AFD expenditure differed by accommodation type or angler country of origin. Among international visiting anglers there was no practical difference in total AFD expense among those that stayed in hotel, guest-house or B&B accommodation, with visitors staying in self-catering accommodation spending somewhat less, which is as one would expect. Irish tournament anglers spend considerably less than international visiting anglers, as it is feasible for them to return home on the same day in many instances.

The current paper considers expenditure by tournament anglers at over 100 sea, coarse, pike and game angling tournaments during 2013, principally attributing expenditure by angler socio-demographics. The dataset contained limited information about the tournament venues and further research is necessary to evaluate how expenditures differ depending on tournament-specific characteristics (e.g. facilities, fish stocks, associated social events, etc.) and also whether there are seasonal variations.

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