

The Economic Impact of  
**GAME AND COARSE ANGLING**  
IN SCOTLAND



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**Research Report:**

# **The Economic Impact of Game and Coarse Angling in Scotland**

*Alan Radford, Geoff Riddington, John Anderson,  
Glasgow Caledonian University  
Hervey Gibson, Cogentsi Research International Ltd*

Prepared for Scottish Executive Environment and Rural Affairs Department



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## FOREWORD

Salmon and freshwater fish are an important natural asset for Scotland. In Celtic mythology the salmon was a symbol of wisdom. Images of the King of fish appear on Pictish stones throughout Scotland, notably at Glamis, in Tayside and Robertlaw, near Hawick. Glasgow, Lanark and Peebles are numbered among the cities and towns that bear salmon on their coats of arms.

Although few species of freshwater fish are native to Scotland, they form an important part of our natural heritage. They also support the maintenance of important fisheries throughout the country.

There has long been a perception that angling for game and coarse fish is important to the Scottish economy. In August 2001 a report entitled *Scotland's Freshwater Fish and Fisheries: Securing their Future*, gave an undertaking to commission an in-depth economic analysis of the sector. This report fulfils that undertaking, and shows that angling is valuable to Scotland, and particularly to rural Scotland.

Through angling, many people benefit from the obvious advantages of being in the open air and the sport can also act to foster an appreciation of Scotland's natural resources. This report makes clear that angling also brings economic benefit at the same time. Around 2,800 full time equivalent jobs are supported by the angling sector as it currently operates.

I would like to see the further development of sustainable fisheries for game and coarse fish in Scotland. I see the results of this survey as a valuable indicator of the scope for such development and look forward to engaging with all those interested in the future of angling in Scotland in the coming months.

A handwritten signature in black ink that reads "Allan Wilson". The signature is written in a cursive style and is underlined with a single horizontal stroke.

**ALLAN WILSON MSP**

Deputy Minister for Environment and Rural Development



## **EXECUTIVE SUMMARY**

### **The Economic Impact of Game and Coarse Angling in Scotland**

*Alan Radford, Geoff Riddington, John Anderson,  
Glasgow Caledonian University  
Hervey Gibson, Cogentsi Research International Ltd*

This Executive Summary presents the principal results of a study to assess the economic impact of game and coarse angling in Scotland. The Research Report provides more detail and a greater level of disaggregation, whereas the Technical Report should be consulted for full details of all aspects of the research process and results.

#### **1. BACKGROUND**

In August 2001, the Green Paper, *Scotland's Freshwater Fish and Fisheries: Securing Their Future*, pointed to the lack of useful data quantifying the economic position of fresh water angling, whether on a national or a regional basis. Against this background, the Scottish Executive contracted the consultants to estimate the economic contribution to Scotland of fresh water angling. The principal aim was to analyse the impact of angler expenditure on output income and employment. Separate impact estimates were to be produced for each of seven regions (Dumfries and Galloway, Borders, Highlands, North East Scotland, Central Scotland, Western Isles, Orkney and Shetland) and for each of four types of angling (Salmon and Sea Trout, Brown Trout, Rainbow Trout and Coarse Fish). In addition to these 28 region/fishery combinations, estimates were also to be produced for Scotland as a whole.

#### **2. RESEARCH METHOD**

There were three key elements of the research activity.

##### **2.1 Construction of Fisheries Data Base**

Extensive surveys of fishery owners enabled the construction of a database containing details of 2830 brown trout, rainbow trout and coarse fisheries, plus salmon and sea trout fisheries on a river-by-river basis. From the database, it is possible to aggregate individual details to provide estimates of angler fishing effort (measured in angler days) for Scotland as a whole, or for four fishing types, or for seven regions. For salmon and sea trout fisheries, estimates are available on a river-by-river basis. Other fisheries can be aggregated by Unitary Authority area or any other geographical boundary. The database also provides a breakdown of angler effort according to angler

origins (e.g. total angler days by local anglers, Scottish visiting anglers, non-Scottish visiting anglers).

## 2.2 Construction of Angler Data Base

Extensive surveys of anglers resulted in a database containing details of over 3000 cases detailing locations of angling, home, species, expenditure and constituents of that expenditure. The database also incorporates a substitution analysis that provides information on angler responses if a particular region/fishery type were not available and the consequential impact on their expenditure.

## 2.3 Economic Impact Analysis

The seven regional economies were modelled using an approach that utilised specific models for angling. The regional models incorporate trade matrices between 53 regions<sup>1</sup> for the 128 individual Standard Industrial Classification categories consistent with known published information and the technical coefficients derived from the Scottish Input-Output Tables. For each region/fishery combination, the models can estimate the impact of angler expenditure on income, output and employment at the regional, Scottish and UK levels. Moreover, these effects can be disaggregated by local angler expenditure, by visiting Scottish angler expenditure and by non-Scottish angler expenditure.

## 3. THE REGIONAL IMPACT OF ANGLING: PRINCIPAL RESULTS

From the angler database, the following distribution of angler effort by region and by species is given in Table 1.

**Table 1 Angler Days Summary Table**

	<b>Salmon &amp; Trout</b>	<b>Sea Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Total</b>
<b>Dumfries and Galloway</b>	48,245	28,195	17,337	23,926	117,703
<b>The Borders</b>	43,000	17,884	10,942	315	72,141
<b>Highland</b>	190,589	78,576	26,702	10,915	306,782
<b>North East Scotland</b>	190,853	54,715	108,894	11,402	365,864
<b>Central Scotland</b>	61,646	134,391	231,615	45,581	473,233
<b>Western Isles</b>	10,715	12,606	<100	<100	23,321
<b>Orkney and Shetland</b>	<100	27,000	<100	<100	27,000
<b>Scotland Total</b>	<b>545,048</b>	<b>353,367</b>	<b>395,490</b>	<b>92,139</b>	<b>1,386,043</b>

The three most important regions are Highlands, North East and Central Scotland. The region receiving the greatest angler effort is Central Scotland,

<sup>1</sup> Boundaries of both Unitary Authority and Local Enterprise Company areas were used, as appropriate, to subdivide Scotland into 40 regions. A further 12 regions were subdivisions of the UK. The rest of the world features as one region.

in part due to the amount of rainbow trout angling in this region. Across Scotland, in terms of angler effort, salmon and sea trout angling is the most important type of angling and is the largest fishery in Dumfries and Galloway, the Borders, Highland and the North East.

Total angler expenditure was estimated by using the fisheries database to scale angler daily expenditure estimates. From Table 2 below, it is estimated that **anglers spend a total of £113million on angling in Scotland, with salmon and sea trout anglers accounting for over 65% (£73m) of this total.**

**Table 2. Total Angler Expenditure Summary Table (£ 000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total</b>
<b>Dumfries and Galloway</b>	£2,962	£1,186	£1,206	£1,397	£6,751
<b>The Borders</b>	£6,669	£672	£607	£16	£7,964
<b>Highlands</b>	£35,408	£5,088	£1,752	£715	£42,963
<b>North East Scotland</b>	£24,344	£1,589	£4,910	£824	£31,667
<b>Central Scotland</b>	£3,386	£5,234	£10,963	£1,930	£21,513
<b>Western Isles</b>	£719	£458	<£1	<£1	£1,177
<b>Orkney and Shetland</b>	<£1	£511	<£1	<£1	£511
<b>Scotland Total</b>	£73,488	£14,739	£19,438	£4,882	£112,547

The substitution analysis was used to estimate the expenditure lost to each region if a particular type of angling ceased to exist. This is given in Table 3 below.

**Table 3 Expenditure Loss Summary Table (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total</b>
<b>Dumfries and Galloway</b>	£1,754	£911	£584	£846	£4,094
<b>The Borders</b>	£4,526	£420	£293	£10	£5,249
<b>Highlands</b>	£20,698	£2,804	£977	£343	£24,821
<b>North East Scotland</b>	£15,322	£1,202	£2,896	£249	£19,670
<b>Central Scotland</b>	£2,044	£2,341	£4,879	£811	£10,075
<b>Western Isles</b>	£162	£246	<£1	<£1	£408
<b>Orkney and Shetland</b>	<£1	£322	<£1	<£1	£322

Each cell in the Table 3 reflects the regional expenditure that would be lost, in circumstances where other types of angling are still available in the region, and the first choice type of angling is still available in other Scottish regions. For example, from Table 3, it can be seen that £20.7m of expenditure would be lost in the Highland region if salmon and sea trout fishing were to cease.

Tracking the above estimated expenditure changes through the models of the regional economy, produces the following estimated impact on regional output (Table 4) regional income (Table 5) and regional employment (Table 6).

**Table 4 Impact on Total Regional Output (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£1,682	£772	£549	£704
<b>The Borders</b>	£4,587	£340	£256	£9
<b>Highlands</b>	£24,592	£2,980	£1,039	£374
<b>North East Scotland</b>	£18,644	£1,116	£3,050	£279
<b>Central Scotland</b>	£2,633	£2,629	£5,831	£832
<b>Western Isles</b>	£133	£214	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£238	<£1	<£1

**Table 5 Impact on Regional Income (Gross Value Added) (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£842	£376	£284	£354
<b>The Borders</b>	£2,469	£176	£136	£4
<b>Highlands</b>	£12,504	£1,524	£535	£187
<b>North East Scotland</b>	£9,310	£545	£1,486	£137
<b>Central Scotland</b>	£1,253	£1,246	£2,786	£379
<b>Western Isles</b>	£86	£126	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£121	<£1	<£1

**Table 6 Impact on Regional Employment (Full-Time Job Equivalents)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	88	38	34	38
<b>The Borders</b>	136	11	10	0
<b>Highlands</b>	781	122	37	12
<b>North East Scotland</b>	688	34	171	27
<b>Central Scotland</b>	63	43	218	25
<b>Western Isles</b>	20	14	N.A.	N.A.
<b>Orkney and Shetland</b>	N.A.	13	N.A.	N.A.

Table 4 informs us that if salmon angling in the Highland region ceased, the £20.7m loss in angler expenditure (see Table 3) would reduce Highland output by £24.6. This fall in output would in turn reduce annual household income in the Highlands by £12.5m (Table 5) and employment by 781 full time equivalent jobs (Table 6).

#### **4 THE SCOTTISH IMPACT OF ANGLING: PRINCIPAL RESULTS:**

The angler substitution analysis reveals how angler expenditure would change in circumstances where other types of angling are still available in the region, and the first choice type of angling is still available in other Scottish regions.

Unfortunately, the angler questionnaires could not accommodate questions about angler alternatives if a type of angling ceased throughout Scotland, or indeed if all forms of angling ceased in Scotland. The estimation of Scottish level impacts therefore had to rely on making assumptions and distinctions between locals and visitors to Scotland. Table 7 below, provides estimates of spending by local anglers (from within the fishery region) Scottish visiting anglers (from Scotland but out-with the fishery region) and non-Scottish visiting anglers (other parts of the UK plus overseas)

**Table 7. Angler Expenditure by Origin (£million)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total</b>
<b>Local</b>	£17.0	£6.8	£10.9	£2.2	£36.8
<b>Scottish Visiting</b>	£7.7	£3.7	£4.5	£0.8	£16.8
<b>Non Scottish Visiting</b>	£48.8	£4.2	£4.1	£1.8	£58.9
<b>All Anglers</b>	£73.5	£14.7	£19.4	£4.9	£112.5

The first rows in Tables 8, 9 and 10 are based on the assumption that all Scottish anglers continue to fish in Scotland whilst all non-Scottish visitors leave when they cannot fish the region/fishery combination they want. This will result in a loss of £58.9m of expenditure in the Scottish economy. The assumption that no Scottish angler will go elsewhere to fish is too strong. It was therefore assumed that those Scottish anglers already visiting other regions for their fishing (Scottish visiting anglers) would take 50% of their expenditure elsewhere outside Scotland. This amounts to £8.4m of lost expenditure. The combined effects of this lost expenditure (£67.3m) on Scottish output, income and employment are shown in the second rows of Tables 8, 9 and 10.

**Table 8. Impact on Scottish Output (£million)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total</b>
<b>Non Scottish Visiting Lost</b>	£75.0	£7.7	£5.7	£2.3	£90.7
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	£80.9	£10.4	£8.7	£5.2	£105.0

**Table 9 Impact on Scottish Household Income (£million)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total</b>
<b>Non Scottish Visiting Lost</b>	£36.2	£2.7	£2.8	£1.1	£42.8
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	£39.0	£3.9	£4.2	£1.3	£48.4

**Table 10. Impact on Scottish Employment (Full-Time Job Equivalents)**

	<b>Salmon &amp; Brown Sea Trout Trout</b>		<b>Rainbow Coarse Trout Fish</b>		<b>Total</b>
<b>Non Scottish Visiting Lost</b>	2,033	157	183	76	2,449
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	2,200	229	264	93	2,786

The best estimate therefore is that freshwater angling in Scotland results in the Scottish economy producing over £100m worth of annual output, which support around 2,800 jobs and generates nearly £50m in wages and self-employment income to Scottish households. This is a significant contribution and it should be appreciated that salmon and sea trout angling has probably provided its annual contribution for most of the last century.

# 1 INTRODUCTION

## 1.1 Background

In August 2001, the Green Paper, *Scotland's Freshwater Fish and Fisheries: Securing Their Future*, pointed to the lack of useful data quantifying the economic position of fresh water angling, whether on a national or a regional basis. Against this background, the Scottish Executive contracted the consultants to estimate the economic contribution to Scotland of freshwater angling.

The principal aim was to analyse the impact on income and employment of angler expenditure. Separate impact estimates were to be produced for each of seven regions (Dumfries and Galloway, Borders, Highlands, North East Scotland, Central Scotland, Western Isles, Orkney and Shetland) as shown in Figure 1. For each region, the impacts for four types of angling (Salmon and Sea Trout, Brown Trout, Rainbow Trout and Coarse Fish) were to be identified and categorised by the home region of the angler. The categorisations were local (from within the fishery region), Scottish visitor (from Scotland but out-with the fishery region) and Non-Scottish visitor (other parts of the UK plus overseas). In addition to the 28 region/fishery combinations, estimates were also to be produced for Scotland as a whole.

The research was undertaken by the following team: Alan Radford, Geoff Riddington and John Anderson of the Division of Economics and Enterprise, Caledonian Business School, Glasgow Caledonian University and Hervey Gibson of CogentSI Research International Ltd<sup>2</sup> who produced the models of the regional economies.

## 1.2 Outputs

The output from the project exists in various forms:

Technical Report	Provides a literature review, full details of all aspects of the research process, including construction of the models of the local economy and all associated outputs.
Research Report	Contains a limited review of the literature, provides an overview of the research process and presents the principal results.
Executive Summary	An overview of the principal results presented at a high level of aggregation

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<sup>2</sup> CogentSI Ltd, Killylung, Dumfries, DG2 0RL, Scotland. CogentSI can provide estimates of input-output and trade tables for any Unitary Authority or Local Enterprise Company area in Scotland, or combinations thereof. If the distribution of expenditure is known then multipliers for any type of tourist activity in any area can be calculated

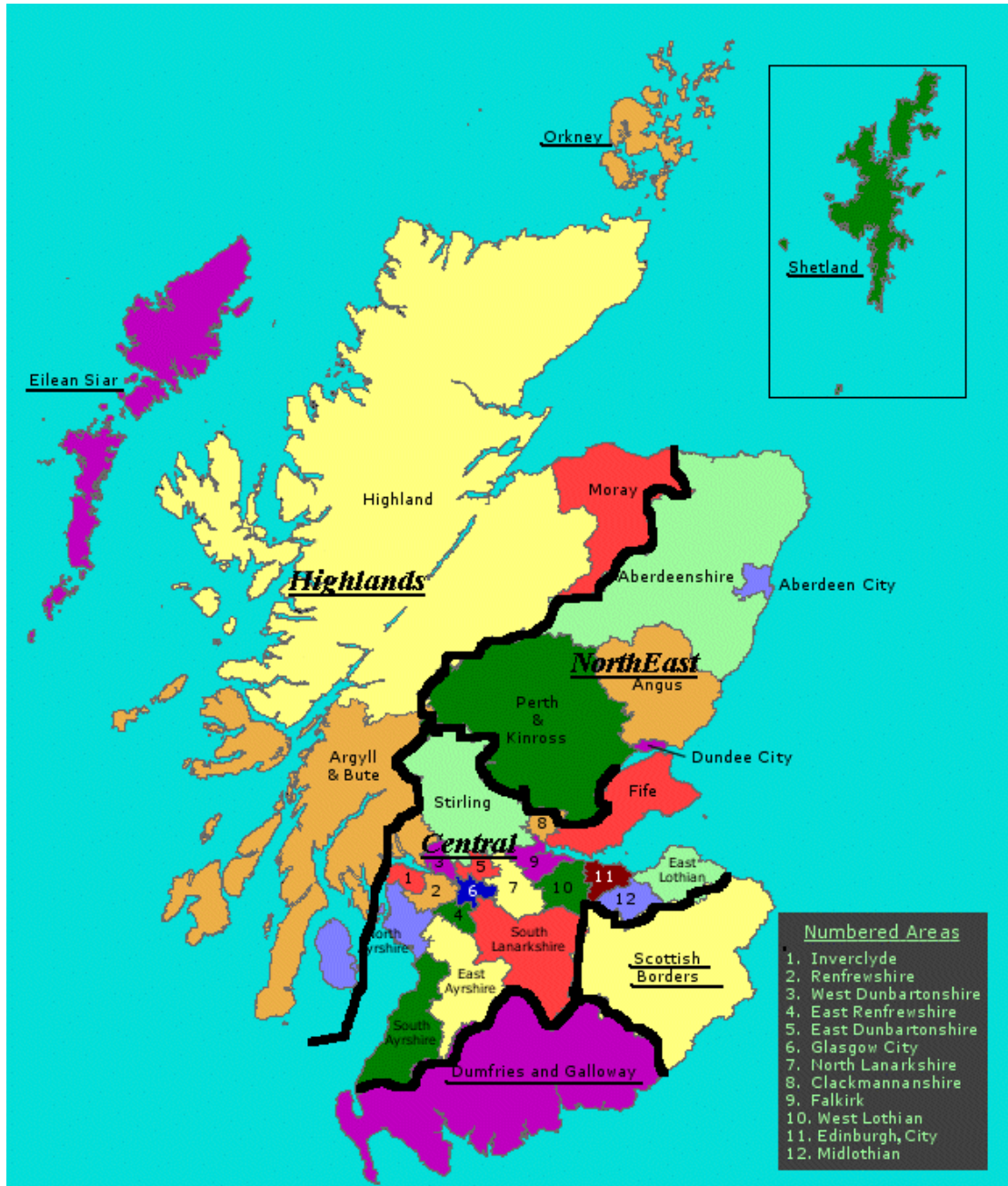


Figure 1: The regions of Scotland used in this report

### 1.3 Structure of the Research Report

The remainder of this section provides a brief overview of the study method. Thereafter this report is structured as follows:

Section 2:	Literature Review
Section 3:	The Survey of Anglers and the Angler Database
Section 4:	The Survey of Owners and the Fisheries Database
Section 5:	Angler Activity and Angler Expenditure
Section 6:	The Impact of Angler Expenditure on Regional Output, and Income
Section 7:	Regional Employment Effects
Section 8:	Impact on the Scottish Economy
Section 9:	Concluding Note.

### 1.4 Overview of the study method

The overall research effort involved a range of approaches.

- a) Qualitative research involving a critical evaluation of the literature and discussions with the various stakeholder groups. The full literature review is available in the Technical Report, an abbreviated review is presented in the next section.
- b) A survey of anglers that sought to estimate:
  - The average expenditure per angler day for each of the 28 region/fishery combinations; and
  - The estimated expenditure diverted as anglers pursue substitute activity if a particular choice' region/fishery combination were not available.

The survey of anglers used a variety of instruments including face-to-face interviews conducted at fisheries, self-completion questionnaires distributed by post and made available on-site at fisheries. In addition, an electronic questionnaire was placed on the University web site, to which hot links were established on national and international angling web sites.

- c) A survey of owners that sought to construct a database of every fishery in Scotland, containing information on:
  - The number of angler days in a typical season; and
  - Breakdown of these angler days by the origins of anglers using the fishery.

A variety of instruments were employed in constructing this database, including telephone interviews, personal visits, expert interviews, self-completion questionnaires distributed by the consultants and by

organisations representing fishery owners. There was also some use of available secondary data for the Borders and the Western Isles.

- d) Construction of economic models specific to each of the seven regional economies that enabled the consultants to trace through the impact of angler expenditure on regional incomes and employment. These models were based on input-output and trade tables specific to each region<sup>3</sup>. These highly sophisticated models allowed an extensive range of indicators to be generated for each of the region/fishery combinations, including the following ten:

- Direct expenditure.
- First round indirect expenditure
- Subsequent indirect expenditure
- Total output effect
- Direct Jobs
- Total Jobs
- Jobs per 1,000 angler days
- Jobs per £m of effective spend
- Gross Value Added
- Gross Value Added per job generated

In addition, for each region/fishery combination, angler expenditure was categorised as, local (i.e. from within the region), from elsewhere in Scotland or from outside Scotland. The impact of these three categories of spending was tracked through the models and each of the ten indicators are available separately for each category of spending. Thus a total of 30 indicators for each of the 28 region/fishery combination are produced. The output for all region/fishery combinations is available in the Technical Report.

## 1.5 Acknowledgements:

The consultants are deeply indebted to the anglers, owners and club secretaries who completed questionnaires. In addition, there were many individuals who provided valuable assistance and advice. Particular thanks go to Bob Henderson, David Dunkley, David Summers, James Leeming, Andrew Wallace, Brian Davidson, Ron Woods, Dominic Moore, Jim Boyd, George Holdsworth, Jane Wright, James Butler, Michael Brady, Peter Murray, Nick Chisholm. Ewan Brodie, Fred Rind, Miles Larby, Robert Fettes, Hugh Campbell-Adamson, James Campbell-Adamson, Mark Andrew, Chris Whealing, Sir Michael Wigan, John Salkeld, Niall Graham-Campbell, Edward Mountain, Jim Allingham, Lawrence Larmour, Rhoderick Noble, Sandy Murray, Roger Bradley, Robert Shields, Steven Gibbs.

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<sup>3</sup> Details of the construction of regional models are available in the Technical Report

## 2 LITERATURE REVIEW

### 2.1 Introduction

There have been four previous studies of the economic impact of angling in Scotland:

- Tourism and Recreation Research Unit of Edinburgh University study of salmon and sea trout angling in Scotland;
- Mackay Consultants study of salmon angling in Scotland;
- Deloitte and Touche study of freshwater fishing in the Tweed catchment; and
- Fisheries Resource Management study of freshwater fisheries in the Western Isles.

### 2.2 Tourism and Recreation Research Unit (1982)

The survey instruments utilised were a combination of face-to-face interviews and self-completion questionnaires. These two instruments produced 147 observations across three areas (Kyle of Sutherland, the Tay and the Spey). The Department of Agriculture and Fisheries (DAFS)<sup>4</sup> provided estimates of rod days obtained via a form sent out by DAFS to the proprietors of fishing along with the salmon and sea trout catch return form. Combining the mean expenditure with the rod days estimates, produced the following expenditure figures for the three study areas<sup>5</sup>.

**Table 2.2.1 Expenditure Estimates TRRU 1982 (2003 prices)**

Area	Rod Days	Local Expenditure	Non-Local Expenditure	Total
Kyle of Sutherland	7,053	1,134,128	416,618	1,550,747
Tay	42,018	8,031,480	1,874,783	9,906,263
Spey	62,230	13,262,357	3,332,948	16,595,305

The 62,230 salmon and sea trout angler days on the Spey seems high not only in relation to other rivers, but also as a proportion of all rod days in the Highlands (see table 2.2.2 below). For all three areas the implied daily spend is over £200. The rod day estimates were also used to produce a figure for expenditure across the whole of Scotland. The number of regional rod days recorded and extrapolated from the returns is given in Table 2.2.2 below.

<sup>4</sup> Now part of the Scottish Executive Environment and Rural Affairs Department

<sup>5</sup> All monetary values are expressed at 2003 prices

**Table 2.2.2 Regional Rod Days TRRU (1981)**

	<b>Recorded rod days</b>	<b>Estimated rod days</b>
<b>Borders</b>	15,504	22,291
<b>Central</b>	3,310	4,729
<b>Dumfries and Galloway</b>	34,741	49,630
<b>Grampian</b>	74,179	105,970
<b>Highland</b>	70,509	100,727
<b>Strathclyde</b>	17,934	25,620
<b>Tayside</b>	43,140	61,629
<b>Western Isles</b>	2,175	3107
<b>Scotland Total</b>	261,592	373,703

The total expenditure on salmon angling in Scotland in 1982 was estimated to be between £50m and £105m with the best estimate being £79m implying an average daily expenditure of £211.

### **2.3 Mackay Consultants (1989)**

In the Scottish context, the study by Mackay Consultants (1989) has been singularly important as a benchmark measure of angler expenditure. This was a wide ranging study that not only sought to establish the pattern and impact of salmon and sea trout angler expenditure, but also the economic importance of netting and the organisation and promotion of salmon and sea trout angling as a tourism asset. Sample data on angler expenditure were obtained through a mixture of on-site surveys, a postal survey (names and addresses provided by hotels and fishery owners) and questionnaires left with tackle shops, hotels proprietors etc. A total of 2,364 responses were received and the calculated average daily expenditure was £124.34<sup>6</sup>. This was combined with an estimate of 435,000 total Scottish rod days for 1988. Regionally the best estimate of rod days was distributed as follows<sup>7</sup>:

<sup>6</sup> £77.25 (in 1988 prices), derived from the average of anglers across ten case study rivers and not the whole sample of 2,364 anglers (see page 113 of the Mackay study)

<sup>7</sup> The angler day's estimates were derived from a survey of 95 proprietors covering 202 beats across the whole of Scotland.

**Table 2.3.1 Regional Rod Days (Mackay Consultants, 1989)**

	<b>Recorded rod days</b>
<b>Borders</b>	28900
<b>Central</b>	6,400
<b>Dumfries and Galloway</b>	56,800
<b>Grampian</b>	121,600
<b>Highland</b>	112,600
<b>Strathclyde</b>	33,800
<b>Tayside</b>	70,300
<b>Western Isles</b>	3,200
<b>Fife</b>	1,300
<b>Scotland Total</b>	434,900

These figures are higher than the DAFS estimates used by the Tourism and Recreation Research Unit. On this basis, Mackay estimated the direct expenditure of all salmon anglers in Scotland to be £54 million. As far as substitution is concerned, no distinction was made between the impact of visiting anglers' expenditure and resident Scottish anglers' expenditure. This implies that if salmon angling did not exist, all domestic (and visitor) expenditure will be diverted from Scotland. Mackay assumes a multiplier value of 1.5, and given this, the total expenditure in Scotland derived from salmon angling (the sum of direct, indirect and induced expenditure) was estimated to be £81.12 million.

The Mackay study also generated descriptive sample statistics for the ten case study areas: Lewis and Harris, Thurso, Conon, Orchy, Spey, Dee, Tay, Lomond, Nith and the Tweed. These are presented in Table 2.3.2 below for comparative purposes. The information on rod days for the case study areas was believed to be better than the regional rod days (see above), though the Tweed figure seems relatively low.

**Table 2.3.2 River Rod Days (Mackay Consultants, 1989)**

	<b>Rod days</b>		<b>Rod days</b>
<b>Lewis and Harris</b>	2,400	<b>Dee</b>	56,800
<b>Thurso</b>	3,900	<b>Tay</b>	44,000
<b>Conon</b>	9,100	<b>Lomond</b>	11,100
<b>Orchy</b>	2,000	<b>Nith</b>	11,900
<b>Spey</b>	62,100	<b>Tweed</b>	19,400

The accuracy of the angler days is crucial since this is the scaling factor. The Mackay estimate for angler days on the Spey is very similar to the TRRU study; however it is unlikely that the Spey would have nearly three times the angler days of the River Tweed. The Tweed angler days may have been underestimated or the Spey overestimated or some combination of both. The corresponding daily and total expenditures are given below:

**Table 2.3.3 Angler Expenditure (Mackay Consultants, 1989) (2003 prices)**

Region	Average Daily Expenditure	Gross expenditure generated	Local expenditure generated	Expenditure Multiplier	Total
<b>Lewis and Harris</b>	£250	£601,579	82.4%	1.13	£560,142
<b>Thurso</b>	£180	£439,035	83.3%	1.28	£468,116
<b>Conon</b>	£156	£948,104	85%	1.19	£959,007
<b>Orchy</b>	£144	£166,011	88%	1.20	£175,307
<b>Spey</b>	£141	£9,674,556	91.4%	1.28	£11,318,457
<b>Dee</b>	£112	£8,222,619	92.5%	1.34	£10,191,937
<b>Tay</b>	£104	£6,235,783	91.4%	1.35	£7,694,332
<b>Lomond</b>	£83	£377,156	80.1%	1.26	£380,648
<b>Nith</b>	£75	£888,164	85.1%	1.22	£922,110
<b>Tweed</b>	£34	£3,499,452	91.7%	1.2	£3,850,798

The range of per capita daily expenditure is unexpected. The Tweed is by reputation one of the most expensive fisheries in terms of permit charges and the Western Isles generally cheaper, though there are a few very expensive fisheries on the Isles. Generally, daily spending figures seem relatively low given the level of permit charges and accommodation costs. The daily expenditure figures are less than in the TRRU study, and our own survey work generated larger estimates of daily spending. The Mackay estimates are however based on quite large samples.

In Table 2.3.3 above, the local expenditure adjustment percentage simply reflects recorded expenditure that was not spent in the case study area (principally transport). The multipliers are expenditure multipliers that include indirect and induced effects, and are estimated from primary data from the owner survey and other information on the local economy. There is no detailed explanation of how they were derived. Using the ratio of £24,150 of final expenditure to each full time equivalent job (F.T.E.), it was estimated that 3,360 jobs in Scotland depended on the £81.12m expenditure generated through salmon and sea trout angling. This ratio is based on the relationship between fishery proprietors' revenue and their observed number of employees, with a 20% increase to reflect higher wages outside fishing. The Mackay study does not estimate local income effects.

## 2.4 Deloitte and Touche (1996)

Deloitte and Touche (1996) adopted a similar approach to Mackay in their assessment of the economic impact of freshwater fishing on the River Tweed main stem and tributaries. In addition to elite interviews and specially commissioned cross tabulations of the United Kingdom Tourism Survey data (UKTS), they also used a range of survey instruments:

- Interviews with local businesses (to establish multiplier effects);
- Interviews with proprietors or others to establish permit sale; and
- Postal survey of anglers to establish angler spending.

They established the number of angler days for four groups of anglers:

- salmon visitors staying in the area;
- salmon fishers on day trips;
- other non-salmon visitors; and
- other day trippers.

Salmon visitors were initially estimated through a top down analysis of UK Tourism Statistics. Of the 300,000 domestic tourist trips to the Borders Region 3% to 3.5% had coarse/game fishing as the main purpose. After various adjustments, this group were estimated to account for 36,036 angler days. This was consistent with an analysis of the room stock in the area. Interviews with proprietors indicated that a further 5,400 salmon rod days would be taken by day fishers (4,500 of which are non-local day trips). This suggests a total of around 41,500 angler days. A bottom up analysis of beats and occupancy levels conducted in cooperation with James Leeming, the main Tweed letting agent suggested 39,500 salmon and sea trout rod days. It is reassuring that these figures are so similar and the figure of 40,000 salmon and sea trout angler days seems an appropriate estimate of the number of days at the river bank. This differs substantially from the Mackay estimate of 19,400 angler days and is not easily explained by structural change in fishing activity in the seven years between the publication of the two reports.

With respect to daily expenditure, Deloitte and Touche estimate £187 for visitors and £81 for day trips. Both these estimates are substantially larger than the £34 estimated by the Mackay study (see Table 2.3.3).

When non-fishing companions are included and allowance made for non-fishing days by visitors, total expenditure is estimated to be £11.26m. Deloitte and Touche estimated that £8.4m of this (73%) is retained in the first round of expenditure. Most of this will be value added (wages to ghillies, hotel and restaurant workers), but some will be locally purchased inputs. £5.5m (65%) is retained in the next round. This is quite a high retention rate, given prevailing tax rates, and the small proportion of goods and services that will originate within the Borders area. Subsequent rounds are assumed to retain 25%, producing further total retention of £1.4m. The sum of retained expenditure is thus £15.3m. Given the original direct expenditure of £11.36m this implies an (expenditure) multiplier of 1.35. The authors suggest that this implies an output multiplier of 0.34, but do not explain the logic of this.

The total 'economic impact' is stated as £15.3m. This is simply total expenditure on all goods (final and intermediate) and is not synonymous with local output or local income (i.e. value added). Employment is estimated by assuming full costs of employment of £29,025 and dividing the £15.3m turnover/expenditure by this figure. Thus, 520 jobs are estimated to be dependent on salmon and sea trout angling. If employment estimates are to

be based on the wage costs per FTE, then arguably one should divide the wage bill, by £29,025.

## **2.5 Fisheries Resources Management (FRM) (2000)**

In a study for the Western Isles Fisheries Trust, FRM estimated the economic contribution of recreational freshwater fisheries to the Western Isles. This is an extensive and very detailed study that examines many dimensions of freshwater fisheries in the Western Isles. FRM used a variety of survey instruments:

- McPherson Research conducted a survey of 2004 face-to-face interviews with visitors between May and October 1999. This survey included a specific subset of questions related to angling;
- 2,000 self-completion questionnaires were distributed to anglers at designated points of exit; 320 were returned. In addition 35 face-to-face interviews were conducted using a scripted version of the self-completion questionnaire;
- A stratified telephone survey of 782 household on the Western Isles;
- A survey of all known clubs and proprietors on the Western Isles. Of the 32 known 21 responded; and
- Additional survey work on three case study areas; the Kildonan catchment, the River Creed and the Valtos peninsula.

This study is interesting because it used the number of visiting anglers as the scaling factor, since this control total was available from the McPherson study. In this report, the implied total salmon angler days (by visitors and residents) are over 40,000.

There are some problems in reconciling this 40,000 with other information. First, both the DAFS estimate of 3,200 days for the Western Isles and the Mackay estimate of 2400 salmon and sea trout angler days for Lewis and Harris are of completely different orders of magnitude. Second, the study's own survey of owners found that whilst there are 22,000 salmon and sea trout rod days, only 22% were taken up. This implies a total of 4,620 rod days; much closer to the DAFS and MacKay estimates. Third, the official salmon and sea trout catch for the Western Isles for the year 1998 was 3,763 fish. The FRM study reports a catch of 0.56 salmon and sea trout per day. This suggests about 6,700 salmon and sea trout angler days. Fourth, the FRM survey of owners estimates a total catch of 3,563 salmon and sea trout and combining this with the catch per day of 0.56 would produce 6,400 days. In contrast, combining the 40,000 estimated angler days with the catch rate of 0.56, suggests anglers in the Western Isles would be catching 22,400 salmon and sea trout. This is much more than the Spey or the Tweed.

In estimating multiplier effects and employment dependency, the FRM study adopted a slightly different approach from both Mackay Consultants and Deloitte and Touch. Their expenditure multiplier was a Type I multiplier (induced effects ignored) derived by other research workers from input output analysis of the Western Isles. Their expenditure multiplier was 1.14.

Employment was derived from known relationships between the value of output and the amount of labour required to produce it across various sectors in the Western Isles. These employment coefficients were applied only to the first round expenditure, and not the total expenditure.

## **2.6 Concluding Remarks**

In general there are some problems in reconciling the previous studies of the economic impact of angling in Scotland. The Mackay and TRRU estimates of angler days are very similar, although there are substantial differences between them in the average daily spend. The Deloitte and Touche study of the River Tweed generated an estimate of Tweed angler days that differed substantially from the Mackay estimate, but was more credible and their estimate of daily spending was a quite different order of magnitude from the Mackay study. Finally it seems that FRM study of the Western Isles may have over estimated the number of angler days. Overall, our knowledge of the economic impact of angling is patchy and a little confused.



## **3 THE SURVEY OF ANGLERS AND THE ANGLER DATABASE**

### **3.1 Introduction**

As outlined in Section 1.4, the angler survey sought to estimate:

- The average expenditure per angler day for each of the 28 region/fishery combinations; and
- The estimated expenditure diverted as anglers pursue substitute activity if a particular choice' region/fishery combination were not available.

By itself, the angler survey is simply not designed to estimate aggregates such as the total number of anglers, total catch, total expenditure etc. In this study, the angler survey seeks, for each region/fishery combination, to collect observations on angler days, primarily to provide estimates of expenditure per day. These estimates are scaled using information from the owner survey. In the angler survey, the relevant population is the number of angler days for each region/fishery combination and not the number of anglers.

### **3.2 Survey Instruments**

The angler questionnaires were sectionalised by fishing type. If an angler had engaged in salmon and brown trout angling then his/her questionnaire should have generated observations on a typical angler day on two types of fishing. Three survey instruments were employed. These are outlined below:

- An electronic questionnaire was developed and published on the Web. Most of the angling periodicals and a few of the national papers carried favourable editorial comment and advertised the URL. Hotlinks on specialist angling sites both in the UK and overseas were also obtained. This was very important in ensuring that both overseas anglers and particular niche markets were aware of the web-based questionnaire;
- The second instrument was a paper version that was produced and distributed via fishing clubs, proprietors, tackle shop etc. The whole questionnaire was fitted on one A3 sheet folded to A4 and accompanied by an explanatory letter, information and a stamped addressed envelope. Respondents themselves were asked to identify 3 region/species combinations fished and the daily expenditure associated with each. A total of 920 questionnaires were sent to fisheries, clubs and shops; 32.3% were returned. Publicity in the fishing and national press provided the backdrop and the managers were asked to emphasise the importance of the study; and

- Finally, there was some limited on-site survey work with 71 questionnaires completed in the Shin and Spey catchment. The standard paper questionnaire was utilised although all combinations necessarily were located in the Highlands. The dominant species was salmon.

The resulting database consists of over 3000 observations which were analysed as 28 fishery/region combinations. Table 3.2.1 shows the distribution of responses across the fishery/region combinations.

**Table 3.2.1 Number of Responses for Each Region/Species Combination**

	Salmon & Brown Sea Trout	Brown Trout	Rainbow Trout	Coarse Fish <sup>8</sup>	Total
<b>Dumfries and Galloway</b>	112	18	29	61	220
<b>The Borders</b>	218	35	40	22	315
<b>Highlands</b>	737	262	73	29	1101
<b>North East Scotland</b>	423	75	107	21	626
<b>Central Scotland</b>	114	155	260	148	677
<b>Western Isles</b>	80	65	6	1	152
<b>Orkney and Shetland</b>	7	26	3	0	36
<b>Scotland Total</b>	1691	636	518	282	3127

The only problem areas are rainbow and coarse fish angling in the Western and Northern Isles and salmon and sea trout in Orkney and Shetland.

### 3.3 Angler Database

The database has the capacity to provide information in a number of dimensions including, by species (four), by region (seven), by expenditure category (13) and by angler origin (13).

Thus for example, **expenditure per angler day** is available for:

- All angler days in Scotland;
- Each type of fishing in Scotland (e.g. coarse anglers days in Scotland);
- Each type of fishing by region (e.g. brown trout angler's days in The Borders);
- Expenditure category by each fishing type by region (e.g. expenditure on permits on rainbow trout anglers days in Central Scotland);
- Expenditure category by each fishing type by region by angler origins (e.g. accommodation on salmon and sea trout angler days in the Highlands by anglers from North America).

<sup>8</sup> For the purpose of this study Grayling was included in the coarse fish category.

## 4 THE SURVEY OF OWNERS AND THE FISHERIES DATABASE

### 4.1 Introduction

The Owners' Survey is of pivotal importance and had the following objectives:

- To provide estimates of **angler days** for each of the specified combinations of regions and fishery types; and
- For each of the combinations, to provide estimates of the proportion of anglers who are respectively local, visitors from within Scotland and non-Scottish visitors.

The aspiration was to obtain data from every freshwater fishery in Scotland, be it an expensive salmon beat on the Spey, a commercially run rainbow trout fishery in the North East or a small coarse fishing pond in Dumfries and Galloway. Consequently, the survey of owners did not involve any explicit sampling process. Also, where possible the intention was to use, amend or update previous studies. As discussed in Section 2, in the case of salmon and sea trout in the Borders, extensive work had been undertaken by Deloitte and Touche and in the Western Isles on game fishing by FRM. These studies were utilised as appropriate.

### 4.2 The Inventory of Fisheries

The first task was to establish a comprehensive inventory of all fisheries by principal type (salmon & sea trout, brown trout, rainbow trout, coarse fisheries). This inventory was broken down into the seven geographical regions and was compiled from a variety of secondary sources (general and specific angling guides to Scotland, specialist Web sites, etc.). There are many secondary sources that provide descriptive information about Scotland's freshwater fisheries. The most comprehensive and reliable source was Sandison (1997); this is an important and extensive outline of Scotland freshwater fisheries. Other publications and information from angling web sites were similarly useful.<sup>9</sup>

Using a combination of survey instruments the consultants sought to contact every one of the proprietors or groups of proprietors in the compendium. In practice, it is not possible to generate data from every fishery. Reasons for this include:

- Fisheries might have been overlooked in inventory construction;
- No contact details were available;

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<sup>9</sup> Where to Fish 2002 – 2003. The Angling Directory, The ultimate guide to freshwater Fisheries – Fish hooked Discovering Scotland (Atlas & Guide), Who Owns Scotland – Andy Wightman The Scottish Fishing Book – Lomond Books, Assessing the Diversity, Distribution & Abundance of Coarse Fish in Scotland – FRM Status of Rainbow trout in Scotland: The Results from a questionnaire survey – FRS SANA membership handbook & Annual Report See appendix 1 for list of web sites

- Available contact details were inaccurate;
- Contact could not be established, either by phone, mail or personal visit; and
- Contact was established but there was a refusal to respond.

There is therefore a general problem of scaling for non-response. For rainbow trout, brown trout and coarse fisheries, there is no obvious scaling factor. For these fisheries, the inventory of fisheries is a necessary condition for judging the coverage of the data generation exercise and thus to provide a basis for scaling observations.

In the case of salmon and sea trout angling, scaling is less of a problem. There is systematic collection of catch statistics, and if one can estimate the relationship between angler effort (days) and catch, there is a basis for scaling observations for non-response. Moreover, in the case of salmon fisheries, some District Salmon Fishery Boards assisted with the dissemination of questionnaires or provided contact details for river catchments. Given this, and the existence of a scaling factor for salmon and sea trout, the inventory was restricted to brown trout, rainbow trout and coarse fishing.

At some locations, anglers fish for a number of species. An example is Loch Lomond, which has salmon & sea trout, brown trout and & coarse fishing. In these cases, the Loch was entered under each species heading as a separate entry. Excluding all salmon and sea trout fisheries (and coarse and brown trout, that occur on riverine salmon and sea trout fisheries) the database had a total of 2,830 entries. Contact details were unavailable for 188 of these, most of which were brown trout fisheries in the Highlands.

Some organisations provided contact details or mailed postal questionnaires on our behalf. In other instances, owners were contacted via telephone or personal visit. In others, local knowledge was used to provide the required information on angler days and origins. Generally a pragmatic approach to data collection was adopted. The approach adopted for each species, including the coverage and scaling processes, is discussed in the following sections.

### **4.3 Salmon and Sea Trout Fisheries**

The Association of Salmon Fishery Boards (ASFB) offered to write to every District Salmon Fishery Board (DSFB) asking them if they had available or would be able to collect data on the number of angler days. All of the Boards responding to this request were willing to help with the collection of data. Those not responding were contacted by the consultants and all agreed to assist. The process of estimating angler days (and origins) varied between Boards. There were 9 basic approaches. A formal owner questionnaire was used in approaches (1), (2), (3), (4), (7).

- 1) The agent of the Board (clerk, chair, river manager) provided a return *as if the river were one fishery*. Where there are relatively few proprietors, the agent was able to phone around and assemble a return. In some cases, the agent undertook an assessment of beats/rods and occupancy levels to establish an estimate of angler days and origins.
  - **Luce, Fleet, Dee (Kirkcudbright), Ugie, Ythan, Lossie, Beauly, Brora, Helmsdale, Halladale, Naver and Borgie, Kinloch, Arran, Eachaig**
- 2) Boards provided the study team with names and addresses of proprietors and we mailed questionnaires tailored to the District.
  - **Bladnoch, Cree, Girvan, Doon, Stinchar, Findhorn, Deveron, Kyle of Sutherland, Ewe, Gruinard**
- 3) Boards mailed questionnaire (with the replies being returned directly to Glasgow).
  - **Forth, Ayr, Don, Aberdeenshire Dee, North Esk, South Esk, Spey, Nairn, Ness, Conon, Caithness, Broom, Carron, Lochaber, Skye, Awe, Loch Fyne, Laggan and Sorn.**
- 4) Boards mailed questionnaire, collated responses and forwarded returns or a response to Glasgow Caledonian
  - **Annan, North and West**
- 5) An elite structured interview was conducted
  - **Clyde and Leven**
- 6) The study team obtained contact details and telephoned owners
  - **Nith, Urr**
- 7) The fishery board mailed the questionnaires, collated the returns and scaled for non-response
  - **Tay**
- 8) Secondary data from previous studies were updated and extended.
  - **Tweed**
- 9) Secondary data from a previous study were re-worked to conform to our data requirements
  - **Western Isles**

The Fisheries Research Service (FRS) obtains catch returns from proprietors in response to an annual questionnaire sent to proprietors under the provisions of Section 15 of the Salmon and Freshwater Fisheries (Protection) (Scotland) Act 1951 as amended by the Salmon Act 1986. In 2001, 1914 forms were sent, of which 96% were returned. FRS makes no attempt to correct for non-returns or gaps in the register of proprietors. The catch returns

are collected on a confidential basis and the catches of individual fisheries are not revealed to the DSFBs.

One useful assumption is that the relationship between fishing effort (angler days) and catch is likely to be similar on different sections of the same river system. Provided a valid catch rate can be calculated for the salmon and sea trout fisheries that respond, then non-response can be scaled using the FRS statistics. Consequently, the total angler days as reported by proprietors, can be multiplied by the ratio of the river's total catch to the catch of the responding fisheries to give an estimate of total angler days. This procedure required collation and scaling of data according to the FRS statistical districts or grouping of districts.

In essence, survey data were collected and scaled to produce regional estimates for Dumfries and Galloway, Highland Region, North East and Central. Because of the enormous variability in the size of fishings, it would be totally incorrect to scale angler days on the basis of the percentage of owners not responding. In some catchments, 5% of the proprietors own 90% of the river. If only the 5% who control 90% of the rod days respond, a serious error would result if angler days were scaled on the basis of proprietorial non-response. On the other hand, if only the small ownerships respond angler days would be underestimated. In addition the surveys were not seeking information on owners; the aim was an enumeration of angler days. Given these considerations, the response rate is best measured as the percentage of the recorded catch captured by the data generation process rather than as a percentage of owners responding. On this basis the response rates were:

**Table 4.3.1 Regional Response Rates for Salmon Fisheries**

Dumfries and Galloway	39%
Highland Region	38%
North East	52%
Central	8%

The response for the Central region was disappointing. Many of the responses were from owners reporting one or two fish. Despite significant assistance from the Forth District Fishery Board and the Boards covering the rivers in Ayrshire, the larger owners did not respond in sufficient numbers.

#### **4.3.1 Orkney and Shetland**

The FRS statistics report a negligible catch of salmon and a small sea trout catch. We scaled the sea trout catch using the catch rate for all Scotland. Later, on the advice of local anglers in the analysis this was subsumed within the wild (brown) trout totals.

### **4.3.2 Borders**

As outlined in Section 2, Deloitte and Touche estimated there were 36,036 angler days by visitors staying overnight, and this was consistent with an analysis of the room stock in the area. Based on interviews with proprietors they estimated a further 5,400 salmon rod days would be taken by day fishers. This suggests a total of around 41,500 salmon and sea trout angler days.

In that study, a bottom up analysis of beats and occupancy levels conducted in cooperation with James Leeming, the main Tweed letting agent suggested 39,500 salmon and sea trout rod days in 1996. Fortunately Mr Leeming has maintained an extensive database on the Tweed beats he manages. Since 1996, for a variety of reasons there would appear to be a 10% increase in the number of anglers paying for fishing. Some of this is due to an increase in occupancy levels. There seems also to be a reduction of the amount of fishing being retained by owners for themselves and guests. This is a change in the type of angler and will produce an increase in the average expenditure per day on permits; but not necessarily an increase in angler days.

On the basis of this information it was estimated that in the Borders, salmon and sea trout angler days have increased to around 43,000 over the period. The Deloitte and Touche study did not provide details on the origins of anglers at the level required. Using postcodes supplied by the study team Mr Leeming, interrogated his database and provided a breakdown of anglers by origins

### **4.3.3 Western Isles**

The initial intention was to use this study's estimates of angler days and origins; however, we found it difficult to reconcile the angler day estimates of this study. The Western Isles report however contained much valuable supplementary information which was utilised to provide estimates for the Western Isles (see the Technical Report for a full discussion)

## **4.4 Brown trout, coarse and pike fisheries on salmon rivers.**

Estimation of angler days on **riverine** fisheries piggy-backed on the estimation of salmon angler days. Questionnaires were distributed to proprietors on the following river catchments Bladnoch, Cree, Girvan, Doon, Stinchar, Findhorn, Deveron, Kyle of Sutherland, Ewe, Gruinard Forth, Ayr, Don, Aberdeenshire Dee, North Esk, South Esk, Spey, Nairn, Ness, Conon, Caithness, Broom, Carron, Lochaber, Skye, Awe, Loch Fyne, Laggan and Sorn. These questionnaires included questions about the number of brown trout, pike, rainbow trout and coarse days. The proportion of the official catch of salmon captured in the responses provided a scaling factor for salmon days on each of these rivers. If the data generation process only counted, say, an

estimated 50% of salmon and sea trout angler days it was hypothesised that angler days for the other species needed to be scaled in the same proportion.

On the following rivers, the agent of the DSFB provided information on angling for non-salmon species: Luce, Fleet, Dee (Kirkcudbright), Ugie, Ythan, Lossie, Beaully, Brora, Helmsdale, Halladale, Naver and Borgie, Kinloch, and Arran. An elite interview was conducted for Clyde and Leven. For the Tay, the agent of the DSFB provided a scaled estimate. For the Western Isles, secondary data from the FRM study was re-worked. Trout and coarse fish information was also supplemented by estimates provided by angling clubs, associations, hotels and estates, particularly on the Tweed. Details of individual riverine fisheries from different sources were checked to eliminate double counting.

#### **4.5 Brown Trout, Rainbow Trout and Coarse Fisheries**

The database of fisheries was largely composed of brown trout, rainbow trout and coarse fisheries in still-waters, and rivers that do not support salmon and sea trout populations. There is no obvious factor with which to scale observations on angler days collected from proprietors for these waters, since they vary dramatically even within a local area. Thus, it was necessary to achieve as complete a census as possible. As a result, the final database contained 2,830 entries or waters, with some form of contact for 2,642 of these. Within this list, it needs to be appreciated that an individual estate may own 30-60 named lochs, or an angling club may lease five lochs, whereas a commercial operator may just have a single “put and take” fishery. However the “put and take” may have 20 times more angler days than the estate with 60 lochs. Given this diversity it was necessary to use a variety of survey instruments to carry out the census.

##### **4.5.1 Mixed Fishing**

Some water bodies occur more than once in the database for example as both a rainbow trout and coarse fishery. These mixed fisheries present a difficulty, since some estimates of anglers days related to multiple forms of angling. It was also necessary to estimate the number of angler days for each type of fishing for mixed fisheries for which we had no observations. In both these circumstances the following rules of thumb were employed. These were based on the patterns observed from the replies received from owners:

- For angling club waters which hold Brown & Rainbow Trout, unless we knew otherwise, 60% of the days went to brown trout with the remaining 40% going to Rainbow trout days;
- For angling club waters with Browns, Rainbows & Coarse Fish, 50% of the days went to brown trout, 30% went to rainbows and 20% to coarse fish:

- For angling club waters with only Browns & Coarse, 80% was allocated to brown trout fishing, 20% to coarse:
- For commercial fisheries with all three species, 80% of days were allocated to rainbows, with 10% to browns and 10% to coarse:
- For commercial fisheries with Browns & Rainbows only, 80% was applied to rainbows, 20% to Browns: and
- For commercial fisheries which stocked only rainbows & Coarse, 85% of the days were applied to rainbows, with the remaining 15% applied to Coarse fishing.

The range of survey instruments employed to generate data across the various segments of brown trout, rainbow trout and coarse fisheries in the database is described below.

#### **4.5.2 Angling Club Waters**

There are approximately 400 or so angling clubs in Scotland, however many of these are travelling clubs which do not own or lease their own water. Clubs and associations owning or controlling waters were identified. If a club controlled one or two waters, club secretaries were telephoned normally in the evenings or at weekends. If they controlled a large number of waters, a questionnaire was mailed to club secretaries. If there was a non-response there was a followed up telephone enquiry. If that was unsuccessful, angler days were estimated based on number of angler days typically encountered for that the size and type of club water in the region.

#### **4.5.3 Commercial Stillwater Trout Fisheries**

Most of the 'commercial' put and take fisheries in Scotland are concentrated in the North East and Central Scotland, probably due to the population densities in these areas. Rainbow trout is not the only species of freshwater fish that some of these fisheries stock, with widespread reports of stocking blue trout, golden trout, brook trout and other species. However when questioned, most fisheries stated that Rainbows were predominant.

The parent association for these types of fisheries is the Association of Scottish Stillwater Fisheries (ASSF). The ASSF were very helpful and provided contact details of its 50 or so members and a postal questionnaire was forwarded. There are however many more not connected to this organisation. These other fisheries were contacted by telephone. Estimates were received from 108 of this type of fishery.

For known commercial fisheries who were unable to provide estimates or who were unable to be contacted, estimates were generated using the average number of days from our known sample of commercial fisheries in that particular region.

#### **4.5.4 Coverage of Rainbow Trout Fisheries**

Walker (2002) produced a list of 287 waters which were stocked with rainbow trout. Unfortunately, no further information was supplied, apart from the grid reference. Crucially, there were no contact details for possible estimates.

Combining the survey estimates from clubs, commercial operators and other sources, data were obtained on 223 of the 287 rainbow trout fisheries, giving coverage of 77%. The remainder are believed to be very minor fisheries with a minimal number of angler days.

#### **4.5.5 Scottish Water Lochs & Reservoirs**

Scottish Water (SW) own 60 lochs/reservoirs throughout Scotland with fishing run by SW on about 10 of these waters, the remainder being leased out to angling clubs. SW was very helpful in providing permit sales figures and contact details to obtain estimates from the tenants. It was not possible to contact all of the tenants concerned. Where a non-response was encountered, estimates were generated using the average number of days from our known sample of this type in that region.

#### **4.5.6 Estate Waters**

There is a great deal of brown trout fishing to be found on estates throughout Scotland, especially in the Highlands. Using the internet<sup>10</sup> and other sources, 48 estates with this type of fishing were identified and contact was attempted. In total, 25 estates with known brown trout fishing provided estimates, with the remainder (those unwilling to participate or those who were not contacted) being estimated on the basis of the number of angler days typically encountered for that the size and type of water in the region.

#### **4.5.7 Hotel Waters**

There are a number of hotels throughout Scotland who provide permit sales for various types of fishing (mainly brown trout). Some hotels are built around the theme of angling and cater specifically for anglers and there are others that simply sell permits. Again these hotels are mainly situated in the Highlands, with a couple in Dumfries & Galloway. Again, where it was impossible to obtain an estimate, the mean number of days for comparable hotels in that region was estimated.

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<sup>10</sup> Who owns Scotland: [www.whoownsscotland.org.uk](http://www.whoownsscotland.org.uk)

#### **4.5.8 Coarse Fisheries**

Coarse fishing is the least regulated type of freshwater fishing in Scotland and is the most difficult to associate with identified suppliers. In the past many owners saw the coarse fish mainly as a predator which adversely affected salmon and trout stocks. In recent years however, attitudes towards coarse angling by the owners has changed and coarse angling in Scotland has become more commonplace. A recent addition has been Scotland first 'Coarse only' commercial fishery - Magiscroft in Condorrat.

In England and Wales, coarse fishing in rivers is not allowed between 15 March and 15 June, though there is no close time in still-waters and canals. No such rules apply in Scotland and as a result a number of coarse anglers from England come to Scotland to fish, particularly in Dumfries and Galloway.

The Scottish Federation for Coarse Angling (SFCA) was able to provide contacts for the coarse fisheries. As many of these waters are not actively managed, in many cases it proved necessary to rely on estimates from experienced coarse anglers as to the number of fishing days. Experts, mainly members of the Scottish Pike Anglers Alliance were very helpful in supplying these estimates for each of the regions.

#### **4.5.9 Other Lochs & Reservoirs**

Some fisheries simply do not fit neatly into any of the above categories. For these fisheries estimates were obtained through tackle shops, informed anglers or the persons supplying the fishing. Where estimates could not be obtained, figures were again scaled up using the average number of days in this category.

### **4.6 Coverage of Non Salmon Fisheries**

In total 738 responses out of a possible 872 were received from our contact list. This provided estimates of angler days and origins for 1935 fisheries/waters of the 2830 entries in the database (68.4%). To clarify, some contact/responses provided group estimates of waters. This usually occurred when dealing with angling clubs and estates in particular (i.e. Assynt Angling Company supplied one group estimate for 152 waters). It was therefore also necessary for us to derive estimates for the remaining 134 owners covering the remaining 895 fisheries in the database who we were unable to contact. Again this was mainly angling clubs and individual estates. The breakdown of estimates by region and fishery type is given below.

**Table 4.6.1 Proportions of Given and Derived Estimates for Non-Salmon Fisheries by Region**

Region	Given Estimates	Derived estimates	Total Estimates	% Given
Dumfries and Galloway	141	15	156	91.0%
The Borders	41	9	50	82.0%
Highland	194	55	249	83.1%
North East Scotland	99	37	136	72.8%
Central Scotland	245	34	279	83.1%
Western Isles	2	0	2	100%
Orkney and Shetland	3	1	4	75%
<b>Scotland Total</b>	<b>725</b>	<b>151</b>	<b>876</b>	<b>84.6%</b>

**Table 4.6.2 Proportions of Given and Derived Estimates for Non-Salmon Fisheries by Region and by Fishery Type**

Region	Given Estimates			Derived Estimates			Total Estimates			Total
	Brown Trout	Rainbow Trout	Coarse Fish	Brown Trout	Rainbow Trout	Coarse Fish	Brown Trout	Rainbow Trout	Coarse Fish	
D & G	51	32	58	7	2	6	58	34	64	156
Borders	24	13	4	8	1	0	32	14	4	50
Highlands	135	30	29	35	6	14	170	36	43	249
North East	49	40	10	19	7	11	68	47	21	136
Central	117	84	44	20	7	7	137	91	51	279
Western Isles	1	1	0	0	0	0	1	1	0	2
Orkney & Shetland	3	0	0	1	0	0	4	0	0	4
<b>Scotland Total</b>	<b>380</b>	<b>200</b>	<b>145</b>	<b>90</b>	<b>23</b>	<b>38</b>	<b>470</b>	<b>223</b>	<b>183</b>	<b>876</b>
	<b>52.3%</b>	<b>27.6%</b>	<b>20.0%</b>	<b>59.9%</b>	<b>15.1%</b>	<b>25.0%</b>	<b>53.7%</b>	<b>25.5%</b>	<b>20.9%</b>	

#### 4.7 The Fisheries Database

From the database, it is possible to aggregate individual estimates to provide estimates for Scotland as a whole, or for four fishing types, for seven regions, by 13 angler origins. For salmon and sea trout fisheries, estimates are available on a river-by-river basis. Other fisheries can be aggregated by Unitary Authority area or any other geographical boundary.

For example, from the database it is possible to provide estimates of the **total number of angler days** in a typical season on:

- All freshwater fisheries in Scotland;
- Each type of fishing in Scotland (eg coarse fisheries in Scotland);

- Each type of fishing by region (eg brown trout fisheries in the Borders);
- Each type of fishing by region by angler origins (eg salmon and sea trout fisheries in the Highlands by anglers from North America);
- Salmon and sea trout fisheries by river by angler origin (eg the River Tay by anglers from the South of England); and
- Non salmon and sea trout fisheries by Unitary Authority area by angler origin (eg rainbow trout fisheries in East Renfrewshire by anglers from the North of England).

In terms of reporting results, assurances of confidentiality were given to all respondents and results will only be reported such that individual fisheries will not be identified. In this study, results are reported at the level of the regions specified by the project remit.



## 5 ANGLER ACTIVITY AND EXPENDITURE

### 5.1 Angler Days

From the fisheries database, the distribution of angler days across regions and fishery types in Scotland is given in Table 5.1.1. It is estimated that there is a total of 1.4m angler days annually in Scotland. The three most important regions are Highlands, the North East and Central Scotland. The region receiving the greatest angler effort is Central Scotland, in part due to the amount of rainbow trout angling in this region. If rainbow trout days are removed from the table, the central region is still the third most important angling region (behind the Highlands and the North East). The Highlands and the North East have over 70% of the total salmon and sea trout angler days (381,000 angler days). If salmon and sea trout angler days are removed, the North East and the Highlands are, respectively, the second and third most important fishing regions.

**Table 5.1.1 Angler Days Summary Table**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	48,245	28,195	17,337	23,926	117,703
<b>The Borders</b>	43,000	17,884	10,942	315	72,141
<b>Highlands</b>	190,589	78,576	26,702	10,915	306,782
<b>North East Scotland</b>	190,853	54,715	108,894	11,402	365,864
<b>Central Scotland</b>	61,646	134,391	231,615	45,581	473,233
<b>Western Isles</b>	10,715	12,606	<100	<100	23,321
<b>Orkney and Shetland</b>	<100	27,000	<100	<100	27,000
<b>Species Average</b>	545,048	353,367	395,490	92,139	1,386,043

Across Scotland, in terms of angler effort, salmon and sea trout angling is the most important type of angling and is the largest fishery in Dumfries and Galloway, the Borders, Highland and the North East.

There are five cells in the above table with very low or zero angler days. It is known that angling for these species does occur in these regions because, with the exception of coarse angling in Orkney and Shetland, returns were obtained from anglers for these species in these regions (see Table 3.2.1). However the number of returns was very small and the local fishing organisations were unable to estimate separate angler days for these species. On the advice of these organisations, we have recorded less than 100 days (<100) and any known minimal activity has been subsumed into the brown trout totals.

The relatively low numbers of coarse fishing days in the Borders is surprising (especially since Grayling, for the purposes of this study is included in the coarse fish category). Anecdote suggests that one there should be more days in this particular region/fishery combination. One particular angling club,

which did not respond to the owner survey was reputed to be responsible for over 100 coarse angler days. Additional research did not produce sufficient evidence for this to be changed, prior to the calculation of economic impacts. Updating at some future date may be possible if further evidence is forthcoming.

Of the 1,386,043 angler days, 773,208 (56%) were made by locals. Table 5.1.2 provides a breakdown of local angler days by region and fishery type. The last column records the percentage of total angler days in each region fished by locals. It can be seen that anglers resident in the Central Region fish 81% of all angler days in the Central Region. This contrasts with the Borders and Highlands where local residents, respectively fish only 24% and 27% of angler days.

The last row in Table 5.1.2 records the percentage of total angler days for each species fished by local anglers. Local anglers fish only 39% of all salmon and sea trout angler days, whereas local anglers fish 67% of all rainbow trout days and 70% of all brown trout angler days.

**Table 5.1.2 Angler Days by Local Anglers**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Total Local Days</b>	<b>% of Total Region Days</b>
<b>Dumfries and Galloway</b>	28,492	11,815	9,258	3,943	53,508	45%
<b>The Borders</b>	2,170	10,572	4,556	120	17,417	24%
<b>Highland</b>	43,670	27,313	7,784	3,682	82,449	27%
<b>North East Scotland</b>	81,415	37,359	69,426	4,575	192,775	53%
<b>Central Scotland</b>	48,805	125,117	172,779	38,080	384,782	81%
<b>Western Isles</b>	7,888	9,252	<100	<100	17,140	73%
<b>Orkney and Shetland</b>	<100	25,137	<100	<100	25,137	93%
<b>Total</b>	212,441	246,564	263,804	50,400	773,208	55%
<b>% of Fishing Type</b>						
<b>Days</b>	39%	70%	67%	55%	55%	

Of the 1,386,043 angler days, only 242,979 (18%) were made Scottish visiting anglers. Table 5.1.3 provides further information on the angler days of Scottish anglers visiting other regions. The Highland region has the highest percentage of days fished by Scottish visiting anglers (24%). With respect to fishing type, 23% of rainbow trout angler days were fished by Scottish visiting anglers, compared with only 14% of salmon angler days.

**Table 5.1.3 Angler Days by Scottish Visiting Anglers**

	Salmon & Sea Trout	Sea Brown Trout	Rainbow Trout	Coarse Fish	Total Visiting Scots	% of Total Region Days
<b>Dumfries and Galloway</b>	5,434	6,961	3,002	5,387	20,784	18%
<b>The Borders</b>	5,312	3,694	2,396	92	11,493	16%
<b>Highland</b>	27,845	29,622	11,981	2,647	72,096	24%
<b>North East Scotland</b>	33,120	10,735	28,635	4,751	77,242	21%
<b>Central Scotland</b>	3,313	5,619	44,264	3,835	57,031	12%
<b>Western Isles</b>	1,370	1,640	<100	<100	3,011	13%
<b>Orkney and Shetland</b>	<100	1,323	<100	<100	1,323	5%
<b>Total</b>	76,395	59,594	90,278	16,712	242,979	18%
<b>% of Fishing Type Days</b>	14%	17%	23%	18%	18%	

Of the total 1,386,043 angler days, 369,855 (27%) were made by anglers from outside Scotland. Table 5.1.4 provides further information on angler days by non-Scottish visiting anglers. There are significant differences between regions in the relative importance of these anglers. In the Central region only 7% of all angler days are fished by visitors to Scotland, compared with 60% in the Borders and 50% in the Highland region. With respect to types of fishing, it is clear that salmon and sea trout angling attracts a greater proportion of anglers from outside Scotland. Indeed, non-Scottish visiting anglers are responsible for nearly a half of all salmon and sea trout angler effort.

**Table 5.1.4 Angler Days by Non Scottish Visiting Anglers**

	Salmon & Sea Trout	Sea Brown Trout	Rainbow Trout	Coarse Fish	Total Visiting	% of Total Region Days
<b>Dumfries and Galloway</b>	14,319	9,419	5,077	14,596	43,411	37%
<b>The Borders</b>	35,518	3,618	3,990	104	43,230	60%
<b>Highland</b>	119,074	21,640	6,937	4,586	152,236	50%
<b>North East Scotland</b>	76,318	6,621	10,833	2,075	95,847	26%
<b>Central Scotland</b>	9,527	3,656	14,571	3,666	31,421	7%
<b>Western Isles</b>	1,457	1,714	<100	<100	3,170	14%
<b>Orkney and Shetland</b>	<100	540	<100	<100	540	2%
<b>Total</b>	256,212	47,208	41,408	25,027	369,855	27%
<b>% of Fishing Type Days</b>	47%	13%	10%	27%	27%	

## 5.2 Angler Expenditure Per Day

The estimates of angler expenditure include the expenditure by anglers on behalf of others. Therefore if an angler is paying for a spouse or offspring this is included. The independent expenditure of a non-angler accompanying an angler is not included. Thus, the expenditure by a spouse say buying a valuable antique while their partner is on a fishing trip is explicitly discounted in this study.

There is some evidence of considerable expenditure by anglers' companions, particularly salmon and sea trout anglers and some studies have made allowances for this expenditure.<sup>11</sup> On the other hand, casual observations suggest that coarse anglers are less likely to have high spending non-angler companions. In the survey design stages ways were sought of capturing these effects. Unfortunately given the other priorities, the inclusion of this element produced unwieldy questionnaires. If this study was restricted to salmon angling, there may have been a stronger imperative to include non-angling expenditure at the expense of other elements. As a consequence, the economic importance of salmon and sea trout angling may be underestimated.

The angler database provides estimates of the mean expenditure per angler day for each of the region/fishery combinations. These are presented in Table 5.2.1 below.

As expected, salmon angling attracts the highest spending per day, both generally (£134.83) and across every region, except Dumfries and Galloway. On average, the Highlands is the most expensive region (£140.04); though, rainbow trout in Dumfries and Galloway and coarse angling in the North East are marginally more expensive than in the Highlands.

**Table 5.2.1 Angler Expenditure Per Day**

	<b>Salmon Sea Trout</b>	<b>&amp;Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	£61.39	£42.06	£69.56	£58.39	£57.36
<b>The Borders</b>	£155.09	£37.58	£55.47	£50.79	£110.39
<b>Highlands</b>	£185.78	£64.75	£65.61	£65.51	£140.04
<b>North East Scotland</b>	£127.55	£29.04	£45.09	£72.27	£86.55
<b>Central Scotland</b>	£54.93	£38.95	£47.33	£42.34	£45.46
<b>Western Isles</b>	£67.10	£36.33	N.A.	N.A.	£50.47
<b>Orkney and Shetland</b>	N.A.	£18.93	N.A.	N.A.	£18.93
<b>Species Average</b>	£134.83	£41.71	£49.15	£52.99	£81.20

It was also possible to estimate average daily expenditure for local anglers (from within the fishery region), Scottish visitor (from Scotland but out-with the

<sup>11</sup> The Deloitte and Touche study had some 11,261 'angler days' associated with non-fishing companions.

fishery region) and non-Scottish visitor (other parts of the UK plus overseas). These are presented in Tables 5.2.2 to 5.2.4, below. The general pattern of the Highlands being the most expensive region, and salmon and sea trout being the most expensive type of fishing is replicated through these three tables.

**Table 5.2.2 Local Angler Expenditure Per Day**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	£36.89	£15.32	£21.49	£26.88	£28.74
<b>The Borders</b>	£74.19	£26.20	£36.65	£16.67	£34.85
<b>Highlands</b>	£121.96	£44.01	£56.01	£77.40	£87.93
<b>North East Scotland</b>	£97.89	£18.87	£39.90	£70.38	£61.04
<b>Central Scotland</b>	£44.24	£31.70	£42.13	£39.21	£38.72
<b>Western Isles</b>	£36.89	£12.11	N.A.	N.A.	£23.51
<b>Orkney and Shetland</b>	N.A.	£14.12	N.A.	N.A.	£14.12
<b>Species Average</b>	£79.83	£27.57	£41.13	£43.81	£47.62

**Table 5.2.3 Scottish Visiting Angler Expenditure Per Day**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	£66.62	£49.56	£34.31	£39.54	£49.22
<b>The Borders</b>	£113.52	£32.21	£30.47	£54.35	£69.69
<b>Highlands</b>	£131.66	£52.83	£48.58	£41.93	£82.15
<b>North East Scotland</b>	£79.05	£34.75	£31.71	£70.30	£54.81
<b>Central Scotland</b>	£85.42	£177.43	£63.32	£46.68	£74.73
<b>Western Isles</b>	£157.66	£131.10	N.A.	N.A.	£143.14
<b>Orkney and Shetland</b>	N.A.	£86.92	N.A.	N.A.	£86.92
<b>Species Average</b>	£101.42	£62.59	£49.50	£50.32	£69.10

**Table 5.2.4 Non-Scottish Visiting Angler Expenditure Per Day**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	£108.18	£69.96	£178.06	£73.86	£96.52
<b>The Borders</b>	£166.25	£76.29	£91.98	£86.54	£151.68
<b>Highlands</b>	£221.85	£107.26	£105.81	£69.56	£195.68
<b>North East Scotland</b>	£180.25	£77.18	£113.73	£80.96	£163.46
<b>Central Scotland</b>	£99.09	£73.85	£60.53	£70.65	£74.92
<b>Western Isles</b>	£145.50	£77.01	N.A.	N.A.	£108.20
<b>Orkney and Shetland</b>	N.A.	£74.07	N.A.	N.A.	£74.07
<b>Species Average</b>	£190.39	£89.16	£99.45	£73.20	£159.36

### 5.3 Angler Expenditure

Estimates of angler expenditure per day (Tables 5.2.1 to 5.2.4) were scaled using the information on angler days (Table 5.1.1 to 5.1.4) to produce estimates of total angler expenditure. The results are presented in Table 5.3.1 to 5.3.4.

**Table 5.3.1 Angler Expenditure Summary Table (£ 000s)**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Total</b>
<b>Dumfries and Galloway</b>	£2,962	£1,186	£1,206	£1,397	£6,751
<b>The Borders</b>	£6,669	£672	£607	£16	£7,964
<b>Highlands</b>	£35,408	£5,088	£1,752	£715	£42,963
<b>North East Scotland</b>	£24,344	£1,589	£4,910	£824	£31,667
<b>Central Scotland</b>	£3,386	£5,234	£10,963	£1,930	£21,513
<b>Western Isles</b>	£719	£458	<£1	<£1	£1,177
<b>Orkney and Shetland</b>	<£1	£511	<£1	<£1	£511
<b>Scotland Total</b>	£73,488	£14,739	£19,438	£4,882	£112,547

Anglers spend a total of £113million on angling in Scotland, with salmon and sea trout anglers accounting for over 65% (£73m) of this total. It is worth noting that the comparable figure for salmon spending estimated by McKay Consultants was £54m.

Whilst in terms of angler days, rainbow trout angling in Central Scotland attracts the largest number of angler days, salmon and sea trout in the Highlands and the North East are much more significant in terms of expenditure.

Anglers fishing within their own region spent £36.8m and were responsible for (33%) of the £113m total. Table 5.3.2 below provides a breakdown of local angler spending by region and fishery type. The last column records the percentage of total regional expenditure made by local anglers. It can be seen that 69% of angler expenditure in the Central region is made by anglers from that region. This contrasts with the Borders and Highlands where local residents are responsible for only 8% and 17% of angler expenditure.

The last row in Table 5.3.2 records the percentage of total expenditure for each species made by local anglers. Local anglers make only 23% of salmon and sea trout angler expenditure, whereas local anglers make 56% of rainbow trout and 46% of brown trout angler expenditure.

**Table 5.3.2 Expenditure by Local Anglers (£'000s)**

	Salmon& Sea Trout	Brown Trout	Rainbo w Trout	Coars e Fish	Total Local Anglers	% of Total Regional Spend
<b>Dumfries and Galloway</b>	£1,051	£181	£199	£106	£1,538	23%
<b>The Borders</b>	£161	£277	£167	£2	£607	8%
<b>Highland</b>	£5,326	£1,202	£436	£285	£7,250	17%
<b>North East Scotland</b>	£7,970	£705	£2,770	£322	£11,767	37%
<b>Central Scotland</b>	£2,159	£3,966	£7,279	£1,493	£14,897	69%
<b>Western Isles</b>	£291	£112	<£1	<£1	£403	34%
<b>Orkney and Shetland</b>	<£1	£355	<£1	<£1	£355	46%
<b>Total</b>	£16,959	£6,798	£10,850	£2,208	£36,817	33%
<b>% of Fishing Type Spend</b>	23%	46%	56%	45%	33%	

Scottish visiting anglers spent a relatively modest £16.8m (15%) of the £113m total expenditure. Table 5.3.3 below provides further information on the expenditure by Scottish visiting anglers. The Western Isles is the region with the greatest proportion (37%) of its expenditure accounted for by such anglers. This is surprising since only 13% of the Western Isles angler days are by Scottish anglers visiting (see table 5.1.3). The relative costs of travelling to the Western Isles from within Scotland may be an explanatory factor.

**Table 5.3.3 Expenditure by Scottish Visiting Anglers (£'000s)**

	Salmon& Sea Trout	Brown Trout	Rainbo w Trout	Coars e Fish	Total Visiting Scots	% of Total Region Spend
<b>Dumfries and Galloway</b>	£362	£345	£103	£213	£1,023	15%
<b>The Borders</b>	£603	£119	£73	£5	£801	10%
<b>Highland</b>	£3,666	£1,565	£582	£111	£5,923	14%
<b>North East Scotland</b>	£2,618	£373	£908	£334	£4,234	13%
<b>Central Scotland</b>	£283	£997	£2,803	£179	£4,262	20%
<b>Western Isles</b>	£216	£215	<£1	<£1	£431	37%
<b>Orkney and Shetland</b>	<£1	£115	<£1	<£1	£115	23%
<b>Total</b>	£7,748	£3,730	£4,469	£841	£16,789	15%
<b>% of Fishing Type Spend</b>	11%	25%	23%	17%	15%	

Anglers from outside Scotland spent £59.9m (52%) of the £113m total expenditure. Table 5.3.4 below provides further information on the expenditure by non Scottish visiting anglers.

**Table 5.3.4 Expenditure by Non-Scottish Visiting Anglers (£'000s)**

	Salmon & Sea Trout	Brown Trout	Rainbow Trout	Coarse Fish	Total Visiting Scots	% of Total Region Spend
<b>Dumfries and Galloway</b>	£1,549	£659	£904	£1,078	£4,190	62%
<b>The Borders</b>	£5,905	£276	£367	£9	£6,557	82%
<b>Highland</b>	£26,416	£2,321	£734	£319	£29,789	69%
<b>North East Scotland</b>	£13,756	£511	£1,232	£168	£15,667	49%
<b>Central Scotland</b>	£944	£270	£882	£259	£2,354	11%
<b>Western Isles</b>	£212	£132	<£1	<£1	£343	29%
<b>Orkney and Shetland</b>	<£1	£40	<£1	<£1	£40	8%
<b>Total</b>	£48,780	£4,209	£4,118	£1,832	£58,940	52%
<b>% of Fishing Type Spend</b>	66%	29%	21%	38%	52%	

There are notable differences between regions in the relative importance of these anglers. In the Central region only 11% of angler expenditure is made by visitors to Scotland, compared with 82% in the Borders and 69% in the Highland region. With respect to types of fishing, anglers visiting Scotland made 66% of all expenditure on salmon and sea trout angling.

#### 5.4 Displacement and Substitution Possibilities

If a fishery ceased to exist, then theoretically all angler expenditure could be lost to a region. Thus, for example the Highland region could lose £35.4m if salmon angling ceased (See Table 5.3.1). But this loss would only occur in the event that all anglers fished or otherwise diverted expenditure outside the region. This is not likely and some researchers therefore expediently assume that whereas visitors have better substitutes outside the region, residents have better substitutes within it. Thus, 100% of resident expenditure is simply 'displaced' within, and the region loses only the expenditure of visiting anglers. In other words, only visitor spending is relevant, the rest is displacement. On this basis, in the case of salmon angling in the Highland region, £5.3m of local spending would be displaced (see Table 5.3.2). The region would lose a total of £30.1m, comprising £3.7m of Scottish visiting angler expenditure (see Table 5.3.3) plus £26.4m of expenditures by non Scottish visiting anglers (see Table 5.3.4).

In addition to separately estimating local and visitor spending, the study also analysed anglers' actual substitution possibilities, irrespective of where they came from. Anglers were asked to indicate their preferred option in the event of a fishery type in a region ceasing to exist. For example, some overseas anglers may still visit the region, whereas some locals may decide to fish another region. Depending on angler responses, estimates were made of the expenditure change associated with the fishery ceasing to exist.

In effect, there were five possible scenarios about displacement and associated with each an estimate of regional expenditure supported by a particular type of fishery. The first scenario assumes that all expenditure is lost (i.e. zero displacement). The second assumes that only visitor spending is lost. The other three scenarios were based around anglers' stated reaction to a fishery type ceasing to exist. The angler questionnaires presented anglers with four options. These are given below **(1) – (4)**. It was necessary to make an assumption about the expenditure switch of those anglers who selected response **(4)** below. In fact, three assumptions were made, listed **i)**, **ii)** and **iii)** below, and based on each assumption, the three further displacement estimates were produced.

<u>Stated Angler Reaction</u>	<u>Impact on Regional Expenditure.</u>
<b>1.</b> Different Species, Same Region	No Expenditure Loss.
<b>2.</b> Same Species, Other Scottish Region	Loss of Expenditure
<b>3.</b> Fish Outwith Scotland	Loss of Expenditure
<b>4.</b> Would Not Fish	Assumption:
	<b>i.</b> no local and no visitor expenditure lost
	<b>ii.</b> no local and 50% visitor expenditure lost
	<b>iii.</b> no local and all visitor expenditure lost

For each region/fishery combination, different estimates were made of the regional expenditure lost, depending on alternative displacement scenarios. Only two of the five displacement estimates are reported here. These two are the zero displacement scenario and displacement based on the anglers' stated response **(1) to (4)**, where assumption **(ii)** is made for those (relatively few) anglers choosing not to fish. The rest of the displacement estimates are given in the Technical Report.

Table 5.4.1 presents the displacement factor based on anglers' stated reaction for each of the region/fishery combinations. This is the percentage of the total angler expenditure that would be lost to a region if a fishery type ceased to exist.

**Table 5.4.1 Percent of economic activity lost to regions**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	59.0%	78.3%	48.1%	60.8%	60.4%
<b>The Borders</b>	67.9%	65.3%	45.6%	65.1%	66.1%
<b>Highlands</b>	58.5%	55.2%	56.0%	50.9%	57.9%
<b>North East Scotland</b>	63.0%	72.4%	58.9%	30.1%	62.0%
<b>Central Scotland</b>	60.7%	44.1%	44.2%	42.6%	46.8%
<b>Western Isles</b>	19.9%	53.0%	N.A.	N.A.	32.4%
<b>Orkney and Shetland</b>	N.A.	32.8%	N.A.	N.A.	32.8%
<b>Scottish Average</b>	60.6%	50.9%	48.9%	45.9%	56.8%

There is significant variation in the reaction of anglers. The Western Isles and Orkney and Shetland retain a greater proportion of their angler spending. This is probably because resident anglers would simply switch species rather than incurring the travel costs associated with fishing on the mainland. There also exists the strong possibility that a relatively higher proportion of visiting anglers incur the relatively higher costs in fishing these islands because their visit is essentially multipurpose (e.g. visiting relatives, staying with friends). These visitors are more likely to continue to visit even if their preferred fishing were not available. Anglers in Central Scotland also seem to have good substitution possibilities within their region. Salmon anglers appear to be the most loyal to their sport with on average 60% of expenditure being diverted outside the region.

The displacement factors in Table 5.4.1 are used to produce estimates of the expenditure lost to each region. From Table 5.4.2 below it can be seen that, if salmon and sea trout angling ceased, £20.7m of expenditure would be lost in the Highland region (compared with £35.4m with zero displacement and £30.1m if only local expenditure is displaced).

**Table 5.4.2 Expenditure Loss Summary Table (£'000s) with displacement**

	<b>Salmon &amp; Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£1,754	£911	£584	£846
<b>The Borders</b>	£4,526	£420	£293	£10
<b>Highlands</b>	£20,698	£2,804	£977	£343
<b>North East Scotland</b>	£15,322	£1,202	£2,896	£249
<b>Central Scotland</b>	£2,044	£2,341	£4,879	£811
<b>Western Isles</b>	£162	£246	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£322	<£1	<£1

Unfortunately, the angler questionnaires could not accommodate questions about angler alternatives if a type of angling ceased throughout Scotland, or indeed if all forms of angling ceased in Scotland. It is thus important to realise that each cell in the Table 5.4.2 reflects the regional expenditure that would be lost, in circumstances where other types of angling are still available in the

region, and the first choice type of angling is still available in other Scottish regions.

Strictly, the loss to Scotland as a whole from the collapse of a type of angling throughout Scotland cannot be obtained by aggregating the losses to the individual regions (or to fishing types) as reflected in Table 5.4.2. This is because the substitution possibilities increase as the area becomes larger. The questionnaire could not ask anglers about these particular substitution possibilities. In effect, the aggregation of the individual cells could provide an approximation to the upper limit on the expenditure loss to Scotland. This approximation is closer to the true loss the greater is the proportion of anglers normally transferring within Scotland, who would transfer outside, in the event of a complete Scottish collapse.



## **6 THE IMPACT OF ANGLER EXPENDITURE ON REGIONAL OUTPUT AND INCOME**

### **6.1 Introduction**

In assessing the regional economic impact of angling, researchers are implicitly addressing the question “*what would happen to a region’s economy if a type of angling ceased to exist?*”. Section 5 above, provides estimates of the change in angler expenditure for each region/fishery combination. The next step is to model the consequential impacts on each region’s output, income and employment. This requires modelling of the direct, indirect and induced effects. Prior to the presentation of results, these effects are explained below.

### **6.2 Direct Effects**

The Direct Effect is simply the increase in local incomes (wages and self-employment income) and any increase in locally sourced inputs (i.e. additional local output) that arise from the *initial* angler expenditure. Notice that some expenditures have a minimal initial local impact. For example, only about 5% of spending on petrol in, say, The Borders has a direct effect locally, 95% ‘bounces off’ through the purchasing of inputs from outside. In contrast, after VAT has been removed, quite a high proportion of accommodation spending is paid out in wages and in the purchase of locally sourced inputs. The composition of angler expenditure is thus important in determining the magnitude of the initial Direct Effect.

### **6.3 Indirect Effects**

There are knock on effects from the Direct Effect. Specifically, the local impact of producing these additional locally sourced inputs is known as the first round Indirect Effect. This effect manifests itself in further increase in local incomes (wages and income from self-employment) and further demands by firms for locally produced inputs. The local effect of producing more local inputs creates further rounds of successively smaller Indirect Effects. The combined impact of the Direct and all the rounds of Indirect Effects are modelled by what is termed “Type I” multiplier analysis. Among other things, this analysis would calculate the total local output dependent on the fishery (in this report termed the Type I Total Output Effect) and the total increase in local household income (in this report termed the Type I Gross Value Added).

### **6.4 Induced Effects**

As described, both the direct effect and every round of indirect effects increases household incomes (wages and income from self employment) and in each spending round a proportion of these are spent on locally produced goods, creating further local income and local output. This is the Induced

Effect. “Type II” multiplier analysis incorporates these induced effects into the analysis, enabling the estimation of the corresponding Type II Total Output Effects and the Type II Gross Value Added.

## **6.5 Employment**

Once the (Type I and/or Type II) local incomes or output impacts are calculated, (Type I and/or Type II) local employment can be estimated through known relationships between output and employment or total wages and employment.

## **6.6 Modelling the Local Economy**

The magnitude of the overall effect on local output, incomes and employment depends on a number of key characteristics of the regional economy. An important characteristic is the absorption rate, which is the propensity to purchase locally produced goods. A heavy and homogeneous product, such as building materials, would have a high level of absorption in the local economy. If not available locally it will come from sources as close to the area as possible. On the other hand, the ‘absorption rate’ in financial services would be low relative to cement. The size of the area is also critical. A smaller region such as The Borders is unable to supply most of the goods required and consequently the Type 1 multiplier effect is small. Larger regions such as the Central region will source a greater proportion of goods from within the region and the multiplier will be relatively large. However it should be noted that the larger the region the more angling alternatives there are inside the region and a greater proportion of expenditure would not be lost if angling ceased.

The seven regional economies were modelled using an approach, developed by CogentSi, that utilises specific models for angling. The model incorporates trade matrices between 53 regions<sup>12</sup> for the 128 individual Standard Industrial Classification categories generated by an estimated gravity (distance related) model and consistent with known published information. It also utilises the technical coefficients derived from the Scottish Input-Output Tables and again reconciled to known outputs/inputs and estimated flows. Details of the construction of these tables and the full output are given in the technical report.

## **6.7 Impact on Regional Output**

The impact on total regional output was estimated by taking the angler expenditure data in Tables 5.3.1 (zero displacement) and Table 5.4.2 (with displacement) and tracking the data through a Type II multiplier analysis using the CogentSi models described above.

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<sup>12</sup> The boundaries of both Unitary Authority and Local Enterprise Company areas were used, as appropriate, to subdivide Scotland into 40 regions. A further 12 regions were subdivisions of the UK. The rest of the world features as one region.

Tables 6.7.1 to 6.7.4 below summarise the impact on output for each of the 28 region/fishery combinations. These are presented with zero displacement and with displacement based on anglers stated reaction to a fishery closing in a region.

**Table 6.7.1 Impact on Total Regional Output (Type II, Zero Displacement) (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£2,849	£986	£1,141	£1,158
<b>The Borders</b>	£6,755	£520	£562	£13
<b>Highlands</b>	£42,063	£5,395	£1,855	£735
<b>North East Scotland</b>	£29,577	£1,541	£5,182	£929
<b>Central Scotland</b>	£4,338	£5,962	£13,205	£1,955
<b>Western Isles</b>	£669	£404	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£378	<£1	<£1

The above table presents only the impact on each region of a fishery in that region ceasing to exist. The estimated expenditure on salmon and sea trout angling in the Highland region was £35.4m (Table 5.3.1 in Section 5). Table 6.7.1 above informs us that the combined effects of the direct, indirect and induced effects would translate this into a loss of £42.1m of output produced within the Highland region.

Please note that the impact *on Scotland* of each pound lost to the Highlands requires a separate estimation procedure. This is because, the indirect and induced effects will be greater because the Scottish economy is much larger and thus better able to supply its own needs. On the other hand, the relevant expenditure loss would be less than £35.4m, because, many anglers may simply switch location within Scotland. Given this, it makes little sense therefore to sum the rows and columns of the above table. Fortunately, the models are designed to provide separate estimates of the impact of a *known change* in angler expenditure within a given region on the Scottish economy (and indeed the UK Economy). This is presented in Section 8.

In the event of cessation of salmon angling in the Highlands, Table 6.7.1 overestimates the output effect, since it is highly unlikely that there would be zero displacement of all angler expenditure. In the context of complete closure, it is preferable to use the (with displacement) expenditure changes in Table 5.4.2.

Tracking these expenditure changes through the regional models generates Table 6.7.2 below. It can be seen, for example, that the £20.7 expenditure loss (in Table 5.4.2) to the Highland region from the closure of salmon angling would produce an annual fall of £24.6m in Highland output.

**Table 6.7.2 Impact on Total Regional Output (Type II, With Displacement) (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£1,682	£772	£549	£704
<b>The Borders</b>	£4,587	£340	£256	£9
<b>Highlands</b>	£24,592	£2,980	£1,039	£374
<b>North East Scotland</b>	£18,644	£1,116	£3,050	£279
<b>Central Scotland</b>	£2,633	£2,629	£5,831	£832
<b>Western Isles</b>	£133	£214	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£238	<£1	<£1

Table 6.7.3 below presents ratios (multipliers) that link regional output to a change in expenditure. Since we are referring to specific changes in angler expenditure, displacement is not an issue and the relevant ratio is Table 6.7.1 (output without displacement) to Table 5.3.1 (expenditure without displacement)<sup>13</sup>.

**Table 6.7.3 Ratio of Regional Output Change to Angler Expenditure Change**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>
<b>Dumfries and Galloway</b>	0.96	0.83	0.95	0.83	0.91
<b>The Borders</b>	1.01	0.77	0.93	0.81	0.99
<b>Highlands</b>	1.19	1.06	1.06	1.03	1.16
<b>North East Scotland</b>	1.21	0.97	1.06	1.13	1.18
<b>Central Scotland</b>	1.28	1.14	1.20	1.01	1.18
<b>Western Isles</b>	0.93	0.88	N.A. <sup>14</sup>	N.A.	0.91
<b>Orkney and Shetland</b>	N.A.	0.74	N.A.	N.A.	0.74
<b>Scottish Average</b>	1.17	1.03	1.13	0.97	1.14

It can be seen that every £1 increase/decrease in salmon angler spending in the North East results in a £1.21 increase/decrease in output in the North East; whereas in the Borders a £1 change in brown trout angler spending changes local output by £0.77<sup>15</sup>. The multipliers vary between these two values because of variations in the size and economic structure of the regions, as well as variations in the composition of angler expenditure. Given the size of these regions and their economic structure it is not surprising that some of the above ratios are less than unity. The ratio of the change in total regional expenditure<sup>16</sup> to angler expenditure will usually be greater than one,

<sup>13</sup> The ratio of Table 6.7.2 (output with displacement) to Table 5.4.2 (expenditure with displacement) would produce the same results.

<sup>14</sup> It is not appropriate to calculate ratios for these cells.

<sup>15</sup> There is no expectation that the ratios in the table should be >1. For example, £30 of angler spending in a petrol station might result in a direct effect of as little as £1, after taking off VAT, fuel duty, value of goods brought into the region (e.g. petrol, newspapers confectionary). There would need to be very strong indirect and induced effects for this kind of spending to generate local output of £30.

<sup>16</sup> Mackay Consultants and Deloitte Touche employed multipliers that linked angler expenditure to total regional expenditure.

but much regional expenditure is on goods imported into the region. It is local output, income and employment that determine local living standards and this study therefore focuses on these, rather than on total expenditure.

The relative magnitude of the ratios in the above table is consistent with prior expectations. From Table 6.7.3, salmon angling with its high levels of labour input from ghillies and workers in hotels and restaurants will have a relatively high ratio. The multipliers in the salmon column are indeed greater than the multipliers in other fishery columns. Rainbow trout angling has relatively strong indirect effects because of the need to restock. In contrast, brown trout angling is dominated by locals whose expenditure is largely on fuel, which in turn has minimal knock on effects. With respect to regional differences, it can also be seen that Central Scotland and to a lesser extent the North East have higher multipliers than the norm, because these large populous regions are more capable of satisfying demands within the region. It is therefore not surprising that brown trout angling in a small region such as the Borders has a relatively low multiplier compared with salmon angling in the North East.

Table 6.7.4 below relates total regional output (Table 6.7.1) to changes in angler days (Table 5.1.1). Once again since the context is a given change in angler days, displacement is not an issue.

**Table 6.7.4 Regional Output Effect Per Change in Angler Day**

	<b>Salmon &amp; Brown Sea Trout Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>	
<b>Dumfries and Galloway</b>	£61.39	£42.05	£69.56	£58.39	£57.35
<b>The Borders</b>	£155.09	£37.58	£55.47	£50.79	£110.40
<b>Highlands</b>	£185.78	£64.76	£65.61	£65.51	£140.05
<b>North East Scotland</b>	£127.55	£29.05	£45.09	£72.27	£86.55
<b>Central Scotland</b>	£54.93	£38.95	£47.33	£42.34	£45.46
<b>Western Isles</b>	£67.10	£36.36	<£1	<£1	£50.48
<b>Orkney and Shetland</b>	<£1	£18.94	<£1	<£1	£18.94
<b>Scottish Average</b>	£134.83	£41.71	£49.15	£52.99	£81.20

The table informs us that on average an increase/decrease of one salmon angler day in the Highlands will increase/decrease output in the Highlands by £185.78, whereas a change of one brown trout angler day in the Borders will result in a change of £37.58.

## 6.8 Impact on Gross Value Added (ie Regional Income)

Of particular interest is the impact of angler expenditure on household incomes in the form of wages, rents and income from self-employment. Gross Value Added (GVA) is a measure of the income in these forms to households in the region. The difference between Regional Output and GVA is the import content in locally produced goods and services. Tables 6.8.1 and 6.8.2 give the effect on income by region and species, with and without displacement.

**Table 6.8.1 Impact on Gross Value Added With Zero Displacement (Type II) (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£1,425	£480	£590	£583
<b>The Borders</b>	£3,636	£269	£299	£7
<b>Highlands</b>	£21,388	£2,760	£955	£368
<b>North East Scotland</b>	£14,769	£752	£2,524	£456
<b>Central Scotland</b>	£2,064	£2,826	£6,309	£890
<b>Western Isles</b>	£432	£237	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£192	<£1	<£1

In Section 5, the estimated expenditure on salmon and sea trout angling in the Highland region was £35.4m (Table 5.3.1). Table 6.7.1 informed us that this would translate into £42.1m of output produced within the Highland region. From Table 6.8.1 above, production of this output would generate £21.4m annually in household income. This income is in the form of wages and all income from self-employment<sup>17</sup>.

The 'with displacement' analysis is more relevant when describing the current total contribution of angling. Table 5.4.2 informs us that if salmon angling in the Highland region ceased, angler expenditure would fall by £20.7m and this would reduce Highland output by £24.6 (Table 6.7.2). This in turn would reduce local household income by £12.5m (Table 6.8.2 below).

**Table 6.8.2 Impact on Gross Value Added With Displacement (Type II) (£'000s)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	£842	£376	£284	£354
<b>The Borders</b>	£2,469	£176	£136	£4
<b>Highlands</b>	£12,504	£1,524	£535	£187
<b>North East Scotland</b>	£9,310	£545	£1,486	£137
<b>Central Scotland</b>	£1,253	£1,246	£2,786	£379
<b>Western Isles</b>	£86	£126	<£1	<£1
<b>Orkney and Shetland</b>	<£1	£121	<£1	<£1

Using Tables 5.3.1 and 6.8.1 the ratio of local income change to the initial change in expenditure is calculated. These particular tables are used because an actual change in regional expenditure is envisaged and therefore displacement is not relevant<sup>18</sup>. Table 6.8.3 below presents these ratios. From the table, it can be seen for example that a given £1 increase or decrease in spending by salmon anglers in the Borders results in a £0.55 increase or decrease in household income in the Borders.

<sup>17</sup> Pure profit or dividend income is assumed to be a leakage from the regional economy.

<sup>18</sup> Table 5.4.2 and 6.8.2 would also have produced the results given in Table 6.8.3

**Table 6.8.3 Ratio of Regional Income Change to Angler Expenditure Change**

	<b>Salmon &amp; Brown Sea Trout Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>	
<b>Dumfries and Galloway</b>	0.48	0.41	0.49	0.42	0.46
<b>The Borders</b>	0.55	0.40	0.49	0.43	0.53
<b>Highlands</b>	0.60	0.54	0.55	0.51	0.59
<b>North East Scotland</b>	0.61	0.47	0.51	0.55	0.58
<b>Central Scotland</b>	0.61	0.54	0.58	0.46	0.56
<b>Western Isles</b>	0.60	0.52	N.A.	N.A.	0.57
<b>Orkney and Shetland</b>	N.A.	0.38	N.A.	N.A.	0.38
<b>Scottish Average</b>	0.59	0.51	0.55	0.47	0.57

As expected, smaller less self-sufficient regions have lower ratios. The column differences reflect the different expenditure patterns of different anglers, notably the high rents and accommodation payments of salmon and sea trout anglers. Thus, salmon and sea trout angling in the North East and Central regions have the highest ratios and brown trout angling in Orkney and Shetland the least. The relative magnitudes generally follow the relativities in Table 6.7.3 (the ratio of output change to angler expenditure change). The exception is the Western Isles where there is an apparently higher ratio of income to output, particularly in the accommodation and retailing sectors.

Table 6.8.4 below relates regional income to changes in angler days. The table informs us that on average an increase/decrease of one salmon angler day in the Highlands will increase/decrease household income in the Highlands by £112.22 per annum, whereas a brown trout angler day in the Borders will result in a change of £15.04.

**Table 6.8.4 Regional Income Per Change in Angler Day**

	<b>Salmon &amp; Brown Sea Trout Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>	<b>Regional Average</b>	
<b>Dumfries and Galloway</b>	£29.55	£17.04	£34.04	£24.37	£26.16
<b>The Borders</b>	£84.55	£15.04	£27.35	£21.87	£58.37
<b>Highlands</b>	£112.22	£35.12	£35.78	£33.73	£83.03
<b>North East Scotland</b>	£77.38	£13.74	£23.18	£40.03	£50.57
<b>Central Scotland</b>	£33.49	£21.03	£27.24	£19.52	£25.55
<b>Western Isles</b>	£40.34	£18.78	<£1	<£1	£28.69
<b>Orkney and Shetland</b>	<£1	£7.11	<£1	<£1	£7.11
<b>Scottish Average</b>	£80.20	£21.27	£27.00	£25.01	£46.33

## 6.9 Comparison of Ratios

In Table 6.9.1, below a number of multipliers are presented. The multipliers in columns one and two (taken from Tables 6.7.3 and 6.8.3) are local multipliers with angler regional expenditure as the denominator. The third column presents the multipliers linking Scottish output to angler regional expenditure as estimated by the models. The effect of angler expenditure at the Scotland level is, unsurprisingly much larger than at the regional level.

The fourth column presents the ratio of regional output to the direct effect (sometimes referred to as direct output). The latter is simply the proportion of initial angler expenditure retained in the region. Since the denominators are smaller, these multipliers are correspondingly larger. The fifth column is the ratio of regional income to the direct effect

**Table 6.9.1 Some Alternative Ratios**

	<b>Regional Output to Angler Regional Expenditure</b>	<b>Regional GVA to Angler Regional Expenditure</b>	<b>Scottish Output to Angler Regional Expenditure</b>	<b>Regional Output to Direct Effect</b>	<b>Regional GVA to Direct Effect</b>
<b>Dumfries and Galloway</b>	0.91	0.46	1.29	1.36	0.68
<b>The Borders</b>	0.99	0.53	1.50	1.29	0.69
<b>Highlands</b>	1.16	0.59	1.50	1.50	0.76
<b>North East Scotland</b>	1.18	0.58	1.46	1.58	0.78
<b>Central Scotland</b>	1.18	0.56	1.28	1.71	0.81
<b>Western Isles</b>	0.91	0.57	1.32	1.33	0.83
<b>Orkney and Shetland</b>	0.74	0.38	1.29	1.10	0.66
<b>Scottish Average</b>	1.14	0.57	1.53	1.43	0.77

Relationships between sales, production, wages, operating surplus and employment were estimated by manipulation of data provided by the Annual Business Enquiry (ABI). Within the models, the relationships between employment and output and income are specific to regions and industrial sectors.

Table 7.1 summarises the employment locally that is possibly supported by angling, by species and by region.

**Table 7.1 Employment With Zero Displacement. (FTE's)<sup>19</sup>**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	151	46	73	62
<b>The Borders</b>	242	17	20	0
<b>Highlands</b>	1,361	179	63	21
<b>North East Scotland</b>	1169	63	244	48
<b>Central Scotland</b>	103	142	295	44
<b>Western Isles</b>	33	19	N.A.	N.A.
<b>Orkney and Shetland</b>	N.A.	21	N.A.	N.A.

If salmon and sea trout angling in the Highlands ceased to exist, it is unlikely that as many as 1,361 jobs would be lost as the direct, indirect and induced effect worked through the Highland economy. It is more appropriate to consider employment after displacement effects.

**Table 7.2 Employment With Displacement. (FTE's)**

	<b>Salmon &amp; Brown Sea Trout</b>	<b>Brown Trout</b>	<b>Rainbow Trout</b>	<b>Coarse Fish</b>
<b>Dumfries and Galloway</b>	88	38	34	38
<b>The Borders</b>	136	11	10	0
<b>Highlands</b>	781	122	37	12
<b>North East Scotland</b>	688	34	171	27
<b>Central Scotland</b>	63	43	218	25
<b>Western Isles</b>	20	14	N.A.	N.A.
<b>Orkney and Shetland</b>	N.A.	13	N.A.	N.A.

Table 7.2 is a better estimate of the impact on employment by fishing type by region. These are the number of jobs that are dependent on angling. Thus for example, it is estimated that 781 jobs would be lost in the Highland region if salmon and sea trout angling ceased. Some of these would be directly employed in angling or hotels, others would be indirectly employed in supplying services to estates or hotels, other jobs would be dependent on the spending of hotel and estate staff.

<sup>19</sup> Full-time Job Equivalent



## 8

## IMPACT ON THE SCOTTISH ECONOMY

The models used can provide estimates of the impact at the Scottish and UK levels of a fishery in a particular region ceasing to exist. The knock on effects of a *given change* in angler expenditure will necessarily be larger at the Scottish and UK level. This is because these larger areas are more capable of supplying both consumers and local industries. However, the larger the area the stronger is the displacement effect. If an angler switches from the Highland Region to the North East it is a loss to the Highlands but not to Scotland as a whole.

The angler survey revealed how angler expenditure would change in circumstances where other types of angling are still available in the region, and the first choice type of angling is still available in other Scottish regions. Unfortunately, the angler questionnaires could not accommodate questions about angler alternatives if a type of angling ceased throughout Scotland, or indeed if all forms of angling ceased in Scotland. It cannot be assumed that a local (Highland) angler who states he would fish for the same species in another region (North East), would fish outside Scotland (e.g. Norway) when faced with closure of a complete fishery type.

The estimation of Scottish level impacts therefore had to rely on making assumptions and distinctions between locals and visitors to Scotland. Table 8.1 below, provides estimates of spending by local anglers (from within the fishery region) Scottish visiting anglers (from Scotland but out-with the fishery region) and Non-Scottish visiting anglers (other parts of the UK plus overseas).

**Table 8.1. Angler Expenditure by Origin (£million)**

	Salmon & Brown Sea Trout	Brown Trout	Rainbow Trout	Coarse Fish	Total
<b>Local</b>	£17.0	£6.8	£10.9	£2.2	£36.8
<b>Scottish Visiting</b>	£7.7	£3.7	£4.5	£0.8	£16.8
<b>Non Scottish Visiting</b>	£48.8	£4.2	£4.1	£1.8	£58.9
<b>All Anglers</b>	£73.5	£14.7	£19.4	£4.9	£112.5

The first scenario is that all angler expenditure is lost (£112.5m). This is unrealistic. An alternative assumption is that all Scottish anglers continue to fish in Scotland, whilst all non-Scottish visitors leave when they cannot fish the region/fishery combination they want. From Table 8.1, this second scenario will result in a loss of £58.9m of expenditure. The assumption that no Scottish angler will go elsewhere to fish is too strong. A third scenario is that (in addition to the £58.9m of lost non-Scottish expenditure), Scottish visiting anglers would take 50% of their expenditure (£8.4m) elsewhere outside Scotland.

The first row of Table 8.2 informs us that, with the first scenario, the combined impact of the direct, indirect and induced effects would result in a decrease in Scottish output of £164.6m per annum. The second row in Table 8.2 is based

on the second scenario and the loss of Scottish output is estimated to be £90.7m. The third row in Table 8.2 is based on the third scenario and it is estimated that the expenditure loss of £67.3m will result in loss of £105m in Scottish output. On the basis of this last scenario, it is reasonable to speculate that angling in Scotland generates over **£100m** of Scottish output per annum.

**Table 8.2 Impact on Scottish Output (Type II) (£million)**

	Salmon & Brown Sea Trout Trout		Rainbow Coarse Trout Fish		Total
<b>All Expenditure lost (Zero Displacement)</b>	£111.3	£22.1	£25.4	£5.8	£164.6
<b>Non Scottish Visiting Lost</b>	£75.0	£7.7	£5.7	£2.3	£90.7
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	£80.9	£10.4	£8.7	£5.2	£105.0

Table 8.3 gives the impact on Scottish household income under the same three scenarios. On the basis of the third scenario, it is believed that freshwater angling is responsible for some **£48m** of Scottish income per annum.

**Table 8.3 Impact on Scottish Household Income (£million)**

	Salmon & Brown Sea Trout Trout		Rainbow Coarse Trout Fish		Total
<b>All Expenditure lost (Zero Displacement)</b>	£53.6	£8.8	£12.0	£2.7	£77.1
<b>Non Scottish Visiting Lost</b>	£36.2	£2.7	£2.8	£1.1	£42.8
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	£39.0	£3.9	£4.2	£1.3	£48.4

Table 8.4 gives the impact on employment in Scotland. On the basis of the third scenario, the total number of jobs associated with coarse and game angling is around 2,800.

**Table 8.4. Impact on Scottish Employment (Full-Time Job Equivalents)**

	Salmon & Brown Sea Trout Trout		Rainbow Coarse Trout Fish		Total
<b>All Expenditure lost (Zero Displacement)</b>	3,058	489	696	175	4,418
<b>Non Scottish Visiting Lost</b>	2,033	157	183	76	2,449
<b>Non Scottish Visiting + 50% of Scottish visiting anglers</b>	2,200	229	264	93	2,786

The best estimate therefore is that freshwater angling in Scotland results in the Scottish economy producing over **£100m** worth of annual

**output, which support around 2,800 jobs and generates nearly £50m in wages and self-employment income to Scottish households. This is a significant contribution and it should be appreciated that salmon and sea trout angling has probably provided its annual contribution for most of the last century.**

## **9 CONCLUDING NOTE**

This report is essentially a snapshot of the current economic contribution of freshwater fishing to Scotland and its regions. In producing this analysis the authors have sought where possible to adhere to a number of principles:

- To use an analytical framework that is coherent, clear and replicable;
- Explain and define the economic vocabulary that is used;
- To ensure that our vocabulary is consistent with usage elsewhere;
- Use recognised conventions (e.g. expenditure categorisation consistent with tourist expenditure data, using standard industrial classification designations); and
- Make due allowance for both multipliers and substitution as defined by the area under study.

Undoubtedly there are areas where estimates could be further refined, and there may also be a need for future updating. It is hoped that practitioners engaged in future updating and/or refinement would consider utilising both this approach and the principles outlined above. In this way, incompatibility between studies can be minimised.

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