

Thesis
2682

**SIR JAMES MAITLAND
AND
THE HOWIETOUN FISHERY**

Stephen Anthony Hill

Submitted for the Degree of Doctor of Philosophy

July 1995

Department of History

University of Stirling SAH

ABSTRACT

For several millennia man has in some way farmed his waters by holding fish captive in ponds. Not until the second half of the nineteenth century, however, as a result of a general concern in the industrialised nations that fishery stocks were declining, were serious attempts made to breed fish artificially. The most concerted of these attempts in Britain effectively began in 1873 when Sir James Maitland (1848-1897), a Scottish landowner, commenced experiments which evolved into the construction of the world's largest salmonoid piscicultural establishment. This operation, the Howietoun Fishery, sold its produce nationally on the open market, a new departure in pisciculture. It also advanced the piscicultural process scientifically in selectively breeding fish superior to nature's own.

Maitland's work was not, in itself, particularly successful commercially. This was not, however, the result of commercial failure on his behalf but rather a reflection of his desire to develop pisciculture for the public good in an attempt to restock impoverished fisheries and to disseminate knowledge in the hope that others would be encouraged to imitate his example on a more commercial basis.

Maitland's piscicultural work was highly important to the development of what has today become a significant global industry, though his contribution has not hitherto been recognised. The thesis intends to set out Maitland's piscicultural advances and their significance. It offers a detailed analysis of Maitland's entrepreneurship and casts its net wider to draw in some discussion of his work away from Howietoun, particularly on his membership of the Fishery Board for Scotland where it examines the debate over state support for nineteenth century British science. The thesis concludes with an analysis of the development of Howietoun in the seventy years after its founder's death. In addition to Maitland's own writings, the thesis uses evidence from Howietoun's general records, Maitland's family papers, Fishery Board for Scotland material, and a very wide variety of published sources.

ACKNOWLEDGEMENTS

So many friends and colleagues have in some way assisted in the preparation of this thesis that it would be impossible to mention them all here. Some have been acknowledged in footnotes to the text indicating their input at a particular juncture, but, whether mentioned or not, I am deeply indebted to them all.

The University of Stirling, through the Howietoun Fishery, provided me with a scholarship to fund my researches for which I am deeply grateful. It also provided me with the excellent supervision of Professor George Peden and Dr Neil Tranter who never failed to offer sound advice, trenchant criticism, and constant support and encouragement. Dr Derek Robertson of the Howietoun Fishery has been a similar source of advice and encouragement.

In collecting material, I have relied heavily upon the services of Gordon Willis, Arts Librarian at Stirling, and the staff of the Scottish Record Office and Central Region Archives. Hugh Peebles of Stirling's Department of Accountancy was invaluable in guiding me through the rigours of nineteenth century book-keeping. Linda Cameron of Stirling's Inter-Library Loans Office willingly handled a huge number of requests whilst Jan Milne and Sue Rae of Robert Gordon's Inter-Library Loans Office enthusiastically handled some of the most obscure requests with which they have ever had to deal.

Dr David Kennedy, Principal of The Robert Gordon University, has been a constant source of encouragement and support over the last year of preparing the thesis, allowing me generous periods of absence from work. Fiona Sturgeon has gone far beyond the call of duty in making up for such absences. Neil Robinson has been a source of constant support and has helped in the final preparation of the text.

Finally, I must thank Niki for her fortitude which has been greatly tested by many things, not least this thesis.

CONTENTS

	Page
Abstract	<i>i</i>
Acknowledgements	<i>ii</i>
List of Tables	<i>v</i>
List of Charts	<i>viii</i>
List of Illustrations	<i>ix</i>
Chapter One	
<i>Introduction</i>	1
Chapter Two	
<i>Historical Foundations and Motivating Influences</i>	23
Chapter Three	
<i>Fish Culture at Howietoun</i>	68
Chapter Four	
<i>The Business of Fish Culture, 1873-1885</i>	121
Chapter Five	
<i>Howietoun Under Threat</i> <i>- The Falkirk Water Bill Case, 1886</i>	139
Chapter Six	
<i>The Business of Fish Culture, 1886-1897</i>	164
Chapter Seven	
<i>Maitland without Howietoun and Howietoun</i> <i>without Maitland</i>	214
Chapter Eight	
<i>Maitland, Fish and the State</i> <i>- State Support for Nineteenth Century Science:</i> <i>Fish Culture and the Fishery Board for</i> <i>Scotland, 1882-1892</i>	237
Chapter Nine	
<i>Maitland's Legacy</i>	278

	Page
Chapter Ten	
<i>Howietoun after Maitland, 1897-1967</i>	324
Conclusion	371
Appendix I	
<i>The Lauderdale Peerage Case, 1885</i>	378
Appendix II	
<i>The Recalculation of Howietoun's Financial Data into Constant Terms</i>	383
Primary Source Bibliography	390
Secondary Source Bibliography	399

LIST OF TABLES

	Page
Table 4.1 <i>Howietoun Fishery Income, Expenditure and Profit (£), 1875-1885</i>	123
Table 4.2 <i>Howietoun Fishery Construction Capital Account (£), 1874-1885</i>	126
Table 4.3 <i>Howietoun Fishery Estates Advance Account (£), 1874-1885</i>	126
Table 4.4 <i>Howietoun Fishery Profit Expressed as a Percentage of Turnover and of Capital Employed (£/%), 1879-1885</i>	128
Table 4.5 <i>Howietoun Fishery Income and its Trend using a 3-Year Average (£), 1879-1885</i>	131
Table 4.6 <i>Howietoun Fishery Expenditure Accounts: Miscellaneous, Labour, Management, Advertising, and Interest (£), 1875-1885</i>	133
Table 4.7 <i>The Effect of Interest Payments on Howietoun Fishery Profits (£), 1879-1885</i>	133
Table 6.1 <i>Howietoun Fishery Income, Expenditure and Profit (£), 1875-1897</i>	166
Table 6.2 <i>Howietoun Fishery Construction Capital Account (£), 1874-1893</i>	169
Table 6.3 <i>Howietoun Fishery Estates Advance Account (£), 1874-1893</i>	170

	Page
Table 6.4 <i>Howietoun Fishery Profit Expressed as a Percentage of Turnover and of Capital Employed (£/%), 1879-1897</i>	171
Table 6.5 <i>Howietoun Fishery Income and its Trend using a 3-Year Average (£), 1879-1897</i>	174
Table 6.6 <i>Howietoun Fishery Expenditure Accounts: Miscellaneous, Labour, Management, Advertising, and Interest (£), 1875-1897</i>	178
Table 6.7 <i>The Effect of Interest Payments on Howietoun Fishery Profits (£), 1879-1892</i>	182
Table 6.8 <i>Howietoun Fishery Pre-Interest Profit Expressed as a Percentage of Turnover (£/%), 1879-1892</i>	202
Table 9.1 <i>Howietoun's Stocking of Loch Leven, 1875-1885</i>	293
Table 10.1 <i>Howietoun Fishery Expenditure, Income, Profit and Profitability (£/%), 1898-1913</i>	334
Table 10.2 <i>Howietoun Fishery/Howietoun and Northern Fisheries Company Income and its Trend using a 3-Year Average (£ in Current Prices), 1879-1972</i>	337
Table 10.3 <i>Howietoun Fishery/Howietoun and Northern Fisheries Company Income and its Trend using a 3-Year Average (£ in Constant Prices), 1879-1972</i>	341
Table 10.4 <i>Howietoun and Northern Fisheries Company Profit and Profitability (£/% in Current and Constant Prices), 1917-1963</i>	344

	Page
Table 10.3A (Appendix II) <i>Howietoun Fishery/Howietoun and Northern Fisheries Company Income (£), 1879-1972. Recalculated into Constant (1891) Prices.</i>	385
Table 10.4A <i>Howietoun Fishery/Howietoun and Northern Fisheries Company Profits (£), 1879-1963. Recalculated into Constant (1891) Prices.</i>	388

LIST OF CHARTS

	Page
Chart 4.1 <i>Howietoun Fishery Income and its Trend using a 3-Year Average (£), 1879-1885</i>	131
Chart 6.1 <i>Howietoun Fishery Income and its Trend using a 3-Year Average (£), 1879-1897</i>	174
Chart 10.1 <i>Trend of Howietoun Fishery/Howietoun and Northern Fisheries Company Income using a 3-Year Average (£ in Current Prices), 1879-1972</i>	338
Chart 10.2 <i>Trend of Howietoun Fishery/Howietoun and Northern Fisheries Company Income using a 3-Year Average (£ in Constant Prices), 1891-1972</i>	342
Chart 10.3 <i>Howietoun Fishery/Howietoun and Northern Fisheries Company Profits (£ in Constant Prices), 1879-1963</i>	345

LIST OF ILLUSTRATIONS

	Page
Illustration 1 <i>Sir James Ramsay Gibson Maitland (Colour Facial)</i>	<i>xi</i>
Illustration 2 <i>Stripping a trout</i>	67
Illustration 3 <i>Francis Day's illustrations of the Loch Leven trout at Howietoun</i>	108
Illustration 4 <i>Map showing location of the Howietoun Fishery c1880</i>	109
Illustration 5 <i>The Howietoun pond system</i>	110
Illustration 6 <i>Fishery workers netting the ponds and stripping fish</i>	111
Illustration 7 <i>Fishery workers packing eggs for despatch</i>	112
Illustration 8 <i>Howietoun despatching house (engraving)</i>	113
Illustration 9 <i>Fishery workers preparing to despatch young fish</i>	114
Illustration 10 <i>Howietoun's packing boxes and tanks</i>	115
Illustration 11 <i>Howietoun despatching house and ponds (photograph)</i>	116
Illustration 12 <i>A hybridised 'zebra' fish</i>	117
Illustration 13 <i>Howietoun's certificate from the 1882 Edinburgh Fisheries Exhibition</i>	118

	Page
Illustration 14 <i>Maitland's certificate from the 1883 London Fisheries Exhibition</i>	119
Illustration 15 <i>Maitland's certificate from the 1883 London Fisheries Exhibition</i>	120
Illustration 16 <i>Sir James Ramsay Gibson Maitland (Black and White Body)</i> ..	235
Illustration 17 <i>Sauchieburn Mansion House</i>	236
Illustration 18 <i>Amateur backyard piscicultural apparatus</i>	323



Sir James Ramsay Gibson Maitland, Baronet (1848-1897)

Chapter One

INTRODUCTION

Pisciculture is an unusual sort of a business with world-wide ramifications - a business, likewise, that contributes to the enjoyment of a quiet and reflective pastime which shows no sign of losing its popularity, and an organisation that helps in the provision of an important item of diet for the people of the country.¹

It would be difficult to travel around Britain, particularly Scotland, without, at least once on the journey, coming across a fish farming operation. From the early 1970s, the United Kingdom's production of farmed trout has increased from less than 1,000 tonnes *per annum* to over 16,000 tonnes *per annum* by 1988.² In 1990, there were a total of 769 registered fish farming businesses operating on 1,211 sites throughout the United Kingdom. 295 of these businesses and 569 of the sites were located in Scotland. The total value of farmed salmon and trout output in 1988 amounted to £100 million, whilst the total value of all non-farmed fish and shellfish landings by British vessels in that year was £400 million. In 1988, the fish-farming industry directly employed an estimated 5,000 people and probably a further 5,000 indirectly. In the eyes of the Government, fish farming is a valuable industry, particularly in areas such as the Scottish Highlands and Islands where it "offers employment in small and isolated communities ... [and] ... helps to diversify the economic base and retain population in areas where there are

¹ Stirling Journal and Advertiser 26 May 1927 p.7.

² The output of farmed salmon increased from less than 1,000 tonnes to 18,000 tonnes *per annum* over the same period.

few alternative opportunities."³

It is also an important industry globally with a significant presence on all continents except Antarctica. In 1987, the world produced an estimated 14.5 million tonnes of farmed fish and shellfish, 12.3 *per cent* of the total world fish and shellfish harvest. Production is predicted to increase at 5.5 *per cent per annum* up to the year 2010. The industry is of particular importance in Asia, where over 80 *per cent* of the world harvest is produced.⁴

Fish farming has only really emerged as a significant economic sector in Britain over the past two decades as emphasis has developed on production, mainly of trout, salmon and shellfish, for the table.⁵ But the

³ House of Commons Agriculture Committee, Fourth Report - Fish Farming in the United Kingdom: Volume 2; Minutes of Evidence and Appendices (1990) pp.1-3. Numerous different terms are used to describe fish farming - the phrase 'fish farming' itself, 'fish culture', and 'pisciculture' being the main three. Each phrase is used interchangeably throughout this thesis and can be defined as the husbandry or the artificial rearing or fattening of fish. (The word artificial is used as an indication of the fact that something in the process can be considered to be not what would happen were fish raised naturally in the wild.) It should be noted that 'fish culture' is not synonymous with 'aquaculture' but is in fact part of the wider field of aquaculture which covers the cultivation of all aquatic species, whether of piscine, molluscan or vegetable origin. Landau, M Introduction to Aquaculture (1992) p.3.

⁴ *Ibid.* pp.3-14.

⁵ Before the 1970s, pisciculture was undertaken mainly for the purposes of restocking fisheries. With higher standards of living since then, and a reduction in the price of food for fish farms, it has become economically viable to farm salmon and trout for the table as well as for restocking. A delicacy "once enjoyed only by the rich is now within reach of everyone."
(continued...)

practice of fish farming itself dates back over not much less than five millennia. First practised in Ancient China, the husbandry of aquatic species spread throughout the world and, in the later eighteenth century, was enhanced by the discovery of the means to actually *propagate* fish through artificial insemination. In the nineteenth century this process was developed on a large scale - largely because of concern that sea and freshwater fishery stocks were declining as the result of over-fishing and pollution, a concern that remains prevalent in the later twentieth century.⁶ Particularly in Britain, France and the United States, artificial fish culture was seen as a way to restock waters damaged by man. Another reason for the growth in pisciculture in the nineteenth century was the growth in the popularity of angling as a recreational pursuit amongst all classes. Angling too has remained

⁵(...continued)

University of Stirling, Howietoun Archive, HF/B28: Unsorted loose material. Howietoun and Northern Fisheries Company Report entitled 'Trout Production - Opportunities and Problems' (nd - circa 1973).

⁶ Hickling strikes the distinction between fish farming and fishing, illustrating how fish culture could come to the aid of over-fished waters:

Fishing (and whaling) are the last and greatest of Man's activities as a hunter. But however mechanised and streamlined, with radio, radar, sonar and other electronic aids to the hunt, fishing is still the chase of wild creatures, free to wander as they will, and owned by no man until they are in the nets or on the hook. Much of the anarchy of the modern fisheries scene is due to the attempt by the maritime fishing countries to secure a greater ownership of these wild creatures, some kind of proprietary right, at least for their own nationals. But if fishing is hunting, then fish culture is stock raising. Here there is no question of ownership or proprietary rights, for the fish are grown in natural or artificial ponds which are owned by someone, and the fish he grows are his property as much as the cattle on a ranch are the property of the rancher.

Hickling, CF Fish Culture (1962) p.13.

a feature of national life with over 3 million regular anglers in the United Kingdom at the present time.⁷

One of the many people involved in the development of fish farming in nineteenth century Britain was Sir James Ramsay Gibson Maitland, Baronet (1848-1897), incumbent of the Barnton Estate near Edinburgh and the Bannockburn and Sauchie Estates in Stirlingshire.⁸ No evidence survives to

⁷ Lowerson, J 'Angling' in Mason, T (ed.) Sport in Britain - A Social History (1989) p.23. Anglers spend an estimated £1 billion *per annum* on their sport. The Times 6 March 1994. Reference obtained through the Joint Academic Network's (JANET) Wide Area Information Server containing extracts from The Times. There are no page references available in this media.

⁸ The Sauchie Estate had been acquired in 1786 by Maitland's great-great-grandfather, William Ramsay, a merchant banker who already owned the Barnton and Bannockburn Estates. On William's death in 1807, the three estates passed to his only surviving son, George, also a banker. George died in 1810 and was succeeded by his son of six months, William. William went on to become Liberal Member of Parliament for Midlothian and, on his death in 1850, the estates passed to his only child, Charles William Ramsay. Charles died without issue at only twenty-one years of age in 1865. By deed of entail the estates then passed to Maitland's father, Sir Alexander Charles Gibson Maitland of Clifton Hall and Kersie (1820-1876), a grandson of George Ramsay, distantly related to the Earls of Lauderdale and Liberal Member of Parliament for Midlothian between 1868 and 1874. On succeeding to the estates, Alexander added the name Ramsay to the family surname. Gibson, JC 'The Baronies and Owners of Sauchie and Bannockburn' Transactions of the Stirling Natural History and Archaeological Society 56 (1934) pp.108-128. The three estates covered a total of 10,228 acres and had an annual value of £20,328. Bateman, J The Great Landowners of Great Britain and Ireland (1883) p.260/296.

(continued...)

document Maitland's early life, nor is there much covering his adult life before he succeeded to the baronetcy in 1876. Nothing is known about his schooling except that, in 1863, at the age of 15, he went to the University of St Andrews, where he studied English Literature, Greek, Latin, Mathematics and Logic before leaving, without graduating, in 1865.⁹ He then received military training at Sandhurst and entered the army with a commission as Cornet in the Fourth Dragoon Guards. In May 1869, Maitland left the army to marry Fanny Luce White, the youngest daughter of Sir Thomas Wollaston White.¹⁰ It is not known what the couple did in the four years immediately after the wedding but in 1873 they took up residence at Craigend House, on the Sauchie Estate, where Maitland immediately began experimenting in pisciculture. As well as this and time spent enjoying his favourite sport of

⁸{...continued}

The Maitland baronetcy itself had been founded in 1818 when the title was awarded to General Alexander Maitland (1728-1820). Alexander was succeeded by his son, Alexander Charles (1755-1848), who, in turn, was succeeded by Sir James Maitland's father, his grandson, also Alexander Charles. Sir James Maitland had two female children, Mary (1871-1944), and Sybille who died at only 4 months of age in 1873. On his death in 1897, Sir James was succeeded by his cousin, John Nisbet Maitland (1850-1936), the only child of his father's brother, George Ramsay (1821-1866). Burke's Peerage (1936) p.1595.

⁹ I am indebted for this information to Mr Robert N Smart, Keeper of the Muniments at the University of St Andrews. Letter from Mr Smart dated 29 June 1993.

¹⁰ Stirling Journal and Advertiser 21 May 1869 p.4. See also The Times 14 August 1884 p.6. One of Maitland's obituarists noted that Fanny "took much interest in natural science, and more especially in bird life and geology." Anon. 'Sir James Maitland' Proceedings of the Linnean Society of London (1898) pp.41-44.

angling upon Loch Leven, Maitland worked in local government and served as a magistrate and Deputy Lieutenant for Stirlingshire and as a Captain in the local militia, the Highland Borderers.¹¹ Between 1882 and 1892, he was also a member of the Fishery Board for Scotland. In 1885, he fought, and lost, a peerage case in the House of Lords when he tried to prove himself as the rightful heir to the Earldom of Lauderdale but was pipped at the post by a descendant of a dubiously legitimized bastard grandson of an eighteenth century earl. In 1886, he returned to the House of Lords to fight and win a case against a Falkirk Town Council Water Bill which would have brought his piscicultural work to an end. After a long period working in county administration, Maitland became Convenor of Stirlingshire County Council in 1890 and held this position until his death in 1897 at the age of only 49.

The main concern of this thesis is Maitland's piscicultural work. Within the space of a few years, the piscicultural experiments begun in 1873 resulted in the construction of a fish farm at Howietoun, close to Craigend House, which produced trout eggs and live fish for sale to angling clubs and fishery proprietors desirous of restocking their waters. By 1886, the Howietoun Fishery, as it became known, was the largest single piscicultural establishment in the world. It was referred to as "a food producing industry on an extensive scale ... pisciculture on a scale that has never been equalled and with results that cannot be matched," and as "incontestably the most important

¹¹ The Times 14 August 1884 p.6.

establishment of its kind in the world."¹²

The thesis will examine the history of fish farming prior to the later nineteenth century and draw from this the various motivating influences which brought Maitland into the piscicultural arena (Chapter Two). It will analyse in detail the piscicultural work at Howietoun, and attempt to assess Maitland's contribution to the development of the science of fish farming (Chapters Three and Nine). The thesis will suggest that, though only one of many people involved in the development of fish farming in the nineteenth century, Maitland deserves an historical niche that has thus far eluded him. Though fish farming has only become big business in Britain over recent years, it will be argued that Maitland's work laid down the principles on which pisciculture has evolved over the past century. In the late nineteenth century, Howietoun was an piscicultural establishment unrivalled in terms of both size and, more importantly, quality. It was a fish *breeding* establishment where Maitland bred, in carefully controlled conditions, pedigree fish of the highest quality to be sold on the open market. In the late twentieth century, though much has changed with the introduction of high technology to the piscicultural process, the basic method of fish culture rests on a process developed and perfected in Stirlingshire between 1873 and 1897. Indeed, it will be shown that Maitland's work helped to rescue pisciculture, in Britain at least, from an increasingly apathetic attitude towards it amongst those involved.

Maitland's work will also be assessed from a commercial point of view

¹² Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.4/236.

in two chapters which look at the business performance of the fishery between 1873 and 1885 and 1886 and 1897 (Chapters Four and Six). The evidence presented in these chapters will be used to analyse Maitland's commercial ability in the light of historical arguments concerning both the aptitude of late nineteenth century British entrepreneurs and the role of cultural forces in British economic decline since then. Separating the two chapters on the fishery's business performance will come a chapter on the Falkirk Water Bill case of 1886 (Chapter Five). This provides a detailed analysis of how and why Maitland won the battle against a Bill which, had it passed, would have closed the fishery. The chapter is important to the thesis not only because success snatched Howietoun from the lion's jaw but also because it confirmed the important nature of Maitland's work.

The second half of the thesis takes a broader look at Maitland's work away from Howietoun, discussing his time as a member of the Fishery Board for Scotland and, briefly, the non-piscicultural commitments with which he became increasingly involved from 1886. Chapter Seven covers his fight for the Lauderdale peerage, his attempt to become a Member of Parliament and his work as Convenor of Stirlingshire, considering whether Howietoun suffered as a result of these distractions. Chapter Eight examines Maitland's time on the Fishery Board for Scotland in the context of current historical debate over the issue of state support for nineteenth century British science.

How and why history has failed to adequately recognise Maitland's legacy will be discussed in detail later in the thesis (Chapter Nine). But the lack of recognition is worth brief illustration here as an entrée to the

exposition of his achievements. Whilst Maitland lived he was lauded as being "not only in the foremost rank, but at the head of the great body of modern pisciculturalists."¹³ When he died his obituarists paid tribute to his great "success in pisciculture" at Howietoun, "one of the most successful fish hatchery establishments in the world."¹⁴ Yet Maitland is mentioned in, it seems, only four of the numerous modern works on fish farming, many of which include an historical survey as an introduction, and then only in passing.¹⁵

This lack of recognition is more surprising when one considers that Howietoun did not die with Maitland but continued in operation and, still running today, is the oldest fish farm in Britain.¹⁶ In part, the neglect of

¹³ Field 30 June 1883 p.883.

¹⁴ Land and Water 20 November 1897 p.810.

¹⁵ Clements, J Salmon at the Antipodes: A History and Review of Trout, Salmon and Char Introduced in Australasia (1988) p.130. I am indebted to Mr Clements for supplying me with a copy of the book as it is not available in this country. Deacon, M 'State Support for Useful Science: The Scientific Investigations of the Fishery Board for Scotland, 1883-1899' in Scheiber, HN (ed.) Ocean Resources: Industries and Rivalries Since 1800 (1990) p.1. Laird, L and Needham, T Salmon and Trout Farming (1991) p.22. Munro, ALS and Waddell, IF 'Growth of Salmon and Trout Farming in Scotland' in Bailey, RS and Parrish, BB (eds.) Developments in Fisheries Research in Scotland (1987) p.246. Munro and Waddell refer to Maitland as Sir Thomas Maitland of Howietown (sic).

¹⁶ Howietoun remained in the sole hands of the Maitland family until 1914 when it was merged with a rival piscicultural operation to form a new limited company, the Howietoun and Northern Fisheries Company. The Maitland family remained the majority shareholders in the
(continued...)

Maitland's achievements could be explained by what will be shown to be the generally disappointing performance of the Howietoun operation in the years between 1897 and 1967 when it passed out of the hands of his heirs (Chapter Ten). Perhaps the main explanation, however, is that historians themselves have paid little attention to the subject of pisciculture.

The most important archival source used in this thesis is the Howietoun Archive housed at Stirling University Library. This contains the surviving records of the fishery for the period from its inception in 1873 to 1979. The archive comprises 122 volumes, 28 boxes and 174 bundles of material. The material divides neatly into two sections, before and after Maitland's death in 1897. For the period before 1897 the amount of material is relatively modest but better organised. It is comprised mainly of the fishery's bound cash and ledger books and 15 bound letter books each amounting to at least 1,000 pages. The cash books record every individual transaction from expenditure of, for example, just one penny on a stamp to large sales amounting to several hundred pounds. The ledger book presents the detailed accounts in summary form, consolidating the individual daily transactions of the cash book into monthly and annual sums. It also groups the data under various account headings, such as sales and management expenses, and thereby does away with the need to go through every single transaction in the cash book and regroup them into sets. Nevertheless, as historians of accounting practice

¹⁶(...continued)
new venture and ran the fishery until 1967 when it was sold to a non-family interest. In 1979, the farm was sold to its present owner, the University of Stirling.

readily testify, few historical accounts are easily or quickly comprehended however clear their form and presentation.¹⁷ The Howietoun accounts are certainly no exception. Problems encountered included relatively simple matters such as the checking of account balances and more complex difficulties thrown up by changes in the style of the fishery's account keeping towards 1897.¹⁸

The letter books contain a copy of every letter sent out by the fishery during Maitland's lifetime. They are indexed by addressee rather than subject and thus much time had to be spent leafing through every individual page and scanning the contents of the correspondence. The index proved useful in tracing correspondence with well-known persons, for example that between Maitland and the ichthyologist Francis Day or the head of the United States Commission on Fish and Fisheries, Professor Spenser Fullerton Baird. But it could not serve as a pointer to the vast amount of valuable information lying in letters to innocuous and unknown addressees, such as an 1885 letter to a WW Strickland of Bridlington, in which the fishery secretary revealed in the clearest possible terms Maitland's intentions for the fishery's business development. These letters provide information on a wide range of topics ranging from trivial matters such as the fishery's secretary having caught a chill to Maitland's polemics against those he saw as piscicultural ignoramuses.

¹⁷ *Vide infra* p.125.

¹⁸ There are also problems with the statistical records in that some data is missing and the detail of record-keeping drops significantly in the later years of Maitland's life. *Vide infra* p.165.

The letter books also contain copies of other interesting and useful sources such as Maitland's political speeches from his fruitless campaigns to enter the House of Commons in 1880 and 1886, drafts of work to be published and notes of stocks and sales records together with copies of every individual invoice sent out by the fishery.

One difficulty with the letter books, apart from the need to leaf through each individual page, is that an out-letter alone is often not enough to allow us to put events and opinions into their full context. Unfortunately, most of the letters *received* by Howietoun prior to 1897 have not survived. As a result, it is often unclear to what or to whom letters are referring and it becomes necessary to search out what one can glean of the context in the other sources available. Probably the greatest difficulty with the Howietoun Archive is that severe water damage has rendered many of the letter books, particularly those for the late nineteenth and early twentieth centuries, almost completely illegible. Though frustrating, this problem can to some extent be overcome by using evidence from other sources, particularly that in published material.¹⁹

¹⁹ *Vide infra* p.18. It is ironic that, in fact, *all* the letter books in the collection have been water damaged; but it is only those which are in typescript that have been rendered useless because the pen ink has resisted the water whilst the typed carbon copies have completely succumbed. It is not known how or when the water damage occurred, other than that it was definitely before the University of Stirling took over in 1979. Since the books were housed in a dilapidated attic room up to that time, a leaking roof would seem a probable cause.

In addition to the material in the bound volumes, the pre-1897 archive contains a few bundled papers which include general loose correspondence, notes and such material as labourer's wage books, expense voucher receipts and a handful of in-letters. These papers were useful in allowing the double-checking of information formally recorded in the bound volumes and occasionally acted as a complete new source of evidence such as in the case of Maitland's notebook covering his early piscicultural work between 1873 and 1880.

The second and larger part of the Howietoun Archive, that covering the period from Maitland's death in 1897, comprises sources of a rather different nature. It is similar to the first part of the collection in that it contains bound volumes of statistical records and letter books but, whilst far greater in volume, the post-1897 material is rather weaker in detail. The post-1897 letter books, particularly those covering the period to 1914, are heavily water-damaged and even the legible records therein largely consist of simple copies of despatch notes and invoices. The books do not contain the same kind of lengthy correspondence on the fishery's work as written during Maitland's lifetime. The Minute Book of the Howietoun and Northern Fisheries Company is a very important source for the period from 1914. It gives a good deal of extra information that was originally intended for the owners' attentions only. This includes, for example, management worries about a decline in the quality of Howietoun's produce or the opinion of the owners that the fishery's financial difficulties in the early 1930s were the result of a Socialist Government's taxation policy. A significant part of the post-1897 material,

particularly for the period after 1945, is in loose unsorted correspondence. Much of this is mundane but does occasionally yield significant additional information to that in the Minute Book.

The financial records for the period after 1897 also take a substantially different form to those for the earlier period. Accounting practice became far less detailed comprising more simple statements of income, profit and loss than minute delineations of the accounts. Nevertheless, the financial material contained in the Minute Book and other sources is sufficiently full to allow the compilation of data on the company's business performance after 1897 and sufficiently clear enough to show the financial mess into which the company became increasingly embroiled in the twentieth century. Together with the non-financial records and the help of other sources discussed below, the Howietoun Archive's material for the post-1897 period is more than adequate for the relatively brief analysis of that period in this thesis.

Whatever the problems with the Howietoun Archive, it is undoubtedly a valuable and unique collection. Despite extensive searching through the National Register of Archives and archives overseas, and corresponding with every British archive in the locus of a fishery and with every person known to me to be interested in the topic, it has not been possible to find any other primary records relating to a private, commercial fish hatchery such as Howietoun was. In Britain, the only known archival material relating to pisciculture other than that at Howietoun is some typed notes from the 1940s, held at the Gloucestershire Record Office. These relate to a late nineteenth century fish farm at Guildford in Surrey but offer only a simple

potted history of the operation. It was hoped that the long-standing fish farms at Bibury and Dumfries, founded in the early twentieth and late nineteenth centuries respectively and which are still operational, would be able to offer considerable records but, due to changes of ownership and occasional periods of non-operation, no such evidence has survived and they have no records going back further than the past decade. Help from local archivists contacted in the search for primary material did turn up occasional references to nineteenth century piscicultural operations in local newspapers such as the Stamford Mercury, a Lincolnshire paper that carried an article on a fishery at Caistor, or in local journals, such as the Transactions of the Dumfries and Galloway Natural History and Antiquarian Society which carried one or two articles on the fishery at Dumfries. These do not, however, offer anything to match the hard primary evidence in the Howietoun Archive.

Material in the Howietoun Archive is complemented by Maitland's family papers held in the Steel-Maitland Collection at the Scottish Record Office in Edinburgh.²⁰ The span of the collection covers successive generations of the Maitland family from the seventeenth century through to the 1950s though only a relatively small amount of material relates to either Maitland or Howietoun. Nevertheless, the archive is very well catalogued with several sections devoted entirely to fishery papers. Material in these sections provides considerable information on issues such as the fishery's water supply

²⁰ Steel-Maitland became the family surname in 1901 when Maitland's only surviving child, Mary, married Mr (later Sir) Arthur Steel and amalgamated the two names. *Vide infra* p.325.

problems (Chapter Six) and, more importantly, was extremely useful in researching the history of the fishery after Maitland's death in 1897. Here, it provides an abundance of internal reports on the fishery and private family correspondence pertaining to it. Searching the Steel-Maitland collection for items not catalogued under fishery headings reveals valuable contextual material, relating both to the fishery and to Maitland's wider interests.

The Scottish Record Office also keeps the papers of the Fishery Board for Scotland, the predecessor of what is now the Scottish Office Agriculture and Fisheries Department, of which Maitland was a member between 1882 and 1892. These papers, though considerable in volume, are rather disappointing in detail from the perspective of researching Maitland's individual role and work on the Board. The thesis makes use of the records of the Scientific Investigations Committee of the Board, upon which Maitland served. Largely in the form of copy letters, these papers throw light on the rather turbulent relationship between Maitland and his scientific colleagues on the Board, the other members of the Fishery Board as a whole, and the Government when it came to central funding for scientific fishery investigations and the control of their direction and emphasis. This material is supplemented by the inclusion of Treasury papers pertaining to the Fishery Board which were removed from the Whitehall collection and added to the Edinburgh stock. Unfortunately, the minute books of the Board covering the entire period of Maitland's membership have been lost. Their absence means that an analysis of Maitland's work on the Fishery Board must be based solely on what was written between members and Government departments rather

than on what was said privately at Board meetings.²¹ It also makes the contextualisation of some of the material in the correspondence files difficult. Some of the missing contextual material, however, can be extrapolated from the voluminous Annual Reports issued by the Board from 1882.

The final archival source of which significant use is made in this thesis is the minutes of the 1886 Falkirk Water Bill case in the House of Lords (Chapter Five). Apart from documenting the case itself, the minutes provide important material on other matters, particularly on why Maitland conceived the fishery in the first place, what he hoped to achieve with it, how successful it was, and what developments were planned for it in the future. The minutes give a far better background and introduction to Maitland's work than any other source because they record what he and his piscicultural contemporaries actually said when explaining Howietoun's importance to the hearing. Indeed, so much evidence on fish culture and the importance of Howietoun's work was given in the course of the hearing that its chairman turned away some of Maitland's witnesses on this subject stating "we hardly require any more evidence upon that point."²² The minutes are available in manuscript at the House of Lords Record Office and in typescript at Central Region Archives in

²¹ In view of the turbulent relations between Board members and the Government (Chapter Eight), what was said privately may well have been more revealing. The Board's most recent historian, Margaret Deacon, believes that the minute books may have been deliberately removed in the late nineteenth century as a result of their controversial nature. Letter from Dr Deacon dated 13 November 1992.

²² Central Region Archives, FA1/6/1, p.237.

Stirling. Supplementary information on the case's background can be found in the Howietoun Archive, the Steel-Maitland Archive, and in local newspaper reports.

Apart from that in archival material, a large amount of evidence also exists in published form. As will be discussed in Chapter Two, the second half of the nineteenth century saw a significant surge of public interest in pisciculture and this was mirrored in newspapers and other popular publications. To sample this I have examined five published sources, representing both local and national resources: The Times, Field, Fishing Gazette, Stirling Saturday Observer, and Stirling Journal and Advertiser.²³

Whilst The Times contains only a handful of direct references to Maitland and his piscicultural work, it is invaluable in providing reports on the general nature of the British fisheries and world pisciculture in the later nineteenth century which can be used to place Maitland against the wider, national and international background. By contrast, the local Stirling Saturday Observer and Stirling Journal and Advertiser, which appear to have been very proud to have the world's largest piscicultural establishment in their environs,

²³ Another journal of the period, Land and Water, was not consulted, other than for Maitland's obituary therein, since, firstly, it was believed that its two rivals, the Field and Fishing Gazette, offered a wide enough span of the information available, and, secondly, because this particular journal had not been indexed and would therefore have required a great deal of time in locating information. Maitland himself had little time for Land and Water, cancelling fishery advertisements therein once he had realised that the response did not justify the expenditure. University of Stirling, HF/V50: Letter Book 6, p.150. James Guy (Howietoun's Secretary) to Mr M Kelson of Land and Water, 11 December 1886.

provide much more extensive information on both Maitland's piscicultural work and on his wider non-piscicultural activities. The Field and the Fishing Gazette, the two most popular 'country life' newspapers of the later nineteenth century, also provide useful information on Maitland's work, on the progress of British and world pisciculture throughout the later nineteenth century, and on the fishery problems which gave rise to an interest in pisciculture. Finding material in the national resources was not difficult as all are well-indexed. The Times, Field, and Fishing Gazette are each indexed annually rather than for the whole period and thus some time had to be spent looking under various headings for each volume but this is far easier than for the Stirling Saturday Observer which is not indexed and had to be scanned page by page in an attempt to find relevant articles and headlines. The Stirling Journal and Advertiser does have an index though it is not particularly comprehensive; nevertheless, the location of articles in its rival paper, the Stirling Saturday Observer, serves as a guide for locating information not included in its index.²⁴

In addition, there is much material to be found in the numerous, more specialised, late nineteenth and early twentieth century monograph and

²⁴ The majority of the late nineteenth century issues of the Field and Fishing Gazette are available at the National Library of Scotland in Edinburgh, whilst most of The Times, Stirling Saturday Observer and the Stirling Journal and Advertiser are available at Stirling University Library, Stirling District Library, and Central Region Archives in Stirling. The few missing parts are located at the British Library's Newspaper Library at Colindale, London.

periodical publications on pisciculture.²⁵ Some of the publications, such as HH Almond's Nineteenth Century article on the decay of the salmon fisheries and JJ Armistead's book A Short History of the Art of Pisciculture, were extremely useful in setting Maitland and Howietoun in the historical context of public concern over declining freshwater fishery stocks and increased interest in pisciculture as a solution to the problem. In the absence of archival material, the discussion of the development of fish culture up to 1873 in the following chapter, for example, had to be based entirely on such sources. Some particularly useful publications look at Howietoun in particular; a Scottish Review article, for example, gives a detailed account of the stocking of a barren loch with Howietoun fish and goes on to evaluate the importance of Maitland's work.²⁶ Other more specialised journals, such as the Transactions of the American Fisheries Society and the Progressive Fish Culturist, contain many useful articles which, though not dealing directly with

²⁵ The main bibliographic work consulted in searching for references to such publications was Bibliotheca Piscatoria, a list of all known publications in English on fish, fishing and fish culture which the Field described as "a magnum opus in every sense of the word." Field 17 March 1883 p.347. Westwood, T and Satchell, T Bibliotheca Piscatoria (1883). Also used were: Poole's Index to Periodical Literature 1802-1906 (1907), North, JS The Waterloo Directory of Scottish Newspapers and Periodicals 1800-1900 (1989), the British Library Catalogue and the National Union Catalogue.

²⁶ Almond, HH 'Decay in British Salmon Fisheries' Nineteenth Century 45 (1899); Armistead, JJ A Short History of the Art of Pisciculture, Showing its Utility and Some of the Advantages Which May be Derived from it if it is Properly Carried On (1870); Bertram, JG 'The Salmon in Scotland' Scottish Review 14 (1889).

Maitland himself, give detailed information on piscicultural work in the United States and allow comparisons to be drawn with that carried out at Howietoun.²⁷

The last and most important of the secondary sources used are the publications issued by Howietoun itself between 1880 and 1903. These include the various editions of the Pamphlet on Stocking, which described the best ways to restock depleted waters with trout, Maitland's papers on fish culture, and occasional articles in the Transactions of the Stirling Natural History and Antiquarian Society. Together, these provide the background for the most important single published source available on Howietoun, Maitland's own monograph, The History of Howietoun: Volume I, published in 1887. This is a complete treatise on fish culture, vital for studying the Howietoun piscicultural method in great detail, and provides a comprehensive discussion of the annual development of the fishery and its piscicultural work from 1873 to 1880. Unfortunately, a promised second volume, bringing the story through to the completion of Howietoun in 1886, never appeared.²⁸ Nevertheless,

²⁷ A British equivalent of these publications, the Journal of the National Fish Culture Association appeared in 1887 but folded after just one four part volume had been issued. The National Fish Culture Association itself is discussed in Chapter Three. *Vide infra* p.101.

²⁸ The question of what happened to the second volume of the work, which should have been published late in 1887, is a mystery. There is no explanation for its non-appearance to be found in the Howietoun Archive. Nor, unlike for the first volume, have any draft chapters for the second volume survived. Note that throughout this thesis, no second volume having ever appeared, the book is referred to simply as The History of Howietoun rather than The History of Howietoun: Volume I.

some less detailed information on the work after 1880 can be found in the brief pamphlet A Short Account of the Howietoun Fishery published by the fishery in 1903. The fishery also issued regular annual press releases which appeared in the local press and in specialist fishery publications such as the Field and Fishing Gazette. These annual releases, though very brief, do contain enough information to draw up a suitable picture of the fishery's development from year to year and go some way towards redressing the damage done by water to the letter books for the 1890-1897 period and by the absence of the second volume of the History of Howietoun.

Chapter Two

HISTORICAL FOUNDATIONS AND MOTIVATING INFLUENCES

What is a river, a Scottish river, without its trout? What is the ocean without its navies? What are the heavens without their stars? There is scarcely a scene or landscape, in Highlands or Lowlands, with which this fish is not in some measure associated. Climb yonder hill and gaze around and before you. See there an earl's proud mansion, his parks and pleasure grounds. See there trees of twice a century's growth. ... But mark! Seemingly at your feet, the life blood of the picture, a broad, shining, rejoicing river!¹

Before discussing Maitland's piscicultural work itself, it is important to determine why he chose to work in fish culture in the first place. None of his estates encompassed fisheries which, in need of replenishment, would have attracted him to such a pursuit. As the Stirling Saturday Observer commented, "It must be particularly noted that Sir James Gibson Maitland's fishery is not in connection with either the Forth or any other river. It is an independent enterprise and has been apparently planned and carried out by the noble baronet independently of all pecuniary considerations."² This chapter seeks to identify and discuss the factors that gave rise to the creation of the Howietoun Fishery from 1873. In so doing, it falls into two distinct sections. The first, an extended discussion of the pre-nineteenth century history of fish culture, lays out the historical foundations upon which Howietoun was built. The second continues the history of pisciculture into the nineteenth century,

¹ Stoddart, TT The Angler's Companion to the Rivers and Lochs of Scotland (1847) p.1.

² Stirling Saturday Observer 12 March 1881 p.1. Much later, another local newspaper mistakenly believed that Maitland had set out to rear trout "in order to improve the sporting value of the burns and lochs on his estate." Stirling Journal and Advertiser 26 May 1927 p.7.

up to the early 1870s, but also extends its analysis to discuss the particular influences of that century which both initiated and maintained a national 'climate' for piscicultural entrepreneurship and which stimulated Maitland to create Howietoun.

As the Fishing Gazette noted in 1881, "pisciculture has been practised from the remotest antiquity."³ Maitland was not the world's first pisciculturalist nor was Howietoun its first fish farm. Fishing is as old as mankind and Maitland's work in the later nineteenth century was built on a world piscicultural tradition that extended as far back as well over 2,000 years before the birth of Christ.⁴ Fish culture in the sense that we now know it - the propagation of live fish by means of the *artificial* fertilisation and incubation of fish eggs - has a history of only a few centuries. However, its equally important antecedent - fish culture in the sense of the husbandry and controlled rearing or planting of *naturally* propagated live fish and eggs - has

³ Fishing Gazette 16 April 1881 p.183.

⁴ Archaeologists regularly discover prehistoric fishing tackle or cave drawings depicting the capture and eating of fish. See Dunfield, RW The Atlantic Salmon in the History of North America (1985), Clark, JGD Prehistoric Europe: The Economic Basis (1952), and Brandt, A von Fish Catching Methods of the World (1984). It should be noted that the following discussion of the history of fish culture, though covering all of the major developments in world piscicultural history, is far from comprehensive in dealing with their particulars. A whole thesis could be written on this subject alone and, therefore, much detail has had to be omitted. The chapter is nevertheless sufficient to set Maitland in his historical context and, at the same time, provides a necessary introduction to the history of a somewhat esoteric, but nevertheless interesting field of study.

its origins in Ancient China. The common carp was a staple of the Ancient Chinese diet and the earliest records, dating from around 2698BC, document a process of restocking waters where the fish had become scarce by importing eggs from waters where it was plentiful.⁵ Subsequently, the Chinese developed the actual farming of fish for commercial gain: breeding carp were confined in ponds and their offspring fattened before being sold on the open market. In 1135BC, Wen Fang, possibly the first fish farmer recorded by name, built ponds for carp rearing in Hunan Province and kept records on the growth and behaviour of fish.⁶ The first known document on pond fish culture, Fan Li's Yang Yu Ching (Treatise on Fish Culture), appeared in 475BC.⁷

⁵ The eggs were collected by means of a framework of hurdles, upon which the fish would spawn, which were placed on wooden posts dug into the river bed. Ling, SW Aquaculture in Southeast Asia: An Historical Overview (1977) pp.4-7. See also: Costa-Pierce, BA 'Aquaculture in Ancient Hawaii' Bioscience 37 (1987) *passim* and Hickling, CF Fish Culture (1962) pp.21-27. One mid-nineteenth century British piscicultural writer could not believe that the Chinese had actually practised this method of fish farming: "these statements are so ridiculous ... who could believe that by damming up a river, the spawn of fishes could be gathered in tubs and sold by measure?" Young, A The Natural History and Habits of the Salmon with Reasons for the Decline of the Fisheries. Also an Account of the Artificial Incubation of the Salmon (1854) p.53.

⁶ Landau, M Introduction to Aquaculture (1992) p.4.

⁷ Fan Li's treatise covered the rearing of fish for commercial gain:

King Wei of Chi, upon learning that Chu Kung was visiting in neighbouring Lau, invited him over and asked: "I hear that you have been calling yourself a different name every time you visit a different country, and in Yuch you are called Fan Li. Is it true?" "True" answered Chu Kung. The King continued:

(continued...)

Fish culture developed further in China after the birth of Christ. The period of the Han Dynasty (25-220AD) saw the evolution of the symbiotic culture of fish and rice - the other main staple of the Chinese diet - in the same pond, a system still widely used in China today. This gave a significant boost to the spread of popular fish farming in a country where almost

⁷(...continued)

"You live in a very expensive house, and you have accumulated millions. What is the secret?"

Whereupon Chu Kung responded: "Here are five ways of making a living, the foremost of which is aquatic husbandry, by which I mean fish culture. You construct a pond out of six mou of land. [6.6 *mou* equates to approximately 1 mile] In the pond you build nine islands. Place into the pond plenty of aquatic plants that are folded over several times. Then collect twenty gravid carp that are three *chih* in length and four male carp that are also three *chih* in length. [1 *chih* equates to approximately 0.3581 metres] Introduce these carp into the pond during the early part of the second moon of the year. Leave the water undisturbed and the fish will spawn. During the fourth moon introduce into the pond one turtle, during the sixth moon two turtles, and during the eighth moon three turtles. The turtles are heavenly guards against the invasion of flying predators. When the fish swim round and round the nine islands without finding the end, they will feel as if they are in natural rivers and lakes. By the second moon of the next year you can harvest fifteen thousand carp of one *chih* in length, forty-five thousand carp of two *chih*, and ten thousand carp of three *chih*s.

"The total harvest can render a cash value of one and one quarter million coins. The following year you can get one hundred thousand carp of one *chih*, fifty thousand carp of two *chih*, fifty thousand carp of three *chih*, and forty thousand carp of four *chih*. Save two thousand carp that are two *chih* in length as parent stock and market the remainder. The take will amount to five million and one hundred and fifty thousand coins. In one more year the increase in income is countless."

Following the evidence of Chu Kung, King Wei started a fish pond in his garden. In his first year, the king made more than three hundred thousand coins. In his ponds there were built nine islands. In addition, eight depressions were excavated. Each depression had two *chih* of water at the rim and six *chih* of water at the centre. The carp would segregate themselves according to size in these depressions. The reason to raise carp rather than other species of fish is that the carp is not cannibalistic, that it is fast growing, and that it is inexpensive to raise.

Carp as large as three *chih* are obtained only in the vicinity of large rivers and lakes. If you start with small fish, they would take too long to mature. If you start with the spawn, the method to collect spawn is to go to shore areas on rivers and lakes where large carp gather. Collect the mud at the water's edge, take a dozen loads or so, and spread the mud on the bottom of the culture pond. Within two years there will be grown large carp. This is because the mud contains eggs of large carp, which hatch readily in pond water.

everybody had access to a rice paddy.⁸ During the reign of the Tang Dynasty (500-800), the scope of pisciculture spread when it was discovered that other carp species, aside from the common carp alone, were suitable for pond culture.⁹ The Ming Dynasty (1368-1644) witnessed the publication of several detailed treatises on pond fish culture which, by then, had become a major sector of the Chinese economy.¹⁰

The Ancient Romans practised pond fish culture from around 91BC.¹¹ Varro states that freshwater fish were reared in ponds by Roman "common folk" who disposed of them in a "not unprofitable" fashion.¹² Columella records the restocking of depleted waters, as practised in Ancient China, by

⁸ Kangmin, L 'Rice Fish Culture in China: A Review' Aquaculture 71 (1978) p.87. The culture of fish in paddies proved beneficial to rice production because the fish ate rice parasites, their swimming action aerated the water and loosened the bottom soil to release nutrients trapped therein, and their faeces acted as fertilisers.

⁹ Landau, Introduction p.4. It is amusing to note that this development came about as a direct result of the Tang Dynasty's family name, Li, which was also the species name of the common carp. The dynasty found it unacceptable that their subjects should eat their namesakes and thus prohibited the cultivation and consumption of that particular variety of the fish.

¹⁰ Zhong, L Pond Fisheries in China (1991) p.2.

¹¹ According to Pliny the first Roman fish culturist was Lucius Murena "in the time of the orator Lucius Crassus, before the Marsian War" (91-88BC). Rackham, H Translation of Pliny's Natural History (1962) IX, lxxx and Boyd-Ash, H Translation of Varro's De Re Rustica (1934) III, xv, 1-17.

¹² Boyd-Ash, Varro's De Re Rustica III, xv, 1-17.

peasants who "filled the lakes which nature had formed with fish spawn brought from the sea."¹³ However, most classical writers indicate that Roman pond fish culture was mainly the preserve of the wealthy, ponds being used more as a lavish display of opulence and less for the practical purposes of food production, restocking or commercial gain. As Varro put it, these ponds appealed "more to the eye than the purse, and exhaust the pouch of the owner rather than fill it."¹⁴ Roman fish became pets rather than food. Pliny, for example, noted that Drusus' wife, Antonia, "adorned her favourite lamprey with earrings" and that, subsequently, "affection for individual fishes came into fashion."¹⁵ According to Seneca, at least at times, the richer Romans did use their ponds for rearing fish for consumption; but he was scornful that these ponds were "enclosures designed to save men's gluttony from having to run the risk of storms and to ensure the extravagance of safe harbours of their own, however wildly the high seas might be raging."¹⁶ There is also some archaeological evidence of fishponds at Romano-British villas, though, again, most were probably ornamental rather than functional.¹⁷

¹³ Boyd-Ash, H Translation of Columella's De Re Rustica (1955) VIII, xvi.

¹⁴ Boyd-Ash, Varro's De Re Rustica III, xv, 1-17. See also: Shackleton-Bailey, DR Translation of Cicero's Ad Atticum (1978) II, i, 7, and Shackleton-Bailey, DR Translation of Martial's Epigrams (1993) X, xxx, 22-24.

¹⁵ Rackham, Translation of Pliny's Natural History IX, lxxxi.

¹⁶ Quoted in Kirk, R A History of Marine Fish Culture in Europe and North America (1987) p.12.

¹⁷ Zeevat, RJ 'Fishponds in Roman Britain' in Aston, M (ed.) Medieval Fish, Fisheries and (continued...)

After the fall of the Roman Empire, pond fish culture for practical rather than luxurious purposes became prevalent in Britain.¹⁸ Fishponds (or stewes), used to fatten freshwater fish such as pike, dace, barbel and roach for the table, are one of the commonest earthwork remains of medieval England, especially in the midlands and the south.¹⁹ One of the main questions in the Domesday survey related to the number of fish ponds held.²⁰ Ponds were particularly common on monastic estates because of the importance of fish in the religious diet, monks being required to abstain from eating meat on certain days of the week and during religious festivals.²¹ They were also

¹⁷(...continued)
Fishponds in England (1988) pp.17-23 and Wild, JP 'The Roman Fishponds at Lynch Farm' Dubroviae 1 (1973) pp.20-21.

¹⁸ The pond fish culture described below was, in fact, prevalent across Europe, though only the British evidence is discussed here.

¹⁹ As one medieval historian points out: "There are few workers in the field of English Medieval Local History who will not at some stage of their investigations have come across a reference to a fishpond." In Oxfordshire alone, there are 65 medieval fish pond systems. Roberts, BK 'Medieval Fishponds' Amateur Historian (1966) p.47. Note that the word *stewe* can also be used to describe a brothel.

²⁰ Nicol, A Domesday Book (1981) p.5.

²¹ Bond, CJ 'Monastic Fisheries' in Aston, Medieval p.104. Refusing to observe religious fish days could be a serious offence. In March 1552, for example, "a wyfe of Hammersmith brought two pygges to London to a carpenter dwellinge in Smythfield, which was taken contrary to a proclamation for eating of fleshe in Lent, and by judgement of my Lord Mayor and Alderman they did ryde on two horses with panelles of straw about the markettes of the citie, having eche of them a garland on theyr heades of the pygges pettie toes, and a pygge
(continued...)

important to the English monarchy which, by the fourteenth century, owned pond systems in at least 33 different locations.²²

But although they supplied fish for consumption, overcoming the difficulties of transporting live sea fish great distances inland, there is little evidence to show that the fish ponds of medieval Britain were utilised on the Ancient Chinese model for the commercial farming of fish or for the restocking of depleted waters.²³ Some of the pond systems were so large that the amount of fish they could have produced would have been in excess of local requirements and thus must have gone elsewhere; but most were of a size suitable only for supplying the requirements of the owner.²⁴ Nor were the majority of the ponds particularly productive. Surviving accounts from pond-owning houses show that the ponds could meet only about three-fifths of the household requirement for freshwater fish, the shortfall having to be purchased from outside agencies. Furthermore, as with the Ancient Romans, it appears that medieval British fishponds remained largely the preserve of the

²¹(...continued)
hanging on each of their breasts afore them." Wriothesley, C A Chronicle of England 1485-1559 (nd), quoted in Drummond, JC The Englishman's Food - A History of Five Centuries of English Diet (1964) p.63.

²² Steane, JM 'The Royal Fishponds of Medieval England' in Aston, Medieval p.44. Stirling Castle had a complement of fish ponds to supply the tables of the Jacobean monarchs who once resided there. Stirling Saturday Observer 22 April 1882 p.3.

²³ Drummond, Englishman's Food p.38.

²⁴ Bond, 'Monastic' p.104. For a detailed analysis of one fishpond system, that belonging to William More, Prior of Worcester between 1518-1536, see Hickling, CF 'Prior More's Fishponds' Medieval Archaeology 15 (1971).

wealthy. The evidence shows that most commoners ate sea fish rather than the freshwater pond varieties because of the prohibitive prices of the latter. An average size pike in the fifteenth century, for example, cost between 2 and 3 shillings, a sum equal to the weekly wage of a skilled craftsman.²⁵ Similarly, Chaucer's Franklin in The Franklin's Tale was a wealthy man with "many a luce and bream in stewe."²⁶

At some time during the later middle ages or early modern era, however, British pond fish culture appears to have developed into a more commercial farming operation. The author of a late sixteenth century angling treatise, for example, urged upon "such as have not rivers" that "it shall be goode to save, keepe and maintaine [in ponds] all such fish as may be nourished and bred in freshwaters."²⁷ By the eighteenth century, fishpond

²⁵ Dyer, C 'The Consumption of Freshwater Fish in Medieval England' in Aston, Medieval p.32.

²⁶ Spearer, AC The Franklin's Prologue and Tale (1994) Line 353.

Medieval Czechoslovakia provides an interesting contrast in that its pond fish culture was not confined to the wealthier members of society. Fishponds became a popular source of income for Czechoslovakian peasant farmers from the fourteenth century under the economic reforms of the Holy Roman Emperor Charles IV. During the fifteenth century, pond 'mania' swept across Czechoslovakia with the construction of 25,000 ponds in Bohemia alone. However, the mass appeal of popular pisciculture resulted in the over-production of fish, rapidly declining prices and the collapse of the market by the late sixteenth and early seventeenth centuries. After the Thirty Years War (1618-1648), many ponds were filled and the land reclaimed for more lucrative livestock farming. Andreska, J 'Development of Fish Pond Culture in Bohemia' in Gunda, B (ed.) Fishing Culture of the World (1984).

²⁷ Mascal, L Booke of Fishing with Hooke and Line (1590) p.58.

management had become a fairly common subject in farming treatises. In 1705, for example, one commented that:

It is unknown but to such as have made tryal what a great profit may be made by breeding of carp, especially near the City of London, or within reach of any eminent town or city in England inhabited by the Nobility or Gentry. The pond for the carp is no great charge in making, the stocking of it with fish much less, and the looking after it no charge at all, it being only the expense of idle hours.²⁸

Thus far, discussion has centred on either the artificial restocking of waters through the importation of *naturally* spawned ova or live fish, or on the artificial rearing/fattening of naturally spawned ova and fish in ponds. The next stage in piscicultural development came in 1420 when a Benedictine monk at the Abbé de Réome in France, Dom Pinchon, experimented in the *artificial* fertilisation of trout eggs.²⁹ Having observed the natural spawning of trout, Pinchon realised that, since fertilisation took place outwith the body, it might be possible for man to perform it artificially.³⁰ He thus caught a male and

²⁸ More, J England's Interest, or the Gentleman and Farmer's Friend (1705), quoted in Fishing Gazette 18 October 1884 p.200. See also Bradley, R The Country Gentleman and Farmer's Monthly Directory (1736).

²⁹ The fact that Pinchon was a monk implies that he was already well acquainted with fishponds. *Vide supra* p.29.

³⁰ In natural spawning/fertilisation, the male and female trout or salmon go through a courtship ritual and pair off, sometimes not without considerable fighting between several concupiscent males. The female uses her tail to make a trench in the gravelly stream bottom whilst the successful male swims around in a suggestive manner. The female is induced to deposit her eggs in the trench and, once she has finished, the male ejaculates his milt (sperm)
(continued...)

female fish and stripped them himself, leaving the artificially fertilised ova to incubate in a wooden box standing in a stream.³¹ When the first young fish broke out of their shells several weeks later, Pinchon had demonstrated that the artificial fecundation and incubation of ova was possible and that it was no longer necessary to rely on natural processes for the stocking of ponds.³² The discovery, however, was not widely publicised, nor, indeed, was it accepted by those who knew of it as being of any significance. Pinchon's experiment was quickly forgotten until an old manuscript containing details of

³⁰(...continued)
over them and fertilisation takes place. The female then swims slightly upstream of the eggs and dislodges some more gravel with her tail. This flows downstream to cover the eggs. The female's work is now done and the eggs are left alone to incubate. The male may go on to repeat this process with remaining unattended females. Landau, Introduction p.266.

³¹ 'Stripping' means the taking of a female fish which is on the point of depositing its eggs and stimulating the release of the eggs artificially by stroking the abdomen. The eggs are then held in a receptacle whilst the process is repeated with a male to procure milt. The milt is mixed with the eggs to allow fertilisation - artificial fecundation - to take place. The process used by Pinchon, which is no different to that used in modern trout farms, is best described by the eighteenth century pisciculturalist, Jacobi:

Stroke them [the female] with a hand or fingers downwards, till the spawn discharges into the bowl ... then rub the belly of the male trout in the same manner till some of its milk [sic] discharges into the water ... then stir the whole with your hand so as to mix it well, and all the eggs or spawn will be fructuated.

Royal Dublin Society 'A New Method of Breeding Salmon and Trout' Transactions of the Royal Dublin Society 1 (1800) p.119. Jacobi's work is itself discussed below. There is an illustration of a fish being stripped on page 67.

³² Radcliffe, W Fishing from the Earliest Times (1926) p.291.

it was unearthed in 1854.³³ Whilst his experiment provides the first known reference to the actual artificial stripping and fertilising of fish eggs, the lack of interest in it means that his discovery "interests only from a historical point of view."³⁴

The Westphalian landowner and keen amateur naturalist, Stefan Ludwig Jacobi (1711-1784), was probably the first artificial fish culturist whose work has become widely known. Unaware of Pinchon's discoveries three centuries earlier, Jacobi too had observed natural spawning/fertilisation processes and was induced to attempt artificial fecundation in 1730.³⁵ The subsequent hatching of the eggs proved successful and Jacobi continued artificial propagation until 1763, erecting his own purpose-built hatchery on his estate in 1741.³⁶ Publishing the results of his experiments, Jacobi concluded that "as salmon do not spawn in ponds and as it is very difficult to procure a stock of young ones from rivers, our method, therefore, of multiplying them, may be very useful ... It appears that it would be no hard matter to breed trout in a place where there never had been before."³⁷

³³ Fish, FF 'Founders of Fish Culture: European Origins' Progressive Fish Culturist 16 (1936) p.8.

³⁴ Radcliffe, Fishing p.291.

³⁵ Wilkins, N Ponds, Passes and Parcs: Aquaculture in Victorian Ireland (1989) pp.20-21.

³⁶ Fish, 'Founders' p.9 and Wilkins, Ponds p.21.

³⁷ Hanover Magazine 62 (1765). Jacobi's article was published in English by the Royal Dublin Society in 1800. The editor of the Society's journal cautiously introduced it with the statement that "We do not, however, vouch for the truth of the facts alleged in this statement (continued...)"

Earlier pond fish culture had been useful enough, but it had ultimately relied on natural processes. Naturally impregnated eggs had to be brought to stock ponds and/or the owner had to await the natural breeding of fish confined in ponds.³⁸ In either case, man had very little control; he could never be sure of getting enough eggs to meet his requirements, nor could he protect the eggs he did get against all the losses attendant to natural incubation.³⁹ Under artificial propagation, however, man could fertilise the eggs at will, without having to search for well-hidden spawning areas - provided of course that the parents were ripe and ready to release their ova and milt - procuring as many as the fish he had could produce. The eggs could then be incubated and hatched in protected boxes where the only attendant evil would be natural wastage. The young fish could be similarly protected until such time as it was seen fit to release them into ponds or the wild. Jacobi had discovered both the method and the potential of fish culture in its truest sense.⁴⁰

³⁷(...continued)

[that salmon and trout could be bred artificially with great success] as a greater number of experiments would have to be necessary to confirm them." Royal Dublin Society, 'A New Method' p.119.

³⁸ Some fish, such as carp, will spawn and breed in ponds. Others, such as salmon and trout, will not because they need shallow gravelly spawning redds with a good flow of water. *Vide infra* p.69.

³⁹ These include storms, floods, pollution, predators (including cannibalism in the family), and the natural wastage of sickly or improperly fertilised embryos.

⁴⁰ Though Jacobi himself gave pisciculture up in 1763, the estate hatchery continued in operation until 1810. Fish, 'Founders' p.9.

Throughout the remainder of the eighteenth century, however, there was no attempt to develop the potential of Jacobi's discoveries. This was simply because nobody had yet perceived a need to do so. The early nineteenth century saw a change in this perception as certain factors, primarily a perceived decline in freshwater fishery stocks, particularly of salmon and trout, led to growing world interest in pisciculture, not least in Britain. These factors explain both the piscicultural climate in which Maitland found himself and, in association with factors peculiar to himself, provided his motivation for commencing piscicultural work.⁴¹

Being an island with both an extensive coastline and many freshwater lakes, lochs and rivers, Britain was particularly favoured with both sea and freshwater fisheries, and fishing, which had always been an important sector of the national economy, became even more important in the nineteenth century as a rising population and more efficient methods of transporting fresh fish, such as ice preservation and railways, widened the market and increased demand. For centuries before the industrial revolution, salmon had been so plentiful in Scotland that it was a staple in the diet of even the poorest members of society. In 1881, for example, the Stirling Journal and Advertiser wrote of "the days when apprentices ... refused salmon for their meals thrice

⁴¹ It will be observed that some of the following evidence is taken from the period after 1873, the year in which Maitland first began piscicultural work. It can thus be seen as an illustration of why Maitland's interest was maintained after he began his experiments, as well as of why he turned to fish culture in the first place.

weekly."⁴² Indeed, nineteenth and twentieth century folklore holds that an ancient Scottish statute legally obliged masters not to compel their servants and apprentices to eat the fish more than three times weekly. There is, in fact, no evidence other than hearsay that the statute ever existed, but, mythical or not, it indicates a past time when copious amounts of salmon were available.⁴³ Captain Francks, a Cromwellian trooper, for example, visited Stirling between 1660 and 1670 and wrote that "The abundance of salmon in these parts is hardly to be credited ... the Forth relieves the country with her great plenty of salmon."⁴⁴

⁴² Stirling Journal and Advertiser 4 March 1881 p.4. A nineteenth century historian of Stirling recorded that the Forth had once produced "vast quantities of excellent salmon" which was a principal of the Stirling diet. He added: "It is recorded of the apprentices of the town that, before engaging with masters, they generally stipulated that they were not to dine on salmon oftener than four times a week." Drysdale, W Old Faces, Old Places and Old Stories of Stirling (1898) p.259.

⁴³ Adams, WM A Popular History of Fisheries and Fishermen of All Countries from the Earliest Times (1883) p.59. Day quotes numerous other instances of apprentices' dislike for regular meals of salmon. Day, F British and Irish Salmonidae (1887) pp.112-113. A similar legend also runs in the history of the North American salmon fisheries: late eighteenth and early nineteenth inhabitants of Connecticut apparently complained that paupers and apprentices had to eat salmon more than twice weekly. Gay, J and Seal, WP 'Fish Culture - Past, Present, and Future' Transactions of the American Fisheries Society 19 (1890) p.69.

⁴⁴ Quoted in Bremner, D The Industries of Scotland: Their Rise, Progress, and Present Condition (1869) p.526. Francks is also credited with widely publicising Scotland's potential for anglers. Campbell, RN 'Trout Angling in Scotland, Past and Present: A Highly Personal View' Proceedings of the Salmon and Trout Association Annual Conference (1972) p.3.

But, as the Fishing Gazette had noted with the benefit of hindsight, "a water-locked land ... should ever be watchful of its aqueous resources."⁴⁵ The dawning of the nineteenth century brought fears among fishermen, fishery proprietors and fishery experts that salmon stocks were declining as a result of over-fishing, industrial pollutions and obstructions, and a lack of observance of laws designed to protect them from such factors.⁴⁶ Over-fishing meant the taking by fishermen of too many fish, particularly the younger ones with the greatest potential to procreate in the future, thus leaving too few fish in the fisheries to replenish stocks through natural reproduction. Those expressing concern about over-fishing saw its root cause in the late eighteenth century development of the coastal stake net. These large nets, supported by stakes and placed across river estuaries, caught huge quantities of salmon at one time by trapping the fish in shoals as they either entered or left the river from or to the sea.⁴⁷ It was argued that the lower

⁴⁵ Fishing Gazette 5 March 1881 p.113.

⁴⁶ Throughout the nineteenth century, the word 'salmon' tended to be used interchangeably with 'trout'. Whilst there is a clear biological distinction between the two fish - most obviously that the trout resides in freshwater whilst the salmon is anadromous - they come from the same species (the *salmonidae*) and their stock levels received equal concern in the period.

⁴⁷ Anon Observations Regarding the Salmon Fishery of Scotland (1824) p.11. Salmon are anadromous fish which spend their early life in freshwater before entering the sea to feed and grow for up to four years. After that the fish return to the natal stream to procreate. Robertson, IA The Tay Salmon Fisheries in the Nineteenth Century, Unpublished Ph.D Thesis, University of Stirling, (1989) pp.13-18.

stake net proprietors were both depriving proprietors at the upper reaches of the river of a fair share of the catch and were, at the same time, having a deleterious effect on the size of the overall salmon stock by taking more fish than nature could replace. The stake net fishermen, it was argued, were literally biting the hand that fed them. As one opponent of the stake net cause put it:

Suppose a man were to rent a farm and stock it with sheep, and after a year or two had elapsed commenced killing off both sheep and lambs indiscriminately, would it surprise anyone to find that there were no sheep left on his farm? This is just what has been done on our water farms - the salmon have been killed or caught indiscriminately, both old and young, and the consequence is that in many places our streams have been reduced almost to the same position that a sheep farm would be if the animals upon it were treated in the manner above described.⁴⁸

Robertson's research into the nineteenth century history of Scotland's great salmon fishery on the River Tay provides an interesting case study of how bitter divisions between upper and lower proprietors concerning over-fishing split the river into rival factions. Robertson shows that, having once been under the unified control of John Richardson, 'The Great Fishmonger of Tay', from the 1770s until the coming of the stake net in 1797, the river split between competing interests as individual fishing stations sought to maintain and develop their own share of the catch. Lower proprietors rapidly developed stake net fishing to the ire of upper proprietors who launched a legal case against them in 1799. The stake net cause lost but, even after losing a subsequent appeal to the House of Lords in 1805, the lower proprietors

⁴⁸ Armistead, JJ A Short History of the Art of Pisciculture (1870) p.19.

managed to exploit a loop-hole in the law and moved their nets out into the firth of the river. Interestingly, however, Robertson notes that whilst complaints and acrimony between upper and lower proprietors about over-fishing continued, all were concerned to enhance their catches. The Tay fishings thus became increasingly commercialised and the size of the fish stock itself actually became less and less of an issue. Parliamentary enquiries were held into the state of the Tay fisheries in 1824 and 1827 but the bitterness between the river's rival factions resulted in little worthwhile actually being determined. Indeed, an 1828 Act of Parliament designed to protect the fishings was reduced almost to nothing because of competing interests within the House of Commons itself.⁴⁹ It was neither proved nor disproved that the Tay was suffering from over fishing but, as Robertson points out "lack of evidence has never been a reason preventing people from holding strong beliefs, certainly not the participants in the Tay fisheries."⁵⁰ The statistics available for the catch on the river in the period are poor but Robertson's research has shown that catches on *individual* fishings were

⁴⁹ Robertson, *Tay passim*. The acrimony between upper and lower river proprietors resulted in any attempt to legislate for the salmon fisheries being met with cries of 'not enough' from one side and 'draconian' from the other. As an early twentieth century observer noted:

The whole history of salmon literature reminds us that to write on this subject is to open up argument and dispute. I have heard of a Cabinet Minister who, when asked to advance salmon fishery legislation, promptly declined, saying he wished to die in his bed.

Calderwood, WL *The Life of the Salmon* (1907) p.xiii.

⁵⁰ Robertson, *Tay* p.215.

decreasing, possibly as a result of the greater exploitation of the river through a larger number of fishing stations. The problems on the Tay were only put to rest in 1899 when the fisheries were returned to a homogenous whole under the control of the newly formed Tay Salmon Fisheries Company.⁵¹

Complaints about over-fishing and fears about a diminution in salmon stocks led to attempts being made to build upon the potential of artificial fish culture first demonstrated by Jacobi in the eighteenth century. The next stage in the history of fish culture occurred in Scotland, between 1836 and 1839, with experiments performed by John Shaw, a game keeper to the Duke of Buccleuch. Using Jacobi's method, Shaw set out to raise salmon in closed conditions so that he could determine whether the fish known as the parr was a species *suis generis*, as was then commonly thought, or was, as some argued, the young of the salmon.⁵² His experiments proved that parr were indeed young salmon, and, at the same time, provided the first British demonstration of the artificial propagation and rearing of fish.⁵³ They also

⁵¹ Ibid. pp.403-405. The first managing director of the Tay Salmon Fisheries Company, Peter Duncan Malloch, went on to become a joint owner and director of the Howietoun and Northern Fisheries Company from 1914. *Vide infra* p.326.

⁵² The parr looked markedly different to the adult salmon because it bore 13 distinctive body-stripes or 'parr markings'. It could also be very easily confused with the brown trout (*salmo fario*). The parr stage began when the fish was about one year old and could last for several years. Robertson, Tay p.14.

⁵³ Shaw's experiments were widely reported in such newspapers as the Field, Perthshire Courier, Scotsman, and The Times. They were described in detail in his own publications:
(continued...)

added to the concerns about over-fishing and declining stocks. Until it had been proven that parr were young salmon, these fish had been believed useless and were indiscriminately culled for use as pig food and land fertiliser. Not surprisingly, Shaw's discovery caused considerable consternation because it was realised that *all* fishermen - not only the stake netters - had unwittingly been exacerbating the problem of declining salmon stocks by the wholesale destruction of the young of the fish. As a later nineteenth century pisciculturalist observed:

If then, salmon are destroyed wholesale before they are advanced sufficiently in life to spawn, is it reasonable to suppose that there will be an abundant supply of full-grown fish? The two things are so analogous that the truth of them must be apparent to even the most casual observer. It is very like destroying the goose to get at the golden egg.⁵⁴

At one and the same time, Shaw had illustrated both a possible cause

⁵³(...continued)

Shaw, J 'An Account of Some Experiments and Observations on the Parr and on the Ova of the Salmon' Edinburgh New Philosophical Journal 21 (1836), 'Experiments on the Development and Growth of the Fry of the Salmon' Edinburgh New Philosophical Journal 24 (1838), and 'Account of Experimental Observations on the Development and Growth of Salmon Fry from the Exclusion of the Ova to the Age of Two Years' Transactions of the Royal Society of Edinburgh 14 (1840). It should be noted that Shaw was not alone in performing experiments on the parr issue though his work was the best documented and probably the most widely known at the time. For brief details of others involved with the subject, see Milton, JS 'Observations and Experiments Proving the Parr or Brandling to be the Young of a Variety of the Salmon' Quarterly Journal of Agriculture 6 (1836) and Flowerdew, H The Parr and Salmon Controversy (1871).

⁵⁴ Armistead, Short History p.72.

of and a possible cure for declining salmon fishery stocks. Since artificial factors had caused the decline, artificial solutions were sought. Shaw's work led to pisciculture being seen as an ideal way to replenish over-fished stocks. One anonymous reviewer of it, for example, commented that the "discovery will still be further valued from its practical bearing on the artificial breeding and rearing of fish, by which there is a possibility that its numbers may be so increased as to render it generally procurable as an article of food."⁵⁵ Twenty years before the commencement of Maitland's work, the Stirlingshire local press called for the adoption of pisciculture on the Forth in view of "the great advantages which would be conferred on Stirling and its neighbourhood by adopting the new mode of increasing salmon."⁵⁶

It is worth digressing a little to note that, by the 1870s, concern about over-fishing had extended from the freshwater to the sea fisheries. The coming of a large scale railway network and the development of ice-packing as a means of preservation after 1850 made the market for fresh sea fish more national than coastal and reduced the price of the commodity to such an extent that fresh sea fish became commonplace in the working class

⁵⁵ Anon 'Remarks on the Salmon' Quarterly Journal of Agriculture 13 (1843) p.489.

⁵⁶ Stirling Journal and Advertiser 9 December 1853 p.3. The editorial continued:

We only recur to this subject from a sense of its great importance, and from a conviction that the adoption of the system on an extensive scale would be greatly beneficial to the town, and to the several proprietors on both sides of the river. We earnestly trust that someone will have public spirit enough to take up the matter and bring it into a practical shape. It is an established fact that salmon may be propagated in ponds in millions, at a small cost, and we do not see why Stirling and the residents on the banks of the Forth should fail to avail themselves of such obvious advantages.

diet.⁵⁷ Increased demand for sea fish led to the development of deep sea trawling. Trawling - whereby huge nets were dragged across the sea bed by large steam powered vessels capable of traversing huge expanses of ocean for days on end - was the sea fishing equivalent of the freshwater stake net, allowing the capture of much larger quantities of fish and indiscriminately harvesting young and old fish alike.⁵⁸ At Grimsby, for example, the rise of the trawler saw deep sea hauls increase from 453 tonnes *per annum* in 1854 to over 45,000 tonnes by 1881. The enmity between the trawler men and those who adhered to the older methods of sea fishing using small nets and boats mirrored that between the upper and lower freshwater fishermen.⁵⁹

Returning to freshwater fishery matters, the fears about a decline in

⁵⁷ Burnett, J Plenty and Want: A Social History of Diet in England from 1815 to the Present Day (1979) p.135. See also Walton, JK Fish and Chips and the English Working-Class, 1870-1940 (1992).

⁵⁸ Thompson, P Living the Fishing (1983) p.16. Thompson states that the coming of the trawler made a real industry out of sea fishing and led to the rise of large scale "trawling capitalism." Likewise, Cushing describes the nineteenth century as the period of the "first industrialisation of fisheries." Cushing, DH The Provident Sea (1988) p.103.

One observer at the height of the trawling boom foresaw that "Much as the hand looms in the cottages scattered about the Yorkshire moors and lanes went down before the spinning-jennies and the mills, so the family fishing boat will disappear before the trawler and the Fishing Company." Liddel, AGC 'The Trawling Commission' Blackwoods 137 (1885) p.672.

⁵⁹ Adams, Popular History p.49. The number of sea fish catches carried by the railway companies increased from 98,154 tonnes in 1862 to 120,454 tonnes in 1864. Cushing, Provident p.115.

salmon stocks and calls for a piscicultural remedy were strengthened by other deleterious influences on the salmon fisheries which were quite separate from the mode of capture. The most important of these were obstructions, such as industrial mill lades, dams and weirs, which blocked the return of salmon from the sea to spawn in their natal streams. In 1871, 1,265 miles of salmon rivers in England and Wales, for example, were thus blocked to spawning fish.⁶⁰

One observer noted of such obstructions that:

Like a turnpike gate in a leading thoroughfare, they obstruct the traffic and reduce it to a minimum. The salmon cannot, like their friends the Rebeccaites in Wales, pull down the obstructions: neither can they turn back and go by another road. They are on the horns of a dilemma from which escape is impossible. They quietly submit to *force majeure*, and have their revenge by dying out altogether.⁶¹

The industrial revolution and concomitant urbanisation also brought the problem of river pollution through the discharge of manufacturing effluent and sewerage. The River Thames, for example, once plentiful with salmon and trout fisheries, had become so polluted that by 1850 it was virtually lifeless. In 1858, the year of the 'Great Stink', the stench of the polluted and stagnant water was so great that Victoria and Albert had to cancel a Thames pleasure cruise and Westminster offices along the riverside became unusable.⁶² In

⁶⁰ The Times 21 July 1871 p.4.

⁶¹ Fryer, CE The Salmon Fisheries (1883) p.27.

⁶² Francis Francis, a nineteenth century pisciculturalist (*vide infra* p.55), summed the state of the Thames thus:

Salmon have entirely ceased to enter its waters, Shad, once very plentiful, are very rarely taken. Smelts ... are no longer seen in sufficient numbers to pay for their capture. Flounders ... are almost extinct. ... Little or nothing appears to now remain of the fishery of the tidal waters but that of whitebait and

(continued...)

1879, the Stirling Saturday Observer complained that "The state of the Scotch rivers is bad enough to create some anxiety among people who use the water for drinking or washing. To the fish it is a matter of life and death, while anglers find their occupation gone, and the lover of nature is obliged to give streams wide berth."⁶³ Another observer was particularly vociferous:

The greatest men of this generation, among them Thomas Carlyle and John Ruskin, have spoken in no uncertain voice against the frightful system of discharging the whole filth and refuse of our cities and manufactories into our rivers; but it requires no greatness of mind to discern the evil - it is patent to every man who is not besotted with greed or prejudiced with self interest. Is it reasonable that any class or individual should have the liberty to convert a river, which is the property not only of riparian owners but of mankind, one of the most beautiful things in the universe, the sight of which cannot fail to refresh and ennoble, into a noisome sewer, certain only to disgust and demoralise?⁶⁴

The final contributory factor in declining freshwater fishery stocks was a general failure to observe laws enacted to protect the fisheries from over-exploitation and, indeed, the state of the law itself. In Scotland in particular, the importance of the salmon fisheries had long been recognised in legislation, the need to protect breeding fish from capture first being stressed in Robert I's Act of 1318, 'Of Fyschen in Watteris', and further confirmed in an Act of

⁶²(...continued)

shrimps. ... Many of the fishermen have left the river for other more profitable pursuits, and there has scarcely been a youth apprenticed to the calling of a fisherman for the last few years.

Quoted in Francis, JM and Urwin, ACB Francis Francis 1822-1886: Angling and Fish Culture on the Twickenham, Teddington and Hampton Reaches of the River Thames (1991) pp.6-7.

⁶³ Stirling Saturday Observer 17 May 1879 p.2.

⁶⁴ Stirling, J 'Trout Fishing on our Highland Lochs: Causes of its Deterioration and Remedies' in Herbert, D (ed.) Fish and Fisheries (1883) p.331.

James I in 1424. Subsequent legislation stipulated the need to attain a royal grant for salmon fishing, prohibited the destruction of young fish through damaging modes of fishing, and instituted an annual close time to prevent fishing when the fish were spawning.⁶⁵ Such legislation prevented over-fishing and, in the absence of industrial pollutions and obstructions, helped to maintain salmon stocks right through into the later eighteenth century.⁶⁶

But ancient statutes were not sufficient to protect salmon stocks against the industrial revolution, nor, by the time that stake net fishing became commonplace in the early nineteenth century, were old and largely forgotten laws any deterrent to over-fishing. There was by then what one observer called "a conspiracy on the part of the public to ignore and nullify all that is wise and worthy of remembrance in these statutes; a disgraceful oblivion has long overtaken their clear manifestos."⁶⁷ Moreover, particularly in Scotland, the ancient salmon legislation on the statute books was so numerous and complex that the actual ordinances were often unclear to both fishermen and law-enforcers.⁶⁸

It can thus be seen that, for a variety of reasons, but particularly with regard to over-fishing, the mid nineteenth century witnessed considerable

⁶⁵ Barker-Duncan, J Manual of the General Acts of Parliament Relating to the Salmon Fisheries of Scotland, 1828-1882 (1886) p.iii. See also Leith, JM 'Salmon Legislation in Scotland at Present Applicable to the Salmon Fisheries and the Best Means of Improving It' in Herbert, Fish and Fisheries.

⁶⁶ Fishing Gazette 24 March 1894 p.291.

⁶⁷ Paterson, J 'The English Salmon Fisheries' Edinburgh Review 137 (1873) p.158.

⁶⁸ Stirling Saturday Observer 28 February 1880 p.1.

concern that salmon stocks were declining. In the absence of reliable statistical data for salmon catches and stocks, however, it is very difficult to assess how realistic the concern about depletion was.⁶⁹ It is certainly true that new modes of capture, the mistaken culling of the parr, obstructions, pollutions, and the state of the law, must, by their nature, have resulted in greater pressure being placed on natural stocks. But this does not necessarily prove that there was an ongoing and possibly terminal decline in British salmon fishery stocks. In fact, it is clear that quite normal regional and seasonal variations in catches, rather than an ongoing shrinking of the stock may have been the cause of at least some of the perceived decline in salmon

⁶⁹ Adequate statistics of the Scottish salmon catch did not become available until 1952. Association of Scottish District Salmon Fishery Boards Salmon Fisheries of Scotland (1977) p.13. The lack of statistical evidence in the nineteenth century was due to the difficulties of collating such information at a time when the technology for doing so was largely absent and when fishing was organised in small units, performed by individual fishermen rather than large companies. Furthermore, the controversial nature of the issue, as demonstrated by the differences between upper and lower proprietors, means that the claims about over-fishing should themselves be treated with caution. Those fishermen who caught the least fish would be prone to exaggerate their plight in order to drive their message home, whilst those who caught the most would be prone to agree that catches were declining in order not to be accused of over-fishing. As one rather astute contemporary observer noted:

In no class of persons perhaps is there, however, more frequent complaining or grumbling about bad times than among fishermen; if they are asked about how their fishing is going on ... complaints are heard of the fish having been almost all driven away ... and comparisons are made of the present bad times with some particular season when, on enquiry being made, it is probably found that the fish were unusually abundant.

Holdsworth, EWH Sea Fisheries (1877) p.2.

fisheries.

After complaining of diminution and disaster in the local salmon fisheries in 1873, for example, the Stirling Saturday Observer reported in 1874 that "The Forth and Teith are swarming with salmon ... and to all appearance this will be one of the busiest spawning seasons which has been known for many years past."⁷⁰ September 1875 saw Britain approach "the conclusion of one of the worst salmon fishing seasons we ever remember."⁷¹ Things were no better the following year when the Field complained that "this has been one of the worst seasons for spring salmon on record."⁷² Yet the 'decline' was halted and 1878 proved an excellent year.⁷³ Then again, in 1879, The Times noted that in Scottish rivers in particular "salmon have been almost entirely absent, and fears are entertained lest the supply of fish during the present year may prove considerably below the average."⁷⁴ A relatively poor Forth salmon season in 1884 was followed in 1885 by the fisheries

⁷⁰ Stirling Saturday Observer 21 November 1874 p.2 and Stirling Journal and Advertiser 20 February 1874 p.5.

⁷¹ Field 11 September 1875 p.297. Hoping for the adoption of national pisciculture and fishery protection policies, the editorial continued:

Thirty or forty years hence, the present time will be looked back to as a sort of 'dark ages' as regards our fishery management, and people will wonder at what a strange, dirty, and wasteful generation we were, and why we didn't have the rivers and lakes as bright, pure and wholesome, and a crowded with all sorts of the most valuable fish as they will have, while we are fancying ourselves in the very van of what we describe as civilisation and progress.

⁷² *Ibid.* 25 March 1876 p.353.

⁷³ The Times 16 July 1878 p.4.

⁷⁴ *Ibid.* 4 February 1879 p.12.

being more successful than for fifty years past.⁷⁵ In 1888, "many good judges" of the state of the Forth salmon fishings were "of opinion that salmon in our best Scottish rivers are as abundant as they ever were before."⁷⁶ On the other hand, 1889 was a bad year on the Forth: "the tacksmen will be glad if they can pay working expenses out of their venture, let alone rent."⁷⁷

That natural fluctuations could have been interpreted as a terminal decline in stocks is demonstrated by recent work in environmental history. Summers assesses the data that is available concerning historical salmon catches and uses it in an attempt to discover the long term population dynamics of Scottish salmon. He finds that catch records from different fisheries show a broad correlation with the late eighteenth and early nineteenth centuries having very high catches with relatively lower ones thereafter though with some increases in the 1870s and 1880s. In the twentieth century, catches increased in the 1920s and 1930s, fell in the 1940s, increased again in the 1950s and 1960s but fell quite sharply in the 1980s. In view of the fact that these fluctuations affected geographically disparate fisheries, Summers suggests that their explanation lies in the sea where salmon from different rivers share a common environment. He postulates that the marine environment, particularly temperature in the effect it has on the food chain and availability of food for the salmon, may well hold

⁷⁵ Stirling Saturday Observer 8 August 1885 p.3.

⁷⁶ *Ibid.* 1 December 1888 p.4. The problem, as the newspaper noted, was not with the absolute supply of fish but with getting them at the right place and the right time for capture.

⁷⁷ *Ibid.* 24 August 1889 p.3.

the answer.⁷⁸

Nevertheless, whatever the real truth about the nineteenth century salmon fishery issue, it cannot be denied that many held, rightly or wrongly, that stocks were declining and went on to seek remedies for the problem. A detailed evaluation of whether there actually was a decline is not really the concern here. What matters is that many believed the problem to exist and that this gave rise to a pro-piscicultural climate of opinion. This climate of opinion in Britain resulted in several experimental forays into pisciculture, all building on Shaw's earlier work in the 1830s. A gamekeeper, Gottlieb Boccus, for example, artificially propagated 120,000 trout in 1841 and went on to publish a piscicultural manual.⁷⁹ At about the same time, two other Britons, Thomas Garnett of Clitheroe and Mr Fawkes of Farnley, performed small scale piscicultural experiments, "the whole of which were successful."⁸⁰ Similar experiments were carried out on the artificial

⁷⁸ Summers, DW 'Scottish Salmon - The Relevance of Studies of Historical Catch Data' in Smout TC (ed.) Scotland Since Prehistory: Natural Change and Human Impact (1993) pp.98-113. Summers traces the relationship between marine temperature, as measured by the amount of ice building up off the coast of Greenland, and Scottish salmon catches. He finds there to be a possible positive correlation between decreases in marine temperature and increases in the Scottish salmon catch.

⁷⁹ Boccus, G A Treatise on the Management of Freshwater Fish with a View to Making Them a Source of Profit to Landed Proprietors (1847).

⁸⁰ Garnett, T Essays in Natural History and Agriculture (1883) pp.55-60. Unfortunately, Garnett does not elaborate on what his experiments were, which is surprising since he mistakenly claims the discovery of artificial propagation for himself.

fertilisation and hatching of trout ova by Sir Francis Mackenzie in Rosshire in 1840.⁸¹

The most important development, however, came in Ireland in the 1850s. From 1856, the Ballisodare fishery in Co. Sligo undertook artificial propagation to increase salmon stocks. In 1858, the annual salmon catch on the fishery was 1,400. By 1864-1878 it had reached between 8,000 and 9,000.⁸² Artificial propagation was also undertaken at the Doohulla fishery in Galway between 1859 and 1863, successfully stocking a river that had previously been devoid of salmon life.⁸³ But the largest and most important piscicultural venture in the period was that of the Lancashire millowners, the brothers Thomas and Edmund Ashworth, who purchased the Galway fishery in 1852 and opened the United Kingdom's first commercial salmon hatchery at Oughterard on the Owneriff river.⁸⁴ By 1854, the stock of the Galway

⁸¹ Mackenzie, FA 'Brief and Practical Instructions for the Breeding of Salmon and Other Fish Artificially' Annals of Natural History 8 (1842) pp.166-169.

⁸² Wilkins, Ponds pp.86-99 and Went, AEJ 'History of the Ballisodare Fishery' Scientific Proceedings of the Royal Dublin Society 22 (1940) pp.289-306.

⁸³ Wilkins, Ponds pp.73-85.

⁸⁴ The hatchery was put under the charge of William Ramsbottom of Clitheroe, a fishing tackle manufacturer who had experimented in fish culture under Thomas Garnett. It should be noted that the use of the word 'commercial' is meant to signify that pisciculture was practised not for experimental purposes but for the replenishment of a depleted commercial fishery. It does not mean that ova and fish raised through pisciculture were sold on the open market, rather that such fish were returned to their natural environment to be caught and sold once they had reached maturity.

fishery was increasing dramatically.⁸⁵ In their own words, the Ashworths, whose work was widely publicised, had "rendered the science of pisciculture subservient to commercial purposes" and set a practical example for others to follow.⁸⁶

The final stage of British piscicultural development in the pre-Maitland era occurred on the River Tay, where fish stocks had been the subject of considerable concern.⁸⁷ In July 1853, Thomas Ashworth gave a lecture on pisciculture to a meeting of some of the Tay proprietors. The proprietors were suitably impressed and voted £500 towards a piscicultural operation of their own, to be situated on the river at Stormontfield.⁸⁸ By the 1870s, the operation was producing 100,000 young salmon *per annum* and the proprietors' rental incomes from their fishings had steadily risen from 1852.⁸⁹

Apart from concern over the alleged depletion of freshwater fishery

⁸⁵ Wilkins, Ponds pp.49-71. Wilkins gives much fuller details of all events in Ireland and continues the story of Irish pisciculture through into the later twentieth century.

⁸⁶ Ashworth, E Remarks on the Artificial Propagation of Salmon and Some Account of the Experiment at Stormontfield (1875) p.6. In Ireland alone, at least seven other salmon hatcheries, mostly relatively small scale affairs, opened between 1863 and 1871. Wilkins, Ponds p.229.

⁸⁷ *Vide supra* p.39.

⁸⁸ Brown, W The Stormontfield Experiment on the Salmon (1862) pp.24-29.

⁸⁹ Young, A Salmon Fisheries (1877) p.205. This may, in fact, have been the result of an increased intensity of fishing rather than of an actual increase in stocks as the result of artificial propagation. *Vide supra* p.40.

stocks, another impetus to pisciculture came with the later nineteenth century boom in angling as a sport and leisure activity. Popular angling came about with the railway age which enabled poorer urban 'Waltonians' to reach rural waters with considerable ease.⁹⁰ The estimated number of anglers rose from 50,000 in 1878 to 100,000 in the early 1900s and 200,000 by 1914.⁹¹ In 1881, the Fishing Gazette reported that "not a week passes in either of our large cities but an angling fraternity is established; in London alone, the number is so large that the railway companies find it expedient to extend concessions to most of them."⁹² The growth in angling was a cause of

⁹⁰ Anglers are often referred to as 'Waltonians' in the light of the legacy of Isaac Walton, a famous seventeenth century angler who popularised the sport in his classic work, The Compleat Angler (1653). He became a hero of the new angling fraternity in the later nineteenth century and the book went through a huge number of popular reprints, 55 during Victoria's reign alone. Field 24 August 1878 p.243 and Lowerson, J 'Angling' in Mason, T (ed.) Sport in Britain - A Social History (1989) p.14. See also Senior, W Angling in Great Britain (1883) and Lowerson, J 'Isaac Walton - Father of a Dream' History Today 33 (1983).

⁹¹ Lowerson, J 'Brothers of the Angle. Coarse Fishing and English Working Class Culture, 1850-1914' in Mangan, JA (ed.) Pleasure, Profit and Proselytism (1988) p.105.

⁹² Fishing Gazette 5 March 1881 p.113. Lowerson sees the growth of popular angling to have had "strong roots in a popular arcadianism, the idea of a 'real England' and a time-limited escape from urban living." Lowerson, Angling' p.13 and 'Isaac Walton' p.31. In some way, save for the phrase 'time-limited', Lowerson's statement tends to support the thesis of Professor Martin Wiener that the nineteenth century witnessed an increasingly pro-rural and anti-urban and industrial ethos within British society. *Vide infra* p.188. The reflections of a nineteenth century angler on a sporting trip to Loch Coila in Sutherlandshire, go some way
(continued...)

pressure on fishery stocks and, at the same time, a stimulus to pisciculture.

As one observer commented:

Most of our lochs are now fished regularly every day of the season, where twenty years ago a fly was seldom cast, if ever indeed. The construction of the Highland and West Highland Railways has thrown open to the holiday-seeking inhabitants of our cities districts having the very scantiest resident population, and scarcely ever visited before, save by a few zealous tourists. In the days of stage coaches the travelling itself occupied the greater part of the time, and the whole attention of the tourist, but now, since the facilities for locomotion are so great, the attention of the traveller is bestowed upon his destination and its attractions, not on his journey and its attendant discomforts. The angling of our Highlands is now recognised as an attraction second only to their scenery, consequently vast numbers of tourists carry their rods with them, and if they are out up in the neighbourhood of a bit of water, the chances are that it will be well lashed before they leave.⁹³

The 1860s saw the emergence of two 'piscicultural propagandists', both of them keen anglers, who believed that British pisciculture should be encouraged to build on the examples set at Stormontfield and Galway. Francis Francis (1822-1886), angling editor of the Field, disseminated piscicultural knowledge through his editorials, wrote several books on the subject and

⁹²(...continued)
to confirm this view:

Once a day the mail cart brought letters and an occasional paper a week old. No tourists ever come near our paradise, not even a commercial traveller, although these swarm all over Scotland and even haunt the Shetlands. We were many miles from a telegraph office, perhaps thirty from a doctor, and at least forty from a lawyer. The Ministry might fall, empires shake, the money market be convulsed; but what cared we? Not the faintest echo of these disturbances reached the snug breakfast party before we went off, each with his own gillie, north, south, east, or west at will.

Watkins, MG 'A Fush at Last' (sic) Longmans Magazine 4 (1884) p.176.

⁹³ He concluded that "artificial stocking is the remedy which in my regard will best assist us to counteract the causes of depletion." Stirling, 'Trout Fishing' p.317. As Lowerson notes, "one of the sport's earliest ancillary industries was pisciculture." Lowerson, 'Angling' p.17.

opened up a small experimental hatchery at his Twickenham home where he supplied fish for the restocking of the Thames.⁹⁴ But it was Frank Buckland (1826-1880), a surgeon, physician, naturalist and scientist, who was the major player in piscicultural propaganda. From 1860, he toured the country to give talks and demonstrations on fish culture and in 1863 opened a 'Museum of Economic Fish Culture' at the Natural History Museum in South Kensington.⁹⁵

Closing his main work on fish culture, Buckland concluded that his labours to popularise the process had "been amply repaid, not only by the general public interest excited ... but also by the visits and anxious enquiries

⁹⁴ Francis, F Fish Culture (1863). The inscription on Francis's tombstone was somewhat poignant: "And angle on, and beg to have a quiet passage to a welcome grave." Even more interesting were his views on the similarities between womankind and fish:

Depend on it, brother angler, that there is no dogmatic rule to be laid down either for maidens or for fish. Take the word of one who hath had experience of both. You can't diagram them: you must study their humours as well as you can, and suit your arts to your customer as near as may be. If that fails, try perseverance.

Both quoted in Francis and Urwin, Francis Francis p.12.

⁹⁵ Burgess, GHO The Curious World of Frank Buckland (1962) p.120. See also The Times 29 January 1873 p.5, for details of the museum at South Kensington.

When he died in 1880, Buckland bequeathed £5,000 to endow a trustfund for the establishment of a professorship of economic fish culture. The money was not, however, to be released from his estate until after the death of his wife. This did not occur until 1920 when the funds were put to use to create the Buckland Foundation. The Times 3 January 1881 p.7 and Lee, AJ The Directorate of Fisheries Research: Its Origins and Development (1993) p.16. Mr Lee, sadly now deceased, kindly offered to lend me some valuable, rare publications on fish culture from his private library. Letter of 9 February 1993.

of many influential gentlemen and proprietors of fisheries."⁹⁶ By the early 1870s, a form of fish culture mania was sweeping every strata of British society. The influential and landed classes had already been well educated in the basic principles of fish culture by an endless flow of articles, letters and discussions in publications such as the Field and Fishing Gazette. Some, such as the Marquis of Ailsa and the Earl of Kinnoul, tried pisciculture for themselves in an attempt to restock their estate fisheries.⁹⁷ At the other end of the social scale, many ordinary working class people had been introduced to fish culture by the operational displays of pisciculture in process at Buckland's museum and by articles in provincial newspapers such as the Stirling Saturday Observer. In 1880, the Fishing Gazette reported the existence of a "rapidly growing crowd of fish culturists and angler naturalists."⁹⁸ Artisan angling clubs established their own small hatcheries and some private individuals even attempted backyard hatching operations with buckets of tap water. Buckland and Francis had clearly achieved their aim of making pisciculture "a matter of much public interest and importance."⁹⁹

⁹⁶ Buckland, F Fish Hatching (1863) pp.216-217. At least twelve of those who heard the lecture on which the book was based commenced fish culture for themselves.

⁹⁷ Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Third Annual Report of the Fishery Board for Scotland (1884) pp.177-183.

⁹⁸ Fishing Gazette 24 January 1880 p.40.

⁹⁹ Francis, Fish Culture p.v. Buckland stressed the easiness of pisciculture, arguing that "at the cost of only a few pounds" it was possible to turn "a useless stream of clear running water into a vivifier of thousands of fish." Buckland, Fish Hatching p.219. All those who took
(continued...)

Francis and Buckland had, however, also called for the establishment of a large scale commercial piscicultural industry in Britain, one that sold ova and live fish on the open market rather than producing it for the benefit of one particular fishery as smaller operations such as Galway and Stormontfield did. This desire was not realised until Maitland's Howietoun Fishery became fully operational in the early 1880s. His work was the result not only of all the factors discussed above but also of forces which acted specifically upon him. Maitland was a keen angler who, despite having no fisheries of his own, was attracted to artificial propagation through a "desire to help neighbours."¹⁰⁰ He fished on Scotland's greatest angling water, Loch Leven, which, with the boom in angling, was 'enjoying' unprecedented fishing.¹⁰¹ Having won several angling championships on the loch in the early 1870s, Maitland was elected a director of the Loch Leven Angling Association and he soon realised that the popularity of the loch was beginning to take its toll on fish stocks.¹⁰² Between 1872 and 1875, the number of trout taken on the loch

⁹⁹(...continued)

up pisciculture were led to believe that it was a simple process which could put the nation's perceived fishery problems right at a very little expense. Unfortunately, Buckland was naively incorrect in his assertions and it took Maitland's work, as will be discussed in Chapter Nine, to bring a new air of realism to the piscicultural world. *Vide infra* p.281.

¹⁰⁰ Field 1 October 1881 p.480.

¹⁰¹ A correspondent of The Times described "a day on Loch Leven, with a steady easterly breeze and a grey sky darkening the ripple on the water" as "one of the joys of spring in this part of the country." The Times 26 May 1879 p.6.

¹⁰² Central Region Archives, FA1/6/1, Falkirk Water and Drainage Bill (1886) Minutes of
(continued...)

fell by over 66 *per cent*, from 17,231 in 1872 to 13,394 in 1873, 6,352 in 1874 and 5,060 in 1875.¹⁰³ Maitland discussed the Loch Leven problem with Frank Buckland in 1873 and was induced by the latter to practice artificial propagation as a solution.¹⁰⁴

It remains to note a handful of further influences which sustained an interest in pisciculture beyond its use as a solution to declining fishery stocks. The first of these was the example set by events in France and the United States. Whilst the relatively small scale British piscicultural experiments by Boccus, Garnett and Mackenzie were taking place, a more important development had occurred across the English Channel in France. There, "two illiterate fishermen, ... endowed by nature with a rare spirit of observation and a rarer perseverance" were in 1841 "the first among us to make practical application of the discovery of artificial fecundation to the rearing of fish."¹⁰⁵ These two peasants, Joseph Gehin and Antoine Remy, worried by declining fish catches in the Moselle and its tributaries, performed artificial trout culture. According to one observer, "in the course of a short time they

¹⁰²(...continued)

Evidence; p.188. See also: Stirling Saturday Observer 27 February 1875 p.1. Maitland became Chairman of the Association in 1874. Stirling Saturday Observer 14 November 1874 p.2.

¹⁰³ Field 11 September 1875 p.298.

¹⁰⁴ Central Region Archives, FA1/6/1, p.187. Maitland stated that "some words of Frank Buckland" had inspired his work. The Times noted that Howietoun had its "origin in a conversation ... with Mr Frank Buckland in 1873." The Times 17 April 1882 p.6.

¹⁰⁵ Buckland, Fish Hatching pp.236-237.

succeeded in stocking these waters with millions of trout."¹⁰⁶ Their work was discovered and made more widely known by "the Napoleon of pisciculture," the Parisian Professor of Embryology, JM Coste.¹⁰⁷ As a result, France went on to become the first country to adopt artificial pisciculture on a national scale when Coste persuaded his government to build a large fish cultural establishment at Huningue on the banks of the Rhine.¹⁰⁸ The 70 acre establishment opened in 1852 and worked as a distribution point for the restocking of France's rivers and lakes with artificially propagated fish.¹⁰⁹ By 1861, Huningue was producing over 16 million salmon and trout eggs *per annum* for distribution amongst 65 French *départements*; by 1863,

¹⁰⁶ Piscarius, The Artificial Production of Fish (1852) p.9. Miss KJ Russel at the Scottish Office Agriculture and Fisheries Department in Edinburgh kindly provided me with a copy of this pamphlet. Letter of 3 March 1992.

¹⁰⁷ Stirling Saturday Observer 12 May 1881 p.1. See also: Garlick, T A Treatise on the Artificial Propagation of Certain Kinds of Fish (1857) p.43. In 1853, Coste published his Instructions Pratiques sur la Pisciculture, the first detailed treatise of the modern age on the artificial propagation of fish. The book was translated into English by the Ashworth brothers. (*Vide supra* p.52.) Ashworth, T and Ashworth, E A Treatise on the Propagation of Salmon and Other Fish (1853). Wilkins states that Coste's book "was to become a pivotal text in the history of the propagation of fish ... More than any other, this small booklet was the text from which the new science was to grow and develop." Wilkins, Ponds pp.26-27.

¹⁰⁸ Coste argued that it was the Government's "duty that France shall take the lead in giving a practical example of this great scientific discovery which can so greatly increase popular wealth by creating an inexhaustible means of production." Translated in Garlick, Treatise p.57.

¹⁰⁹ Wilkins, Ponds p.29.

20 branch establishments had opened around the country.¹¹⁰

Huningue's most immediate and significant effect on the gathering pace of piscicultural development came in North America. The idea of large scale fish culture was popularised in the United States by WH Fry, the Paris editor of the New York Tribune between 1846 and 1852, who had been so fascinated by the reports of Gehin and Remy's work that he published a piscicultural treatise in 1854.¹¹¹ Fry's efforts provoked practical interest in pisciculture in a country which, like Britain, was experiencing public concern at a perceived decline in freshwater fishery stocks.¹¹² His book stimulated a physician from Ohio, Theodatus Garlick, to develop a large piscicultural operation and to publish his own piscicultural treatise.¹¹³

Others followed Garlick's example and, by 1870, 200 fish culturists were active in 19 states.¹¹⁴ In the same year these individuals joined

¹¹⁰ Francis, Fish Culture pp.11-13. Work continued at Huningue until the establishment was lost to Germany in the Franco-Prussian War. Wilkins, Ponds p.29.

¹¹¹ Fry, WH A Complete Treatise on Artificial Fish Breeding (1854).

¹¹² Parker, NC 'History, Status, and Future of Aquaculture in the United States' Reviews in Aquatic Sciences 1 (1989) p.97.

¹¹³ Garlick, Treatise p.24 and Potter, ED 'Pioneer Experiments of Theodatus Garlick in Fish Culture' Transactions of the American Fisheries Society 19 (1890) pp.41-43. Garlick became known as the 'father' of American pisciculture. Goode, GB 'Epochs in the History of Fish Culture' Transactions of the American Fisheries Society 10 (1881) pp.34-58.

¹¹⁴ Sullivan, CR 'The History, Structure, and Function of the American Fisheries Society' Fisheries 6 (1981) pp.25-29. See also Thompson, PE 'The First Fifty Years - The Exciting Ones' in Benson, NG (ed.) A Century of Fisheries in North America (1971) pp.1-49.

together to form the American Fish Culturalists Association.¹¹⁵ In 1871, in the light of continuing fears that national fisheries were rapidly dissipating, the Association persuaded the United States Government to establish a Commission on Fish and Fisheries. The Commission was set up under the direction of the then Secretary of the Smithsonian Institution, Professor Spenser Fullerton Baird, and in the early years placed its greatest emphasis on artificial propagation, incubating and hatching millions of eggs of various kinds of fish for the restocking of both inland and coastal fisheries.¹¹⁶

At least as regards the French, the rise of a British piscicultural climate can clearly be identified as coming in part from a dent in the British national pride. Stormontfield and the Ashworth's fishery in Ireland were on a larger scale than earlier experiments, but, to the ire of the British piscicultural propagandists, they were not on a *national* scale. Frank Buckland believed that "the French pisciculturalists have done so much in the way that we ought to

¹¹⁵ Atkinson, CE 'Fisheries Management: An Historical Overview' Marine Fisheries Review 50 (1988) p.111. The Association proclaimed its goals "to promote the cause of fish culture; to gather and diffuse information bearing upon its practical success; the interchange of friendly feelings and intercourse among members of the association, and the uniting and encouraging of the interests of fish culturalists." In 1885, the Association changed its name to the American Fisheries Society, the title it still bears today. Parker, 'History' p.98.

¹¹⁶ Baird had vigorously supported the Association's campaign for the Commission's establishment. Dall, WH Spenser Fullerton Baird: A Biography (1915) pp.420-421. See also Allard, DC 'Spenser Fullerton Baird and the Foundations of American Marine Science' Marine Fisheries Review 50 (1988) p.126 and Allard, DC SF Baird and the United States Fish Commission (1978).

be ashamed of ourselves for being all behind-hand in this important matter."¹¹⁷ Likewise, Francis Francis declared that "if it is creditable to France that she should take the lead in this department of science, it is, on the other hand, discreditable to ourselves."¹¹⁸

British pisciculture was also stimulated by concerns over social order and the food supply. The second half of the nineteenth century witnessed not only a perceived decline in the fisheries but also concern that the rise in population would outstrip the food supply and lead to starvation and social unrest. Fish culture, by propagating fish for food in their millions, was seen as an ideal solution.¹¹⁹ Maitland himself stated that part of the object of pisciculture was to "do good to our fellow men, to make food cheaper, and the lot of life more easy to all the dwellers in this country."¹²⁰ Similarly,

¹¹⁷ Buckland, Fish Hatching p.15.

¹¹⁸ Francis, Fish Culture p.14.

¹¹⁹ There was a particular concern that the supply of meat would be exhausted. Apart from fish culture, another suggested solution was the acclimatisation of overseas animals in Britain. Supporters of this idea, mostly members of the British Zoological Society, formed the British Acclimatisation Society in 1860. Some ludicrous ideas were put forward by the Society, including the acclimatisation of capybara, kangaroos, lions and elan. Burgess, Curious World pp.87-95. See also Bartrip, P 'Food for the Body and Food for the Mind: The Regulation of Freshwater Fisheries in the 1870s' Victorian Studies 28 (1985) and Wood, JC 'Acclimatisation' Longmans Magazine 8 (1886).

¹²⁰ Quoted in Stirling Saturday Observer 22 April 1882 p.3. In 1887, in his capacity as a leading member of the Stirlingshire Conservative Association, Maitland was criticised by the local Liberal press for advocating policies that would tend to do quite the opposite: ever keen
(continued...)

when opening the Norwich Fisheries Exhibition in 1881, the Prince of Wales had noted that "The growing importance of fish as a source of food supply which is practically unlimited, and the increasing favour with which such diet is now regarded, must cause the culture and preservation of fish to be more closely and scientifically studied."¹²¹ In 1884, a British commentator writing in the United States stressed the benefits of pisciculture, not only for increasing food supplies but also for easing social tension through the provision of leisure activities. He argued that increasing the fish supply through pisciculture "for the sport of the angling fraternity is a matter well worthy of attention, as the facilities for rational and wholesome recreation are no mean elements towards the well-being of a nation, and especially of its poorer classes."¹²²

¹²⁰(...continued)

to ensure the "propagation of the Protectionist heresy," Maitland had spoken in favour of abandoning Free Trade at a London political meeting. Stirling Saturday Observer 31 December 1887 p.3.

¹²¹ The Times 18 April 1881 p.10.

¹²² Manley, JJ 'Pisciculture in England' Bulletin of the United States Commission on Fish and Fisheries 4 (1884) p.74. It is also possible that the growth of interest in pisciculture was sustained by the effects of the Great Agricultural Depression of 1873-1896. The Stirling Saturday Observer noted in 1882:

In these times of agricultural depression, it may be worthwhile to consider whether fish culture might not eventually pay better than farming. There would be no foreign competition to contend against, and the weather would not be such a source of anxiety as it is at present.

Stirling Saturday Observer 22 April 1882 p.3. One year earlier, a correspondent of The Times,

Mr F Bellaies, had taken a rather cynical approach:

(continued...)

By the 1870s, all the ingredients for the development of British fish farming on a practical, national and commercial scale were complete. After centuries of pond pisciculture which dealt only with natural methods, but nevertheless showed the advantages of holding, rearing or planting fish, Jacobi's work in the eighteenth century had proven the potential of artificial fish culture. The French had supplied proof that artificial propagation was a viable proposition for the large-scale practical restocking of national fisheries. The concern at declining fishery stocks had given it a British *raison d'être*, and the rise in angling and the work of the piscicultural propagandists had sustained its momentum. Finally, the operations at Galway and Stormontfield had proven that such operations could also be turned to commercial advantage and brought pisciculture full circle, back to the farming of fish for pecuniary gain as practised by the Ancient Chinese. The commercial farming of fish and ova for sale, rather than for the restocking of commercial fisheries, was, however, as yet unknown. In 1862, Frank Buckland urged:

It may not be imagined that this [artificial pisciculture] is a mere toy, a mere scientific plaything, but a science as yet in its infancy and from which the greatest results may be expected. ... Man has dominion given him over both land and water. Of the former he has taken every advantage; from the earliest days there have been **agriculturalists** or land farmers. The human race, however, seems to have entirely forgotten the second item in the double privilege given to them; they take no pains to cultivate the largest portion of their earth - the waters. Who ever heard of

¹²²(...continued)

Here in England, where wheat is being grown at a heavy loss, where meat must before long fall some thirty to fifty percent, where iron is accumulating for want of purchasers ... our waters are kept for the amusement of the rich. Trout streams and rabbit warrens are to my mind the best English investments on offer today.

an **aquaculturalist** or water farmer? We have been asleep - we have had gold nuggets under our noses and have not stooped to pick them up.¹²³

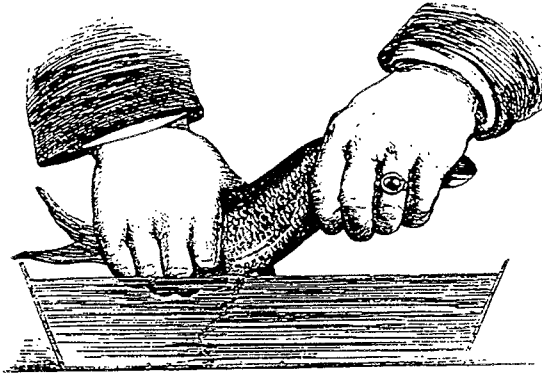
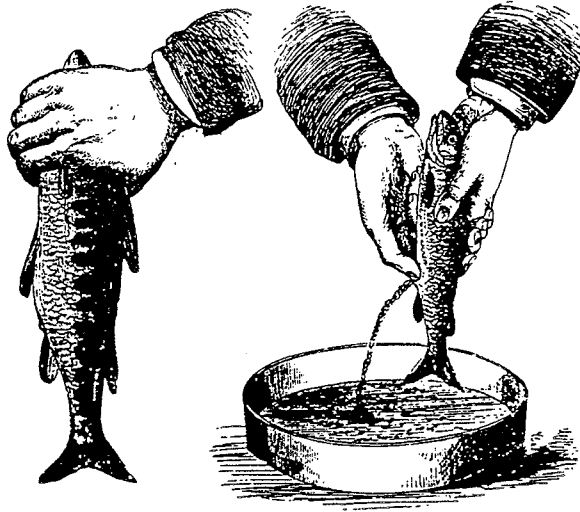
What Buckland looked for was an operation that acted for the benefit of the whole nation and not, like Stormontfield had done, for the benefit of only one localised area. He called for "an establishment where the art of pisciculture should be carried out and brought to perfection, from where eggs may be distributed to every part of this, our own favoured land."¹²⁴

¹²³ Buckland, Fish Hatching p.5/186. 1,800 years earlier, Columella had argued the reverse of this, believing that "the management of fishes" was "far removed from the business of farmers - for what things are so contrary to one another as dry land and water." Boyd-Ash, Columella's De Re Rustica VIII, xvi.

¹²⁴ Buckland, Fish Hatching pp.219-220.

ILLUSTRATION 2

Stripping a trout.



Source: Francis, F Fish Culture (1863) p.ii.

The first two illustrations show the female fish being stroked and stimulated to release her ova. In the third illustration the male fish is stimulated to ejaculate his milt, this being directed by the pisciculturalist such that the ova are covered with milt.

Chapter Three

FISH CULTURE AT HOWIETOUN

And it is from this beginning that I, unaided by Government, and laughed at by my relations, have reared the largest and most successful fish farm the world has ever seen.¹

Having shown the historical foundations and motivating influences from whence Howietoun came, this chapter discusses the development of the fishery from Maitland's first piscicultural experiment in 1873 to the completion of the works in 1886. It shows how Maitland rose to Buckland's call for a large-scale commercial piscicultural establishment and sets out the major pillars of his piscicultural achievement.

At the outset, it should be noted that Maitland's piscicultural work dealt almost exclusively with the trout and not the salmon. The concern at the alleged depletion of freshwater fishery stocks discussed in the previous chapter centred on the salmonidae as a whole - the salmon, trout, charr and grayling - but was most vociferous over the perceived decline in salmon stocks, probably so because of the controversial nature of the stake net issue.² Maitland's work was devoted to the trout because, in the first place, his direct stimulus to pisciculture came with the decline of Loch Leven's trout stocks, and, in the second place, because the artificial propagation of the salmon was not a worthwhile venture for a private pisciculturalist. Whilst trout remain enclosed within a body of water, such as a loch or a stream, the

¹ Maitland, JRG The History of Howietoun (1887) p.178.

² *Vide supra* p.38.

salmon spends its early life in freshwater before leaving to descend to the sea, returning some years later to spawn. As a result of this, private pisciculturalists would have no control over, or commercial benefit from, salmon and thus dealt with the more manageable trout. Salmon pisciculture was practised by groups of individuals with combined ownership of an entire fishery, such as the proprietors at Stormontfield or at Galway, or public bodies such as Salmon Fishery Boards, where any gain from artificial propagation was enjoyed by the entire river and not by only one private individual.³

The trout with which Howietoun dealt were mainly of the Loch Leven variety (*salmo levensis*), but it also had stocks of the common brown trout (*salmo fario*) and, having imported eggs from the United States, had smaller supplies of the American rainbow trout (*salmo gairdneri*) and brook trout (*salmo fontinalis*). The life histories of the freshwater trouts are very similar and elaboration here concentrates on the Loch Leven variety.⁴ The trout will breed in the colder months of the year between October and February. The female deposits her ova in shallow, gravelly parts of the stream or loch and

³ *Vide supra* p.52. Maitland did occasionally incubate salmon ova at Howietoun on behalf of the Forth and Dee Salmon Fishery Boards, however, and also experimented in creating a breed of land-locked salmon. *Vide infra* p.96.

⁴ One commentator on the life history of the trout noted: "I have had ample opportunity of studying Loch Leven trout and nothing I have noticed about them has caused me to think they are different from any other trout." The Loch Leven was simply a particularly fine variety of the common trout with enhanced taste and strength. Malloch, PD Life History and Habits of the Salmon, Sea Trout and Other Fish (1912) p.228. There is an illustration of Howietoun's Loch Leven trout on page 108.

it is then fertilised by the male's milt.⁵ Gestation takes approximately 70 days during which time the egg grows in size and the embryo of the young fish slowly becomes clearly visible.⁶ When the gestation period is over, tiny tadpole like creatures - alevins - break out from the eggs. For some weeks the alevins are nourished by a 'yolk sac' attached to their bodies which functions rather like the mammalian placenta. Once the sac has been exhausted it breaks away from the young fish, now known as fry, which must then forage for food for themselves. Over the following months, the fry will gradually become less like tadpoles and, increasing to several inches in length, will become more discernible as small trout. The fish grow steadily thereafter before reaching maturity at between 6 and 8 years of age though they are able to procreate from the age of about 2 to 3 years.⁷

Maitland's foray into pisciculture began on a very small scale in Autumn 1873 in a stream at Middlethird on his father's Sauchie Estate in Stirlingshire.⁸ He experimented with the artificial impregnation of 2-3,000 ova taken from spawning trout at Loch Leven and placed the artificially fertilised eggs in a tray in a shallow part of the stream. The coming of the winter frost

⁵ *Vide supra* p.32 for a description of the spawning process among wild salmonidae.

⁶ Early in the gestation period, a black dot - the 'eye spot' - forms inside the egg. This, the first sign of the embryo, is an indication of successful fertilisation of the ova by the milt. The length of the gestation period is directly affected by the temperature of the water in which the eggs are placed. *Vide infra* p.76.

⁷ Malloch, Life History pp.228-238 and Landau, M Introduction to Aquaculture (1992) pp.227-229.

⁸ Maitland and his wife lived at the nearby Craigend House.

proved fatal to many of the delicate ova, however, so Maitland built a small hatchery capable of holding 20-30,000 ova on trays under cover.⁹ He procured further ova from Loch Leven to stock the new hatchery, and enjoyed far better results, hatching thousands of alevins in early 1874. His enthusiasm increased, Maitland resolved to enlarge his experiments and extended the hatchery such that it could accommodate 100,000 ova.¹⁰

Once the young fish were too large to remain in rearing boxes in the hatchery, they were moved to a small, portable plank pond which was placed in the stream at Middlethird. The pond did not prove successful as the filters allowing water in and out continually clogged with floating leaves. Maitland did not, however, get the chance to try to improve the design since it and its occupants were carried away down the stream in a spate.¹¹ Maitland

⁹ The hatchery was fed by a pipe with water from the Middlethird stream.

¹⁰ However, as a result of human error, the young fish did not fare so well once they were turned out of the hatching trays and placed in a rearing box. On 16 March 1874 Maitland left Stirling to visit his parents in Edinburgh, and returned the next day to find that one of the estate workmen, Andrew, had turned the water supply to the rearing box off in his absence, leading to the death of many of the fish. On 18 March Maitland wrote in his notebook that he had "told Andrew that if I could not go away for 24 hours without the water being put wrong in the hatching house he was no use to me." University of Stirling, Howietoun Archive, HF/B1/6: Notebook with notes on pisciculture. Entry for 18 March 1874. There are no page references in this document.

¹¹ Maitland, History of Howietoun p.100. The pond was chased by Maitland with the assistance of his head gamekeeper. It was captured by their wading into the stream but, on trying to recover it, the keeper lost his footing and, being unable to swim, panicked. This resulted in the pond being overturned and the fry escaping.

resolved to search the Sauchie Estate for a site less prone to such natural disasters. As a temporary measure, he shifted his piscicultural apparatus to the gun room of his marital home at Craigend House, setting up hatching boxes to incubate ova taken from Loch Leven in late 1874. The measure proved more temporary than he had previously planned since the continual dripping noise coming from the apparatus annoyed his wife considerably: "I (being a married man) had to pay some attention to the *lares et penates*. They stood it for one short season; the amateur gun room establishment was a thing of the past."¹²

Accordingly, in 1875, Maitland erected a new hatchery with a capacity for 260,000 ova at the site of an old mill, Howietoun, on the nearby Auchenbowie or Loch Coulter Burn flowing from Loch Coulter. The site was little more than a stone's throw from Craigend House.¹³ It had a reliable water supply, the burn having a substantial watershed and a reserve supply being available in the loch, from which the flow was controlled by a sluice under Maitland's control, should the burn run dry.¹⁴ The new Howietoun hatchery was filled with trout eggs taken from Loch Leven in late 1875 and, once past the rearing box stage, the fish were to be housed in three purpose-

¹² *Ibid.* p.148.

¹³ Howietoun means 'town in a hollow', reflecting the physical layout of the fishery site. The map on p. 109 shows the location of the fishery.

¹⁴ The loch gave Maitland a reserve supply of 300 million gallons of water. Stirling Journal and Advertiser 11 March 1881 p.3 and University of Stirling, HF/V49: Letter Book 5, p.35. Maitland to James Temple of Battersea, 11 January 1886.

built ponds in the grounds of Craigend House.¹⁵

The new Howietoun hatchery proved eminently successful and Maitland developed the site further by extending the hatchery and adding more ponds at the Howietoun site itself.¹⁶ Maitland's father died in 1876 and, on succeeding to the title and ownership of the estates, the land became his to do with as he pleased.¹⁷ The fishery grew steadily and by 1878 had a stock of 13,593 fish, a considerable increase on the 2-3,000 ova with which Maitland had started.¹⁸ On 25 March 1879, Maitland issued 300 copies of

¹⁵ Howietoun Fishery A short account of the Howietoun Fishery (1903) p.3.

¹⁶ Whilst showing a friend the works on the new hatchery in 1876, Maitland fell into a deep hole in the floor, and, becoming stuck in the clay below, had to be hauled out by his navvies who, it appears, never forgot the incident. Later, he remembered how he had "stumbled most carelessly into it ... Practical jokes are not necessarily fish culture." Maitland, History of Howietoun p.219.

¹⁷ Maitland indicated that he had had to be mindful of his expenditure before he succeeded to the estates: "At that date [1874/1875] expense was a great consideration and it was advisable not to attempt anything the ordinary estate labourer could not undertake." Ibid. pp.178-9. The fishery's construction was funded by money advanced from the Sauchie Estate. *Vide infra* p.124.

¹⁸ One of the locals had helped themselves to 224 of these fish in 1877 but Maitland noted that he had taken "certain personal steps in the matter with a heavy six-shooter, and have had no reason to suspect any loss from theft since." Maitland, History of Howietoun p.251. Another commentator noted that the fishery was "surrounded by a high paling, which once or twice marauders have tried to surmount, but they have been dealt with in such a fashion by Sir James that they are now very shy of the place." Field 1 October 1881 p.480.
(continued...)

Howietoun's first price list which announced that "the fishery is now sufficiently developed to undertake the stocking of lakes with mature trout."¹⁹

The 'piscicultural propagandist' Francis Francis visited Howietoun for the first time in 1881 and described it as "something truly prodigious."²⁰ Another hatchery, covering over 3,000 square feet and capable of incubating millions of eggs, a despatching house, a food preparation house, and offices for the fishery staff were all added in 1883.²¹ Several further ponds were added in 1885 as demand for the fishery's produce grew; the year saw the sale of 95,000 one and two year old fish and the incubation of over 20 million

¹⁸{...continued}

Two "notorious poachers", James Malcolm and Peter Carey, were found on the estate in February 1884 and were each given a £10 fine and two months hard labour. Stirling Saturday Observer 1 March 1884 p.3.

¹⁹ University of Stirling, HF/B1/6. Entry for 25 March 1879. Maitland named his establishment the Howietoun Fishery.

²⁰ *Vide supra* p.55 for discussion on Francis Francis. Francis commented on his visit:

Altogether, I do not know when I have spent so pleasant and instructive a day, for Sir James's experience has been well tried, and he has learnt a great deal and discovered many things which he told me while we were talking, and which interested me exceedingly. I viewed the whole thing *con amore*, and thought of the sort of place I might have called into being if - but there is no use repining or looking back.

Field 1 October 1881 p.480.

²¹ University of Stirling, HF/V48(i): Letter Book 3, p.275. Maitland to Mr Crossman, Member of the Executive Committee of the 1883 London Fisheries Exhibition, 18 October 1883.

ova.²² When the construction of the fishery was completed in 1886, it comprised two huge hatcheries and 33 ponds covering 9 acres.²³ Maitland's initial take of 2-3,000 ova in 1873 had been transformed into a stock of 282,672 live fish.²⁴ One visitor to the fishery, well before the works had been completed, observed:

A charming scene bursts upon the view. Beautiful ponds surrounded with fine walks and verdant banks of green grass, and water passing on from pond to pond. It looks like fairyland.²⁵

Before discussing Maitland's achievements at Howietoun, it would be useful to lay out exactly what fish culture at Howietoun entailed and how it corresponded to the brief description of the wild trout's life history given above. Once Maitland had reared enough fish from eggs taken from wild parents at Loch Leven, he was able to keep a broodstock of fish in his own ponds and had no further need to make recourse to the wild. The parents were stripped of ova and milt between October and February and the eggs taken to be laid down on glass grilles in boxes in one of the hatcheries.²⁶

²² Stirling Saturday Observer 7 November 1885 p.3. See also the Fishing Gazette for the same date p.227.

²³ A further 134 acres were covered by the fishery's reservoir, Loch Coulter, and its watershed. University of Stirling, HF/V49: Letter Book 5, pp.35-45. Maitland to James Temple of Battersea, 11 January 1886.

²⁴ Maitland, History of Howietoun pp.7-9. The layout of the pond system is illustrated on page 110.

²⁵ Stirling Saturday Observer 28 February 1880 p.1.

²⁶ For a description of 'stripping', *Vide supra* p.33. The photographs on p.111 show the
(continued...)

Here they were incubated for a period of 77 days, during which they were kept at a constant temperature under a shallow and gentle stream of water pumped into the hatchery from an underground spring at the Howietoun site.²⁷ Eggs that were to be sold before hatching were packed for despatch when almost at the end of the gestation period. This was achieved by gently removing the glass grilles and floating them in water in a large sink; the grille would sink to the bottom of the sink whilst the eggs would remain afloat and could be scooped up using a frame of mesh netting, the eggs spreading "as if by magic one into each mesh." A layer of damp moss was then placed over the eggs and a layer of thin muslin was placed above this. The frame was then gently inverted such that the eggs became "beautifully arranged on the moss in rows according to the meshes of the net." A second layer of moss was then laid over the eggs and the process repeated until six layers of eggs, separated by moss, had been formed into a pile. These layers were then

²⁶(...continued)

fishery workers netting one of the ponds for parent fish and then stripping and fertilising the eggs.

²⁷ Temperature is a very important consideration during the incubation of eggs. Ideally, it should be 44.1 degrees Fahrenheit. Too high a temperature would either kill the eggs or lead to the young fish hatching prematurely; likewise, too low a temperature would kill the eggs. During the incubation period any dead or diseased eggs should be removed to prevent bacteria spreading to other healthy eggs. Otherwise the eggs should not be disturbed as they are very delicate and can be killed by the slightest touch. Maitland, History of Howietoun pp.48-57.

packed in a secure box ready to be despatched to the customer.²⁸

Eggs that were not to be despatched were moved to a hatching tray towards the end of the gestation period. This involved moving the glass grilles to a sink of water, as was done in preparing for despatch, but this time leaving the eggs until the alevins emerged.²⁹ The abandoned shells would

²⁸ For journeys within Britain, the damp moss would be sufficient to keep the eggs alive until the consignment reached its destination. Longer journeys required more attention. *Vide infra* p.90. On receiving his order, the customer would either hatch the eggs in his own hatching trays or would place them gently in a stream. There are illustrations of the egg-packing process on p.112.

²⁹ The 'piscicultural propagandist' Francis Francis described the hatching of fish eggs thus:

Some morning, when you visit your trays, you notice a small reddish shining spot amongst the ova, rather larger than a pellet of ova, which catches the eye instantly; and on looking closer, you find that one of your fish has thrown off its shell, and emerged to life.

Take it up tenderly,

Treat it with care,

Fashioned so -

No, not 'Slenderly,' for a more unwieldy, delicate, clumsy, welcome little stranger does not exist to gladden the eyes of the delighted pisciculturalist withal. Now you have it in the little glass reservoir, with a drop or two of water around and over it, under the microscope. How it wriggles and kicks! What vigorous vitality is here, in this little curious object! Now it is quiescent, and what a wondrous spectacle is revealed to you! Is this a fish or a new kind of tadpole? Verily, Sir Philosopher, it is of fish, fishy - though not, perchance, fishlike. Could this strange, helpless little thing ever become the magnificent twenty-pounder, that takes you down with breathless haste, with bending rod and whizzing reel, stumbling and panting, full five hundred yards of that terrific torrent, and flinging somersaults that rival those of the deftest acrobat, gives you a full half hour's hard work and awful excitement in the dark pool below? Can this little marvel, I say, be the foundation of that which has hundreds of laws made for it, thousands of pages of reports collected on it, myriads of law-suits fought about it, Royal Commissions without end imposed upon it, treatises unnumbered, written by great lights of science and genius, concerning it, by the catching of which thousands live and hundreds realise fortunes, or the reverse, which millions feed on, and which should be, if properly understood and treated, one of the richest veins of our natural wealth and subsistence. Verily, indeed, wonderful are the works of Providence!

Francis, F Fish Culture (1863) pp.85-86.

sink to the bottom of the sink whilst the young fish would congregate just below the surface of the water. They would be gently scooped up in a small pail and transferred to a wooden rearing box supplied with a gentle flow of spring water. Here the alevins spent their first few months of life, growing into fry, being fed on a paste of boiled horse meat once the yolk sacs had been absorbed, until such time as they were either sold or transferred to one of the fishery's ponds.³⁰ The fish that remained at Howietoun were segregated according to age, sex and size and, if not sold, would eventually become part of the Howietoun broodstock.³¹ The broodstock fish were fed solely with clams which, being more sustaining and nourishing than any food that the fish would have got in the wild environment, made them larger and stronger.³² Maitland found that the eggs produced by parents fed solely on clams were

³⁰ Members of the Stirling Natural History and Antiquarian Society who visited Howietoun were somewhat perturbed by the "peculiar odour" which emanated from the food preparation house. Anon. 'A Visit to Howietoun' Transactions of the Stirling Natural History and Antiquarian Society 3 (1879) p.72.

³¹ The foregoing description of the Howietoun piscicultural process is taken from Maitland, History of Howietoun pp.22-76. Live fish that were sold were sent out by rail in travelling tanks. All despatches of eggs and live fish had to be completed by April at the latest as they could only be safely carried through in low temperatures.

The illustrations on pp.113-115 show the Howietoun despatching house, fishery workers preparing to despatch young fish, and Howietoun's packing boxes and tanks.

³² The photographs on p.116 show some of the Howietoun ponds and the despatching of tanks of young fish from the despatching house. On the top right of the photograph showing the ponds can be seen a large slag heap of discarded clam shells.

of a far greater vitality than those procured from wild breeders or domesticated fish fed with meat.³³

So what did pisciculture at Howietoun entail that made it different from its predecessors and that justifies the assertion made in Chapter One that Maitland's work deserves historical recognition? *Prima facie*, the distinction

³³ University of Stirling, HF/V47(ii): Letter Book 2, p.79. James Guy (Howietoun's Secretary) to Mr JA Place of Limerick, 25 February 1882. The non-broodstock fish continued to be fed on horse meat. The Howietoun fish became accustomed to being fed at a particular place and time of the day and could be alerted, like a faithful dog, by a whistle or call from the feeder. This domestication amazed visitors:

The feeding of these large congregations is a spectacle worth travelling many miles to witness. No sooner had our guide got inside the fence at a gate ... and made aloud the remark that 'here were his favourites', than a huge wave rolled from the lower end of each pond toward the head walk.

'What is the cause of such a disturbance?' we asked.

'These are old friends of mine and they know my voice,' remarks Sir James. Whatever may have been said to the contrary, it certainly appeared manifest that the sound of our talking attracted the attention of the fish which were at the further end of the pond, and with one consent they headed their way to the point at which we were standing, which having reached, a career of splashing, dashing, actually causing the water to seethe, began. A few spoonfuls of meat were thrown to them, and the scramble - for want of a better word - to obtain a mouthful was most amusing and not less highly interesting.

Stirling Journal and Advertiser 25 March 1881 p.4. An American contemporary of Maitland's noticed similar domestication amongst fish, even to the point that some would jump up from the water to take the food from the feeder; he warned that one should thus "be careful not to get hurt by their sharp teeth." Koss, RA 'Trout and Trout Culture' Bulletin of the United States Commission on Fish and Fisheries 3 (1883) p.474. Perhaps it was fear of being bitten that led one of Howietoun's customers, rather than to feed his fish himself, to automate the process by hanging a dead cat over the water to furnish his fish with maggots. Howietoun's secretary, Guy, believed this to be "a very excellent plan." University of Stirling, HF/V48(i): Letter Book 3, p.749. Guy to Mr W Thompson of Bangor, 19 March 1884.

between Howietoun and its predecessors was that the fishery was a fully fledged *commercial* fish *farm* which sold eggs and live fish to fishery owners, angling clubs and public bodies desirous of restocking their waters. This made it quite distinct from earlier operations such as those at Galway and Stormontfield which had been intended to restock only one local fishery.³⁴ In its first year's trading in 1879, Howietoun sold over 2 million ova.³⁵ By 1883, the fishery was inundated with so many orders that larger consignments had to be split into two separate despatches, there not being enough carrying tanks for live fish or packing boxes for ova to facilitate a single shipment.³⁶ The fishery's trade was such that, by 1886, "on most of the principal lines of railway, the Howietoun tanks are nearly as well known as the milk cans."³⁷

The next factor marking Howietoun out from its predecessors was its size. In 1880, it became the largest piscicultural operation in the United

³⁴ *Vide supra* p.52. Stormontfield and Galway were commercial in that they were intended to restock a fishery from which subsequent catches were to be sold. Howietoun was commercial in that it marketed the piscicultural product itself.

³⁵ University of Stirling, HF/V50: Letter Book 6, p.810. Note of sales. See also Maitland, History of Howietoun p.50.

³⁶ University of Stirling, HF/V47(ii): Letter Book 2, p.659. Guy to Mr Bennett of Grimsby, 19 December 1882.

³⁷ Field 13 March 1886 p.319. The fishery's commercial success is discussed in Chapters Four and Six.

Kingdom.³⁸ The Stormontfield operation on the Tay, for example, the largest British piscicultural operation of the pre-Maitland era, had had the use of only a handful of small ponds, whereas Howietoun had 33 large ones. Stormontfield had been run single-handedly by its operator, Robert Buist; Howietoun, on the other hand, required the services of Maitland, a manager, seven operatives, four labourers, two carpenters and a part-time secretary.³⁹ By 1885, Howietoun had an annual incubation capacity of 20 million ova whilst Stormontfield could handle only a maximum 300,000 ova *per annum*.⁴⁰ Even Howietoun's next largest contemporary establishment, Thomas Andrews's Guildford Fishery, could only handle 4 million ova *per annum* after being considerably enlarged in 1887.⁴¹ By early 1886, Howietoun was one of 11 hatcheries in Scotland but its annual produce was

³⁸ University of Stirling, HF/V47(i): Letter Book 1, p.59. Maitland to Livingstone Stone of the United States Commission on Fish and Fisheries, 13 November 1880.

³⁹ Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Third Annual Report of the Fishery Board for Scotland (1884) pp.174-184. The manager, John Thompson, had been appointed by Maitland in 1882. Maitland spent three years educating him in pisciculture before relinquishing the running of the fishery to him in 1885. The secretary, James Guy, worked for the fishery in addition to his main duties as secretary to the Sauchie Estate. Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.204.

⁴⁰ University of Stirling, HF/V49: Letter Book 5, p.394. Maitland to RB Marston, Editor of the Fishing Gazette, 20 February 1886.

⁴¹ Fishing Gazette 5 November 1887 p.286. *Vide infra* p.286 for discussion of the fishery at Guildford.

three times as great as that of the other ten put together.⁴²

Indeed, Howietoun was the largest single salmonoid piscicultural establishment in the world.⁴³ In 1883, the combined total output of salmonoid fry from all eleven hatcheries in Canada, for example, amounted to 5,649,000 whilst Howietoun alone produced 6,600,000.⁴⁴ In 1886, the largest hatchery operated by the United States Commission on Fish and Fisheries covered 1,500 square feet which was less than half the size of Howietoun's principal hatchery.⁴⁵ As late as 1893, the largest hatcheries on continental Europe, at Selzenhof and Seewiese in Germany, could only produce 8 and 4 million salmonoid eggs *per annum* respectively.⁴⁶ As a correspondent of The Times, Henry Ffennell, noted of Howietoun in 1886:

⁴² Central Region Archives, FA1/6/1, p.236. The other ten hatcheries were JJ Armistead's Solway Fishery at Dumfries, two on the Tay at Stormontfield and Dupplin, one owned by the Loch Leven Angling Association, one on Linlithgow Palace loch, one belonging to the Marquis of Ailsa at Culzean in Ayrshire, the Benmore hatchery at Kilmin in Argyll, the Lochbuy fishery on Mull, and two small hatcheries at Aberdeen and Inverness. With the exception of the Solway Fishery, all were designed for the restocking of local waters only and not for commercial purposes. Barker-Duncan, 'Salmon and Trout' *passim*.

⁴³ The Times 17 April 1882 p.6 and Fishing Gazette 13 November 1897 p.355.

⁴⁴ University of Stirling, HF/V48(i): Letter Book 3, p.271. Maitland to the Secretary of the 1883 London Fisheries Exhibition, 18 October 1883.

⁴⁵ University of Stirling, HF/V49: Letter Book 5, p.394. Maitland to RB Marston, Editor of the Fishing Gazette, 20 February 1886. *Vide supra* p.62 for details of the United States Commission on Fish and Fisheries.

⁴⁶ Borodine, V 'Statistical Overview of Fish Culture in Europe and North America' Transactions of the American Fisheries Society 22 (1893) p.108.

Here we have a fish farm which certainly has no equal in the United Kingdom, while, from what I hear on good authority, I believe there is nothing to compare to it in the United States, in Canada, or on the continent.⁴⁷

Where Howietoun really stood out, however, was in the *quality* of its product, in terms of both hatching survival rates and of the vitality of the fish produced. From 1876, Maitland's hatchery at Howietoun had delivered alevins from eggs with only a ten *per cent* loss in hatching, far less than that experienced by his piscicultural predecessors.⁴⁸ The loss at Huningue, for example, had amounted to between 60 and 70 *per cent*.⁴⁹ At Stormontfield, it had been as much as 80 to 90 *per cent*.⁵⁰ After 1876, as the size of Howietoun and Maitland's skill grew, hatching success rates increased to 93.3 *per cent*, rising further to 95-99 *per cent* by the mid 1880s.⁵¹ A higher loss "would be considered extraordinary at Howietoun."⁵²

The reason for such impressive success rates - and Maitland's most important contribution to piscicultural science - was his use of stock fish for breeding. As he himself put it: "It is here that Howietoun has worked a revolution in fish culture."⁵³ All earlier pisciculturalists had procured ova and

⁴⁷ The Times 1 May 1886. p.6.

⁴⁸ Field 17 April 1875 pp.381-2. Letter from Maitland advising of his results.

⁴⁹ Stirling Saturday Observer 22 April 1882 p.3. *Vide supra* p.60 for details of the establishment at Huningue.

⁵⁰ Field 9 December 1882 p.836.

⁵¹ Maitland, History of Howietoun p.219.

⁵² *Ibid.* p.28 and Day, F British and Irish Salmonidae (1887) p.267.

⁵³ Maitland, History of Howietoun p.86.

milt from fish on the point of spawning naturally in their wild environment. Maitland's work was different. Initially taking a supply of ova and milt from wild breeders in Loch Leven between 1873 and 1877, Maitland kept a supply of his artificially propagated progeny at Howietoun and thereby bred a stock of domesticated trout with which to fulfil his future requirements for parent fish. Howietoun became self-sufficient in its needs for ova and milt, entirely devoid of reliance on the natural environment, and had a captive broodstock of 11,000 trout of which 7,000 *per annum* were always in prime condition and ready to spawn.⁵⁴ This shielded Howietoun from the uncertainties of relying on the capture of wild spawners with wills of their own which had plagued earlier pisciculturalists.⁵⁵ Maitland could acquire between 0.3 and 0.5 million eggs in a single morning whilst it took the operators of the Dupplin

⁵⁴ This development was perhaps a logical one for Howietoun since it was not devoted to the needs of a particular fishery and, by the same token, Maitland did not have a fishery of his own from which he could plunder ova and milt.

⁵⁵ One of Maitland's piscicultural contemporaries, JJ Armistead, looked back in 1895 on the days when he took eggs from wild breeders:

Many a time I have started off at 4 or 5 o'clock on a November morning for a long and tedious walk over the Cumberland mountains, often rendered even dangerous by the accumulations of snow and ice met with at that season of the year. After fishing all day we would come back tired and weary at night, with perhaps a few thousands of trout eggs in the collecting cans, and often enough with none.

Having changed to a broodstock method, Armistead found he was able to collect 0.25 million eggs daily. Armistead, JJ *An Angler's Paradise* (1895) p.141. *Vide infra* p.286 for details of Armistead's piscicultural work.

hatchery on the Tay 22 days to secure 360,000 eggs from wild parents.⁵⁶

More importantly, the use of a domesticated broodstock led to Maitland's discovery that the quality of artificially propagated fish could actually be enhanced, by the careful selection of parent fish, such that they became superior to those naturally propagated in the wild.⁵⁷ After carefully studying fish bred from parents of varying ages, Maitland realised that a clear positive correlation existed between the age and size of the parent fish and the vitality of their progeny.⁵⁸ Eggs procured from big, older spawners were larger in size (with a relatively lower number of ova per female fish), more resistant to force and less likely to abort during gestation than those taken from smaller, younger spawners. Four year old fish, for example, produced eggs that numbered 32 per length of glass grille in the fishery's hatching trays

⁵⁶ The Dupplin hatchery, itself modelled on Howietoun, had been built on the Tay in 1882 to supplement the operation at Stormontfield. Field 22 April 1882 pp.525-526. The size of Howietoun's broodstock was the main reason for the fishery being larger than any earlier establishment, the threat of cannibalism requiring the housing of different ages of fish in separate ponds. Maitland also discovered that males were best kept separate from females to avoid the danger of crimes of passion. Male trout were apt to fight to the death when courting but he "noticed better behaviour in these gentlemen when living in bachelor quarters." Maitland, History of Howietoun p.88.

⁵⁷ This accounted for Howietoun's high hatching success rates.

⁵⁸ Maitland, History of Howietoun p.12. Pre-Maitland pisciculturalists used wild parent fish without any regard to maturity and weight, stripping parent fish as soon as they were found to be sexually mature and able to spawn. Buckland, F Fish Hatching (1863) p.13.

whilst the eggs of six year old fish numbered only 27 per grille.⁵⁹ The fry produced from such larger eggs were found to grow into larger and stronger adult fish with a greater life expectancy than the progeny of younger, unselected parents.⁶⁰ The best summation of the practical effects of using larger, older spawners is given in Francis Day's evidence to the House of Lords hearing on the Falkirk Water Bill:

On the 2nd of November 1882, two sets of Loch Leven trout were spawned, the one set were seven year old fish, and the other set eight year old fish. These eggs were hatched in February of the succeeding year, and in about March they were removed to two ponds at Craigend. These two ponds are of exactly the same size and fed by the same stream of water, and the fish from the older parents were put into the lower pond, and the fish from the younger parents were put in the upper pond. On the 29th of November of the same year ... I went to those ponds with Sir James Maitland and others, and we put nets in for the purpose of seeing the comparative size of the fish in the two ponds, and we found that the older fish, that is to say those spawned from the eight year old fish, in the lower pond, which had the worst water, were nearly a quarter longer taking the proportions in large numbers, than the young fish in the upper ponds which were taken from the seven year old parents. But Sir James Maitland and myself were not satisfied with this experiment entirely, and we thought it advisable to take the next year two sets of trout of exactly the same age, and to go through this experiment again. Having done this we found that at the end of nine months the fish in the two ponds were of exactly the same size, showing that the one year's difference made a difference of nearly one-quarter in the length of the fish

⁵⁹ Day, F Fish Culture (1883) p.16. Ova from 2 and 3 year old fish was found to be an average of 0.17 inches in diameter whilst that from 6 year olds averaged 0.18 to 0.19 inches, and that from 8 year olds averaged between 0.2 and 0.22 inches. Day, British and Irish p.208.

⁶⁰ Ibid. p.227 and Day, F 'The British Salmonidae' Journal of the National Fish Culture Association (1887) pp.3-26.

in nine months.⁶¹

By determining only to use mature parent fish, Maitland improved the quality of the breed of trout initially taken from Loch Leven in the mid 1870s. Whilst the ova of wild fish in Loch Leven ran at 40,000 to the gallon, the ova of Howietoun-bred Loch Levens ran at 23-26,000 to the gallon by 1886. This was the same size as the ova of the trout's more fashionable cousin, the *Salmo Salar*, which, on the River Tay, ran at 25,000 to the gallon. Putting it another way, 1,250 Loch Leven ova spawned from the Howietoun fish in 1886 occupied the same space as 2,500 ova from wild spawners in Loch Leven and 1,350 Tay salmon ova.⁶² The fishery secretary, James Guy, told an enquirer that:

There is no specific difference between the Loch Leven and the common brown trout only that, from being carefully bred at Howietoun, they have developed into a very fine variety, quite as distinct from the original stock in Loch Leven as those are from common trout.⁶³

⁶¹ Central Region Archives, FA1/6/1, pp.229-230. Francis Day was an ichthyologist who became a close friend of Maitland's in the early 1880s, using Howietoun as a laboratory for his own researches. The Falkirk Water Bill case is discussed in Chapter Five.

⁶² Ibid. p.232. Whilst the average weight of the spawning fish performing natural reproduction in Loch Leven was 1.5 pounds, the Howietoun spawners weighed in at between 7 and 8 pounds. University of Stirling, HF/V51: Letter Book 7, p.621. James Guy to Messrs Handy of Alnwick, 25 April 1888.

⁶³ University of Stirling, HF/V50: Letter Book 6, p.678. James Guy to an unknown addressee, 4 April 1887. As noted above (*vide supra* p.69), the Loch Leven trout was a particularly fine variety of the common brown trout. The enhanced quality of the Howietoun
(continued...)

The Field greeted Maitland's discovery most enthusiastically, remarking that it gave Howietoun's fish an "extraordinary vigour and vitality, ... [they] ... could stand almost any vicissitude."⁶⁴

Maitland's enhancement of the quality of artificially propagated fish contributed to the success of Howietoun's export of trout and salmon ova to the Antipodes. British emigrants to the Antipodes had long been desirous of acclimatising in their new home the game fish they had left behind, and the first attempt to export ova to the Antipodes had been made by Gottlieb Boccus in 1852.⁶⁵ This and subsequent shipments in 1860 and 1862 failed

⁶³(...continued)

fish meant that attempts at restocking fisheries were far more likely to succeed, a factor which is discussed in Chapter Nine.

⁶⁴ Field 22 April 1882 pp.525-526.

⁶⁵ Boccus was mentioned in the discussion of the history of pisciculture in the previous chapter. *Vide supra* p.51.

Though in the case of exporting the British salmonidae to the Antipodes the acclimatisers wished to introduce a previously unknown species, colonisation could itself act as a destructive force. As the head of the United States Commission on Fish and Fisheries, Spenser Fullerton Baird, noted in 1878:

It may safely be said that wherever the white man plants his foot, and the so-called civilisation of a country is begun, the inhabitants of the air, the land, and the water begin to disappear. The bird seeks a new abiding place under the changed conditions of the old; but the return of the season brings him again within the dangerous influence, until taught by several years of experience that his only safety is in a new home. The quadruped is less fortunate in this respect, environed as he is by more or less impassable restrictions, such as lofty mountains, deep rivers and lakes, and abrupt precipices, and sooner or later reaches the point of comparative extinction, or reduction to such limited numbers as not to invoke a continuance of special attack. The fish, overwhelmingly numerous at first, begin to feel the fatal influence in even less time than the classes already mentioned, especially such species as belong to the fresh waters and have a comparatively limited range. The cause of this rapid deterioration is not to be found in a rational and

(continued...)

with all eggs perishing on board.⁶⁶ A further attempt in 1864, organised by Frank Buckland and Francis Francis proved more successful, probably because the ova had been cared for by an attendant who accompanied throughout their 84 day journey from London.⁶⁷ Though a large amount of ova had been found to be alive at Melbourne, many perished soon after, though a few hundred young trout and salmon were successfully hatched. Various attempts to send more took place over the next few years, mainly under the direction of Francis and Buckland. In every case, though there were no more complete failures, the shipments resulted in, at best, the hatching of a few hundred fish - an amount that could make no appreciable contribution to stocking Antipodean waters.⁶⁸

⁶⁵(...continued)

reasonable destruction for purposes of food, of material for clothing, or for other needs. The savage tribes, although more dependent for support upon the animals of the field and forest than the white man, will continue for centuries in their neighbourhood without seriously diminishing their numbers. It is only as the result of wanton destruction for the purposes of sport, or for the acquisition of some limited portion only of the animal, that a notable reduction is produced, and the ultimate tendency to extinction initiated.

Quoted in Gay, J and Seal, WP 'Fish Culture Past Present and Future' Transactions of the American Fisheries Society 19 (1890) p.68.

⁶⁶ It was impossible to transport live fish over such a long distance - the voyage taking up to three months - and the export of eggs remained fraught with difficulty because of the need to keep it cool on a journey that crossed the equator and took as long as eggs normally take to hatch out. If the eggs hatched *en route* the consignment would be lost and the young fry would perish in the packing cases.

⁶⁷ *Vide supra* p.55 for discussion on Francis and Buckland.

⁶⁸ For a detailed history of Antipodean fish acclimatisation, see Clements, J Salmon at the Antipodes: A History and Review of Trout, Salmon and Char Introduced in Australasia (1988).

In 1881, Maitland was approached by New Zealand's Otago Acclimatisation Society and asked to try to export Loch Leven trout ova to the dominion. His first shipment of 10,000 ova in December 1881 was a complete failure with all eggs lost *en route*.⁶⁹ A further two shipments in 1882 also failed as the result of the high temperature on board the ship proving fatal to the ova.⁷⁰ Maitland overcame this problem for his next shipment in 1884 by using a special felt-lined cooling box for the ova which was housed within an ice chamber in the bowels of the ship.⁷¹ Many ova still perished *en route* but the shipment was a partial success and, by May 1885, 1,700 young fish were thriving at Dunedin and a further 1,000 at Wellington.⁷² Given the satisfactory temperature *en route*, and the fact that the selectively bred Howietoun eggs were stronger than any that could have been obtained from wild breeders, Maitland studied the development of the egg during incubation and determined that the solution to the problem lay in the age of the fish embryo at the date of packing for despatch. Earlier pisciculturalists had realised that the period from fertilisation of the egg to the development of the eye spot was one at which the ova was particularly delicate and should not

⁶⁹ Maitland, History of Howietoun p.13.

⁷⁰ *Ibid.* p.15. The purser had kept a daily record of temperature for Maitland's subsequent attention.

⁷¹ It was vital to keep the eggs at as low a temperature as possible to retard their development towards hatching, a process which speeded with increased temperature. Freezing the eggs was not a solution since it killed them, as would very high temperatures.

⁷² Maitland, History of Howietoun p.17.

be disturbed.⁷³ Maitland, however, took the study of the development of the embryo down to minute detail. He found that when incubation was only 17 *per cent* complete, the slightest touch to an egg would cause death and that 30 *per cent* was the earliest possible time for movement, once the eye spot had become fully developed. Further shipments to New Zealand in 1885 and 1886, packed when the eggs were 33 *per cent* of the way through incubation, proved "eminently successful."⁷⁴ 1886 saw Maitland's last exportation to the Antipodes as he thereafter became less involved in piscicultural work. There were many further attempts by other pisciculturalists to export eggs to the Antipodes after 1886, until the British salmonidae became firmly acclimatised there in the twentieth century.⁷⁵

⁷³ Francis, Fish Culture pp.78-9. For explanation of the term 'eye-spot', *vide supra* p.70.

⁷⁴ Maitland, History of Howietoun pp.18-19, The Times 30 January 1884 p.5, and Field 27 November 1886 p.785. Maitland commented: "It became evident that perfect success could be ensured in future, and that I had found the key to the whole problem, namely the precise period which should elapse between spawning and packing of the ova." Maitland, History of Howietoun p.18. Earlier exporters had sought to pack eggs rather earlier to prevent them hatching during the long voyage across the world. Francis, Fish Culture pp.77-78. Maitland's work had determined the right balance by packing eggs early in the incubation process (eggs for domestic despatch would be packed at no earlier than 90 *per cent* of the way through incubation) - but not too early - and by retarding their development by ensuring a low temperature *en route*.

⁷⁵ Clements, Antipodes (1988) and Flain, M 'The History of New Zealand's Salmon Fishery' Proceedings of the Salmon Symposium (1981) pp.8-10. Maitland's work was clearly appreciated by the New Zealanders. In 1888, he was presented with a number of New
(continued...)

Maitland also successfully exported to North America, playing an important part in the acclimatisation of Loch Leven trout in the United States and in Canada. In 1884, he sent 108,000 trout ova to the head of the United States Commission on Fish and Fisheries, Spenser Fullerton Baird. This was the first time that Loch Leven trout had been sent to the United States and the American pisciculturalists subsequently bred from the imports to create large domestic stocks.⁷⁶ In 1885 and 1888, Maitland sent two consignments of 100,000 Loch Leven trout ova each to Newfoundland, both of which were

⁷⁵(...continued)
Zealand bird skins by Sir Francis Bell, the dominion's High Commissioner in London, "as a slight acknowledgement of the services ... rendered on so many occasions to the colony in the introduction and acclimatisation of the salmonidae." Scottish Record Office, Steel-Maitland Collection, GD193/69/2: Papers about the export of trout and salmon ova to Natal and New Zealand. Letter from Bell to Maitland, 5 April 1888. Maitland received 23 different skins including those of the South Island Kiwi, the Ground Parrot, Black Wood Hen, Pigeon, Gannet and Hawk. The skins were "stuffed and mounted in an artistic manner and placed under glass." Ibid. Letter from the Colonial Secretary's Office at Wellington, New Zealand, to Bell, 1 February 1888. The giving of exotic bird skins as presents is, ironically, indicative of the deleterious effects of man's desire for luxuries on wildlife as criticised by SF Baird. *Vide supra* p.88.

⁷⁶ Smiley, CW 'Loch Leven Trout Introduced in the United States' Bulletin of the United States Commission on Fish and Fisheries 7 (1889) pp.28-37. The eggs were distributed around New Hampshire, Iowa, Maine, Michigan and New York. Though the introduction was successful, early twentieth century Americans do not seem to have had much affection for the British trout. As one commentator noted: "they are not so highly regarded or so valuable as our native trouts, and the demand for them is decreasing." Smith, HM 'Our Fish Immigrants' National Geographic 18 (1907) p.395.

eminently successful with only a 5 *per cent* loss in hatching.⁷⁷

Maitland also made several experiments on fish and ova at Howietoun. Some of these were corollaries to his work in selective breeding, such as his examination of the gestation period and the relative vitality of siblings raised from parents of varying ages. Others, attempting to create hybrids between different breeds of fish and a race of land-locked salmon, were intended to engineer whole new species. Pisciculturalists before Maitland had experimented in crossing the ova of one species of fish with the milt of another.⁷⁸ All had come up against poor rates of survival of the hybrid embryo and sickly fry amongst those that were hatched. Moreover, the experimentalists had all found that any hybrid fish that did survive to maturity

⁷⁷ Stirling Journal and Advertiser 6 January 1888 p.2. Whatever early twentieth century Americans may have thought about the British trout, the Loch Leven trout became the most popular game fish in Canada where large domestic stocks were bred from the Howietoun imports. Letter from Mr Al Brown of Linwood, Ontario, dated 16 October 1991. Mr Brown is an 'Outdoor Columnist' for several Canadian publications including Fish'n Canada and Angler and Hunter. Howietoun also exported in the early 1880s to France, Austria, Germany and Natal.

International introductions of fish became very popular in the twentieth century as technology and long-distance transportation links improved; by 1992, there had been at least 1,673,000 introductions of 291 different species into 148 different countries. Welcomme, RL 'A History of International Introductions of Inland Aquatic Species' ICES Marine Science Symposium 194 (1992) pp.3-14.

⁷⁸ Francis, Fish Culture p.108.

were sterile.⁷⁹ Maitland, however, felt that this lack of success had been caused by not selecting the best parents for the job. He believed that, by a judicious selection of breeders, there was "no reason why we should not obtain ... an improved trout the same as we now have an improved short horse."⁸⁰ He had thus made his first experiment a cross between a fresh water trout and a sea trout in the hope of uniting "the flavour of their Loch Leven mother and the sport of their sea trout sire."⁸¹ Maitland went on to perform several other crosses, mainly between Loch Leven trout and salmon, different breeds of British trout, and British trout with American trout and char.⁸² He came across the same high losses amongst hybrid fry as earlier experimentalists had, but, due to the increased vitality of the ova and milt

⁷⁹ Day, British and Irish p.49. The Royal Dublin Society observed that "It is proper to observe that mongrel animals have not the power of reproducing themselves; whence it is evident, that God, in the creation of nature, has determined the number of species that were to exist." Royal Dublin Society 'A New Method of Breeding Salmon and Trout' Transactions of the Royal Dublin Society 1 (1800) p.129.

⁸⁰ University of Stirling, HF/V47(i): Letter Book 1, p.559. Maitland to Francis Francis, 13 September 1881. Elsewhere, Maitland wrote that hybridisation experiments were of value "not merely in their relation to many profound biological problems, but also in regard to the probability of promoting the inland fisheries by producing more vigorous and valuable breeds." Maitland, JRG 'Notes on the Intercrossing of Members of the Genus Salmo' Seventh Annual Report of the Fishery Board for Scotland (1888) p.383.

⁸¹ Maitland, History of Howietoun p.168.

⁸² The photograph on p.117 shows a cross between an American char and a Loch Leven trout. Maitland called this fish a 'zebra' because of its distinctive zebra-like markings. Malloch, Life History p.276.

used at Howietoun, to a lesser extent. An average of 59 *per cent* of all hybridised ova failed, though the loss was much less, between 6 and 28 *per cent*, among crosses between male salmon and Howietoun's large, strong female Loch Leven trout.⁸³ Losses between the fry and adult fish stage were much higher than in the Howietoun pure breeds but all Maitland's hybrids, though some took a considerable length of time to develop sexually, proved fertile. This dispelled earlier assumptions that hybrids would inevitably be sterile in order to prevent the intermingling of species. By 1887, Maitland had bred three successive generations of hybrid fish and was able to conclude that "many phases in hybridism were entirely due to the age of one or other of the parents, ... many crosses supposed hitherto to be unfertile were merely so because immature, for some crosses take several years longer to develop than pure breeds."⁸⁴ As with the shipments of ova to the Antipodes, however, Maitland ceased experimenting in hybridisation after 1886 when he became less involved in piscicultural work.⁸⁵

⁸³ Day, British and Irish p.268.

⁸⁴ Maitland, JRG 'Fish Culture as an Exponent of Evolution' Transactions of the Stirling Natural History and Antiquarian Society 10 (1887) p.48. He told the Society, members of which planned to visit the fishery: "I hope when you come to have to visit Howietoun, you will look on the fisheries not only as a practical undertaking but also as one which is capable of yielding up some of the most jealously guarded secrets of nature."

⁸⁵ Though he thereby failed to improve the breed of fish by engineering new species, his experiments did, at least, prove that crossing was possible. Malloch, Life History p.276. Modern aquaculturalists have developed many strains of hybridised fishes. Landau, Introduction pp.129-132.

As was noted earlier, private pisciculturalists like Maitland dealt only with the artificial propagation of trout and not of salmon, because the latter could not be kept in ponds and controlled.⁸⁶ Maitland attempted to create a race of land-locked salmon that would overcome this problem and make salmon breeding worthwhile to the private pisciculturalist. In 1881, he hatched several thousand salmon eggs taken from the River Teith and reared the young fish in captivity.⁸⁷ They developed into healthy young salmon which, by late 1883, were seen to be repeatedly trying to jump out of the pond towards the end where water flowed in, as if wishing to ascend the stream.⁸⁸ Both male and female fish taken from the pond for dissection were found to be sexually mature and, in late 1884, Maitland stripped the fish, going on to hatch over 10,000 young fry. This, according to Francis Day, was "the first successful attempt in Great Britain at breeding from salmon which have undoubtedly passed their entire existence in freshwater." Day concluded that:

Some authors hold that salmon are freshwater forms that proceed to the sea, and that there is a physiological necessity for their doing so in order to be able to produce ova. Others, who I believe are more correct, consider these fish marine forms that descend into fresh water to deposit their eggs and rear their young. As it is evident from the Howietoun experiments that these fish can give eggs without descending to salt water, such disposes of the 'psychological necessity' theory. Possibly this

⁸⁶ *Vide supra* p.69.

⁸⁷ Traditionally, salmon culturalists would release their fry as soon as they became old enough to fend for themselves.

⁸⁸ Day, F 'On the Breeding of Salmon from Parents Which Have Never Descended to the Sea' Proceedings of the Linnean Society of London (1886) p.457.

migration may be classed among the instances of 'inherited instinct' and may be lost in such a race of salmon as have been reared for a few generations in fresh water.⁸⁹

However, Maitland discontinued breeding the land-locked salmon because he was dissatisfied with their size, the fish being rather smaller than their so recently anadromous ancestors.⁹⁰

It is worth emphasising the rigorous control and professionalism that Maitland brought to his piscicultural work. For example, earlier pisciculturalists had realised that the health of young fish was directly related to the length of the gestation period which itself was determined by the temperature of the water in which the egg was incubated.⁹¹ By experimentation, Maitland determined that the optimum gestation period was 77 days; a shorter period would result in weak fry and a longer one would result in possible abortion. He found that gestation could be made to last for exactly 77 days by maintaining the eggs in water at a constant temperature of 44.1 degrees

⁸⁹ Ibid. p.459.

⁹⁰ Malloch, Life History p.130 and University of Stirling, HF/V54: Letter Book 10, p.99. Maitland to Colonel Duncible of the Department of Science and Art, 3 February 1891. Maitland believed their small size to be due not to failure of the breed but to the ponds at Howietoun being rather more shallow than the deeper waters frequented by wild salmon. University of Stirling, HF/V55: Letter Book 11, p.440. Guy to Alexander Darroch of the Isle of Mull, 19 February 1892.

Modern aquaculturalists now successfully breed land-locked salmon and have also over come the problems of farming wild salmon by developing sea 'ranching' techniques. Landau, Introduction pp.268-270.

⁹¹ Francis, Fish Culture p.53 and Buckland, Fish Hatching pp.96-7.

Fahrenheit and kept his main hatchery at that temperature by the use of cooling devices and thermal wall and roof insulation.⁹² Maitland was particularly proud of the hatchery, describing it as "probably the only building in the world, with the exception of the coffin chamber in the Great Pyramid, which has solved the problem of a perfectly even temperature."⁹³ The constant temperature meant that the date of the ova's hatching could be accurately predicted and thus, at any given time, the fishery staff knew at what stage of incubation the egg was at. They were therefore always ready to transfer eggs to the hatching trays or to pack them in time to reach their destination before hatching commenced.

Likewise, the fishery's ponds were fitted with an elaborate system of sluices, filters and drains which ensured that the water supply was uninterrupted and at a constant volume.⁹⁴ A pressing machine was developed so that the moss used in packing ova for despatch was pressed to exactly the right thickness to keep the eggs secure but not so tightly that the

⁹² Barker-Duncan 'Salmon and Trout' pp.174-175.

⁹³ University of Stirling, HF/V48(i): Letter Book 3, p.275. Maitland to Mr Crossman, Member of the Executive Committee of the 1883 London Fisheries Exhibition, 18 October 1883. A year earlier, Maitland had told his solicitor that "The engineering difficulties which have been overcome to secure such a result were very great, and I am rather proud of my success." University of Stirling, HF/V47(ii): Letter Book 2, p.278. Maitland to John C Brodie of Brodies, Edinburgh, 20 May 1882.

⁹⁴ University of Stirling, HF/V47(i): Letter Book 1, p.222. Maitland to Mr McFee of Edinburgh, 7 February 1881. The Times described Maitland's pond system as "ingenious and successful." The Times 18 April 1882 p.4.

capillary action of the gaps in the moss, which allowed the ova to breath, was reduced.⁹⁵ The travelling tanks used for carrying live fish were made deliberately weightier than they needed to be so that they were heavy enough "to induce porters and carters to handle them delicately. Human nature has a wonderful respect for its own toes, and although a lady's band-box may afford infinite amusement as a catch, a tank weighing 1.5cwt will always secure respectful attention."⁹⁶

Such minute control also applied to the fishery workers. For example, rather than simply ordering his workers to pack trout ova in a safe and expeditious manner, Maitland detailed the exact positions in which they should stand, and the exact movements they should make whilst doing so in order to try to obviate as much of the risk of carelessness as possible. The sinks for preparing ova for despatch had tap handles situated at knee-height so that the operator could regulate the water flow whilst being able to give the full use of his hands to the preparation of the ova.⁹⁷ When the fish were removed from the ponds for stripping, the fishery operatives were dressed in buttonless silk aprons to prevent any damage being done to the fish by coarse material or jagged edges.⁹⁸ Only women, believed to be more gentle and

⁹⁵ Maitland, History of Howietoun p.38. *Vide supra* p.76 for a description of the Howietoun method of packing eggs for despatch.

⁹⁶ Maitland, History of Howietoun p.77.

⁹⁷ Maitland, History of Howietoun pp.33-41. The knee-height taps can be seen in the illustration on p.112.

⁹⁸ *Ibid.* p.25. Cuts and abrasions on a fish could act as a nidus for infection.

careful than men, were allowed to work with ova in the hatcheries.⁹⁹ In short, nothing was allowed to go to chance.¹⁰⁰

Chapter Nine looks at Maitland's achievements in a broader perspective, assessing his legacy to both British and world pisciculture. At this point, however, it is important to illustrate the importance which was accredited to his work whilst he lived. As early as 1880, when Howietoun was still far from complete, a journalist visiting the fishery recorded that "no one can surpass Sir James in energy and zeal and practical knowledge in all piscatorial science and research."¹⁰¹ In a lecture on artificial fish culture at the Edinburgh Museum of Science and Art in 1884, Professor Ewart, a member of the Fishery Board for Scotland, praised Howietoun as "undoubtedly the best" piscicultural establishment in the world.¹⁰² As late as 1895, long after several other British piscicultural establishments had opened and Maitland had become less involved in piscicultural work, Howietoun was still seen as "a private hatchery on an imperial scale [which] has done more for this country than the government hatchery of Huningue did for France, and still remains

⁹⁹ Ibid. pp.48-49.

¹⁰⁰ A visitor to the fishery, Henry Ffennell, remarked on how he had been particularly struck ... [by] ... the systematic manner in which the work is carried on, even down to the smallest detail." The Times 1 May 1886 p.6. Likewise, an 1895 observer noted that at Howietoun "every mechanical detail ... has been worked out to the greatest perfection." Anderson-Smith, W 'Fish Hatching' Scottish Review 26 (1895) p.303.

¹⁰¹ Stirling Saturday Observer 28 February 1880 p.1.

¹⁰² Ibid. 12 April 1884 p.3.

the model hatchery."¹⁰³

Maitland was also praised on a more formal, national scale. In 1881, a representative of the Japanese government, Mr Takayama Nakomoto, who had come to Britain to learn about salmon fishery development and pisciculture, was advised to visit Howietoun as a centre of excellence.¹⁰⁴ In the following year, Maitland's work was recognised at Government level when, in November, he was made a member of the Fishery Board for Scotland, the predecessor of today's Scottish Office Agriculture and Fisheries Department.¹⁰⁵ Also in 1882, Maitland was unanimously elected President of the newly formed British National Fish Culture Association.¹⁰⁶ He was

¹⁰³ Anderson-Smith, 'Fish Hatching' p.303.

¹⁰⁴ Stirling Saturday Observer 9 July 1881 p.2. The fishery became widely known as a centre for piscicultural excellence with many correspondents desirous of piscicultural advice from Maitland. *Vide infra* p.196.

¹⁰⁵ Scottish Record Office, GD193/69/5: Appointment of Sir James Maitland as a member of the Fishery Board for Scotland, 1882.

¹⁰⁶ The Association, set up by various people interested in the fisheries and pisciculture, including the Marquis of Exeter and the Duke of Sutherland, was intended to be a British equivalent of the American Fisheries Society (*vide supra* p.62). The Times 21 December 1882 p.8 and Stirling Saturday Observer 30 December 1882 p.4. The Field saw its foundation as "a subject of congratulation to everyone who has the interest of our fisheries at heart." It wished the Association "all sorts of success" and hoped "that it may be supported liberally and handsomely." Field 30 December 1882 p.928. This was not, however, for unknown reasons, to be the case. Apart from publishing one volume of a journal in 1887, and setting up some small scale piscicultural works at a hatchery at Delaford Park in Buckinghamshire, (continued...)

invited to join the organising committees of the Edinburgh and London Fisheries Exhibitions in 1882 and 1883 respectively.¹⁰⁷ In 1882, he received gold medals for pisciculture from the Edinburgh Exhibition, the Paris Acclimatisation Society and the Highland Society.¹⁰⁸ A French delegate to the Edinburgh Exhibition, M.Chabot-Karlen, visited Howietoun and went on to praise it as a "solution upon a very grand scale to the problems of artificial and industrial pisciculture."¹⁰⁹ In 1883, the London Exhibition awarded Maitland gold medals and diplomas for his fish rearing establishment and services rendered in organising the event, and a silver medal and diploma for

¹⁰⁶(...continued)

the Association does not seem to have accomplished anything. Maitland resigned from the it in 1884 on account of his living too far from the south of England to play an active role, and, at some time thereafter, it "died of inanition." Fishing Gazette 13 November 1897 p.355.

¹⁰⁷ Herbert, D (ed.) Fish and Fisheries (1883) p.1 and University of Stirling, HF/V47(i): Letter Book 2, p.341. Maitland to James Chatham, address unknown, 13 June 1882.

¹⁰⁸ Stirling Saturday Observer 7 October 1882 p.2. In addition, the Edinburgh exhibition awarded Maitland two £10 awards for a model of his fish travelling tanks and a gold medal for his exhibits of his fish hatching and rearing apparatus. He was also awarded a silver medal for a display of an "infantile regiment" of live salmonidae. Scottish Record Office, GD193/69/1: Diplomas received by the Howietoun Fishery and Bertram, 'Pisciculture' p.599. Maitland's wife, Fanny, won a silver medal for a bronze model of herring wheels. The Times 18 April 1882 p.10.

The certificate confirming one of Maitland's gold medals from the Exhibition is reproduced on p.118.

¹⁰⁹ Chabot-Karlen's report to the French Government. Quoted in Field 28 May 1883 p.696.

a model of the Howietoun ponds.¹¹⁰

An 1895 commentator on Howietoun observed that "Under the care of Sir James Maitland, and the outcome of his own assiduous and skilled personal attention, this fine hatchery has carried the art [of pisciculture] into a science."¹¹¹ Given the substantial advances that Maitland made in pisciculture, and the praise with which he was showered, it is pertinent here to ask whether he actually was a scientific man or, on the other hand, a practical layman who, simply by tinkering, hit upon a scientific way of doing things. Such an enquiry is particularly apt in the light of relatively recent arguments on the role of 'empirical tinkering' in the British industrial revolution.¹¹²

Maitland was probably a tinkerer. Certainly, he had no formal scientific training in anything even remotely connected with pisciculture or biology in general and had been drawn to pisciculture not by scientific curiosity but for

¹¹⁰ Scottish Record Office, GD193/69/1. The certificate confirming Maitland's gold medals for his establishment and for his services are reproduced on pp.119-120.

¹¹¹ Anderson-Smith, 'Fish Hatching' p.303.

¹¹² Discussing eighteenth century British science and technology in the run up to the industrial revolution, Musson examines the view that "native empiricism was of immense and probably predominant importance." Musson, AE 'The Diffusion of Technology in Great Britain During the Industrial Revolution' in Mathias, P (ed.) Science, Technology and Economic Growth in the Eighteenth Century (1972) p.97. See also Musson, AE and Robinson, R Science and Technology in the Industrial Revolution (1969) *passim*, where the authors challenge the view that the industrial revolution was "almost entirely a product of uneducated empiricism," though stressing that practical achievements remained important.

the functional reason of restocking Loch Leven.¹¹³ As a student at the University of St Andrews, he had studied mathematics, Greek, Latin and philosophy.¹¹⁴ Of course, nineteenth century science was nowhere near as developed as it is today and would not have been too difficult for a reasonably intelligent layman to grasp.¹¹⁵ But the evidence indicates that Maitland himself preferred to be seen as a practical man. Expressing his disgust at the decision to award the surplus of the 1882 Edinburgh Fisheries Exhibition to contribute to the cost of writing up the report of the Challenger expedition, rather than to use it in promoting the interests of the Scottish fisheries at the forthcoming 1883 London Exhibition, for example, Maitland complained that "The way we have been treated is singly awful. I suppose it was necessary for the scientific lobby that any working man was ignored."¹¹⁶ After the

¹¹³ *Vide Supra* p.58.

¹¹⁴ Letter from Mr Robert N Smart, Keeper of the Muniments at the University of St Andrews, 29 June 1993.

¹¹⁵ Twentieth century commentators observed that: "The disposition of modern writers to regard nineteenth century inventors as uneducated and empirical in their methods is a direct outcome of the difficulty which academically educated people often have in understanding the possibilities of self-education." Jewkes, J, Sawers, D, and Stillerman, R The Sources of Invention (1969) pp.63-64.

¹¹⁶ University of Stirling, HF/V47(i): Letter Book 2, p.929. Maitland to Archibald Young, Inspector of Scottish Salmon Fisheries, 6 March 1883. Maitland, who had been on the organising committee for the Edinburgh Exhibition, had been outvoted by his colleagues on the matter. The voyage of the Challenger around the world's oceans lasted from December 1872 to May 1876 and was the largest and most detailed oceanographic survey ever carried
(continued...)

London Exhibition, this time complaining about the awards of the jury on pisciculture, Maitland criticised one juror for having knowledge that was "merely scientific and not practical."¹¹⁷ Likewise, he told a journalist from The Times that he aimed "to carry on the fishery on more practical and less purely scientific methods."¹¹⁸ In the History of Howietoun, he quoted the scientific description of the gestation period directly from Balfour's Embryology but then laid it all out again in more practical and understandable terms, describing such stages of development as "the mulberry stage" or that at which the egg had "the appearance of a pair of spectacles, minus one eye, and a little later bears a striking resemblance to the three legs on a Manx coin."¹¹⁹ The whole development of Howietoun was based on practice rather than theory. Maitland's scientific discoveries were arrived at after a long process of trial and error and the comparison of results attained by using

¹¹⁶(...continued)
 out. A huge amount of data was collected and the Challenger team grossly underestimated the amount of time that it would take to write up their reports into a publishable format. The work, originally planned to be completed in 1881, was not actually finished until 1895. It was thus that the team ran into repeated financial difficulties and sought assistance from the Edinburgh Fisheries Exhibition. Detailed accounts of the Challenger expedition and its work can be found in: Deacon, M Scientists and the Sea 1650-1900 - A study of Marine Science (1971) and Burstyn, HL 'The Challenger Expedition' Bulletin de l'Institut Océanographique No.2 (1968) pp.603-611.

¹¹⁷ University of Stirling, HF/V48(i): Letter Book 3, p.275. Maitland to Mr Crossman, Member of the Exhibition Executive Committee, 18 October 1883.

¹¹⁸ The Times 18 April 1882 p.4.

¹¹⁹ Maitland, History of Howietoun p.55.

different methods.¹²⁰ As Maitland put it:

The steps by which the fishery has arisen are very gradual; there have been no leaps and bounds nor have there been any serious checks; losses have occurred but I have always endeavoured to treat them as valuable experiments from which to deduce the conditions of success.¹²¹

Nevertheless, none of the foregoing detracts from the fact that Maitland's work in selective breeding was a scientific achievement. As Francis Day put it, in dedicating his work on the British and Irish salmonidae to Maitland, Maitland was a man "whose practical knowledge and unwearied attention has enabled him to inaugurate a fish farm at Howietoun of unrivalled eminence, both as a school for fish culture and for ichthyological research."¹²²

¹²⁰ As two American pisciculturalists noted, "Failure is as much a part of the development of any economic theory as is success, and it is only through repeated failures that success is finally achieved." Gay and Seal, 'Fish Culture' pp.66-79. An eminent American pisciculturalist, Fred Mather, reminisced in 1900 that he had learnt his trade "by many expensive errors and mistakes." Mather, F Modern Fish Culture in Fresh and Salt Water (1900) p.7.

¹²¹ Maitland, History of Howietoun p.11. Howietoun's secretary, Guy, told one of the fishery's correspondents that "we have nothing to do with theory but merely with facts." University of Stirling, HF/V47(i): Letter Book 1, p.721. Guy to J Dunbar-Brander of Elgin, 24 November 1881.

¹²² In the preface to the work, Day again offered his "best thanks" to Maitland "without whose assistance this work would never have seen the light; he has afforded me every information during the course of my inquiries, and furnished me with specimens for examination and delineation." Day, British and Irish pp.ii-vii.

The Field found Day's book "the most valuable work in existence upon the salmonidae
(continued...)

In conclusion, this chapter has shown how, by 1886, Maitland had risen admirably to Buckland's call for an establishment where pisciculture could be carried out on a large, commercial scale.¹²³ But he had far surpassed Buckland's expectations, and perhaps even his own. Having commenced pisciculture out of a desire to restock the depleted waters of Loch Leven, Maitland had created the largest piscicultural establishment in the world. His work had produced new advances in piscicultural science, most importantly the development of selective breeding from a captive broodstock. His achievements, built on practical methods of trial and error and minute attention to detail, had been nationally recognised. Maitland was "no mere theorist, but a gentleman having an extensive practical acquaintance with the breeding and habits of fish."¹²⁴ The next chapter turns to the question of whether all Maitland's scientific work and innovation was actually worth it in financial terms. Did fish culture pay?

¹²²(...continued)
of these islands, ... the angler and the man of science must have their already heavy debt of gratitude to the author much increased by this valuable treatise." Field 12 November 1887 p.757.

¹²³ *Vide supra* p.58.

¹²⁴ Stirling Saturday Observer 4 June 1881 p.2.

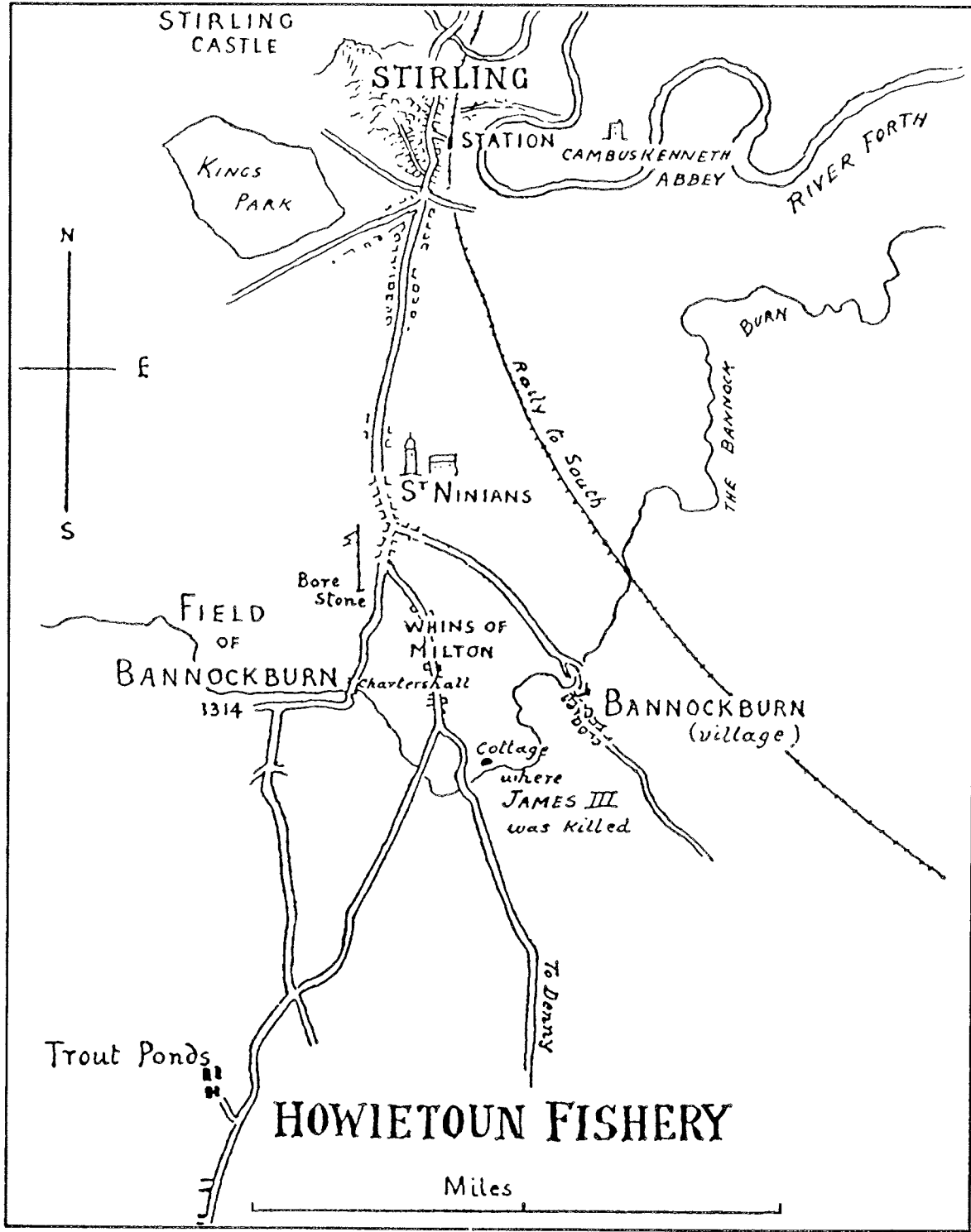
ILLUSTRATION 3

Francis Day's illustrations of the Loch Leven Trout
at Howietoun



Source: Day, F British and Irish Salmonidae (1887) p.306

The top fish is a male (note the sharp teeth), the middle is a female and the lower is a young female.



Shaver

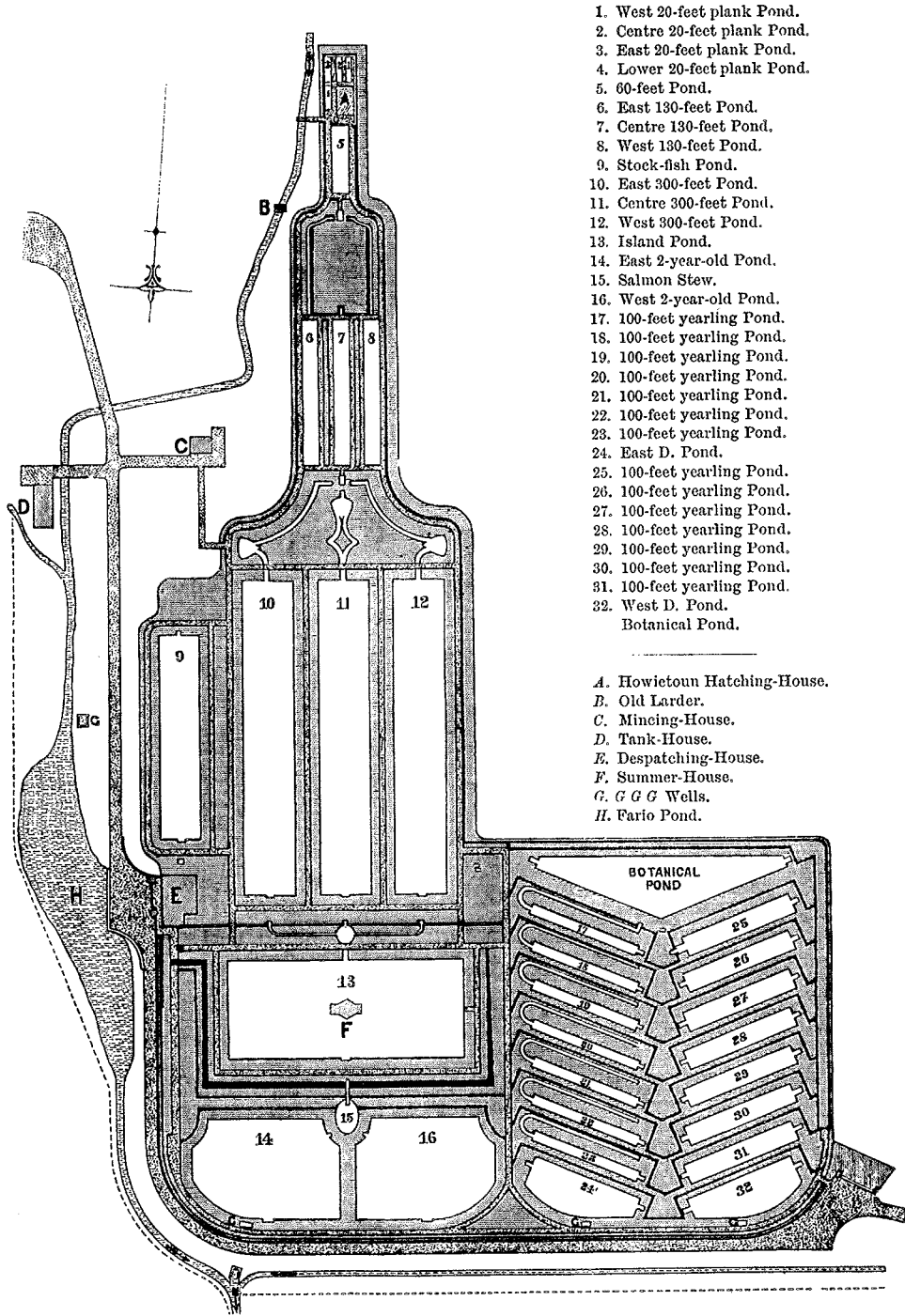
ILLUSTRATION 4

Map showing the location of Howietoun (circa 1880)

Source: University of Stirling, The Story of Howietoun (1989) p.29.

ILLUSTRATION 5

The Howietoun pond system.

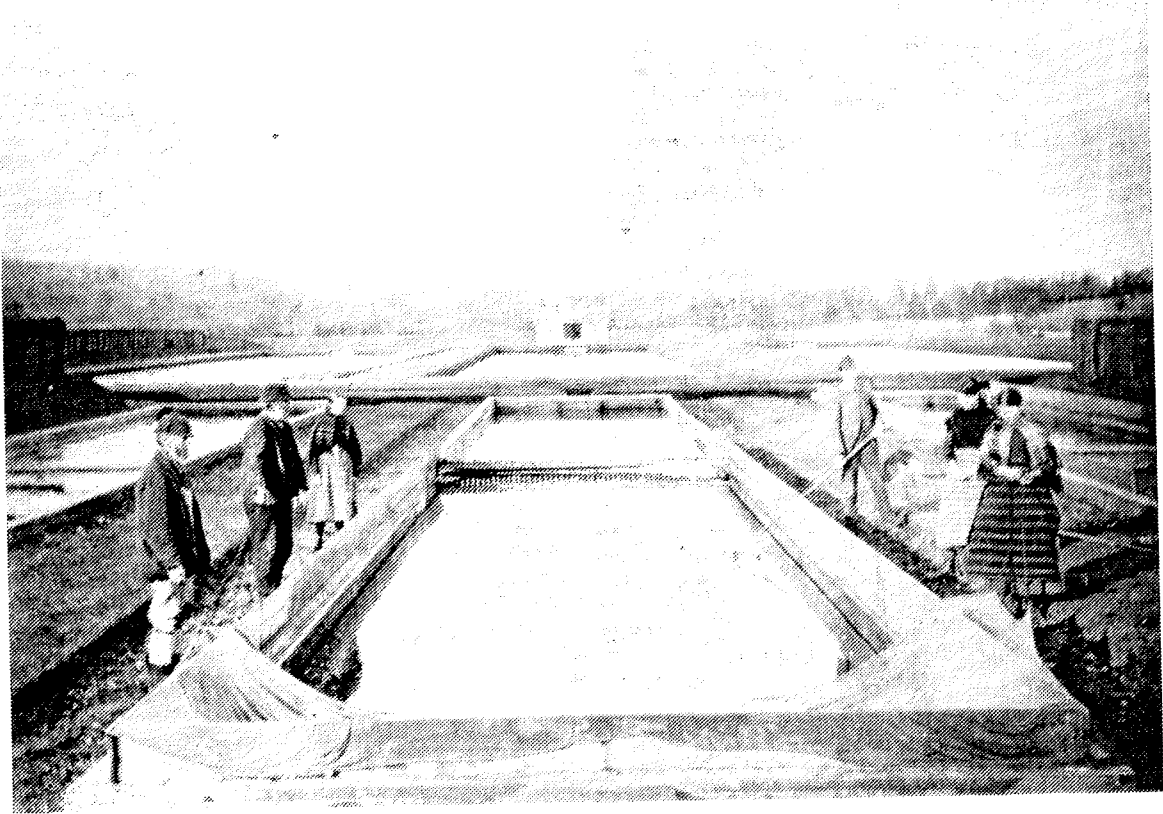


1. West 20-feet plank Pond.
2. Centre 20-feet plank Pond.
3. East 20-feet plank Pond.
4. Lower 20-feet plank Pond.
5. 60-feet Pond.
6. East 130-feet Pond.
7. Centre 130-feet Pond.
8. West 130-feet Pond.
9. Stock-fish Pond.
10. East 300-feet Pond.
11. Centre 300-feet Pond.
12. West 300-feet Pond.
13. Island Pond.
14. East 2-year-old Pond.
15. Salmon Stew.
16. West 2-year-old Pond.
17. 100-feet yearling Pond.
18. 100-feet yearling Pond.
19. 100-feet yearling Pond.
20. 100-feet yearling Pond.
21. 100-feet yearling Pond.
22. 100-feet yearling Pond.
23. 100-feet yearling Pond.
24. East D. Pond.
25. 100-feet yearling Pond.
26. 100-feet yearling Pond.
27. 100-feet yearling Pond.
28. 100-feet yearling Pond.
29. 100-feet yearling Pond.
30. 100-feet yearling Pond.
31. 100-feet yearling Pond.
32. West D. Pond.
Botanical Pond.

- A. Howietoun Hatching-House.
- B. Old Larder.
- C. Mincing-House.
- D. Tank-House.
- E. Despatching-House.
- F. Summer-House.
- G. G G G Wells.
- H. Fario Pond.

ILLUSTRATION 6

Fishery workers netting the ponds and stripping fish



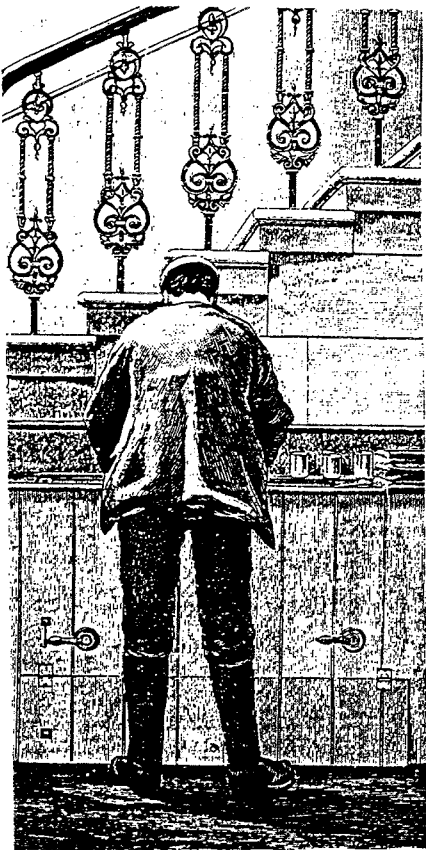


ILLUSTRATION 7

Fishery workers packing eggs for despatch

Source: The History of Howietoun pp.33-37.

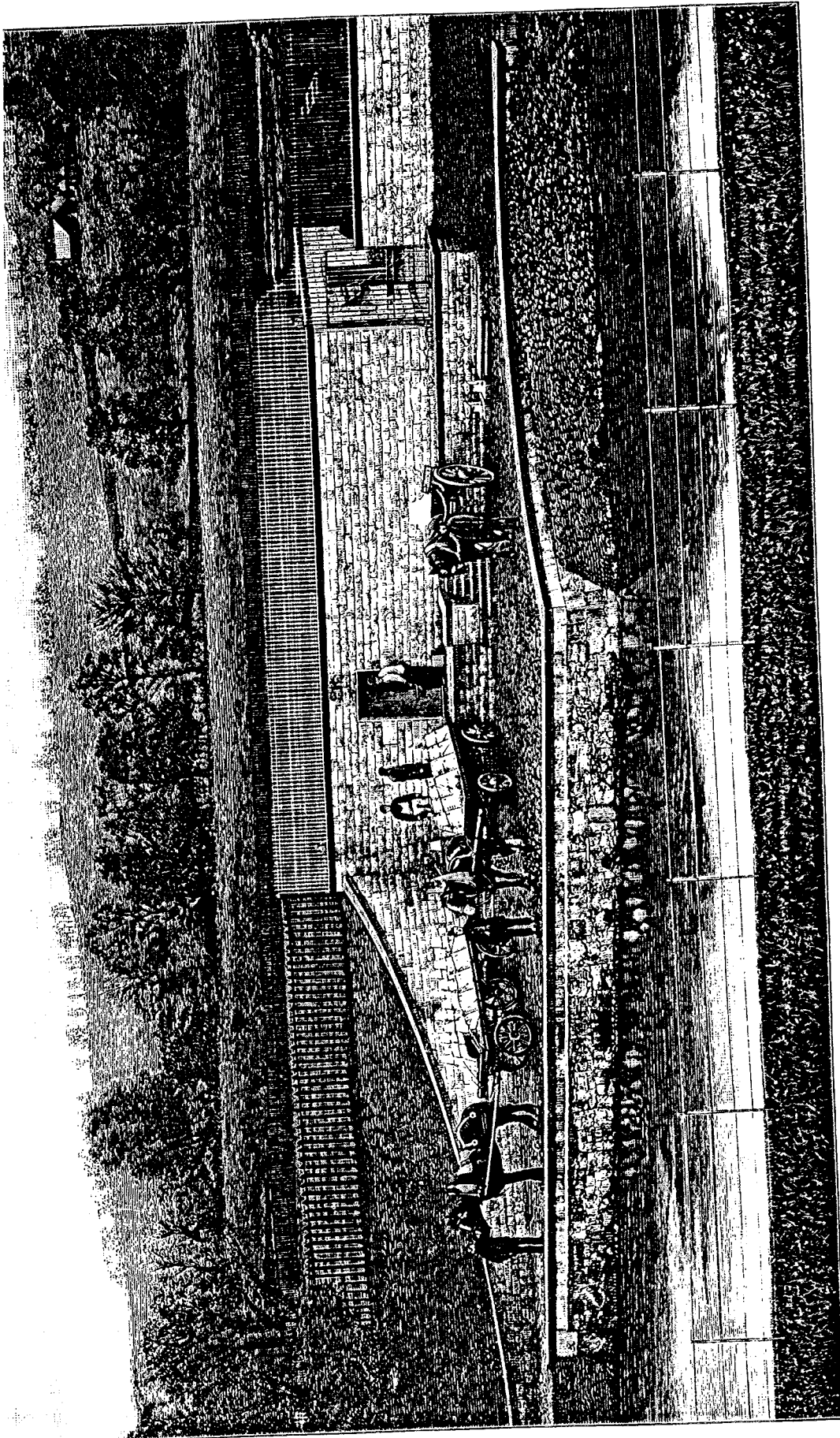


ILLUSTRATION 8 The Howietoun despatching house

Source: The History of Howietoun p.82.

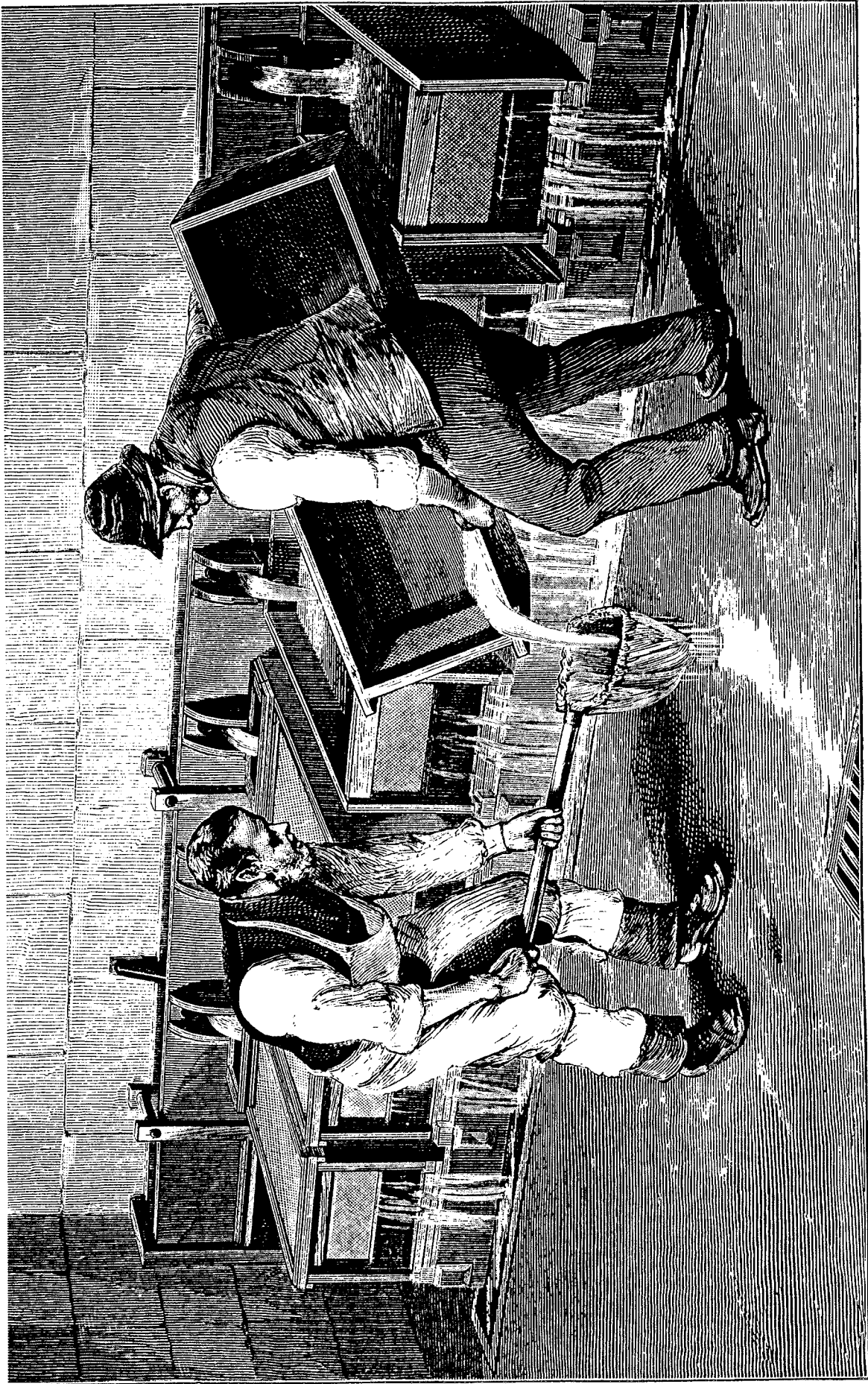
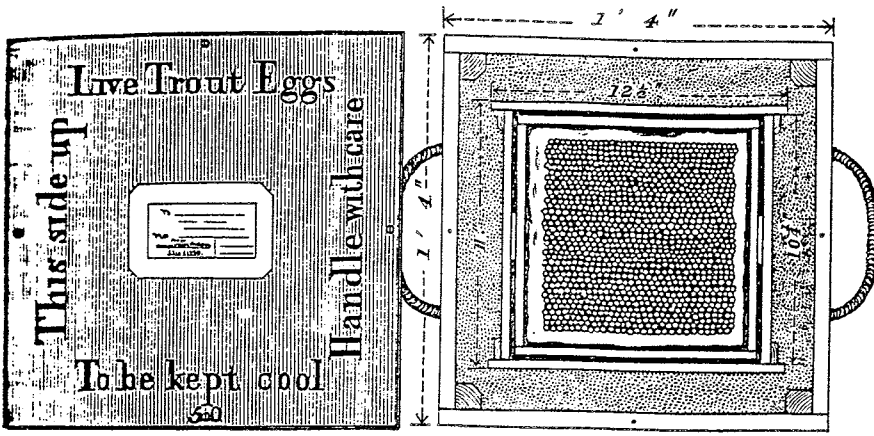


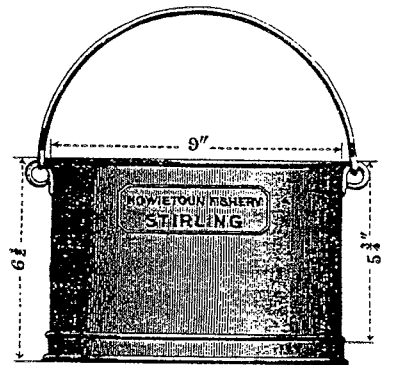
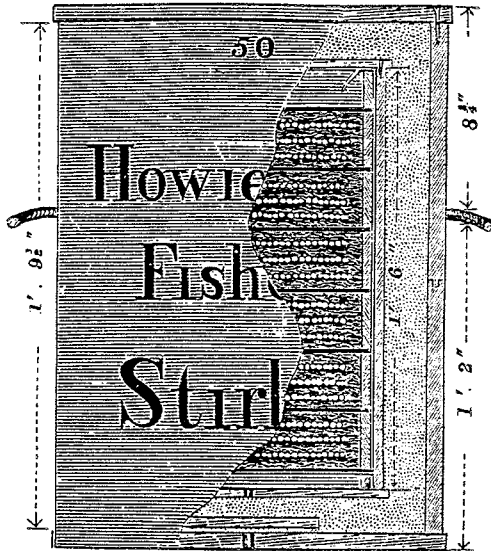
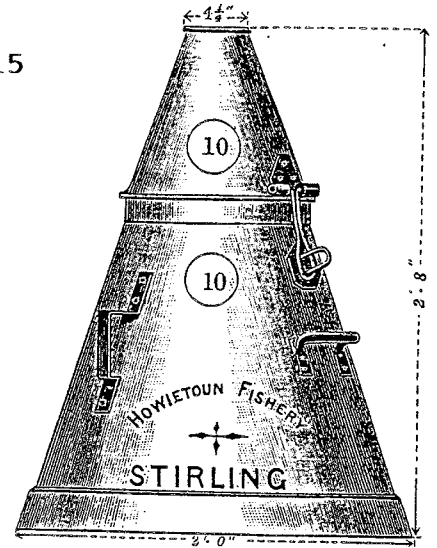
ILLUSTRATION 9

Fishery workers preparing to despatch young fish

Source: History of Howietoun p.84.



115



LIVE TROUT OVA. *Per Express Passenger Trains.*

WITH CARE.	To _____		TO BE KEPT COOL.

Via _____		_____ S. _____	
FROM HOWIETOUN FISHERY, STIRLING.		Spawned _____	
Date, _____		Train, _____	

ILLUSTRATION 10

Howietoun's packing boxes and tanks.

Source: The History of Howietoun p.39.

The boxes were used for eggs and the tanks for live fish.

ILLUSTRATION 11

Howietoun despatching house and ponds

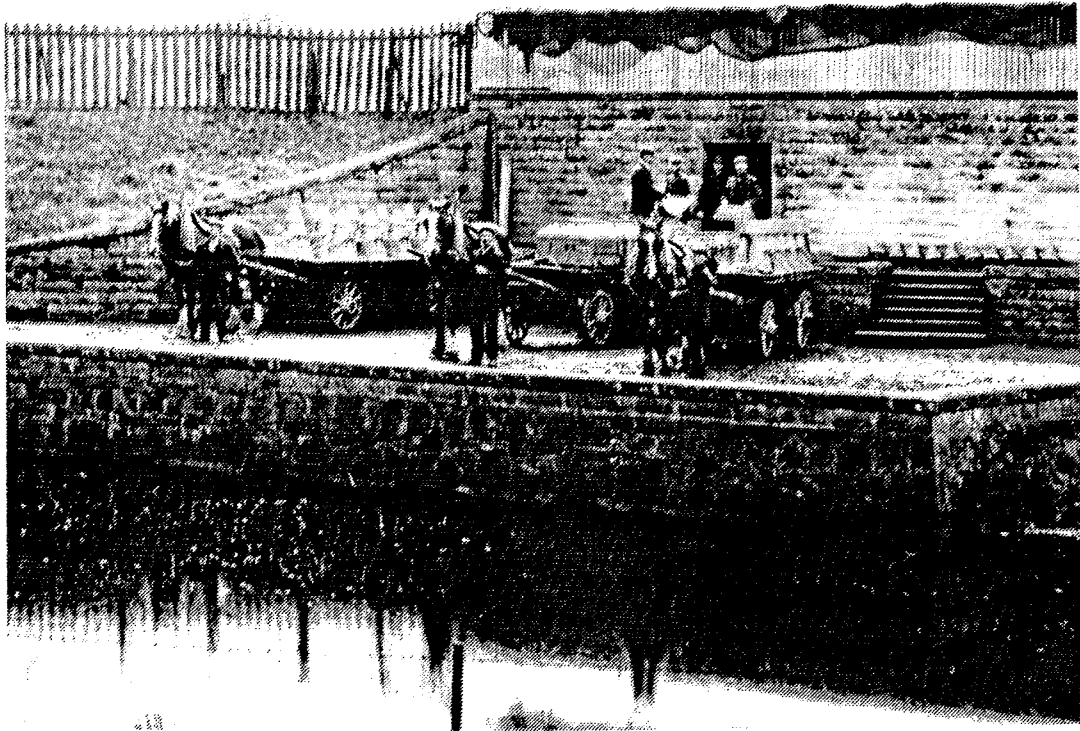
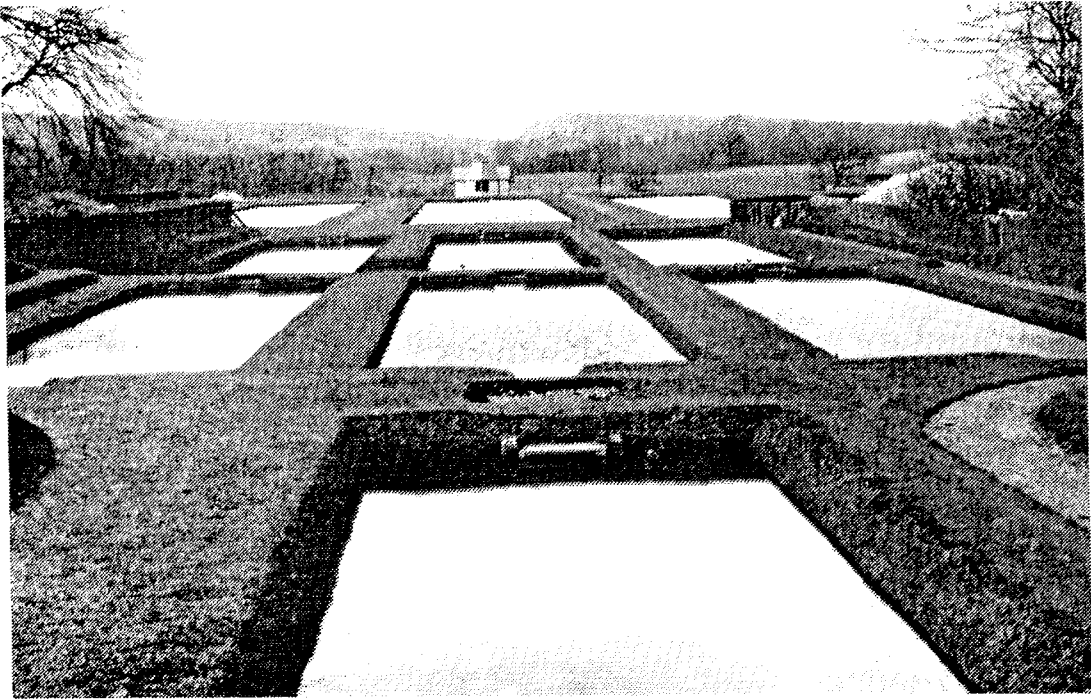


ILLUSTRATION 12

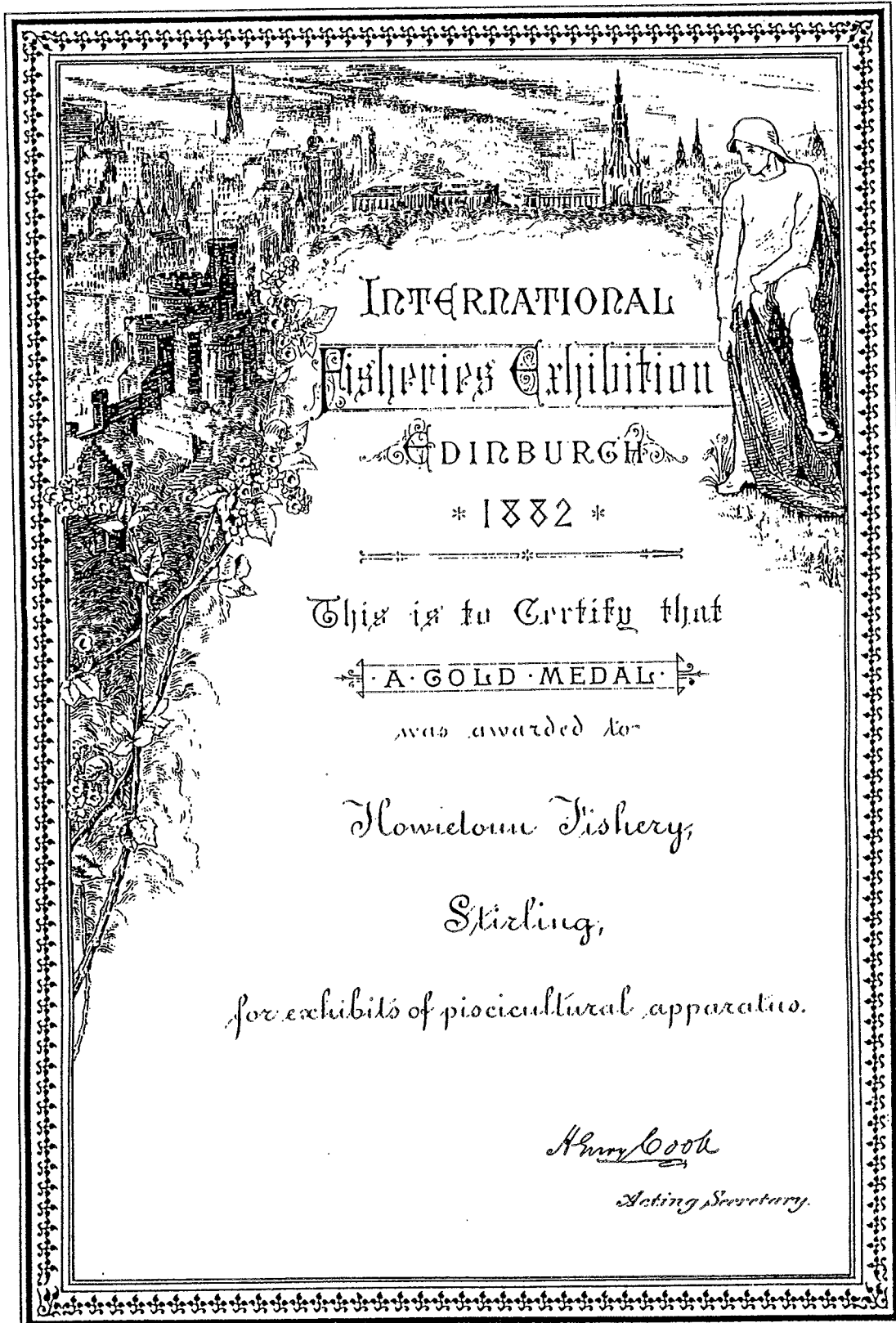
A hybridised 'zebra' fish



Source: Malloch, PD Life History and Habits of the Salmon
(1912) p.276.

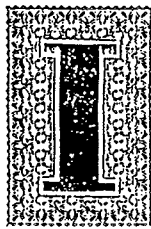
ILLUSTRATION 13

Howietoun's certificate from the 1882 Fisheries Exhibition



The · International · Fisheries · Exhibition,
LONDON, 1883.

Certificate of Award



Hereby Certify that the COMMISSIONERS
appointed by Her Majesty's Government
have, upon the RECOMMENDATION of the
INTERNATIONAL JURIES, awarded

A Gold Medal
— AND —
A Diploma of Honour

To Sir James Maitland Bart.

— FOR —

Establishment for Fish Rearing

Edward Birbeck

Chairman of the Executive Committee.

* Note—The Diploma will be duly transmitted at a later date.

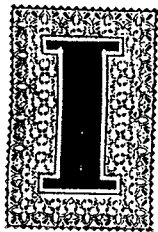
ILLUSTRATION 14

Maitland's certificate from the 1883 Fisheries Exhibition

Source: The Howietoun Fishery

The · International · Fisheries · Exhibition,
LONDON, 1883.

Certificate of Award



Hereby Certify that the COMMISSIONERS
appointed by Her Majesty's Government
have, upon the RECOMMENDATION of the
INTERNATIONAL JURIES, awarded

A Gold Medal
— AND —
A Diploma of Honour

To Sir James Ramsay-Gibson Maitland Bart.

— FOR —

Special services rendered.

Edward Birllbeck

Chairman of the Executive Committee.

* Note.—The Diploma will be duly transmitted at a later date.

ILLUSTRATION 15

Maitland's certificate from the 1883 Fisheries Exhibition

Source: The Howietoun Fishery

Chapter Four

THE BUSINESS OF FISH CULTURE 1873-1885

The object in view has been to prove by actual experience that the culture of the salmonidae can be made commercially a success, if set about in a business-like manner.¹

The business history of the fishery during Maitland's lifetime falls into two distinct periods: that between the beginning of record keeping by Maitland in 1874 and the completion of the works, and that from 1886 to Maitland's death in 1897.² The period is also neatly divided in 1886 by the Falkirk Water Bill case. This case, in which Maitland successfully fought to defend Howietoun from the ravages of a Falkirk Town Council Water Bill, is analysed in detail in Chapter Five, before Chapter Six returns to the post 1885 business history of the fishery. The current chapter lays out the financial data for the years to 1885, looking firstly at overall levels of profit and profitability and secondly at the component areas of income and expenditure. Whilst this examination shows that, in the early years at least, Maitland did succeed in making fish culture pay, it also reveals that, despite a large initial investment in the fishery, the rate of return was low and uncertain. Maitland's commercial success apparently failed to match the magnitude of his scientific

¹ Maitland, JRG The History of Howietoun (1887) p.ix. Similarly, The Times noted Maitland's intention "to show that this breeding of fish could be made to pay." The Times 17 April 1882 p.6.

² Whilst Maitland actually commenced piscicultural work in 1873, he does not appear to have kept any financial records before 1874.

achievement. In order to assess Maitland's actual performance as a businessman in the light of such findings in as full a way as possible, however, the chapter leaves detailed analysis of them until Chapter Six.³

The financial records cover two distinct types of account, the balance (trading) accounts and the invested capital accounts. The former detail the basic income and expenditure of the fishery, such as sales and incidental revenue, and moneys expended on labour, advertising and management costs. These trading transactions make up the Balance Account in which the sum totals of expenditure accounts are subtracted from those of the income accounts, to produce a figure representing the fishery's overall trading profit or loss. The Balance Account also contains cumulative data, that is the profit or loss in the first year added to that in the second and so on. These cumulative data, to which Maitland himself referred in assessing commercial performance, are useful in showing the overall trend of the fishery's business development and help to iron out the distorting effects of year to year fluctuations in profit and loss.⁴

³ The financial records for the period up to Maitland's death can be found in the ledger and cash book volumes of the Howietoun Archive. University of Stirling, Howietoun Archive, HF/V113, HF/V114 and HF/V115. Ledger book, June 1874 to April 1892 and Cash books, June 1874 to February 1892 and July 1893 to May 1905. *Vide supra* p.10 for discussion on the nature of these sources.

⁴ University of Stirling, HF/V113 pp.415-420, 563-570.

TABLE 4.1**Howietoun Fishery Income, Expenditure and Profit (£), 1875-1885**

YEAR	INCOME	EXPENDITURE	PROFIT	CUMULATIVE PROFIT
1875	0	3	-3	-3
1876	0	7	-7	-10
1877	0	14	-14	-24
1878	0	102	-102	-126
1879	78	131	-53	-179
1880	245	239	6	-173
1881	702	433	269	96
1882	1,171	897	274	370
1883	1,304	1,214	90	460
1884	1,457	1,700	-243	217
1885	1,562	1,301	261	478
TOTAL	6,519	6,041	478	

Source: *University of Stirling, HF/V113 pp.415-420, 563-570.*

The invested capital accounts relate to the amount of money invested by Maitland in the fishery. The Construction Capital Account details the amount spent on the actual erection of Howietoun, both annually and cumulatively, whilst the Estates Advance Account details the amounts advanced by Maitland from the Sauchie Estate to finance his piscicultural work.⁵ The Estates Advance Account also details the interest charged to Howietoun on the sums advanced and records repayments made by the fishery to the estate.⁶

Table 4.1 (page 123) sets out Howietoun's total income, expenditure and profit data to 1885. Not surprisingly, the table shows that, before its first sales in 1879, Howietoun made a loss.⁷ 1880 was the first year in which income exceeded expenditure, though by only £6, but by 1882 there was a £274 surplus, the highest profit in the period covered in this chapter. The surplus dipped to £90 in 1883, largely as a result of expenses incurred in exhibiting Howietoun's work at the International Fisheries Exhibitions in

⁵ Unfortunately, the Steel-Maitland collection at the Scottish Record Office does not hold the account books of the Sauchie Estate for Maitland's lifetime and thus it is not possible to look at the role the fishery played in the business of the estate as a whole.

⁶ University of Stirling, HF/V113 pp.1-56, 61-78. Repayments were not cash remittances as such but reductions 'in kind' for services rendered to the estate by the fishery such as fishery workers assisting with grouse beating. Ibid. p.69/73/75.

⁷ The component accounts making up the overall income and expenditure figures are discussed later in this chapter. Prior to the first sales in 1879, Maitland still charged some amounts to the trading accounts, presumably in anticipation of the fishery becoming sufficiently developed to undertake commercial operations.

Edinburgh (1882) and London (1883), and partly as a result of expenditure on adding the fishery's offices, new hatchery and despatching house.⁸ Large labour expenses in 1884, incurred in extending the pond system, resulted in expenditure exceeding income by £243 but this was corrected in the following year which returned a profit of £261.⁹ By 1885, the fishery's cumulative trading profit amounted to £478, an average £68 *per annum* in the seven years since commercial operations began. However, though the fishery was clearly capable of returning profits, the data for 1883 and 1884 show that it was not sufficiently profitable to maintain surplus levels against the effects of surges in expenditure.

⁸ *Vide supra* p.74. University of Stirling, HF/V113 p.99/179.

⁹ Why Maitland charged this construction expenditure to the balance accounts and not to the investment capital accounts is not known. It was *possibly* because he used his own fishery workers for this particular piece of construction rather than construction workers and navvies from outside contractors, but this is only supposition. Though reference to several of the many histories of accounting revealed no clues as to why Maitland may have chopped and changed between accounts in this fashion, it highlighted the confusions caused by such accounting practices. A sixteenth century Dutchman, for example, noted:

The whiche maners of keypyng bokes I have seen and knowen sondry and diverse marchantes so grosly, obscurely, and lewdly kept, that after their desease nether wife, servaty, executor nor other could by their bokes perceive what of right ether apperteigned to them to be received of other, nether what justly was due by them unto other.

Ympyn, Jan A Notable and Very Excellent Woorke (1547), quoted in Yamey, BS 'Pious Inscriptions, Confused Accounts, Classifications of Accounts: 3 Historical Notes' in Yamey, BS (ed.) Essays on the History of Accounting (1978) p.143. See also Yamey, BS 'Scientific Book-Keeping and the Rise of Capitalism' Economic History Review 1 (1949) p.99.

TABLE 4.2

Howietoun Fishery Construction Capital Account (£), 1874-1885

<i>YEAR</i>	<i>EXPENDITURE</i>	<i>BALANCE</i>
1874	29	29
1875	101	130
1876	150	280
1877	195	475
1878	1,068	1,543
1879	906	2,449
1880	860	3,309
1881	1,501	4,810
1882	2,228	7,038
1883	1,458	8,496
1884	1,308	9,804
1885	523	10,327

Source: University of Stirling, HF/V113 pp. 1-56

TABLE 4.3

Howietoun Fishery Estates Advance Account (£), 1874-1885

<i>YEAR</i>	<i>AMOUNT ADVANCED</i>	<i>INTEREST CHARGED</i>	<i>TOTAL</i>	<i>AMOUNT REPAID</i>	<i>BALANCE</i>
1874	29	0	29	0	29
1875	101	3	104	0	133
1876	150	7	157	0	290
1877	195	14	209	0	499
1878	1,147	37	1,184	14	1,669
1879	990	74	1,064	105	2,628
1880	1,024	109	1,133	44	3,717
1881	1,732	148	1,880	706	4,891
1882	2,646	201	2,847	920	6,818
1883	2,341	260	2,601	1,104	8,315
1884	2,801	311	3,112	1,679	9,748
1885	1,599	340	1,939	1,681	10,006
TOTAL	14,755	1,504	16,259	6,253	

Source: University of Stirling, HF/V113 pp.61-78.

Trading surpluses alone, however, are of little analytical use. Profits can only be properly evaluated in terms of the *rate* of return on moneys invested in an operation and the turnover of the operation.¹⁰ **Tables 4.2 and 4.3** (page 126) set out the Construction Capital and Estate Advance Accounts. **Table 4.2** shows the significant increase in construction costs once Maitland's early experiments evolved into the construction of a large scale fish farm. From an annual average construction expenditure of £119 between 1874 and 1877, average expenditure rose to £1,333 between 1878 and 1884.¹¹ By 1885, Maitland had expended a total of £10,327 on construction work. **Table 4.3** shows how his investment in the fishery was financed with funds advanced from the Sauchie Estate. By 1885, Maitland had advanced a total of £14,755 and Howietoun had been charged a total of £1,504 in interest. He 'repaid' £6,253 of the outstanding balance, Howietoun remaining £10,006 in debt by 1885.¹²

¹⁰ Calculating the rate of return on capital invested in an enterprise "is no business for a man with a sensitive stomach." Solow, RM Capital Theory and the Rate of Return (1963) p.78.

¹¹ Maitland's new hatchery (*vide supra* p.74) cost £2,193. In 1885, as if to signal the impending completion of the works, £51 was expended on insurmountable "iron fencing around the fishery." University of Stirling, HF/V113 pp.1-12. As noted in the previous chapter (*vide supra* p.73), Maitland had had to be mindful of expenditure until he succeeded to the estates in 1876.

¹² As noted above, these were repayments 'in kind'. Note that the excess of estates advances over the amounts expended on construction capital are accounted for by funds being drawn to invest in areas other than construction, such as the purchase of equipment.

TABLE 4.4

Howietoun Fishery Profit Expressed as a Percentage of Turnover and of Capital Employed (£/%), 1879-1885

<i>YEAR</i>	<i>PROFIT</i>	<i>TURNOVER</i>	<i>% OF TURNOVER</i>	<i>CAPITAL</i>	<i>% OF CAPITAL</i>
1879	-53	78	-67.95	2,628	-2.02
1880	6	245	2.45	3,717	0.16
1881	269	702	38.32	4,891	5.5
1882	274	1,171	23.4	6,818	4.02
1883	90	1,304	6.9	8,315	1.08
1884	-243	1,457	-16.68	9,748	-2.49
1885	261	1,562	16.71	10,006	2.61

Source: Tables 4.1 (p.123), 4.2 and 4.3 (p.126).

Table 4.4 (page 128) illustrates the actual profitability of the fishery, expressing profit as a percentage of both turnover and capital employed. Between 1880 and 1885, the fishery produced between -17 and +38 *per cent* profit on its turnover, an average 11.9 *per cent* profit *per annum*.¹³ In cumulative terms, the £478 surplus of income over expenditure by 1885 amounts to a 7 *per cent* profit on a total turnover of £6,519.¹⁴ The rate of return on capital investment is, however, a more telling measure of profitability. This fluctuated between -2 and +5.5 *per cent* profit, an average of 1.8 *per cent* profit *per annum* in the six years between 1880 and 1885.¹⁵ In cumulative terms, the £478 surplus of income over expenditure to 1885 amounts to a return of 4.8 *per cent* on a net capital investment of £10,006 over 10 years.

These calculations of actual profitability make it difficult to draw favourable conclusions on Maitland's success in his desire to make fish culture pay. When at its highest in 1881, his return amounted to only 5.5 *per cent* on an investment of nearly £5,000 over the previous six years. This was only 2 percentage points higher than the return guaranteed by investing in consols for just one year. By 1885, when Maitland's investment had doubled to just over £10,000, the return had fallen to 2.6 *per cent*, less than would have

¹³ The 67.95 *per cent* loss on turnover in 1879 is not included in this calculation, that being the first year of trading with a minimal revenue of £78 against expenditure of £131.

¹⁴ See **Table 4.1** on p.123.

¹⁵ Again, 1879 is excluded because of the high loss made in that first year of commercial operations.

been obtained from investment in such securities.¹⁶ Indeed, this 2.6 *per cent* return came after a 2.5 *per cent* loss in 1884, indicating that the return on the investment was not only small, but also uncertain. Maitland's return therefore presents a rather tenuous idea of profit. As one mid nineteenth century coal owner put it in 1847: "I never consider that I have made a profit till I have realised something over and above the interest which the money would have fetched in the market."¹⁷ Despite the low rate of return, however, it has to be borne in mind that Howietoun in 1885 was still a relatively new operation and had only been trading for seven years. It is therefore apt to leave the final verdict on the fishery's performance as a business until analysis has continued, in Chapter Six, up to Maitland's death in 1897.

Nevertheless, further information on Howietoun's commercial performance at this stage can be gained from an examination of the data in the individual trading accounts which make up the Balance Account.

¹⁶ For information on consuls see the Statist 10 February 1912 p.295.

¹⁷ Joseph Pease, quoted in Church, RA The History of the British Coal Industry: Volume 3 - 1836-1913, Victorian Pre-eminence (1986) p.513. Indeed, Church states that many coal owners would not even declare a profit until the interest which could have been earned in the market had been exceeded. Of course, the acid test of Howietoun's performance as a business would be to compare it with other similar establishments. But, as noted in Chapter One, the Howietoun material is unique and there are no similar records available for the drawing of such a comparison. *Vide supra* p.14.

TABLE 4.5

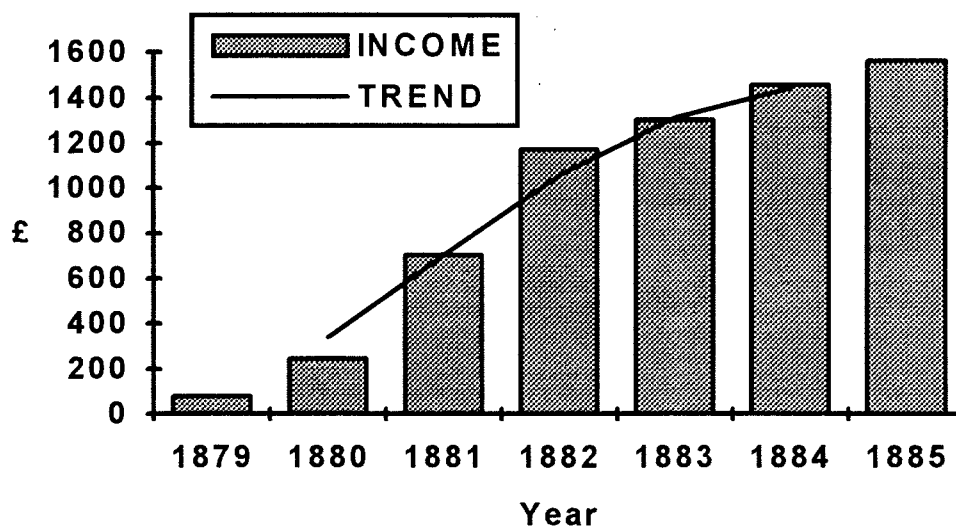
Howietoun Fishery Income and its Trend using a 3-Year Average (£),
1879-1885

YEAR	INCOME	TREND
1879	78	
1880	245	342
1881	702	706
1882	1,171	1,059
1883	1,304	1,311
1884	1,457	1,441
1885	1,562	

Source: University of Stirling, HF/V113 pp.271-276, 351-357.

CHART 4.1

Howietoun Fishery Income and its Trend using a 3-Year Average (£),
1879-1885



Source: Table 4.5.

Table 4.5 and **Chart 4.1** (page 131) set out Howietoun's revenue data and their trend between 1875 and 1885.¹⁸ The data show a steady increase in turnover from the first sales in 1879. By 1885, income had reached £1,562, a twenty-fold increase on its original level of £78 in 1879. Nevertheless, as illustrated in **Chart 4.1**, the rate of increase in sales slowed down after 1882, as if beginning to level out. As with the calculations of profitability, this can be seen as suggesting that Maitland was not making as much of a commercial success of pisciculture as he may have liked. Profits do not seem to have been sturdy enough to withstand increases in expenditure, nor do they seem to have had a firm base in that the rate of increase in income maintained its momentum.¹⁹

Table 4.6 (page 133) sets out the five major subsets of Howietoun's trading expenditure - outgoings on miscellaneous items, labour, management costs, advertising, and interest charged on the sums advanced from the Sauchie Estate.²⁰

¹⁸ Howietoun's revenue was almost wholly comprised of money earned through the sale of ova and fish. Occasionally there were other small sources of income, such as the selling of waste by-products like horse hides and bones, but these were incidental and at most represent no more than 2 *per cent* of the total income figure in any given year. University of Stirling, HF/V113 pp.271-276, 351-359.

¹⁹ *Vide supra* p.125.

²⁰ The miscellaneous category covers expenditure on such items as food, public burdens, legal work, and other items of minor expenditure such as the occasional purchase of a bucket. University of Stirling, HF/V113 pp.89-562.

TABLE 4.6

Howietoun Fishery Expenditure Accounts: Miscellaneous, Labour, Management, Advertising, and Interest (£), 1875-1885

<i>YEAR</i>	<i>MISC.</i>	<i>LABOUR</i>	<i>MANAGEMENT</i>	<i>ADVERTISING</i>	<i>INTEREST</i>
1875	0	0	0	0	3
1876	0	0	0	0	7
1877	0	0	0	0	14
1878	65	0	0	0	37
1879	54	0	0	3	74
1880	106	4	0	20	109
1881	220	9	22	34	148
1882	253	161	26	256	201
1883	370	219	182	183	260
1884	467	497	169	256	311
1885	416	346	122	77	340
TOTAL	1,951	1,236	521	829	1,504

Source: University of Stirling, HF/V113 pp.89-562.

TABLE 4.7

The Effect of Interest Payments on Howietoun Fishery Profits (£), 1879-1885

<i>YEAR</i>	<i>PROFIT AFTER INTEREST</i>	<i>INTEREST</i>	<i>PROFIT BEFORE INTEREST</i>
1879	-53	74	21
1880	6	109	115
1881	269	148	417
1882	274	201	475
1883	90	260	350
1884	-243	311	68
1885	261	340	601

Source: Tables 4.1 (p.123) and 4.6.

Miscellaneous expenditure rose steadily from 1879 before dipping a little in 1885. This increase was largely accounted for by rising expenditure on food, mainly horses and clams, for the steadily increasing stock of breeders at the fishery.²¹ Miscellaneous expenditure shows a strong correlation with rising sales having a coefficient with the income data set in **Table 4.5** (page 131) of 0.964 or a 92.9 *per cent* strength of relationship between 1879 and 1885.

Labour expenses also rose steadily throughout the period though their trend was somewhat distorted by the high 1884 figure occasioned by the extension of the fishery's pond system.²² Labour costs too show a fairly strong correlation with income, having a coefficient of 0.861 or a 74.1 *per cent* strength of relationship. The coefficient would doubtless be stronger if the data for labour costs did not also include some construction expenditure.²³

Management expenses increased sharply after Maitland took on and trained John Thompson as a full time manager in 1882 and also as the

²¹ *Vide supra* p.78.

²² University of Stirling, HF/V113 p.99.

²³ *Vide supra* p.125. The fishery's staffing establishment consisted of a manager, John Thompson, seven operatives, four labourers, two carpenters and a part-time secretary. Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Third Annual Report of the Fishery Board for Scotland (1884) pp.174-184. Maitland relinquished the day-to-day running of the fishery to Thompson in 1885. The secretary, James Guy, worked for the fishery in addition to his main duties as secretary to the Sauchie Estate. Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.204.

fishery's administrative costs increased with its growing trade.²⁴ The rising trend of labour costs shows some degree of correlation with management costs between 1881 and 1885, with a coefficient of 0.742 or a 55.1 *per cent* strength of relationship. The correlation between management expenses and income over the same period is slightly less marked, at 0.725 or 52.6 *per cent*. The lack of a stronger relationship in these correlations is probably because, in the former, the labour data are distorted by the inclusion of some construction costs and, in the latter, because the fishery became a centre for fish cultural excellence and much administrative expenditure went on giving piscicultural advice to persons who did not necessarily go on to place an order.²⁵

This factor also affected advertising expenditure which fluctuated considerably in the period, between a high of £256 in 1884 and 1882 and lows of £3 and £20 in 1879 and 1880 respectively. The high advertising expenditure between 1882 and 1884 was not, in fact, the result of increased

²⁴ In 1885, when he took over full running of the fishery, Thompson was paid a salary of £104 *per annum* whilst a further £20 *per annum* was paid to James Guy who acted as the fishery's secretary in addition to his principal duties as secretary to the Sauchie Estate. Postage, telegraph and stationery costs rose from £23 in 1882 to £52 in 1885. Note that the total management account expenditure in 1885 is lower than the sum of Guy and Thompson's salaries because the account was credited with monies received by Howietoun for the loan of Thompson to the Tay Fisheries' salmon hatchery at Dupplin. University of Stirling, HF/V113 pp.323-342, 451-454, 551-562.

²⁵ This is a key factor in Chapter Six's analysis of Maitland's entrepreneurial performance. *Vide infra* p.196.

marketing activity, but of the account being debited with the costs incurred by the fishery in entertaining various visitors and in its literally giving away quite substantial amounts of produce. In 1882 and 1883, for example, Howietoun expended over £200 on purveying for visiting delegates from the Edinburgh (1882) and London (1883) Fisheries Exhibitions.²⁶ In 1884, Howietoun put out over £100 worth of fish and eggs *gratis* to angling clubs and district fishery boards. Between 1883 and 1885, over £200 was charged to the advertising account for the costs of printing and distributing, again free of charge, 1,000 copies of Maitland's Pamphlet on Stocking and his paper On the Culture of the Salmonidae.²⁷ Far smaller amounts were spent on 'real' advertising in the form of fishery notices in such mediums as the Field or Fishing Gazette.²⁸ The correlation between advertising expenditure and the

²⁶ University of Stirling, HF/V113 pp.175-194, 540-550. The visitors from the Edinburgh Exhibition in 1882 were given a comprehensive tour of the fishery and were then served a meal, rather aptly, on the upper floor of Maitland's new hatching house which had not yet been fitted with appliances. "The weather also proving favourable, it was a bright day in all respects." Herbert, D. (ed.) Fish and Fisheries p.xxxvii. An amusing incident took place at the Exhibition grounds as the party prepared to depart to Howietoun:

Near the collection in the Waverley Market was stationed a policeman whose acquaintance with fish was confined to the experience of eating them. A gentleman came up to him and enquired if he could see a specimen of the *salmo ferox*, to which the constable replied that he did not know a Samuel Ferox at that stall, the only gentleman connected with it being Mr Edon. With an amused smile on his countenance, the visitor pursued his enquiries in another quarter.

Stirling Saturday Observer 22 April 1882 p.2. See also The Times 15 April 1882 p.6.

²⁷ University of Stirling, HF/V113 p.187.

²⁸ In 1882, for example, from a total advertising expenditure of £256, only £45 was spent on 'real' advertising. *Ibid.* pp.177-179.

fishery's income over the period between 1879 and 1885 is therefore fairly low, at 0.729 or a 53.1 *per cent* strength of relationship. That Maitland preferred to spend money on purveying and disseminating his piscicultural knowledge rather than on 'real' advertising is, perhaps, another indication that his commercial success (or aptitude) may not have been particularly strong.

This contention is further advanced by **Table 4.6**'s data on the fishery's outgoings in interest payments. The amount paid in interest on the sums advanced from the Sauchie Estate increased steadily from 1875 as the size of the debt itself increased.²⁹ Interest payments became a major part of Howietoun's outgoings and, as can be seen in **Table 4.7** (page 133), which calculates annual surpluses before the deduction of interest, were a significant factor in reducing profit levels. In 1885, for example, a £601 surplus of income over trading expenditure was more than halved to £261 once interest payments had been met. In 1884, furthermore, interest payments turned a trading profit of £68 into a net loss of £243. From 1883 to 1885, annual trading profits never attained a level at which they remained higher than the total amount deducted for interest. Howietoun was thus paying an increasing amount of interest on the money advanced to establish it as a business and yet it was failing to produce enough of a return to offset the actual costs of borrowing.

In opening up discussion on the business history of Howietoun, this chapter has shown that the period to 1885 witnessed a steady increase in Howietoun's income, though sales do appear to have begun to level off from

²⁹ See **Table 4.3** on p.126.

1882, and profit levels were somewhat low and uncertain. Indeed, despite a net capital investment of £10,006 by 1885, the fishery was struggling to realise any significant level of return over and above that which could have been attained had Maitland invested his money on the financial market place.³⁰ The foregoing does little to show that Maitland had been successful in making pisciculture a commercial success. Nevertheless, such a verdict may be premature. After all, Howietoun *did* make a profit, albeit a low and uncertain one, and had done so within 2 years of the start of trading in 1879. Though 12 years old by 1885, the fishery was still in its final stages of construction and had been operating commercially for only seven years. It is thus better to leave the final analysis of Maitland's entrepreneurial acumen until Chapter Six takes the discussion through to his death in 1897.

³⁰ *Vide supra* p.130.

Chapter Five

HOWIETOUN UNDER THREAT

The Falkirk Water Bill Case (1886)

Before any hope can be entertained [of being successful in fish culture] it is all-essential that a place be found where the water is suitable and the supply is constant and cannot be interfered with by other parties.¹

The town of Falkirk has brought in a bill to appropriate my storage reservoir, which was constructed by my predecessors, and to give me a small inadequate quantity of peaty water as full compensation which will entirely destroy the Howietoun fishery.²

Whatever the viability of the fishery as a business by the mid 1880s, 1886 was an important year for Maitland and Howietoun seeing the completion of both his book, The History of Howietoun, and the works at the fishery. But it was also a year in which Maitland had to fight a legal battle in the House of Lords upon which the very existence of Howietoun rested. The case, which ran from 30 March to 6 April 1886, concerned Maitland's opposition to the Falkirk Water and Drainage Bill of 1885 which proposed to supply the Burgh of Falkirk, approximately sixteen miles from Howietoun, with water from Loch Coulter which Maitland had hitherto used as a reservoir for Howietoun. This chapter will discuss and analyse the case which, as will be shown, was to be won easily by Maitland though not without expense. The chapter provides an indication of how an operation like Howietoun had to

¹ The Times 1 May 1886 p.6.

² University of Stirling, Howietoun Archive, HF/V49: Letter Book 5, p.448. Maitland to Mr Henry Ffennell of London, 2 March 1886.

battle for recognition from the authorities and, moreover, in Maitland's winning that battle, gives an indication of the fishery's importance.

Falkirk's Bill, lodged in Parliament on 14 November 1885, proposed to convert Loch Coulter into a reservoir for the town's use. Falkirk planned to enlarge the loch and to add further water to it from the nearby Earl's Burn and Buckie Burn. Water was not to be taken from these burns until they were in spate, with a minimum flow of 1.2 million gallons per 24 hours in the Earl's Burn and 287,000 gallons per 24 hours in the Buckie Burn. For those affected by the new waterworks, "all millowners and other persons interested in the waters flowing out of Loch Coulter," compensation water would be discharged down the Auchenbowie Burn (sometimes known as the Loch Coulter Burn), the stream which fed Howietoun, at a rate of 231,000 gallons per 24 hours. This would be "deemed to be full compensation ... for the water intercepted and appropriated for the purposes of this Act."³

³ The Falkirk Water and Drainage Bill (Ch.49 & 50, Victoria) 1886 pp.1-12. The Bill was seen as a solution to Falkirk's deeply serious water supply problems. *Vide infra* p.156.

Maitland was not the only petitioner against the Bill, though only his case will be dealt with here. He was joined by millowners with establishments on the Auchenbowie Burn and on the Bannock Burn into which the Auchenbowie ran, a delegation of various millowners on the River Carron, the Carron Iron Company, representatives of the parishes of Larbert, Denny, and Dunipace, and the Caledonian and North British Railway Companies. The opposition of Larbert, Denny, and Dunipace, which were all to receive some of the water destined for Falkirk, stemmed from disagreement about how much Falkirk would charge for it and was settled by private agreement between counsel shortly after the hearing began. The opposition
(continued...)

Maitland's grievances against the Bill are excellently summed in his petition to the House of Lords.⁴ He claimed that Loch Coulter was "essential to the successful working of Howietoun" which was described as "a food-producing industry on an extensive scale" the closing of which would be "a serious public loss" in the light of the need to restock freshwater fisheries. The 231,000 gallons of water *per diem* offered in compensation for the loss of Maitland's exclusive use of Loch Coulter was "utterly inadequate" for Howietoun which, needing the much larger amount of 3 million gallons daily, would have to close down were the Bill to pass. At some times, enough natural rainfall occurred to feed the fishery from the Auchenbowie Burn, but

³(...continued)
of the Carron Company and the railway companies was concerned with the drainage section of the Bill, which affected neither Howietoun nor the millowners, and this too was withdrawn after an agreement between counsel. The Auchenbowie and Bannock Burn millowners' argument against the Bill concurred exactly with Maitland's, that is, that the Bill offered grossly insufficient compensation water and could just as easily be replaced with another scheme. Maitland too owned mills on the Auchenbowie Burn but this will not be discussed here since he made no reference to this interest during the case, having agreed to let the other millowners deal with the mill supply issue. University of Stirling, HF/V49: Letter Book 5, p.112. Maitland to millowners, 20 January 1886. The River Carron millowners, on the other hand, were opposing the proposed abstraction of water from the Earl's Burn, a tributary of the Carron, but Maitland had no grievances about this; indeed, he actually preferred a scheme on the Earl's Burn. Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.1.

⁴ The text of the petition is not recorded in the actual Minutes of Evidence but is printed in the Falkirk Herald 27 February 1886 p.4.

Loch Coulter was there for the times when this was insufficient, such as in the three driest months of the year, June, July and August. At such times, Loch Coulter was the fishery's only source of supply. The petition further claimed that the passage of the Bill would have a serious effect on the quality as well as the quantity of the fishery's water supply. The taking of water from the Earl's and Buckie Burns when in spate, Maitland argued, meant the introduction of peaty water into the previously pure spring-fed loch. In peaty waters, he claimed, "young fish do not thrive and the effect of carrying the flood waters of those streams into Loch Coulter will be to so alter the character of the water of the loch as to destroy its suitability for piscicultural purposes." The petition then criticised the Bill on its merits as a water scheme, arguing that Falkirk could just as easily construct a reservoir on the Earl's Burn as on Loch Coulter. Such a scheme had, in fact, been planned by Falkirk Town Council in 1884 but had been rejected by local ratepayers due to its cost.⁵

⁵ The cost of the Earl's Burn scheme had been £27,000. As an alternative, the ratepayers suggested that water be taken from underground springs and streams within local coal mines. However, whilst this scheme would have cost only £5,000, it would give only a small additional supply of water which, furthermore, would be prone to contamination by coal dust and other impurities. The ratepayers soon realised the false economy of the pit scheme and gave their backing to a new scheme to take water from Loch Coulter. The estimated cost of this was £19,000, cheaper because the Earl's Burn scheme required the construction of a new reservoir whereas that on Loch Coulter needed only the alteration of the existing loch. Scottish Record Office, Steel-Maitland Collection, GD193/895: Papers relating to Falkirk water supply (Loch Coulter Scheme). Copy of a Report to Falkirk's Ratepayers, dated 25 April 1883, by the town's Chief Engineer, Copeland, p.16 and Falkirk Herald 27 February 1886 p.4.

Maitland would not oppose a scheme on the Earl's Burn and it was his aim to show that Falkirk's only reason for wanting Loch Coulter water was financial. When considering the considerable opposition to the current Bill, furthermore, Maitland's petition argued that the Earl's Burn scheme would in fact work out "better and cheaper."⁶

Opening the case for Falkirk, the town's counsel, Balfour-Browne, strongly refuted Maitland's claims. He agreed that the destruction of Howietoun would indeed be a serious public loss, but asserted that: "It is not our intention to destroy that fishery. We say distinctly that the fishery will be in no way affected by the proceeding of the Bill." He argued that 231,000 gallons of compensation water per day would be "ample for all Sir James Gibson Maitland's purposes." With regard to the peaty water question, Balfour-Browne insisted that such water would have no effect upon Howietoun, asserting that "trout and salmon do thrive remarkably well in peaty waters" and that the water discharged from the loch would not be made significantly more peaty by the introduction of burn water since any peat therein would settle during loch storage time. Finally, with regard to Maitland's criticism of Falkirk's rejection of the 1884 Earl's Burn scheme, Balfour-Browne insisted that scheme had been dropped not because it was too costly but because it was, in fact, considered too dangerous to construct a whole new reservoir on the burn. Balfour-Browne also pointed out the inconsistency between Maitland's assertion that Earl's Burn water was of a poor, peaty quality and that Falkirk should turn to the Earl's Burn for a water

⁶ Falkirk Herald 27 February 1886 p.4.

supply: "He said it was impregnated with peat, and if not good enough for the fish I should have thought it was not good enough for the inhabitants of Falkirk." But, as Maitland's counsel, Jeune, pointed out: "That is exactly the difference. That which is quite good enough for us is not good enough for the fish."⁷

The argument therefore centred on three main issues: the quantity of compensation water, the quality of that water, and the debate as to whether the Loch Coulter scheme could be safely and economically replaced with one on the Earl's Burn, as had at first been planned by Falkirk in 1884.

Falkirk presented various engineering witnesses to testify that the compensation water offered to Maitland was sufficient to meet Howietoun's needs. William Copeland, the engineer who had designed the Loch Coulter scheme, stated that Maitland could cope "quite well" with 231,000 gallons per day but conceded that, in planning the scheme, he had never once sought to consult Maitland as to Howietoun's water requirements.⁸ Copeland's colleague, James Gale, engineer to the Glasgow Corporation Waterworks, agreed that the compensation water offered "would be very insufficient" if Howietoun did in fact require three million gallons per day. The Falkirk case on Howietoun's water requirement rested on the fact that engineers had found Maitland's sluice on the loch to be leaking, thereby allowing between 300,000 and one million gallons of water per day to go to waste. Falkirk therefore argued that Howietoun could not require as much water as Maitland claimed

⁷ Central Region Archives, FA1/6/1, pp.2-6.

⁸ *Ibid.* p.13.

that it did, otherwise he would have taken action to prevent it going to waste in such a manner.⁹

Maitland personally took the stand to refute Falkirk's claims on water quantity. He impressed upon the hearing that the survival of Howietoun depended upon the assurance of a large reservoir in Loch Coulter should the Auchenbowie Burn run dry:

It is necessary to have a reservoir because if you run short in any one year for a few days, the whole of your fishery would be destroyed, and you must not only have a supply but you must have a reserve of a very large quantity; I use about three million gallons a day and I require a large reservoir to take me over a very dry year. ... Loch Coulter is an insurance against the fishery being destroyed in an exceptionally dry year.¹⁰

The compensation offered was thus grossly insufficient, being less than eight percent of Howietoun's daily requirement. Maitland added that the leaking sluice on the loch had been left defective since repairing it with mortar risked contaminating the water with lime, a chemical that would severely damage,

⁹ Ibid. p.91.

¹⁰ Ibid. p.96. Francis Day had warned that "the intending fish culturist has to be careful to examine the proposed locality as to whether the water supply during the hottest and driest periods of the year would be sufficient for his wants, because its value to him is only in proportion to the supply at this time." Day, F Fish Culture (1883) p.27.

Maitland got all he could from his water supply, running it through each of his ponds in turn: "The first item of importance is the water supply. This is so arranged as to utilise Loch Coulter to the uttermost, and I must say the water **after** it leaves the fishery smells distinctly fishy." Maitland, JRG 'Fish Culture as an Exponent of Evolution' Transactions of the Stirling Natural History and Antiquarian Society 10 (1887) p.45. Loch Coulter contained a reserve supply of 300 million gallons. Stirling Journal and Advertiser 11 March 1881 p.3.

and possibly kill, the fish in the ponds downstream.¹¹

Shifting to the second major issue of the case - water quality - Falkirk's engineer, Copeland, refused to accept that the introduction of water into Loch Coulter from the Earl's Burn and Buckie Burn would make Howietoun's water supply peaty:

It is a well-known fact that water going into a large area like this [Loch Coulter] deposits all the matter it has in suspension, and even the colouring matter that is left, that is not in suspension, is bleached by the action of the sun ... [thus the proposed supply] ... would be quite as good as anything that is now in Loch Coulter.

His colleague, Gale, concurred and added that he estimated that burn water would be stored in the loch for about three years before being discharged, thus giving considerable time for its quality to improve.¹² These opinions were supported by Dr Wallace, a Glasgow chemical analyst, Dr Aitken of the Scottish Sanitary Association, and Professor James Dewar of the University of Cambridge.¹³ Falkirk then produced witnesses from the salmon fisheries on the River Tay to testify that, even if peaty water was supplied to Howietoun, no deleterious consequences would befall Maitland's fish. They argued that the Tay's own piscicultural operation at Stormontfield functioned

¹¹ Central Region Archives, FA1/6/1, p.109.

¹² Ibid. pp.12-13. Indeed, before Falkirk had firmly decided on Loch Coulter, Copeland had reported to the Council that water from Loch Coulter would not need to be filtered before consumption due to the storage capacity of the existing loch, whereas water from a newly constructed reservoir on the Earl's Burn would not be stored for so long and would have required filtration. Scottish Record Office, GD193/895. Report to Falkirk's Ratepayers, p.12.

¹³ Central Region Archives, FA1/6/1, pp.123-127.

quite well despite having a peaty water supply.¹⁴

Challenging Falkirk's argument on water quality, Maitland's chemical analyst, Professor Tidy of the London Hospital, asserted that Earl's Burn water was at least twice as peaty as that in Loch Coulter. He agreed that storage in the reservoir would indeed reduce peat levels but pointed out that this would not occur in practice since the proposed entrance conduit bringing water from the Earl's Burn into the loch was in very close proximity to the proposed exit conduit taking water to Howietoun. Peaty water brought into the loch would, therefore, have no time to settle, simply passing straight out of the loch and down to the fishery.¹⁵ Under cross-examination, two of Falkirk's chemist witnesses, Aitken and Wallace, had to admit that they knew nothing of fish culture.¹⁶ When himself cross-examined by Falkirk's counsel, Maitland did not deny that fish could survive in peaty water but argued that the Howietoun

¹⁴ Ibid. p.117. The Tay is a peaty river and had extensive salmon fisheries in the nineteenth century. *Vide supra* p.39. Maitland, clearly with sarcastic intent, had written that: "The promoters [of the Bill] are I understand to bring people from Stormontfield to prove that peaty water is the one thing necessary to success." University of Stirling, HF/V49: Letter Book 5, p.482. Maitland to JJ Armistead of Dalbeattie, 8 March 1886.

¹⁵ Central Region Archives, FA1/6/1, pp.242-245.

¹⁶ Ibid. pp.127-132. Before the case, Maitland had described Falkirk's chemist witnesses as "men who from their position will be very careful before committing themselves to any statement regarding pisciculture of the details of which they are all equally ignorant..." University of Stirling, HF/V49: Letter Book 5, p.174. Maitland to RB Marston, Editor of the Fishing Gazette, 3 February 1886. Professor Dewar did state that he had personally studied Maitland's work. Central Region Archives, FA1/6/1, p.127.

fish were acclimatised to pure water and the introduction of peat would, he believed, give "a jerk to the fish who would resent it most bitterly."¹⁷ Maitland's ichthyological friend, Francis Day, testified that in an experiment he had conducted to compare the hatching of fish eggs in pure spring water and peaty Earl's Burn water, only half of the latter eggs had hatched successfully whilst nearly all of the former had. The surviving fish from the peaty water batch were found to have much larger heads and smaller brains than those hatched in pure water.¹⁸

Maitland's counsel concluded the argument over water quality by making a mockery of Falkirk's witnesses from the Tay. It was pointed out that Tay fish lived in their natural environment, albeit peaty, and were not, like those at Howietoun, specially bred 'pedigree' fish in a captive environment.¹⁹ It was made clear that Stormontfield, unlike Howietoun, was purely a hatching operation which relied on wild breeders rather than a broodstock and made no attempt to enhance the quality of the fish it produced.²⁰ One of Falkirk's

¹⁷ Ibid. p.202.

¹⁸ Ibid. pp.230-232. The peaty water fish had a head that took up 25-30 *per cent* of the total body whilst the pure water fish had a head of less than 20 *per cent* of the total body. See also Field 24 April 1886 p.520.

¹⁹ *Vide supra* p.87.

²⁰ Central Region Archives, FA1/6/1, p.112. Falkirk's counsel, Balfour-Browne, seems to have become somewhat bemused with proceedings on this point. Having heard Maitland insist that his bred fish were of better quality than those which reproduced naturally in peaty water, he cynically commented that the natural ones were "real Scotch fish." Ibid. p.203. Maitland
(continued...)

witnesses, Robert Jackson, showed no understanding of the questions put to him. Asked whether peaty water would harm young fish, he first had to ask for an explanation of the word 'injurious' and then replied that he felt poachers would take fish from any river, peaty or pure. It was soon established that this fishery 'expert' was, in fact, a water bailiff.²¹

Falkirk's chief engineer, Copeland, was the main witness on the third and final issue of the case - Maitland's contention that the Loch Coulter scheme had only been selected to save the miserly Falkirk ratepayers the extra expense of the Earl's Burn scheme and that the Earl's Burn scheme was itself a far better option than Loch Coulter. Copeland stated that he had chosen Loch Coulter because the hill sides around the Earl's Burn were rather steep and building a dam there ran the risk that it could be washed away in times

²⁰(...continued)
told the hearing how his selective breeding techniques had augmented the size and quality of the Howietoun ova. Concluding Falkirk's case, however, Balfour-Browne dismissed Maitland's work in this direction, stating that "It had no bearing upon the case at all. It showed by the fine process of selection which Sir James Maitland has been carrying on at the farm that he has proved the theory of Darwin to some extent, and nothing more; and we will not be thrown out upon Darwin's theory." Ibid. p.9.

²¹ Ibid. p.117. The conclusion of Jackson's encounter with Maitland's counsel, Jeune, is rather amusing:

If I understand it, or caught it rightly, you have had no experience whatever of fish culture. Have you had any experience whatever of breeding fish? - **No**. Your whole line of business has been catching them? - **No I been protecting the fish in winter.** (sic)
You acted as a water bailiff? - **Yes**.
In breeding ponds I suppose you have had no experience whatever?
- **No I have not**.
Then I will not trouble you with any questions, I think.

of heavy flood due to the high pressure of a large body of water mounting up behind it. On the other hand, Loch Coulter was a ready-made reservoir with none of these inherent difficulties.²² Indeed, he continued, a scheme on the Earl's Burn would upset millowners on the River Carron, into which the Earls's Burn flowed, by appropriating their water supply: "There are other people in the world besides Sir James Maitland who would oppose a water scheme."²³ Nevertheless, he conceded that he had favoured Loch Coulter primarily "because it was the cheaper" of the schemes on offer.²⁴ Another of Copeland's colleagues, Alexander Leslie, an Edinburgh engineer, went on to actually agree that there were in fact no real problems of safety with an Earl's Burn scheme, only that it would be more costly: "It is a mere matter of money."²⁵ Falkirk's other engineer, Gale, commented that Loch Coulter

²² Ibid. p.5. Copeland had previously told Falkirk Town Council that his preferment for Loch Coulter lay on the fact that "the construction of the works would infer very much less risk than the making of an embankment on ... the Earl's Burn." Scottish Record Office, GD193/895. Report to Falkirk's Ratepayers, p.12.

²³ Central Region Archives, FA1/6/1, p.32.

²⁴ Ibid. p.7. Before mentioning the alleged risk involved with a scheme on the Earl's Burn, Copeland's 1883 report to Falkirk Town Council had noted that the Loch Coulter plan was the correct one for Falkirk to choose since it was "considerably cheaper." Scottish Record Office, GD193/895. Report to Falkirk's Ratepayers, p.12.

²⁵ Central Region Archives, FA1/6/1, p.102. It is worth quoting the interrogation of Leslie by one of the counsel for the millowners who were opposing the Bill, Clerk, a little further:

Of course, where you can get a reservoir that other people have made you can take water from it with a very small expenditure of money? - **Yes, surely.**
 Where you have got to make a reservoir for yourself, you must expend some money? - **Yes.**
 That is the distinction, and that is the principle of the Bill? - **Yes**

would prove "an admirable reservoir ... even if a cheaper scheme could be devised."²⁶

Falkirk's witnesses having already shown that the chief reason for preferring Loch Coulter was financial, Maitland's counsel had little to do to demonstrate his argument on the viability of the Earl's Burn scheme.²⁷ Nevertheless, Maitland's case was firmly restated with the testimony of James Wilson, engineer to the Greenock Water Trust. Wilson asserted that the Loch Coulter scheme would actually be more expensive in the long run since Maitland would have to be paid financial compensation for the loss of Howietoun, providing of course that the hearing agreed that the Bill would destroy it. Such compensation was likely to amount to at least £16,000 and would thus increase the cost of the Loch Coulter scheme to £35,000, against £27,000 for that on the Earl's Burn.²⁸ Wilson's evidence was backed up by Thomas Hawksley, Maitland's private engineer. His testimony provides an

²⁶ Ibid. p.82.

²⁷ It was Falkirk's parsimony that annoyed Maitland most. Before the hearing he wrote that "It is not a case of a town wanting water but a town wishing to steal a private reservoir ... to save themselves the expense of constructing their own." University of Stirling, HF/V49: Letter Book 5, p.522. Maitland to RB Marston, Editor of the Fishing Gazette, 13 March 1886. The Stirling Saturday Observer agreed, seeing the Bill as "an appropriation scheme which might have more fitly emanated from the Irish land League than a Scottish Town Council." Stirling Saturday Observer 10 April 1886 p.3.

²⁸ Central Region Archives, FA1/6/1, pp.156-166. The figure of £16,000 consisted of £12,000 minimum for the reinstatement value of the fishery itself plus at least £4,000 for the stock of fish.

excellent summation of the opposition to the Bill and of the reasons why Falkirk ultimately failed:

I think it is a very insufficient scheme and a scheme that will do a great deal of mischief and no good. I think it is misconceived and it is misconceived in a pettifogging money interest, not the water interest, but the money interest; and the result of it would be that instead of costing less it would cost a good deal more because all these vast interests [the millowners as well as Howietoun] will have to be compensated in money. The Bill provides that this small quantity of water should be full compensation to everybody; but there are interests other than those which water will provide for.²⁹

Maitland's counsel closed his argument by demonstrating that Howietoun was simply too important to be destroyed by the Bill's passage. He emphasised that the fishery was of unique importance, both scientifically, in developing and advancing pisciculture, and, practically and economically, in the restocking of depleted fishery stocks.³⁰ Francis Day asserted that the closure of Howietoun would be a "disgusting national loss." Archibald Young, Inspector of Scottish Salmon Fisheries, described Howietoun as "incontestably the most important establishment of its kind in the world." Maitland himself concluded, stating that, even if an alternative site for piscicultural operations could be found, it would take a very long time to create a new breeding stock and for a replacement operation to reach Howietoun's current level of

²⁹ Ibid. pp.245-259. Hawksley's last sentence probably refers to the parsimony of Falkirk's ratepayers.

³⁰ Ibid. p.191. Shortly after the case had concluded, a letter in The Times noted that Howietoun was "not only a hatching and rearing establishment" but was, in fact, "a college for carrying on scientific investigations. The value of such an institution cannot be overestimated." The Times 1/5/1886 p.6. Letter from Henry Ffennell.

development. He made an emotive appeal for the safety of his fishery: "I have practically made fish culture the work of my life, and no money payment would compensate this great personal and national loss if the mischief were done."³¹

After the conclusion of the evidence on 6 April, the hearing took only a short time to reach the decision that "the public interest would be best consulted by rejecting this Bill altogether."³² Maitland had been entirely successful in his opposition to the Bill which ultimately went through Parliament as the Falkirk Drainage Act (1886), all sections pertaining to the water supply having been removed. Maitland was left with Howietoun fully intact and Falkirk with the task of finding an alternative scheme that would succeed in Parliament. The factors that lie behind Maitland's success (and Falkirk's failure) are clearly revealed in the preceding discussion. Basically, Falkirk completely failed to prepare adequately for the case and, furthermore, failed to present suitable witnesses to put across effectively what little evidence it had. On the other hand, Maitland had prepared a large amount of evidence and had excellent witnesses, not least himself, to support it.

Falkirk's decision to offer 231,000 gallons of daily compensation water was an arbitrary one, taken without consulting Maitland.³³ Maitland needed

³¹ Central Region Archives, FA1/6/1, p.215/228/236.

³² *Ibid.* p.263.

³³ Maitland had only come to hear of the scheme in the first place because of a casual remark made by Robert Henderson, the Falkirk Town Clerk, to Adam Smith of Denny, an
(continued...)

only to state that he required more than the amount offered; Falkirk could not retaliate with opposing evidence because it simply did not have any. As the Stirling Saturday Observer, an ardent supporter of Maitland's case, put it, rather more bluntly, Falkirk "knew no more about Sir James' requirements than the man in the moon."³⁴ On the water quality issue, Falkirk could only reveal that it knew nothing of fish breeding, whilst on the viability of the Earl's Burn scheme its own witnesses concurred that Loch Coulter had been chosen because it was the cheaper scheme and not because that on the Earl's Burn was too dangerous.

Falkirk's lack of preparation for the case is particularly striking in that the town had already once before backed down from the Loch Coulter scheme because of the threat of Maitland's opposition. Falkirk's Councillor James Wilson told the hearing that the Loch Coulter scheme had been suggested in 1884 but that "rather than have the opposition of Sir James Maitland" the Town Council dropped the idea. Asked why the plan had been retabled, he asserted "they did not know all the circumstances then so well as we know them now."³⁵ As it turned out in 1886, they did not, in fact, know anything

³³(...continued)
acquaintance of his. Scottish Record Office, GD193/895. Letter from Smith to Maitland, 2 July 1883.

³⁴ Stirling Saturday Observer 10 April 1886 p.3. In a letter to Francis Day, Maitland had joked that Falkirk did not realise "that fish cannot live without water (they are sure to swear that they can for three months in the year)." University of Stirling, HF/V49: Letter Book 5, p.402. Maitland to Day, 22 February 1886.

³⁵ Central Region Archives, FA1/6/1, p.63.

more than in 1884. There was indeed, as the Stirling Saturday Observer noted "a clear want of foresight on the part of the promoters."³⁶ As Maitland's counsel asked, "I should like to know why in the world this Loch Coulter scheme was introduced in the first place."³⁷

The inadequacy of Falkirk's witnesses lies at the heart of Maitland's victory. Copeland, Falkirk's main witness, stated clearly that he chose Loch Coulter "first because it was the cheaper" of the schemes and went on virtually to deride Maitland, demonstrating an obvious lack of concern for any of his grievances.³⁸ When told that Maitland would not repair the leakage from Loch Coulter because of the threat of lime contaminating the water, for example, he replied that this was "about the weakest reason" he had "ever heard stated" for such a lack of maintenance. When asked if he had any experience of fish culture on which to base this assertion, he replied: "I would not like to have if there is any such risk that a few spoonfuls of mortar would kill them all." In answer to another question as to whether Maitland would be protected from impurities such as waste and agricultural effluent polluting his water supply should the Bill pass, Copeland dismissively replied: "We will

³⁶ Stirling Saturday Observer 10 April 1886 p.3.

³⁷ Central Region Archives, FA1/6/1, p.1. Indeed, when Falkirk Town Council had formally adopted the Loch Coulter scheme at a meeting on 7 November 1885, one member alone, Councillor Watson, opposed the scheme and pointed out that a large amount of resistance would be met by those with vested interests in Loch Coulter. He was, however, ignored. Falkirk Herald 8 November 1885 p.2.

³⁸ Central Region Archives, FA1/6/1, pp.6-7.

consider ourselves as of more consequence."³⁹ After the failure of the Bill, Copeland was criticised by the Falkirk Herald as the man whose evidence had "proved so disastrous to the town."⁴⁰ Falkirk's fishery witnesses, particularly the illiterate water bailiff called to discuss scientific fish culture, were farcical. Likewise, Falkirk's chemist witnesses all admitted that they knew nothing of the effects of water quality on fish culture. As Maitland's counsel, Jeune, put it to Dr Wallace, "chemical analysis certainly does not teach everything about water does it?"⁴¹

The only real argument in Falkirk's favour was the town's dire need for water and this probably explains the town's lack of preparation for the case.⁴² Falkirk may have felt that its water shortage was so great that the

³⁹ Ibid. p.82/109.

⁴⁰ Falkirk Herald 10 April 1886 p.2.

⁴¹ Central Region Archives, FA1/6/1, p.128. Maitland's witnesses, on the other hand, came fully prepared, all having received a script of their evidence and the questions that Maitland's counsel would ask of them. University of Stirling, HF/V49: Letter Book 5, pp.402-436. Indeed, many of Maitland's proposed witnesses, such as the 'piscicultural propagandist' Francis Francis, were left uncalled because there was simply no need for them.

⁴² Falkirk had had water supply problems for the best part of two centuries and these had steadily worsened with industrialisation and population growth through the nineteenth century. The town's supply was deficient in both quantity, being at most half of what was required for human and industrial use, and quality, in that the town was having to draw water from coal mines, canals, and even from burns that were polluted with industrial effluent and sewage. For detailed analysis and discussion of Falkirk's water problems, see Central Region Archives, FA1/6/1, pp.1-125 and, for the historical background, Taylor, RS 'Falkirk's Fight (continued...)

Bill would pass regardless of Maitland's opposition.⁴³ As Falkirk's counsel concluded: "We are not here for our amusement; we are here under dire necessity for a supply of good wholesome water for a population that is on the brink of water famine."⁴⁴ But the town had been over-confident and thus had to wait longer for water because of the failure of the "recklessly framed" Bill.⁴⁵ This recklessness cost Falkirk's ratepayers £4,500, in addition to £1,200 already expended on planning the abandoned Earl's Burn scheme in 1884. The Falkirk Herald felt that "the money might as well have been thrown into the sea, or into Loch Coulter."⁴⁶

⁴²(...continued)

for Water' Proceedings of the Falkirk Archaeological and Natural History Society; 1935-1946 (1946) pp.25-40 and Anderson, MS This is my Town: Letters to my Grandchildren on the Burgh of Falkirk (1981).

⁴³ As one of Falkirk's witnesses, James Wilson, a solicitor, told the hearing:

Every year we are scarce of water for hours every day, and often for the greater part of the day there is no water to be had in the houses in Falkirk. Some have had no water for weeks in their houses and this year, already, the scarcity has begun to be felt, and it will go on from this time up to October or November. We absolutely need a scheme and it will be a very serious matter indeed for the town if we do not get it soon.

Central Region Archives, FA1/6/1, p.68. The Falkirk Herald certainly believed that the House of Lords could not reject such a desperately needed Bill. Falkirk Herald 19 December 1885 p.2.

⁴⁴ Central Region Archives, FA1/6/1, p.5.

⁴⁵ Stirling Saturday Observer 10 April 1886 p.3.

⁴⁶ Falkirk Herald 7 April 1886 p.2. Even after the failure of the Bill, Falkirk Town Council continued to insist that it had been right all along. Provost Cockburn told a meeting that he felt the hearing's decision had been rather unfair and that the peers had been inclined towards
(continued...)

Falkirk finally went ahead with a scheme on the Earl's Burn in 1888. The scheme, as forecasted, met with great opposition from those reliant upon the burn for their own water requirements and was opposed in both Houses of Parliament before finally being passed. Whatever Falkirk's shortcomings, the town did not find the improvement of its water supply an easy matter to attend to. As the town's counsel told the 1886 hearing, "I think this case illustrates remarkably well the huge difficulty that a town like Falkirk has when it has to supply itself with pure water." Whilst one group told Falkirk to use Loch Coulter, another said it should go to the Earl's Burn, and "between those two stools we are likely to fall to the ground and get no water at all for Falkirk."⁴⁷

As regards the validity of Maitland's case, modern aquaculturalists have now solved the question of pisciculture in peaty waters. It would seem that peaty water itself, provided that the concentration is not too severe, is suitable for fish culture and produces healthy fish though their skin colour may be slightly tainted by the brownish tint of the water. However, the current management of Howietoun, though they do not deny the suitability of peaty waters, feel that the introduction of such water to fish at a farm so long

⁴⁶(...continued)

Maitland because he was closer to their social class. He accepted that Copeland may have been "too confident" on the water quantity issue but observed that "Sir James Maitland was the rock on which they had split, although it had not been proved, but only supposed, that damage would be done to the fish." Falkirk Herald 14 April 1886 p.2.

⁴⁷ Central Region Archives, FA1/6/1, p.5. The 1888 Earl's Burn scheme required an expenditure of £55,000. Stirling Saturday Observer 17 March 1888 p.3.

acquainted with pure waters would cause a reactive 'jerk' which could prove fatal. Indeed, no pisciculturalist is advised to use peaty water if pure water is available.⁴⁸ Falkirk's argument on the role of storage reservoirs in improving water quality, however, has been vindicated by modern geologists and environmental scientists.⁴⁹ This is not, however, to denigrate Maitland's argument. If he was wrong about the water quality issue, he was still correct that peaty water could damage Howietoun and one cannot expect him to have submitted to taking the risk.⁵⁰ As he himself had warned another budding pisciculturalist several years before the case, "It is not probabilities but possibilities which must be guarded against."⁵¹

The validity of Maitland's complaints about the quantity of water needed, however, is subject to doubt. It seems that his figure of a three million gallon daily requirement was somewhat exaggerated. Howietoun is currently very much the same size as it was in 1886, and yet requires only one million gallons daily. In the opinion of the current manager, a supply of

⁴⁸ Ministry of Agriculture, Fisheries and Food, Leaflet Number 29, Fish Culture (1969) and conversation with Dr Derek Robertson, manager of the Howietoun Fishery since 1979, February 1992.

⁴⁹ Brown, AR The Effects of Reservoirs and Forestry on Water Quality Unpublished B.Sc. Dissertation, University of Stirling (1992) pp.23-45.

⁵⁰ There is also the fact, as pointed out by Professor Tidy, that the close proximity to the output sluice of the conduit bringing Earl's Burn water into the loch meant that water had little time to settle. *Vide supra* p.147.

⁵¹ University of Stirling, HF/V47(i): Letter Book 1, p.222. Maitland to Mr McFee of Edinburgh, 7 February 1881.

anything like three million gallons might 'wash the fishery away'. Indeed, Howietoun has operated on a daily ration of one million gallons of Loch Coulter water since 1921 when, under the Stirlingshire and Falkirk Water Order Confirmation Act, Loch Coulter, with the concurrence of Maitland's daughter, Mary, was finally attained for public use.⁵² On the other hand, it should be noted in Maitland's defence that, even if only one million gallons were required daily, the compensation that Falkirk was offering was still highly insufficient. Moreover, perhaps Maitland was increasing the requirement figure in order to make the case seem more urgent than it was; after all, Falkirk had never consulted him on the issue and he had nothing to lose by doing so.⁵³ There is also the fact that the stated requirement of 3 million gallons per day may have been designed to accommodate future extensions to the fishery;

⁵² Central Region Archives, FA1/6/1A: Falkirk and District Water Acts, 1888-1957; p.41 and *vide infra* p.329.

⁵³ When negotiations were taking place between Maitland's heirs and Falkirk on the 1921 water issue, Maitland's son-in-law, Arthur Steel-Maitland, noted of the quantity of the fishery's water supply that:

In the Falkirk Water Case this was stated at 3 million gallons per diem. It was not contested at the time, but Mr Learmouth [the Stirlingshire County Clerk] said that of course they would not accept this as authoritative.

Similarly, he noted of the water quality issue that:

Sir James made great point that peaty water was bad for young fish. Mr Malloch [a Perth Fishing Tackle Manufacturer who was, from 1914, a director of Howietoun] says he does not believe it, though he believes that vegetable or animal contamination is bad. I am inclined rather to agree with Malloch though I cannot speak definitely. ... Provided we are completely satisfied as to these ... main points, I do not think that as a fishery we ought to oppose the scheme.

Scottish Record Office, GD193/86/1: Howietoun Fishery Correspondence. Steel-Maitland to his son, Keith, 9 October 1920.

certainly, Maitland told the House of Lords "I intend to develop my establishment to the limits of the water."⁵⁴

Victory in the case was important to Howietoun for the obvious reason that it guaranteed the fishery's existence. It is also probable that the case had a beneficial effect on Howietoun in popularising Maitland's piscicultural success. The hearing was given wide coverage in the local press of both Stirling and Falkirk with the former taking every opportunity to sing Maitland's praises and the latter to condemn him as being the arbiter of the town's water misery. The Field, with a more national readership, commented that:

The valuable assistance rendered by Sir James Maitland to the culture and distribution of salmonidae throughout the kingdom is so well known that it will be with great regret that those interested in pisciculture will learn that the continued prosperity of his breeding farm at Howietoun, if not its very existence, is seriously threatened by a Bill now before the House of Lords ... Probably those who arrived at this decision [to use Loch Coulter] misunderstood the nature of Sir James Maitland's enterprise, and underrated its size and importance ... [which] ... can hardly be over estimated.⁵⁵

The one disadvantage of the case to Howietoun was its financial cost. The sum of £2,280 spent in fighting the case put Howietoun's cumulative balance account into continual loss for the rest of Maitland's life.⁵⁶ However, compared with the amount that Maitland was prepared to spend defending

⁵⁴ Central Region Archives, FA1/6/1, p.192.

⁵⁵ Field 13 March 1886 p.319.

⁵⁶ University of Stirling, HF/V113 p.455. The money, though charged to Howietoun for accounting purposes was actually raised by cashing in one of Maitland's life insurance policies. HF/V49: Letter Book 5, p.514. Maitland to his solicitors, Brodies of Edinburgh, 12 March 1886.

Howietoun, this was a modest sum. In 1882, when Falkirk had first publicly discussed the possibility of a Loch Coulter scheme, Maitland had informed his solicitors that "it will be advisable for us ... to free £40,000 to £50,000 to enable us to fight the case in both houses if we are beaten in committee."⁵⁷ He fully expected the case to require a large expenditure but felt that victory would be well worth it: "It is quite evident that the fight will be a very expensive one but I shan't stick at that and have great hopes of beating them."⁵⁸

There are one or two *possible* indications that Maitland may have considered a financial settlement to compensate for the loss of Howietoun under the Bill. Whilst this would, of course, have been impractical for Falkirk in that paying Maitland an estimated £16,000 in compensation would have eradicated the financial viability of the Bill as opposed to the more expensive Earl's Burn scheme, it does nevertheless warrant some attention as part of an overall assessment of Maitland's 'feeling' for Howietoun. When, in 1884, he

⁵⁷ Scottish Record Office, GD193/895. Maitland to his solicitors, Brodies of Edinburgh, 18 November 1882.

⁵⁸ University of Stirling, HF/V49: Letter Book 5, p.527. Maitland to JJ Armistead, Dalbeattie, 14 March 1886. But Maitland did feel the pinch of the costs actually incurred. On accepting the Conservative candidature for Stirlingshire at the 1886 election, he was obliged to look to his mother for help in funding the campaign. He wrote that "The opposition to the Falkirk Water Bill has proved costly and I do not like to spend another £1,000 this year unless I get some assistance from the Dowager Lady Maitland." HF/V49: Letter Book 5, p.640. Maitland to unknown addressee though the context of the letter clearly indicates that it was to a member of the Stirlingshire Conservative Association, 12 April 1886.

first instructed his solicitors to inform Falkirk of his opposition to the scheme, their letter stated that "to proceed with the Loch Coulter scheme would involve the payment by the commissioners to Sir James Maitland of very large compensation in the event of the necessary powers being obtained." In early 1886, Maitland commented that "if the Bill passes only a large amount of money will compensate me for my loss."⁵⁹ But, since the evidence also shows that Maitland was willing to spend a sum far larger than that actually required, it seems that financial compensation would only be acceptable as an option to be taken on defeat.

The Falkirk Water Bill case was nothing less than a complete success for Maitland, its only negative point being its cost, and even that was much less than it might have been. For Falkirk it was a complete and embarrassing failure. Both Maitland's victory and Falkirk's failure rested on the latter's lack of substantial opposition to the former.⁶⁰ Victory marked an important milestone in Howietoun's development, widely demonstrating the work and importance of the fishery prior to the appearance of The History of Howietoun early in 1887 and guaranteed the future security of the operation.

⁵⁹ Both quoted by Maitland's counsel. Central Region Archives, FA1/6/1, p.63.

⁶⁰ Indeed, if the other petitioners in the case, such as the Auchenbowie Burn millowners, had been included in this discussion, it would be seen that the same argument applies to that part of the case.

Chapter Six

THE BUSINESS OF FISH CULTURE 1886-1897

The chief importance of the Howietoun Fishery is the demonstration it affords of the value of pisciculture from a commercial point of view.¹

This chapter continues analysis of Howietoun's business history covering the period from 1886 through to Maitland's death in 1897. It confirms the suspicion raised in Chapter Four that Howietoun was not a business success and that Maitland seems largely to have failed in his goal of making fish culture pay, despite describing himself as one "who brought pisciculture from a scientific pastime to a commercial success."² There is, however, evidence to suggest that the quotation at the head of this chapter should be taken literally - Maitland wanted to *demonstrate* the commercial viability of pisciculture and not necessarily to reap profits for himself.

As in Chapter Four, the statistical evidence for this chapter comes from the ledger and cash books in the Howietoun Archive.³ The accounts themselves take the same form but differ in comprehensiveness from those

¹ Maitland, speaking to delegates visiting Howietoun from the International Fisheries Exhibition (1882). Stirling Saturday Observer 22 April 1882 p.3.

² University of Stirling, Howietoun Archive, HF/V48(i): Letter Book 3, p.275. Maitland to Mr Crossman, Member of the Executive Committee of the 1883 London Fisheries Exhibition, 18 October 1883.

³ University of Stirling, HF/V113, HF/V114 and HF/V115. Ledger book, June 1874 to April 1892 and Cash books, June 1874 to February 1892 and July 1893 to May 1905.

for the earlier period.⁴ The data are complete between 1886 and 1892 but are very patchy for 1893, with figures for only the Sales, Interest, Construction Capital and Estates Advance Accounts surviving. After 1892, a significant change occurred in Howietoun's accounting procedure. Payments of interest to the Estates Advance Account ceased, the cumulative Balance Account, the Construction Capital and Estates Advance Accounts were closed and an annual rent began to be charged by the estate for the land which the fishery occupied. The fishery stopped keeping a ledger book after 1892 and a new cash book, the old one also terminating in 1892, did not begin until 1893. The loss of the ledger book means that, from 1893, it is not possible to view accounts in summary form with each account's transactions grouped together. Nevertheless, annual summaries of accounts in the cash book permit the extrapolation of overall account totals.

Table 6.1 (page 166) sets out Howietoun's profit data to 1897, showing the total income and expenditure on the various trading accounts.⁵ The data demonstrate the long-term effects of the cost of the Falkirk Water Bill case. By 1885, the fishery had accumulated a £478 surplus of income over expenditure, but in 1886, as a result of the £2,280 spent on fighting Falkirk, it was burdened with a cumulative loss of £1,626.⁶

⁴ *Vide supra* pp.10, 122-124.

⁵ For comparative purposes, all tables in this chapter relist the data from the earlier period to 1885 discussed in Chapter Four. As noted in Chapter Four (*vide supra* p.132), 'income' can be taken to mean sales.

⁶ University of Stirling, HF/V113 p.455.

TABLE 6.1

Howietoun Fishery Income, Expenditure and Profit (£), 1875-1897
*Showing profit data which both include (1886) and exclude (1886!)
 expenditure on the Falkirk Water Bill case in 1886*

YEAR	EXPENDITURE	INCOME	PROFIT	CUMULATIVE PROFIT	CUMULATIVE PROFIT!
1875	3	0	-3	-3	
1876	7	0	-7	-10	
1877	14	0	-14	-24	
1878	102	0	-102	-126	
1879	131	78	-53	-179	
1880	239	245	6	-173	
1881	433	702	269	96	
1882	897	1,171	274	370	
1883	1,214	1,304	90	460	
1884	1,700	1,457	-243	217	
1885	1,301	1,562	261	478	
1886	3,686	1,582	-2104	-1,626	
1886!	1,406	1,582	176	⇒⇒⇒⇒	654
1887	1,366	1,412	46	-1,580	700
1888	1,386	1,522	136	-1,444	836
1889	1,496	1,488	-8	-1,452	828
1890	1,405	1,309	-96	-1,548	732
1891	1,618	1,828	210	-1,338	942
1892	1,724	1,505	-219	-1,557	723
1893	n/a	1,418	n/a	n/a	n/a
1894	1,319	1,168	-151	n/a	n/a
1895	1,825	2,154	329	n/a	n/a
1896	1,588	1,666	78	n/a	n/a
1897	1,585	1,408	-177	n/a	n/a
TOTAL	25,039	24,979			
TOTAL!	22,759	24,979			

Source: *University of Stirling, HF/V113 pp.415-420, 563-570
 HF/V115 pp.1-73.*

Six years later, income accumulated since 1875 still fell £1,557 below expenditure.⁷ There was thus a decrease in the total (cumulative) loss of only £69 between 1886 and 1892 when the cumulative Balance Account was closed.⁸ Such a small decrease in the cumulative loss is accounted for by the great fluctuation in annual profits after 1886. In 1891 and 1895, the fishery made £210 and £329 profit respectively, but, otherwise, profits only exceeded £100 in 1888 and there were bad years in 1889, 1890, 1892 and 1897 when Howietoun experienced trading losses of £8, £219, £151 and £177 respectively.⁹ That profits were neither assured nor increasing raises questions about the underlying strengths of Howietoun as a business. This is particularly the case since the table also shows that post-1885 profits usually fell below the levels attained before then despite, by 1897, Howietoun having

⁷ As was noted in Chapter Five, the actual finance capital for the Falkirk Water Bill costs was raised by liquidating a policy on Maitland's life. The amount required was then debited from the fishery accounts. *Vide supra* p.161.

⁸ Table 6.1 also calculates data for what the balance of the cumulative Balance Account would have been without the Falkirk Water Bill expenditure. The implication of the data is, of course, the same with a theoretical cumulative trading profit of £654 in 1886 rising to only £723 in 1892.

⁹ The rather high profit in 1895, moreover, was the result of a number of late payments, actually due to the fishery in 1894, not being received until 1895. An entry in the 1894 accounts reads: "the number of outstanding accounts due by customers was much larger at the end of the year than at the beginning. This would either very much reduce the above loss or perhaps turn the balance on the transactions into a profit." University of Stirling, HF/V115 p.17.

had nineteen years of trading in which to strengthen its commercial muscle.

As was noted in Chapter Four, profit is a relative term which can only properly be assessed against the turnover and capital investment of the business at hand. **Tables 6.2 and 6.3** (pages 169 and 170) set out the Construction Capital and Estates Advance Accounts for period from 1874 to their closure in 1893. Between 1886 and 1893, total cumulative construction and maintenance costs increased from £10,776 to £14,559. They averaged £529 *per annum* but were considerably above this level in 1889, 1890 and 1892 as alterations were made to the fishery's pond system.¹⁰ Nevertheless, the amounts expended were considerably lower than those for the period to 1885 when the fishery was in the main phase of construction and £10,000 was spent in the space of 11 years. The Estates Advance Account - the cumulative total advanced by the estate to fund Howietoun - increased from £10,006 in 1885 to £17,136 in 1893. The larger portion of this increase, £3,992, came with the addition of interest charges; apart from £2,850 added in 1886 to cover the costs of the Falkirk Water Bill case and ancillary expenses, and a further £301 in 1891 with alterations to the pond system, the period after 1886 saw no other advances made from the account.¹¹ However, Maitland had also stopped 'repayments' and, apart from a rather inconsequential £13 in 1888, failed to reduce the fishery's debt.¹²

¹⁰ University of Stirling, HF/V113 pp.1-56.

¹¹ *Ibid.* p.78.

¹² As noted in Chapter Four (*vide supra* p.124), repayments to the Estates Advance Account were 'in kind' rather than cash remittances.

TABLE 6.2**Howietoun Fishery Construction Capital Account (£), 1874-1893**

<i>YEAR</i>	<i>EXPENDITURE</i>	<i>BALANCE</i>
1874	29	29
1875	101	130
1876	150	280
1877	195	475
1878	1,068	1,543
1879	906	2,449
1880	860	3,309
1881	1,501	4,810
1882	2,228	7,038
1883	1,458	8,496
1884	1,308	9,804
1885	523	10,327
1886	449	10,776
1887	396	11,172
1888	442	11,614
1889	681	12,295
1890	743	13,038
1891	466	13,504
1892	592	14,096
1893	463	14,559

Source: University of Stirling, HF/V113 pp.1-56

TABLE 6.3**Howietoun Fishery Estates Advance Account (£), 1874-1893**

YEAR	AMOUNT ADVANCED	INTEREST CHARGED	TOTAL	AMOUNT REPAID	BALANCE
1874	29	0	29	0	29
1875	101	3	104	0	133
1876	150	7	157	0	290
1877	195	14	209	0	499
1878	1,147	37	1,184	14	1,669
1879	990	74	1,064	105	2,628
1880	1,024	109	1,133	44	3,717
1881	1,732	148	1,880	706	4,891
1882	2,646	201	2,847	920	6,818
1883	2,341	260	2,601	1,104	8,315
1884	2,801	311	3,112	1,679	9,748
1885	1,599	340	1,939	1,681	10,006
1886	2,850	366	3,216	0	13,222
1887	0	463	463	0	13,685
1888	0	479	479	13	14,151
1889	0	495	495	0	14,646
1890	0	514	514	0	15,160
1891	301	536	837	0	15,997
1892	0	560	560	0	16,557
1893	0	579	579	0	17,136
TOTAL	17,906	5,496	23,402	6,266	

Source: University of Stirling, HF/V113 pp.61-78.

TABLE 6.4

Howietoun Fishery Profit Expressed as a Percentage of Turnover and of Capital Employed (£/%), 1879-1897

<i>YEAR</i>	<i>PROFIT</i>	<i>TURNOVER</i>	<i>% OF TURNOVER</i>	<i>CAPITAL</i>	<i>% OF CAPITAL</i>
1879	-53	78	-67.95	2,628	-2.02
1880	6	245	2.45	3,717	0.16
1881	269	702	38.32	4,891	5.5
1882	274	1,171	23.4	6,818	4.02
1883	90	1,304	6.9	8,315	1.08
1884	-243	1,457	-16.68	9,748	-2.49
1885	261	1,562	16.71	10,006	2.61
1886	-2104	1,582	-133	13,222	-15.91
1887	46	1,412	3.26	13,685	0.34
1888	136	1,522	8.94	14,151	0.96
1889	-8	1,488	-0.53	14,646	-0.05
1890	-96	1,309	-7.33	15,160	-0.63
1891	210	1,828	11.49	15,997	1.31
1892	-219	1,505	-14.55	16,557	-1.32
1893	n/a	1,418	n/a	17,136	n/a
1894	-151	1,168	-12.93	n/a	n/a
1895	329	2,154	15.27	n/a	n/a
1896	78	1,666	4.68	n/a	n/a
1897	-177	1,408	-12.57	n/a	n/a

Source: Tables 6.1 (p.166), 6.2 (p.169) and 6.3 (p.170).

Table 6.4 (page 171) illustrates the actual profitability of the fishery, expressing profit as a percentage of both turnover and capital employed. The data show a complete lack of stability in profit expressed as a percentage of turnover. From a -133 *per cent* profit in 1886 as a result of the Falkirk Water Bill (*ceteris paribus*, there would have been a +11.13 *per cent* profit without the expenditure on fighting the Bill), fishery revenue fluctuated between a high of +15.27 *per cent* profit on turnover in 1895 and -14.55 *per cent* profit in 1892.¹³ If one excludes 1886 because of the distorting effects of the expenditure on the Falkirk Water Bill case the figures show an average annual return on turnover of -0.4 *per cent* between 1887 and 1897. Between 1880 and 1885, the return on turnover had averaged 11.9 *per cent per annum*.¹⁴ Over the whole period between 1880 and 1897, excluding 1886, the average return was 4.2 *per cent per annum*. Between 1886 and 1897, therefore, the fishery became, on average, a loss-making operation.

A -15.91 *per cent* return on capital invested in 1886 as a result of the Falkirk Water Bill (*ceteris paribus*, there would have been a 1.33 *per cent* return without the expenditure on fighting the Bill) was followed by fluctuation between a maximum return of 1.31 *per cent* in 1891 and a minimum return

¹³ The high profit in 1895 was, as noted above (p.167), the result of overdue accounts being carried over from 1894. The year with the highest profitability after 1895 was 1891, at 11.5 *per cent*.

¹⁴ *Vide supra* p.129.

of -1.32 *per cent* in 1892.¹⁵ If one again excludes 1886 because of the distortion caused by the expenditure on fighting the Falkirk Water Bill, the figures shown an annual average return on the capital invested of only 0.1 *per cent* between 1887 and 1892. This minuscule return was on an investment that totalled over £17,000 by 1893. Between 1880 and 1885, the return on the investment had averaged 1.8 *per cent per annum*, eighteen times greater than the post-1886 return.¹⁶ The average annual return on the capital investment over the whole period between 1880 and 1892 was 1.0 *per cent*. Maitland's return was far less, both in terms of volume and the security of the investment, than he could feasibly have obtained in other investment opportunities such as consuls.¹⁷

¹⁵ 1892 being the last year for which Estates Advance Account data is available to make the calculation.

¹⁶ *Vide supra* p.129.

¹⁷ *Vide supra* p.129. It should be noted here that Maitland made no allowance for depreciation on his investment capital accounts. Bates notes that rates allowed for depreciation vary so widely from business to business that it is not worth even attempting to give an average guide. Bates, J 'The Profits of Small Manufacturing Firms' in Hart, PE (ed.) Studies in Profit, Business Saving and Investment in the United Kingdom, 1920-1962 (1965) p.192.

TABLE 6.5

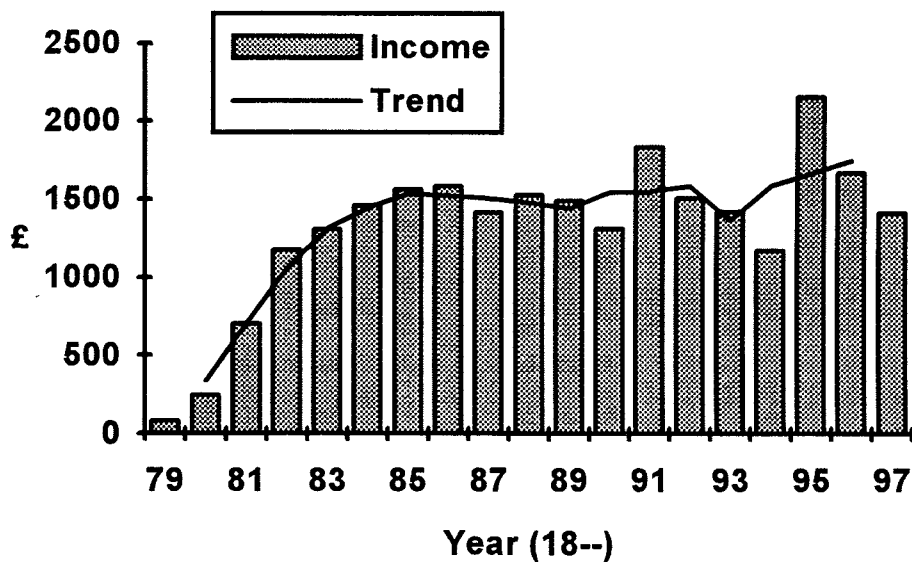
Howietoun Fishery Income and its Trend using a 3-Year Average (£),
1879-1897

YEAR	INCOME	TREND
1879	78	
1880	245	342
1881	702	706
1882	1,171	1,059
1883	1,304	1,311
1884	1,457	1,441
1885	1,562	1,533
1886	1,582	1,518
1887	1,412	1,505
1888	1,522	1,474
1889	1,488	1,439
1890	1,309	1,541
1891	1,828	1,547
1892	1,505	1,583
1893	1,418	1,363
1894	1,168	1,580
1895	2,154	1,662
1896	1,666	1,742
1897	1,408	

Source: University of Stirling, HF/V113 pp.271-357/V115 pp.1-73

CHART 6.1

Howietoun Fishery Income and its Trend using a 3-Year Average (£)
1879-1897



Source: Table 6.5.

Moreover, **Table 6.5** and **Chart 6.1** (page 174) show that Howietoun's low profitability was accompanied by limited potential for commercial growth through increased trading. They show that, from 1885, the trend of the fishery's income largely levelled off at around the £1,500 *per annum* mark.¹⁸ Whatever Maitland's public statements to the contrary, it seems that he had not succeeded in making fish culture pay; scientific prestige had not been accompanied by pecuniary success.¹⁹

Barker, Campbell, Mathias and Yamey warn about the grave "dangers of writing about a business unit in isolation."²⁰ Though there are no surviving

¹⁸ Average income was £1,538 *per annum* between 1886 and 1897. Note that 1891 was a year of exceptionally high turnover whilst 1895, as noted above, was a year in which income was increased by late payment of customer accounts from the previous year.

¹⁹ It should be noted that sales levelled not because of a slackening of demand but because demand continually exceeded supply, which is in fact an indication of commercial success. Each of the fishery's annual press releases, for example, noted an "ever-increasing demand for trout for stocking purposes," whilst the fishery secretary, Guy, informed advertising salesmen that "our business at present exhausts the production of trout and we should harm rather than help by increased advertising." Stirling Saturday Observer 16 December 1893 p.1 and University of Stirling, HF/V55: Letter Book 11, p.228. Guy to GS Brown of Rod and Gun, 26 January 1892. The point, however, is that Maitland failed to reap substantial profits, exploiting such favourable demand conditions to their utmost, and, as will be discussed in the following chapter, that he failed to expand the fishery to accommodate the orders which had to be turned away.

²⁰ Barker, TC, Campbell, RH, Mathias, P and Yamey, BS Business History (1971) p.20. They state: "Since the fortunes of all businesses depend to a large extent upon those of their
(continued...)"

records from other nineteenth century fish farms, some attempt can be made to place Howietoun's performance in context by looking at one or two general indicators of profits made by nineteenth century British businesses.²¹ Church's study of the coal industry found that the average annual net rate of return between 1865 and 1913 was 8.2 *per cent* on coal mining assets.²² Campbell's study of the Carron Iron Company shows great fluctuations in profit similar to those at Howietoun. Between 1875 and 1897, for example, the Company's profits varied between -£10,472 (in the six months ending in December 1891) and +£40,279 (in the six months ending in June 1896). Expressed as a percentage of nominal capital, these amounts, respectively, were a 7 *per cent* loss and a 26.9 *per cent* profit; as a percentage of assets, the respective figures were a 1.1 *per cent* loss and a 3.9 *per cent* profit.²³ A study of the Kenricks Hardware business shows similar fluctuation in profits. Expressed as a percentage of turnover, Kenricks' profits varied between 26 *per cent* (1876) and 6 *per cent* (1886) whilst, expressed as a percentage of capital employed, they varied between 10 *per cent* (1884) and

²⁰(...continued)
competitors, it is impossible to write a satisfactory business history without reference to these other concerns."

²¹ *Vide supra* p.14. There is some discussion of other nineteenth century British fish farms in Chapter Nine. *Vide infra* p.286.

²² Church, RA The History of the British Coal Industry: Volume 3 - 1836-1913 Victorian Pre-eminence (1986) p.533. Church notes that the figure "contains some elements of exaggeration because of the tendency for assets to be undervalued."

²³ Campbell, RH Carron Company (1961) pp.335-6.

2 *per cent* (1915).²⁴ Davis and Huttenback look at the records of 482 British firms in the late nineteenth and early twentieth centuries as part of an examination of whether British imperial expansion paid substantial dividends to the mother country. Their calculations of profits, expressed as the rate of return achieved after dividing profits by total assets, allowing for depreciation and goodwill, show that between 1860 and 1912 commercial banking profits fluctuated between 1.2 and 2.3 *per cent*, brewing and distilling between 4.6 and 19.9 *per cent*, iron and steel between 7.3 and 17.5 *per cent*, railroads between 2.6 and 4.3 *per cent*, and extractive/agricultural industry between 0.9 and 19.4 *per cent*.²⁵ Alford found that WD & HO Wills, one of the 13 companies merged to form Imperial Tobacco, was making £0.75 million profit in 1900, equivalent to 60 *per cent* of the capital employed.²⁶ Of course, none of these statistics are really comparable with the Howietoun data, coming as they do from a variety of different industries and from operations which would have relied more on institutional finance than on funds provided by a benevolent estate. But they do indicate that whilst other concerns had fluctuating profit levels, most usually remained in profit and did so at levels higher than those achieved by Howietoun.

²⁴ Church, RA Kenricks in Hardware - A family business 1791-1966 (1969) pp.140-141.

²⁵ Davis, LE and Huttenback, RA Mammon and the Pursuit of Empire: The Political Economy of British Imperialism 1860-1912 (1986) pp.81-88.

²⁶ Alford, BWE 'Penny Cigarettes, Oligopoly, and Entrepreneurship in the United Kingdom Tobacco Industry in the Late Nineteenth Century' in Supple, B (ed.) Essays in British Business History (1977) p.49.

TABLE 6.6

Howietoun Fishery Expenditure Accounts: Miscellaneous, Labour, Management, Advertising and Interest (£), 1875-1897

<i>YEAR</i>	<i>MISC.</i>	<i>LABOUR</i>	<i>MANAGEMENT</i>	<i>ADVERTISING</i>	<i>INTEREST</i>
1875		0	0	0	3
1876		0	0	0	7
1877		0	0	0	14
1878	65	0	0	0	37
1879	54	0	0	3	74
1880	106	4	0	20	109
1881	220	9	22	34	148
1882	253	161	26	256	201
1883	370	219	182	183	260
1884	467	497	169	256	311
1885	416	346	122	77	340
1886	2,529	336	192	263	366
1887	283	333	193	94	463
1888	296	388	194	29	479
1889	295	337	250	119	495
1890	284	334	231	42	514
1891	323	468	249	42	536
1892	416	429	225	94	560
1893	n/a	n/a	n/a	n/a	579
1894	727	352	184	47	9
1895	1,154	327	253	72	19
1896	1,012	337	174	58	7
1897	1,051	301	162	71	0
TOTAL	10,321	5,178	2,828	1,760	5,531

Source: University of Stirling, HF/V113 pp.89-562/V115 pp.1-73.

Before assessing Maitland's entrepreneurial skills, it would be useful to discuss the component expense account data in order to examine whether the fishery's business performance was being adversely affected by upward trends and inefficiency in the expense accounts. **Table 6.6** (page 178) sets out the five major subsets of Howietoun's trading expenditure - outgoings on miscellaneous items, labour, management costs, advertising, and interest charged on the sums advanced by the Sauchie Estate.²⁷ Miscellaneous expenditure in the period 1886-1892, largely consisting of food for fish, was far lower than that for the period 1894-1897 when, after the change in the fishery's accounting procedure, the investment capital accounts ceased to exist. From then on, the miscellaneous category included money that would normally have been charged to the old investment capital accounts such as construction and maintenance costs.²⁸ Nevertheless, as can be seen by referring back to the profit and loss figures in **Table 6.1** (page 166), this does not seem to have affected overall levels of profit and loss.²⁹ Labour expenses

²⁷ The miscellaneous category covers expenditure on such items as food, public burdens, legal work, and other items of minor expenditure such as the occasional purchase of a bucket. It is extremely high in 1886 because of the costs of fighting Falkirk. University of Stirling, HF/V113 *passim*.

²⁸ In any case, as noted in Chapter Four (*vide supra* p.125), Maitland tended to chop and change the direction of construction costs between the balance and investment capital accounts.

²⁹ Indeed, the increase in miscellaneous expenditure from 1894 is largely offset by the great decrease in interest payments (from £579 in 1893 to £9 in 1894, and to zero by 1897)

(continued...)

remained relatively steady in the period between 1886 and 1897 at an average £358 *per annum*, though they did exceed £400 in 1891 and 1892 as a result of pond amendment work.³⁰ Poor profits cannot, therefore, be explained by an absolute rise in either miscellaneous or labour costs.

Management expenses also remained relatively steady throughout the period, at around £200 *per annum*. They did rise above this level between 1889 and 1892, possibly because this period saw Maitland - who did not take a salary from the fishery for his own work - become less and less involved in pisciculture as his commitments to county work grew, particularly when he became Convenor of the new Stirlingshire County Council in 1890. In 1889, for example, he wrote to the Crown Agent for Natal in London that "I have been so much occupied lately with public business that I have not been able to give the fishery the personal supervision I used to."³¹ This meant that more time and effort was required of Maitland's manager, John Thompson, whose annual salary rose from £104 in 1884 to £120 in 1890.³² The

²⁹(...continued)

as the result of Maitland having closed the Estates Advance Account, ending the fishery's obligation to pay interest on the moneys advanced.

³⁰ University of Stirling, HF/V113 p.147/155.

³¹ Scottish Record Office, Steel-Maitland Collection, GD193/69/2. Papers about the introduction of trout and salmon ova to Natal and New Zealand. Maitland to Crown Agent, 26 November 1889.

³² University of Stirling, HF/V113 pp.327-329, 555-559. As noted in Chapter Four (*vide supra* p.135), the Management Account does not just include salaries, but also administration costs such as postage, stationery and telegraph expenditure. Whether Howietoun suffered as a result of Maitland's absence is discussed in Chapter Seven.

reasons for the rather high management costs in 1895 are unknown - perhaps it was the result of the pursuit of the bad debtors of 1894 - but, in any case, for an unknown reason, expenditure dropped significantly below £200 thereafter.³³ It would thus seem that there are no overall increases in management expenses on which to blame poor profits.

Advertising expenditure between 1886 and 1897 averaged £85 *per annum*, a figure that would be lower but for the high expenditure of £263 incurred in fighting Falkirk in 1886.³⁴ Advertising expenses, too, cannot, therefore, be held accountable for low profit levels after 1886. Nor could it be argued that Maitland was failing to promote the fishery enough since demand continually exceeded supply.³⁵ Indeed, the correlation coefficient of the advertising and income data sets for the post 1886 period is a minuscule 0.043, or a relationship of less than 1 *per cent*.

³³ *Vide supra* p.167. It is not possible to trace individual transactions on the accounts after 1893. *Vide supra* p.165.

³⁴ The 1886 expenditure included £172 worth of fish and ova given free of charge to the Falkirk and Denny Angling Clubs; this must surely have been a furtive attempt to win over support for the fishery against Falkirk Town Council within the town itself. Stirling Saturday Observer 28 May 1886 p.5. The average advertising expenditure for the pre-1886 years had been £118 *per annum* though, as noted in Chapter Four (*vide supra* p.136), much of this was spent on 'public relations' advertising such as purveying rather than on marketing in its strictest sense.

³⁵ *Vide supra* p.175.

TABLE 6.7

The Effect of Interest Payments on Howietoun Fishery Profits (£), 1879-1892

<i>YEAR</i>	<i>PROFIT BEFORE INTEREST</i>	<i>INTEREST</i>	<i>PROFIT AFTER INTEREST</i>
1879	21	74	-53
1880	115	109	6
1881	417	148	269
1882	475	201	274
1883	350	260	90
1884	68	311	-243
1885	601	340	261
1886	-1738	366	-2104
1887	509	463	46
1888	615	479	136
1889	487	495	-8
1890	418	514	-96
1891	746	536	210
1892	341	560	-219

Source: Tables 6.1 (p.166) and 6.6 (p.178)

Finally, the Interest Account shows a steady increase in Howietoun's payments to the Estates Advance Account from £366 in 1886 to nearly £600 in 1893 at which point payments were terminated.³⁶ Such a steady increase in interest payments confirms the suspicion, first noted in Chapter Four, that the interest paid to the estate was an increasingly heavy millstone around the fishery's neck.³⁷ **Table 6.7** (page 182), which calculates annual surpluses before the deduction of interest, shows that, from 1886, the subtraction of interest payments from revenue led to the fishery returning either a much lower profit or, in 1889, 1890 and 1892, a loss.³⁸ Remaining trading profits after the deduction of interest never even approached the level of the amount paid in interest. In 1891, which was in itself a very successful year for trading, for example, Howietoun paid interest of over £500, reducing a gross profit of over £700 to only £210.

The analysis of Howietoun's performance as a business up to Maitland's death in 1897 seems to indicate that the fishery was a commercial failure. It produced no substantial profits, and, particularly after 1886, offered no guarantee that profits would be returned at all. Demand for the fishery's produce was high and yet sales were allowed to level off whilst interest payments burgeoned to 1893. Profit as a percentage of turnover was on

³⁶ *Vide supra* p.165. Interest payments made after 1893 are in favour of overdrawn balances on the fishery's current account with the National Bank of Scotland.

³⁷ *Vide supra* p.137.

³⁸ **Table 6.7** does not include the interest payment for 1893 as the profit amount is not available for that year.

average absent, the fishery becoming, on balance, a loss making concern after 1886, and profit as a percentage of capital employed was absolutely minimal. Maitland had made a huge investment in Howietoun by 1893 in order to show that fish culture could be made to pay. Yet the foregoing analysis does little to suggest that he succeeded in doing anything more than diverting the majority of any profits he made to pay interest on his investment capital whilst failing to capitalise on favourable demand conditions. One might cynically suggest that an offer of £16,000 compensation for the passage of the Falkirk Water Bill would have been an excellent way for Maitland to cut his losses.³⁹ This affords an excellent opportunity to widen the scope of the thesis and examine Maitland's work as a case study for ongoing historical arguments on two of the suggested causes of British economic decline since the late nineteenth century - the alleged failure of the entrepreneur, and the role of cultural forces.⁴⁰

³⁹ *Vide supra* p.151. In addition to the quotations given at the beginning of this and Chapter Four, there are numerous other instances of Maitland asserting that he had made pisciculture commercially successful. In 1883, for example, he wrote: "I by my own unaided effort raised it [pisciculture] to a commercial success." University of Stirling, HF/V48(i): Letter Book 3, p.284. Maitland to Mr Duff MP of London, 20 October 1882. Similarly, a few years later, the Field noted: "The guiding principle which Sir James laid down when he commenced fish breeding in 1874 was that, in order to make the fishery a useful as well as an interesting institution, it must be made to pay." Field 13 March 1886 p.319.

⁴⁰ The late nineteenth century saw a relative decline in British economic power in the face of growing competition in world markets, especially from the rising industrial economies of
(continued...)

Derek Aldcroft's 1964 paper, 'The Entrepreneur and the British Economy', lies at the centre of the debate over entrepreneurial failure. Aldcroft argued that the British entrepreneur failed to combat the effects of the rise of foreign economic competition by neglecting 5 main areas of opportunity which were being exploited by Britain's rivals. The first of these was a failure to adopt new technology - such as mechanical cutting in the coal industry - to increase industrial competitiveness and efficiency.⁴¹ Secondly, this was

⁴⁰{...continued}

Germany and the United States. The rate of growth of British industrial productivity fell from 1.2 *per cent per annum* in the 1870s to only 0.25 *per cent* between 1890 and 1914. Between 1883 and 1913, the British share of total world manufacturing exports fell from 37.1 to 25.4 *per cent* whilst that of Germany rose from 17.2 to 23.0 *per cent* and that of the United States from 3.4 to 11.0 *per cent*. Whilst the British share was still the largest at the outbreak of the Great War, the relative decline was an indication of things to come; by 1975, the British share was less than 10 *per cent*, a figure below that of Germany, France, Japan and the United States. Rubinstein, WD Capitalism, Culture and Decline in Britain; 1750-1990 (1993) p.5 and Dintenfass, M The Decline of Industrial Britain, 1870-1980 (1992) p.9.

⁴¹ 19 *per cent* of British coal output in 1924 was mechanically cut, compared to 70 *per cent* in the United States. There are many other examples of technological retardation. British iron and steel entrepreneurs largely failed to adopt the 'direct' process of steel-making - in which liquid pig iron was converted directly, and thus more economically than in traditional methods, into steel - and the use of coking by-product recovery ovens which allowed economic use to be made of what would otherwise have been waste products. The result was that German and American steel prices fell by an average of 17 *per cent* between 1883 and 1910 whilst British prices consistently remained at a level about one-third higher. In 1913, 28 *per cent* of British steel was produced by the direct method in comparison to 75 *per cent*
(continued...)

accompanied by a failure to develop on a large scale new industries, such as the manufacture of chemicals, machine tools, scientific instruments, motor vehicles and electrical goods, all of which had far greater potential for long-term growth than the staple industries of the first industrial revolution.⁴² Thirdly, both these failures might have been avoided, Aldcroft argued, had the entrepreneur appreciated the importance of science and scientific research to economic advancement rather than preferring empirical tinkering to scientific

⁴¹(...continued)

in Germany, a level which had been achieved as early as 1900. In 1909, 18 *per cent* of British steel making utilised by-product recovery ovens in comparison to 82 *per cent* of the German. Aldcroft, D 'The Entrepreneur and the British Economy, 1870-1914' Economic History Review (1964) p.116. The cotton industry is charged with largely failing to adopt the more efficient Northrop automatic loom, itself actually a British invention, and the more efficient mode of ring-spinning instead of mule-spinning in producing yarn. By 1939, 5 *per cent* of British cotton output was produced with the Northrop loom compared to 95 *per cent* of United States output. Also in 1939, mule-spinning remained the norm in 75 *per cent* of the Lancashire cotton industry. Coleman, DC and MacLeod, C 'Attitudes to New Techniques: British Businessmen, 1800-1950' Economic History Review 39 (1986) pp.589-90. See also Byres, T 'Entrepreneurship in the Scottish Heavy Industries, 1870-1900' in Payne, P (ed.) Studies in Scottish Business History (1967) pp.253-261 for details of entrepreneurial innovatory actions in the Scottish heavy industries and Coleman and MacLeod, 'Attitudes' pp.589-595 for evidence of failings in technological innovation in the rifle, shipbuilding and dyestuff industries.

⁴² In the case of chemicals, for example, Britain in 1913, having once been the world's dominant producer, produced 11 *per cent* of the total world output whilst Germany and the United States produced 56 *per cent*. Aldcroft, 'The Entrepreneur' p.118.

theoretics.⁴³ Fourthly, having failed to introduce new productive *technology*, Aldcroft alleged that the entrepreneur failed to introduce new productive *techniques* such as standardised mass production (making large numbers of cheap, rather than small numbers of expensive goods) and the consolidation of production (from large numbers of small enterprises to small numbers of large enterprises) in order to reap beneficial economies of scale.⁴⁴ Finally, Aldcroft condemned British overseas marketing men as arrogant and

⁴³ *Ibid.* p.118 and *vide supra* p.103. As a Sheffield steelmaker put it in 1884, "the finest steels in the world are made in Sheffield ... but we do not know why it is. We do it but it is really by rule of thumb." Coleman and MacLeod, 'Attitudes' p.603. The leather industry, to take another example, is claimed to have fallen behind its competitors because it failed to appreciate the scientific use of chemicals as a quicker and cheaper method of tanning leather. Church, RA 'The British Leather Industry and Foreign Competition, 1870-1914' Economic History Review 24 (1971).

⁴⁴ The result was competitive disadvantage, particularly relative to the United States where mass production and large-scale corporatism were the norm, and a subsequent loss of export orders because British goods were not competitively priced. The British machine tool industry, for example, like chemical manufacture once a world leader, produced a huge variety of tools which were double the price of the handful of standards produced in the United States in the late nineteenth century. Other industries, such as coal, textiles and iron, were split between many small and independent family-owned firms rather than being consolidated, by amalgamation, into efficient national corporations which could further benefit from floatation on the Stock Exchange to raise investment capital. By 1914, 80 *per cent* of British companies remained in private hands. Aldcroft, 'The Entrepreneur' pp.121-132. Family firms still account for 75 *per cent* of all Scottish companies. 'Family Fortunes' Scottish Business Insider 4 (1995) p.10.

complacent.⁴⁵

Professor Martin Wiener's thesis looks less at the entrepreneur himself and more at the environment in which he operated, arguing that economic (and entrepreneurial) decline can be blamed upon anti-industrial 'cultural forces' prevalent in British society from the 1850s. Wiener argues that entrepreneurs failed to meet the challenges of foreign competition because they had lost the essential desire for "expansion, productivity and profit" to a national attitude at best apathetic and at worst downright hostile to industry, urban living, profit making and the cut and thrust of the capitalist business world.⁴⁶ Wiener demonstrates the existence of these anti-industrial,

⁴⁵ They were, he felt, disinclined "to supply cheaper goods, to study the customers' wishes properly or to adopt the metric system in calculations of weight, measures and currency." Aldcroft, 'The Entrepreneur' p.125.

⁴⁶ According to Wiener, the mid nineteenth century saw the 'directing strata' of British society, the landed elite, reassert the rural pre-modern traditions that had been temporarily silenced by the industrial revolution. The anti-industrial sentiments which they espoused permeated down to the lower orders, particularly affecting the educated and literary classes, and engulfing the entrepreneurial class in aristocratic, landed and non-industrial values. A key link in this process, Wiener believes, was the English public school which acted as the nexus of transmission of anti-industrial values to the entrepreneurial class. By the mid nineteenth century, more than 50 years of industrialisation had created businessmen wealthy enough to send their sons to such establishments, traditionally the preserve of the landed and very wealthy upper middle classes. These sons, rubbing shoulders with the offspring of the anti-industrial social elite, were influenced by the opinions of the latter. Moreover, the very curricula of the public schools, bulging with arts and classics and highly deficient in technical
(continued...)

anti-urban and anti-capitalistic cultural forces with such evidence as a quotation from John Ruskin's 'Nightmare Vision of the Twentieth Century' (1859) in which the author foresaw:

The whole of the island ... set as thick with chimneys as the masts stand in the docks of Liverpool; that there shall be no meadows in it; no trees; no gardens ... that you do not even have room for roads but travel either over the roofs of your mills on viaducts; or their floors, in tunnels; that, the smoke having rendered the light of the sun unserviceable, you work always by the light of your own gas: that no acre of English ground shall be without its shaft and its engine ...⁴⁷

⁴⁶(...continued)

and vocational education, were themselves essentially anti-industrial being more concerned with educating gentlemen than producers. One nineteenth century public school headmaster, for example, felt that vocational education went against "the object of a great school ... [which in fact was] ... mental and bodily training in the best way, apart from immediate gain." As a result, Wiener contends, most industrialists' sons left school to opt, as their aristocratic classmates had long done, for careers in the non-industrial and more socially acceptable professions, such as finance, commerce, law, politics or empire administration, rather than in production. Those who did return to the family business (or to another branch of industry) were lethargic and complacent towards business success, having had an education unsuited to industry's requirements and a large dosage of anti-industrial values to boot. Wiener concludes: "However many businessmen's sons entered, few further businessmen emerged from these schools, and those who did were 'civilised'; that is detached from the single-minded pursuit of production and profit." Wiener, MJ English Culture and the Decline of the Industrial Spirit, 1850-1980 (1981) pp.19-20/127.

⁴⁷ Ibid. p.27. In his Culture and Anarchy (1868), to take another example, Matthew Arnold slated the northern industrial middle-class, particularly damning "their way of life, their habits, their manners, the very tones of their voices" and asking "would any amount of wealth be
(continued...)

Anti-industrialism and anti-urbanism came together, Wiener contends, in intellectual condemnation of the industrial revolution as an event which, more than anything else, had brought great social despair and tension; crowded slums and ugly factories with unhappy workers were seen as the inevitable, but no longer acceptable, accompaniment of industrial profit. The Liberal MP Charles Milnes Gaskell, for example, wrote in 1886 that "in spite of all the luxuries of our lives, we have chill prospects on every side to tell us how little our vaunted improvements are worth, and how thin the veneer is of civilisation."⁴⁸

The best way to test such historical arguments as Aldcroft's and Wiener's is to perform case-study investigations of individual entrepreneurs

⁴⁷(...continued)

worth having with the condition that one has to become just like these people by having it?" In 1902, reviewing a book on rural retreats, the Daily News exhibited the taint of anti-urbanism in its reflection that "under its spell we lose for a time the brick and mortar civilisation that sometimes seem all pervading, and gladly fly ... to the green lanes and fields outside our prison" Wiener, English Culture pp.37/49-50.

⁴⁸ Industrialisation, according to Wiener, was seen as "the spread over a green and pleasant land of dark satanic mills that ground down their inmates." (The hymn 'Jerusalem' with its talk of green and pleasant land juxtaposed against dark satanic mills is, of course, another example of the pervasion of anti-industrial sentiment.) Historians, such as the Hammonds in The Town Labourer (1917) argued that industrialisation "had delivered society from its primitive dependence on the forces of nature, but in return it had taken them prisoner." As a result of the "vicious monomania" of maximum production, they concluded, the country "had turned aside from making a society in order to make a system of production." Wiener, English Culture pp.83-86.

like Maitland. The material presented in Chapter Three showed that Aldcroft's five criteria of failure do not readily apply to Maitland and the venture at Howietoun. Firstly, Maitland clearly adopted, indeed developed for himself, the most modern piscicultural techniques such as the use of a broodstock to aid selective breeding.⁴⁹ Secondly, in view of the size of today's aquacultural industry, Maitland had taken up a new industry with great future potential.⁵⁰

⁴⁹ *Vide supra* p.87. Revisionists of Aldcroft's work have argued that a lack of innovation could have been just as much an act of entrepreneurial rationality as failure. The cotton entrepreneurs' lack of interest in adopting ring-spinning over mule-spinning, for example, has been shown to be the result of the fact that ring-spinning was essentially a labour-saving process and not one that actually delivered lower costs in itself; indeed, the process actually required the use of a longer and more expensive cotton staple. In the United States, where labour was in shorter supply and thus relatively more expensive than in Britain, this was acceptable but British entrepreneurs had no rational need to convert to such technology. Sandberg, L 'The Entrepreneur and Technological Change' in Floud, R and McCloskey, D (eds.) The Economic History of Britain since 1700: Volume II - 1860 to the 1970s p.115.

Similarly, the poor rate of adoption of mechanical cutting in the British coal industry has been mitigated by the fact that geological conditions rendered only one quarter of the British coal face suitable for the process. Indeed, in the 25 *per cent* of the industry with faces that were suitable, the rate of adoption of mechanised cutting did in fact compare favourably with that in the United States. Church, British Coal p.357. Church notes that "nonetheless, the diffusion of machine cutting still appears to have been a protracted process."

⁵⁰ *Vide supra* p.1. More generally, while revisionists of the Aldcroft thesis accept that more effort could have been put into the development of such industries as chemical and motor vehicle manufacture and electrical engineering, they point out that the late nineteenth century witnessed great British success stories in other new industries. Lever Brothers,
(continued...)

Thirdly, he had clearly appreciated the importance of science in his work since all of the advances that he made were based on a practical application of scientific technique.⁵¹ Fourthly, he developed pisciculture on a large scale.

⁵⁰(...continued)

Beechams, Cadburys, Rowntrees, Guinness, Liptons and Boots, all major business in the later twentieth century, were each founded by vigorous late nineteenth century entrepreneurs whose work can be described as anything but a failure. Wilson in particular draws attention to the multitude of new late nineteenth century industries producing in bulk such commodities as soap, margarine, confectionery, tobacco, shoes, hats, clothes and patent medicine, and argues that their appreciation has been "bedeviled" by "the obsessive concentration of economists on the importance of spectacular technological innovation and massive investment as the indispensable condition of economic growth." Wilson, C 'Economy and Society in Late Victorian Britain' Economic History Review 18 (1965) pp.191-192.

The most interesting and substantial criticism of the Wiener thesis is in a similar vein. Rubinstein has recently argued that Wiener's opinions are not only incorrect, "but arguably the very opposite of the truth." Rubinstein criticises Wiener for assuming that Britain was a *fundamentally* industrial power and argues that, even at the height of the industrial revolution, the British economy was always essentially financial and commercial. The cultural thesis, therefore, is based on a fundamental misconception of the nature of the British economy, suffering from a gross "manufacturing fetishism." Rubinstein finds it "difficult to believe that there is not some underlying sexual undertone to the widespread preference for manufacturing rather than the services, manufacturing industry being virile and related *inter alia* to military prowess, the services in contrast being seen as effete and non productive, although they generate far more revenue." Rubinstein, Capitalism pp.3/24-25/36-44.

⁵¹ Though he did not have any formal natural scientific training, having studied mathematics and classics at an ancient university, this does not seem to have hindered his scientific work. *Vide supra* p.104. Likewise, Harvey and Press's investigation into the alleged
(continued...)

Howietoun was capable of producing 20 million eggs *per annum* while earlier British operations, such as Stormontfield, had managed an output of only a few hundred thousand ova.⁵² Fifthly, whilst Maitland could not market his

⁵¹(...continued)

lack of technical education among late nineteenth and early twentieth century British overseas metal mining engineers reveals that though there *was* a lack of formal training, engineers were educated in other ways, such as through reading educational material, attending lectures and making personal contact with others who *had* received formal technical education. Harvey, C and Press, J 'Overseas Investment and the Professional Advance of British Metal Mining Engineers, 1851-1914' Economic History Review 42 (1989) p.83.

⁵² *Vide supra* p.81. Revisionists of Aldcroft's work have also shown there to have been many industries, such as those involved in boot and shoe, toy and small arms manufacture, which *did* adopt techniques of standardised mass production in the later nineteenth century. Church's study of the late nineteenth and early twentieth century boot and shoe industry highlights the sector's success in fighting back a flood of imports particularly from the United States. Church, RA 'The Effect of the American Export Invasion on the British Boot and Shoe Industry, 1885-1914' Journal of Economic History 28 (1968). Lumley shows how small arms manufacture in Birmingham did adopt North American methods of mass factory production with interchangeable parts, in a trade that was traditionally small and highly skilled. Lumley, R 'The American System of Manufacture in Birmingham' Business History 31 (1989). Brown's study of the toy manufacturers William Britain shows how the firm routed French and German competition in the British market from the 1890s, becoming, by 1914, the world's largest producers of miniature lead figures. The firm practised standardised mass production to the effect that it could undercut the price of German imports of toy soldiers by half. Brown, K 'Models in History: A Micro-Study of Late Nineteenth Century British Entrepreneurship' Economic History Review 42 (1989). Similarly, other entrepreneurs, such as Boot and Lipton, already noted as successful entrepreneurs of 'new' industries, pioneered the British advance
(continued...)

goods on any significant scale overseas since the export of ova was difficult and the export of live fish impossible in the nineteenth century, there were successful experimental shipments to France, Germany, Switzerland, the United States, Canada, Natal and the Antipodes.⁵³

On the other hand, the Howietoun financial data *do* suggest that Maitland's entrepreneurial skills failed when it came to producing the sales and consequent profits required to make the fishery a commercial success. Perhaps, though, Maitland can be redeemed by the argument that he never intended to be a *business* entrepreneur in the first place. Although anxious to demonstrate that pisciculture could be made a commercial success, he did not actually intend to reap any substantial profits for himself. This disinclination

⁵²(...continued)

into large scale corporate retail chains, making their businesses far stronger than those which remained organised on the small and independent level. Wilson; 'Economy and Society' *passim*.

⁵³ *Vide supra* p.90. Nicholas has challenged Aldcroft's contention that late nineteenth century British entrepreneurs failed in overseas marketing, criticising the evidence, mainly British Consular Reports, used to support the argument. Nicholas believes these to be poor sources, written largely by consuls who were in no position to judge salesmen objectively since they had little knowledge of trade and what constituted good practice therein. Moreover, he argues, those who claim that entrepreneurs failed in overseas marketing often fail to look *beyond* the Consular reports to other important sources of information. The archives of the Board of Trade, for example, paint a far more favourable picture and, indeed, United States official reports praise the standard of British overseas marketing. Nicholas, S 'The Overseas Marketing Performance of British Industry, 1870-1914' Economic History Review 37 (1984).

to make profits was not Wienerish anti-capitalism but the result of benevolence. Maitland saw the fishery as a non-profit making establishment which served the public interest by either restocking depleted fisheries at minimal cost or by encouraging others to take up pisciculture in a more commercial manner than he.⁵⁴

In the early 1880s, as the 'piscicultural propagandists' had done before him, Maitland stated his aim to be the fostering of a wider piscicultural following "by promoting the establishment of fish hatcheries, making known their operations and otherwise."⁵⁵ Howietoun would be a *modus vivendi* of achieving this goal. The regularly revised editions of his Pamphlet on Stocking, published throughout the 1880s and 1890s, are all examples of an attempt to disseminate knowledge. Maitland told one recipient of the Pamphlet to "mark, read, and inwardly digest its contents as it contains all we at present know on trout culture."⁵⁶ By early 1886, the fishery had a list of over 1,400

⁵⁴ This argument, developed fully below, centres on Maitland's general economic or entrepreneurial ability as regards profit maximisation. The Wiener thesis also argues that entrepreneurs neglected their businesses by drifting away to other pursuits and generally taking a hands-off approach. The following chapter will look at Maitland's actual level of involvement with the fishery and whether his non-piscicultural activities had a deleterious effect.

⁵⁵ Field 4 September 1880 p.371. *Vide supra* p.55 for discussion on the 'propagandists'.

⁵⁶ University of Stirling, HF/V47(i): Letter Book 1, p.56. Maitland to Jonathon Haigh, address unknown, 12 November 1881. The fishery further offered "any information on the subject of salmon stocking which is not treated of in the pamphlet." Letter Book 1, p.184.
(continued...)

correspondents to whom advice on pisciculture was given. Letters sent out to enquirers went into great detail on the best methods to achieve success, included complex diagrams and sometimes even discussed the best way for a new commercial fish farming operation to become a success.⁵⁷ Maitland's book, The History of Howietoun, was a complete treatise on pisciculture which went into minute detail on exactly how Howietoun had achieved its success. As one reviewer commented:

There have been many books on fish culture but this stands out alone ... there could be no more instructive or profitable reading. Sir James conceals nothing, and shows how the experience he has gained may be turned to advantage. ... Its publication marks a new point of departure in fishing literature, and renders it possible for fish culture to be carried on at a profit.⁵⁸

When Maitland died in 1897, the Fishing Gazette noted that "Of Sir James personally, we can testify, from a very long experience, to his kindly good nature and willingness to impart any information in his power on the subject

⁵⁶(...continued)

Guy to Mr H Philips of York, 31 January 1881. The Pamphlet on Stocking was published four times during Maitland's lifetime, in 1880, 1882, 1884 and 1892. Maitland also produced a longer pamphlet for the 1883 London Fisheries Exhibition: Maitland, JRG On the Culture of the Salmonidae and the Acclimatisation of Freshwater Fish (1883).

⁵⁷ University of Stirling, HF/V49: Letter Book 5, p.296. Maitland to Mr H Brown, address unknown, 13 February 1886.

⁵⁸ Review of Maitland's book in the Journal of the National Fish Culture Association (1887) pp.80-81. The book became the standard text for late nineteenth century British pisciculture, replacing earlier works by the 'piscicultural propagandists', Frank Buckland and Francis Francis.

of fish, fishing, and fish culture."⁵⁹

Of course, none of this substantively portrays Maitland as anything other than a case for the entrepreneurial failure argument since, regardless of his primary aim, there was nothing to prevent him from also making a profit. A closer look at the evidence, however, reveals that Howietoun did not *fail* to make profits but that Maitland actively chose not to use Howietoun as a vehicle for profit. As Howietoun's secretary, Guy, told one of the fishery's correspondents, "the object of the fishery [is] more to promote fish culture than to make a profit."⁶⁰ Guy impressed upon customers and correspondents that the prices charged by Howietoun were "calculated as closely as possible on the cost of production." The prices quoted, he insisted, were "merely cost of production plus cost of delivery."⁶¹ Occasionally, the fishery even apologised for the prices charged and explained its profit intentions to customers. A good example of this can be found in a letter from Guy to a Mr Rollit of Hull: "We have gone carefully into the cost of Loch Leven yearlings and we find that if we sell 60,000 yearlings at £10 per thousand, the profit will be seven shillings per thousand and this margin is absolutely necessary

⁵⁹ Fishing Gazette 13 November 1897 p.355. Likewise, the Field had earlier praised Maitland for the way in which he "so lavishly discloses knowledge." Field 30 June 1883 p.883.

⁶⁰ University of Stirling, HF/V48(ii): Letter Book 4, p.900. Guy to WW Strickland of Bridlington, 30 November 1885.

⁶¹ University of Stirling, HF/V51: Letter Book 7, p.853. Guy to Edward Jephcott of Warwickshire, 21 November 1888.

to cover the risk of delivery."⁶² Where possible, the fishery was quite happy to offer prices far lower than those of other piscicultural operations that had arisen in its wake.⁶³ Guy was not exaggerating when he told one correspondent that "we do not think you can get better value elsewhere, price and quality considered."⁶⁴

Indeed, Howietoun literally gave away a substantial amount of fish and ova. In 1882, for example, 10 *per cent* of Howietoun's total production was put out *gratis*.⁶⁵ The Thames, Henley and District Angling Association showered Maitland with gratitude for a gift of 40,000 Loch Leven ova in

⁶² University of Stirling, HF/V48(i): Letter Book 3, p.689. Guy to Mr Rollit of Hull, 4 March 1884. It is interesting to note that this explanation was not good enough for Mr Rollit who pressed for a reduction in price. Guy firmly refused, stressing again that "We are sorry we cannot make any alteration in the price as it merely represents what the fish cost us to produce." Letter Book 3, p.699. Guy to Rollit, 8 March 1884.

⁶³ University of Stirling, HF/V48(ii): Letter Book 4, p.23. Guy to Mr Hinchcliffe of Keighley, 3 September 1884. In response to Hinchcliffe's request for a lower price Guy responded "If you will refer to the price lists of English dealers you will find that the fish including carriage are very considerably cheaper than they charge at their fisheries, and you would have a heavy carriage to pay in addition." It is interesting to note Guy's use of the word 'dealer' in the above quotation, as if he wished to strike a distinction between Howietoun and other, purely commercial piscicultural operations. These are discussed in Chapter Nine. *Vide infra* p.286.

⁶⁴ University of Stirling, HF/V53: Letter Book 9, p.896. Guy to Mr Malcolm of Invergarry, 1 December 1890.

⁶⁵ University of Stirling, HF/V48(i): Letter Book 3, p.11. Maitland to Francis Francis, 29 March 1883.

1883.⁶⁶ In 1885, he performed the annual restocking of the Teith salmon fisheries entirely at his own expense.⁶⁷ In 1886, the members of the Denny Angling Club each contributed their own money to pay for 10,000 Howietoun yearlings. Maitland returned their remittance with the order and sent a further 30,000 in addition to the 10,000 ordered.⁶⁸ In 1894, Howietoun gifted a "large quantity of trout fry" to the St Bernard's Trout Conservancy Association for the restocking of Edinburgh's Water of Leith.⁶⁹

This non-commercial attitude, and Howietoun's subsequent poor performance as a business, is reconciled to Maitland's frequent statements that he had made pisciculture pay by reference to his primary goal - the spread of the piscicultural ethic. He wanted to encourage the spread of pisciculture by proving that it could be commercially viable - others were more likely to adopt it if they saw a chance for profit. But he chose only to *demonstrate* that viability rather than to enjoy its financial fruits for himself because, as part of a wider concern about the state of the national freshwater fisheries that had brought Howietoun into being, the fishery, as the largest of its kind in the world, was a "public work ... which must be carried on by someone somewhere in the place."⁷⁰ In fact, as we have seen, the fishery did make

⁶⁶ Field 6 January 1883 p.17.

⁶⁷ Stirling Saturday Observer 6 June 1885 p.3.

⁶⁸ Stirling Journal and Advertiser 28 May 1886 p.5. But, as noted above (*vide supra* p.181), the intention here may have been 'political' in the light of the Falkirk Water Bill issue.

⁶⁹ The Times 17 April 1894 p.3.

⁷⁰ Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of (continued...)

occasional profits up to Maitland's death in 1897. However small the surpluses, Maitland himself was evidently satisfied with the fishery's performance, telling the hearing on the Falkirk Water Bill that "*even regarded as business*, it is a fairly profitable business."⁷¹ Later on, in 1894, he told a regular correspondent of The Times: "Good wine needs no bush and I am quite satisfied with the return on the fishery."⁷² Thus Howietoun cannot be criticised for failing to make substantial or regular profits. Any analysis of an entrepreneur must ensure that the subject in question is assessed on the basis of what he aspired to achieve in the long-term and not on what a historian may expect him to have aspired to in the short-term.⁷³

⁷⁰(...continued)

Evidence; p.204. For discussion on the concern over the state of the national fisheries in the later nineteenth century, *vide supra* p.38.

⁷¹ Central Region Archives, FA1/6/1, p.200. Emphasis my own.

⁷² University of Stirling, HF/V57: Letter Book 13, p.117. Maitland to Henry Ffennell of London, 22 January 1894. Maitland had taken this expression from Shakespeare's As You Like It.

⁷³ Coleman points out that late nineteenth century entrepreneurs should be assessed "by strictly contemporary [personal in Maitland's case] standards ... [We should] try to purge our minds as far as possible of current teachings, and consider our evidence in the light of what contemporaries saw as the relevant criteria. ... [This is a] necessary first step before which no really valid historical or economic judgement can be made." Coleman warns against seeing profit maximisation as the be-all and end-all of entrepreneurial and business success: "the ends are more intangible and varied." He quotes Samuel Courtauld in 1856:

It is not, so far as I know, by any means to mere money gain so much as success in well-contrived and well-conducted action that our interest and satisfaction in our business is found; the money gain is a legitimate result, and

(continued...)

In any case, an analysis of Howietoun's payments of interest to the Sauchie Estate shows that, though Maitland had no profit intentions, the fishery actually performed far better, in terms of profit and rate of return, than at first sight appears. Earlier discussion showed that interest payments were an increasingly large burden for the fishery, rising nearly 200 fold between 1875 and 1893.⁷⁴

⁷³{...continued)

no doubt enhances the interest and satisfaction; but it is not the spirit and soul of it, infinitely less is it the measure of it.

Coleman, DC 'Gentlemen and Players' Economic History Review 26 (1973) pp.95-96. Emphasis is Courtauld's.

This argument can also be related to Wiener's beliefs on the role of cultural forces in British economic decline in that Wiener's thesis takes its evidence at face value and refuses to consider different possible explanations of the apparent facts. As Ashworth points out, the ditty that 'there'll be blue birds over the white cliffs of Dover' cannot be taken literally to mean that those singing along are all "colour blind ornithologists." Ashworth, W Review of Wiener Economic History Review 34 (1981) p.660. Moreover, Wiener's thesis can also be criticised on historiographical grounds concerning the way it collates and presents evidence. The most glaring problem is the fact that Wiener generalises about *British* industrial decline on the basis of *English* culture. Robbins scathingly notes that Wiener "does not appear to notice that there might be other cultures in Britain besides that of the English which need to be taken account of." Robbins, K 'British Culture versus British Industry' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990) pp.7-8. Indeed, few would deny that English culture is itself split between that of the north and that of the south, yet Wiener bases his entire argument on southern English culture. Payne describes Wiener's evidence as "partial and inadequate." Payne, PL 'Entrepreneurship and British Economic Decline' in Collins and Robbins, British Culture p.31.

⁷⁴ *Vide supra* p.183.

TABLE 6.8

Howietoun Fishery Pre-Interest Profit Expressed as a Percentage of Turnover (£/%), 1879-1892

YEAR	PROFIT BEFORE INTEREST	TURNOVER	% OF TURNOVER
1879	21	78	26.92
1880	115	245	46.94
1881	417	702	59.4
1882	475	1,171	40.56
1883	350	1,304	26.84
1884	68	1,457	4.67
1885	601	1,562	38.47
1886	-1738	1,582	-109.9
1887	509	1,412	36.05
1888	615	1,522	40.41
1889	487	1,488	32.73
1890	418	1,309	31.93
1891	746	1,828	40.81
1892	341	1,505	22.66

Source: Tables 6.1 (p.166) and 6.7 (p.182).

But, in view of the fact that Maitland was his own banker, possibly charging interest to make the fishery's business operations seem as realistic as possible, interest could itself be seen as a form of return.⁷⁵

Table 6.8 (page 202) therefore recalculates Howietoun's trading profit as a percentage of turnover *before* the deduction of interest payments. On this basis, it is clear that, with the exception of the expenditure on fighting Falkirk in 1886, Howietoun's trading account was in profit for all years between 1879 and the termination of interest payments in 1893. Disregarding the effect of the Falkirk Bill expenditure, the revised data show the fishery making quite substantial returns between a low of 4.7 *per cent* profit on turnover in 1884 and a high of 59.4 *per cent* in 1881. The data for the period between 1887 and 1892, by which time the fishery was complete, show fluctuation between a minimum return of 22.7 *per cent* of turnover in 1892 and a maximum of 40.4 *per cent* in 1891. The average annual return before deducting interest payments over the whole period between 1879 and 1897, excluding 1886 because of the distortion caused by the expenditure on fighting the Falkirk Water Bill, is 34.5 *per cent*, considerably more than the 4.2 *per cent* average annual return after deduction.⁷⁶ Of course, these are

⁷⁵ A bank, moreover, may well have charged a higher rate of interest on the capital advanced. When, as Convenor of the Stirlingshire County Council, Maitland moved a 1d in the pound increase in the County Road Assessment, he observed that he "did not think it was good financing to have to pay large sums for bank interest." Stirling Saturday Observer 21 April 1894 p.4.

⁷⁶ *Vide supra* p.172.

hypothetical figures. One cannot realistically disregard the cost of finance capital since Maitland would have had to have borrowed his money from somewhere and, as noted above, a bank would probably have charged a higher rate of interest. But in view of the fact that Maitland was his own banker, the figures do at least show that the fishery, if only on paper, performed somewhat better than it would at first appear.⁷⁷

Some facets of the Maitland case-study, however, could perhaps be seen to support Aldcroft and Wiener's arguments on entrepreneurial failure. Maitland could certainly be criticised for the fact that, even if continuing to charge for goods at cost price, he failed to increase the scale of the Howietoun operation despite a demand from his customers for him to do so.⁷⁸ There is also the possibility that Maitland's cost price benevolence, by beating the prices charged by other pisciculturalists, may actually have retarded the business development opportunities of those whom Maitland had encouraged to adopt pisciculture for commercial gain. However, there is no evidence whatsoever to support the assertion; certainly, neither of the two main British pisciculturalists after Maitland, Thomas Andrews of Guildford and Joseph Armistead of Dumfries, went under in the period or complained,

⁷⁷ Indeed, Maitland's using estate funds to fund a new venture could be seen as his having 'saved' his own investment capital to avoid the need to borrow, in which case no interest would be payable.

⁷⁸ *Vide supra* p.175. This argument will not be discussed further here but is left for the following chapter, where it is suggested that the failure to extend the fishery further after 1886 may well have been the result of Maitland being distracted from pisciculture from the mid 1880s.

publicly at least, about Maitland under-cutting of their prices.⁷⁹

Maitland's benevolent entrepreneurship might also be seen as an example of a Wienerish distaste for profit in that he preferred not to develop the profit potential of his business, living instead on his estate income and, moreover, letting the estate fund the fishery.⁸⁰ There is no reason why Maitland could not have done his "public work" whilst still reaping some profit for himself; it may well have been *better* to rely on market forces than on benevolence in order to generate capital to fund extension of the fishery for the *further* good of the national fisheries.⁸¹

However, Maitland would hardly have desired to demonstrate

⁷⁹ It is unfortunate that the price lists of neither Howietoun nor the other fisheries have survived.

⁸⁰ Wiener charges that late nineteenth century British businessmen lacked the drive for "direct profit maximisation." Wiener, English Culture pp.145-154. Coleman singles out as a nineteenth century "vague but persistent belief that some things were indeed more important than profits." Coleman, 'Gentlemen and Players' p.109.

⁸¹ In an analysis of later nineteenth century landowners in south west Scotland, Campbell observes a tendency amongst landowners to damage the long-term viability of their estates by failing to capitalise on estate income and sort out short-term problems such as tenant rent arrears. Instead, debts were allowed to lie and interest charges to accumulate. Given Maitland's failure to capitalise on his income from the fishery - for whatever reasons - it would have been interesting, had the Sauchie Estate account books survived, to assess whether he followed a similar practice with his running of the wider estate. Campbell, RH Owners and Occupiers: Changes in Rural Society in South West Scotland Before 1914 (1991) pp.128-181. Subsequent discussion will, however, show that this would probably not appear to have been the case. *Vide infra* p.211.

pisciculture's commercial potentialities, encouraging others to make a profit from it and publicly boasting about his having raised it to a commercial success, if he had a distaste for capitalism.⁸² Indeed, within the overall framework of benevolent entrepreneurship, Maitland ran the fishery in a business-like, capitalist fashion. For example, attempts to enhance sales *were* made; in 1881, all past customers and correspondents were sent mailshots inviting them to order and this was repeated in 1884 and 1885. Attempts were also made to determine the success of the fishery's advertising in attracting customers.⁸³ Maitland saw the publication of the History of Howietoun as a possible benefit to his sales prospects, telling his publishers "I am anxious to get the book received early enough to affect this season's fish sales."⁸⁴ Indeed, as has already been shown, if one treats interest

⁸² Maitland wrote the second edition of the Pamphlet on Stocking (1882), for example, with the aim of informing the reader how "aquaculture may be pursued with a fair prospect of profit." University of Stirling, HF/V47(i): Letter Book 1, pp.574-589. Maitland's draft of the Pamphlet.

⁸³ University of Stirling, HF/V50: Letter Book 6, p.150. Guy to Mr Kelson of Land and Water, 11 December 1886. When the Fishing Gazette neglected to print a pre-booked fishery advertisement and subsequently failed to offer an explanation to Maitland, Guy wrote the publication's editor that "we must conclude the exclusion of our advertisement during the most valuable part of the season was intentional and calculated to cause us loss. We accordingly, we regret, place the matter in the hands of our London solicitors." University of Stirling, HF/V57: Letter Book 13, p.544. Guy to RB Marston, Editor of the Fishing Gazette, 10 June 1894.

⁸⁴ University of Stirling, HF/V48(ii): Letter Book 4, p.919 Maitland to Messrs. Constable, (continued...)

payments to the Estates Advance Account as part of the fishery's return, Howietoun performed somewhat better than it would at first sight appear. Moreover, the very fact that Maitland charged interest, even though he was his own banker, thereby making Howietoun a realistic business operation, can also be seen as an argument against the Wiener thesis.

Whilst Maitland did not increase the overall productive capacity of the fishery to meet rising demand, he did alter its internal components to meet changes in consumer taste. For example, the common brown trout, *salmo*

⁸⁴(...continued)

Edinburgh, 14 December 1885. The fishery was also businesslike in the sense that it was very keen to promote itself as a reliable supplier and always strove to maintain good customer relations. An extra quantity was always added to orders to cover any loss during transit and if ever a consignment of ova or fish was ruined, as a result of any deficiency in the packing or supplies, Howietoun would instantly replace it free of charge and send an apology. In fact, losses happened very rarely and in the entire period to 1897, there is evidence of only one customer complaint. This related to a shipment of live trout to Tiree which perished as a result of delay at Inverary. The purchaser, Mr J Wyllie of the Chamberlain's Office at Inverary, blamed Howietoun but appeared to have forgotten that the fishery had warned him several times that a shipment of ova, and not live fish, would be far more likely to survive the sea voyage to Tiree. Howietoun thus refused to take the blame for the loss and insisted that Wyllie pay for the consignment. University of Stirling, HF/V47(ii): Letter Book 2, p.670. Guy to Mr J Wyllie of Inverary, 2 January 1883.

Shortly after this, another incident occurred involving the loss of fish whilst in transit which is worthy of note if only for its amusing nature. A shipment of over 1,000 fish was sent to a Mr Williams of Edgbaston in January 1883 but, on arrival, it was found that every last fish had disappeared, only the water remained. The perpetrator was never discovered. Letter Book 2, p.753. Guy to Mr Williams of Edgbaston, 29 January 1883.

fario, had been shunned by customers for many years but as its popularity increased from the mid 1880s, Maitland reorganised his ponds in order to cultivate it for the growing market.⁸⁵ Ponds were further altered in 1890 and 1891 to meet an increasing demand for two-year old fish.⁸⁶ Lastly, the American rainbow trout (*salmo gairdneri*), which had been discontinued in the late 1880s, were reintroduced in 1892/3 when they became a fashionable requirement.⁸⁷

As a member of the landed elite, does Maitland conform to what Wiener would have us believe were the anti-industrial characteristics of that class?⁸⁸ Here, too, the answer to the question would seem to be no. Maitland was himself an industrialist of sorts in that he owned mills on the burn below the fishery. These were 'hands-off' affairs, the mills being leased to tenants. But that in itself is not enough to indicate an anti-industrial ethos since Maitland clearly enjoyed the rent from these industrial operations even though he was not himself directly involved.⁸⁹ In this respect, Maitland may be taken as

⁸⁵ University of Stirling, HF/V50: Letter Book 6, p.73. Maitland to Professor Ewart of the Fishery Board for Scotland, 1 November 1886.

⁸⁶ Fishing Gazette 6 December 1890 p.306.

⁸⁷ Stirling Saturday Observer 16 December 1893 p.1. This could be seen as commercial foresight since rainbow trout is now the most popular freshwater fish in Britain; it is increasingly difficult to purchase any other variety of fresh trout for the table.

⁸⁸ *Vide supra* p.188.

⁸⁹ As noted in Chapter Five (*vide supra* p.141), the mills, using the same Loch Coulter water supply as enjoyed by Howietoun, were similarly threatened by the Falkirk Water Bill. (continued...)

another example of an argument often levied against the Wiener thesis - that many of the allegedly anti-industrial aristocrats actually had substantial interests *in* industry, and benefitted enormously from large investments in such areas as mining, railways, cotton, iron, and innovations in agriculture and transportation. The Third Marquis of Bute, for example, owned Welsh docks, enjoyed ground rents from the Cardiff conurbation and mineral royalties from the South Wales coalfield.⁹⁰

⁸⁹(...continued)

Maitland did not make representations on their plight to the House of Lords hearing, the matter being handled on his behalf by the owners of the neighbouring mills whilst he concentrated on the defence of the fishery. An ardent supporter of the Wiener thesis may claim this to indicate that Maitland was not concerned with his industrial interests but this would not seem to be the case since he specifically asked his fellow owners to represent him and also complained to one of the fishery's correspondents about the proposed Bill's effect on his mills. University of Stirling, HF/V49: Letter Book 5, p.112. Maitland to Mr D Wardlaw, address unknown, 20 January 1886.

⁹⁰ Daunton, ML 'Gentlemanly Capitalism and British Industry, 1820-1914' Past and Present 122 (1989) p.142. More generally, historians have argued that the rural idyll in popular culture and literature, of which Wiener makes great play, was not new in the mid nineteenth century, but was a long-standing phenomenon that had pre-existed industrialisation. It is, therefore, hard to see it as a factor in industrial decline. Coleman and MacLeod, 'Attitudes' p.599 and Dintenfass, Decline p.60. Anti-industrial cultural forces, moreover, were as prevalent in Germany and the United States - nations more economically successful than late nineteenth century Britain - as in Britain herself. James, H 'The German Experience and the Myth of British Cultural Exceptionalism' in Collins and Robbins, British Culture p.97 and Pollard, S 'Reflections on Entrepreneurship and Culture in European Societies' Transactions of the Royal Historical Society 40 (1990) p.112.

Maitland did declare that "the fisheries may be made more valuable to the country than the manufactories," but this should not unquestionably be taken as indicative of an anti-industrial ethos. More likely, he was simply trying to emphasise the importance of the fisheries to the national economy and the food supply.⁹¹ Moreover, Maitland had hoped that there should be no more "insane attempts to introduce trout into waters which the industrial interest of their banks demand as the outlet of the refuse of a vast population. In fact there will be a place for everything and everything in its place." He understood that industry was a necessary thing and that it was sometimes necessary for manufacturers to pollute waters. Pisciculture, he believed, practised on a professional level as at Howietoun, could offset the damage done by pollution without having to take action against the industrialists.⁹²

Maitland does not seem to have had any grievances towards profit making and capitalist opportunism in a more general sense. In 1892, for

⁹¹ University of Stirling, HF/V47(i): Letter Book 1, p.68. Maitland to Mr J Barker-Duncan of Edinburgh, 20 November 1880.

⁹² University of Stirling, HF/V47(ii): Letter Book 2, p.664. Maitland to Francis Francis, 2 January 1883. Emphasis is Maitland's own. It is worthy of note here that both the growth in angling and complaints about river pollution in the nineteenth century discussed in Chapter Two (*vide supra* p.46/54) could be seen as indication of Wiener's cultural forces at work. However, the rise of piscicultural impetus as a result of these factors could, on the other hand, be seen as an example of anti-urban cultural forces actually *stimulating* capitalist enterprise. Brown makes a similar point in his study of the toy manufacturers William Britain, in that the firm's success rested on the nineteenth century growth in hobbies and leisure activities. Brown, 'Models in History' p.532.

example, the Stirling Saturday Observer admired his business acumen in planning to host the 1893 Highland and Agricultural Society show on his Barnton Estate. His plans, the newspaper believed, were purely with gain in mind: "The grounds are so very desirable that one would think prospective villa builders had only to see them to determine upon occupying them forthwith. The big show will give them the opportunity and Sir James Maitland the chance."⁹³ By the time of Maitland's death in 1897 the same newspaper observed that the Barnton estate was "potentially of enormous value, as it is just outside Edinburgh, and is rapidly being built upon." Indeed, Maitland had been a major proponent and sponsor of the Barnton-Edinburgh rail link, designed to encourage Barnton's potential as a residential suburb to the capitol.⁹⁴

Maitland does not appear to have done anything other than maximise the income from his estates.⁹⁵ In 1887, for example, he severely upset St Cuthbert's Parochial Board in Edinburgh over the rent on a field he leased to the Board for the use of the poor house. The Board had asked for a reduction in the rent but Maitland replied in a fashion to "mark his disgust at the dishonest attempt of a public body to wriggle out of an engagement" and subsequently demanded a rent increase of 33.5 *per cent*. This greatly annoyed

⁹³ Stirling Saturday Observer 19 November 1892 p.3. Barnton was an extremely lucrative estate with farm rents amongst the highest in Great Britain. Stirling Saturday Observer 9 July 1892 p.3. Today, it remains an extremely fashionable area.

⁹⁴ Stirling Saturday Observer 4 December 1897 p.5.

⁹⁵ Unfortunately, the accounts of Maitland's estates have not survived.

the Board, particularly since the period was one of agricultural depression and declining rents, and it found Maitland's communication "as disgraceful as ever was written to a public body."⁹⁶ Finally, Maitland was often praised for his business sense displayed as Convenor of Stirlingshire.⁹⁷ In 1893, for example, a Councillor Stewart had motioned a reduction in the County Road Assessment. Maitland opposed this on the grounds that he feared the county would be left without sufficient funds to meet unforeseen expenses - "he had found from long experience ... that work was more economically done when the estimate was sufficient, and they could finish the year with a balance."⁹⁸

To conclude, Howietoun's financial records convey the impression of a fundamentally weak operation which, though scientifically successful and of an unprecedented size, failed to produce an increasing level of sales and profitability or anything more than a modest rate of return on Maitland's huge investment. However, closer scrutiny of Maitland's aspirations shows that Howietoun was intended for the dissemination of knowledge rather than the maximisation (or, indeed, acquisition) of profit. As the Stirling Journal and Advertiser put it, Maitland's was an "ambitious scheme" to restock national waters; it required "the expenditure of a small fortune, and Sir James made

⁹⁶ The lease was subsequently terminated. Stirling Saturday Observer 29 January 1887 p.4.

⁹⁷ Stirling Saturday Observer 13 November 1897 p.5.

⁹⁸ Stirling Saturday Observer 22 April 1893 p.4. Stewart retracted his motion, stating that "there is very little use making an amendment against Sir James. We are followers of Sir James to a man." Laughter and applause ensued.

little, if anything, out of the venture."⁹⁹ Poor business results were thus the outcome of a conscious decision by Maitland not to maximise profits and not the result of entrepreneurial failure on his behalf.

⁹⁹ Stirling Journal and Advertiser 26 May 1927 p.7. Reporting on a visit by a group of Edinburgh anglers to Howietoun in 1889, the Stirling Saturday Observer commented that:

The party had not only enjoyed themselves on their visit; they had been immensely interested, and were filled with admiration at the skill and genius displayed in the works they had inspected. It certainly showed an immense amount of public spirit in a proprietor to find him willing, not for the sake of profit, but for the public good, to spend so much as Sir James had done on these public works.

Stirling Saturday Observer 13 April 1889 p.3.

Chapter Seven

MAITLAND WITHOUT HOWIETOUN AND HOWIETOUN WITHOUT MAITLAND

In appearance, Sir James Maitland might claim to be handsome, although his figure and very significant moustachios do suggest a fashion plate, or the picture of the hero in such literature as 'Lady Sylvia's Secret' or 'The Bloodstained Oatcake'. He is not at all romantic, however, and unlike such heroes can look things round and round with a very calculating purpose. He is a good man of business and devotes a great deal of time and energy to the work of the county.¹

There was, of course, more to Maitland's life than Howietoun. Whilst the central theme of this thesis is Maitland's piscicultural work, the analysis would not be complete without some discussion of his non-piscicultural career, such as his work in local administration and politics, which absorbed increasing proportions of his time after 1886. It is important to discuss not only what Maitland did but whether his absence had an adverse effect upon Howietoun. In so doing, Maitland can be further assessed in the light of another of another of the arguments concerning the late nineteenth century entrepreneur mentioned in the previous chapter, that businessmen abdicated from the hands-on running of their operations in order to pursue other, more

¹ Stirling Saturday Observer 24 December 1892 p.3. Neither *Lady Sylvia's Secret* nor *The Bloodstained Oatcake* appear actually to exist. I am grateful to Lesley Gordon of the Robinson Library at the University of Newcastle-upon-Tyne for the information that the titles are likely to be spoofs. She suggests that *Lady Sylvia's Secret* may be a parody of Mary E Braddon's "sensational" novel Lady Audley's Secret. Mailbase Internet Newsgroup Posting dated 31 May 1995.

socially acceptable, pursuits.²

Maitland's public work began in earnest long before the completion of Howietoun. On the death of his father in 1876, he took up the deceased's seat among the Commissioners of Supply for Stirlingshire, the predecessor body of the County Council.³ Later that year he was appointed to the rank of Captain in the Highland Borderers Militia, a local unit of reserve troops.⁴ In 1877, he became Deputy Lieutenant of the County of Stirling and took an active role in various local committees, most notably those responsible for finance, prisons and public work.⁵ In 1879, he became a Justice of the Peace and also began to take a leading role in the local Conservative Association.⁶ In 1882, his position as a piscicultural expert led to his appointment as a member of the Fishery Board for Scotland, a post which he held until 1892.⁷ From 1884, Maitland became the Chairman (Convenor) of the Stirlingshire Commissioners of Supply and proceeded to undertake a heavy load of public duties in addition to those listed above. He chaired the Prison Visiting and Valuation Committees and was active on the District Lunacy Board, the Police Committee, the Parliamentary Bills Committee and the committee in charge of

² *Vide supra* p.188.

³ Stirling Saturday Observer 5 May 1877 p.2.

⁴ Scottish Record Office, Steel-Maitland Collection, GD193/69/6: Appointment of Sir James Maitland as a Captain in the Highland Borderers, 1876.

⁵ Stirling Saturday Observer 5 May 1877 p.2.

⁶ *Ibid.* 12 July 1879 p.2 and 20 December 1879 p.2. Maitland's role in Conservative politics will be elaborated more fully below.

⁷ Maitland's activities with the Board are discussed in the following chapter.

implementing the Contagious Diseases (Animals) Act.⁸

1885 saw Maitland devote his energies to the advancement of his social position by the pursuit of a peerage. The Baronets Maitland were distantly related to the Earls of Lauderdale and in August 1884, after the twelfth Earl was struck by lightning and died without issue, Maitland, being descended from the seventh son of the sixth Earl, believed himself to be the heir. His succession was announced by The Times immediately the twelfth Earl died.⁹ However, another contender for the title, Major Frederick Maitland, Maitland's distant cousin, came forward claiming to be descended from the sixth Earl's sixth son. Maitland disregarded this contention, believing it invalid since the sixth son's children, all sired in America, had each been illegitimate. Nevertheless, Major Maitland insisted that his line had been legitimised by a death bed marriage of the sixth son in New York and vowed to prove his claim before the Peerage Committee of the House of Lords. The Lauderdale estates were thus put into the hands of a trustee whilst lawyers for each party prepared their cases.¹⁰

Nevertheless, from 27 November 1884, Maitland began referring to himself as the Earl of Lauderdale and used the Lauderdale crest upon his

⁸ Stirling Saturday Observer 3 May 1884 p.3.

⁹ The Times 14 August 1884 p.6.

¹⁰ The Lauderdale estates in Berwick, Roxburgh and Haddington covered 25,512 acres and had a gross annual value of £17,318. Maitland's estates in Stirling, Midlothian and Linlithgow were smaller in acreage, covering 10,228 acres, but had a rather higher annual value at £20,328. Bateman, J The Great Landowners of Great Britain and Ireland (1883) p.260/296.

correspondence.¹¹ He justified his presumption of success in the forthcoming legal case by asserting that he found his distant cousin's "contention so frivolous that there is no longer any reason why I should delay my assumption of the title."¹² Unfortunately, however, Major Maitland did prove the legitimisation of his ancestor and he was ruled to be the rightful heir in July 1885.¹³ Maitland reverted to the use of his original title, telling an American pisciculturalist who had addressed him as the Earl of Lauderdale that "The House of Lords decided that a death bed marriage had been celebrated in America with the effect of legitimising a distant cousin and cutting me out of the titles and Earldom of Lauderdale."¹⁴

¹¹ University of Stirling, Howietoun Archive, HF/V48(ii): Letter Book 4, p.116. The full title was Earl of Lauderdale, Viscount of Lauderdale, Viscount Maitland, Lord Maitland of Thirlstane, and Lord Thirlstane of Boulton, all in the Peerage of Scotland.

¹² University of Stirling, HF/V48(ii): Letter Book 4, p.119. Maitland to Sir Francis Bell, Agent General for New Zealand in London, 1 December 1884. The Stirling Saturday Observer commented:

The succession to the Earldom of Lauderdale is a matter of some interest to the community of Stirling, one of the two claimants to the peerage being our esteemed neighbour, Sir James R Gibson Maitland, Bart. of Sauchie, whose ability and success in regard to pisciculture have gained for him a worldwide reputation. We are sure that the legal establishment of Sir James's claim to be Earl of Lauderdale would be nowhere received with greater satisfaction than in the Stirling district where he is best known.

Stirling Saturday Observer 15 November 1884 p.3.

¹³ The Times 23 July 1885 p.3.

¹⁴ University of Stirling, HF/V50: Letter Book 6, p.691. Maitland to Fred Mather, Cold Spring Harbour, New York, 6 April 1887. Maitland told the House of Lords hearing on the Falkirk Water Bill that claiming the peerage had been "an expensive operation." Central Region
(continued...)

When Scottish Local Government was reformed in 1890, Maitland's long experience in local administration led to him taking over the Convenorship of the new Stirlingshire County Council and he was re-elected unopposed to the post every year until his death. His work in this field was particularly time-consuming since County Councils were entirely new and untested bodies which required careful attention and leadership in their early days. He sat on the committees dealing with legal and parliamentary matters, the administration of the Contagious Diseases (Animals) Act, district highways and public health. In addition to this, he chaired the Standing Joint Committee, the Stirling District Valuation Committee, the Finance and General Purposes Committee and the County Road Board.¹⁵ The evidence illustrates both that Maitland was a respected and successful Convenor and that he gave up a large amount of his time (which might otherwise have been spent at Howietoun) to the County Council. In 1892, for example, Maitland was presented with a large portrait of himself in recognition of his services to the county. A Councillor Smith told those at the presentation that "All can bear

¹⁴(...continued)

Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.193. The peerage case is discussed in a little more detail in Appendix I. *Vide infra* p.378.

¹⁵ Browne, TB Browne's County Council Year Book (1892) p.634. Browne noted of Maitland that "his activity and ability soon made him prominent" amongst councillors.

Membership of the Public Health Committee did not prevent Maitland being sued at Edinburgh Sheriff Court by Midlothian County Council under the Housing of the Working Classes Act (1890) because seven houses belonging to him in Cramond on the Barnton Estate were found to be unsanitary. Stirling Saturday Observer 13 May 1893 p.1.

testimony to the invariable courtesy and kindly bearing which Sir James extends to everyone with whom he comes in contact. In short, Sir James has endeared himself to all, and we look upon him as the model county convenor in Scotland."¹⁶ Similarly, speaking after Maitland's death, the Duke of Montrose stated:

I am quite sure that there was no Convenor throughout Scotland who spared himself less, or managed to control the business of so many committees, more successfully than Sir James did. ... Sir James succeeded to his duties, as you all know, when the Local Government Acts first came into force. He had to guide and superintend an entirely experimental machine, and you know

¹⁶ Stirling Journal and Advertiser 14 October 1892 p.4. Smith also noted that Maitland enjoyed "world-wide renown as a scientist in pisciculture." On a more humorous note, another member of the Council, Colonel Wilson, stated that he "should have preferred to see Sir James represented in a costume of Scottish tweeds and knickerbockers, rather than in the regulation frock coat of a London church parade." The Stirling Saturday Observer agreed, commenting:

The portrait is a full-length one and represents Sir James standing as if in the act of addressing a meeting, and close to a table upon which are near at hand several documents to which he has seemingly been making reference, and a despatch box. The portrait is a striking likeness, though the frock coat which Sir James wears gives him an unfamiliar appearance, as he is much better known in his Scotch tweeds and knickerbockers.

Stirling Saturday Observer 15 October 1892 p.4.

The portrait, painted by Sir George Reid, President of the Royal Scottish Academy, still hangs in Court Number 3 at Stirling Sheriff Court, formerly the County Council offices. The colour picture of Maitland's head at the beginning of this thesis was copied from the original portrait. The black and white picture on p.235 is also a copy of the portrait and shows rather more than Maitland's head alone. It still, however, omits his lower legs and feet which can only be seen on the original at Stirling Sheriff Court.

how well he succeeded in his duties.¹⁷

Maitland was not, however, as successful in pursuing politics at a national level and his place in the history of the Stirlingshire Conservative Association is not a particularly memorable one. Nevertheless, a little elaboration on Maitland's candidature in the 1880 and 1886 elections is not only interesting, both in itself and as an illustration of Stirlingshire working-men's devotion to Liberalism, but also provides an illustration of how Maitland's piscicultural work, much applauded in other quarters, brought ridicule upon him as a parliamentary candidate.¹⁸

In 1880, the Stirlingshire Conservative Association persuaded Maitland to oppose the hugely popular Liberal incumbent of the Stirling Burgh seat, the future prime minister Henry Campbell-Bannerman. Maitland was the first Conservative to do so since 1832 and his candidature was greeted with a torrent of abuse in the staunchly pro-Liberal local press:

Mr Campbell-Bannerman, we expect, will be trembling already in view of the formidable opposition he is threatened with. But the movement must have some better foundation than a motley gathering and an adjournment from labour to refreshment, with an unlimited supply of permits to visit the Howietoun fish ponds, before we can attach any importance to it.¹⁹

Maitland was described as "an amiable baronet" but it was noted that he had

¹⁷ Central Region Archives, SC3/1/8: Stirlingshire County Council Minute Book 1890-1899; Minutes of meeting held on 21 December 1897, p.325.

¹⁸ *Vide supra* p.101 for details of the praise accorded to Maitland's piscicultural achievements.

¹⁹ Stirling Saturday Observer 13 March 1880 p.2. The "motley gathering" was the meeting, at the Golden Lion Hotel in Stirling, where Maitland's candidature had been secured.

"changed the family politics for the worse" in standing for a cause "which his late lamented father spent his life in opposing ... So do some families degenerate." Maitland was slighted, probably correctly, for holding no qualifications or aptitude for parliamentary office and his standing was viewed as "an insult to an intelligent community."²⁰

Maitland's campaign and manifesto did little to alter this viewpoint. For example, he did little to purport himself as an able and knowledgeable parliamentary candidate when he told one interviewer that "he was not an old enough politician to be able to give an opinion as to the assimilation of the burgh and the county franchise."²¹ Likewise, he rather naively pledged that

²⁰ Ibid. p.2 and 20 March 1880 p.2. Maitland's father had been a much loved Liberal who had himself fought the seat unsuccessfully in 1847 but had remained active in local Liberal politics and became Liberal MP for Midlothian in 1868, holding the seat until 1874. This changing of the family politics may be one of the reasons which explain the few shreds of evidence that indicate Maitland to have had a stormy relationship with his mother after the death of his father. In 1883, for example, she demanded some oak bookcases from one of the family's properties, seeing fit to do so through solicitors rather than personally. Maitland seems to have acquiesced in this, telling his solicitors that "The Dowager has always behaved in so grasping a way that it really is not worth fighting over." University of Stirling, HF/V48(i): Letter Book 3, p.280. Maitland to Brodies of Edinburgh, 19 October 1883.

Maitland himself excused his changing of the family politics, telling a political meeting at Culross that "he begged to say that he was on much the same platform as his father was when he contested Midlothian. The fact of the matter was that the moderate Conservative of the present day held the same views as the Liberals of ten or twenty years ago." Stirling Journal and Advertiser 2 April 1880 p.3.

²¹ Ibid. 26 March 1880 pp.3-4.

he would reward the voters on his election by restocking Stirling's fisheries and thus increasing their value to the town. To this the opposition replied that "the benefit is so remote that we don't think a single elector will give Sir James a vote for his kind offer."²²

Certainly, hardly a single elector gave Maitland a favourable reception on the hustings and at most meetings he was shouted down by a torrent of Liberal abuse. At one meeting, for example, he was introduced by Provost Anderson with the words "Gentlemen, Sir James is known to you all." To this a heckler replied "What for? For fish?!" The meeting erupted into laughter and Maitland failed to make himself heard. He left the gathering after a motion for a vote of thanks to him was almost unanimously defeated by an amendment that he was "not a fit and proper person" to represent Stirling.²³ Maitland's piscicultural work clearly became a source of mockery from Liberal supporters during his campaign; the Stirling Saturday Observer noted that "he has yet to show himself capable of harder work than breeding fish."²⁴

²² Stirling Saturday Observer 20 March 1880 p.2. Maitland made his offer in an open letter to the newspaper, dated 15 March 1880.

²³ *Ibid.* 27 March 1880 p.4. The local Conservative newspaper put the situation quite simply: Maitland was booed and hissed at a meeting of which the proceedings were

from beginning to end, of an extremely stormy character. ... He proceeded to defend the foreign policy of the Government amid incessant and emphatic marks of disapprobation, the singing of popular airs, mingled with cheers for Mr Gladstone and Mr Bannerman, and groans for the Government. ... [Maitland had to contend with] ... severe heckling, most of his answers being received with every possible indication of dissatisfaction.

Stirling Journal and Advertiser 26 March 1880 pp.3-4.

²⁴ Stirling Saturday Observer 3 April 1880 p.2. An earlier editorial had commented:

(continued...)

Hardly surprisingly, the Conservative Association withdrew Maitland's candidature before polling day. Even then, the Liberal press would not leave Maitland and his party alone, commenting that "They have therefore discredited themselves and their cause, and lying as they do in the dirt, they deserve nothing else than to be contemptuously, if metaphorically, kicked."²⁵ Maitland's campaign expenses amounted to a wasted £875.²⁶ When the votes were actually counted (the ballot papers had already been prepared when the candidacy was withdrawn) Maitland polled 132 votes against Bannerman's 2,906.²⁷

Maitland seems to have felt rather disgruntled at the way his candidature was dropped, complaining to a Conservative colleague of "how badly the party treated me in the last election."²⁸ Nevertheless, he accepted

²⁴(...continued)

While we admire Sir James's pluck in leading a forlorn hope, there is so much of the burlesque element about his candidature that we cannot help regarding it as, to some extent at least, a mere frolic. ... It is well known that Sir James Maitland has never turned his attention to politics - that is the reason, perhaps, why he is a Tory - but has confined himself to the congenial pastimes of killing game and breeding fish. ... It is a highly comic production but its comicality is due not to the wit but to the ignorance of the scriptwriter.

Ibid. 20 March 1880 p.2.

²⁵ Ibid. 10 April 1880 p.3.

²⁶ Ibid. 12 June 1880 p.2.

²⁷ Stirling Journal and Advertiser 9 April 1880 p.2.

²⁸ University of Stirling, HF/V49: Letter Book 5, p.275. Maitland to Mr John G Urqhart, address unknown, 10 February 1886. The Liberal Stirling Saturday Observer agreed that Maitland had been treated unfairly, commenting several years later:

After incurring all the official expenses, the attempt was abandoned as hopeless on the eve of the polling day. The only thing that the [Conservative] Club succeeded in doing was to bring themselves and their party into ridicule,

(continued...)

another invitation in 1886, this time to contest the Stirling County seat, with relish, asserting his determination "to accept the great honour you have proposed for me and fight in the coming battle between honesty and anarchy. ... I have not much hope of the result ... but am fully alive to the importance of fighting the seat."²⁹ In speaking of anarchy, Maitland was referring to the Irish Home Rule question. He had a bitter hostility towards Gladstone's plans for Home Rule, accusing the Liberal leader of planning to hand Ireland over to a "disloyal majority."³⁰ Again, however, Maitland's candidature failed to run the course and he withdrew in favour of a Liberal Unionist candidate.³¹

²⁸(...continued)

the shameful way in which they left their honourable candidate in the lurch exciting the indignation of Liberals as well as Conservatives.

Stirling Saturday Observer 11 April 1885 p.3.

²⁹ University of Stirling, HF/V49: Letter Book 5, p.640. Maitland to an unknown addressee but context clearly indicates that it is a member of the Stirlingshire Conservative organisation, 12 April 1886.

³⁰ Stirling Saturday Observer 29 May 1886 p.4. The newspaper's editorial retorted that Maitland was typical of "a number of the present day politicians; they have faith in majorities only when they themselves belong to them." In a speech on Irish Home Rule Maitland concluded:

Gentlemen, this edifice is to cost you £50 million without any guarantee that the architect's estimate will not be largely exceeded. This edifice may, I say, be an abode of love. But it is more likely to be a lunatic asylum where the wardens have withdrawn from their posts. But this edifice will be - if you permit it to be built - the tomb of the honour of England.

University of Stirling, HF/V49: Letter Book 5, p.734. Text of Maitland's speech.

³¹ Stirling Saturday Observer 26 June 1886 p.3. For once, the newspaper's editorial was relatively unscathing towards Maitland, congratulating him on "escaping from a position in
(continued...)"

Asked to contest the seat again at the next election, Maitland firmly refused and gave up all attempts to enter the national political scene.³²

Since Wiener contends that cultural forces led Victorian entrepreneurs to devote their attention more to genteel pursuits such as local administration or the pursuit of peerages and less to the running of their businesses, it is important to assess whether Howietoun suffered an adverse effect from having an otherwise occupied proprietor.³³ A direct comparison between Howietoun with Maitland and Howietoun without Maitland is impossible since Maitland had always had commitments elsewhere from the beginning of his piscicultural work in 1873. But it does not seem that these other commitments were detrimental to Howietoun's progress. Up to the mid

³¹(...continued)

which there was neither honour nor success to be gained." After the speech in which Maitland announced his intention to step down, Mr Forbes of the Callendar estate in Falkirk moved a vote of thanks to him, stating that "as that gentleman had worn the Queen's colours it would have surprised him if he had done otherwise than he had done. He thought it would be a very good thing for Mr Gladstone to take a leaf from Sir James's book and put patriotism before self." Stirling Journal and Advertiser 25 June 1886 p.2.

³² Ibid. 22 October 1887 p.3. Maitland did, nevertheless, remain active in the local Conservative Association. In October 1889, for example, he officially welcomed Lord Hartington to a huge Unionist demonstration in Stirling and made a speech expressing his hope that Hartington would "continue the same patriotic and statesmanlike course, supporting the cause of constitutional government and true freedom, as against a policy of disruption and dismemberment of the empire." Stirling Saturday Observer 12 October 1889 p.4.

³³ Wiener, MJ English Culture and the Decline of the Industrial Spirit, 1850-1980 (1981) pp.137-154.

1880s, Maitland's involvement with Howietoun remained strong and he personally oversaw both the ongoing construction of the operation and its day to day running. He told the Falkirk Water Bill hearing that he was his "own engineer, architect and contractor," and he went on to state that he had made pisciculture his life's work.³⁴ In 1881, Maitland had astounded even himself in turning down a dinner invitation from the Lord Mayor of London in favour of fishery work.³⁵ Similarly, in 1882, commitments both at Howietoun and on the Fishery Board for Scotland led to his resignation from the Highland and Agricultural Society, the District Lunacy Board and the Prison Visiting Committee. He told a friend: "My time is now so much occupied by fishery business that I cannot devote myself to county work as much as I have hitherto done."³⁶ He personally superintended the spawning and packing each season and, despite growing public duties and a peerage case, still managed to pen three issues of the Pamphlet on Stocking and the first volume

³⁴ Central Region Archives, FA1/6/1, p.207. A published account of the fishery's work after Maitland's death confirmed that Howietoun was "entirely planned, thought out, and constructed under the direct supervision of the late Sir James Maitland ... It engaged a large share of his attention during the ten years of continuous construction between 1874 and 1885." Howietoun Fishery A Short Account of the Howietoun Fishery (1903) p.3. In an interview with Francis Francis for the Field in 1881, Maitland spoke of how his plans had driven an architect "frantic." Field 1 October 1881 p.480.

³⁵ University of Stirling, HF/V47(i): Letter Book 1, p.737. Maitland to an unknown addressee, 26 November 1881. Maitland wrote: "I have had actually had to refuse that."

³⁶ University of Stirling, HF/V47(ii): Letter Book 2, p.623. Maitland to Sir Henry Stuart, address unknown, 16 December 1882.

of the History of Howietoun before 1887.³⁷

It is clear, nevertheless, that Maitland's time for fishery business lessened in the early 1880s, and particularly so from 1886. From 1883, the fishery's letter books indicate that his personal correspondence on piscicultural matters decreased and that his manager, Thompson, was giving advice that Maitland might formerly have given. From 1886, correspondence from Maitland disappears almost completely from the letter books. In the letter book for 1887/8, for example, there is only one letter written by Maitland. The remaining six letter books up to his death in 1897 contain only a handful of letters penned by him amidst nearly 7,000 pages of correspondence. Correspondents who wrote to Maitland personally from 1886 onwards were seldom graced with a personal reply. Most were replied to by the fishery secretary, Guy, explaining that Maitland was tied up elsewhere. A few received a note from Maitland stating, for example, that "I am so little at home that it will be more convenient if you write to Mr Guy."³⁸

But it does not seem that Maitland's absence meant either that Howietoun suffered or that he was led away by a Wienerish distaste for

³⁷ There is the point that the second volume of the book, for whatever reasons, failed to appear. *Vide supra* p.21.

³⁸ University of Stirling, HF/V52: Letter Book 8, p.218. Maitland to Mr J Gordon-Mason at the Scottish Conservative Club in Edinburgh, 10 February 1889. Later that year, Maitland told the Crown Agent for Natal "I have been so much occupied lately with public business that I have been unable to give the fishery the personal supervision I used to." Scottish Record Office, GD193/69/2. Papers about the introduction of trout and salmon ova to Natal and New Zealand. Maitland to the Crown Agent, 26 November 1889.

hands-on management. Howietoun was left in the charge of a highly capable manager, John Thompson, whom Maitland had appointed in 1882 and then spent three years educating him in pisciculture before relinquishing the running of the fishery to him in 1885. By that time, Thompson was as versed in the practice of fish culture as his employer. Maitland told the Falkirk Water Committee that "Up to two years ago I was my sole manager, but I am a member of the Fishery Board for Scotland, and I have a good deal of public work to do as Convenor of the County, and I have a manager who now knows nearly as much as I do myself."³⁹ Similarly, the fishery secretary told one enquirer who desired personal advice from Maitland on pisciculture, that Thompson was himself perfectly capable of offering advice: "I regret my general instructions are not even to consult the proprietor on these subjects."⁴⁰ Indeed, when illness compelled Thompson finally to leave Howietoun's service in 1917, some twenty years after Maitland's death, the then owners of the fishery

unanimously carried that they put on record an expression of their appreciation of the long and faithful services rendered by Mr Thompson who spared no effort of his that would make for the prosperity of the fisheries, and also to express their sympathy with him in being compelled on account of ill health to sever a connection that has been honourable to him whilst beneficial to the company.⁴¹

³⁹ Central Region Archives, FA1/6/1, p.204.

⁴⁰ University of Stirling, HF/V54: Letter Book 10, p.533. Guy to Mr BR Stanbridge, Fishing Rod Manufacturer, Eton-on-Thames, 23 March 1891.

⁴¹ University of Stirling, HF/V13: Minute Book of the Howietoun and Northern Fisheries (continued...)

It is clear that Maitland's increasing commitments elsewhere did not detract from the affection and interest that he had for Howietoun. Right up until 1893, he chose to live at Craigend House, close to Howietoun, rather than at the traditional home for Sauchie Estate owners, (Old) Sauchieburn House, which was situated a few miles distant. He told the Falkirk Water Bill hearing that "I live at Craigend on account of the fishery. If not for the fishery I should live at Sauchie."⁴² Even if he only penned a few letters on pisciculture after 1886, his so doing is an indication of a continuing piscicultural interest. This is also demonstrated by his publishing an updated edition of the Pamphlet on Stocking in 1892. Indeed, the fishery press

⁴¹(...continued)

Company, 1915-1963. Minute of meeting held on 26 May 1917. Moreover, when, in 1919, Thompson's son, James, who worked as a labourer on the Sauchie Estate, had to be dismissed "as he is not a good workman through some cause either mentally or otherwise," Maitland's daughter, Mary, insisted that he at least be kept on on a casual basis because of "old associations with his parents." Scottish Record Office, GD193/20/22: Miscellaneous Papers. Grigor (Factor of the Sauchie Estate) to Mary Steel-Maitland and her reply, both 5 May 1919.

⁴² Central Region Archives, FA1/6/1, p.205. Thomas Andrews, a Surrey pisciculturalist, reminded readers of the Fishing Gazette:

That a hatching house should be handy and easy of access ... [since] ... it may be necessary to pay a visit at night and in any weather. Should the hatchery be any considerable distance from one's own residence, or the keeper's cottage, there may be the temptation to defer the visit till a more convenient season, with probably the result that all the previous trouble one has taken is but lost labour. Something or other has 'gone wrong with the works,' and you are informed some morning that the hatchery contains nothing but dead fish.

Andrews, T 'How to Breed and Rear Trout' Fishing Gazette 30 January 1892 p.61. Maitland's manager, Thompson, lived immediately adjacent to the main Howietoun hatchery.

welcomed the appearance of the booklet with the comment that "The experience which Sir James Maitland has acquired at a vast outlay of money and exertion has not diminished his enthusiasm in the work of fish culture."⁴³ Maitland still superintended the fishery when he could and gave it attention when it was needed. In the 1893/4 spawning season, for example, Thompson fell ill and Maitland went in to oversee the work himself.⁴⁴ His baronial mansion, (New) Sauchieburn House, completed in 1893, included a fully equipped piscicultural laboratory.⁴⁵ Maitland's obituary in The Times records that he "only wrote a few days ago" to a member of the Board of Trade that he would again help in exporting ova to the Antipodes, more than a decade after his last export to New Zealand.⁴⁶

All the foregoing indicates that Maitland's increasing separation from Howietoun seems to have been more a distraction by the other duties expected of men of his position than a planned separation. Indeed, it must be stressed that Maitland died suddenly and unexpectedly at the relatively young age of 49. It may well have been that he planned to return to a more active role in Howietoun's operation after a few years work in the public sphere but

⁴³ Field 23 April 1892 p.601. Howietoun Fishery Pamphlet on Stocking (4th edn.) (1892).

⁴⁴ University of Stirling, HF/V57: Letter Book 13, p.127. Maitland to the Marquis of Exeter, 29 January 1894.

⁴⁵ Stirling Saturday Observer 8 November 1890 p.4. *Vide infra* p.232 for details of the new Sauchieburn House.

⁴⁶ The Times 19 November 1897 p.6. Maitland's earlier exports to the Antipodes were discussed in Chapter Three. *Vide supra* p.90. Howietoun went ahead with the exports without Maitland in 1898. Howietoun Fishery, Short Account p.7.

was prevented from doing so by fate.

Nevertheless, it should be noted that Maitland could be criticised for his distraction from piscicultural work having stunted Howietoun's growth. Chapter Six noted that the fishery's sales levelled at around £1,500 *per annum* from 1886 because it was producing to capacity and had continually to turn orders away.⁴⁷ A solution to this, and an opportunity for Maitland to make more money from pisciculture, would have been to extend the operation.⁴⁸ This he failed to do, despite telling the Falkirk Water Bill hearing that the fishery had not reached "anything like its full stage of development" and that he planned to go on expanding for as long as demand outstripped supply: "I intend to develop my establishment to the limits of the water."⁴⁹

Indeed, Maitland admitted to the hearing that the fishery's development had already been put on hold in 1885 because of the cost of his unsuccessful pursuit of the Lauderdale peerage.⁵⁰ It is, perhaps, significant that when Maitland's financial position had recovered by the late 1880s, he chose to

⁴⁷ *Vide supra* p.175.

⁴⁸ A handful of new ponds were added in the 1890s, and some of the existing ones were rearranged, but there was no large scale expansion of the fishery's productive capabilities. *Vide supra* p.208.

⁴⁹ Central Region Archives, FA1/6/1, p.192. Plans had already been prepared for the construction of a third main hatchery and a small reservoir to supplement Loch Coulter. Maitland told the editor of the Fishing Gazette that "six million gallons a day will be required when the fishery is completed." University of Stirling, HF/V49: Letter Book 5, p.520. Maitland to RB Marston, Editor of the Fishing Gazette, 13 March 1886.

⁵⁰ Central Region Archives, FA1/6/1, p.193.

devote his money to building a huge mansion house rather than to invest in extending the fishery.⁵¹ That he did so is particularly interesting in the light of Campbell's observation that some late nineteenth century Scottish landowners possibly lacked improvement capital as a result of "maintenance of a style of life which the estate could not support." He goes on to list the erection of mansion houses, which was very common in the period, as one of "the most notable, and among the more permanent forms of conspicuous

⁵¹ Sauchieburn Mansion, built to replace an older, smaller house, was an impressive structure in Scottish baronial style. Its main feature was a tower, 90 feet high, with parapet and battlements. Aside from a large number of bedrooms and reception rooms, the house featured a drawing room, library, boudoir, dining room, billiard room, smoking room, modelling room for Lady Maitland, private secretary's room, business room, charter room, servants quarters of an "unusually large size," and a laboratory. The main hall, two storeys high and 70 feet long, was adorned with portraits of Maitland's ancestry and was modelled on the scene from Gilbert and Sullivan's Ruddigore in which the ghosts of a baronet's ancestors step down from their portraits and return to walk amongst the living. The house was powered and lit by electricity throughout, whilst exterior stone walls with interior brick linings were intended to make the house "impervious to rats or mice." Scottish Record Office, GD193/681. Sauchieburn House building contracts and Stirling Saturday Observer 8 November 1890 p.4 and 13 August 1892 p.3. The newspaper concluded: "The result will be a singularly compact and comfortable house ... Taking everything into account, Sauchieburn will be unsurpassed as a place of residence in Stirlingshire."

Maitland moved into his new home in December 1893. University of Stirling, HF/V57: Letter Book 13, p.3. Note to this effect. There is a photograph of the house on page 236.

consumption."⁵²

In conclusion, the evidence indicates that Howietoun led a healthy co-existence with Maitland's other activities both whilst he remained actively involved in pisciculture and after he became increasingly distracted - but not separated - from it in the mid 1880s. Once Maitland left the helm, Howietoun ran as successfully as it had previously done and there is no evidence of it having suffered from having an absentee proprietor. It is nevertheless possible that Maitland's distraction proved a block to further plans for the fishery and that Howietoun, though not suffering as it stood, lost out on where it could have gone to. This certainly accords some weight to historical arguments on entrepreneurial absenteeism in the late nineteenth century, though it is clear that Maitland's absence was never borne out of a *desire* to get away from his

⁵² Campbell, RH Owners and Occupiers: Changes in Rural Society in South West Scotland Before 1914 (1991) p.142/3. As noted in Chapter Three (*vide supra* p.95), Maitland's distraction from Howietoun also prevented the continuance of his work in hybridisation and, at least until 1897, put a stop to intercontinental exports. In 1889, for example, Maitland had to refuse an application for trout ova from Natal, advising the colony's Crown Agent to look to Thomas Andrew's Guildford fishery for assistance: "I should have had great pleasure in acceding to the application to aid the government in obtaining a shipment of salmon and other ova for the colony, but I have been so much occupied lately with public business that I have not been able to give to the fishery the personal supervision I used to and which this matter would require." Scottish Record Office, GD193/69/2. Maitland to the Crown Agent, 26 November 1889. A few years later, Maitland declined a request to send salmon ova out to the Eastern United States, commenting that "I do not like foreign consignments as they require a greater amount of personal attention than I can afford." University of Stirling, HF/V55: Letter Book 11, p.642. Maitland to Francis Francis Jnr., 12 April 1892.

creation. But it is unwise to place too much emphasis upon presumptions about what might have been, particularly when one considers that Maitland died relatively young.⁵³ At the time of Maitland's death, Howietoun remained recognised as

an institution of world-wide fame and importance - a great centre at which scientific research has been systematically carried on ... [and which] ... has proved of incalculable value in furthering our knowledge and assisting the study of the life history of some of the most interesting of our freshwater fish.⁵⁴

⁵³ As one of Maitland's masonic brethren noted, "the grave ... closed over the remains of Sir James Maitland, whom the great Architect of the Universe [had] called from amongst us while yet in the prime of his manhood." Stirling Journal and Advertiser 19 November 1897 p.4.

⁵⁴ The Times 19 November 1897 p.6.



ILLUSTRATION 16

Sir James Ramsay Gibson Maitland



ILLUSTRATION 17

(New) Sauchieburn Mansion House

Source: RCAHMS (ST/2902)

Chapter Eight

MAITLAND, FISH AND THE STATE

State support for Nineteenth Century Science: Fish Culture and the Fishery Board for Scotland, 1882-1892

I think we have a right to hope that sooner or later we shall be officially recognised, and the Government will see the advantage of encouraging fish culture and will lend that aid which other governments have lent to associations of this kind.¹

Unlike the United States Government, the British Government in the later nineteenth century failed to offer pisciculturalists any aid despite the national concern at depleted freshwater fishery stocks. Against the backdrop of criticism of the late nineteenth and early twentieth century British state's lack of support for science, this chapter looks at the rather limited base of surviving evidence which documents Maitland's position on the issue of state support for fish culture. Such an analysis is particularly pertinent when one remembers that Maitland saw Howietoun as "public work" in that it was a national centre for piscicultural excellence, knowledge dissemination, and restocking at as close to cost price as possible, and that he had funded it with a large amount of money from his own purse.² The chapter then looks at the issue of state support as it affected the Fishery Board for Scotland, of which Maitland was a member between 1882 and 1892, thereby completing the

¹ Chambers, WO British Fishes (1884) p.4. Chambers was writing on the British National Fish Culture Association and referring to the government aid given to French, Canadian, and, in particular, United States pisciculture. *Vide supra* p.62 and p.101.

² Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence; p.204.

picture of Maitland's life outside the strict confines of Howietoun which was begun in the last chapter.

In general terms, the nineteenth century witnessed a significant development of science and technology in the aftermath of the industrial revolution, and a significant growth in the number of scientists who, having previously funded their researches either from their own pockets or with the help of donations from private benefactors, increasingly called for financial assistance from the state. These men, led by influential characters such as the marine biologist E Ray Lankester and the mathematician Charles Babbage, and voicing their opinions through publications such as Nature and organisations such as the Royal Society or the British Association for the Advancement of Science, protested that British science was hindered by a lack of sufficient state aid, arguing that British aid levels were "small when compared with that which is needed in the interests of science."³ There was, it was believed, a "scientific deadness" in the British nation, especially in the education system, and particularly so in comparison to the amount of aid given to science in

³ Gore, G 'The National Importance of Scientific Research' Westminster Review 43 (1873) quoted in MacLeod, RM 'Science and the Treasury: Principles, Personalities and Policies, 1870-1885' in Turner, GL'E (ed.) The Patronage of Science in the Nineteenth Century (1976) p.116. For discussion on the nature of the lobbying groups, see also Alter, P The Reluctant Patron: Science and the State 1850-1920 (1987) pp.78-84 and MacDonagh, O 'Government, Industry and Science in Nineteenth Century Britain' Historical Studies 16 (1975). The various lobbying groups became collectively known as the Endowment of Research Movement. MacLeod, RM 'Resources of Science in Victorian England: The Endowment of Science Movement, 1868-1900' in Mathias, P (ed.) Science and Society, 1600-1900 (1972).

Britain's main rival, Germany.⁴ It was "almost obligatory" for British scientists to visit Germany to study or to gain a doctorate prior to 1914. British scientific lobbyists lauded Germany as having an efficient, lavishly funded and open tertiary education sector which placed equal emphasis on both scientific teaching and research, and as having an industrial base supported by research both in universities and in institutes outwith the education sector. Britain, on the other hand, had few universities, even fewer institutes of technology, fewer students and fewer research laboratories outwith the universities, none of which received any significant financial aid from the government.⁵ Germany's system of compulsory elementary education, with a strong emphasis on science and technology, was seen as a crucial factor in the German economic success of the later nineteenth century. The strength of British science's admiration for the German example can be seen in Nature's reaction to the founding of the Kaiser-Wilhelm Society for the Promotion of Science in 1911:

The spirit of trust in science has penetrated the whole German nation. ... This spirit, which permeates the German people, from the emperor on his throne to the representatives of the peasants,

⁴ Sir William Huggins, President of the Royal Society (1904) quoted in Alter, P 'Science and the Anglo-German Antagonism' in Gourvish, T and O'Day, A (eds.) Later Victorian Britain 1867-1900 (1988) p.271. Alter notes that those clamouring for increased state aid for scientific research found it hard to reconcile the parsimony of the British state with the liberality and modernity of its political system.

⁵ *Ibid.* pp.272-277. This also relates to Aldcroft's argument, noted in Chapter Six, that British entrepreneurs were deficient in scientific training in the nineteenth century. *Vide supra* p.186.

causes admiration; would that it could inspire imitation!⁶

Concerns over the lack of state support for British science gathered strength in the last three decades of the nineteenth century as the result of growing feelings of insecurity about Britain's supremacy in the world, economically, politically and militarily. Such feeling began in earnest after the 1867 Paris Exhibition where Britain had achieved 'excellent' ratings in barely one tenth of the divisions compared to success in nearly all categories at the 1851 London Exhibition.⁷ It gathered pace after the *débâcle* of the Boer War (1899-1902) and in the face of rising German economic and military power, as expressed in a speech by Norman Lockyer, President of the British Association for the Advancement of Science, in 1903:

We have lacked the strengthening of the national life produced by fostering the scientific spirit among all classes, and along all lines of the nation's activity; many of the responsible authorities know little and care less about science; we have not learned that it is the duty of a State to organise its forces as carefully for peace as for war; that universities and other teaching centres are as important as battleships or big battalions; are, in fact, essential parts of a modern State's machinery, and, as such, to be equally aided and as efficiently organised to secure its future well-being.⁸

⁶ Alter, 'Science' p.279. Comparative data on the amounts actually spent on science and education in Britain and Germany are very hard to come by. See Alter, Reluctant Patron pp.68-69 and Pollard, S Britain's Prime and Britain's Decline: The British Economy, 1870-1914 (1989) pp.154-155.

⁷ Pollard, Britain's Prime p.117.

⁸ Alter, 'Science' p.275. See Newton, S and Porter, D Modernization Frustrated: The Politics of Industrial Decline in Britain Since 1900 (1988) for a wider discussion of the
(continued...)

The blame for the lack of state support was accorded to the Treasury which, holding the purse strings of all others, had emerged as the dominant Government department in the nineteenth century. Its attitudes are worth looking into here in order to inform later discussion on the relationship between the Fishery Board for Scotland and its funding body. Robert Lowe, Chancellor between 1868 and 1873, rejected the very principle of state aid for science, stating that "the first maxim of economy is that Government should not be called upon to do that which there is a reasonable probability people will do for themselves."⁹ The Treasury refused to even consider giving aid without a detailed set of proposals from scientists, together with a firm assurance of positive and nationally beneficial results - something which was very difficult for pure researchers to do. Government departments which chose to undertake some scientific research were refused extra funding to cover its costs and told to make the best of the cash already available for existing responsibilities.¹⁰ Underlying the Treasury's attitude to state support

⁸(...continued)

twentieth century British 'modernisation movement' outwith the strict confines of science. Newton and Porter observe that the Boer War had a tremendous effect on the British national psyche: "As intimations of mortality fell like shadows across the empire on which the sun never set, Victorian values and the institutions that embodied them were subject to sceptical reassessment" Ibid. p.1.

⁹ Alter, Reluctant Patron p.67.

¹⁰ An 1887 internal Treasury memorandum set out policy thus: "The first object of the Treasury must be to throw the departments on their defence, and to compel them to give strong reasons for any increased expenditure, and to explain how they have come to demand it." Ibid. p.73.

for science was the nineteenth century British 'budgetary tradition' which centred on a need to avoid increases in expenditure, to reduce the national debt, to rely on free trade and to prefer the action of the individual over that of the state. This resulted in a "spirit of rigorous national accounting, ... the reification of thrift as a moral virtue" and the belief that "with money left to fructify in the pockets of the people, private initiative would ultimately secure its own rewards."¹¹ In the later nineteenth century the budgetary tradition became deeply intertwined with the dictums of Gladstonian finance. Becoming Chancellor in 1859, facing the financial legacy of the Crimean War (1854-1856), and then Prime Minister in 1868, Gladstone had been determined to balance the budget by reducing expenditure. He believed that if science was worthy of state expenditure, then it was worthy enough to attract private investment in order to pay its own way. In 1872, for example, he told the Institute of Civil Engineers:

A fair field and no favour is the maxim of English administration. A field so fair, so extensive and so promising that all industry may find its place, and such an absence of favour that one as well as another may hope for success. If, under these conditions, the state does nothing for science, it cannot be helped, nor need it be lamented, considering how little science stands in need of aid.¹²

¹¹ MacLeod, 'Science and the Treasury' p.124.

¹² *Ibid.* pp.134-135. In a Midlothian speech in 1879, Gladstone asserted:

The Chancellor of the Exchequer should boldly uphold economy in detail, and it is the mark of a chicken-hearted Chancellor when he shrinks from upholding economy in detail, when, because it is a question of only two or three thousand pounds, he says that it is no matter. He is ridiculed, no doubt, for what is called candle-ends and cheese-parings but he is not worth his salt if he is not ready to save what is meant by candle-ends and cheese-parings in the cause of the country.

There are, of course, two sides to every argument. Whereas contemporaries were 'obsessed' with maligning late nineteenth and early twentieth century British science, particularly in education, in comparison to that in Germany,¹³ Pollard's recent thesis takes a very different view. He argues that the popular education system in Germany was generally rather poor; as late as 1903, it had an average of 61 pupils per teacher and many schools had only a single class for all ages and abilities.¹⁴ Regarding scientific education in particular, the Germans complained as much as the British that science, engineering and technology were considered down-market subjects, inferior to the classics and liberal arts.¹⁵ Perhaps, indeed, Germany can be seen as an example of *too much* learning; by the late nineteenth and early twentieth centuries the German science and technology graduate supply was outstripping the availability of employment, whilst teachers were burdened with huge class loads and were deprived of time to undertake research.¹⁶ Finally, with regard to the *results* of German support for science

¹³ Alter, 'Science' pp.276-277.

¹⁴ Pollard, Britain's Prime pp.146-147. He comments that "it seems that admiring British observers were too often blinded by the regulations [such as compulsory elementary education], without observing the practice."

¹⁵ James, H 'The German Experience and the Myth of British Cultural Exceptionalism' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990) *passim*.

¹⁶ German academics were paid per student taught and thus carried the relentless pressure to take larger classes, thereby increasing income but reducing or eliminating research time. Pollard sees this as "an acute form of the perennial university problem that while academic
(continued...)

education, Pollard points out that among the 'science-based' industries it was only in chemicals that Germany was really ahead of Britain and, even there, markedly so only in the synthetic dye sector.¹⁷ Indeed, he argues that the Germans became heavily dependent on the United States when it came to the scientific requirements of technological advances in electrical engineering and motor vehicle manufacture. Pollard concludes that though Germany was different to Britain in offering a large amount of state aid to scientific education, this has to be seen in the context of a country that was playing catch-up with a far more long-standing industrial power.¹⁸

Having shown that the German provision of science education was not necessarily all that *good*, Pollard goes on to argue that the British provision was not necessarily all that *bad*. He points out that mathematics, a subject

¹⁶(...continued)
recognition, employment and promotion depend on research, professors are normally paid to teach students." Pollard, Britain's Prime p.160.

¹⁷ Ibid. p.160. Britain did not lag far behind Germany in the production of sulphuric acid, super phosphates and chemical nitrogen and was way ahead of her rival in the production of soda ash.

¹⁸ He states:

Altogether, it would be hard to maintain that Germany derived much gain and much in the way of superiority over Britain as distinct from catching up, from her more lavish, more centralised expenditure on science and technology on the part of the state ... outside a few particular points of comparative cost advantages.

Ibid. p.160-162. Brock points out that the German way of doing things owed much to the "ignominy of Prussia's defeat by Napoleon [which] helped to make state patronage of science and education seem a potent means of recovering prestige and strength. Brock, WH 'The Spectrum of Science Patronage' in Turner, Patronage p.200.

which "could also form the basis of later scientific interests or industrial and commercial occupations," featured in almost every school curriculum.¹⁹ Great advances were made in British educational provision in the later nineteenth century with the rise of central schools and technical institutes. Unlike their German counterparts, furthermore, British science professors were independent and well-motivated to carry out original research whilst teaching students who *wanted*, and were not forced, to study. Germany had nothing like the British Department of Science and Art (founded 1853) or the City and Guilds Institute which, from the later nineteenth century, funded and presented thousands of students for examination in science.²⁰

In any case, and in more general terms than in education alone, state aid to science was *not* as deficient as some of the nineteenth century lobbyists for increased funding claimed. The state funded surveys, expeditions and observatories, and passed legislation, such as that for public health, railways, and, of course, fisheries, which required the appointment of civil service scientists.²¹ On the other hand, as these instances illustrate, the Treasury was, indeed, far more likely to sanction expenditure on 'useful'

¹⁹ Pollard, Britain's Prime p.169. Maitland, indeed, had mathematic training. *Vide supra* p.5.

²⁰ Pollard, Britain's Prime pp.197-207. The number of pupils examined in science rose from 1,300 in 1861 to 100,000 in 1887. Poole, JB and Andrews, K (eds.) The Government of Science in Britain (1972) p.7.

²¹ Other government departments requiring scientific expertise included the mines, food and drug inspectorates, the excise department and the Royal Mint. Brock, 'Spectrum' pp.178-180.

applied science and projects that promised tangible national benefits than on theoretical or pure science.²² As the Treasury Commission on the Meteorological Grant noted in 1877:

It is not the policy of the Government in this country to give direct assistance to the study of any science - except with a view to the more immediate application of scientific theories to practical purposes in which the public have a direct interest.²³

MacLeod mitigates the Treasury for its parsimony towards science, pointing out that it could not allow itself to become a cash-cow and had a moral responsibility to ensure national financial rectitude. He also shows how, as the demand for state aid rapidly increased in the later nineteenth century, the Treasury sought to respond more effectively by turning to scientific experts, usually members of the Royal Society, for advice.²⁴ Government grants to scientific activities excluding education rose from £34,000 (0.9 *per cent* of civil estimates) in 1850 to £600,000 (2.6 *per cent*) in 1900.²⁵ Alter believes that state aid became far more generally available through the later nineteenth century as the result of growing Government unease over Britain's

²² *Vide supra* p.241.

²³ Deacon, M 'Crisis and Compromise: The Foundation of Marine Stations in Britain During the Late Nineteenth Century' Earth Sciences History 12 (1993) p.25. The Fishery Board for Scotland, to which discussion will shortly turn, is itself an ideal example of this.

²⁴ MacLeod, 'Science and the Treasury' pp.148-160. He points out that "the Treasury [may have] appeared despotic when it was actually being cautious," though he does accept that its cautiousness "probably delayed innovation and discouraged many good men" in their search for research funding.

²⁵ *Ibid.* p.122.

position in the world, particularly with regard to the rising Anglo-German antagonism.²⁶

Pollard observes that it is too easy to view state aid as a great panacea, blindly assuming that its relative absence in Britain in comparison to Germany *necessarily* meant that British science suffered. Nor, indeed, is there a proven case for the assumption that, in the nineteenth century at least, state aid was *necessarily* the only way to support science. By 1912, for example, the National Physical Laboratory, which had been set up in 1900 with a modest government grant, was receiving enough private subscriptions to give it an annual budget of £32,000 and a staff of 150.²⁷ Brock too questions the assumption that state aid was the "ideal and only valid system of patronage." Noting that very little real work has been done by historians in assessing the validity of contemporary claims about the lack of support for British science, he observes a 'spectrum' of patronage in the nineteenth and early twentieth centuries which encompassed aid not only from the state but also from industry and commerce, learned societies, publishers and individual

²⁶ *Vide supra* p.240. Alter nevertheless points out that the response came in the form of larger amounts of *ad hoc* aid rather than in any systematic and organised provision. Alter, 'Science' p.273/287. It was only after the working out of the antagonism in the 1914-1918 war that aid became more formalised. Alter, Reluctant Patron pp.191-214.

²⁷ Pollard, Britain's Prime p.123/188. Pollard notes that the Laboratory soon "wiped out the lead of its German rival," the PTR (Physikalisch-Technische Reichsanstalt) set up in Berlin in 1887. *Ibid.* p.154/197.

philanthropy.²⁸

Finally, it must be noted that much of the criticism of the nineteenth century state's support for science came not from the mass of the population but from scientists who were bound to ask for more aid whatever the real conditions, perhaps deliberately underrating the status of British science in order to further their own interests, ambitions and, of course, pockets. Moreover, as Pollard points out, many of those criticising the state for not supporting science worked in fields such as astronomy and physiology, which could offer little to future prospects of economic growth.²⁹ It is also worth stressing that many British scientists were actually opposed to increased state aid for science on the grounds that it meant state interference and loss of scientific independence and freedom; there was, indeed, a Society for Opposing the Endowment of Research.³⁰ Even those who did want state aid

²⁸ Brock, 'Spectrum' *passim*. A University of Edinburgh professor, Fleming Jenkin, for example, developed electrical cables for marine telegraphy and thereby earned enough money to fund a laboratory at his home that his employers could not finance at the workplace. Morrell, JB 'The Patronage of Mid-Victorian Science in the University of Edinburgh' in Turner, Patronage p.84.

²⁹ Pollard, Britain's Prime p.122.

³⁰ *Ibid.* p.209. The Cambridge Professor of Philosophy and Liberal Unionist MP for the University of London, Michael Foster, commented:

The spirit which rules the state in its ordinary payment of scientific work is, put baldly, that it should have its money's worth in return for the money spent. ... The paid scientific servant of the state ... must not wander away from the prescribed end, ... a narrow path is laid out for him, he must not stray from it. ... Very different is the spirit which guides the independent man of science ... for that spirit is the spirit of perfect freedom. ... He starts on the enquiry with an impulse denied to him who undertakes a task not chosen by

(continued...)

were often split over the question as to whether it should be given directly to individual scientists or indirectly through the medium of supporting universities and societies.³¹

Having looked at the general background to the question of state funding for nineteenth century British scientific research, discussion now turns to the specific issue of the funding of pisciculture and fisheries research. There is no lack of evidence to show that influential people believed nineteenth century British pisciculture to have suffered from a lack of state support. Maitland's ichthyological friend, Francis Day, for example, complained that:

It is remarkable how British fisheries have been treated ... No Government official is now engaged in the artificial propagation of fish, or in experiments upon how to augment the supply of this necessary article of food. In fact, the British Government, respecting freshwater fisheries, is now behind almost every country, in that it gives no assistance to the fish culturists, and keeps up no establishments of its own in order to maintain the necessary number of fish in our waters.³²

³⁰(...continued)

himself but offered to him by others.

Quoted in Poole, JB and Andrews, K (eds.) The Government of Science in Britain (1972) p.33.

MacLeod notes that "many held that British science, noisily accompanied by public begging, was in danger of losing its dignity." MacLeod, 'Resources' p.154.

³¹ Macleod, 'Science and the Treasury' p.132.

³² Day, F Fish Culture (1883) p.7. After Maitland had presented a paper on fish culture to the 1883 London Fisheries Exhibition, Day remarked that Maitland "had taken up a position which was assumed by the government in most foreign countries; he had, at his own expense, kept hatcheries and fisheries, which in almost every civilised country were carried
(continued...)"

Similarly, in his first report to the Fishery Board for Scotland, Archibald Young, Inspector of Scottish Salmon Fisheries, spoke of the desirability of state support for salmonoid propagation on the North American model, concluding that:

Individual effort has recently done a great deal in this country in the way of artificial breeding; but there have been no attempts made by the Government in this direction. Great Britain protects fish and does not breed them. The US breeds fish and does not protect them.³³

However, the snippets of evidence that survive do not seem to indicate Maitland's concurrence with these points of view. Whilst asserting that

³²(...continued)
on by government officials." Maitland, JRG On the Culture of the Salmonidae and the Acclimatisation of Freshwater Fish (1883) pp.25-26.

³³. First Annual Report of the Fishery Board for Scotland (1882) pp.47-48. Young had surveyed Scottish salmon fishery owners and had found a majority in favour of state aid for salmonoid pisciculture. In recommending that such aid be given, he nevertheless accepted that the United States "have not to keep up great military and naval establishments as we have" and could therefore afford to help its pisciculturalists more than the British Government could.

Among those clamouring for state support for British pisciculture, the United States was held in as high an esteem as Germany was by those lobbying for more state aid to science in general. Whereas the British Government gave no aid to its countrymen exhibiting at the 1882 Edinburgh Fisheries Exhibition, the United States Government gave a £10,000 donation to American exhibitors. The Times 21 July 1882 p.10. By the late 1880s, the United States Commission on Fish and Fisheries (*vide supra* p.62) was receiving £70,000 *per annum* from federal government alone. The Times 5 January 1889 p.7. Further details on American state aid for pisciculture are given below. *Vide infra* p.261.

Howietoun had been constructed "unaided by government," Maitland appears to have been more proud that without such aid he had "reared the largest and most successful fish farm the world has ever seen" than to have been perturbed at the lack of state support for fish culture.³⁴ Certainly, he looked for state intervention in furthering the interests of the fisheries as a whole and, in his desire for state help for the Scottish contingent at the London Fisheries Exhibition in 1883, had argued that "It would be a great pity if, from want of funds, Scotland be meanly represented in comparison with America, Australia and Canada, the congresses of whom are already voting large grants."³⁵ Similarly, he wrote to the 'piscicultural propagandist' Francis Francis expressing support for "deserving men" to be given grants to fund scientific fishery research, something which a "jobbing government" had thus far failed to do.³⁶ But he seems to have believed that for fish culture in particular, as he had shown so remarkably at Howietoun, private enterprise should take the lead: "It is the duty of Government to educate and regulate. It is the duty of private enterprise to produce."³⁷ He wanted Government to introduce legislation that would enable district fishery boards to raise loans to build hatcheries and ponds for pisciculture but, having done that, he believed

³⁴ Maitland, JRG The History of Howietoun (1887) p.178.

³⁵ University of Stirling, HF/V47(ii): Letter Book 2, p.240. Maitland to Mr Mark Stewart at the Carlton Club in London, 4 May 1882. *Vide supra* p.104.

³⁶ University of Stirling, HF/V47(ii): Letter Book 2, p.664. Maitland to Francis Francis, 2 January 1883.

³⁷ Maitland, History of Howietoun p.209.

that restocking would become self-financing by increasing river rentals,³⁸ a belief that ties in well with Gladstone's argument for a 'fair field and no favour' for British science and Robert Lowe's conviction that the state should not intervene in any area in which people were likely to pay for work themselves.³⁹ Maitland's stance also seems to confirm Brock and Pollard's arguments that state aid was not necessarily either the only or the ideal way to fund scientific enquiry.⁴⁰

Other practising pisciculturalists took a similar view. There is, for instance, no evidence to suggest that the two leading British pisciculturalists after Maitland, Thomas Andrews and Joseph Armistead, desired financial support from the government.⁴¹ Similarly, the Chairman of the Severn Fishery Board, Willis-Bund, argued that pisciculturalists would do

better work when left to themselves than when they were perpetually harassed by a government official saying 'You are to do this, You are not to do that'. State aid meant state inspection and he would far sooner be without the aid if the inspection was coupled with it.⁴²

³⁸ University of Stirling, HF/V50: Letter Book 6, p.239. Maitland to the Editor of the Scotsman, 4 January 1887. The letter was reprinted in the Stirling Saturday Observer 8 January 1887 p.3.

³⁹ *Vide supra* p.241. Maitland's view that private, commercial pisciculture could and should pay its own way could be used as a further example in Chapter Six's argument against Maitland being subject to Wiener's anti-capitalistic cultural forces.

⁴⁰ *Vide supra* p.247.

⁴¹ Andrews and Armistead are discussed in the following chapter. *Vide infra* p.286.

⁴² Field 6 February 1886 p.160. Willis-Bund's feelings concur with those of Michael Foster quoted above. *Vide supra* p.248.

Finally, it is perhaps no coincidence that once Maitland's success at Howietoun had become more widely known after the publication of the History of Howietoun in 1887, protests about the lack of state support for fish culture seem to have disappeared.

Indeed, it should be noted that those who yearned for the British Government to imitate the United States in its support for pisciculture do not seem to have realised that the problem of fishery depletion was probably much greater on the other side of the Atlantic. British fisheries, though affected by over-fishing and the like, were ultimately owned by an individual or individuals who could take action against such problems. In North America, on the other hand, fisheries were public property and open to all. As the Field put it "there the freedom and independence of the citizen resulted very much in the extinction of the fish, and when the states began to make laws for their preservation, it became necessary to restock a large portion of the waters."⁴³ It should also be borne in mind that the size and federal nature of the United States required some form of central government involvement in the issue. As Professor SF Baird, the United States Commissioner of Fish and Fisheries, wrote to the Speaker of the House of Representatives in 1876, when applying for a \$17,500 grant, it would be pointless to expect such land-locked states as Iowa, Minnesota, Ohio or Pennsylvania to expend large amounts on artificial propagation since the fish returning from the sea along the Mississippi would largely be caught before returning to the original spawning ground in the interior states. It was thus far better to have a nationally directed and centrally

⁴³ Field 23 March 1878 p.346.

controlled effort to maximise efficiency.⁴⁴

The question of state support for nineteenth century British science is best analysed in the context of this thesis by examining fishery science in general rather than pisciculture in particular. This is achieved by a discussion of the Fishery Board for Scotland, of which Maitland was a member between 1882 and 1892. Like Howietoun, the new Board, established late in 1882 as the successor to the old British Board of the White Herring Fishery, was born out of the general late nineteenth century concern over the state of the British sea and freshwater fisheries.⁴⁵ Its remit was to superintend all the Scottish sea and freshwater fisheries, to develop their potential for food production and to investigate and attempt to remedy any perceived decline in their produce.⁴⁶

⁴⁴ The Field 29 April 1876 p.485. Indeed, in the same vein as Pollard points out that the British lobbyists tended to see the German example of state support for science through rose-coloured spectacles (*vide supra* p.243), the next chapter will attempt to demonstrate that neither was publicly funded pisciculture in the United States particularly praiseworthy in comparison to the private work at Howietoun.

⁴⁵ *Vide supra* p.38.

⁴⁶ In addition to Maitland, eight other Board members were appointed by Parliament. The members in turn appointed an Inspector of Salmon Fisheries, Archibald Young, a Secretary to the Board, Dugald Graham, and 26 fishery officers, one for each of the Scottish fishery districts. The headquarters of the Board itself were in Edinburgh. First Annual Report of the Fishery Board for Scotland (1882) p.i. Young had previously been Secretary to the old Board of the British White Herring Fishery, holding the post from Spring 1882, and had been supported by Maitland in his candidature. University of Stirling, HF/V47(ii): Letter Book 2, p.159. Maitland to Young, 21 March 1882.

At the very least, the existence of the Fishery Board itself is an indication that the British Government was willing to spend at least some money investigating a topic of national concern in the hope of beneficial results for the economy.⁴⁷ Equally, the expense of marine research, not being laboratory based but requiring costly equipment and vessels, presented a clear case for state involvement - even the most hardened Gladstonian at the Treasury could not expect a researcher to purchase his own steam ship.⁴⁸ However, the Fishery Board is a useful and interesting case study less because its existence shows that the Government was prepared to provide some money than because the amounts given were initially insufficient. The work of the Fishery Board is also important in showing how, once funds did become more readily available, as result of a constant battle between scientists and administrators over the way money should be spent, they were not always put to the best use by the Board with a resultant detrimental effect

⁴⁷ *Vide supra* p.245. In 1884, the produce of the Scottish fishing industry was valued at £3.4 million *per annum* and it directly employed 103,804 persons. The total produce consisted of £2.3 million in cured sea fish, £0.8 million in fresh, and £0.3 million in salmon. The industry operated 15,445 vessels which, including their nets, were estimated to be worth £1.8 million. Third Annual Report of the Fishery Board for Scotland (1884) p.xlv.

⁴⁸ MacLeod points out that rising demand for state aid for science in the later nineteenth century stemmed not only from the belief that British science was lagging behind that of Germany but also from the fact that the nature of science itself was becoming more expensive; new disciplines such as solar and electrical physics and meteorology required costly equipment which could often not be afforded by or, indeed, housed in small, independent laboratories. MacLeod, 'Science and the Treasury' pp.116-117.

on scientific work. At one and the same time, therefore, the Board is an example of both state parsimony in supporting scientific research, and living proof of the validity of Treasury fears that money should not be given to those who showed signs of what a Permanent Secretary to the Treasury described as "running wild, or of spending too much or of producing no result."⁴⁹

Mindful of its remit to develop the potential of the fisheries for food production, in early 1883 the new Board set up a committee for scientific investigations under the joint directorship of Maitland and Professor Cossar Ewart (1851-1933) of the University of Edinburgh.⁵⁰ Maitland and Ewart chose to investigate the main sea food fishes, beginning with a study of the life history, food distributions and migrations of the herring.⁵¹ Over the longer term, investigations were planned into the causes of the alleged decline in fishery stocks, the best means to protect young fish from destruction, the artificial propagation of indigenous species and the acclimatisation of new

⁴⁹ Alter, Reluctant Patron p.72. In 1883/84 the Board was voted £17,740 by Parliament for all its work. No specific allowance was made for scientific investigations. Second Annual Report of the Fishery Board for Scotland (1883) p.lxv.

⁵⁰ Ewart, having entered academic life in London, had previously been Professor of Natural History at Aberdeen where he had founded a small marine laboratory known as the Scottish Zoological Station. Deacon, M 'State Support for Useful Science: The Scientific Investigations of the Fishery Board for Scotland, 1883-1899' in Scheiber, HN (ed.) Ocean Resources: Industries and Rivalries Since 1800 (1990) p.7.

⁵¹ The main sea food fishes were the herring, cod, ling, mackerel, sole, plaice and flounder.

ones.⁵² Similar scientific investigations had been conducted earlier under the old White Herring Board in the 1840s and 1860s in the light of persistent claims by line and drift fishermen that the new method of trawl fishing was ruining their livelihoods.⁵³ This research, however, had been very rudimentary and suffered from a lack of continuity and financing:

Although the Commissioners [of the old Board] seem to have been perfectly conscious of the great want of information as to the habits of the food fishes, they always, as soon as the complaints ceased, abandoned the inquiries they had instituted, so that little or no useful knowledge was gained; and as a result sooner or later a new agitation began amongst fishermen, to be followed by another enquiry, or the appointment of a Commission, and so it has continued until the present day. Had the Board been provided with the necessary [government] funds to carry on continuous investigations ... not only would an immense amount of valuable information have been obtained but the great expense of Commissions of Enquiry might have been avoided.⁵⁴

This tradition of poor financing did not bode well for Maitland and Ewart's scientific researches. Whilst the Act of Parliament which had created the new Fishery Board empowered it to undertake scientific investigations, nothing was said about the financing of these researches over and above amounts taken from the herring brand surplus.⁵⁵ Indeed, the Act stressed

⁵² First Annual Report pp.xvi-xix.

⁵³ *Vide supra* p.44.

⁵⁴ Second Annual Report p.xv.

⁵⁵ The Herring brand was the official accreditation of quality stamped on herring barrels by the Fishery Board. A fee was charged to herring merchants for the stamp with the Board's income therefrom usually exceeding its administrative expenditure. The subsequent surplus, which came to £2,400 in 1883, technically had to be surrendered to the Treasury but, in
(continued...)

that the Board should "take cognisance of everything relating to the coast and deep sea fisheries of Scotland, and take measures for their improvement as the funds under their administration and not otherwise may admit of."⁵⁶ Maitland and Ewart's scientific investigations therefore ran into financial trouble from the start, £115 granted to them from the herring brand surplus proving quite insufficient.⁵⁷ Appeals to the Treasury, "the Dread Department,"⁵⁸ for more funds and for the loan of a steam ship from the Admiralty for hydrographic work fell on deaf ears. The Board's first Report commented

it is to be hoped that the Lords of the Treasury will yet see their way to grant our request, for, if the investigations could be set on foot at once, we are confident that important results could be obtained ... there is no doubt that, with increased government assistance, much might be done in this direction for the development and improvement of our fisheries.⁵⁹

The Treasury did agree to allow the Board one month's use of the gunboat HMS Jackal in August 1883, but Maitland and Ewart had to cover the

⁵⁵(...continued)
practice, was retained by the Board, an equal amount being deducted from its parliamentary vote in the following year. It was used by the Board firstly for fisheries improvement, for example harbour and telegraph extension, before any moneys could be given to fund scientific investigations. Moreover, Treasury sanction had to be sought before money could be diverted from the surplus funds towards scientific work. Ibid. p.lxv.

⁵⁶ Ibid. p.xix.

⁵⁷ First Annual Report p.xxix.

⁵⁸ Sir William Flower, Director of the British Museum's Natural History Section (nd).
Quoted in MacLeod 'Science and the Treasury' p.188.

⁵⁹ First Annual Report p.xx.

expenses of both themselves and their assistants in researches conducted.⁶⁰ The vessel arrived so late in the fishing season that Maitland and Ewart did not have time to make proper arrangements but did manage to make rudimentary investigations in the Moray Firth herring spawning banks, taking temperatures and water and sand samples.⁶¹ After repeated appeals by the Board, the Treasury was forthcoming with a £335 grant towards fitting a small coastal laboratory in a disused St Andrews fever hospital, but Maitland and Ewart found this "quite insufficient, ... [the Treasury] ... failing to appreciate the importance of the scientific work of the Board."⁶² A request for a further £300 to fund investigations on the west coast in late December 1883 was refused and in mid January 1884 the Treasury stated that unless the Board "could suggest the diversion of a portion of the herring brand surplus to meet these expenses ... the investigations should at once be

⁶⁰ Second Annual Report p.xx. This ties in with Lowe's view as Chancellor of the Exchequer (*vide supra* p.241) that the state should not fund anything that could be financed from elsewhere. The fact that Maitland and Ewart were *expected* to use their own money in public work - and that they in fact did - strikes a fascinating contrast with equivalent research today. Nevertheless, the fact that Maitland and Ewart could afford to offer their own money is an example of Brock's argument that science did not necessarily suffer because of a lack of state aid. *Vide supra* p.247.

⁶¹ Second Annual Report p.xx-xxii. The report noted that "almost everything has still to be learned regarding the habits and life history of our food fishes."

⁶² *Ibid.* p.xviii.

suspended."⁶³ The Board reluctantly agreed to this, diverting £785 of the surplus to scientific investigations, but expressed concern to the Treasury that the investigations were being seriously hindered by lack of financing whilst the diversion of money from the brand surplus only served to injure other worthy causes. A letter from the Board to the Treasury, dated 19 February 1884, pleaded for £1,000 to establish scientific investigations on a firm footing.⁶⁴ The request was turned down by the Treasury on 10 March with the effect that scientific investigations on the west coast ran out of finance and had to be suspended.⁶⁵ In a lecture at the Edinburgh Museum of Science and Art in

⁶³ Treasury to the Board, 18 January 1884, quoted in *Ibid.* p.xviii and also available in Scottish Record Office, Fishery Board for Scotland Papers, AF37/108: Correspondence relating to the Fishery Board's scientific investigations. In a letter of 10 December 1883, the Treasury had pointed out that "No expense must be incurred for this service [scientific investigations] during the current year which cannot be met out of this years vote for the Fishery Board ... for my Lords are not prepared to present any supplementary estimate for the Board." Quoted in Second Annual Report p.xviii.

⁶⁴ The letter urged upon the Treasury that "If the Fishery Board is worth maintaining at all, and if it is to be of any service to the valuable interests committed to its charge, it is impossible to avoid incurring expenditure of a new character." *Ibid.* p.xxviii.

⁶⁵ *Ibid.* p.xxviii. The letter of 10 March from the Treasury stated that "My Lords are not prepared to ask Parliament for a special grant of £1,000 for these investigations ... or to sanction any expenditure upon them which will cause an excess on the estimate of the Fishery Board." Scottish Record Office, AF37/108. Leonard Courtney (Treasury Clerk) to the Board, 10 March 1884.

As with the lack of state support for pisciculture, the Treasury attitude appeared even
(continued...)

April 1884, Ewart expressed his hope that "the government would be somewhat more liberal in the way of giving grants for scientific research" to the Board.⁶⁵ In June 1884, the Fishery Board sent a delegation to London (not including Maitland) to lobby the Home Secretary, Sir William Harcourt, on the need for the Board to receive an increased grant and the use of a gunboat. Harcourt told the delegation that:

They may count on his doing anything in his power to further their wishes. But it happened to the Government as to all firms that there were some partners more accommodating than others and there was one partner in the Government which he never mentioned without awe and that was the Treasury. The existence of the Government was a perpetual struggle between the departments and the Treasury, the departments desiring to spend money for extremely useful and beneficial purposes, and

⁶⁵(...continued)
 more parsimonious in comparison to the example set by the United States Government. The United States Commission on Fish and Fisheries (*vide supra* p.250), was funded to the extent that it could employ 30 skilled naturalists in a well equipped marine laboratory and had the exclusive use of a purpose built steam ship worth £60,000. In 1882/3 alone, the Commission was given £40,000 from the Federal Government in addition to £24,000 from State Governments. The Fishery Board believed that the head of the Commission, Professor SF Baird, got "whatever assistance he requires." Second Annual Report p.xxxi. Such feelings were heightened after Ewart visited North America in 1884 on a fact-finding mission. Ewart, J 'Report on the Progress of Fish Culture in America' in Third Annual Report.

Late in 1884, the scientist Lyon Playfair wrote to The Times that:

in the United States all the departments of the government cordially cooperate in fish culture. ... In Scotland we have a Fishery Commission willing and able to make experiments, but the Admiralty cannot find a vessel to make dredging experiments, and the Treasury cannot find £1,000 to carry out important researches only half complete.

Quoted in Stirling Saturday Observer 15 November 1884 p.3.

⁶⁶ Stirling Saturday Observer 12 April 1884 p.2.

the Treasury resisting their demands. That was the normal condition of affairs.⁶⁷

The problems of poor finance continued through 1884 with only rudimentary observations on the life history of the herring being carried out. Ewart had to hire and man a small steam yacht at his own expense in order to prosecute research for the Board. On 18 August 1884, Maitland and Ewart applied through the Board to the Treasury for a total grant of £2,200 to fund the construction of two small laboratories on the east and west coasts (£1,200) and for ongoing scientific researches (£1,000). Over and above this, they requested a further £1,500 *per annum* for the years from 1885/6 to 1887/8.⁶⁸ This was flatly refused by the Treasury but appeals by Steven Williamson, MP for St Andrews and also a Board member, eventually persuaded it to allow £600 to be taken from the herring brand surplus in both 1884/5 and 1885/6.⁶⁹ Perhaps Maitland and Ewart erred in asking for too

⁶⁷ The Times 24 June 1884 p.9.

⁶⁸ Scottish Record Office, AF37/108. Board to Treasury, 18 August 1884. The Board believed these sums to be "even in their aggregate extremely small" in comparison to the amount of aid given in the United States and, moreover, it stressed, were to further a cause of "imperial importance." The Times reported of the letter that the Board was trying to win over the Treasury where the Lords "continue to harden their hearts." The Times 21 August 1884 p.8.

⁶⁹ Scottish Record Office, AF37/108. G Barrington (Treasury Clerk) to Board, 2 September 1884. It should be noted that whilst the Treasury flatly refused to fund any expenditure on laboratories, it did note in reply to the Board that "on receipt of full information, they [the Lords of the Treasury] might not be indisposed to sanction the expenditure of so much of the estimated cost of research as may be entirely independent of the proposed laboratories."

much at once; modern historians point out that the Treasury was often frightened off by the prospect of being dragged into open-ended or long-term funding arrangements which the construction of permanent laboratories seemed to threaten. It was not possible to be sure of balancing the books three years hence and scientists who asked for money in advance were seen as trying both to have their cake and eat it.⁷⁰

The £600, of course, fell far short of Maitland and Ewart's expectations, and investigations continued to be hindered by a lack of finances. Appeals for more financial support for scientific investigations continued and, surprisingly, in late September 1884, the Treasury finally approved a grant of £1,000 for 1884/5 and a further £1,500 for 1885/6.⁷¹ Evidence in MacLeod's essay on the way the Treasury dealt with requests from scientists for state aid suggest that the new funds for the Board may have been given on the assumption that the work would soon fail and that any requests for aid in the future could therefore be refused. MacLeod quotes the response of First Class Treasury Clerk, F A'Court Bergne, a character whose "negative attitude tended to sour everything he touched," and who had been appointed to a post with direct responsibility for such scientific expenditure in 1884. Faced with applications for funds from both the Fishery

⁷⁰ Deacon, 'Crises and Compromise' p.19. Maitland had initially suggested that the Board petition the Treasury for £3,000 for 1885 alone. University of Stirling, HF/V48(ii): Letter Book 4, p.107. Maitland to Ewart, 23 November 1884.

⁷¹ Scottish Record Office, AF37/108. G Barrington (Treasury Clerk) to Board, 25 September 1884.

Board and the Marine Biological Association, which was desirous of opening a biological laboratory, Bergne wrote to a colleague in November 1885 that

I do not believe that any addition to the food supply will be secured by anything that is done at the Biological Laboratory. ... I don't believe that a single herring or sole will be caught the more for all the Association's efforts. But if we find that there is duplication of work we may cut down the expenditure on both bodies; for this reason it is necessary to know what they are doing ... and be in a position to stop the Fishery Board from trying to begin abstract studies. ... After a year or two I expect to find a consensus of opinion among practical men that neither body has done any good at all; if we then put them to proof we may get rid of the grants to them both.⁷²

Whatever the Treasury's motives, the work of the scientific committee received a further boost with the publication of the report of the Trawling Commission in 1885.⁷³ The resultant 1885 Sea Fisheries (Scotland)

⁷² Quoted in MacLeod, 'Science and the Treasury' pp.147-148.

⁷³ By 1885, there were 3,000 trawlers operating in British waters, with a capital stock of £15 million and an annual catch of £3 million worth of fish. The rise of trawling had resulted in huge complaints from more traditional fishermen that the trawlers were exhausting the fish supply and ruining their nets. As Liddell put it, it was "as though the tram cars of a prosperous line were not content with running omnibuses and carriages off the road, but actually ran them down as well." So many complaints and representations were made about trawling to the Board of Trade that, in 1883, a Commission was appointed to look into it. The strength of the feelings of traditional fishermen against the trawlers was well illustrated in the various hearings held by the Commission around the country. One witness insisted that "a woman in Aberdeen got the jaundice through eating fish caught by the trawlers," whilst another told the Commission that "there is a lot of the scum of Hull" on the trawlers; he believed that even "a soldier can be a trawler fishermen." The report of the Commission, published in 1885, came to the preliminary conclusion that many fishing grounds were
(continued...)

Amendment Act both empowered and financed the Fishery Board to investigate the effects of different modes of fishing, mainly trawling, on fish stocks.⁷⁴ An average £2,000 *per annum* was given by the Government to fund scientific investigations from 1885.⁷⁵ This can be seen as another example of Alter's argument that the Treasury was far more benevolent with research funds once it had been proven that research was actually needed and was likely to produce nationally beneficial results.⁷⁶ Deacon points out that nineteenth and early twentieth century marine stations, for example, received more aid, and were far more likely to survive, if they abandoned pure research

⁷³(...continued)

suffering from declining fish takes, though it could not determine whether trawling was the cause of this. It recommended that the Government finance and empower bodies such as the Fishery Board for Scotland to undertake further researches in this direction. Liddell, AGC 'The Trawling Commission and our Fish Supply' Blackwoods 137 (1885) pp.656-672.

⁷⁴ Under the Act (48 & 49 Vict. c70), the Fishery Board was empowered and funded to "make experiments with the view of ascertaining whether any particular mode of fishing is injurious."

⁷⁵ Scottish Record Office, AF56/1473. Correspondence relating to the Fishery Board's scientific investigations. Note of Parliamentary Question on the Board's funding, 20 April 1888.

⁷⁶ Alter, Reluctant Patron p.66. This, of course, is not to deny that the state can be seen as parsimonious and short-sighted in failing to endow pure research projects which could have produced a significant economic or social return in the long run. In another article, Alter quotes the 1905 view of Richard B Haldane, a future war secretary, on the desire for science to produce immediate results: "Our people like to see cash over the counter, and they do not like to wait for deferred payment." Alter, 'Science' p.272.

in marine zoology and stuck instead to more applied research in fishery sciences.⁷⁷

The Board was now able to take on premises and staff for scientific work. It purchased its own research ship, the Garland, and in 1885 carried out trawling experiments, involving closing waters to fishermen, along the east coast.⁷⁸ Interestingly, but ironically, however, the new funds did not see the scientific work established on a firmer footing since the period of more generous financing was soon upset by quarrelling between Maitland, Ewart and the other Board members over the way in which funds were to be spent.⁷⁹ In 1887, the majority of the Board became unhappy with Maitland and (particularly) Ewart's conduct on the Board's committee with

⁷⁷ Deacon, 'Crisis and Compromise' pp.19-47. Deacon notes: "only these [fisheries problems] attracted the grants essential for their survival" but she goes on to record that several stations still floundered because the absolute amount of money available was not enough.

⁷⁸ Experiments were carried out in the Firth of Forth and in St Andrews Bay which involved closing certain parts of the waters to trawlers and then assessing relative takes between open and closed areas. Over 10 years, the Board determined that catch fluctuations between open and closed areas largely correlated with each other and that it could not firmly be said that trawling was injurious to fish stocks. Wemyss-Fulton, T 'Review of the Trawling Experiments of the Garland in the Firth of Forth and St Andrews Bay in the Years 1886-1895' Fourteenth Annual Report of the Fishery Board for Scotland (1896) pp.128-149.

⁷⁹ This is not to say that financial problems ceased, only that they became easier to deal with. A particular problem encountered by the Board was that the Garland proved very expensive to run and there were also difficulties in replacing scientific staff who left the Board's service. Deacon, 'State Support' p.11.

responsibility for scientific investigations. They believed them not to be accountable enough to the Board as a whole and their researches to be slanted too heavily towards what Ewart wanted to do as a university professor rather than to what needed doing for the benefit of the Scottish fisheries, as required under the Board's parliamentary remit. It was claimed that the pair had spent so much of their endowment on their own interests that it had been necessary to suspend the very trawling work for which the money had been given. On 29 March 1887, ignoring Maitland and Ewart's opposition, the remainder of the Board voted to end their control over scientific investigations and to replace them with a salaried scientific superintendent who, as an employee rather than a member of the Board, would be subject to the authority of the Board as a whole.⁸⁰

The feelings of the majority of the Board against Maitland and Ewart are summed up in a letter written by one of its members, Guthrie-Smith, the Sheriff of Aberdeen, to the Secretary of State for Scotland, Lord Lothian, on 6 April 1887.⁸¹ The problems of which he speaks serve as an example of why the Treasury might have had good reason to be wary of granting requests for scientific funding:

The proper spending of public money by a public department on what is called 'science' is manifestly a difficult question in public administration. A parliamentary grant to a scientific society or scientific commission is an expression of sympathy with the

⁸⁰ It should be noted here that the Minute Books of the Board for the entire period of Maitland's membership, 1882 to 1892, are missing. *Vide supra* p.16.

⁸¹ The Board's responsibility, initially to the Home Secretary, was transferred to the Secretary of State for Scotland when that office was set up in 1885.

object; it is spent or misspent and there is an end to it. But a vote to be administered by a public department stands on a different footing, for the department is responsible to Parliament and to the country for what is done with the money like any of the expenditure in the public service.

Guthrie-Smith went on to discuss how Maitland and Ewart had been appointed joint directors of the scientific department "on the express condition that no expenditure should be incurred beyond the amount set forth in a scheme which had been submitted to and approved by the Board and that every month the directors would bring up a printed report for the information of the Board." These reports were never furnished and scientific investigations appeared to have "drifted into a system under which all its functions ... were practically delegated to two of their number, [ie Maitland and Ewart] the information being furnished to the other members being altogether inadequate compared with the extent of their public responsibility." Accordingly, in planning the next year's scientific work, the rest of the Board had decided that "it was plainly impossible to continue a system which never had been intended, and which in principle was altogether objectionable."⁸²

Maitland and Ewart were furious at the intended usurpation of their

⁸² He felt that Maitland and Ewart should not feel slighted by the rest of the Board's wishes and hoped "that they do not suppose for one moment that there was any wish to deprive them of their just influence in the conduct of our scientific investigations, to which from their abilities and scientific knowledge they are so well entitled." He stressed that they would continue to have a say "but it will be as members of the Board, not as the Board and the other members will be fully informed of what is intended to be done and how much it is to cost before they are committed to expenditure." Scottish Record Office, AF56/1473. Guthrie-Smith to Lord Lothian, 6 April 1887. Emphasis is Guthrie-Smith's own.

power over scientific investigations and themselves wrote to the Scottish Office. In a joint letter, they turned the argument of the majority on its head, arguing that there were no problems with their conduct of the scientific work and that it would be unwise to grant control over it to the whole Board since they alone, as the only scientists on the Board, were qualified enough to direct it. Indeed, they felt that "it could only be through a want of intelligent interest [among other members of the scientific committee] that practically two members came to be the committee." They felt that the appointment of a paid superintendent would be unwise since he would not have the high-ranking background and access to laboratories, staff and students that Ewart had at the University of Edinburgh. Furthermore, they asserted that, because he would not be a member of the Board, he would have no authority to command the assistance of other Board employees, such as the Fishery Officers. In any case, it was claimed that investigations had run into financial difficulties not because of frivolous spending but because the fitting out of the Garland had cost nearly £400 more than expected. They accepted that no formal report of the work had yet been prepared but pointed out that "it is hardly correct to state that a report was never furnished, Professor Ewart from time to time laying reports on the table." A formal report would be provided once results had been collated and worked out.⁸³ Lothian appears to have taken Maitland

⁸³ Scottish Record Office, AF56/1473. Maitland and Ewart to Lothian, 20 May 1887. The letter concluded that Maitland and Ewart felt it "most proper that the Board should be fully informed of the nature of the scientific work proposed and of its progress from time to time."
(continued...)

and Ewart's side in the argument and asked the Board not to proceed with its new plans for scientific investigations, pointing out that, in any case, it was nearing the end of its first 5 year term of office and would be reconstituted at the end of 1887; any amendments to procedure should therefore be deferred until the new Board took over.⁸⁴

⁸³(...continued)

But they "could not ensure their clearly understanding the relative importance of the various enquiries."

⁸⁴ Scottish Record Office, AF37/108. Lothian to Board, 31 May 1887. On receiving Maitland and Ewart's letter, Lothian had commented: "It is difficult to see how a non-scientific body can direct scientific investigations." Scottish Record Office, AF56/1473. Lothian's notes on the content of Maitland and Ewart's letter.

The discrepancy between the opinions of Maitland and Ewart on the one hand and of the rest of the Board on the other was 'leaked' in some way and became a matter of debate in Parliament. On 14 July 1887, Mr Laing Brown MP asked the Lord Advocate to explain the matter to the House of Commons and to lay on its table all relevant correspondence. To this the Lord Advocate replied that it could "only be by distinct breach of official confidence that materials for such a question ... can be obtained; and it is not usual to present to Parliament confidential communications regarding [such] matters." The Scottish Office requested that the Board seek out the person guilty of 'leaking' the information but he was not found. AF56/1473: Extract of written Parliamentary Question tabled 14 July 1887 and Scottish Office telegram to the Board, 12 July 1887.

Controversy over the issue continued after the reconstitution of the Board in December 1887. One of the retiring members, James Grieve, wrote to the Secretary of State on 29 February 1888 complaining that "having served faithfully on the Board for five years he expected some expression of thanks on his retirement and criticises at length the management of the scientific work of the Board and the action of the Secretary of State in connection therewith." He added that he reserved his right to publish official correspondence on the matter that had been copied to him during his time on the Board and which he had retained since leaving. AF56/1473. Scottish Office clerk's notes on Grieve's letter of 29 February. Having read the letter, the Lothian commented "This is an unpleasant letter" and his secretary, Cochran-Patrick, remarked "If you come to consider the matter, it is a very strong thing to abstract letters from official records and then publish them - if this were
(continued...)

When the Board was reconstituted in December 1887, the *status quo* of the scientific work in fact remained largely unchanged. Scientific investigations were placed in the charge of a four-man Scientific Report Committee - responsible for preparing the scientific part of the Board's annual reports to Parliament - of which both Ewart and Maitland were members. In practice, the direction of the scientific work continued to be left largely to Maitland and Ewart whilst the idea of appointing a salaried superintendent under the direction of the Board as a whole was dropped. In 1888, a marine scientist, Wemyss-Fulton, was appointed as a salaried scientific secretary but served under the direction of the Scientific Report Committee alone and not under the authority of the Board as a whole. The Scottish Office was pleased to see the appointment of the Scientific Report Committee, Cochran-Patrick, Lord Lothian's secretary, noting that "This is a step in the right direction and might have been done some two years ago with advantage." Lothian himself noted "This is very satisfactory."⁸⁵

⁸⁴{...continued)
permitted the public service would become intolerable." The Scottish Office replied on 12 March, telling Grieve that it refused to discuss official matters and pointing out that publishing the correspondence would be a breach of confidence. On 30 March, Grieve replied, announcing his decision to publish the correspondence "as he does not think he has been well treated." At this Cochran-Patrick wrote the Secretary of State "I think the best course is to let the matter drop - if Mr Grieve publishes the correspondence he will injure his own credentials more than anybody else's." The Secretary of State agreed: "I entirely concur. This may be troublesome - but I am disposed to take no further notice." AF56/1473. Scottish Office notes on Grieve's correspondence.

⁸⁵ Scottish Record Office, AF56/1474: Correspondence relating to the Fishery Board's Scientific Report Committee. Scottish Office notes on letter from Board to Lothian, 5 April 1888.

In 1889, however, trouble flared when the rest of the Board, this time including Maitland, again became unhappy with Ewart's overly-independent conduct of the scientific work. Maitland, having once bitterly resented the idea of placing scientific work under the authority of the Board as a whole, now appears to have taken the lead in usurping Ewart's control. On 27 August 1889, he wrote to the Board

requesting that the position of the Scientific Report Committee be brought before the Board as he feels that the time has come when the scientific part of the Board's work should be placed on an intelligible footing either as a committee of the whole Board with a skilled secretary or a small committee of three individuals.⁸⁶

A special committee of investigation was set up to report on Ewart's work and, in October 1889, concluded that he was indeed acting too independently, arguing that he had seriously hindered scientific investigations, depriving them of a firm programme by dallying between different subjects of interest to him and failing to commit resources to one large laboratory but several small ones.⁸⁷ Ewart, they believed was too concerned with his

⁸⁶ Scottish Record Office, AF37/1475. Quoted in 'Report on the Position of the Scientific Report Committee', 29 October 1889. Maitland does appear to have taken back seat role to Ewart in scientific investigations, his only contribution to the Board's publications being a short article in 1889. Maitland, JRG 'Notes on the Intercrossing of Members of the Genus *Salmo*' Seventh Annual Report of the Fishery Board for Scotland (1888) p.383. *Vide supra* p.94 for details of Maitland's hybridisation experiments at Howietoun.

⁸⁷ Scottish Record Office, AF37/1475. 'Report on the Position'. Though the main part of the Board's scientific work was devoted to trawling investigations, Ewart was also investigating the sizes of immature and mature fish, the distributions of fish of varying ages
(continued...)

academic work and not with the work required for the benefit of the Scottish fisheries; the Board wanted "less of the Professor and more of the Public Official."⁸⁸ Even whilst under investigation by the committee, Ewart had aroused the anger of the other Board members when, in September 1889, he had sanctioned the expense of £166 on the building of a temporary laboratory at Dunbar without first seeking the approval of either the Scientific Report Committee or the Board as a whole.⁸⁹ In November 1889, the Scientific

⁸⁷(...continued)

in both inshore and offshore waters, the food of fishes, the spawning periods and requirements of the edible fishes, the relative proportions of the sexes amongst edible fishes, the migratory movements of fishes, the relative value of different baits and the possibility of devising artificial substitutes, mussel and bait beds in the Forth, the hatching and rearing of lobsters, the pelagic fauna and invertebra of the sea bed, the embryology and development of food fishes, and micro-organisms in river water. AF37/108. 'Statement by the Scientific Report Committee of the Fishery Board for Scotland on the Scientific Work Carried on During 1888'. Clearly, not all of these can be taken as having an immediate practical relevance to the Scottish fisheries and the determination of the effects of trawling.

⁸⁸ Scottish Record Office, AF37/185. Board to Lothian, 24 December 1889. Early in 1890, the Board accepted a resolution tabled by Maitland to the effect that "hitherto too large a portion of [the] grant has been expended on investigations of a purely scientific but not immediately practical nature." AF56/1475. Board to Lothian, 1 March 1890.

⁸⁹ Ibid. 'Report on the Position'. Ewart's sanctioning of the expense was found to be "grossly irregular and so large an expenditure ought not to have been incurred without the sanction of the Board." The special committee of investigation believed "that if a systematic plan had been originally adopted and adhered to, the Board would now have been in possession of at least one thoroughly equipped laboratory for scientific fishery work." Deacon
(continued...)

Report Committee was found to have accumulated a £378 deficit.⁹⁰ As Deacon puts it, "the outcome had been just the kind of self-indulgent behaviour that many had feared if research funds became freely available."⁹¹ It was thus decided that control of the scientific work be placed in the hands of Wemyss-Fulton, the scientific secretary, who would act under instruction from the Board as a whole.⁹² Despite Ewart's protestations, both to his colleagues and to the Secretary of State, the Board accepted the conclusions of the committee of investigation and relived him of his scientific authority.⁹³ After this rather remarkable *volte-face* in his opinions, Maitland appears to

⁸⁹(...continued)

comments that Ewart was an enthusiastic scientist with no time for, or perhaps no understanding of, the requirements of administration and accountability. Deacon, 'State Support' p.11.

⁹⁰ Scottish Record Office, AF37/1475. 'Report on the Position'.

⁹¹ Deacon, 'State Support' p.11.

⁹² Scottish Record Office, AF37/1475. 'Report on the Position'.

⁹³ Scottish Record Office, AF37/185. Ewart to Lothian, 18 November 1889. Note that Ewart's protests to the Scottish Office made great play on the amount of his own money which had gone into prosecuting research for the Fishery Board. He pointed out that he had expended over £1,000 from his own pocket; in 1884 he had bought a steam boat for researches at a cost of £300 but the money had proved wasted since the Board was unable to pay for vital repairs and the boat sank in Tarbert harbour in 1885. Commenting on Ewart's protests, the Board pointed out that his using his own money would never have been necessary if there had been "a proper system of managing our scientific vote." It suggested that Ewart had had to spend the money as a result of his "making the Board, of which he is a member, an appendage of the chair, of which he is professor." AF37/185. Board to Lothian, 24 December 1889.

have taken a back seat role on the Board since there is no further evidence available to document the remainder of his period in office up to December 1892.⁹⁴

Nevertheless, before concluding, it is interesting to note that the Stirling Saturday Observer records an incident involving Maitland, which occurred after he left the Board in December 1892 and which is indicative of the kind of in-fighting which took place whilst he was still a member of the Board. The appointment of the new Board chairman, Mr Esslemont, formerly the MP for East Aberdeenshire, in 1892, led to a by-election in his constituency. During the campaign, the defeated candidate, Colonel Russell of Aden, claimed that Esslemont planned to rescind the previous Board's ban on trawling in the Moray Firth. Esslemont denied this, but Russell repeated the charge, claiming that he had been told by Maitland that Esslemont had stated this intention at a meeting of the Board. An 'Inquirer' wrote to the Stirling Saturday Observer asking Maitland to state whether he had told the truth but the latter remained silent.⁹⁵ The matter refused to die down and, in March 1893, questions were asked in Parliament. The Lord Advocate told Parliament that he believed Esslemont's denial to be "absolutely conclusive" and pointed out that:

⁹⁴ Ewart was replaced on the Board in 1892 by Professor William Carmichael M'Intosh who had earlier advised the Board whilst working as a biologist at the University of St Andrews. This drawing by the Board on the skills of academics highlights what Sanderson sees as "one of the most successful linkages of Scottish university science with its home industry." Sanderson, M The Universities and British Industry, 1850-1970 (1972) p.164. See also Gunther, AE The Life of William Carmichael M'Intosh (1977).

⁹⁵ Stirling Saturday Observer 31 December 1892 p.4 and 14 January 1893 p.4.

The Fishery Board, like all other similarly constituted administrative bodies, holds its meetings in private, and all that passes there is confidential except for the ultimate decision at which the Board arrives. For a member of the Fishery Board to bring before the public what he states to have passed at the Board with the object of casting on a colleague a reflection, whether that colleague is the chairman or not, is neither more nor less in accordance with the rules observed in public business and public life than if a member of the Board of Admiralty was to give his version of what passed in the confidence and privacy of the board-room in order to attack a colleague.⁹⁶

In conclusion, this brief case study of the scientific work of the Board can be seen to support arguments both that the British Treasury was niggardly and that it had good reasons for being so. Certainly, the Board's researches were severely hindered in the early years by a lack of financing. But, equally so, some extra money, however limited, was forthcoming after persistent appeals. Of course, one could say that the Board should have been given more in those early years but, after all, how much is enough? Within the confines of late nineteenth century Gladstonian finance, the Fishery Board for Scotland certainly does not seem to have fared badly; it is an excellent example of a more benevolent Treasury approach to 'useful', applied science. Yet, when the Board was endowed with more money, complaints about the lack of finance were replaced by complaints that the resources given were being wasted because research was unplanned and uncontrolled. This was the very

⁹⁶ Stirling Saturday Observer 4 March 1893 p.3. The matter was then laid to rest, the newspaper noting that "Probably the Convenor of Stirlingshire now realises there are things which are better left unsaid." Perhaps it was for the protection of the "confidence and privacy of the board-room" that the minute books of the Board for the 1882-1892 period have disappeared. *Vide supra* p.16.

nightmare scenario that put the Treasury on its guard against requests for the funding of scientific research in the first place. Perhaps the problems arose because scientists were unaccustomed to being reasonably well funded whilst, at the same time, the Treasury was not yet well versed in ensuring that its resources were spent appropriately.⁹⁷ There seems no better conclusion than that offered by Deacon, the most recent and thorough of the Board's historians, who stresses the uniqueness of the Fishery Board example in that its problems "stemmed at least partly from having too much money at its disposal, instead of the reverse as was usually the case. ... both sides still had a lot to learn about the administration of institutional science."⁹⁸

⁹⁷ The Board had written to the Scottish Office that it "considered that the scientific work should be dealt with by them as an administrative body like any other branch of their administration. Professor Ewart, on the other hand, held that science was not for an administrative body at all but for the scientific members who should be allowed to have their own way. They have had their own way and the consequence is seen in the very unfortunate state of matters now disclosed." Scottish Record Office, AF37/185. Board to Secretary of State, 24 December 1889.

⁹⁸ Deacon, 'State Support' p.13. In a similar vein, the Fishery Board case study is an excellent example of both of the "major stumbling blocks" that MacLeod sees in the path of increased state aid to science from the Treasury - "the widespread inability of civil servants to appreciate the difficulty, purposes, and ultimate value of fundamental research" and "the inability of men of science to recognise the difficulty and necessity of accountability." MacLeod, 'Science and the Treasury' p.160. Elsewhere, he noted how, in the present day, "we have become accustomed to situations where scientists urge the social utility of science when asking for public money, but defend the social autonomy of science while spending it." MacLeod, 'Resources' p.112.

Chapter Nine

MAITLAND'S LEGACY

The results of fish culture as applied to the salmonidae were in general very meagre, ... now, with fuller knowledge, I only wonder that any results were obtained.¹

Sir James Maitland took up the study and practice of pisciculture as an amusement at first, and he has followed it as an enthusiast; and the knowledge which he has obtained, and which he so lavishly discloses ... places him not only in the foremost rank, but at the head of the great body of modern pisciculturalists. Were an international society of pisciculturalists established, he would by his knowledge worthily occupy the post of President. ... Sir James has made a multitude of valuable discoveries in the science. ... We are sorry that we cannot deal with it more definitely but the *embarras des richesses* is too complete and full.²

Discussion this far has analysed Maitland's work in the context of the advances in fish cultural technique made at Howietoun and as a businessman in the light of historical theses on the failure of the late nineteenth century entrepreneur. This chapter looks at his impact in a broader perspective, beyond the confines of both Howietoun and his own lifespan. It assesses Maitland's contribution to piscicultural development from the late nineteenth century onwards, looking at his role in resurrecting what was in fact becoming a defunct scientific experiment and assessing the real success of his pisciculture in dealing with the perceived decline in late nineteenth century freshwater fishery stocks. His contribution is then examined in a more global context, particularly in comparison to United States fish culturists who have

¹ Maitland, JRG The History of Howietoun (1887) p.ix.

² Field 30 June 1883 p.883.

traditionally been seen as the real piscicultural achievers of the period. Having argued that Maitland does play an important role in piscicultural history, the chapter concludes with a brief analysis of why this role has hitherto gone unrecognised.³

The discussion in Chapter Two of the factors which motivated Maitland towards a piscicultural career noted the existence of a mid nineteenth century British 'climate' for pisciculture. It demonstrated that this climate was the product of the very general perception that freshwater fishery stocks were declining and was supported in no small measure by the work of vociferous 'piscicultural propagandists,' such as Frank Buckland, who had personally suggested to Maitland that he take up pisciculture.⁴ Many, from the landed elite with fisheries of their own to small groups of working class anglers with buckets of tap water in their backyards, were encouraged to attempt fish culture. It was held to be an easy process with which "at the cost of only a few pounds," it was possible to turn a "useless stream of clear running water into a vivifier of thousands of fish."⁵ Pisciculture was, they believed, "the Alpha and Omega of salmon preservation, as if the whole secret of the salmon fishery problem were summed up in the injunction, 'First hatch your salmon

³ The chapter also shows how Maitland's benevolent entrepreneurship - the spreading of piscicultural good practice - actually worked in encouraging others to take up fish culture on a large, professional scale.

⁴ *Vide supra* p.59.

⁵ Buckland, F Fish Hatching (1863) p.219. Buckland's 'backyard and tap water' piscicultural apparatus is pictured on page 323.

and then catch him.'"⁶

This view, and that of the piscicultural propagandists was, in fact, fundamentally flawed and naive. It is contended here that perhaps Maitland's most important contribution to piscicultural development was that he added an element of realism, putting fish culture back on the right tracks for long-term success and resurrecting it from what became a climate not of enthusiasm but of apathy and despair. The proponents of pisciculture, including more educated and influential men such as Buckland, looked only as far as the myriads of tiny fry hatched out using the essentially easy process of artificial fish propagation.⁷ Pre-Maitland piscicultural experimentalists found that, under artificial propagation, an average of 50 *per cent* of the incubated eggs successfully *hatched* and this was compared to the situation in the wild where only one egg in every thousand (0.1 *per cent*) ever reached *maturity* as an adult fish.⁸ In comparing two rather incomparable statistics, they took no account of the survival rate of the fry once they had been returned to their natural environment.⁹ The belief that a nation of amateur backyard

⁶ Fryer, CE The Salmon Fisheries (1883) p.69.

⁷ *Vide supra* p.57.

⁸ Buckland, Fish Hatching p.13 and Robertson, IA The Tay Salmon Fisheries in the Nineteenth Century, Unpublished PhD thesis, University of Stirling, (1989) p.15/36.

⁹ Those uninformed on pisciculture were particularly amazed when they heard stories of fish being raised from the ova of dead or diseased salmon, failing to realise that the life of the parent was irrelevant providing that the eggs dispelled were alive since fertilisation and incubation took place out of body. When Joseph Napier of the Forth Salmon Fishery Board
(continued...)

pisiculturalists could solve the problem of declining fishery stocks naively failed to appreciate the need for pisciculture to go one better than nature by producing fish that were healthier and stronger than those in the wild and which were thus more capable of winning the battle to survive to maturity. It was not realised that quality was more important than quantity. Nor was it realised that pisciculture could only make a real impact if practised on a large scale with an output of millions, rather than hundreds or thousands, of ova.¹⁰

Naivety leads to disappointment; by the time that Maitland began his work in the 1870s, enthusiasm for pisciculture was dissipating rapidly because the early experimentalists had failed to produce any large scale or long term improvement in freshwater fishery stocks. Predictions of streams, rivers and lakes teeming with artificially propagated fish remained unfulfilled. Widespread apathy prevailed towards pisciculture and the numbers involved went into steep decline. Even the larger and more professional establishments fared badly; when the Tay's piscicultural establishment at Stormontfield was established in 1853, for example, the Stirling Journal and Advertiser

⁹(...continued)

hatched ova taken from a dead salmon, for example, the Stirling Saturday Observer enthused "it is hoped that such an important discovery will not be lost sight of in future efforts to stock our salmon rivers." Stirling Saturday Observer 15 March 1884 p.3 and 29 March 1884 p.3. This simple experiment still met with amazement some forty years later when one observer commented "It is almost beyond belief what was actually done on one particular occasion with a dead female salmon." Derrick, OP Salmon Fishings on the River Forth (1922) p.22.

¹⁰ See Robertson, The Tay Salmon Fisheries p.480.

applauded the move and noted that "there is not the slightest doubt ... that the residents in the vicinity of the Tay will, in due time, reap their reward."¹¹

Twenty years later, however, The Times could only assert that the operation had "slightly augmented the produce of Tay salmon."¹² The propagandising of pisciculture was replaced by a belief that "any attempt at fish breeding will be a waste of money and will give no tangible return for the outlay."¹³ A writer in the Fishing Gazette, Greville Ffennell, lamented of British pisciculture that:

the return for capital and labour expended has not been remunerative. There have been literally millions of the fry of salmon and trout poured into the Thames, and many thousands into the river Lea, yet up to the present moment even the most sanguine and zealous pisciculturalists will but admit that such vast numbers have not as yet made any appreciable mark or apparently added a single 'take' to the returns of the angler.¹⁴

Just as Maitland was beginning his piscicultural work in 1873, a writer on the English salmon fisheries noted of Buckland's popularisation of fish culture that:

The new lights which then gained a conspicuous place in the government of fish may burn more and more brightly. But still there has been much hope deferred. The sanguine predictions of teeming rivers and propagations, indefinite and infinite, of the

¹¹ Stirling Journal and Advertiser 9 December 1853 p.3. *Vide supra* p.53.

¹² The Times 17 March 1873 p.7.

¹³ Field 29 December 1877 p.777.

¹⁴ Fishing Gazette 11 September 1880 p.450. The restocking of the Thames had been attempted under Frank Buckland and his piscicultural colleagues, Stephen Ponder and Mr Forbes of Chertsey.

salmonidae, have not yet been verified.¹⁵

The substance of Maitland's piscicultural advances were discussed in Chapter Three; what matters here is that he proved that pisciculture could be a success and could play a significant part in restocking, but was not of any use if carried out on an amateur scale. It was not a toy and required large scale implementation with huge inputs of time, skill and, not least, capital.¹⁶ With the development of selective breeding from a captive broodstock, he showed that the way forward was for pisciculturalists to produce healthier and stronger fish by artificial methods than those procreated naturally in the wild. Such selectively bred fish were far more likely to survive to maturity and have a real long-term effect on the size of fishery stocks. When the Duke of Sutherland had wound down his amateur piscicultural operation in failure in

¹⁵ Paterson, J 'The English Salmon Fisheries' Edinburgh Review 137 (1873) p.153. In early 1874, Buckland had written to The Times on his and Ponder's attempts to restock the Thames that "the seeds sown last winter in such abundance are just germinating into life, promising the public salmon harvests of unusual abundance in future years." The Times 21 February 1874 p.10. But, as an observer cynically noted nine years later:

For some years several hundred thousand young salmon fry were turned into the Thames by Mr Forbes of Chertsey, the late Mr Frank Buckland, and the late Mr S Ponder. But not one of those fry has ever come knocking at the door of Mr Forbes' house at Chertsey, which they ought to have done if it be true that salmon always return to the spot where they were hatched.

Fryer, Salmon Fisheries (1883) p.69.

¹⁶ As GS Libey, Associate Professor of Aquaculture at Virginia Technical College, recently put it: "Fish farming is, as are most other types of farming, a risky business that requires special knowledge, skills, and careful consideration. ... Can you really devote the money, time, and labour necessary?" Internet Newsgroup Posting, July 1994 Should You Attempt Fish Farming? Considerations for Prospective Fish Growers.

1883, for example, Maitland commented that "His Grace ... [had] ... discovered the mere hatching of eggs does not necessarily improve a river. What His Grace has yet to learn is how to hatch eggs into fish that will thrive."¹⁷ Maitland aimed to make Howietoun's "principal object ... the overturning of all the amateur ideas which have hitherto rendered fish culture comparatively barren."¹⁸ He treated the amateurism of the piscicultural propagandists with unashamed scorn:

Fish culture means increasing the food of the people and it has been cruelly wronged by the attempts so frequently made to persuade the world that a little ingenious apparatus, and a few buckets of water, are its principal essentials. ... It seems absurd to have to repeat what appear to me to be self evident truisms, but it is necessary. There are so many who, from the difficulty they find in casting off old notions, are continually dinning fallacies into the public, without the slightest attempt at proof. ... The public has nether the time nor the inclination to compare their statements with the authentic reports, and the old errors still pass as current coin. It is amusing to note that the universal tendency of these men is to ignore the old maxim, *ex nihilo nihil fit*.¹⁹

Influential people learned from Maitland's example and turned their backs on the amateurism of the piscicultural propagandists. For example, after studying Maitland's work, an editorial in The Times noted that, "While

¹⁷ University of Stirling, HF/V47(i): Letter Book, p.62. Maitland to Mr Bogie of the Loch Leven Angling Association, 8 November 1881. Emphasis is Maitland's own.

¹⁸ University of Stirling, HF/V49: Letter Book 5, p.520. Maitland to RB Marston, Editor of the Fishing Gazette, 13 March 1886.

¹⁹ Maitland, History of Howietoun p.2/p.208. He realised that successful fish culture required "far more skill than growing hothouse flowers." University of Stirling, HF/V48(i): Letter Book 3, p.203. Howietoun's secretary, Guy, to Mr WK Pomeroy of London, 17 August 1883.

encouraging the artificial hatching of salmon with a view to increase the produce of our salmon rivers we should not hold out too sanguine hopes of success unless it is carried out on a very large scale."²⁰ The article, which applauded Maitland's "good work in this respect," can be contrasted with one some 13 years earlier on Buckland's operations, to show the sea change in attitudes to piscicultural amateurism:

In spite of limited space, limited means, and various other headwinds, this enthusiastic naturalist, whose sympathies and activities seem to range over the whole animal creation, from salmon ova to the infant hippopotamus, has managed to bring into operation a small water farm of singular interest. ... This is actually the whole science of pisciculture, and by these simple means, and at a small expenditure, our rivers may be crowded with fish, costing no one a farthing for their food, and coming by mere lapse of time to be themselves the best of food.²¹

As one essay writer at the 1883 London Fisheries Exhibition realised, Maitland had shown that: "To give back to the rivers the stock they once possessed, and to vivify with fresh abundance our waste and desecrated waters, is a task requiring much intelligence, no little capital and almost infinite patience."²²

The fact that Maitland's demonstration of the need for large-scale professionalism, with attention paid to the quality of the product, paid off is demonstrated by the rise of the piscicultural professional from the 1880s.²³

²⁰ Reprinted in the Stirling Journal and Advertiser 5 February 1886 p.6.

²¹ The Times 4 August 1873 p.4.

²² Adams, WM Fisheries and Fishermen of All Countries from the Earliest Times (1883) p.60.

²³ By the same token, it shows Maitland's success in his benevolent entrepreneurial goal of demonstrating the commercial utility of pisciculture and spreading its large scale adoption.

Several large-scale piscicultural operations were founded in the 1880s and 1890s, the two most important being Thomas Andrew's Surrey Trout Farm at Critchmere in Surrey and Joseph Armistead's Solway Fishery in Dumfriesshire.²⁴ Of course, the lack of surviving evidence from other

²⁴ Both utilised domesticated broodstocks of trout and other fish. Andrews had commenced pisciculture to restock Surrey waters free of charge in the late 1870s and became a commercial trout farmer in the early 1880s. In 1889, The Times praised his establishment as "the most important ... of its kind in the kingdom ... next to the well-known hatchery of Sir James Maitland at Howietoun near Stirling." The Times 28 January 1889 p.7. See also Fishing Gazette 16 February 1884 p.74. Andrews died in late 1894 but the fishery continued in business under his heirs. Kelly's Directory of Surrey for 1899 recorded that "the trout farm, or nursery at Critchmere, consists of several fish-ponds forming a terrace of lakes, a spring supplying the necessary clear running water: in the hatchery, where the ova is developed under a steady temperature, about 3,000,000 eggs are hatched annually, and both eggs and fish are sent to parts of Great Britain and abroad." I am indebted to Elizabeth Taylor at the Surrey Record Office for this reference.

Armistead had begun pisciculture at Troutdale in Cumbria in 1868 but in 1875 had relocated his operations to found the Solway Fishery at Dalbeattie in Dumfriesshire. By 1889, when Armistead had purchased the land on which the fishery was built from Lord Herries, his fishery was "favoured with orders from all classes, from the Royal family to the schoolboy." Dumfries and Galloway Standard and Advertiser 27 November 1889 p.5. The fishery grew steadily thereafter though Armistead left the country to lead fisherman's missions from 1897, leaving it in the hands of a manager. He sold the fishery in 1908. *Ibid.* 8 January 1908 p.3. See also Armistead, JJ 'Piloted' - Being a Series of Notes and Experiences from the Author's Life (1906) in which Armistead described the role of faith in his work both as a pisciculturalist and as a missionary, and Armistead, JJ A Handy Guide to Fish Culture (1897). The Solway
(continued...)

fisheries makes it impossible to definitively state that Armistead and Andrews developed their operations on the crest of Howietoun's wave, but this certainly appears to have been the case.²⁵ Neither of the new operations flourished until Maitland's work became widely known in the 1880s, both having started out as amateur pisciculturalists before Maitland but not developing the large scale professional potential of their art until well into the 1880s. Armistead and Andrews had both been in regular correspondence with Maitland on piscicultural technique in the early 1880s and both went to the Falkirk Water Bill hearing to testify for Maitland as to Howietoun's national importance.²⁶ Finally, a glance at their own writings on pisciculture indicates

²⁴(...continued)

Fishery continued in operation throughout the twentieth century, though for some periods being closed, and is still in operation today. Dumfries and Galloway Standard and Advertiser 17 September 1971 p.9.

²⁵ *Vide supra* p.14.

²⁶ Only Andrews actually took the stand, Armistead remained uncalled after the hearing decided that enough evidence had been heard on pisciculture. Central Region Archives, FA1/6/1: Falkirk Water and Drainage Bill (1886) Minutes of Evidence, p.237.

Armistead himself was to go on to have trouble with his water supply in 1888 when he sued a timber merchant, James Bowerman, for £700 damages after muddy water entered his hatchery. Joseph Napier, the District Fishery Inspector for the Forth Salmon Fishery Board, gave evidence for Armistead at the hearing in which he noted that Howietoun was still "the best [fishery] in existence." Fishing Gazette 3 March 1888 p.118 and Dumfries and Galloway Standard and Advertiser 18 January 1888 p.5. The last reported that Armistead's hatchery "was conducted pretty much on the same principle as Sir James Maitland's." Armistead had
(continued...)

their complete concurrence with Maitland's techniques. In a series of detailed articles for the Fishing Gazette, for example, Andrews reaffirmed Maitland's technique of selecting only the best parent fish, referring to Maitland as "one of the greatest living authorities on trout breeding."²⁷ Armistead, perhaps a little irritated that, having begun pisciculture in 1868, he had been overtaken by Maitland the late-starter, was particularly self-glorifying in his espousing of techniques first developed at Howietoun. In 1895, for example, he imparted "one of the great secrets of successful fish culture" to readers of the Fishing Gazette - that older fish should be used as spawners.²⁸

²⁶(...continued)

visited Howietoun in 1880 and, according to Maitland, was "much pleased" at what he saw there. University of Stirling, HF/B1/6: Notebook with Notes on Pisciculture. Entry for 4 November 1880.

²⁷ Fishing Gazette 3 December 1892 p.454.

²⁸ Fishing Gazette 16 November 1895 p.337.

Two other smaller scale piscicultural establishments of the later nineteenth century, of which little is known, were Thomas Ford's Hundon Manor Fishery at Caistor in Lincolnshire and Colonel Frederick Custance's establishment at Weston-Longville in Norfolk. A recent biographical note on Thomas Ford records that he was a man of many varied talents, being:

... a great authority on fish culture. He travelled all over the country advising on the stocking of rivers and lakes. His clients included Edward VII, the Duke of Albany, the Dukes of Bedford and Portland, Lord Jersey, John Jacob Astor, and, locally, the Earl of Yarborough. ... Ford suffered from deafness early in his life - caused by the cold waters of the Swale. He wrote fishing articles for the Field, Land and Water, and Fishing Gazette. He published a book on Fly and Trout Fishing and a book of poems about places he had visited. He composed a part song, 'God Save Britannia's Queen' which was accepted by Queen Victoria. He was friendly with Canon Rawnsley, co-founder of the National Trust, and with other members of this Lincolnshire family. He corresponded with Dean Stanley and with Gladstone. He was a naturalist, Fellow of the Linnean Society, and a recorder of rainfall for the Meteorological Survey.

(continued...)

When Maitland died in 1897, the Fishing Gazette observed that the "greater interest in, and knowledge of fish culture" over the previous two decades had been in a large part due "to the practical work, and published writings and lectures of Sir James Maitland."²⁹ This greater knowledge of more professional pisciculture in the wake of Maitland's work is indicated in other sources. In 1888, The Times, for example, reported that "fish culture is admitted by all those cognisant of its practical achievements as having passed an experimental stage and become a practical art, capable of being made an important factor in the economy of this country."³⁰ In 1889 the Field stated that "the advantages of fish culture are beginning to be far more generally

²⁸(...continued)

Leach, T 'A Lincolnshire Fish Farmer' Newsletter of the Lincolnshire History and Archaeology Society 52 (1987) p.11 See also the Stamford Mercury 27 April 1888 p.5. I am indebted to Eleanor Nannestad, Local Studies Librarian for Lincolnshire County Council, for these references.

Custance was a land owner who, like Maitland, built up a commercial operation from small experiments on his estate. His obituary noted that his piscicultural success

produced a demand for Weston trout with which to stock the waters of his friends, and this demand led to the establishment of the trout farm, carried on by him for more than 50 years, and well known as the Weston Fishery. An unflinching source of pleasure to him was personally to conduct visitors over the Trout Farm, and at a convenient place there hung always a small pail containing food ready to be used to show the feeding fish.

Eastern Daily Press 1 October 1925 p.7. I am indebted to Jean Kennedy, County Archivist at Norfolk Record Office, for this reference. See also Bickerdyke, J The Book of the All-Round Angler: A Comprehensive Treatise on Angling in both Fresh and Salt Water (1889) which lists the locations of various fish cultural establishments.

²⁹ Fishing Gazette 13 November 1897 p.355.

³⁰ The Times 9 October 1888 p.14.

recognised than was the case a year or two back."³¹ In 1895, a member of the Fishery Board for Scotland noted that fish culture was "in a revival."³²

One of its revivalists, Thomas Andrews, noted:

I think we may congratulate ourselves in having brought fish culture to such a state at the present time that we are able, between 5 or 6 pisciculturalists in Great Britain alone, to distribute hundreds of thousands of yearlings and two year old trout, whereas, 30 years ago, some difficulty would have been found in finding and supplying a few dozen where required.³³

Maitland's preface to the fourth edition of Howietoun's Pamphlet on Stocking, published in 1892, welcomed the rise of piscicultural 'competition' and clearly struck the distinction that Maitland perceived to exist between Howietoun as an example and other establishments as businesses:

The first edition had to beg the whole question of modern fish culture, the fourth edition finds artificial stocking very generally adopted, and trout farms established in many places in England and Scotland as *purely* commercial ventures, thriving both fishculturally and financially.³⁴

With 25 fish farms scattered around Britain by 1920, 56 trout farms in England and Wales alone in 1972, and over 450 fish farm or hatchery entries in the 1994 Yellow Pages, pisciculture has obviously come a long way from the late 1870s belief that "any attempt at fish breeding will be a waste of

³¹ Field 4 May 1889 p.633.

³² Anderson-Smith, W 'Fish Hatching' Scottish Review 26 (1895) p.303.

³³ Fishing Gazette 17 December 1892 p.493. A year earlier, he had remarked "I wonder what Frank Buckland would think if he could see Howietoun or Critchmere now." *Ibid.* 12 December 1891 p.365.

³⁴ Howietoun Fishery Pamphlet on Stocking (4th edn) (1892) p.1. Emphasis my own.

money and will give no tangible return for the outlay."³⁵ Maitland's benevolent entrepreneurship seems to have been successful.

Having shown that Maitland's work resurrected pisciculture, it remains to place that work against the context from which it arose, namely the late nineteenth century concern at declining freshwater fishery stocks. The Howietoun method of producing stronger and healthier fish than those bred in the wild can only be seen as a real achievement if those fish can be seen to have succeeded in restocking fisheries where earlier pisciculture had failed. The success of a hatchery can only be properly judged by some measure of the vitality of the young fish released therefrom and the rate of their survival to maturity. Unfortunately, due to the obvious difficulty of counting fish that roamed in the wild (let alone determining their origin) in the late nineteenth

³⁵ The Field 29 December 1877 p.777. Joseph Armistead's son noted that "there are now trout farms scattered all over the country, and any intending purchaser need only look up the nearest fish culturist's address and apply to him ... Nowadays, fish culturists are fully alive to the importance of breeding carefully, and any purchaser should satisfy himself as to the quality of the trout he is getting rather than trouble about the size." Armistead WH Trout Waters (1920) pp.125-133. For names and locations of the fish farms, see *Ibid.* p.ii and University of Stirling, HF/B28: Unsorted Loose Material, Howietoun and Northern Fisheries Company 'List of Fish Farms in England and Wales, 1972' (not sourced). The Yellow Pages data does not do full justice to the size of the present day British piscicultural industry which has burgeoned since the 1970s as fish food prices have fallen. In 1990, there were a total of 769 registered fish farming businesses operating on 1,211 sites throughout the United Kingdom. 295 of these business and 569 of the sites were located in Scotland. House of Commons Agriculture Committee, Fourth Report - Fish Farming in the United Kingdom: Volume 2, Minutes of Evidence and Appendices (1990) pp.1-3.

century, before the development of electronic fish tagging, there are hardly any records that could act as a basis for such an analysis.³⁶ Probably the only detailed records of an artificial stocking by Howietoun (or any other fish farm for that matter), covers Maitland's work for the Loch Leven Angling Association in the late 1870s and 1880s.³⁷ The data, shown in **Table 9.1** (page 293), cover a relatively short period and a very localised area but they do, nevertheless, indicate at least the short-term results of a Howietoun stocking.

³⁶ It is noteworthy that the lack of information also stems from the fact that owners of newly stocked waters did not want attention drawn to them and were reluctant to report back the necessary information to Howietoun. University of Stirling, HF/V48(ii): Letter Book 4, p.563. Guy to Mr Holland Hebbert of Waterford, 12 March 1885. What information on the success of Howietoun restocking projects that was collected seems to have been destined for publication in the missing second volume of the History of Howietoun. University of Stirling, HF/V49: Letter Book 5, p.394. Maitland to RB Marston, Editor of the Fishing Gazette, 20 February 1886.

³⁷ These statistics have been collated from a variety of sources: University of Stirling, HF/V47(ii): Letter Book 2, p.449. Note of Loch Leven stocking to date; Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Third Annual Report of the Fishery Board for Scotland (1884) p.184; Stirling Journal and Advertiser 9 September 1887 p.6; and The Times 22 September 1888 p.3. Some of the figures are also reprinted in the Journal of the National Fish Culture Association (1887) p.468 and Day, F British and Irish Salmonidae (1887) p.229.

TABLE 9.1
Howietoun's Stocking of Loch Leven, 1875-1888

<i>YEAR</i>	<i>FRY PUT IN</i>	<i>TROUT CAUGHT</i>	<i>AVERAGE WEIGHT (lbs)</i>	<i>TOTAL WEIGHT (lbs)</i>
1875	9,000	5,060	1.130	5,676
1876	22,000	3,227	1.086	3,505
1877	70,000	6,286	0.900	5,657
1878	45,000	13,519	0.685	9,261
1879	0	21,491	0.777	16,699
1880	0	19,642	0.960	18,856
1881	0	16,811	1.050	17,652
1882	50,000	9,018	1.011	9,019
1883	0	14,191	0.898	12,747
1884	150,000	15,734	0.860	13,532
1885	0	16,558	0.872	14,434
1886	0	11,938	0.946	11,294
1887	0	17,892	0.964	17,244
1888	0	23,516	0.900	21,074

Source: See Footnote 37 p.292.

The table indicates that catches fell between 1875 and 1876, rose sharply from 1877 to 1879 before beginning to fall again in 1880, and then fell dramatically between 1881 and 1882. The catch then rose steadily to 1888 except for a bad year in 1886.³⁸ The table also indicates a decline in the average weight of trout caught from 1875 to 1879 but a slight rise thereafter until it reached 1 pound and then dropped again. The table clearly shows that the restocking of the loch in 1875-1878, 1882 and 1884, resulted in a vastly increased catch - a fourfold increase between 1875-1879, for example - coming after a time when the trend of fish caught had been rapidly decreasing.³⁹ It also indicates, however, that increased catches dwindled within a few years of each restocking, thus requiring a further replenishment, and that increased catches through such replenishment came always at the expense of a decline in the average weight of the trout caught. At no time between 1875 and 1888 did the average weight attain the level it had been at before artificial stocking commenced in 1875.

The question is, therefore, can artificial stocking be considered a success when an increase in the quantity of fish caught (which itself dwindled after a few years thus requiring a further input of fry) came at the expense of the average weight of the fish? The answer is probably a qualified yes. The

³⁸ This bad year could well have been the result of external factors unconnected with restocking, such as the effects of inclement weather or atmospheric variations. *Vide supra* p.50.

³⁹ Between 1872 and 1875, the catch on the loch (in absolute numbers) fell by over 66 *per cent* from 17,231 in 1872 to 5,060 in 1875. Field 11 September 1875 p.298.

average weight of trout in the loch would be bound to decrease as a result of the periodic introduction of a total of 346,000 small fry between 1875 and 1884. Thus one can see a decline in weight immediately after the stockings, but a reversal of this trend as the 'new' fish grew, with the average weight increasing year by year until a new stocking was performed. It must also be remembered that trout fishing is not salmon fishing and one does not hear of the 'monster' fish of 20 pounds and upwards which were quite often caught on British salmon rivers. Trout are a small fish, noted for their qualities as game and food, rather than for their size. As one fisherman stated:

I can occasionally enjoy a run with a bigish salmon very well, but as a rule I generally prefer to stake my credit on numbers rather than weight. Not being favoured with an extra stock of patience, I sometimes get into a sad mess with some of the big fellows, often losing the 'sma'en'o'my rod an'a guid cast o'flees'.⁴⁰

Furthermore, there is no evidence that Loch Leven anglers were disappointed with the decline in average catch weight and the Stirling Saturday Observer, for one, certainly saw fit to praise Maitland for his Loch Leven work when it reported an unprecedented success in the loch's trout fishings in 1878. This it accredited to "the artificial propagation of Loch Leven trout which has been so successfully prosecuted by Sir James Ramsay Gibson Maitland of Sauchie."⁴¹ A little later the Stirling Journal and Advertiser noted

⁴⁰ Quoted in Stirling Saturday Observer 18 July 1885 p.4. The average Loch Leven catch weight grew over the coming years to 3 pounds per fish though some 'monsters' weighing between 9 and 10 pounds apiece were also taken. Malloch, PD Life History and Habits of the Salmon, Sea Trout and Other Fish (1912) p.233.

⁴¹ Stirling Saturday Observer 21 September 1878 p.1.

that Loch Leven anglers now possessed "a fair chance of splendid sport."⁴² One keen angler was delighted at the effect that Howietoun's work had had on the loch: "Trout fishing at one's door is so convenient and interesting that I wonder more people do not endeavour to obtain it, particularly considering how easy it is to get a stock of yearlings specially educated to rise to a fly, as are the Howietoun fish."⁴³ An 1887 investigation into Stirlingshire trout fishing revealed the loch to be the only fishery in the region not to have suffered a diminution in trout over recent years.⁴⁴

Indeed, had Loch Leven not been such a popular angling water, and had angling not been such a rapidly growing sport in the later nineteenth century, the young fish introduced would have been given time to grow, thereby increasing the average weight and maintaining catch volume for a longer period of time. The purpose of the stocking was to provide fish for sport and, in that, it can certainly be seen as successful with an average two year gap between the stocking and the results becoming evident. Artificial restocking holds no claims to last forever and has to be replenished every few years. It is, of course, impossible to tell what the catch of fish would have been had the loch been left alone. However, even if we assume that catch levels

⁴² Stirling Journal and Advertiser 16 September 1881 p.5.

⁴³ Ramsden, R 'Piscicultural Experiences' Journal of the National Fish Culture Association (1887) pp.375-380.

⁴⁴ Stirling Saturday Observer 12 November 1887 p.4. All other areas surveyed, such as Doune, Dunblane, Balquhiddy and Clackmannanshire, all reported "a very noticeable decrease of trout" over the previous few years.

remained the same from 1876 (3,227), between 1876-1882 we see that the introduction of 196,000 fry resulted in the catch of an extra 75,655 fish. This figure amounts to more than one third of the total number of 'new' fish put into the loch and is considerable since, on average, only 0.1 percent of naturally propagated fry will survive to become adult fish.⁴⁵ This certainly seems to add weight to Maitland's claims that the ova he produced gave rise to healthier fry with far greater longevity than those produced under natural wild conditions.⁴⁶

Finally, despite the lack of wide-ranging, long-term statistics to demonstrate the fishery's success (or otherwise) in national restocking, the documentary evidence that does survive makes it clear that Howietoun restockings resulted in only a handful of dissatisfied customers and many thousands of happy ones. The fishery was showered with praise from a wide variety of sources and Howietoun's secretary, Guy, could confidently assert,

⁴⁵ Robertson, The Tay Salmon Fisheries p.15/36.

⁴⁶ Although less statistically detailed, a record of a Howietoun stocking can also be found in an 1893 article in Blackwood's Magazine. In January 1884, 30,000 Loch Leven ova from Howietoun were placed on hatching redds at Loch a Vadi, situated between Loch Moidart and Loch Aylort in the Scottish Highlands. (*Vadi* means wolf and the loch was given the name as the result of its being the legendary place where the last Scottish wolf was slain.) The loch had been previously barren of trout but, by 1886, small half-pound trout were being taken. By 1888, the average weight of trout rose to one pound and increased steadily from then on. By 1892, 1,262 trout had been taken from a previously uninhabited loch and trout-eating birds had taken up residence there. Cook, CH 'Successful Fish Culture in the Highlands' Blackwoods Magazine 154 (1893) pp.839-841.

firstly in 1884 and then many times afterwards, that "We have received the most gratifying accounts of our fish from all parts of the country."⁴⁷ There is an indication of a failed stocking in 1888 when Guy thanked a correspondent for a communication stating that "We are always anxious to hear of the result of our stocking especially if it has not succeeded."⁴⁸ But only a week later, he was able to tell another correspondent that Howietoun was "constantly receiving satisfactory reports of the success of our stocking from all parts of the kingdom, whilst the failures have been very few."⁴⁹ In 1891, the Fishing Gazette praised the "beneficial results" that Howietoun restocking had brought to trout fishing in lochs, lakes and rivers across the country.⁵⁰ In the year of Maitland's death, the Field applauded the success of pisciculture throughout Great Britain, both at Howietoun and at the other fisheries that arose in its wake, and noted that "On the whole it must be admitted that the variety and excellence of sport afforded by Great Britain is remarkable, and is superior to anything offered by foreign countries."⁵¹ This point of view can be contrasted with a letter to The Times 20 years earlier

⁴⁷ University of Stirling, HF/V48(i): Letter Book 3, p.958. Guy to George MacRae of Perthshire, 5 June 1884.

⁴⁸ University of Stirling, HF/V51: Letter Book 7, p.878. Guy to Alfred Davy of Sheffield, 10 December 1888.

⁴⁹ Ibid. p.909. Guy to The Honourable Lieutenant Colonel Napier of London, 18 December 1888.

⁵⁰ Fishing Gazette 14 November 1891 p.302.

⁵¹ Field 13 March 1897 p.385.

which described British trout as "a scarce fish."⁵² When Maitland died, the Fishing Gazette noted that "It would be difficult to overestimate the good work done by him in restocking rivers at home and in our colonies, and in the advancement of the art of pisciculture generally."⁵³ The allegations of rapidly declining freshwater fishery stocks which, in the main, gave rise to later nineteenth century British piscicultural impetus, disappeared completely from the mid 1880s, at least regarding the trout, as the pace of piscicultural restocking spread.⁵⁴

Whilst it has already been argued that Maitland encouraged others to take up piscicultural enterprise and thus helped to make fish culture the kind of large scale commercial operation that it is today, the acid test of Maitland's importance in piscicultural development has to be whether his work was a crucial phase in the development of the science of the modern aquaculture industry, with his discoveries continuing to play an important role in pisciculture well after his death in 1897. That this is in fact the case is beyond doubt; the new techniques which were developed at Howietoun in the 1880s,

⁵² The Times 26 December 1878 p.5. Letter from 'Man in the crowd'.

⁵³ Fishing Gazette 15 November 1897 p.355. A little after Maitland's death, Howietoun published a pamphlet which noted:

The fishery correspondence shows a continuous stream of letters testifying to the great success which has followed the stocking of waters with ova or fish from Howietoun, and the splendid sport obtained. The best proof of this is that many of its patrons repeat their orders either yearly or periodically.

Howietoun Fishery A Short Account of the Howietoun Fishery (1903) p.11.

⁵⁴ It should be remembered, nevertheless, that it is not altogether certain that there was a real decline in freshwater fishery stocks. *Vide supra* p.49.

principally the selective breeding of fish from a captive broodstock within the overall framework of a large scale professional operation, remain the cornerstone of modern pisciculture. A cursory glance at even a very small sample of the hundreds of monographs published on fish culture from 1897 to the present day clearly illustrates Maitland's legacy to modern pisciculture. Whilst pre-Maitland publications, such as those of Buckland, Francis, Armistead and Capel, advocated the pursuit of fish culture on the old small scale and amateurish lines, all those written after the dissemination of Maitland's knowledge in the 1880s reflected his teachings.⁵⁵ In 1870, for example, Armistead supported the notion of amateur pisciculture; by 1897 he still accepted its role as an "amusement" but noted that any real attempt at effective fish culture needed "the hands of an experienced and skilful operator ... [with] ... a thoroughly good, practical education" in pisciculture.⁵⁶ In 1903, 'Practical', who quoted Maitland's writings at length in his own work, recommended all the techniques laid down by Maitland in the History of Howietoun as the only way to succeed in fish culture.⁵⁷

From this time onwards, all salmonoid culture manuals advised the use of the same techniques that were tested and proved at Howietoun in the

⁵⁵ Buckland, Fish Hatching; Francis, F Fish Culture (1863); Armistead, JJ A Short History of the Art of Pisciculture, Showing its Utility and Some of the Advantages Which May be Derived from it if it is Properly Carried On (1870); and Capel, CC Trout Culture (1877).

⁵⁶ Armistead JJ A Handy Guide to Fish Culture (1897) p.iii and Short History p.60.

⁵⁷ Practical Fish Farming for Pleasure and for Profit (1903) p.115. He described Maitland's work on the use of older spawners to produce healthier fry as a "most weighty and valuable statement."

1870s and 1880s. Of course, with the development of science in general and aquaculture in particular in the twentieth century, these instructions did become more technical, advocating, for example, the use of pesticides, electronic sorting machinery and anaesthetics. But the basic techniques of the artificial propagation of the salmonidae remain the same today as practised by Maitland.⁵⁸ The best and most recent example of this can be found in Matthew Landau's brief summary of trout culture methods. He recommends the use of all the major facets of pisciculture as set out by Maitland over 100 years ago and in particular stresses the importance of keeping a captive broodstock. He advocates using older spawners to produce larger eggs as "this increases the chances of survival for the fry." The various stages of ova incubation, though in much less detail, are discussed as they are in the History of Howietoun and the similarities continue throughout such topics as the sorting of eggs, and the hatching, feeding and raising of fry.⁵⁹ It is, of course, impossible to definitively state that Maitland 'invented' modern pisciculture, but it is clear that modern pisciculture reflects his findings and that there is no evidence of work such as his, either in terms of its discoveries or its size, having taken place before him.

⁵⁸ See, for example: Majumder, TC Fish Culture (1986); Nosh, T (ed.) Salmon Broodstock Maturation (1981); Barrington, R Making and Managing a Trout Lake (1983); Leitritz, E & Lewis, RC Trout and Salmon Culture (Hatchery Methods) (1980); and Huet, M Textbook of Fish Culture: Breeding and Cultivation of Fish (1971).

⁵⁹ Landau, M Introduction to Aquaculture (1992) pp.227-234. Modern aquaculturalists do not, unlike Maitland, recommend using fish aged six years or older but concur with him that the best age for parents is at four years and above. Huet, Textbook p.69.

This contention is perhaps best supported by looking at Maitland's work in a more international context. An 1895 observer saw Maitland's History of Howietoun as "an epoch making work which has clearly proved that this country is without doubt in the very first rank in aquaculture."⁶⁰ Does Maitland's legacy remain confined to the British Isles or did he have a more global impact on the development of fish culture? The only real foreign recognition of Maitland's work seems to have come from France with Maitland being awarded a gold medal by the Paris Acclimatisation Society in 1882.⁶¹ As noted in Chapter Three, Howietoun was also highly praised by a visiting French delegate to the 1882 Fisheries Exhibition in Edinburgh.⁶² But, part from this, there do not seem to be any written references to either Maitland or Howietoun in other foreign sources, both in the later nineteenth century and thereafter, that would indicate his work to have had a global influence or, indeed, global recognition.

Some attempt can, however, be made to place Howietoun in a global context by looking at North American evidence, the United States being the most pisciculturally active nation of the late nineteenth and early twentieth centuries.⁶³ From 1873, the United States carried out a huge centrally financed and directed fish cultural effort to restock national waters under the

⁶⁰ Anderson-Smith, 'Fish Hatching' p.303.

⁶¹ University of Stirling, HF/V48(i): Letter Book 3, p.403. Maitland to the Secretary of the Paris Acclimatisation Society, 31 December 1883.

⁶² *Vide supra* p.101.

⁶³ *Vide supra* p.62.

auspices of the United States Commission on Fish and Fisheries. The man in charge of this operation, Commissioner Professor SF Baird, had heard of Maitland's claims to possess the world's largest fish-cultural establishment in the early 1880s and wrote to Professor Thomas Archer at the University of Edinburgh that he would "of course be delighted to see Sir James Maitland's establishment. The figures, however, do not seem quite so large to us, as we have over fifty million eggs in one establishment and, at the present time, two thirds as many more in another."⁶⁴ It is evident, however, that Baird was writing under a fundamental misconception about how to interpret figures. The fish of which he spoke were those of the white fish, *coregonus albus*, whose eggs were tiny compared to those of the trout at Howietoun. There was thus no relevance in slighting Maitland's assertions as regards the number of eggs that the fishery could incubate.⁶⁵ In terms of the salmonidae alone, the distinction between Howietoun and the United States piscicultural

⁶⁴ University of Stirling, HF/V47(ii): Letter Book 2, p.708. Baird to Archer, 20 December 1882 (copy supplied by Archer).

⁶⁵ Maitland found Baird's statements laughable, replying to Professor Archer that Baird dealt with "poor dear little white fish with its tiny eggs, a million of which would go with an ordinary stable bucket, looks lovely on paper when counted by the hundred million." University of Stirling, HF/V47(ii): Letter Book 2, p.714. Maitland to Archer, 10 January 1883. See also Landau, Introduction pp.384-385. One observer later noted that "Europe can still well compete with America in the breeding of trout and salmon, and even has a station, Howietoun in Scotland, which is larger than any in America." Nordquist, O 'Some Notes about American Fish Culture' Bulletin of the United States Commission on Fish and Fisheries 13 (1894) p.198.

establishments is more apparent. For the three years from 1874 to 1876, the twenty United States Commission on Fish and Fisheries hatcheries combined distributed a total of 40 million ova *and* fry, an average of 13 million *per annum*, which was considerably less than Howietoun's capacity to produce 20 million ova alone *per annum*.⁶⁶ As a correspondent of The Times, Henry Ffennell, noted in 1886:

I think we can claim for ourselves that in no country in the world is there a single establishment devoted to the artificial cultivation of the salmonidae to compare in importance and management to that at Howietoun situated within a short distance of the famous battleground of Bannockburn.⁶⁷

Again, however, size is not everything. What about the comparison of quality rather than quantity? Here, the evidence indicates that, with his development of selective breeding from a captive broodstock, Maitland was way ahead of his North American contemporaries. Whilst Howietoun was an actual *producer* of ova and fish, entirely self sufficient with its own captive broodstock, the American hatcheries were more processing depots which handled, incubated and hatched the eggs of *wild* parent fish selected at random without any regard to their suitability for breeding.⁶⁸

⁶⁶ Stirling Saturday Observer 7 November 1885 p.3. See also the Fishing Gazette for the same date p.227.

⁶⁷ The Times 1 May 1886 p.6. Ffennell went on to make note of another very important point in comparing Howietoun with piscicultural establishments in the United States - everything achieved in the latter was funded by central government whereas Maitland worked without any form of state aid whatsoever.

⁶⁸ Ewart, J 'Report on the Progress of Fish Culture in America' in Third Annual Report of
(continued...)

The contention that Howietoun's pisciculture was quite some way in advance of that in North America is clearly proven in twentieth century North American piscicultural literature. The proof of the pudding lies in an article on selective breeding in the 1902 volume of the Transactions of the American Fisheries Society. The author, Arthur Sykes, introduced his topic noting that: "Much has been said and written about methods and results of propagation; but little thought, it seems, has been given to the foundation on which we work or the quality of the material of which it is comprised, ie., the potency and vigour of the parent fish and the embryo." He argued that American pisciculture should look to an enhancement of the quality of its product through selective breeding rather than by using spawning fish of any size or age taken from the wild. He then gave a clear recognition of the importance of Maitland's work, though even that was tinged with an air of United States superiority, as if Maitland had not actually carried out such work more than 20 years previously:

Sir James Gibson-Maitland, Scotland's greatest fish culturalist, ... said 'Civilisation must breed its trout as its cattle, or civilisation will have no trout.' *The truth of this statement is evident to me, though I have no doubt he wrought better than he knew.*⁶⁹

⁶⁹(...continued)
the Fishery Board for Scotland (1884) p.90. Despite greatly praising the scale of American pisciculture after visiting the United States, Ewart noted that at Howietoun pisciculture had "reached a higher state of perfection than anywhere else in Europe or America."

⁶⁹ Sykes, A 'Inbreeding Pond Reared Trout' Transactions of the American Fisheries Society 31 (1902) pp.116-121. Emphasis my own. It is not known from where Sykes took Maitland's statement.

Indeed, American experiments in selective broodstock breeding only came about some four decades after Maitland's own work, with the experiments of Hayford and Embury from 1919. They found that a "marked increase in the rate of growth ... resulted from a selection of the largest breeders."⁷⁰ As late as 1938, an employee of the United States Commission on Fish and Fisheries clearly indicated how advanced Maitland's work had been and how slow had been his American contemporaries and, indeed, their immediate heirs:

It is all too apparent that progress has been much slower than it might have been. ... The early fish culturist had his problems but no one will deny that, in general, they were much simpler than those which confront his present day successor. All that was necessary was to strip the eggs from wild fish, incubate them in hatchery troughs and, as soon as the fry were able to feed, turn them loose to fend for themselves. A gullible public was assured that under natural conditions less than 5% of the eggs produced fry while under artificial propagation the situation was reversed.

... SELECTIVE BREEDING So far, few attempts have been made to improve trout by this technique. The principle result of selective breeding, first carried on systematically by Hayford and Embury (1930) has been a remarkable increase in the rate of growth and in egg production. Good results were obtained in 2 or 3 generations, and it is surprising to find that so little attention has been paid to the possibilities in this field. Greater vigour, more rapid growth, increased egg production and hatchability, brighter coloration, and an earlier or later spawning season are

⁷⁰ Hayford, C and Embury, C 'Further Progress in the Selective Breeding of Brook Trout at the New Jersey State Hatchery' Transactions of the American Fisheries Society 60 (1930) pp.109-113. Writing in much the same way as Maitland had done in his History of Howietoun, they had earlier stated: "We feel that if these promising results continue from year to year, it will be an indication that one may do quite as remarkable things though the selective breeding of trout as has been done in the case of other domestic animals." Hayford, C and Embury, C 'The Advantages of Rearing Brook Trout Fingerlings from Selected Breeders' Transactions of the American Fisheries Society 55 (1925) pp.135-138.

among the characters that can be developed by selective breeding. ... It is up to the members of this Society to see to it that fish culture advances in step with other lines of animal husbandry. If but a very small proportion of the amount now expended on hatchery operations could be devoted to research and experiment and to the training of men in better fish cultural practices, the history of the next 25 years would be quite different from that of the past - and it would no longer be necessary to apologise for the shortcomings of our hatcheries.⁷¹

Indeed, whilst Maitland lived, there were instances which demonstrated Howietoun's superiority, at least as regards packing ova for trans-Atlantic exportation. When ordering 50,000 American trout eggs from Livingstone Stone, a pioneer United States pisciculturist, in 1880, for example, Maitland lectured his American colleague on the best mode of packaging, because an earlier consignment from Stone had been very poorly packed and had arrived

⁷¹ Davis, HS 'Fish Cultural Developments in Recent Years' Transactions of the American Fisheries Society 68 (1938) pp.234-239. Late nineteenth century Canadian pisciculture, being organised on very much the same lines as that in the United States, also suffered from pisciculturists showing only "modest concern over the quality of the product." MacCrimmon, HR 'Freshwater Aquaculture in Canada' in Department of the Environment, Ottawa: Fish and Marine Service Aquaculture in Canada: the practise and the promise (1974) p.18. Useful accounts of Canadian aquaculture in the nineteenth century can be found in: Rodd, JA 'Sketch of the Development of Fish Culture in Canada' Transactions of the American Fisheries Society 54 (1924) pp.148-160; MacCrimmon, HR 'The Beginning of Salmon Culture in Canada' Canadian Geographic Journal 71 (1965) pp.96-103; and Rodd, JA 'Samuel Wilmot' Progressive Fish Culturist 21 (1936) pp.16-18. Samuel Wilmot was an eminent late nineteenth century Canadian pisciculturist.

among the characters that can be developed by selective breeding. ... It is up to the members of this Society to see to it that fish culture advances in step with other lines of animal husbandry. If but a very small proportion of the amount now expended on hatchery operations could be devoted to research and experiment and to the training of men in better fish cultural practises, the history of the next 25 years would be quite different from that of the past - and it would no longer be necessary to apologise for the shortcomings of our hatcheries.⁷¹

Indeed, whilst Maitland lived, there were instances which demonstrated Howietoun's superiority, at least as regards packing ova for trans-Atlantic exportation. When ordering 50,000 American trout eggs from Livingstone Stone, a pioneer United States pisciculturist, in 1880, for example, Maitland lectured his American colleague on the best mode of packaging, because an earlier consignment from Stone had been very poorly packed and had arrived

⁷¹ Davis, HS 'Fish Cultural Developments in Recent Years' Transactions of the American Fisheries Society 68 (1938) pp.234-239. Late nineteenth century Canadian pisciculture, being organised on very much the same lines as that in the United States, also suffered from pisciculturists showing only "modest concern over the quality of the product." MacCrimmon, HR 'Freshwater Aquaculture in Canada' in Department of the Environment, Ottawa: Fish and Marine Service Aquaculture in Canada: the practise and the promise (1974) p.18. Useful accounts of Canadian aquaculture in the nineteenth century can be found in: Rodd, JA 'Sketch of the Development of Fish Culture in Canada' Transactions of the American Fisheries Society 54 (1924) pp.148-160; MacCrimmon, HR 'The Beginning of Salmon Culture in Canada' Canadian Geographic Journal 71 (1965) pp.96-103; and Rodd, JA 'Samuel Wilmot' Progressive Fish Culturist 21 (1936) pp.16-18. Samuel Wilmot was an eminent late nineteenth century Canadian pisciculturist.

with virtually all eggs lost.⁷² When Maitland supplied the head of the United States Commission on Fish and Fisheries, Baird, with 100,000 and 66,000 trout eggs in 1884 and 1885 respectively, Baird wrote Maitland that he "greatly admired the method in which the eggs were packed, and the perfect condition in which they came to hand."⁷³ Unfortunately, Baird's returning of the favour in 1886 showed no signs of improvement in the American mode of packing eggs, or, indeed, in its efficiency: "The 10,000 eggs Baird advised were only marked 5,000 on the box and when counted were only 3,015 of

⁷² University of Stirling, HF/V47(i): Letter Book 1, p.59. Maitland to Livingstone Stone, 13 November 1880. Maitland's advice seems to have been heeded; he wrote to the pisciculturalist Thomas Andrews of Guildford that "We have given very special instructions as to the packing ... We did not get a dozen good eggs in the two first cases of over 20,000 last year, while after telegraphing instructions, there were not 100 bad ones in a second consignment of the same number." University of Stirling, HF/V47(i): Letter Book 1, p.155. Maitland to Andrews, 14 January 1881. Maitland did not make any use of the surviving eggs in the 1880 consignment, throwing them all into a stream. Some must have been healthy, however, since a small community of American trout had sprung up there by 1885. The Times 15 October 1885 p.7.

⁷³ Letter reprinted in the Stirling Saturday Observer 24 January 1885 p.3. An American pisciculturalist, CW Smiley, reported the excellence of Maitland's packing in the Bulletin of the US Fish Commission: "On opening, the eggs were found to be in excellent condition, there being but a small number dead and but a few indented. The method of packing was found to be most admirable, and the boxes ... were of the most substantial nature." Smiley, CW 'Loch Leven trout introduced into the United States' Bulletin of the United States Commission on Fish and Fisheries 8 (1889) pp.28-32. The Commission reused the Howietoun boxes to send eggs to Germany.

which about 1,200 were bad."⁷⁴ Other British pisciculturalists were also to be disappointed with the American mode of packing eggs. An 1887 import of eggs from the United States, for example, entirely failed "owing to incautious packing ... It is much to be regretted that the second lot were received almost in as bad a condition as the previous batch, due to precisely the same cause."⁷⁵

As the foregoing evidence of communication between Maitland and Baird and of reports of Maitland's work appearing in American publications shows, the opportunity *was* present for the North Americans to tap Maitland's

⁷⁴ University of Stirling, HF/V49: Letter Book 5, p.525. Maitland to Thomas Andrews of Guildford, 14 March 1886. A little later, Maitland warned the High Commissioner for New Zealand against the importation of eggs from the United States: "I get plenty of eggs over from America and my experience is very much against their mode of packing." Ibid. p.818. Maitland to Sir Francis Dillon Bell, 25 May 1886.

⁷⁵ Chambers, WO 'American Fish Eggs Imported by the National Fish Culture Association' Journal of the National Fish Culture Association (1887) p.137. It is amusing to note that an earlier shipment of sole from Chambers to the United States, in 1885, failed, probably because the man left in charge of the consignment at the Liverpool docks "placed the fish in the public baths ... which is not only brackish, but full of impurities, naturally fatal to deep sea fishes like soles." Report of the United States Commission on Fish and Fisheries (1885) pp.xxvii-xxviii. As Baird's most recent biographer, Allard, noted "My God! What about the bathers?" Copies of research notes provided by Dr Allard in a letter of 31 December 1993. See also Allard, DC 'Spenser Fullerton Baird and the Foundations of American Marine Science' Marine Fisheries Review 50 (1988) and Allard, DC SF Baird and the US Fish Commission (1978).

knowledge if they had wished to do so.⁷⁶ Yet it seems that, though at least aware of the existence of Maitland's work, they failed to fully appreciate its value and considered their own endeavours as of more consequence. Indeed, some American pisciculturalists had actually visited Howietoun when in Scotland as delegates to the 1882 Edinburgh Fisheries Exhibition.⁷⁷ They do not, however, seem to have been particularly impressed with what was seen at Howietoun, reporting back that "pisciculture has not received the attention in Scotland that might be expected from the importance here of the subject, but interesting displays of hatching and feeding apparatus were made."⁷⁸ Likewise, in 1883, Baird wrote to Maitland stating his "appreciation of your abilities and public spirit in connection with the propagation of fish for British waters,"⁷⁹ and, in 1884, Maitland became a corresponding member of the American Fisheries Society, an honour bestowed on "foreign officials and others distinguished in fishery affairs for the purpose of interchange of reports

⁷⁶ In 1886, Francis Day published his findings on selective breeding, which made great emphasis on the work at Howietoun, in the United States. Day F 'Experiments with Salmon in Scotland' Bulletin of the United States Commission on Fish and Fisheries 6 (1887) p.56.

⁷⁷ Herbert, D (ed.) Fish and Fisheries (1883) p.xxix.

⁷⁸ Leonard, J 'Report on the Edinburgh Fisheries Exhibition' Bulletin of the United States Commission on Fish and Fisheries 2 (1882) pp.80-82.

⁷⁹ Smithsonian Institution Archives, RV5/4: United States Commission on Fish and Fisheries correspondence, 1877-1896. Baird to Maitland, 2 February 1883. I am indebted to Mr William Cox, Assistant Archivist at the Smithsonian Institution Archives, for supplying me with copies of this material.

and ideas."⁸⁰ In that same year, however, commenting on Ewart's report on American fish culture,⁸¹ the Americans felt that Ewart had visited their country as a result of "the great superiority of the exhibit made by the United States Fisheries Commission at the International Fisheries Exhibition held in London in 1883, and the profound impression which the explanations of its methods and purposes of fish culture produced upon European fish culturists." They did not mention Ewart's comments on Howietoun's superiority or, indeed, that it was Maitland who left the exhibition with gold medals.⁸² The Field noted: "the progress of fish culture, as carried on at the famous Howietoun fishery... is watched with interest by observers on both sides of the Atlantic."⁸³ But, given the absence of selective breeding techniques in the United States, and that country's air of piscicultural superiority, it does not appear that anything was learned.⁸⁴

⁸⁰ University of Stirling, HF/V48(ii): Letter Book 4, p. 977. Copy of invitation from the American Fisheries Society.

⁸¹ *Vide supra* p.305.

⁸² 'A Foreigner's View of American Fish Culture' Bulletin of the United States Commission on Fish and Fisheries 4 (1884) p.83. *Vide supra* p.101.

⁸³ Field 8 December 1883 p.789.

⁸⁴ The dawning of the twentieth century does, however, seem to have brought at least some American recognition of Howietoun's work, if not imitation. In a brief review of non-American fish culture in 1906, for example, the American Fisheries Society noted the existence of the "famous" hatchery at Howietoun which "has been from the first, as now, the leading fish cultural establishment of Great Britain." At the commencement of the decade,
(continued...)

In early November 1897, Maitland was confined to his bed with a gouty infection. His doctors did not, however, see any cause for concern and advised a few weeks rest before returning to work. On 9 November his condition took an unexpected turn for the worst and before the doctor could get to Sauchieburn he succumbed to a sudden heart attack. His sudden death, at the age of only 49, was greeted with genuine grief and dismay amongst people who knew him. His colleagues on the County Council, for example, described him as a "most valuable servant" of the county, "a most excellent Convenor, and a very amiable friend."⁸⁵ His body lay in state at Sauchieburn House for a week and was then carried on a funeral train to Cramond Kirk, on Maitland's Barnton Estate near Edinburgh, where he was interred in the family crypt. The Duke of Montrose, one of Maitland's colleagues on the Stirlingshire County Council, told a meeting of that body:

The ways of Almighty Providence are inscrutable and it does not become us to try to fathom them; but it may be some consolation to those who mourn his loss that he was taken away, not after a long and painful illness, and not after his bright

⁸⁴(...continued)

Fred Mather had written that Howietoun was "a great fish breeding establishment" and that Maitland "had an extensive experience, and [I] would therefore consider that his ideas are as good as mine, if not better." 'Fish Culture in England' (sic) Transactions of the American Fisheries Society 35 (1906) p.210 and Mather, F Modern Fish Culture in Fresh and Salt Water (1900) p.99/154.

⁸⁵ Stirling Saturday Observer 13 November 1897 p.5. Maitland's wife, Fanny, had died on 17 March 1896 "and her death was felt as a very severe loss by her husband." 'Sir James Maitland' Proceedings of the Linnean Society of London (1898) p.44. See also: Stirling Saturday Observer 21 March 1896 p.8.

abilities had lost any of their lustre. Sir James was taken away in the zenith of his life, in the midst of his work, when he was surrounded by a large circle of admiring and affectionate friends. I am quite sure that Sir James' memory will long survive in Stirlingshire as that of a courteous gentleman, a kind friend, and a most excellent man of business.⁸⁶

However, despite the important role clearly played by Maitland in piscicultural development, his achievements have not hitherto been recognised. The remainder of this chapter therefore looks at how and why Maitland has not received historical recognition. When Maitland died, his obituarists paid due acknowledgement to his "success in pisciculture" at Howietoun, "one of the most successful fish hatchery establishments in the world."⁸⁷ But the renown of his work, both generally and specifically, seems to have died with him since he appears to be referred to in only four modern works, even then only in passing and without any real substance. Of these four works, one mentions that he was involved in early exports of salmon and trout ova to the Antipodes,⁸⁸ and another, alluding to his work as a member

⁸⁶ Central Region Archives, SC3/1/8: Stirling County Council Minute Book, p.325. County Council meeting on 21 December 1897. Mr George Ure, another Council member, went even further:

I do not think I can say more today seeing he has so recently died. But from my present feelings it really seems to me that, deprived as we have been by death of his racy, crisp manner in doing business, our County Council meetings can never be the same again. When we think of that, and think also that we shall never look upon that noble head or see that manly presence which formerly presided over us so ably, we cannot do anything but lament and mourn the loss that has come upon us.

⁸⁷ Land and Water 20 November 1897 p.810 and Field 13 November 1897 p.773.

⁸⁸ Clements, J Salmon at the Antipodes: A History and Review of Trout, Salmon and Char Introduced in Australasia (1988) p.130. *Vide supra* p.90.

of the Fishery Board for Scotland, notes that he was a "pioneer of freshwater fish farming who had established a successful hatchery."⁸⁹ The two other works do make reference to his actual piscicultural acts, but one refers to him incorrectly as Sir Thomas Maitland of Howietown (sic) and says nothing more.⁹⁰ The other states that he was a "notable trout farmer" but goes into no further detail on what he actually achieved.⁹¹

Despite the prediction of the Duke of Montrose that "Sir James' memory will long survive," Maitland thus seems to have been almost completely denied a historical niche.⁹² This becomes even more apparent when one looks at the survival of his specific legacy to pisciculture, the development of selective breeding from a captive broodstock in order to enhance the quality of the product. A twentieth century commentator on

⁸⁹ Deacon, M 'State Support for Useful Science: The Scientific Investigations of the Fishery Board for Scotland, 1883-1899' in Scheiber, HN (ed.) Ocean Resources: Industries and Rivalries Since 1800 (1990) p.1.

⁹⁰ Munro, ALS and Waddell, IF 'Growth of Salmon and Trout Farming in Scotland' in Bailey, RS and Parrish, BB (eds.) Developments in Fisheries Research in Scotland (1987) p.246.

⁹¹ Laird, L and Needham, T Salmon and Trout Farming (1991) p.22.

⁹² Central Region Archives, SC3/1/18 p.325. Likewise, the Reverend JM Robertson was incorrect in his prediction to the congregation at St Ninians Parish Church after Maitland's death that:

His labours and efforts in the domain of natural history have added materially to the sum of human knowledge. They will preserve his reputation as a public benefactor when his skilful and energetic administration of local affairs, in which he so highly distinguished himself, become largely forgotten in the course of the years.

Stirling Saturday Observer 21 November 1897 p.4.

pisciculture, for example, noted that: "Fish culture to be classed as a science must include ... a deliberate effort on the part of man to master a technique of fish raising which will yield results far superior to nature's." He believed that the pisciculturalists of the later nineteenth century could not "dispel the fallacy that fish culture need only consist of efficiently hatching all the eggs which can be obtained."⁹³ This commentator made no reference whatsoever to Maitland's work at a fishery whose "principal object" was "to improve the various breeds of salmonidae by careful selection."⁹⁴ Even a more recent and more closely geographically focused piscicultural historian, Noel Wilkins, gives no credit to Maitland's work when he states that:

While the early aquaculturalists tried to enhance and augment the wild fisheries, today's aquaculturalists have divorced themselves almost entirely from them. Farmed stocks are now largely closed populations where the broodstock comes entirely from cultivated strains and the fish are never allowed to go free in the world.⁹⁵

Perhaps the principal reason for Maitland's fall out of history is the fact mentioned at the beginning of the thesis, namely that pisciculture is a topic which has never commanded detailed attention from economic historians. It does not rank alongside cotton and iron in British economic history and is not

⁹³ Fish, FF 'Founders of Fish Culture: European Origins' Progressive Fish Culturalist 16 (1936) p.8. He commented that "Subsequent to the 1870s, fish culture advanced but little in Europe."

⁹⁴ University of Stirling, HF/V50: Letter Book 6, p.92. Guy to Mr C Proctor, Honourary Secretary of the Yorkshire District Fishery Board, 16 November 1886.

⁹⁵ Wilkins, N Ponds, Passes and Parcs: Aquaculture in Victorian Ireland (1989) p.316. Howietoun is mentioned but only in passing and only for a period after Maitland's death.

the kind of subject that one would expect most great Victorians to be remembered for. But, nevertheless, Maitland's importance does not feature in the piscicultural histories that *have* been written or in the many modern textbooks on aquaculture which begin with brief histories of the science.⁹⁶ This seems to be largely because the literature that does exist is largely of North American origin and ignores the British contribution in much the same fashion that it was ignored in the United States whilst Maitland lived.⁹⁷ It displays what the Field, not without irony, once saw as "the least soupcon of desire to exalt the doings of the American fish culturalists, and to look down upon the feeble efforts put forth in this insignificant part of the world, which might as well have been omitted."⁹⁸

⁹⁶ See, for example, Landau, Introduction, Huet, Textbook and Hickling, CF Fish Culture (1962).

⁹⁷ See, for example, Benson, NG (ed.) A Century of American Fisheries (1971).

⁹⁸ Field 23 March 1878 p.346. The editorial continued "It is a pity that any such spirit as this should prevail. We should hardly treat American pisciculturalists in this way." In 1882, the United States Commission on Fish and Fisheries published a paper 'Epochs in the History of Fish Culture', which has been used as the basis for many modern histories of the science. The paper was intended to "recount, in chronological order, the principal steps in the progress of fish culture in Europe and North America" but failed to really step outside North American borders. This, again, attracted the ire of the Field:

England is briefly dismissed with a short reference to Shaw, Boccius and Ashworth, [see Chapter Two *passim*] and an incorrect paragraph as to [the acclimatisation of the salmonidae in] Australasia. If our American friends had cared to know what really has been done in England, the earlier numbers of the Field might have been useful to them. ... But this is not even referred to as if it were a matter of no moment, while every little attempt at fish hatching in every state of America - attempts the like of which are so common all over the country in England that no one notices them - are set forth at full length.

(continued...)

Similarly, it is worth noting that the North American factor also played a role in unjustly diminishing the importance of Maitland's work - and therefore his historical legacy - in Britain itself. Chapter Eight noted that, in clamouring for state support for British pisciculture, some nineteenth century British commentators praised the massive state-funded effort of the United States.⁹⁹ They believed that Britain had to be behind because all she had were private hatcheries. The scientist Sir Lyon Playfair, for example, argued that British pisciculture was a "useful experiment" but one which lacked the "scientific methods necessary to make fish culture prosperous."¹⁰⁰ Like the Americans whom it praised, this view failed to realise that size was not everything and infuriated both Maitland and others who appreciated rather more about the quality of British pisciculture. Howietoun's secretary, Guy, told a fishery correspondent that Playfair's letter was "entirely based on the fallacy that more work is done in fish culture abroad than in Britain, while the Howietoun fishery alone produces more ova ... than the whole of the

⁹⁹(...continued)

... If reports of this nature are to be conceived and compiled in such a spirit, and disfigured by so much inaccuracy, they can hardly be accepted and rated at the value which the compilers themselves probably put upon them.

The Field 11 March 1882 p.326. Goode, GB 'Epochs in the History of Fish Culture' Transactions of the American Fisheries Society 10 (1881). See also Bower, WT 'A History of the American Fisheries Society' Transactions of the American Fisheries Society 40 (1910).

⁹⁹ *Vide supra* p.250.

¹⁰⁰ Letter to The Times from Playfair, quoted in the Stirling Saturday Observer 15 November 1884 p.3.

Government hatcheries of Canada."¹⁰¹ Some years later, another fishery commentator, Henry Ffennell, expressed his annoyance at the rise of

specious views and silly suggestions promulgated by obscure persons ... [who] ... be it observed, altogether ignore Howietoun, Critchmere, Mr Armistead's Solway Fishery, the other smaller fish hatching establishments, and the Marine Biological Laboratory at Plymouth, where work of the very highest importance is being systematically carried on under the direction of thoroughly qualified persons.¹⁰²

But, unfortunately for Maitland's historical legacy, the more correct view has not prevailed.

An equally large factor in Maitland's drift out of the limelight, however, must have been his own actions. Chapter Seven discussed how Maitland largely retreated from piscicultural work after 1886, turning more to county politics and thereby failing to keep his name in the piscicultural public eye. But, even before then, notwithstanding his goal of spreading the piscicultural ideal, he had resented any idea of the fishery becoming some form of a tourist attraction, open to all and not just the pisciculturally-minded. He does not appear to have had either the time or the inclination to become a piscicultural hero and preferred that most people be kept "very much in the dark ... [knowing] ... nothing of the immense advance" that Howietoun had

¹⁰¹ University of Stirling, HF/V48(ii): Letter Book 4, p.116. Guy to Mr CH Cook of Weymouth, 27 November 1884. A biographer of SF Baird, the head of the United States Commission on Fish and Fisheries, believes Playfair's letter to have been written with the intention "to shame his homeland into serious concern with the fisheries." Photocopies of research notes provided by Dr Allard in communication of 31 December 1993.

¹⁰² The Times 18 May 1891 p.10. Critchmere was Thomas Andrews's establishment. *Vide supra* p.286.

made in fish culture, to the fishery being besieged by inquisitive journalists and other visitors.¹⁰³ In 1886, for example, he refused an offer from a writer on fisheries and fish culture to publish a series of articles on Howietoun's work since "with the Falkirk Water Bill ... the fishery has been sufficiently before the public at present."¹⁰⁴ As he told a fishery correspondent of The Times in 1894, "I am sorry but my rule is absolute to supply no information for press purposes. Good wine needs no bush."¹⁰⁵

Maitland had good reasons for not wanting the fishery opened to inquisitive visitors in that he felt such intrusions would be counter-productive. The popularity of the fishery could lead to flaws in its successful operation. As he himself acknowledged,

The real fact why the fishery is not more known consists in the absolute necessity of excluding all visitors from the works, as if the trout were fed - or rather starved - so as to show, they would be thoroughly unfitted for spawning at the most profitable season and the men would be so distracted by questions as to be incapacitated from carrying on the regular work of the fishery.¹⁰⁶

The select few visitors that were admitted to the fishery did not usually get to meet Maitland personally since he gave "strict orders that no one is to be

¹⁰³ Stirling Saturday Observer 28 February 1880 p.1.

¹⁰⁴ University of Stirling, HF/V49: Letter Book 5, p.809. Guy to J Barker-Duncan of Edinburgh, 19 May 1886.

¹⁰⁵ University of Stirling, HF/V57: Letter Book 13, p.117. Maitland to Henry Ffennell, 22 January 1894. Maitland has taken this expression from Shakespeare's As You Like It.

¹⁰⁶ University of Stirling, HF/V47(i): Letter Book 1, p.160. Maitland to an unknown addressee, 14 January 1881.

shown over the ponds except during his absence from home."¹⁰⁷ Maitland had realised the problems inherent in admitting visitors to piscicultural operations from as early as 1874 when he lived to regret allowing a friend to view his small pond for fry at Middlethird.¹⁰⁸ The fry were nurtured by water cress growing in their pond and, with Maitland's back turned, the voracious visitor took it upon himself to deprive the fish of their food by ripping out the plant and eating it. Maitland urged other pisciculturalists to be anti-social:

Never show fish to visitors, at least not without taking extraordinary precautions. One never knows what harm they may unwittingly do: They may move a sluice, or open a valve, or poke a stick through a fine screen, or feed the wrong fish, or frighten the tame ones till they refuse to come for their meals.¹⁰⁹

In conclusion, this chapter has set out both why Maitland deserves a place in piscicultural history and why he does not seem to have held on to that place after his death. Even though it has gone unnoticed, Maitland's work

¹⁰⁷ University of Stirling, HF/V47(i): Letter Book 1, p.400. Guy to Mr Anderson of Bridge of Allan, 11 April 1881.

¹⁰⁸ *Vide supra* p.71.

¹⁰⁹ Maitland, History of Howietoun p.101. But it cannot be said that Maitland was a shrinking violet. When in 1882 he successfully sent eggs to the wilds of Southern Ireland for the first time, the longest journey within the British Isles on Howietoun's records, he wrote to the purchaser that "I shall be awfully obliged if you will report the journey either in the Field or Land and Water." University of Stirling, HF/V47(i): Letter Book 1, p.961. Maitland Mr JA Place, address unknown, 20 January 1882. On first sending ova to Natal, Maitland informed Francis Francis, whose assistance he had sought in preparing the shipment, that it would be a "capital thing to interest the public in what we are doing." *Ibid.* p.964. Maitland to Francis Francis, 20 January 1882.

in the 1870s and 1880s laid all the essential principles for salmonoid culture today. As early as 1883, his work was recognised as having laid "a foundation on which may be built a piscicultural edifice of commanding proportions, capable of doing great work."¹¹⁰ Maitland did not single-handedly 'invent' modern pisciculture. His advances were more variations on a theme that had been established since the days of the Ancient Chinese and been further developed by Jacobi in the eighteenth century than a completely new way of doing things.¹¹¹ But surely science and the modern world owe as much, if not more, to those who apply and develop a discovery as to the inventors. That the course of salmonoid pisciculture, in Britain at least, changed dramatically from the 1880s onwards, and that the principles established by Maitland remain the basic tenets of modern pisciculture is beyond doubt. The nature of the subject - pisciculture not being a mainstream field for historical study or one that is conducive to the depositing of records - makes it impossible to definitively state for a fact that Maitland was the *sine qua non* of modern aquaculture. But the evidence that does exist surely proves beyond all reasonable doubt that he provided a crucial stepping stone in pisciculture's development and thereby laid the basis for further evolution of the science. Maitland himself believed that the French scientist and pisciculturalist, Professor JM Coste was "the father of scientific

¹¹⁰ Bertram, JG 'Pisciculture - Its Progress and Utility' Blackwoods Magazine 131 (1882) p.606.

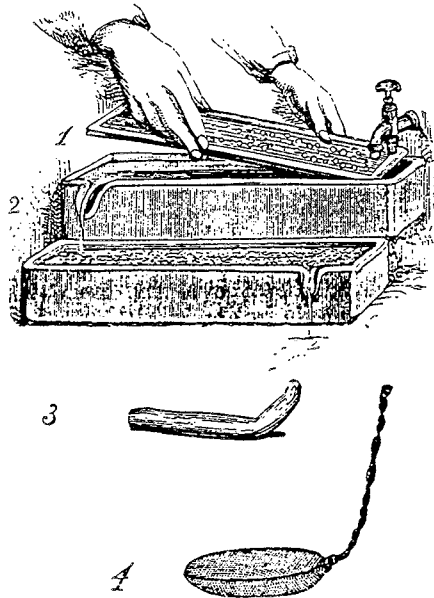
¹¹¹ See Chapter Two, *passim*.

pisciculture."¹¹² Nevertheless, if pisciculture were to rank alongside cotton and iron in economic history, Maitland himself would surely deserve a place equal to that of Kay, Hargreaves, Newcomen and Watt. As his obituarist in The Times, Henry Ffennell, hoped:

I think, Sir, as the founder and director of, perhaps, the finest fish hatchery in the world; an establishment which, I venture to assert, would do credit to a well-subsidised government department, the good work performed by the late Sir James Maitland at Howietoun should receive every recognition and should not be forgotten.¹¹³

¹¹² University of Stirling, HF/V48(ii): Letter Book 4, p.806. Maitland to the Secretary of the Paris Acclimatisation Society, 12 September 1885. One of Maitland's contemporaries agreed, describing Coste as "one who has done more for pisciculture than any one individual in Europe." Anderson-Smith, 'Fish Hatching' p.302. Coste's piscicultural efforts were discussed in Chapter Two. *Vide supra* p.60.

¹¹³ The Times 19 November 1897 p.6.

ILLUSTRATION 18**Amateur backyard piscicultural apparatus**

Source: Buckland, F Fish Hatching (1863) p.255.

1 and 2 are egg trays and water tanks

3 and 4 are instruments used to move and remove eggs

Chapter Ten

HOWIETOUN AFTER MAITLAND, 1897-1967

The work of the fishery is being conducted on the same lines laid down by its founder, who made the science of practical fish culture a life study. ... We are thoroughly alive to the importance of keeping everything connected with the fishery up to date. ... The public may rest assured that no effort will be spared to supply ova and young fish of the highest quality and vitality.¹

The extensions of the Company have largely been designed with this object in mind, viz., that however demand may increase it should not be met by any deterioration in the quality of the supply.²

This final chapter takes a comparatively brief look at Howietoun in the post-Maitland era, covering the period from his death in 1897 to 1967 when the fishery left the hands of the Maitland family. Discussion in this chapter falls into three distinct parts: a brief history of the post-Maitland fishery, an analysis of its success as a business, and a tentative concluding examination of why the fishery developed the way that it did.³ The main aim of the chapter is to tie up earlier discussion on Maitland's work, showing that, despite the intent expressed in the above quotations, and for reasons both within and without their control, but mainly their own incompetence, Maitland's successors failed to realise their ambitions whilst Howietoun failed

¹ Howietoun Fishery Pamphlet on Stocking (5th Edn.) (1898) p.i.

² Scottish Record Office, Steel-Maitland Collection, GD193/86/2: Howietoun and Northern Fisheries amalgamation and items in connection therewith. Announcement of the formation of the new Howietoun and Northern Fisheries Company in late 1914.

³ The word business can be taken literally - benevolent entrepreneurship died with Maitland.

as a business. In so failing, pisciculture at Howietoun was brought full circle and back to an almost pre-Maitland level of achievement.⁴

Practically nothing is known about the development of Howietoun between Maitland's death in 1897 and 1914. As part of the Sauchie Estate, the fishery was inherited by Maitland's only surviving child, Mary (1871-1944), and continued to run fairly independently, as indeed it had done since 1886, under Thompson's management.⁵ In 1901, Mary married Mr Arthur Steel (1876-1935), amalgamating their surnames to Steel-Maitland.⁶ The

⁴ Indeed, whilst Chapter Six argued that Maitland should be exonerated of Aldcroft's charge of entrepreneurial failure, discussion in this chapter presents substantial evidence that his heirs, particularly those of the third generation who ran the company from the mid twentieth century, *were* entrepreneurially lackadaisical. As such, the history of Howietoun after Maitland presents a case study, though in a different time scale, in support of Aldcroft's argument that third generation entrepreneurs in the late nineteenth century had lost the drive and dynamism of their predecessors. Aldcroft, D 'The Entrepreneur and the British Economy, 1870-1914' Economic History Review (1964) p.129.

⁵ Maitland's total estate was valued at £35,046 plus £373,322 worth of heritable property. Scottish Record Office, GD193/20/21: Howietoun Fishery tax returns. Arthur Steel-Maitland to the Collector of Taxes, Stirling, 5 July 1906.

⁶ Steel had been educated at Rugby and Balliol College at the University of Oxford. He entered a career in politics becoming Private Secretary to the Chancellor of the Exchequer in 1902, a post he held until 1905. Between 1915 and 1917 he was Parliamentary Under-Secretary of State for the Colonies and Under-Secretary of State for Foreign Affairs. Between 1917 and 1919, he acted as Parliamentary Secretary to the Board of Trade's Department of Overseas Trade and, between 1924 and 1929, was Minister of Labour. Burke's Peerage (1936) p.1595.

marriage does not seem to have had any effect upon the running of the fishery until 1914 when Howietoun was amalgamated with a new piscicultural operation, the Northern Fisheries Company. This had been jointly owned by Peter Duncan Malloch, a Perth fishing tackle dealer, and William McNicol, an Inverness pisciculturalist.⁷ The amalgamation created a limited company, the Howietoun and Northern Fisheries Company; Howietoun was now an independent company in its own right rather than a piscicultural sideline of the wider Sauchie Estate as it had been under Maitland and for the first 17 years after his death.

The first two meetings of the new company's directors, held in January and February 1915, attended to the routine business of confirming Thompson's continuance as manager and determining the form and control of the business. It was decided that the Company should have three directors, the two Steel-Maitlands together with Malloch, and that Arthur Steel-Maitland should act as their chairman. McNicol had been a junior partner to Malloch in the old Northern Fisheries Company and remained so in the new venture, being a shareholder only. Shares to the value of £20,000 were issued, the allocation and attached voting rights being as follows:

⁷ Malloch had been the first Managing Director of the Tay Salmon Fisheries Company formed in 1899. *Vide infra* p.41.

Arthur Steel-Maitland	04,000 1st. Preference	(12,000 votes)
	01,000 Ordinary	(01,000 votes)
Mary Steel-Maitland	04,000 1st. Preference	(12,000 votes)
	01,000 Ordinary	(01,000 votes)
<i>Steel-Maitland TOTAL</i>	<i>10,000 Shares</i>	<i>(26,000 votes)</i>
Peter Duncan Malloch	05,813 2nd. Preference	(17,439 votes)
	01,375 Ordinary	(01,375 votes)
William McNicol	02,187 2nd. Preference	(06,561 votes)
	000625 Ordinary	(000625 votes)
<i>Other Parties TOTAL</i>	<i>10,000 Shares</i>	<i>(26,000 votes)</i>
	<u><i>TOTALS</i></u>	<u><i>20,000 Shares</i></u>
		<u><i>(52,000 votes)⁸</i></u>

A further £6,000 worth of share capital remained unissued. Though this was never issued, company rules dictated that, should it be so, at least one half should first be offered to the Steel-Maitlands and their heirs.⁹ Whilst the Steel-Maitland interest possessed an exact 50 *per cent* of the shares, and therefore not enough to form an overall majority in voting, its dominance was secured by the fact that, as Chairman, Arthur Steel-Maitland had the casting vote on any issue upon which the vote was split.¹⁰ The Steel-Maitlands also

⁸ University of Stirling, Howietoun Archive, HF/V13: Minute Book of the Howietoun and Northern Fisheries Company, 1915-1963. Minute of Shareholders' meetings on 4 January 1915 and 18 February 1915.

⁹ University of Stirling, HF/B7/50: Memorandum and Articles of Association of the Howietoun and Northern Fisheries Company Limited, pp.5-9.

¹⁰ *Ibid.* p.17.

had priority over the payment of dividends, holding all the First Preference shares. In 1919, though losing this priority over dividends, they secured overall control and majority ownership by exchanging 4,000 of their First Preference shares for 4,000 of Malloch's Second Preference *plus* 100 of his ordinary shares, thus securing them slightly over 50 *per cent* of the shares and 26,100 of the 52,000 votes.¹¹

The fishery continued to run under Thompson's management until 1917, thirty-five years since Maitland had first appointed him, when ill health forced his resignation.¹² The Secretary, George Shorthouse, who had worked at Howietoun since 1898 and who had been fully trained in piscicultural technique by Thompson, replaced him as a joint Secretary-Manager.¹³ The Inverness connection was severed in April 1920 when the operation there was

¹¹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 8 March 1919.

¹² Scottish Record Office, GD193/86/1: Howietoun Fishery correspondence. Thompson to Arthur Steel-Maitland, 13 April 1917. University of Stirling, HF/V13. Minute of Shareholders' meeting on 26 May 1917.

¹³ *Ibid.* Minute of Shareholders' meetings on 26 May 1917 and 8 March 1919. On offering the post to Shorthouse, Arthur Steel-Maitland wrote:

I hope, if you take the work, [Shorthouse had toyed with the idea of going for a career in factorship] that you will really do so with a good heart and intending to make a good thing of it. If anybody really does their best for me, they may always rest assured that I should really do my best for them in return, not only in the particular business in which they are engaged but if any other opening is offered. ... My own opinion is that, looking to the trend of events, it is much more possible for the fishery to develop into a really good business than it is likely for many of factorships of the old kind to be going.

Scottish Record Office, GD193/86/1. Steel-Maitland to Shorthouse, 20 February 1918.

sold for £375.¹⁴ In 1921, Howietoun reached an amicable agreement with Falkirk Town Council over the use of Loch Coulter as a reservoir.¹⁵ 1921 also saw Malloch's death, his replacement as a director by his eldest son, Gilbert D Malloch, and the splitting of his shares between his wife and children. At the same time, Gilbert bought out McNicol's 2,812 shares, becoming the largest single shareholder after the Steel-Maitland interest.¹⁶

Arthur Steel Maitland's position as Minister of Labour saw the fishery feel the sting of the 1926 General Strike. Though really incidental to analysis here, it is worth quoting some of the evidence relating to this as it provides an interesting illustration both of the actions of strikers against a Government

¹⁴ Scottish Record Office, GD193/20/22: Miscellaneous correspondence. Shorthouse to Mary Steel-Maitland, 31 May 1920.

¹⁵ *Vide supra* p.160.

¹⁶ University of Stirling, HF/V13. Minute of Shareholders' meetings on 30 August 1921 and 3 January 1922. The evidence does not give any indication of whether the Steel-Maitlands actually got along with Malloch Senior. All that remains is a letter, of which the context is unknown, in which Arthur Steel-Maitland told his son, Keith, "It is to Malloch's interest, at any rate at present, to act well by us, but he is a shifty beggar." Scottish Record Office, GD193/86/1. Steel-Maitland to Keith Steel-Maitland, 8 October 1920. Certainly, there had been earlier friction between Malloch and McNicol in negotiating the amalgamation. Having finally agreed a deal with McNicol, Malloch wrote to Arthur Steel-Maitland: "I never was so glad to get rid of anyone. ... All he wanted was money. He did not care how he got it." GD193/86/2. Malloch to Steel-Maitland, 13 February 1915. Whatever the truth about their relationship, Malloch's death in 1921 saw Arthur Steel-Maitland minute his "expression of regret and appreciation of Mr Malloch's valuable services to the company since its inception." University of Stirling, HF/V13. Minute of Shareholders' meeting on 30 August 1921.

Minister and of the loyalty of the fishery staff to their employer's cause. At the beginning of the strike, Shorthouse reported to the Steel-Maitlands that:

So far nothing serious has happened at the fishery through the strike. We had them - the miners - inside the iron fence one night and they had the impudence to go into the net house and take out a large net and net one of the ponds but fortunately the mesh was too great for the size of the trout and they all escaped. Not daunted, however, they got hold of another net and managed to select a pond where there were big trout but during netting operations they tore the net and the trout again all escaped. On netting the pond next day we were only two trout short.¹⁷

The strikers returned some time during May 1926 and smashed one of the fishery's gate locks but were deterred from further intrusion by Shorthouse's large dog. In addition to this, roadside pickets had tried to stop the fishery lorry driver making his deliveries on one occasion but were deterred by Shorthouse's presence. Shorthouse made sure that the fishery "hurried through the deliveries which necessitated our passing hot centres in case the strike should be prolonged and bitterness increase through destitution." Once the strike was over, he told his employer:

The country has reason to give thanks to you and all those working with you in having brought us safely through this great disaster. Since the European war we have been living in disconcerting conditions of insecurity. This strike however may clear the air with peace and advancement following.¹⁸

Returning to the history of the fishery itself, there were no further changes in company directorships until Arthur Steel-Maitland died suddenly

¹⁷ Scottish Record Office, GD193/384: Papers concerning the Howietoun Fishery. Shorthouse's Report to the Directors for March/April 1926. One has to ask why, if all this was seen to be going on, none of the fishery staff attempted to interdict the miners.

¹⁸ Ibid. Shorthouse to Steel-Maitland, 17 May 1926.

in 1935, his shares being inherited by his son, Keith (1912-1965), who replaced him as a director. The new board continued Shorthouse's appointment as Secretary/Manager and, in 1938, appointed his son, Sandy, as an apprentice manager.¹⁹ Mary Steel-Maitland died in 1944, her shares being inherited by Keith. Gilbert Malloch died in 1955 and was replaced as a director by his brother, William. A new director, Norman MacKay, an Edinburgh writer to the signet, was added.²⁰ Malloch left the company the following year, his place on the Board being taken by a John Andrew Ure and his shares being purchased by the Barnton, Sauchie and Bannockburn Estates Company. MacKay and Ure were not major shareholders in the Company, possessing only 200 Ordinary shares apiece, and were brought in simply to meet the Articles of Association's requirement that there should be a total of at least three directors.²¹

The remaining evidence does not fully disclose the circumstances of Malloch's departure, but a letter of July 1955 indicates that the Malloch interest may have been trying to secure overall control of the company from the Steel-Maitland interest. Keith Steel-Maitland told his solicitor that he was desirous to ensure his own control because he had "no doubt ... that William

¹⁹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 4 October 1938.

²⁰ Ibid. Minute of Shareholders' meeting on 9 September 1955. William Malloch had earlier published an article entitled 'The Development of Freshwater Fisheries' in the Transactions of the Perthshire Society of Natural Sciences 8 (1925) pp.107-118.

²¹ The Barnton, Sauchie and Bannockburn Estates Company had been set up by Arthur and Mary Steel-Maitland in 1925.

Malloch ... would much like to gain control of the fishery." He went on to state that "some means must be found whereby I am constantly ... clothed with the voting power. Otherwise, I am quite sure that the Mallochs will sooner or later gain control."²² Keith achieved his aim with William Malloch's departure since, either personally or through his estates company, he held all but the £400 worth of share capital allotted to Ure and MacKay.

As the sole owner of almost the entire company, Keith Steel-Maitland was appointed Managing Director at an annual salary of £500.²³ On his death in 1965, Keith was replaced by his niece and sole heiress, Mrs Gay Stafford, and Ure by her husband, Commander Stafford. The latter resigned the following year and was replaced as a director by the Secretary/Manager Sandy Shorthouse, who had succeeded his father in 1956.²⁴ MacKay resigned as a director in April 1966 and was replaced by Mr Sandy Bulloch, a Glasgow wine merchant with a desire to invest in fish farming.²⁵ By this time, as subsequent discussion will show, Howietoun was in an extremely

²² Scottish Record Office, GD193/669: Miscellaneous papers. Keith Steel-Maitland to Mr Morris of Brodies (Solicitors), Edinburgh, 28 July 1955.

²³ University of Stirling, HF/V13. Minute of Shareholders' meetings on 21 December 1956 and 18 October 1957. This was the first time in the company's history that directors had asked for remuneration over and above incurred travelling expenses, but it had always been allowed for under Article 65 of the company's Articles of Association. University of Stirling, HF/B7/50. Memorandum and Articles of Association, p.19.

²⁴ University of Stirling, HF/V13. Minute of Shareholders' meeting on 21 December 1956.

²⁵ University of Stirling, HF/B2/7: Legal and financial letters, papers and accounts. Gay Stafford to Brodies (Solicitors), Edinburgh, 3 April 1966.

serious financial predicament. In 1967, Mrs Stafford sold it to Shorthouse and Bulloch, thereby closing almost a century in which Howietoun had been in either the ownership or majority control of the Maitlands.

Having briefly reviewed the history of the fishery between 1897 and 1967, discussion now looks at Howietoun's performance as a business in the period and lays the basis for an analysis of *why* the fishery developed as it did after 1897. It will be shown that, within an admittedly limited scope of enquiry, Howietoun clearly failed as a business after Maitland's death, or, more specifically, after the 1914 amalgamation. The financial data used for analysis of the post-Maitland period come from the order and cash books for the period and the minute book of the Howietoun and Northern Fisheries Company.²⁶ The data are considerably more complicated than those for the pre-1897 years, particularly so in that accounts are not as clearly broken down into their constituent parts. Nevertheless, they permit the extrapolation of the two most important sets of statistics on revenue and profit.

²⁶ University of Stirling, HF/V2-5: Cash books, 1914-1971; HF/V13: Minute Book of the Howietoun and Northern Fisheries Company, 1915-1963; HF/V14: Cash book, 1947-1963; HF/V28-35 Order books (sales), 1905-1972; and HF/V115-116: Cash books, 1893-1914.

The data for the period from Maitland's death to 1913 are complete - offering details of income, expenditure and profit - but there are a number of gaps in the evidence thereafter. The order and cash books provide total income (sales) data from 1915 to 1932 and from 1944 to 1972. The minute book offers profit and dividend data for the period between 1917 and 1963. With due allowance for the years for which only partial data is available, it is possible to construct a set of statistics documenting the fishery's performance right up to the fishery leaving Maitland's heirs hands in 1967.

TABLE 10.1

**Howietoun Fishery Expenditure, Income, Profit and Profitability (£/%),
1898-1913**

<i>YEAR</i>	<i>EXPENDITURE</i>	<i>INCOME</i>	<i>PROFIT</i>	<i>%</i>
1898	1,326	1,401	75	5.35
1899	1,419	1,768	349	19.74
1900	1,455	1,452	-3	-0.21
1901	1,310	1,784	474	26.57
1902	1,414	1,806	392	21.71
1903	1,497	1,947	450	23.11
1904	2,770	2,085	-685	-32.85
1905	1,665	2,231	566	25.37
1906	1,814	2,110	296	14.02
1907	1,560	1,989	429	21.57
1908	1,442	2,393	951	39.74
1909	1,537	2,245	708	31.54
1910	1,400	2,334	934	40.02
1911	1,577	2,210	633	28.64
1912	1,431	2,281	850	37.26
1913	1,698	1,730	32	1.85

Source: University of Stirling, HF/V115 and HF/V116.

Table 10.1 (page 334) summarises Howietoun's income, expenditure, profit and profitability expressed as a percentage of turnover from 1898 to the close of the accounts in 1913 before the formation of the Howietoun and Northern Fisheries Company in the following year.²⁷ The table shows that the fishery returned a trading profit in most years, fluctuating between a low of -32.85 *per cent* of turnover in 1904 and a high of 37.42 *per cent* in 1910. Indeed, the loss in 1904 was the result of Mary Steel-Maitland transferring £1,333 from the fishery's accounts to those of the Sauchie Estate; had she not done so, Howietoun would have returned a profit in that year of £648, amounting to some 31.08 *per cent* of turnover.²⁸ The average annual profit between 1898 and 1913 was 22.4 *per cent*, far better than the overall trading loss of 0.4 *per cent* achieved by Maitland between 1887 and 1897.²⁹ Similarly, the fishery's income increased quite substantially from the £1,500 mark at which it had levelled in the last ten years of Maitland's life.³⁰ In 1908, income peaked at £2,393 - "the most successful year ever in the history of Howietoun."³¹ 1912 was such a good year for the fishery that,

²⁷ As with other 'income' data throughout this thesis, the figure is almost wholly comprised of fish/ova sales revenue, the fishery gaining a minimum of extra income from such sources as equipment sales or piscicultural consultancy fees. *Vide supra* p.132.

²⁸ University of Stirling, HF/V115 p.234.

²⁹ *Vide supra* p.172.

³⁰ *Vide supra* p.175.

³¹ Scottish Record Office, GD193/86/2. Shorthouse's Report to the Steel-Maitland's for the 1908/1909 season. The rising level of income and the significant increase in trading profit
(continued...)

with demand far outstripping supply, the management decided to restrict advertising expenditure.³² Thereafter, however, income decreased, totalling only £1,730 in 1913, the worst year since 1898.³³ Apart from in 1904 when £1,333 was transferred to the Sauchie Estate, the table shows expenditure to have remained reasonably constant throughout the period, fluctuating around an average of £1,734 (excluding 1904) compared to an average £2,269 (including 1904) for income.

³¹(...continued)

seem to indicate that benevolent entrepreneurship had died with Maitland. There is no evidence that blatantly states Maitland's daughter to have chosen to maximise profit but, given that the years to 1914 were not ones of rampant inflation and that there were no extensions made to the fishery's productive capacity, it would seem that the operation was being run far more as a business, with prices increased to a level above those charged by Maitland for his 'public work.'

³² Howietoun Archive, HF/V80: Letter Book 36, p.276. George Shorthouse to the Editor of the Stirling Sentinel, 27 September 1912.

³³ Such a slump in sales, though profitability remained high, possibly led the Steel-Maitlands to opt for amalgamation with Malloch and McNicol's operation. *Vide infra* p.366.

TABLE 10.2

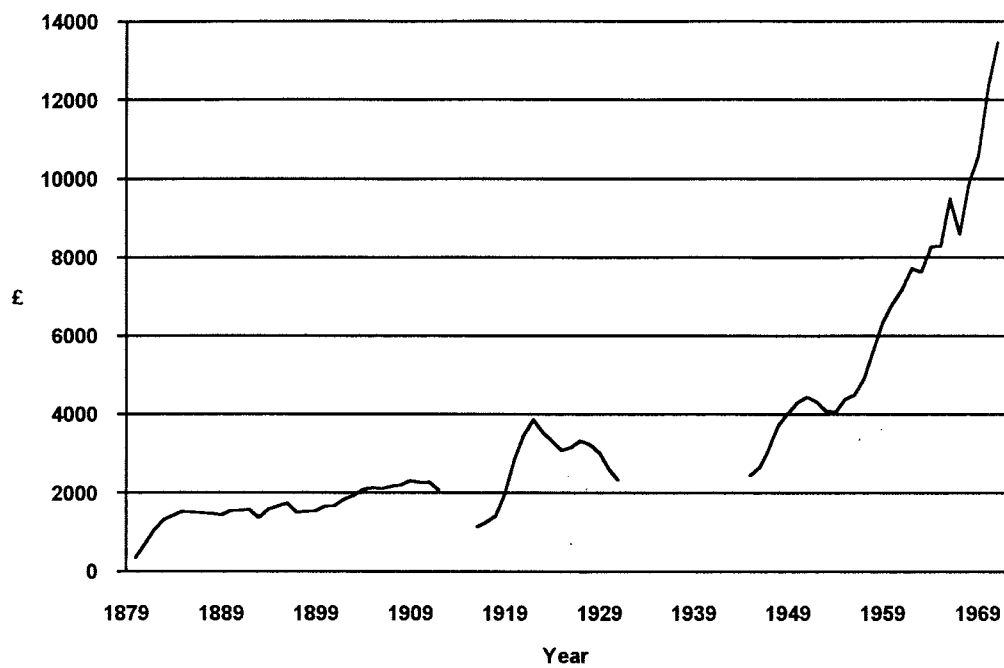
Howietoun Fishery/Howietoun and Northern Fisheries Company Income and its Trend using a 3-Year Average (£ in Current Prices), 1879-1972

YEAR	INCOME	TREND	YEAR	INCOME	TREND	YEAR	INCOME	TREND
1879	78		1917	1,146	1,246	1955	4,580	4,377
1880	245	342	1918	1,408	1,416	1956	4,577	4,489
1881	702	706	1919	1,693	1,969	1957	4,310	4,900
1882	1,171	1,059	1920	2,805	2,867	1958	5,814	5,616
1883	1,304	1,311	1921	4,102	3,481	1959	6,725	6,359
1884	1,457	1,441	1922	3,536	3,873	1960	6,537	6,807
1885	1,562	1,533	1923	3,981	3,547	1961	7,160	7,190
1886	1,582	1,518	1924	3,125	3,324	1962	7,874	7,730
1887	1,412	1,505	1925	2,867	3,088	1963	8,157	7,629
1888	1,522	1,474	1926	3,271	3,171	1964	6,856	8,270
1889	1,488	1,439	1927	3,374	3,327	1965	9,796	8,290
1890	1,309	1,541	1928	3,336	3,232	1966	8,217	9,482
1891	1,828	1,547	1929	2,985	3,013	1967	10,433	8,590
1892	1,505	1,583	1930	2,719	2,630	1968	7,119	9,885
1893	1,418	1,363	1931	2,185	2,333	1969	12,102	10,601
1894	1,168	1,580	1932	2,095	n/a	1970	12,582	12,371
1895	2,154	1,662	1933	n/a	n/a	1971	12,430	13,463
1896	1,666	1,742	1934	n/a	n/a	1972	15,379	
1897	1,408	1,492	1935	n/a	n/a			
1898	1,401	1,526	1936	n/a	n/a			
1899	1,768	1,540	1937	n/a	n/a			
1900	1,452	1,668	1938	n/a	n/a			
1901	1,784	1,681	1939	n/a	n/a			
1902	1,806	1,846	1940	n/a	n/a			
1903	1,947	1,946	1941	n/a	n/a			
1904	2,085	2,088	1942	n/a	n/a			
1905	2,231	2,130	1943	n/a	n/a			
1906	2,110	2,110	1944	2,383	n/a			
1907	1,989	2,164	1945	2,563	2,453			
1908	2,393	2,209	1946	2,412	2,666			
1909	2,245	2,324	1947	3,022	3,117			
1910	2,334	2,263	1948	3,917	3,722			
1911	2,210	2,275	1949	4,226	4,035			
1912	2,281	2,074	1950	3,961	4,290			
1913	1,730	n/a	1951	4,682	4,444			
1914	n/a	n/a	1952	4,688	4,329			
1915	1,101	n/a	1953	3,618	4,093			
1916	1,183	1,143	1954	3,974	4,057			

Source: University of Stirling, HF/V2-5, V13-14, V28-35, V115-116.

CHART 10.1

**Trend of Howietoun Fishery/Howietoun and Northern Fisheries Company
Income using a 3-Year Average (£ in Current Prices), 1879-1972**



Source: *Table 10.2 (p.337)*

Table 10.2 (page 337) sets out the Howietoun income data and its trend in current prices over the whole period 1879-1972, with omissions in 1914 and between 1933 and 1943 due to lack of data.³⁴ Graphically depicted in **Chart 10.1** (page 338), the table shows a levelling of income towards the First World War, followed, not surprisingly, by an absolute drop once hostilities commenced. Income rose considerably after the war, reaching a high of around £4,000 between 1921 and 1923. It then fell off to around the pre-1910 level by 1933 at around £2,000 and, judging from the graph lines at the beginning and end of the missing data set, appears to have remained fairly static between 1933 and 1944. The years after the Second World War, however, despite a downwards fluctuation in 1953 and 1954, saw steady growth with income reaching £10,433 in 1967 when the farm left the ownership of the Maitland family. Indeed, it went on to reach £12,430 and £15,379 in 1971 and 1972 respectively thereafter.

At face value, the data appear to paint an impressive picture of Howietoun's development through the twentieth century with income increasing 197 fold between the first entry in 1879 and the last in 1972. However, viewing data in current values over so long a period, particularly one subject to the financial and economic stresses of the first half of the twentieth century and a demand-managed boom thereafter, is fraught with difficulty. The only way that the income data can be properly comprehended is to recalculate them into constant values immune from the effect of changes in

³⁴ The extra years 1878-1897 and 1967-1972 are included for comparative purposes, to show the full spread of the data.

prices over the period. It is then possible to assess *real* performance and to judge Howietoun's long-term business success.

This is achieved in **Table 10.3** (page 341) which translates the data in current prices from **Table 10.2** into constant figures using a recent index of prices of food and drink in southern England since 1264.³⁵ The table recalculates the income data in terms of what it would have been in any given year if prices in that year had held the same level as in 1891. 1891 is chosen as the base year since it saw the highest income figures of the pre-1897 period (save 1895 which, as noted in Chapter Six, was more the result of a surge of late payment from 1894 than of rising income).³⁶

³⁵ Jay, D *Sterling - Its Use and Misuse: A Plea for Moderation* (1985) pp.275-279. The index used is Jay's *Index of the price of composite unit of consumables in Southern England 1264-1983 (1451-1475 = 100)*.

³⁶ *Vide supra* p.167. **Table 10.3** simply lists constant income values and their trend. The methodology and calculations which give rise to the data are given in **Table 10.3A** in Appendix II. *Vide infra* p.385.

TABLE 10.3

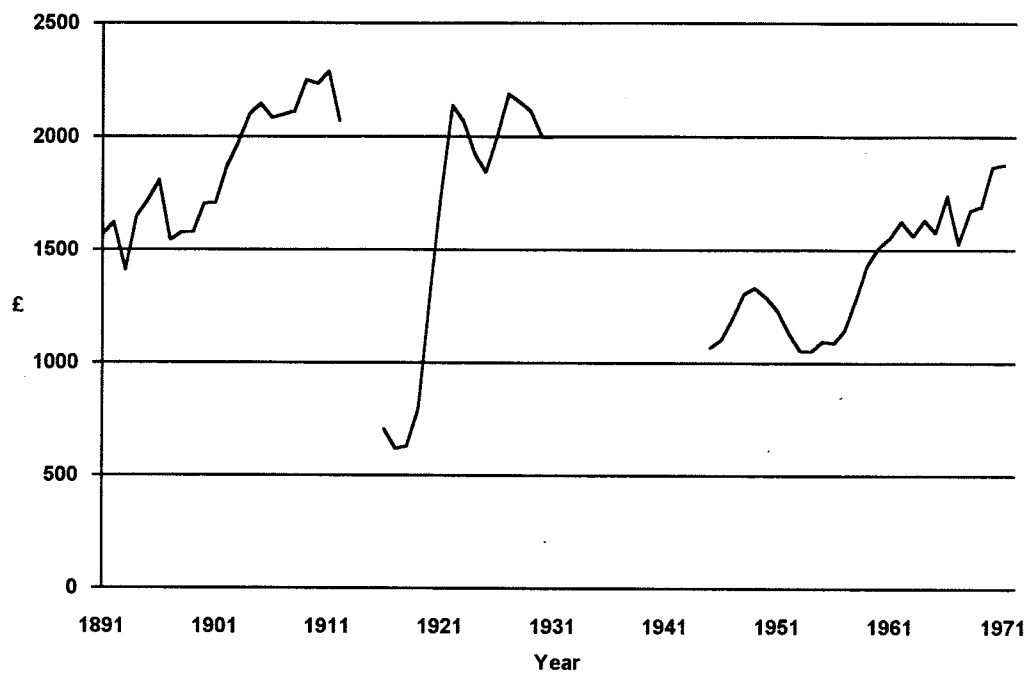
Howietoun Fishery/Howietoun and Northern Fisheries Company Income and its Trend using a 3-Year Average (£ in Constant Prices), 1879-1972

<i>YEAR</i>	<i>INCOME</i>	<i>TREND</i>	<i>YEAR</i>	<i>INCOME</i>	<i>TREND</i>	<i>YEAR</i>	<i>INCOME</i>	<i>TREND</i>
1879	64		1917	582	620	1955	1,154	1,099
1880	208	283	1918	563	631	1956	1,106	1,090
1881	578	604	1919	750	798	1957	1,009	1,146
1882	1,025	901	1920	1,080	1,276	1958	1,324	1,285
1883	1,101	1,161	1921	1,999	1,730	1959	1,522	1,437
1884	1,358	1,326	1922	2,111	2,137	1960	1,465	1,516
1885	1,519	1,522	1923	2,302	2,068	1961	1,561	1,559
1886	1,688	1,560	1924	1,792	1,923	1962	1,651	1,630
1887	1,473	1,585	1925	1,675	1,846	1963	1,679	1,565
1888	1,595	1,544	1926	2,070	1,999	1964	1,366	1,636
1889	1,563	1,511	1927	2,251	2,188	1965	1,864	1,578
1890	1,376	1,589	1928	2,242	2,155	1966	1,505	1,743
1891	1,828	1,571	1929	1,972	2,114	1967	1,861	1,527
1892	1,508	1,624	1930	2,128	2,001	1968	1,214	1,678
1893	1,537	1,411	1931	1,903	1,998	1969	1,958	1,695
1894	1,187	1,648	1932	1,963	n/a	1970	1,914	1,866
1895	2,219	1,719	1933	n/a	n/a	1971	1,727	1,878
1896	1,751	1,809	1934	n/a	n/a	1972	1,995	
1897	1,457	1,544	1935	n/a	n/a			
1898	1,423	1,578	1936	n/a	n/a			
1899	1,853	1,578	1937	n/a	n/a			
1900	1,458	1,705	1938	n/a	n/a			
1901	1,805	1,711	1939	n/a	n/a			
1902	1,869	1,870	1940	n/a	n/a			
1903	1,935	1,972	1941	n/a	n/a			
1904	2,112	2,100	1942	n/a	n/a			
1905	2,251	2,145	1943	n/a	n/a			
1906	2,073	2,083	1944	1,073	n/a			
1907	1,925	2,096	1945	1,121	1,071			
1908	2,290	2,111	1946	1,018	1,103			
1909	2,118	2,250	1947	1,169	1,198			
1910	5,343	2,234	1948	1,406	1,305			
1911	2,241	2,288	1949	1,341	1,333			
1912	2,279	2,070	1950	1,253	1,291			
1913	1,691	n/a	1951	1,278	1,235			
1914	n/a	n/a	1952	1,173	1,139			
1915	834	n/a	1953	967	1,059			
1916	715	710	1954	1,037	1,053			

Source: Table 10.3A (Appendix II p.385)

CHART 10.2

**Trend of Howietoun Fishery/Howietoun and Northern Fisheries Company
Income using a 3-Year Average (£ in Constant Prices), 1891-1972**



Source: *Table 10.3 (p.341).*

The recalculation paints a very different picture. In the 70 years between Maitland's death in 1897 and 1967, income in constant prices increased by a factor of less than 1.3, from £1,457 to £1,861. The 'healthy' income growth depicted in **Table 10.2** and **Chart 10.1** is, therefore, an illusion. **Chart 10.2** (page 342) helps to bring out the implication of the large amount of data in **Table 10.3**. In plotting the trend of the constant income data from the base year in 1891 until 1972, it shows income increasing after Maitland's death in 1897 towards the end of the first decade of the twentieth century. After the war, it recovered in the 1920s, but, as the chart clearly shows, until the break in the data between 1933 and 1943, the fishery did not perform significantly better as a limited company than it had done prior to the amalgamation in 1914. More seriously, the chart makes it clear that, in constant terms, the fishery performed exceptionally badly after 1945 with income never again reaching the levels that had been attained between Maitland's death and 1914. Indeed, between 1945 and 1960, it never even reached the levels that it had done between 1891 and 1897 when Maitland was running the farm less as a business and more as a vehicle for the public good. The fishery's performance after 1914, particularly after 1945, thus did scant justice to Arthur Steel-Maitland's hope in 1918 that Howietoun would "develop into a really good business."³⁷

³⁷ Scottish Record Office, GD193/86/1. Steel-Maitland to Shorthouse, 20 February 1918.

TABLE 10.4

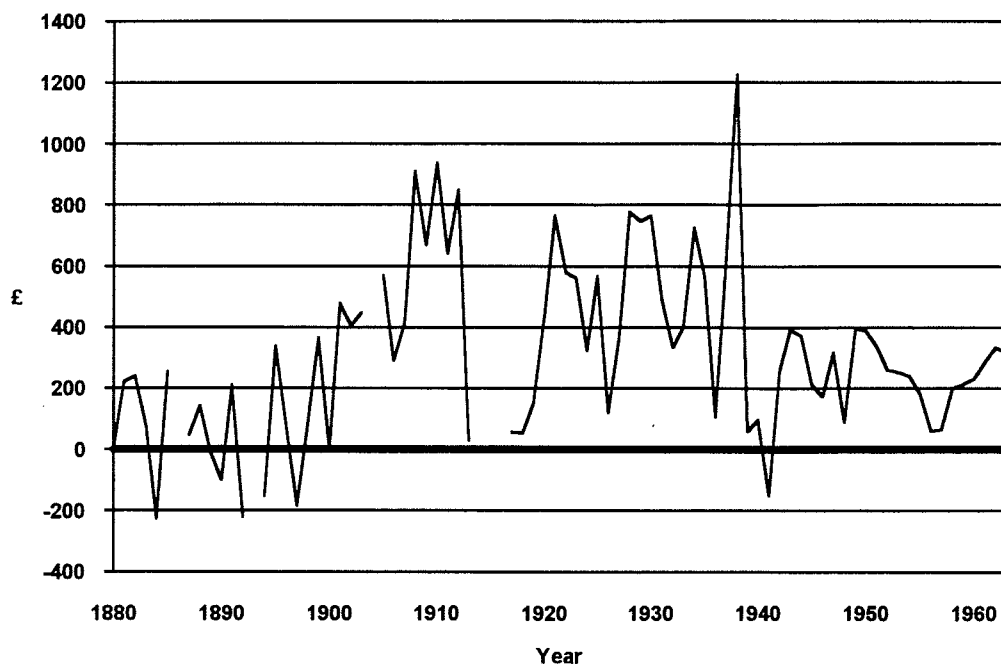
Howietoun and Northern Fisheries Company Profit and Profitability (£/% in Current Prices), 1917-1963. Also showing the recalculation of the profit data into Constant (1891) Prices (£)

YEAR	Profit (Current)	Income	Profit %	Profit (Constant)	YEAR	Profit (Current)	Income	Profit %	Profit (Constant)
1917	113	1,146	9.86	57	1942	553	n/a	n/a	259
1918	135	1,408	9.59	54	1943	845	n/a	n/a	393
1919	342	1,693	20.20	151	1944	828	2,383	34.75	373
1920	1,131	2,805	40.32	436	1945	494	2,563	19.27	216
1921	1,569	4,102	38.25	765	1946	412	2,412	17.08	174
1922	971	3,536	27.46	580	1947	820	3,022	27.13	317
1923	971	3,981	24.39	561	1948	246	3,917	6.28	88
1924	563	3,125	18.02	323	1949	1,249	4,226	29.56	396
1925	972	2,867	33.90	568	1950	1,230	3,961	31.05	389
1926	191	3,271	5.84	121	1951	1,233	4,682	26.33	337
1927	553	3,374	16.39	369	1952	1,041	4,688	22.21	261
1928	1,157	3,336	34.68	778	1953	948	3,618	26.20	253
1929	1,130	2,985	37.86	746	1954	924	3,974	23.25	241
1930	977	2,719	35.93	765	1955	731	4,580	15.96	184
1931	563	2,185	25.77	490	1956	243	4,577	5.31	59
1932	357	2,095	17.04	335	1957	283	4,310	6.57	66
1933	443	n/a	n/a	399	1958	877	5,814	15.08	200
1934	797	n/a	n/a	725	1959	940	6,725	13.98	213
1935	654	n/a	n/a	568	1960	1,037	6,537	15.86	232
1936	128	n/a	n/a	105	1961	1,317	7,160	18.39	287
1937	774	n/a	n/a	606	1962	1,597	7,874	20.28	335
1938	1,565	n/a	n/a	1,226	1963	1,545	8,157	18.94	318
1939	71	n/a	n/a	59					
1940	154	n/a	n/a	98					
1941	-270	n/a	n/a	-151					

Source: *Table 10.2 (p.337), University of Stirling, HF/V13 and Table 10.4A (Appendix II p.388).*

CHART 10.3

Howietoun Fishery/Howietoun and Northern Fisheries Company Profits (£ in Constant Prices), 1879-1963



Source: Table 10.4 (p.344) and Table 10.4A (Appendix II p.388).

Income aside, what about profits? **Table 10.4** (page 344) sets out the available data on Howietoun's profits between 1917 and 1963 in both current and constant terms. It also sets out, where income figures are available, the fishery's profitability expressed as a percentage of turnover at current prices. The data are more attractive than those for income in that, as it had done between Maitland's death and 1913, Howietoun returned an annual surplus every year except for 1941. Over the whole period between 1917 and 1963, profits in current prices averaged £670 *per annum*; profit expressed as a percentage of turnover averaged 21.9 *per cent* in the years for which data are available.³⁸ In constant terms, however, the profit data are as poor as those for income. In constant prices, profits between 1917 and 1963 averaged £347 *per annum*. They were significantly lower after 1941, averaging £254 *per annum* between 1942 and 1963, as opposed to an annual average profit of £429 between 1917 and 1941.³⁹

Chart 10.3 (page 345) plots constant profit data over the whole period from 1879, omitting 1886 and 1904 because of the distortions caused by, respectively, expenditure on the Falkirk Water Bill and Mary Steel-Maitland's taking of £1,333 from the fishery's accounts.⁴⁰ The chart shows that, quite

³⁸ Trading profits before 1914 had averaged 22.4 *per cent*. *Vide supra* p.335.

³⁹ Profits in constant prices have been determined with the same methodology as those for income. **Table 10.4A** in Appendix II contains details of the calculation and, for comparative purposes, also lists profit data for the period from 1879 when Maitland first started trading. *Vide infra* p.388.

⁴⁰ *Vide supra* p.335.

apart from the fact that profits were never on a rising or stable trend, surpluses after the 1914 amalgamation, except for an extraordinary year in 1938, were never as high as they had been before then. After 1945, profits in constant terms were even lower, being less than those attained between 1897 and 1914 and sometimes, in fact, being even less than those attained under Maitland's non-profit-maximising benevolent entrepreneurship prior to 1897.

The foregoing makes it clear that, though successful between 1897 and 1914, the post-amalgamation history of the fishery is a story of failure. Income and profits in constant prices were extremely low and, after 1945, often could not match results attained in the later nineteenth century. The only favourable item of note is that the fishery continued to be profitable and that, though dropping after 1941, profitability expressed as a percentage of turnover maintained favourable levels. But the *amount* of profit was so small in constant terms that it makes such calculations of profitability largely useless. What, after all, is 22 *per cent* of next to nothing?

Why did Howietoun perform so badly after 1914? Much of the answer lies in management, or more specifically, directorial, incompetence in dealing with problems of supply. Chapter Three showed how Maitland's piscicultural success was built upon his pioneering use of a captive broodstock of selected fish. These produced healthier eggs with a far greater propensity to hatch stronger fish capable of winning the battle to survive to maturity. The technique had supplanted the earlier piscicultural method of taking ova from wild or unselected breeders which were far more likely to be sickly and to lead

to much greater loss in hatching and rearing. The Howietoun fish, as the Field noted, showed "extraordinary vigour and vitality, ... [they] ... could stand almost any vicissitude."⁴¹ As the quotations at the head of this chapter show, Maitland's heirs were determined to continue the broodstock principle; when the Howietoun and Northern Fisheries Company was formed, its customers were assured that "the extensions of the company" would not be met by "any deterioration in the quality of the supply."⁴²

The strength of the Howietoun broodstock was maintained by its being fed with highly nourishing clams, a food far more sustaining than any that the fish would have eaten in their natural environment.⁴³ The Great War, however, cut off the fishery's North Sea clam supply and meant that only horseflesh was available for feeding. Very quickly, the broodstock and its egg production capabilities suffered. The broodstock dwindled, producing fewer eggs which were themselves of an inferior quality to those procured under Maitland's methods and Howietoun suffered a rising death rate in the hatching and rearing process. In 1917, the directors noted a "deterioration in the quality of the ova at Howietoun ... Its vitality now is such that when laid down in the hatching house, there is a big percentage of dead eggs to pick

⁴¹ Field 22 April 1882 pp.525-526. *Vide supra* p.87.

⁴² *Vide supra* p.324.

⁴³ Maitland, JRG The History of Howietoun (1887) p.88. Maitland determined that fish fed on clams produced a smaller number but larger size - and hence stronger - eggs than those fed on a natural diet.

out everyday, and this goes on for some time after being deposited."⁴⁴ By 1919, the fishery had only 3,133 suitable breeding fish left from a pre-1914 stock of 9,000 minimum and numbers dwindled further thereafter. In order to continue operating, Howietoun had to use wild or unselected ova for breeding, a practice that had been anathema to Maitland and which undid his "revolution in fish culture."⁴⁵

The loss of the broodstock, which had taken Maitland years to build up, meant that Howietoun was poorly placed to increase its income and profits after the war with the fishery simply failing to raise enough fish to expand production and increase sales.⁴⁶ In 1921, facing a 66 *per cent* mortality in the hatching of eggs, Arthur Steel-Maitland asked Shorthouse to look back to Sir James' work for a possible solution. Shorthouse's reply sums up the fishery's predicament very well:

In fairness to the present day situation, one should have in their mind that the ova spoken of by Sir James were all taken from healthy matured pedigree trout whereas today we have to take ova from promiscuous breeders spawned at Loch Leven, Carsebreck and Dupplin Loch.⁴⁷

⁴⁴ University of Stirling, HF/V13. Minute of Shareholders' meeting on 31 December 1917.

⁴⁵ Ibid. Minute of Shareholders' meeting on 8 March 1919. Maitland, History of Howietoun p.86.

⁴⁶ Breeding from wild fish was highly unsatisfactory as it left the pisciculturalist dependent on nature and, in any case, produced fish far weaker and less likely to survive than those which had been selectively bred. *Vide supra* p.84/283.

⁴⁷ Scottish Record Office, GD193/86/1. Shorthouse to Steel-Maitland, 22 July 1921. In Maitland's day a loss of above 5 *per cent* "would be considered extraordinary." Maitland, History of Howietoun p.28.

In 1924, six years after the end of the war, Howietoun was still suffering from a high death rate among the fry and a "miserable supply of ova."⁴⁸ By 1928, the fishery stocks were so low that ova and fry had to be bought in from other piscicultural establishments.⁴⁹

Of course, the directors cannot be blamed for the Great War. But the fact is that, apart from regular gripes about a "miserable supply of ova" and revenue being "not so good as it has been," they appear to have failed to do anything about the problem once the Great War was over.⁵⁰ In early 1915, when the problem of feeding the broodstock began to hit home, Arthur Steel-Maitland did appeal - with no result - to a biologist at the University of Edinburgh for help in determining a suitable food substitute.⁵¹ He cannot be blamed for the fact that the biologist could not help, but once the post-war clam supply increased, the directors overrode Maitland's dictums and continued to rely on the ova of wild fish. In 1920, Shorthouse asked the

⁴⁸ University of Stirling, HF/V13. Minute of Shareholders' meeting on 31 December 1924.

⁴⁹ Ibid. Minute of Shareholders' meeting on 5 January 1929. This situation contrasts significantly with an announcement in a pre-war Howietoun press release:

We beg to draw the attention of our patrons and those interested in pisciculture to the fact that all our stock fish are naturally fed, principally on shellfish, which gives us the finest quality and size of ova. We do not deal at all in imported ova. ... Our stock fish are now in grand condition, and we confidently expect to have a very fine lot of ova for sale this season, all spawned from our own stock of breeding trout at Howietoun.

Scottish Record Office, GD193/86/2. Copy of Howietoun Fishery Press Release for the 1911/12 season.

⁵⁰ University of Stirling, HF/V13. Minute of Shareholders' meeting on 31 December 1917.

⁵¹ Scottish Record Office, GD193/86/2. Steel-Maitland to Dr Stevenson McAdam at the University of Edinburgh, 18 March 1915.

directors to bear in mind that "the ova from stock fish will be very much better" and reminded them of how limited Howietoun's supplies of fish and ova were.⁵² But the matter was then allowed to lie, despite the problem worsening to the extent that ova had to be bought in from other fish farms. By 1929, there was not a single breeder left in the Howietoun ponds.⁵³ Even then, the directors chose not to invest in new stock breeding because of the time and expense of so doing, but to search for ova in "certain good natural sources." Such unspecified sources as were found obviously did not prove adequate as, in 1939, the fishery could not procure sufficient ova to meet its own internal requirements and had to buy in 20,000 yearling fish.⁵⁴

Only after 1945, when the problem had existed for over thirty years and income and profits dwindled further, did the directors see the need to return to the Maitland way of doing things, blaming the fishery's "highly unsatisfactory" state on the use of wild ova. This they hoped to change:

The provision we are therefore making to secure more staple conditions in this department, by rearing and maintaining a stock of breeders of our own, we are pushing forward. Moreover, the eggs from selected stock are much superior and easier to rear into fry than wild ova collected promiscuously. ... Till then we will have to depend on the ova from wild breeders ...⁵⁵

This new long-termist approach appears to have paid off once time had

⁵² Scottish Record Office, GD193/20/22. Shorthouse's Report to the Directors for April 1920.

⁵³ Scottish Record Office, GD193/384. Shorthouse's Report to the Directors for May 1929

⁵⁴ University of Stirling, HF/V13. Minute of Shareholders' meetings on 8 March 1919, 1 October 1920, 31 December 1924, 9 January 1929, and 11 January 1939.

⁵⁵ Ibid. Minute of Shareholders' meeting on 28 June 1948.

elapsed to raise breeding fish to maturity. As the directors noted of their achievement:

Letters received from a few of our best customers tell us that they are highly pleased with our service and that they have noted an advance in both size and condition. In order to obtain that standard and even surpass it, the selection of breeders is all important. Ova from small, immature and underfed breeders must therefore be eliminated, but of course this takes time.⁵⁶

Unfortunately for Howietoun, this surge of long-termism in management did not last. The directors - or, more specifically, Keith Steel Maitland who by then held almost all of the shares - failed to develop Howietoun's breeding capacity by adding more stock ponds. In 1955, it was noted that more stock ponds were needed to house the growing broodstock but Keith Steel-Maitland decided that the cost of building them was too expensive and chose to consider the matter further before actioning the work.⁵⁷ It was still under consideration in 1959 when the directors "resolved to make no change meantime," despite the fact that over-stocking of the existing ponds went against all accepted practice in fish culture and ran a high risk of cannibalism

⁵⁶ Indeed, income, though not profits, did increase in the 1950s. (See Chart 10.2 on p.342.) The need for a captive broodstock was enhanced by a worsening of the natural ova supply in 1951/2 as a result of poor weather: "We have had lean years in the past, but never have we had climactic conditions which prevented our collecting ova for sale. We dread to think of what might have happened had we not held a reserve of breeders at the fishery to provide stock for our own ponds." University of Stirling, HF/V13. Minute of Shareholders' meeting on 29 August 1952.

⁵⁷ University of Stirling, HF/V13. Minute of Shareholders' meeting on 9 September 1955.

amongst the stock.⁵⁸ All that was done was to note that:

In the past, we have led the world in the art of pisciculture and trout farms all over the world have been constructed on the lines of the Howietoun Fishery. ... The directors feel that it would be wise, if we are going to extend our fishery, to do so by using the most modern methods.⁵⁹

Put simply, this was all talk and no action. Estimates for pond construction were received in 1960 and 1961 but "as these were rather high, it was agreed to do nothing in the meantime." It was agreed that one small trial pond would be added but "before commencing with the work," Keith Steel-Maitland - who, it will be remembered, enjoyed a £500 annual salary - "would visit the fishery to satisfy himself that the expenditure of £30 on the new pipe [for the new pond] would be justified."⁶⁰ In 1962, the idea of

⁵⁸ Landau, M Introduction to Aquaculture (1992) pp.231-232.

⁵⁹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 20 November 1959. Emphasis my own.

⁶⁰ *Vide supra* p.332. University of Stirling, HF/V13. Minute of Shareholders' meeting on 28 April 1961. This rather arrogant approach to the needs of the fishery on Keith Steel-Maitland's behalf extends back to the years before he became Managing Director. In 1940, for example, the fishery had suffered a bout of cannibalism with larger fish eating smaller ones housed in the same pond. The threat of cannibalism had made the housing fish of different sizes in the same pond anathema to fish culturists since the later nineteenth century, but the fishery had been forced to follow the practice because one large pond had been taken out of service to allow it to be used for Keith Steel-Maitland's bathing. George Shorthouse wrote to him asking permission to utilise the pond and stating: "We presume, however, that the want of it will not now inconvenience you seeing the water has become decidedly cooler." Scottish Record Office, Steel-Maitland Collection, GD193/74/3: Howietoun Fishery correspondence and reports. Shorthouse to Keith Steel-Maitland, 3 September 1940.

constructing new ponds was permanently shelved; instead, the fishery would look for ova supplies from wild sources, thereby completely undoing the partial move back towards the use of a broodstock.⁶¹ A note of the Howietoun ova supply in the 1965/6 season clearly shows how Maitland's stringent control of the purity of the fishery's breed had disappeared; Of 176 pints of brown trout ova procured, only 36 came from Howietoun itself.⁶² The fundamental reason for Howietoun's poor performance was, therefore, the failure of the post-1918 directorship to adhere to Maitland's methods and to fully appreciate the need to resurrect the broodstock. This was compounded by the failure of the post-1945 directorship, which did appreciate the need, to do anything substantial about the problem.

Indeed, the directorship of the period between 1914 and 1939 appear to have been unable to see the wood for the trees since they felt Howietoun's problems to be rooted in poor demand, the result of economic depression and government policy, rather than in poor supply. Shorthouse's Report to the Directors for January 1922, for example, said of the fishery's poor results that: "we are inclined to think that the unsettled state of the country politically has much to do with it as one never knows whose income is next to be taken

⁶¹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 28 December 1962. The directors nevertheless noted that they were "aware that if the supply of ova was improved, sales would increase."

⁶² University of Stirling, HF/B25: Unsorted loose material. Note of Ova Supply for the 1955/1956 Season. The remainder came from various wild fisheries across Scotland.

away by the imposition of new taxes."⁶³ In 1931, the company's directors, doubtless influenced by the chairmanship of a high-ranking Conservative politician, blamed poor sales on "the present industrial depression brought about by increased taxation and the uncertainties involved in present day legislation by a Socialist Government."⁶⁴ The directors saw the "principal reason for the present state of the market" as "the outcome of the necessity for a Coalition Government following a collapse in our national finances, and immediately the additional taxation was imposed, the country was forced to economise."⁶⁵ Management appear to have felt that Howietoun continued to be wronged by Government economic policy after 1945 when income and profits had fallen further. In 1949, for example, Shorthouse complained to Keith Steel Maitland that the fishery's position would never recover until "they took something off the Income Tax and refrained from confiscating the property of the well to do to pay for waste and extravagance."⁶⁶

However, closer investigation of the facts reveals that Howietoun was not as much an innocent victim of circumstance as the directors seem to have believed. One of the principal features of the British economy after 1919, and particularly in the 1930s, - one which does not square well with the Howietoun directors' perception of events - was a rise in overall real incomes

⁶³ Scottish Record Office, GD193/384. Shorthouse's Report to the Directors for January 1922.

⁶⁴ University of Stirling, HF/V13. Minute of Shareholders' meeting on 9 January 1931.

⁶⁵ Ibid. Minute of Shareholders' meeting on 30 March 1932.

⁶⁶ University of Stirling, HF/B25. Shorthouse to Keith Steel-Maitland, 4 June 1949.

which, in turn, would have stimulated demand for all goods be it motor vehicles, domestic hardware or, in our case, pisciculture.⁶⁷ Rising real incomes came initially as the result of falling world food prices from which Britain, as a major importer of foodstuffs, benefited greatly. Incomes were further stimulated by a decline in the size of families and by growing opportunities for work, particularly for women.⁶⁸ Between 1922 and 1938, average annual real wage earnings rose by approximately 14 *per cent*.

⁶⁷ Indeed, historians have shown that the inter-war period as a whole was not as gloomy as the Howietoun directors appear to have believed. See, for example, Alford, BWE Depression and Recovery? British Economic Growth, 1918-1939 (1986); Alford, BWE 'New Industries for Old? British Industry between the Wars' in Floud, R and McCloskey, D (eds.) The Economic History of Britain Since 1700, Volume II - 1860 to the 1970s; Dowie, JA 'Growth in the Inter-War Period' Economic History Review 49 (1975); Pollard, S The Development of the British Economy 1914-1990 (1992); and Richardson, HW Economic Recovery in Britain, 1932-1939 (1967).

⁶⁸ The annual rate of increase of the population, which had been 1.2 *per cent* between 1861 and 1881 and 1.0 *per cent* between 1881 and 1911, fell to 0.5 *per cent* between 1911 and 1939. Matthews, RCO, Feinstein, CH, and Odling-Smee, JC British Economic Growth, 1856-1973 (1982) p.40. Between 1911 and 1939, average family size fell from 4.35 to 3.59 persons. Aldcroft, DH The British Economy Between the Wars (1983) p.121. The number of economically active females increased by 0.51 *per cent* between 1921 and 1931 but by 4.92 *per cent* between 1931 and 1951. Matthews et. al. British Economic Growth p.58. In the 1930s, real incomes were further boosted by the effect of the 1931 abandonment of the Gold Standard in reducing rates of interest and by a reduction in the price of general goods as the result of technological innovation and recovery in industry. Richardson, Economic Recovery p.159.

Throughout the inter-war years, money wages were roughly double their pre-war level and, in terms of real income *per capita*, the average Briton was 30 *per cent* better off in 1938 than he had been in 1913.⁶⁹ Incomes continued to grow after the 1939-1945 war with real wages increasing at an average 2.6 *per cent* per man year between 1951 and 1973.⁷⁰

By the late 1930s, the average working class family spent only 44 *per cent* of its income on food, rent and rates, compared to 76 *per cent* in 1914. This meant more money for leisure pursuits, including, of course, angling.⁷¹ The growth in angling, mentioned earlier as a factor stimulating piscicultural impetus in the nineteenth century, continued apace in the twentieth.⁷² Indeed, particularly in the depressed years after the Great War, employers encouraged workers to set up angling societies, the sport being seen as "a valuable prophylactic to industrial unrest."⁷³ Growth continued after the

⁶⁹ Of course, these are overall figures and one should not forget the existence of high unemployment in the inter-war years.

⁷⁰ Matthews et. al., British Economic Growth p.171.

⁷¹ Aldcroft, The British Economy p.121. He notes:

perhaps the most dramatic developments were in the field of leisure and recreational pursuits. Compared with Victorian and Edwardian England, the working man, no less than his wealthier middle class counterpart, was literally bombarded with opportunities for filling in his increased spare time following reductions in hours of work.

⁷² *Vide supra* p.54.

⁷³ Lowerson, J 'Angling' in Mason, T (ed.) Sport in Britain - A Social History (1989) p.23.

One writer had earlier advocated angling as an ideal way to secure popular content:

Though trout fishing is a sport it is nonetheless a thing of national importance; people are at last beginning to realise that relaxation is as important as work in the life of a nation, and that if you wish to make a fine and contented man,

(continued...)

1939-1945 war, particularly as man-made reservoirs were increasingly opened up to the angling fraternity.⁷⁴ Given the increase in real incomes and the continued growth in angling through the twentieth century, it is hard to accept the Howietoun directors' opinion that the fishery was suffering from demand factors outwith management control.

Working class earners, of course, were not the main, directly at least, purchasers of Howietoun produce. In the opinion of the directors, Howietoun's problems were chiefly due to the failure of the salaried and leisured middle and upper classes, the 'well-to-do', to buy Howietoun produce because of the more progressive taxation system after 1919. There may be some truth in this but its importance should not be exaggerated. Certainly, the first half of the twentieth century "saw the beginning of a long-term trend towards a lessening of income inequality and a simultaneous shift of factor shares in the national income." In 1938, 55.5 *per cent* of distributed *gross* personal income was shared between 87.2 *per cent* of income receivers, all of whom earned less than £250 *per annum*; 44.5 *per cent* went to 12.8 *per cent* of receivers earning more than £250 *per annum*, and the top 1 *per cent* of income receivers took 29 *per cent* of total gross incomes.⁷⁵ Between 1913/14 and 1937/38, taxes on incomes over £1,000 *per annum* rose from 4.0 to 8.7 *per*

⁷³(...continued)

it is of as much importance to give him an uplifting occupation for his relaxation as for his work.

Mottram, JC Trout Fisheries - Their Care and Preservation (1928) p.viii.

⁷⁴ Lowerson, 'Angling' p.35.

⁷⁵ Aldcroft, DH The Inter-War Economy: Britain, 1919-1939 (1970) pp.385-387.

cent, on incomes of over £2,000 from 4.0 to 15.6 *per cent*, and on incomes of over £20,000 from 8.1 to 47.5 *per cent*. However, as Aldcroft points out, "the overall impact of these changes ... was somewhat less than one might imagine." In 1938, those earning less than £250 *per annum* received 59.6 *per cent* of total *net* personal incomes, those earning above £250 took 40.0 *per cent*, whilst the top 1 *per cent* of income receivers still took 24.4 *per cent* of total net income.⁷⁶

This may have had some effect on Howietoun's business but, given its limitations and the fact that falling prices stimulated real incomes across the board, it is unlikely that there really was any great effect on demand for the fishery's produce.⁷⁷ In any case, though Lowerson points out that working class angling was more generally in the coarse rather than the game field, Howietoun had always sold to aristocratic landed proprietors and working men's angling clubs alike, and thus could easily have compensated for - even benefited from - a redistribution of incomes in favour of the working classes.⁷⁸ The fact is, both the inter-war years, and the years after 1945, did not see swingeing cuts in higher incomes to the extent that the middle and upper classes were prevented from stocking their waters or enjoying such

⁷⁶ *Ibid.* p.389.

⁷⁷ Indeed, as many would have been mortgage holders, the middle classes would have benefitted most from the post-1931 fall in rates of interest after the abandonment of the Gold Standard. Richardson, Economic Recovery p.159.

⁷⁸ Lowerson, 'Angling' *passim* and Lowerson, J 'Brothers of the Angle - Coarse Fishing and English Working-Class Culture, 1850-1914' in Mangan, JA (ed.) Pleasure, Profit and Proselytism (1988) *passim*.

leisure pursuits as angling.⁷⁹ What those years did see was a growth in overall disposable incomes, a growth in leisure pursuits, not least in angling, and, consequently, there is little to indicate that Howietoun should have performed badly because of demand factors.⁸⁰ The implication of this is both that the directors misunderstood their difficulties and that there was demand there to be exploited had its owners not failed to deal with the supply side of the equation.⁸¹

Further evidence of directorial failure can be found in their reaction to the need for repairs and extension of the fishery after 1945. Post-Second World War meetings noted a great need for a new hatchery water tank, if not an altogether new hatchery, new roofing for the fishery buildings, a new despatch house, the installation of electricity, modern sanitation for the staff,

⁷⁹ Indeed, wealthier fishery owners could have benefitted by leasing fishings to groups of working class anglers. A friend of George Shorthouse's wrote to him that Scottish lairds were themselves "too hard up" to stock their fisheries but did not "worry too much because they have no difficulty in letting their waters." University of Stirling, HF/B4/17 Business Correspondence to the Company. Marshall Robb of Aberdeen to Shorthouse, 9 December 1948. Likewise, post-1945 government policies of "waste and extravagance" included the construction and stocking with fish of large reservoirs and hydro-electric dams - an opportunity ripe for exploitation by fisheries such as Howietoun.

⁸⁰ Indeed, throughout the period from 1879 to the amalgamation in 1914, demand had continually exceeded the fishery's supply. *Vide supra* p.175/336.

⁸¹ Indeed, with the coming of peace in 1945, Shorthouse had complained that the fishery was having to turn away a rise in orders because its stocks were so low. University of Stirling, HF/V19: Letter Book 69, p.859. Shorthouse to the Secretary of the Ballarat Fish Acclimatisation Association, Ballarat, New Zealand, 25 September 1945.

provision of refrigeration for food storage, and new protective screens for pond inlets and outlets.⁸² Clearly, these repairs and alterations were not just a product of the post-war period but must have been required for some time before 1945. The new despatch house, for example, was required to replace the old one suited for despatch of railway carrying cases with ones suited for motor lorry cases; but the fishery had been using a motor lorry since 1926.⁸³ Even twenty years earlier, the fishery had been in need of substantial repairs and a new roof in the main hatchery to prevent plaster from falling onto and killing the ova below. All the fishery's window frames had become rotten through damp whilst the ponds and hatching boxes needed overhauling.⁸⁴

⁸² University of Stirling, HF/V13. Minute of Shareholders' meetings on 20 August 1947 and 18 October 1957. In 1947, Sandy Shorthouse had been to visit a trout farm in Berkshire. After his return to Howietoun, his father had written to the proprietor of the Berkshire establishment that his son had been "highly delighted with his visit but criticised our plant compared with yours." University of Stirling, HF/V21: Letter Book 71, p.399. George Shorthouse to the proprietor of the Berkshire Trout Farm, 28 November 1947. Six weeks earlier, Shorthouse had written to the same stating that: "I am now on the partial retired list and my sympathies are with my son who succeeds me here." Ibid. p.307. Shorthouse to the proprietor of the Berkshire Trout Farm, 5 October 1947.

⁸³ University of Stirling, HF/V13. Minute of Shareholders' meeting on 7 January 1926. Indeed, even before 1926, Howietoun had been borrowing the Sauchie Estate's motor lorry for deliveries. Scottish Record Office, GD193/20/22. Shorthouse's Report to the Directors for February 1925.

⁸⁴ Scottish Record Office, GD193/20/21. Steel-Maitland to the Collector of Taxes at Stirling, 5 July 1906. The manager's office appears to have been in a particularly poor state
(continued...)

Sadly, post war directors, like their predecessors, failed to do very much about the problems. In 1957, they declared themselves to be "fully aware" of the need to have the fishery "modernised and brought up to date."⁸⁵ But, as with the pressing need for stock ponds, nothing was done and the problem was allowed to continue.

The taking of dividends from Howietoun's profits further illustrates the directorial attitude to investment. From 1920, the directors enjoyed dividends every year until 1963, regardless of the underlying trends of the fishery's business, and left little, if any, funds for reinvestment.⁸⁶ Indeed, from 1956, as well as a dividend of £700, Keith Steel Maitland granted himself an annual £500 salary.⁸⁷ Throughout the whole period, any profits remaining after dividends had been taken seem to have been simply left to lie on the balance sheet in order to give a head start to the following year's figures.⁸⁸

⁸⁴(...continued)

of repair. In 1919, on hearing that George Shorthouse was rather ill, PD Malloch had written to Mary Steel-Maitland: "I hope it will not turn out serious, one is so afraid by so many being carried away just now. The last time I was down I felt the draught in his office very much. I wondered how he was able to sit in it all day." GD193/20/22. Malloch to Mary Steel-Maitland, 17 February 1919.

⁸⁵ University of Stirling, HF/V13. Minute of Shareholders' meeting on 18 October 1957.

⁸⁶ See, for example, *Ibid.* Minute of Shareholders' meetings on 3 January 1922, 31 December 1924, 9 January 1930, 27 December 1935, 8 February 1943, and 22 June 1950.

⁸⁷ University of Stirling, HF/V13. Minute of Shareholders' meeting on 21 December 1956.

⁸⁸ It could be argued that the Director's reluctance to part with money or to divert dividends towards investment was a symptom and not a cause of Howietoun's poor
(continued...)

It has to be noted that there were some occasions, particularly before the Second World War, when a more businesslike approach was adopted. During the Great War, the directors sought to maximise profit by diversifying into the sale of the clam shells that had accumulated at the fishery since 1874. In 1917, for example, £348 was raised in this way, enough to put the fishery slightly into profit.⁸⁹ They also appear to have put the interests of the company first in declining to take any dividends for the six years to 1920, allowing what profits there were to be used in offsetting higher wartime production costs.⁹⁰ In the 1930s, particularly in 1932 and 1936, the directors intervened to boost sales by increasing advertising expenditure⁹¹ and encouraged productivity amongst the staff by deciding to reward them with an *ex gratia* allowance over their salaries at the level of 10 *per cent* of profits attained in any given year, a practice which continued through to 1967.⁹² Arthur Steel-Maitland, in particular, appears to have taken a direct

⁸⁸(...continued)
performance. This may be so, but there was nothing to stop Keith Steel-Maitland refusing to take a dividend or his salary and allowing such moneys to be reinvested.

⁸⁹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 24 December 1917.

⁹⁰ Ibid. Minute of Shareholders' meeting on 1 October 1920.

⁹¹ University of Stirling, HF/V13. Minute of Shareholders' meeting on 30 March 1932 and 6 October 1936.

⁹² University of Stirling, HF/V13. Minute of Shareholders' meetings on 7 September 1915, 22 June 1950 and 29 August 1952.

The Steel-Maitlands appear to have been genuinely concerned for the welfare of their staff. An earlier note (*vide supra* p.229) demonstrated their concern for the family of Sir
(continued...)

interest in pisciculture, rather than being an absentee shareholder busying himself with his political life. In 1921, for example, he took the initiative in writing to the Canadian Fisheries Department expressing an interest in importing *ouananiche* salmon eggs to Howietoun in order to experiment on their acclimatisation in Britain.⁹³ Earlier, in 1919, he had believed that, with

⁹²(...continued)

James' first fishery manager, John Thompson, whilst archive correspondence indicates a similar involvement in the affairs of Howietoun's lorry driver, Winchester, in 1933. In January of that year Winchester had been admitted to Stirling Royal Infirmary suffering from a particularly bad bout of shingles. On his release from hospital, Arthur Steel-Maitland was concerned about him returning to the care of his wife who had "been not right in her mind for some years past." He understood that Winchester could not afford to place her in an institution and stated that "Lady Steel-Maitland and I would sooner help to pay ... than leave her with him, if her presence might affect his mind." Scottish Record Office, GD193/385: Papers concerning the Howietoun Fishery. Steel-Maitland to Winchester's physician, Dr Morrison of St Ninians, 11 January 1933. What actually happened is unknown, but Morrison's reply is worth quoting, even if only for its lack of sympathy with Mrs Winchester. He agreed that the woman could not give her husband the care that he needed but went on to state:

Winchester says that his wife is doing him very well, and always has good and regular meals for him. I can only say that I have been in his house at all times of day and have never yet seen anything being cooked. I think that Mrs Winchester should be certified as insane and sent to Larbert Asylum. ... [But he did not advise the contribution of Steel-Maitland money since] ... Mrs Winchester is just the type to go on living for many years yet.

Ibid. Morrison to Steel-Maitland, 13 January 1933.

⁹³ Scottish Record Office, GD193/86/1. Steel-Maitland to Mr A Johnston of the Canadian Fisheries Department, Ottawa, 12 November and 21 December 1921. Steel-Maitland commented:

(continued...)

the end of the Great War, "the fishery is capable of being made now into a very good paying concern" and suggested "the adoption of new methods," such as regular stock-taking and the recording of trends in sales, and sources of demand.⁹⁴ As is indicated in his notes on the resurgence of the Falkirk Water issue in 1920, Steel-Maitland seems to have had a genuine concern for Howietoun. Having been asked if he would consider being bought out of the fishery by the Falkirk Water Commissioners, he answered:

... that while the replacement value would be considerable, the fishery had a value to us over and above that. If we thought that it was proposed to injure it, we would resist to the last if we believed that it was not necessary or that any alternative scheme was possible. If, however, it could be proved to us to be necessary and vital, I could not of course say no at the present stage.⁹⁵

But there is no evidence that any of Steel-Maitland's "new methods" were ever put into practice and none of the foregoing does anything to alter the fact that the directors did nothing to tackle the fundamental problems of supply at

⁹³(...continued)

Lady Steel-Maitland and I, and a friend, run a trout hatchery in which we have always been anxious to make experiments. ... Perhaps you may not know that we at the Howietoun Fishery carried out all the original first experiments in trout culture in the world, including the sending of trout to New Zealand.

Maitland's sending of ova to New Zealand was discussed in Chapter Three. *Vide supra* p.90.

⁹⁴ Scottish Record Office, GD193/86/1. Steel-Maitland to PD Malloch, 26 September 1919.

⁹⁵ Scottish Record Office, GD193/669. Steel-Maitland's notes of an interview with Mr Learmouth, the Stirlingshire County Clerk, 5 October 1920. It should be noted that this view is little different from Maitland's own feelings when in dispute with Falkirk in the 1880s: he would fight to the end but, if all else failed, then a cash settlement may be acceptable. *Vide supra* p.163.

a time when the fishery was increasingly failing as a business.

Even when one looks at other factors that may help to redeem the directors from the charge of failure, it is hard to reach a conclusion favourable to them. Certainly, the setting up of the Howietoun and Northern Fisheries Company appears to have been the result of the Steel-Maitland's desire to develop the fishery's potential as a business, reaping economies of scale, and, not least, to offset the potentially deleterious effects of rivalry from Malloch and McNicol acting as direct competitors. Arthur Steel-Maitland wrote to his solicitors of his two rivals' strengths:

They have considerable facilities for this, [pisciculture] both in ponds, in Malloch's connection with possible customers, and with Loch Leven, through the Tay Fisheries Association, while McNicol is quite a good man of experience in matters of trout hatching. ... You will readily understand that for the fishery the matter is an important one. For this class of customer, the fishery can be affected for good or ill, very considerably, by either Estate Agents, or Fishing and Gunmakers.⁹⁶

The tone of this letter is markedly different to the ones written by Steel-Maitland to Malloch when first suggesting a merger:

Of course it may not be found feasible. But if it is, certain obvious advantages will follow. In the first place you have a very special knowledge of fish, as also of properties in Scotland which might be customers. On the other hand, we have the long practical knowledge of working a fishery. ... I have, of course, no belief at all that you would in anyway wish to interfere with the Howietoun Fishery, nor, of course, would the Howietoun Fishery have any wish to prejudice your projects. On the other hand, it may, of course, be inevitable, despite our wishes, if both

⁹⁶ Scottish Record Office, GD193/86/1. Steel-Maitland to Professor Mounsey of Brodies (Solicitors) of Edinburgh, 18 March 1913. Malloch was primarily a fishing-tackle manufacturer, but he also dabbled in gun-making and estate agency, particularly that relating to fishing rights.

you and I wish to expand our business, that we might come in one another's way. On the other hand, there are very obvious economies and advantages to be obtained by an agreement.⁹⁷

Nevertheless, it does seem that the Steel-Maitlands appear to have rather over-estimated the potential rivalry of Malloch and McNicol. Malloch's Carsebreck operation proved a failure in 1916, being neither secure nor insulated enough for hatching and rearing, and from then onwards was used only for storage of ova. McNicol's operation at Inverness proved uneconomic and was sold for only £375 in 1920.⁹⁸ The need for amalgamation seems, therefore, to have been unfounded since, by 1920, though keeping the original name, the Howietoun and Northern Fisheries Company was, again, purely the Howietoun Fishery Company in terms of operational plant.⁹⁹

It is, perhaps, possible that the fishery may have been doomed from the

⁹⁷ Ibid. Steel-Maitland to Malloch, 21 January and 1 February 1913. Probably acting under the guidance of his employer, the fishery manager, John Thompson, also wrote to Malloch stating that he thought "it would be the wisest policy and for the benefit of all concerned to combine ... with your position and knowledge, and our plant and experience, it would be a strong combination." University of Stirling, HF/V80: Letter Book 38, p.893. Thompson to Malloch, 21 January 1913.

⁹⁸ Scottish Record Office, GD193/86/1. Shorthouse to Mary Steel-Maitland, 31 May 1920 and University of Stirling, HF/V13. Minute of Shareholders' meetings on 23 December 1916 and 1 October 1920.

⁹⁹ This is not to criticise the Steel-Maitlands for seeking amalgamation itself, which, as noted above, can be praised as an attempt to reap economies of scale and offset Malloch and McNicol's potential competition. But it does show that they appear to have erred in their assessment of the situation in 1913, however worthy their intentions.

start. It could be argued that since Maitland had never intended Howietoun to run as a profit-making vehicle, it was never cut out to do so after his death. But for his early and sudden death, Maitland may have had time to either wind it down or to place it on a more profit-making (future proof) foothold. On the other hand, the fishery performed well as a business in the 17 years from Maitland's death in 1897 to amalgamation in 1914 and what failures there were came afterwards and not before. It is far more credible that the fishery suffered from post-1914 management failure than that it was inherently unviable.

Earlier discussion on Maitland's legacy noted the stimulus given by Howietoun to the spread of late nineteenth and early twentieth century pisciculture. As this growth continued through the twentieth century, it is possible that Howietoun's problems were grounded in being driven out of the market by increased competition, and being further disadvantaged by location so far northwards.¹⁰⁰ Unfortunately, the lack of source material from other fisheries makes it impossible to assess Howietoun's relative performance. But, even if there is some truth in this argument, one has to remember that not only did Howietoun have a head start on all other operations, but that it would have largely shared the problems created by war with them. In any case, there is nothing in the Howietoun material to suggest that the directors believed Howietoun to have been beaten out of the market by competition.

The notice for sale of the Howietoun Fisheries advertised the opportunity to purchase "one of the oldest and best known fish farming

¹⁰⁰ *Vide supra* p.290.

establishments in Britain ... offering enormous potential for further development and expansion of restocking, table, or processing markets."¹⁰¹ As the available evidence indicates, little could be further from the truth. By the time that Howietoun left the hands of the Steel-Maitlands in 1967, it had gone from being the largest and most successful private piscicultural establishment in the world to being not only one of many, but one that had almost completely lost touch with the pioneering piscicultural methods laid down by its founder. Indeed, having been run as a non-business concern by Maitland, the business-orientated company formed in 1914 never reached the level of performance attained under Maitland's benevolent non-aggressive entrepreneurship. The end result of the post-1914, and particularly post-1945, management of the company was the destruction of Maitland's legacy by his heirs. Despite the unavoidable problems of world war in the twentieth century, overall rising demand and the strength of Maitland's work prior to 1897 left the fishery well paced to prosper in his absence. By 1967, however, all that really remained of Maitland's work at Howietoun were the buildings - his way of doing things had long been discarded - and even the buildings were

¹⁰¹ University of Stirling, HF/B28: Unsorted Correspondence. Copy of the Notice of Sale of the Howietoun and Northern Fisheries Company. It is not clear what the sale price was but it is clear that Keith Steel-Maitland's heiress, Mrs Gay Stafford, wanted to get rid of Howietoun as soon as possible. Having noted Shorthouse and Bulloch's offer, she wrote to her solicitors that: "I can see no advantage in trying to get a better price from someone else and the accountant seems confident that the bloodsuckers will accept his valuation." HF/B23: Unsorted Correspondence. Gay Stafford to Messrs. Baillie and Gifford (Solicitors) of Edinburgh, 20 January 1967.

dilapidated. His heirs failed to try to counteract problems outwith their control and they failed, particularly after the Second World War, to do anything constructive in making the fishery a success in the long-term. Short-term dividends and salaries appear to have been more welcome than investment for long-term survival.

As I say, I think the fishery should be made quite a first class business. It does, however, depend very largely on the amount of brains and practical attention from day to day which is put into it by the man in charge.¹⁰²

As I explained to you, I take the view that it is for the Managing Director of a company to manage the company competently, but it is not part of his duties to provide from his own pocket the wherewithal to enable the company to function at all. I believe the function of the Managing Director lies in supervision not salvage.¹⁰³

¹⁰² Scottish Record Office, GD193/86/1. Steel-Maitland to George Shorthouse, 20 February 1918.

¹⁰³ Scottish Record Office, GD193/669. Keith Steel-Maitland to Mr AD Morris, Brodies (Solicitors) of Edinburgh, 18 July 1955. Presumably, Morris had discussed the fishery's fortunes with Steel-Maitland and had suggested that he invest some of his own capital in the business.

CONCLUSION

After its sale to Shorthouse and Bulloch in 1967, Howietoun's problems came home to roost. The new proprietors made a genuine effort to tackle the fishery's weaknesses, finally adding at least some of the extra ponds that the broodstock system had so long required. But the company's parlous finances meant that nothing could be done to tackle the dilapidation in the fishery's buildings or to build up trading through investment in new stock and equipment. Shorthouse and Bulloch attempted to resurrect their business by switching production away from the Loch Leven trout towards the Rainbow Trout which, in the early 1970s, was becoming a fashionable requirement both for the rod and for the table. They also invested in a Highlands and Islands Development Board venture to establish a fish farming operation in the Shetland Isles. Both ideas failed miserably and, by the late 1970s, the fishery that had once been the largest and most successful of its kind in the world was literally falling apart and speeding along towards what seemed would be inevitable bankruptcy.

It would be practically impossible to take even the most cursory glance at the material in the Howietoun Archive which covers the post-1967 period without finding evidence, whether it be final demands from creditors and suppliers or letters from neighbours complaining about the nocturnal latrations of Shorthouse's dog, to indicate the deep trouble in which Howietoun was floundering. As it happened, Howietoun survived through the intervention of the University of Stirling. Bulloch, keen to be rid of the affair, made overtures to the management of Stirling's noted Institute of Aquaculture, founded in

1971 as an Aquatic Pathobiology Unit, with a view to persuading the University to purchase the fishery and to develop it as a field-work site for postgraduate students. After some not inconsiderable negotiations, not least within Stirling itself, the University went ahead with the purchase in 1979. It gave Howietoun the financial investment which it so badly needed, repairing and renovating it throughout.

As well as being a field-work site, the fishery became a research centre, for both academic and commercial purposes, and, more than this, its business operation was revived, the University authorities having insisted that the purchase of the fishery was dependent upon the farm paying its own way. Howietoun was returned to the production of Loch Leven and other brown trout and, at long last, its broodstock was restored.¹ Howietoun has flourished over the sixteen years since the University of Stirling came to its rescue and it is again, as it was a century ago, a centre for piscicultural excellence.

The resurrection of Howietoun, in its making available the fishery's records and in the University's funding of the research embodied in this thesis, has been accompanied by an opportunity to resurrect the reputation of the fishery's founder. Sir James Maitland was a practical man who, building on thousands of years of practical effort before him, made a scientific breakthrough which enabled man not only to produce fish at will but also to produce fish of a superior quality to those that nature could herself provide. His work took pisciculture to the stage of development upon which it has

¹ University of Stirling, The Story of Howietoun (1989) pp.44-55.

flourished in the latter part of the present century - the *farming* of fish, like any other livestock, for sale on the open market. Whereas earlier pisciculturalists had produced fish only for their own local needs, Maitland effectively made a service industry out of fish culture, supplying the piscine requirements of fishery owners, angling clubs and public bodies across the length and breadth of Britain. He was also an exporter, being the first to enjoy any great success in exporting fish eggs to the Antipodes and the individual to whom every Loch Leven trout caught in Canada today owes its existence. His was the most important and successful of any of the late nineteenth century piscicultural efforts, either in Britain or overseas. In his mother country at least he was recognised as being a piscicultural innovator of the foremost rank and the importance of that work to the national fisheries - which were in the late nineteenth century the subject of some concern - was clearly recognised in the House of Lords' decision to throw out the Water Bill which threatened to close Howietoun down.

In making an industry out of pisciculture, Maitland's work warrants attention as a case study for current historical debates over the aptitude of the late nineteenth century entrepreneur. He made a huge investment, both of time and money, in fish farming but he reaped no tangible financial reward whatsoever. He was not a great Victorian entrepreneur in the sense that many have defined such an individual as aggressively profit maximising with a "grasp of commercial opportunity combined with a capacity needed to exploit

it."² But neither was he an entrepreneurial failure in the sense that many others have envisaged similar men of his class and generation. Whilst Aldcroft, for example, states that the entrepreneur of Maitland's time was generally "weighed down by complacency, conservatism and antiquated methods" and Wiener believes him to have been a diffident economic leader with "mind-forg'd manacles" restraining his concepts and actions, a case study on Maitland does very little to support these arguments and rather a lot to question them.³ Except for failing to adorn the sacred cow of profit maximisation, Maitland appears to have possessed many of the qualities seen as prerequisites for successful entrepreneurship. Schumpeter's classic definition of the entrepreneur, for example, argued that such an individual must develop new products with new means of production, must seize and develop new markets and must either seek out new raw materials or make scientific improvements in the exploitation of existing ones.⁴ In so far as late nineteenth century pisciculture allows, Maitland rises admirably to Schumpeter's criteria. Likewise, he supports Payne's view of the entrepreneur as courageous, adventurous, progressively efficient, and possessive of

² Payne, PL British Entrepreneurship in the Nineteenth Century (1974) p.30. See also: Sandberg, L 'The Entrepreneur and Technological Change' in Floud, R and McCloskey, D (eds.) The Economic History of Britain Since 1700: Volume 2 - 1860 to the 1970s (1981) p.99.

³ Aldcroft, D 'The Entrepreneur and the British Economy, 1870-1914' Economic History Review (1964) p.114 and Wiener, M English Culture and the Decline of the Industrial Spirit, 1850-1980 (1981) p.10.

⁴ Quoted in Rozwenc, EC and Roehm, AW The Entrepreneur in the Gilded Age (1965) p.4.

organisational ability.⁵

Maitland *could* have expanded his business to accommodate latent demand but, then again, his aim was to encourage others to accommodate that demand and, in that, he succeeded, and continues to succeed, admirably. He is an interesting example of a 'benevolent' entrepreneur who wished his business only to cover costs whilst performing work for the public good. He wanted to demonstrate - and demonstrate must be the operative word - the utility of pisciculture as a commercial operation. In so doing, he laid the basis for what has now become the multi-billion pound global industry of fish culture. Why should that be considered entrepreneurial failure?

Maitland shows us how historians' indictments of entrepreneurial failure (or, indeed, their genuflection to entrepreneurial success) can easily fail to take adequate account of entrepreneurial motives and can be incorrectly cast on a shorter, rather than longer-term view of entrepreneurial horizons. Despite a lack of interest in personal profit, Maitland was genuinely trying to do something new, something economically beneficial to the wider community, and something that would take a considerable amount of time to develop.

Arguments about entrepreneurial failure and anti-profit-maximising cultural forces are intended to explain Britain's relatively poor economic performance in the later nineteenth century and her alleged economic decline since then. The debate over whether Britain did fail in the later part of the last century and whether she has continued to fail since is not our concern here but, in pisciculture at least, she appears to have been way ahead of her

⁵ Payne, Entrepreneurship p.30.

oft-praised trans-Atlantic rival. Likewise, the *general* debate over the view of entrepreneurial failure is largely beyond the scope of this thesis but it is worth pointing out that, in its essence as an explanation of economic decline, the view is too narrow and monocausal. It relies too much on man's inherent propensity to apportion blame in an upwards direction.

Sandberg challenges the assertion of some historians that "if a business deteriorates, it is of no use blaming anyone except those at the top."⁶ It is interesting to observe that this view is probably incorrect as regards the pre-1914 performance of the British economy but probably largely correct when applied to the post-1914 performance of the Howietoun Fishery. Whilst Maitland's impressive entrepreneurial skills went hand-in-hand with a desire not to maximise profits, the business-oriented company that came after him did desire to maximise profits but suffered from entrepreneurial failure. His heirs could not even maintain his methods, let alone develop new ones.

Maitland's time as a member of the Fishery Board for Scotland also provides further evidence on the current historical debate over the adequacy of late nineteenth century government funding for scientific research. It demonstrates that, although the scientific work of the Board did suffer as a result of a lack of sufficient state support, the Board itself did little to help its own case in securing research funds and, moreover, may at times actually have been over-funded.

The most important reason for studying Maitland's work, however, should not be to secure case-study material for current historical arguments.

⁶ Sandberg, 'The Entrepreneur' p.99.

Maitland's piscicultural work is quite capable of standing alone and must be the most important reason for studying his life. He may not have secured a financial reward from Howietoun but, whilst he lived, he was regarded as a piscicultural hero. That benefit too, nevertheless, has proven to be a transient one which failed to out-survive him by more than a few years. Maitland originated many of the basic tenets of modern fish culture but scant attention has been paid to his work in this country and there has been no recognition of it overseas. His achievements are worthy of attention by historians and scientists alike and the development (or, more aptly, retardation) of the fishery itself, when run as a purely commercial undertaking from 1914, deserves much more detailed attention as a business history than has been possible within the bounds of this thesis. Maitland's piscicultural achievements have probably gone largely unrecognised because piscicultural history is not a subject that has received much academic attention. But it is worth finishing here with the point that much of his fame must also have disappeared as the legacy of his teachings was squandered through the incompetence of his heirs.

APPENDIX I

THE LAUDERDALE PEERAGE CASE, 1885

The Baronets Maitland were distantly related to the Earls of Lauderdale and in August 1884, after the twelfth Earl was struck by lightning and died without issue, Maitland, being descended from the seventh son of the sixth Earl, believed himself to be the heir. His succession was announced by The Times immediately the twelfth Earl died.¹ However, another contender for the title, Major Frederick Maitland, Maitland's distant cousin, came forward claiming to be descended from the second son of the sixth Earl's sixth son. Maitland disregarded this contention, believing it invalid since the sixth son's children, all sired in America, had each been illegitimate. Nevertheless, Major Maitland insisted that his line had been legitimised by a death bed marriage of the sixth son in New York and vowed to prove his claim before the Peerage Committee of the House of Lords. The Lauderdale estates were thus put into the hands of a trustee whilst lawyers for each party prepared their cases.² Nevertheless, from 27 November 1884, Maitland began referring to himself as the Earl of Lauderdale and used the Lauderdale crest upon his correspondence.³ He justified his presumption of success in the forthcoming

¹ The Times 14 August 1884 p.6.

² The Lauderdale estates in Berwick, Roxburgh and Haddington covered 25,512 acres and had a gross annual value of £17,318. Maitland's estates in Stirling, Midlothian and Linlithgow were smaller in acreage, covering 10,228 acres, but had a rather higher annual value at £20,328. Bateman, J The Great Landowners of Great Britain and Ireland (1883) p.260/296.

³ University of Stirling, Howietoun Archive, HF/V48(ii): Letter Book 4, p.116. The full title (continued...)

legal case by asserting that he found his distant cousin's "contention so frivolous that there is no longer any reason why I should delay my assumption of the title."⁴

Unfortunately, however, Major Maitland did prove the legitimisation of his ancestor and he was ruled to be the rightful heir in July 1885.⁵ Maitland had challenged his distant cousin's 'frivolous contention' on the grounds that Colonel Richard Maitland, the sixth son of the sixth Earl, had died either unmarried or, if married, without leaving any *legitimate* issue. The case turned on the fact that Colonel Richard, who served with the British Army in North America, and had been established in New York from at least 1760, appears to have been living out of wedlock with one Mary McAdam. When Colonel Richard died on 13 July 1772, they had had three sons: the first died without issue, the second was Patrick Maitland and the third was John (later Admiral) Maitland. A fourth son was born after Colonel Richard's death; Mary was heavily pregnant at the time of his passing and the couple underwent a death-bed marriage at 1600 hours on 11 July 1772 in order to legitimise their offspring and, somewhat belatedly, bring respectability to their relationship. The marriage was conducted by a priest of an Anglican sect at very short notice and Colonel Richard expired at 0200 hours on 13 July 1772.

³(...continued)

was Earl of Lauderdale, Viscount of Lauderdale, Viscount Maitland, Lord Maitland of Thirlstane, and Lord Thirlstane of Boulton, all in the Peerage of Scotland.

⁴ University of Stirling, HF/V48(ii): Letter Book 4, p.119. Maitland to Sir Francis Bell, Agent General for New Zealand in London, 1 December 1884.

⁵ The Times 23 July 1885 p.3.

Maitland disputed that the marriage had ever actually taken place and argued that, if it had, that it was illegal because there had been no banns or dispensation. Maitland charged that Colonel Richard "knew that he was dying and had only a few hours to live, and was incapable of contracting marriage, or performing the covenants of any such contract." However, he was confronted by a record of authorisation produced from the archives at Albany, New York which contained a statement, *in articulo mortis*, by Colonel Richard, stating among other things that he 'thought himself bound in justice' to do the decent thing by eventually marrying Mary McAdam.

Faced with the apparent legality of the deathbed marriage, Maitland's case turned to the question of the legitimacy of Colonel Maitland's children. This rested upon the issue of whether the Colonel could be considered to have been resident in New York at the time of the marriage and, if so, what legal system concerning legitimacy was in force in New York at that time. As a member of the British Army serving in North America, the Colonel could be claimed to have been non-resident but he had purchased an estate there some years earlier, apparently with the intention of settling permanently in upstate New York. The legal system prevailing in the colony of New York as a whole was English Law, but there was some evidence to suggest that the Dutch Law, established when the area had been the Dutch colony of New Amsterdam, was still in force in the city.

The crux of the matter was that, if not resident, Colonel Richard - a Scotsman - could be considered to have come under Scots Law wherein a bastard can be legitimised by the subsequent marriage of its parents. If,

however, he was resident, he was either under English Law which did not at that time allow for the subsequent legitimisation by marriage of bastards, or under Dutch Law which did legitimise bastard children for the inheritance of property but was unclear with regard to titles. Major Maitland claimed that Colonel Richard had been "an ardent soldier, willing to serve anywhere, so long as fighting was to be done and promotion to be obtained, but anxious to get away from America when peace seemed imminent. ... During all this time he retained his domicile of origin."

The final decision of the House of Lords was that the marriage had taken place, that it was legal and that as a member of the army, Colonel Richard could not be considered resident in the United States whilst still on the list for active service. His second son was therefore designated as legitimate under Scots Law and able to transmit the right to the title. The decision was supported by the fact that the child had been brought back to Scotland in 1773 to be raised with the family of the Seventh Earl.⁶

Maitland thus reverted to the use of his original title, telling an American pisciculturalist who had addressed him as the Earl of Lauderdale that "The House of Lords decided that a death bed marriage had been celebrated in America with the effect of legitimising a distant cousin and cutting me out of

⁶ The foregoing account of the case is based on: Stirling Saturday Observer 15, 22 and 29 November 1884 p.3 (all); The Times 10 June 1885 p.6 and 15 June 1885 p.4; House of Lords Record Office, Reports from Committees: XI, 1884/1885. Minutes of the Lauderdale Peerage Case, 1885; and Scottish Record Office, Steel-Maitland Collection, GD193/865-874 and GD193/973: Papers relating to the Lauderdale Peerage Case, 1885.

the titles and Earldom of Lauderdale."⁷

⁷ University of Stirling, HF/V50: Letter Book 6, p.691. Maitland to Fred Mather, Cold Spring Harbour, New York, 6 April 1887.

APPENDIX II

THE RECALCULATION OF HOWIETOUN FINANCIAL DATA INTO CONSTANT TERMS

Methodology

The recalculation makes use of a recently compiled index of the prices of food and drink in southern England since 1264.¹ The data is recalculated in terms of what it would have been in any given year if prices in that year had held the same level as in 1891. 1891 was chosen as the base year since it saw the highest income figures of the pre-1897 period (save 1895 which was more the result of a surge of late payment from 1894 than of a real increase in income).²

The data in current values is transformed into constant values subject to the following criterion: Jay's index value for prices in 1891 is 998, based on 1451-1475 = 100. His index values for the period between 1879 and 1972 are recalculated on the basis that 1891 = 100. Using this new index, the factor difference in prices between any given year (1879-1972) and 1891 is calculated. For example, Jay's original index value for 1958 is 4,382 which, recalculated at 1891 = 100, becomes 439.08, showing prices to have risen by a factor of 4.3908 on their 1891 level. Howietoun's income in 1958 in current terms amounted to £5,814. This figure is translated into constant terms through reduction by a factor of 4.3908, showing sales in 1958 to have

¹ Jay, D *Sterling - Its Use and Misuse: A Plea for Moderation* (1985) pp.275-279. The index used is Jay's *Index of the price of a composite unit of consumables in southern England, 1264-1983 (1451-1475 = 100)*.

² *Vide supra* p.167.

had a constant value, in 1891 prices, of £1,324. Likewise, Jay's original index value for 1886 is 931 which, recalculated at 1891 = 100, becomes 93.28, showing prices in 1886 to have been some 6.72 *per cent* lower than in 1891. Howietoun's sales in 1886 in current terms amounted to £1,582. This figure is translated into constant terms through increasing it by a factor of 1.0672, showing sales in 1886 to have had a constant value, in 1891 prices, of £1,688.

Of course, given the difficulty of determining prices over such a long period, it must be said that such calculations rely on inherently suspect data. As Jay himself acknowledges, such long-term price indices cannot take account of the effects of, for example, changes in commodity quality and consumer tastes. His figures are thus "no more than a long shot ... but it is doubtful if any better shot could be made."³

Tables 10.3A and 10.4A on the following pages show how the constant data for Howietoun's income and profits referred to in Chapter Ten were attained.⁴ The tables show Jay's index, its recalculation, the factors by which prices had either risen or fallen and the Howietoun data itself in both current and constant terms.

³ Jay, Sterling p.274.

⁴ **Table 10.3** (page 341) and **Table 10.4** (page 344) are based on the calculations shown in this appendix.

TABLE 10.3A

Howietoun Fishery/Howietoun and Northern Fisheries Company Income (£), 1879-1972, Recalculated into Constant (1891) Prices using Jay's Index of the Price of a Composite Unit of Consumables in Southern England, 1264-1983

YEAR	JAY's Index	JAY's Index at 1891 = 100	Factor ↓ in Prices on 1891 Level	Factor ↑ in Prices on 1891 Level	Income (Current)	Income (Constant)
1879	1,210	121.2424850		1.212424850	78	64.3339
1880	1,174	117.6352705		1.176352705	245	208.2709
1881	1,213	121.5430862		1.215430862	702	577.5730
1882	1,140	114.2284569		1.142284569	1,171	1,025.1386
1883	1,182	118.4368737		1.184368737	1,304	1,101.0085
1884	1,071	107.3146293		1.073146293	1,457	1,357.6900
1885	1,026	102.8056112		1.028056112	1,562	1,519.3723
1886	931	093.2865732	1.067134269		1,582	1,688.2064
1887	955	095.6913828	1.043086172		1,412	1,472.8377
1888	950	095.1903808	1.048096192		1,522	1,595.2024
1889	948	094.9899800	1.050100200		1,488	1,562.5491
1890	947	094.8897796	1.051102204		1,309	1,375.8928
1891	998	100.0000000	1.000000000		1,828	1,828.0000
1892	996	099.7995992	1.002004008		1,505	1,508.0160
1893	914	091.5831663	1.084168337		1,418	1,537.3507
1894	982	098.3967936	1.016032064		1,168	1,186.7255
1895	968	096.9939880	1.030060120		2,154	2,218.7495
1896	947	094.8897796	1.051102204		1,666	1,751.1363
1897	963	096.4929860	1.035070140		1,408	1,457.3788
1898	982	098.3967936	1.016032064		1,401	1,423.4609
1899	950	095.1903808	1.048096192		1,768	1,853.0341
1900	994	099.5991984	1.004008016		1,452	1,457.8196
1901	986	098.7975952	1.012024048		1,784	1,805.4509
1902	963	096.4929860	1.035070140		1,806	1,869.3367
1903	1,004	100.6012024		1.006012024	1,947	1,935.3645
1904	985	098.6973948	1.013026052		2,085	2,112.1593
1905	989	99.09819639	1.009018036		2,231	2,251.1192
1906	1,016	101.8036072		1.018036072	2,110	2,072.6181
1907	1,031	103.3066132		1.033066132	1,989	1,925.3366
1908	1,043	104.5090180		1.045090180	2,393	2,289.7546
1909	1,058	106.0120240		1.060120240	2,245	2,117.6843
1910	994	099.5991984	1.004008016		2,334	2,343.3547
1911	984	098.5971943	1.014028056		2,210	2,241.0020
1912	999	100.1002004		1.001002004	2,281	2,278.7167
1913	1,021	102.3046092		1.023046092	1,730	1,691.0284
1914	1,147	114.9298597		1.149298597	n/a	n/a
1915	1,317	131.9639279		1.319639279	1,101	834.3189
1916	1,652	165.5310621		1.655310621	1,183	714.6695

<i>YEAR</i>	<i>JAY's Index</i>	<i>JAY's Index at 1891 = 100</i>	<i>Factor ↓ in Prices on 1891 Level</i>	<i>Factor ↑ in Prices on 1891 Level</i>	<i>Income (Current)</i>	<i>Income (Constant)</i>
1917	1,965	196.8937876		1.968937876	1,146	582.0397
1918	2,497	250.2004008		2.502004008	1,408	562.7489
1919	2,254	225.8517034		2.258517034	1,693	749.6069
1920	2,591	259.6192385		2.596192385	2,805	1,080.4284
1921	2,048	205.2104208		2.052104208	4,102	1,998.9238
1922	1,672	167.5350701		1.675350701	3,536	2,110.6029
1923	1,726	172.9458918		1.729458918	3,981	2,301.8760
1924	1,740	174.3486974		1.743486974	3,125	1,792.3851
1925	1,708	171.1422846		1.711422846	2,867	1,675.2143
1926	1,577	158.0160321		1.580160321	3,271	2,070.0431
1927	1,496	149.8997996		1.498997996	3,374	2,250.8369
1928	1,485	148.7975952		1.487975952	3,336	2,241.9717
1929	1,511	151.4028056		1.514028056	2,985	1,971.5619
1930	1,275	127.7555110		1.277555110	2,719	2,128.2839
1931	1,146	114.8296593		1.148296593	2,185	1,902.8185
1932	1,065	106.7134269		1.067134269	2,095	1,963.2019
1933	1,107	110.9218437		1.109218437	n/a	n/a
1934	1,097	109.9198397		1.099198397	n/a	n/a
1935	1,149	115.1302605		1.151302605	n/a	n/a
1936	1,211	121.3426854		1.213426854	n/a	n/a
1937	1,275	127.7555110		1.277555110	n/a	n/a
1938	1,274	127.6553106		1.276553106	n/a	n/a
1939	1,209	121.1422846		1.211422846	n/a	n/a
1940	1,574	157.7154309		1.577154309	n/a	n/a
1941	1,784	178.7575150		1.787575150	n/a	n/a
1942	2,130	213.4268537		2.134268537	n/a	n/a
1943	2,145	214.9298597		2.149298597	n/a	n/a
1944	2,216	222.0440882		2.220440882	2,383	1,073.2103
1945	2,282	228.6573146		2.286573146	2,563	1,120.8913
1946	2,364	236.8737475		2.368737475	2,412	1,018.2640
1947	2,580	258.5170341		2.585170341	3,022	1,168.9752
1948	2,781	278.6573146		2.786573146	3,917	1,405.6692
1949	3,145	315.1302605		3.151302605	4,226	1,341.0328
1950	3,155	316.1322645		3.161322645	3,961	1,252.9566
1951	3,656	366.3326653		3.663326653	4,682	1,278.0733
1952	3,987	399.4989980		3.994989980	4,688	1,173.4698
1953	3,735	374.2484970		3.742484970	3,618	966.7373
1954	3,825	383.2665331		3.832665331	3,974	1,036.8763
1955	3,960	396.7935872		3.967935872	4,580	1,154.2525
1956	4,130	413.8276553		4.138276553	4,577	1,106.0160
1957	4,265	427.3547094		4.273547094	4,310	1,008.5299
1958	4,382	439.0781563		4.390781563	5,814	1,324.1378
1959	4,409	441.7835671		4.417835671	6,725	1,522.2386

<i>YEAR</i>	<i>JAY's Index</i>	<i>JAY's Index at 1891 = 100</i>	<i>Factor ↓ in Prices on 1891 Level</i>	<i>Factor ↑ in Prices on 1891 Level</i>	<i>Income (Current)</i>	<i>Income (Constant)</i>
1960	4,454	446.2925852		4.462925852	6,537	1,464.7342
1961	4,579	458.8176353		4.588176353	7,160	1,560.5329
1962	4,759	476.8537074		4.768537074	7,874	1,651.2402
1963	4,849	485.8717435		4.858717435	8,157	1,678.8381
1964	5,010	502.0040080		5.020040080	6,856	1,365.7261
1965	5,244	525.4509018		5.254509018	9,796	1,864.3036
1966	5,450	546.0921844		5.460921844	8,217	1,504.6910
1967	5,594	560.5210421		5.605210421	10,433	1,861.3039
1968	5,854	586.5731463		5.865731463	7,119	1,213.6594
1969	6,169	618.1362725		6.181362725	12,102	1,957.8207
1970	6,561	657.4148297		6.574148297	12,582	1,913.8601
1971	7,183	719.7394790		7.197394790	12,430	1,727.0138
1972	7,695	771.0420842		7.710420842	15,379	1,994.5734

Source: *Jay, Sterling pp.275-9 and University of Stirling, HF/V2-5, V13-14, V28-35, V115-116.*

TABLE 10.4A

Howietoun Fishery/Howietoun and Northern Fisheries Company Profits (£), 1879-1963, Recalculated into Constant (1891) Prices using Jay's Index of the *Price of a Composite Unit of Consumables in Southern England, 1264-1983*

<i>YEAR</i>	<i>JAY's Index</i>	<i>JAY's Index at 1891 = 100</i>	<i>Factor ↓ in Prices on 1891 Level</i>	<i>Factor ↑ in Prices on 1891 Level</i>	<i>Profits (Current)</i>	<i>Profits (Constant)</i>
1879	1,210	121.2424850		1.212424850	-53	-43.7140
1880	1,174	117.6352705		1.176352705	6	5.1005
1881	1,213	121.5430862		1.215430862	269	221.3206
1882	1,140	114.2284569		1.142284569	274	239.8701
1883	1,182	118.4368737		1.184368737	90	75.9898
1884	1,071	107.3146293		1.073146293	-243	-226.4367
1885	1,026	102.8056112		1.028056112	261	253.8771
1886	931	093.2865732	1.067134269		n/a	n/a
1887	955	095.6913828	1.043086172		46	47.9819
1888	950	095.1903808	1.048096192		136	142.5410
1889	948	094.9899800	1.050100200		-8	-8.4008
1890	947	094.8897796	1.051102204		-96	-100.9058
1891	998	100.0000000	1.000000000		210	210.0000
1892	996	099.7995992	1.002004008		-219	-219.4380
1893	914	091.5831663	1.084168337		n/a	n/a
1894	982	098.3967936	1.016032064		-151	-153.4200
1895	968	096.9939880	1.030060120		329	338.8890
1896	947	094.8897796	1.051102204		78	81.9850
1897	963	096.4929860	1.035070140		-177	-183.2070
1898	982	098.3967936	1.016032064		75	76.2024
1899	950	095.1903808	1.048096192		349	365.7855
1900	994	099.5991984	1.004008016		-3	-3.0120
1901	986	098.7975952	1.012024048		474	479.6993
1902	963	096.4929860	1.035070140		392	405.7474
1903	1,004	100.6012024		1.006012024	450	447.3107
1904	985	098.6973948	1.013026052		n/a	n/a
1905	989	099.0981964	1.009018036		566	571.1042
1906	1,016	101.8036072		1.018036072	296	290.7559
1907	1,031	103.3066132		1.033066132	429	415.2686
1908	1,043	104.5090180		1.045090180	951	909.9693
1909	1,058	106.0120240		1.060120240	708	667.8487
1910	994	099.5991984	1.004008016		934	937.7434
1911	984	098.5971944	1.014028056		633	641.8797
1912	999	100.1002004		1.001002004	850	849.1491
1913	1,021	102.3046092		1.023046092	32	31.2791
1914	1,147	114.9298597		1.149298597	n/a	n/a
1915	1,317	131.9639279		1.319639279	n/a	n/a
1916	1,652	165.5310621		1.655310621	n/a	n/a

YEAR	JAY's Index	JAY's Index at 1891 = 100	Factor ↓ in Prices on 1891 Level	Factor ↑ in Prices on 1891 Level	Profits (Current)	Profits (Constant)
1917	1,965	196.8937876		1.968937876	113	57.3913
1918	2,497	250.2004008		2.502004008	135	53.9567
1919	2,254	225.8517034		2.258517034	342	151.4267
1920	2,591	259.6192385		2.596192385	1,131	435.6379
1921	2,048	205.2104208		2.052104208	1,569	764.5810
1922	1,672	167.5350701		1.675350701	971	579.5801
1923	1,726	172.9458918		1.729458918	971	561.4472
1924	1,740	174.3486974		1.743486974	563	322.9160
1925	1,708	171.1422846		1.711422846	972	567.9484
1926	1,577	158.0160321		1.580160321	191	120.8738
1927	1,496	149.8997996		1.498997996	553	368.9131
1928	1,485	148.7975952		1.487975952	1,157	777.5663
1929	1,511	151.4028056		1.514028056	1,130	746.3534
1930	1,275	127.7555110		1.277555110	977	764.7420
1931	1,146	114.8296593		1.148296593	563	490.2914
1932	1,065	106.7134269		1.067134269	357	334.5408
1933	1,107	110.9218437		1.109218437	443	399.3803
1934	1,097	109.9198397		1.099198397	797	725.0738
1935	1,149	115.1302605		1.151302605	654	568.0522
1936	1,211	121.3426854		1.213426854	128	105.4863
1937	1,275	127.7555110		1.277555110	774	605.8447
1938	1,274	127.6553106		1.276553106	1,565	1225.9570
1939	1,209	121.1422846		1.211422846	71	58.6088
1940	1,574	157.7154309		1.577154309	154	97.6442
1941	1,784	178.7575150		1.787575150	-270	-151.0426
1942	2,130	213.4268537		2.134268537	553	259.1051
1943	2,145	214.9298597		2.149298597	845	393.1515
1944	2,216	222.0440882		2.220440882	828	372.8980
1945	2,282	228.6573146		2.286573146	494	216.0438
1946	2,364	236.8737475		2.368737475	412	173.9323
1947	2,580	258.5170341		2.585170341	820	317.1937
1948	2,781	278.6573146		2.786573146	246	88.2804
1949	3,145	315.1302605		3.151302605	1,249	396.3440
1950	3,155	316.1322645		3.161322645	1,230	389.0776
1951	3,656	366.3326653		3.663326653	1,233	336.5793
1952	3,987	399.4989980		3.994989980	1,041	260.5763
1953	3,735	374.2484970		3.742484970	948	253.3076
1954	3,825	383.2665331		3.832665331	924	241.0854
1955	3,960	396.7935872		3.967935872	731	184.2267
1956	4,130	413.8276553		4.138276553	243	58.7200
1957	4,265	427.3547094		4.273547094	283	66.2213
1958	4,382	439.0781563		4.390781563	877	199.7366
1959	4,409	441.7835671		4.417835671	940	212.7738
1960	4,454	446.2925852		4.462925852	1,037	232.3587
1961	4,579	458.8176353		4.588176353	1,317	287.0421
1962	4,759	476.8537074		4.768537074	1,597	334.9035
1963	4,849	485.8717435		4.858717435	1,545	317.9851

Source: Jay, *Sterling* pp.275-9 and University of Stirling, HF/V13, V113-116.

PRIMARY SOURCE BIBLIOGRAPHY

UNIVERSITY OF STIRLING, THE HOWIETOUN ARCHIVE

Key: HF Howietoun Fishery Archive
 B Box *n*
 V Volume *n*

eg. HF/B1/6 indicates Bundle 6 in Box 1 of the Howietoun Fishery Archive.

- HF/B1/4** Notes on the hatching of fish and on sales, 1957-1964.
- HF/B1/5** Notebooks containing details of fish despatched by rail,
 1900-1926.
- HF/B1/6** Notebook with notes on pisciculture, 1873-1882, and
 orders for the season 1878-1879.
- HF/B2/7** Legal and financial letters, papers and accounts, twentieth
 century.
- HF/B2/9** Draft report to the directors of the Loch Leven Fishing
 Company by Sir James Maitland on pisciculture, 1878.
 Draft of part of a report on the state of consignments of
 fish sent to Dunedin, Wellington and Otago, 1885. Notes
 on pisciculture, n.d.
- HF/B3/10** Minutes of meetings of shareholders and directors of the
 Howietoun and Northern Fisheries Company Limited, with
 notes thereon, 1919-1942.
- HF/B3/11** As in Bundle 10 above, 1943-1947.
- HF/B3/12** Minutes as in Bundle 10 above, accounts and balance
 sheets, 1938-1943.

- HF/B3/13** Abstracts of accounts, balance sheets and memoranda on accounts, 1921-1927.
- HF/B3/14** Management accounts, receipts, notes on public burdens due and similar papers, 1950-1953.
- HF/B3/15** Notes of expenses for electric power and running a motor lorry, with notes of numbers of fish at Howietoun and of ova deposited in the hatchery, 1927-1936.
- HF/B4/16-23** Business correspondence to and from the Howietoun and Northern Fisheries Company Limited, 1946-1958.
- HF/B6/41-42** As in Bundles 16-23 above, 1948.
- HF/B6/45** Abstracts of accounts, memoranda and other papers concerning the company's finances, 1917-1941.
- HF/B6/47** Vouchers, abstracts of accounts, and minutes of shareholders meetings, 1937-1957.
- HF/B7/50** Copies of Articles of Association of the Howietoun and Northern Fisheries Company Limited, 1914.
- HF/B11/111** Minutes of shareholders meetings, reports to directors and particulars of horse-flesh supplied to customers, 1922-1936.
- HF/B19/161** Accounts and related correspondence concerning the Barnton, Sauchie and Bannockburn Estates, and Lady Steel-Maitland's executory, 1938-1943.

- HF/B21** 43 folders of correspondence with angling clubs concerning orders for trout and related material.
- HF/B22-28** Unsorted loose material, Howietoun and Northern Fisheries Company Limited.
- HF/V1** Tabular accounts of fish spawned for the seasons 1882-3 to 1886-7.
- HF/V2** Cash Book, December 1914 - March 1928.
- HF/V3** Cash Book, April 1928 - January 1940.
- HF/V4** Cash Book, January 1940 - March 1955.
- HF/V5** Cash Book, March 1955 - August 1971.
- HF/V9-11** Ledger - supply of ova, young trout etc., 1914-1957
- HF/V12** Ledger - ova received from various sources, 1931-1946.
- HF/V13** Minute Book of the Howietoun and Northern Fisheries Company Limited, 4 January 1915 - December 1963.
- HF/V14** Cash Book, 1947-1963.
- HF/V18** Essay on the Salmon Disease, 1881.
- HF/V19-27** Letter Books, March 1944 - October 1957.
- HF/V28-35** Order books and trout sales, 1905-1972.
- HF/V37** Share Ledger, 1915-1941.
- HF/V39** Notes on weather conditions, hatching of fish and sales, 1952-1967.
- HF/V47-112** Letter Books, June 1880 - March 1944.
- HF/V113** Ledger Book, June 1874 - April 1892.

- HF/V114** Cash Book, June 1874 - February 1892.
- HF/V115** Cash Book, July 1893 - May 1905.
- HF/V116** Cash Book, May 1905 - June 1914.
- HF/V117** Customer account book, 1932-1947.
- HF/V118** Order book, 1903-1905.
- HF/V119** Customer account book, 1905-1909.
- HF/V120** Account book, 1907-1914.

SCOTTISH RECORD OFFICE, THE STEEL-MAITLAND COLLECTION

- GD193/5/6** Financial and legal business of Sir James Maitland, mainly relating to the Lauderdale Peerage Case, 1879-1885.
- GD193/9/5** Correspondence on family matters, 1931-1935.
- GD193/12/3** Fortnightly reports from the Sauchie Estates Office to the Steel-Maitlands on the affairs of the Sauchie, Bannockburn and Barnton Estates, 1907-1909.
- GD193/13/1** Fortnightly reports from the Sauchie Estates Office to the Steel-Maitlands on the affairs of the Sauchie, Bannockburn and Barnton Estates, 1909-1912.
- GD193/13/5** Miscellaneous Correspondence, 1897-1902.
- GD193/13/6** Correspondence on the Proposed Extension of the Costorphine, Barnton and Gogar Railway, 1895-1896.
- GD193/14/1** Miscellaneous accounts and correspondence but mainly estimates of tradesmen and accounts of charge and discharge - Sauchieburn Mansion House, 1878-1895.

- GD193/16/1** Letters from County Buildings, Stirling, to Sir James Maitland on County Business, 1885-1889.
- GD193/16/4** Miscellaneous correspondence on business and estate matters, 1888-1891.
- GD193/15/1** Correspondence on estate matters between John C Brodie and Company and Sir James Maitland and later Miss Maitland, 1895-1898.
- GD193/19/1** Miscellaneous correspondence on estate and family matters, 1884-1890.
- GD193/20/21** Howietoun Fishery Company tax returns.
- GD193/20/22** Miscellaneous - mainly Howietoun Fishery, 1915-1925.
- GD193/30/4** Miscellaneous correspondence on household affairs, 1909-1918.
- GD193/57/8** Receipt from Edinburgh Consistory of K.H. or 30th Degree - Sir James Maitland, 1893.
- GD193/68/3** Minute of Agreement, Memorandum, Petitions etc., Sir James Maitland, 1878-1889.
- GD193/69/1** Diplomas received by the Howietoun Fishery from International Fisheries Exhibitions for various improvements etc. in pond fish culture, 1882-1883.
- GD193/69/2** Papers about the introduction of trout and salmon ova to Natal and New Zealand, and a communication from New Zealand about the presentation of bird skins in appreciation of Sir James Maitland's help in this direction.

- GD193/69/3** Reports from the hatcheries at Wellington, New Zealand on the salmon ova sent from Scotland.
- GD193/69/4** Correspondence from the British Museum, South Kensington Science Museum, Zoological Society of London etc., various things in connection with the Howietoun Fisheries.
- GD193/69/5** Appointment of Sir James Maitland as a member of the Fishery Board for Scotland, 1882.
- GD193/69/6** Appointment of Sir James Maitland as a Captain in the Highland Borderers infantry militia force, 1876.
- GD193/73/8** Some loose papers concerning the Fishery Board for Scotland, 1889-1891.
- GD193/74/3** Howietoun and Northern Fisheries Company Limited - correspondence, monthly reports, etc., 1940-1948.
- GD193/86/1** Howietoun Fisheries correspondence, 1913-1922.
- GD193/86/2** Howietoun Fisheries - Memorandum, Articles of Association making it the Howietoun and Northern Fisheries Company, and correspondence in this connection.
- GD193/384** Papers concerning Howietoun Fisheries, 1922-1930.
- GD193/385** Papers concerning Howietoun Fisheries, 1931-1935.
- GD193/665** Printed booklets 'On Stocking Rivers and Streams'.

- GD193/666** Howietoun and Northern Fisheries correspondence relating to the adjustment of the lease of the Howietoun and Balvenie Fisheries and the Howietoun Fisheries amalgamation, 1914-1915. Draft agreement concerning incorporation of the company with notes and correspondence, 1913. Miscellaneous correspondence, 1914-1915.
- GD193/667** Draft lease for Howietoun Fisheries, 1915. Notes on the formation of the Howietoun and Northern Fisheries Company, 1914.
- GD193/668** Papers relating to the agreement between fishery companies.
- GD193/669** Miscellaneous papers of the Howietoun and Northern Fisheries Company Limited, 1914-1955.
- GD193/681** Sauchieburn House - Building Contracts, 1890.
- GD193/865-874** Lauderdale Peerage Case, 1885. Copy correspondence, miscellaneous papers and list of documents to be produced by Sir James Maitland.
- GD193/895** Papers relating to Falkirk Water Supply (Loch Coulter Scheme).
- GD193/963** Miscellaneous papers relating to the Sauchie and Bannockburn Estates, early twentieth century. Including papers relating to the Howietoun Fisheries, 1925.

- GD193/968** Miscellaneous financial papers mainly relating to the Sauchie and Bannockburn Estates.
- GD193/971-972** Accounts and vouchers of Sir James Maitland's trust, 1880-1883.
- GD193/973** Papers relating to Lauderdale Peerage Case, 1885.

SCOTTISH RECORD OFFICE, FISHERY BOARD FOR SCOTLAND PAPERS

- AF37/108-110** Correspondence relating to the Fishery Board for Scotland's scientific investigations, 1882-1892.
- AF37/185** Correspondence relating to the Scientific Report Committee, 1889.
- AF56/1473** Correspondence relating to the Fishery Board for Scotland's scientific investigations, proposed appointment of a salaried superintendent, 1887.
- AF56/1474** Correspondence relating to the Fishery Board for Scotland's Scientific Report Committee, 1889.
- AF56/1475** Papers relating to the Fishery Board for Scotland's scientific investigations, 1882-1892.

CENTRAL REGION ARCHIVES (STIRLING), LOCAL GOVERNMENT PAPERS

- FA1/6/1** Falkirk Water and Drainage Bill (1886) Minutes of Evidence.
- FA1/6/1A** Falkirk and District Water Acts, 1888-1957.
- FA1/2/8** Falkirk Water and Lighting Committee: Minute Book, 1879-1890.

- SC1/1/7** Stirlingshire Commissioners of Supply: Minute Book, 1868-1878.
- SC1/2/1** Stirling County Provisional Council: Minute Book, 1890.
- SC3/1/1-9** Stirling County Council: Minute Book, 1890-1899.

OFFICIAL PUBLICATIONS

Reports of the Fishery Board for Scotland, 1882-1900

Reports of the United States Commission on Fish and Fisheries, 1873-1900

Bulletins of the United States Commission on Fish and Fisheries, 1881-1900

House of Commons Agriculture Committee, Fourth Report - Fish Farming in the United Kingdom: Volume II; Minutes of Evidence and Appendices (1990)

PRINCIPAL PERIODICALS AND NEWSPAPERS

Field

Fishing Gazette

The Times

Stirling Saturday Observer

Stirling Journal and Advertiser

SECONDARY SOURCE BIBLIOGRAPHY

Adams, WM A Popular History of Fisheries and Fishermen of All Countries from the Earliest Times (1883)

Aflalo, FG 'The Decay of Our Sea Fisheries' Quarterly Review 194 (1901)

Agersborg, HK 'Salient Problems in the Artificial Rearing of Salmonoid Fishes' Transactions of the American Fisheries Society 63 (1933)

Ainsworth, SM 'In Defence of the Doughty Scotchman' Transactions of the American Fisheries Society 55 (1925)

Aldcroft, DH The British Economy Between the Wars (1983)

Aldcroft, DH 'The Entrepreneur and the British Economy, 1870-1914' Economic History Review (1964)

Aldcroft, DH (ed.) The Development of British Industry and Foreign Competition, 1875-1914 (1968)

Aldcroft, DH The Inter-War Economy: Britain, 1919-1939 (1970)

Alford, BWE 'New Industries for Old? British Industry Between the Wars' in Floud, R and McCloskey, D (eds.) The Economic History of Britain Since 1700: Volume II - 1860 to the 1970s (1981)

Alford, BWE 'Penny Cigarettes, Oligopoly, and Entrepreneurship in the United Kingdom Tobacco Industry in the Late Nineteenth Century' in Supple, B (ed.) Essays in British Business History (1977)

Alford, BWE Depression and Recovery? British Economic Growth, 1918-1939 (1986)

Allard, DC 'Spenser Fullerton Baird and the Foundations of American Marine Science' Marine Fisheries Review 50 (1988)

Allard, DC SF Baird and the US Fish Commission (1978)

Allen, GC The British Disease (1979)

Almond, HH 'Decay in British Salmon Fisheries' Nineteenth Century 45 (1899)

Alter, P The Reluctant Patron: Science and the State, 1850-1920 (1987)

Alter, P 'Science and the Anglo-German Antagonism' in Gourvish, T and O'Day, A (eds.) Later Victorian Britain 1867-1900 (1988)

Andersen, C 'Some Aspects of Fish Farming in Norway' Vie Mar 8 (1987)

Anderson, MS This is my Town: Letters to my Grandchildren on the Burgh of Falkirk (1981)

Anderson-Smith, W 'Fish Hatching' Scottish Review 26 (1895)

Anderson-Smith, W 'The Scottish Fisheries under the Fishery Board' Scottish Review 21 (1893)

Andreska, J 'Development of Fish Pond Culture in Bohemia' in Gunda, B (ed.) Fishing Culture of the World (1984)

Annin, J 'Notes on Fish Culture' Transactions of the American Fisheries Society 13 (1884)

Anon. 'Stocking the Hudson with Salmon' Scientific American 62 (1890)

Anon. 'Artificial Propagation of the Atlantic Salmon, Rainbow Trout and Brook Trout' Report of the United States Commission on Fish and Fisheries for 1897 (1898)

Anon. 'Remarks on the Salmon' Quarterly Journal of Agriculture 13 (1843)

Anon. An Enquiry into the Present State and Means of Improving the Salmon Fisheries (1827)

Anon. 'Sir James Maitland' Proceedings of the Linnean Society of London (1898)

Anon. 'Fish Culture' London Quarterly Review 20 (1863)

Anon. 'The Harvest of the Sea' Spectator 82 (1899)

Anon. 'Fish Culture in England' Transactions of the American Fisheries Society 35 (1906)

Anon. 'A Visit to Howietoun' Transactions of the Stirling Natural History and Antiquarian Society 3 (1879)

Anon. Observations Regarding the Salmon Fishery of Scotland (1824)

Anon. 'Fish Farm in Surrey' Spectator 63 (1890)

Anon. 'Exchanging Fish Fry with Europe' Scientific American 81 (1899)

Anon. 'Observations upon Fishes and Fish Culture' Bulletin of the United States Commission on Fish and Fisheries 10 (1890)

Anon. 'Transportation by Rail of Fish and Fish Eggs' Scientific American 78 (1898)

Anon. 'Trout Culture in England' Bulletin of the United States Commission on Fish and Fisheries 5 (1885)

Anon. 'Fishery Board for Scotland' Nature 30 (1884)

Anon. 'The Howietoun Hatchery in Scotland' Bulletin of the United States Commission on Fish and Fisheries 5 (1885)

Anon. 'On Fish Culture in Europe' Intellectual Observer 9 (1866)

Anon. 'On the Agriculture of the Romans' Quarterly Review of Agriculture 11 (1831)

Anson, PF Fishing Boats and Fisherfolk on the East Coast of Scotland (1930)

Armistead, WH Trout Waters (1920)

Armistead, JJ A Short History of the Art of Pisciculture, Showing its Utility and Some of the Advantages Which May be Derived from it if it is Properly Carried On (1870)

Armistead, JJ 'Improvement of our Freshwater Fisheries' Transactions of the Dumfries and Galloway Natural History and Antiquarian Society 8 (1892)

Armistead, JJ 'Atmospheric and Other Influences on the Migration of Fish' Bulletin of the United States Commission on Fish and Fisheries 14 (1894)

Armistead, JJ An Angler's Paradise (1895)

Armistead, JJ A Handy Guide to Fish Culture (1897)

Ashworth, W 'Wiener, M *English Culture and the Decline of the Industrial Spirit* -Reviewed' Economic History Review 34 (1981)

Ashworth, E Remarks on the Artificial Propagation of Salmon and Some Account of the Experiment at Stormontfield (1875)

Ashworth, T and E A Treatise on the Propagation of Salmon and Other Fish (1853)

Association of Scottish District Salmon Fishery Boards, Salmon Fisheries of Scotland (1977)

Atkinson, CE 'Fisheries Management: An Historical Overview' Marine Fisheries Review 50 (1988)

Baird, SF 'The Work of the US Fish Commission' Transactions of the American Fisheries Society 3 (1874)

Baird, SF 'The Work of the US Fish Commission' Transactions of the American Fisheries Society 6 (1877)

Baird, SF 'Statistics of Fish in the US and Canada' Transactions of the American Fisheries Society 7 (1878)

Barker, TC, Campbell, RH, Mathias, P and Yamey, BS Business History (1971)

Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Bulletin of the United States Commission on Fish and Fisheries 5. (1885)

Barker-Duncan, J Manual of the General Acts of Parliament Relating to the Salmon Fisheries of Scotland, 1828-1882 (1886)

Barker-Duncan, J 'Salmon and Trout Hatcheries in Scotland' Third Annual Report of the Fishery Board for Scotland (1884)

Barrington, R Making and Managing a Trout Lake (1983)

Bartrip, P 'Food for the Body and Food for the Mind - The Regulation of Freshwater Fisheries in the 1870s' Victorian Studies 28 (1985)

Bateman, J The Great Landowners of Great Britain and Ireland (1883)

Bates, J 'The Profits of Small Manufacturing Firms' in Hart, PE (ed.) Studies in Profit, Business Saving and Investment in the United Kingdom, 1920-1962 (1965)

Bean, TH 'Hybrids in Salmonidae' Transactions of the American Fisheries Society 18 (1889)

Bell, C 'Fecundation of Fish' Transactions of the American Fisheries Society 2 (1873)

Benson, NG (ed.) A Century of American Fisheries (1971)

Berra, TM 'The Significance of William Bertram' American Midland Naturalist 122 (1989)

Berry, J 'Salmon Research and the Development of Salmon Fisheries' Proceedings of the Royal Philosophical Society of Glasgow 68 (1943)

Bertram, JG The Harvest of the Sea (1865)

Bertram, JG 'Modern Fish Culture' British Almanac Companion 15 (1883)

Bertram, JG 'The Secrets of Salmon Growth' Blackwoods Magazine 133 (1883)

Bertram, JG 'Pisciculture - Its Progress and Utility' Blackwoods Magazine 131 (1882)

Bertram, JG 'The Salmon in Scotland' Scottish Review 14 (1889)

Bickerdyke, J The Book of the All-Round Angler: A Comprehensive Treatise on Angling in Both Fresh and Salt Water (1889)

Boccius, G A Treatise on the Management of Freshwater Fish with a View to Making them a Source of Profit to Landed Proprietors (1847)

Bond, CJ 'Monastic Fisheries' in Aston, M (ed.) Medieval Fish, Fisheries and Fishponds in England (1988)

Boog-Watson, WN 'The Scottish Marine Station for Scientific Research, Granton 1884-1903' Book of the Old Edinburgh Club 33 (1969)

Borodine, V 'Statistical Overview of Fish Culture in Europe and North America' Transactions of the American Fisheries Society 22 (1893)

Bower, WT 'History of the American Fisheries Society' Transactions of the American Fisheries Society 40 (1910)

Bowers, GM A Manual of Fish Culture Based on the Methods of the USCFE (1900)

Boyd-Ash, H Translation of Varro's De Re Rustica (1934)

Boyd-Ash, H Translation of Columella's De Re Rustica (1955)

- Bradley, T 'The History of Atlantic Salmon' Maritime 34 (1990)
- Bradley, R The Country Gentleman and Farmer's Monthly Directory (1736)
- Brandt, A von Fish Catching Methods of the World (1984)
- Bremner, D The Industries of Scotland: Their Rise, Progress, and Present Condition (1869)
- Brock, WH 'The Spectrum of Science Patronage' in Turner, GL'E (ed.) The Patronage of Science in the Nineteenth Century (1976)
- Brown, W The Stormontfield Experiment on the Salmon (1862)
- Brown, AR The Effects of Reservoirs and Forestry on Water Quality
Unpublished B.Sc. Dissertation, University of Stirling (1992)
- Brown, K 'Models in History: A Micro-Study of Late Nineteenth Century British Entrepreneurship' Economic History Review 42 (1989)
- Browne, TB Browne's County Council Year Book (1892)
- Browne-Goode, G 'The First Decade of the US Fish Commission' Marine Fisheries Review 50 (1988)
- Buckland, F Fish Hatching (1863)
- Buckland, F 'On the Scientific Cultivation of a Salmon River' British Association for the Advancement of Science: Report for 1866/1867 (1867)
- Buist, R 'On the Salmon Fisheries' Quarterly Journal of Agriculture 3 (1832)
- Buist, R The Stormontfield Piscicultural Experiments (1866)
- Burgess, GHO The Curious World of Frank Buckland (1962)
- Burnett, J Plenty and Want: A Social History of Diet in England from 1815 to the Present Day (1979)
- Burstyn, HL 'The Challenger Expedition' Bulletin de l'Institut Océanographique 2 (1968)
- Byres, T 'Entrepreneurship in the Scottish Heavy Industries, 1870-1900' in Payne, PL (ed.) Studies in Scottish Business History (1967)

- Calderwood, WL The Life of the Salmon (1907)
- Calderwood, WL The Salmon Rivers and Lochs of Scotland (1909)
- Campbell, RH Carron Company (1961)
- Campbell, RH Owners and Occupiers: Changes in Rural Society in South West Scotland Before 1914 (1991)
- Campbell, RN 'Trout Angling in Scotland, Past and Present: A Highly Personal View' Proceedings of the Salmon and Trout Association Annual Conference, 1972 (1972)
- Capel, CC Trout Culture (1877)
- Chaloner WH 'Was there a Decline in the Industrial Spirit in Britain, 1850-1914?' Transactions of the Newcomen Society 55 (1984)
- Chambers, R 'Three Fishponds at Thame' Oxoniensia 40 (1975)
- Chambers, WO British Fishes (1884)
- Chambers, WO 'American Fish Eggs Imported by the National Fish Culture Association' Journal of the National Fish Culture Association (1887)
- Chang, WYB 'A Historical Centre of Fish Culture in China' Aquaculture Magazine 13 (1987)
- Church, RA 'The Effect of the American Export Invasion on the British Boot and Shoe Industry, 1885-1914' Journal of Economic History 28 (1968)
- Church, RA Kenricks in Hardware - A Family Business, 1791-1966 (1969)
- Church, RA 'The British Leather Industry and Foreign Competition, 1870-1914' Economic History Review 24 (1971)
- Church, RA The History of the British Coal Industry: Volume 3 - 1836-1913, Victorian Pre-eminence (1986)
- Clark, JGD Prehistoric Europe: The Economic Basis (1952)
- Clements, J Salmon at the Antipodes: A History and Review of Trout, Salmon and Char Introduced in Australasia (1988)

Coleman, DC 'Gentlemen and Players' Economic History Review 26 (1973)

Coleman, DC and MacLeod, C 'Attitudes to New Techniques: British Businessmen, 1800-1950' Economic History Review 39 (1986)

Collins, B 'American Enterprise and the British Comparison' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990)

Cook, CH 'Successful Fish Culture in the Highlands' Blackwoods Magazine 154 (1893)

Costa-Pierce, BA 'Aquaculture in Ancient Hawaii' Bioscience 37 (1987)

Coull, JR Fisheries in the North East of Scotland Before 1800 (1969)

Cox, WV 'Transporting Fish in the British Isles' Transactions of the American Fisheries Society 15 (1886)

Culler, CF 'Progress in Fish Culture' Transactions of the American Fisheries Society 62 (1932)

Cushing, DH The Provident Sea (1988)

Cutting, CL Fish Saving - A History (1955)

Dall, WH Spenser Fullerton Baird: A Biography (1915)

Darby-de-Thiersant, P La Pisciculture et la Peche en Chine (1872)

Daunton, MJ 'Gentlemanly Capitalism and British Industry, 1820-1914' Past and Present 122 (1989)

Davis, HS 'Fish Cultural Developments in Recent Years' Transactions of the American Fisheries Society 68 (1938)

Davis, LE and Huttenback, RA Mammon and the Pursuit of Empire: The Political Economy of British Imperialism, 1860-1912 (1986)

Day, F Pisciculture in the Neilgherry Hills (1883)

Day, F Fish Culture (1883)

Day, F 'On the Rearing, Growth and Breeding of Salmon in Freshwater in Great Britain' Bulletin of the United States Commission on Fish and Fisheries 5 (1885)

Day, F 'On the Breeding of Salmon from Parents Which Have Never Descended to the Sea' Proceedings of the Linnean Society of London (1886)

Day, F 'On Hybrid Trout and Salmon' Proceedings of the Linnean Society of London (1886)

Day, F 'Experiments with Salmon in Scotland' Bulletin of the United States Commission on Fish and Fisheries 6 (1887)

Day, F 'On the Loch Leven Trout' Proceedings of the Linnean Society of London (1887)

Day, F 'The British Salmonidae' Journal of the National Fish Culture Association (1887)

Day, F 'Loch Leven and Sea Trout - Raised at Howietoun' Proceedings of the Linnean Society of London (1888)

Day, F 'Salmon Parr and Hybrids between Charr and Trout' Proceedings of the Linnean Society of London (1887)

Day, F British and Irish Salmonidae (1887)

Day, F 'The Hybridisation of Fish' Proceedings of the Cotswold Naturalists Field Club (1889)

Deacon, M Scientists and the Sea 1650-1900: A Study of Marine Science (1971)

Deacon, M 'Some Nineteenth Century Research on Weather and Fisheries: The Work of the Scottish Meteorological Society' (Unpublished Paper) (1989)

Deacon, M 'State Support for Useful Science: The Scientific Investigations of the Fishery Board for Scotland, 1883-1899' in Scheiber, HN (ed.) Ocean Resources: Industries and Rivalries Since 1800 (1990)

Deacon, M 'Crisis and Compromise: The Foundation of Marine Stations in Britain During the Late Nineteenth Century' Earth Sciences History 12 (1993)

Delbos, G 'Semer du Poisson Comme on Semme du Grain' Aquaculture Revue 36 (1991)

Denham, J 'Ways and Whims of Freshwater Fishes' Blackwoods Magazine 149 (1891)

- Derrick, OP Salmon Fishings on the River Forth (1922)
- Dintenfass, M The Decline of Industrial Britain, 1870-1980 (1992)
- Dnes, AW Fish Farming in Scotland Unpublished M.Litt Thesis, University of Aberdeen (1978)
- Dowie, JA 'Growth in the Inter-War Period' Economic History Review 49 (1975)
- Drummond, JC The Englishman's Food - A History of Five Centuries of English Diet (1964)
- Drysdale, W Old Faces, Old Places and Old Stories of Stirling (1898)
- Duncan-Brown, R A Historical Look at Fish Farming and Fisheries Trends in South Africa: Collected Papers from the Symposium on Fisheries and Rural Development Held at the JLB Smith Institute of Ichthyology, Rhodes University, Grahamstown, South Africa (1978)
- Dunfield, RW The Atlantic Salmon in the History of North America (1985)
- Dunlop, J The British Fisheries Society 1786-1893 (1978)
- Dyer, C 'The Consumption of Freshwater Fish in Medieval England' in Aston, M (ed.) Medieval Fish, Fisheries and Fishponds in England (1988)
- Ettrick Shepherd, The 'On the Preservation of the Salmon' Quarterly Journal of Agriculture 3 (1832)
- Evermann, BW 'How the Fisheries of the US are Protected and New Fishing Grounds Discovered or Created' National Geographic 15 (1904)
- Ewart, JC Preservation of Fish (1877)
- Ewart, JC 'Report on the Progress of Fish Culture in America' Third Annual Report of the Fishery Board for Scotland (1884)
- Exeter, Marquis of 'American Fish Eggs in England' Bulletin of the United States Commission on Fish and Fisheries 6 (1887)
- Ffennell, J 'On the Artificial Propagation of the Ova of the Salmon and the Progress of the Experiments now Carrying On' Transactions of the Dublin Natural History Society (1854)

- Fish, FF 'Founders of Fish Culture: European Origins' Progressive Fish Culturist 16 (1936)
- Fisher, I and Hogg, J 'On the Artificial Introduction of Salmon into the Swale' Proceedings of the Linnean Society of London (1853)
- Flain, M 'The History of New Zealand's Salmon Fishery' Proceedings of the Salmon Symposium (1981)
- Flowerdew, H The Parr and Salmon Controversy (1871)
- Francis, F Fish Culture (1863)
- Francis, F A Book on Angling (1867)
- Francis, JM and Urwin, ACB Francis Francis, 1822-1886: Angling and Fish Culture on the Twickenham, Teddington and Hampton Reaches of the River Thames (1991)
- Frewen, M 'A Visit to the Craig Brook Salmon Hatchery' Nineteenth Century 46 (1899)
- Fry, WH A Complete Treatise on Artificial Fish Breeding (1854)
- Fryer, CE The Salmon Fisheries (1883)
- Fulton, TW 'The Scientific Work of the Fishery Board for Scotland' Journal of the Marine Biological Association of the UK 1 (1889)
- Fussell, GE 'The Collection of Agricultural Statistics' Agricultural History 18 (1944)
- Garlick, T Treatise on the Artificial Propagation of Fish (1857)
- Garnett, T Essays in Natural History and Agriculture (1883)
- Gay, J and Seal, WP 'Fish Culture Past, Present, and Future' Transactions of the American Fisheries Society 19 (1890)
- Gibson, JC 'The Baronies and Owners of Sauchie and Bannockburn' Transactions of the Stirling Natural History and Archaeological Society 56 (1934)
- Gibson, J 'Queer Fishes' Longmans Magazine 3 (1884)
- Gilbert, WL 'The Past, Present, and Future of Trout Culture' Bulletin of the United States Commission on Fish and Fisheries 13 (1894)

Goode, GB 'Epochs in the History of Fish Culture' Transactions of the American Fisheries Society 10 (1881)

Goode, GB 'The Status of the United States Commission on Fish and Fisheries in 1884: A Review of What Has Been Accomplished in Fish Culture and the Investigation of the American Fisheries' Report of the United States Commission on Fish and Fisheries for 1884 (1886)

Gray, M The Fishing Industries of Scotland 1790-1914: A Study in Regional Adaptation (1978)

Green, S 'Stocking Depleted Waters' Transactions of the American Fisheries Society 4 (1875)

Green, S 'The Propagation of Fish' Transactions of the American Fisheries Society 5 (1876)

Green, S Home Fishing: A Treatise on Fish Culture (1888)

Gunckel, JE 'Fish Culturists' Transactions of the American Fisheries Society 27 (1898)

Gunther, AE The Life of William Carmichael M'Intosh (1977)

Hachey, HR 'History of the Fisheries Research Board of Canada' in Fisheries Research Board of Canada MS REP 843 (BIOL) (1965)

Haime, J 'The History of Fish Culture in Europe from its Earliest Records to 1854' Report of the United States Commission on Fish and Fisheries for 1873 (1874)

Halford, FM Making a Fishery (1895)

Harvey, C and Press, J 'Overseas Investment and the Professional Advance of British Metal Mining Engineers, 1851-1914' Economic History Review 42 (1989)

Hayford, C and Embury, C 'The Advantage of Rearing Brook Trout Fingerlings from Selected Breeders' Transactions of the American Fisheries Society 55 (1925)

Hayford, C and Embury, C 'Selective Breeding of Brook Trout' Transactions of the American Fisheries Society 60 (1930)

Hayford, C and Embury, C 'Further Progress in the Selective Breeding of Brook Trout at the New Jersey State Hatchery' Transactions of the American Fisheries Society 60 (1930)

Hecht, T and Britz, PJ Aquaculture in South Africa: History, Status, Prospects (1990)

Herbert, M 'Trouting Tattle' Blackwoods Magazine 155 (1894)

Herbert, D (ed.) Fish and Fisheries (1883)

Herbert, M 'English Trout' Blackwoods Magazine 158 (1895)

Hickling, CF Fish Culture (1962)

Hickling, CF 'Prior More's Fishponds' Medieval Archaeology 15 (1971)

Hogg, J 'On the Artificial Breeding of Salmon and Trout, with Remarks on the Fecundation of their Ova' Transactions of the Linnean Society of London (1853)

Holdsworth, EWH Sea Fisheries (1877)

Home-Drummond, H 'On the Salmon Fishery' Transactions of the Highland and Agricultural Society 3 (1847)

Howietoun Fishery, Pamphlet on Stocking (1st edn.) (1880)

Howietoun Fishery, Pamphlet on Stocking (2nd edn.) (1882)

Howietoun Fishery, Pamphlet on Stocking (3rd edn.) (1884)

Howietoun Fishery, Pamphlet on Stocking (4th edn.) (1892)

Howietoun Fishery, Pamphlet on Stocking (5th edn.) (1898)

Howietoun Fishery, A Short Account of the Howietoun Fishery (1903)

Hubrecht, AAW 'Fish Culture as Seen at the London Exhibition with Special Reference to its History, Apparatus and the Methods used in the US' Bulletin of the United States Commission on Fish and Fisheries 3 (1883)

Huet, M Textbook of Fish Culture: Breeding and Cultivation of Fish (1971)

Huisman, EA (ed.) Aspects of Fish Culture and Fish Breeding (1976)

- Huxley, TH 'HMS Challenger' Contemporary Review 25 (1875)
- James, H 'The German Experience and the Myth of British Cultural Exceptionalism' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990)
- Jay, D Sterling - Its Use and Misuse: A Plea for Moderation (1985)
- Jewkes, J, Sawers, D and Stillerman, R The Sources of Invention (1969)
- Jordan, DS 'Loch Leven Trout in California' Science 22 (1905)
- Kangmin, L 'Rice Fish Culture in China: A Review' Aquaculture 71 (1978)
- Kendall, WC 'Founders of Fish Culture: Charles Grandison Atkins - A Pioneer who Blazed the Trails' Progressive Fish Culturist 25 (1936)
- Kirby, M The Decline of British Economic Power Since 1870 (1981)
- Kirk, R A History of Marine Fish Culture in Europe and North America (1987)
- Koss, RA 'Trout and Trout Culture' Bulletin of the United States Commission on Fish and Fisheries 3 (1883)
- La Motte, AV 'Fish Propagation in California - Part 1' Overland Monthly 30 (1897)
- La Motte, AV 'Fish Propagation in California - Part 2' Overland Monthly 32 (1897)
- Laird, L and Needham, T Salmon and Trout Farming (1991)
- Landau, M Introduction to Aquaculture (1992)
- Landes, DS The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present (1969)
- Lankester, ER 'The Value of a Marine Laboratory to the Development and Regulation of our Sea Fisheries' Transactions of the Royal Society of Arts 33 (1885)
- Lankester, ER 'The Advancement of Science' in Lankester, ER Occasional Essays and Addresses (1890)

Lapham, EG 'Address on Fisheries' Transactions of the American Fisheries Society 13 (1884)

Lee, AJ The Directorate of Fisheries Research: Its Origins and Development (1993)

Leggo, W 'The Fishery Question I' The Scottish Review 8 (1886)

Leggo, W 'The Fishery Question II' The Scottish Review 9 (1887)

Leith, JM 'Salmon Legislation in Scotland at Present Applicable to the Salmon Fisheries and the Best Means of Improving It' in Herbert, D (ed.) Fish and Fisheries (1883)

Leitritz, E and Lewis, RC Trout and Salmon Culture (Hatchery Methods) (1980)

Lennox, P 'That Big Trout' Longmans Magazine 2 (1883)

Leonard, J 'Report on the Edinburgh Fisheries Exhibition' Bulletin of the United States Commission on Fish and Fisheries 2 (1882)

Liddell, AGC 'The Trawling Commission' Blackwoods Magazine 137 (1885)

Ling, SW Aquaculture in Southeast Asia: A Historical Overview (1977)

Lowerson, J 'Isaac Walton - Father of a Dream' History Today 33 (1983)

Lowerson, J 'Brothers of the Angle - Coarse Fishing and English Working-Class Culture, 1850-1914' in Mangan, JA (ed.) Pleasure, Profit and Proselytism (1988)

Lowerson, J 'Angling' in Mason, T (ed.) Sport in Britain - A Social History (1989)

Lucas, C 'The Story of Fisheries Research in Scotland' in Bailey, RS and Parrish, BB (eds.) Developments in Fisheries Research in Scotland (1987)

Lumley, R 'The American System of Manufacture in Birmingham' Business History 31 (1989)

Lydell, D 'Progress in Fish Culture' Transactions of the American Fisheries Society 50 (1920)

Lyman, T 'History of American Fisheries and Fish Culture' Transactions of the American Fisheries Society 13 (1884)

MacCrimmon, HR 'The Beginning of Salmon Culture in Canada' Canadian Geographic Journal 714 (1965)

Mackenzie, FA 'Brief and Practical Instructions for the Breeding of Salmon and Other Fish Artificially' Annals of Natural History 8 (1842)

MacLeod, RM 'The Support of Victorian Science: The Endowment of Research Movement in Great Britain, 1868-1900' Minerva 9 (1968)

MacLeod, RM 'Government and Resource Conservation: The Salmon Acts Administration, 1860-1886' Journal of British Studies 7 (1968)

MacLeod, RM 'Resources of Science in Victorian England: The Endowment of Science Movement, 1868-1900' in Mathias, P (ed.) Science and Society, 1600-1900 (1972)

MacLeod, RM 'Science and the Treasury: Principles, Personalities and Policies, 1870-1885' in Turner, GL'E (ed.) The Patronage of Science in the Nineteenth Century (1976)

Maitland, JRG Essay on the Salmon Disease (1882)

Maitland, JRG On the Culture of the Salmonidae and the Acclimatisation of Freshwater Fish (1883)

Maitland, JRG 'Exchange of Land-Locked Salmon Eggs from Maine for Loch Leven Trout Ova from Scotland' Bulletin of the United States Commission on Fish and Fisheries 4 (1884)

Maitland, JRG 'Schoodic Salmon sent to Scotland' Bulletin of the United States Commission on Fish and Fisheries 5 (1885)

Maitland, JRG 'Fish Culture as an Exponent of Evolution' Transactions of the Stirling Natural History and Antiquarian Society 10 (1887)

Maitland, JRG The History of Howietoun: Volume I (1887)

Maitland, JRG 'Notes on the Intercrossing of Members of the *Genus Salmo*' Seventh Annual Report of the Fishery Board for Scotland (1888)

Majumder, TC Fish Culture (1986)

Malloch, PD Life History and Habits of the Salmon, Sea Trout and Other Fish (1912)

Malloch, WM 'The Development of Freshwater Fisheries' Transactions of the Perthshire Society of Natural Sciences (1925)

Manley, JJ 'Pisciculture in England' Bulletin of the United States Commission on Fish and Fisheries 4 (1884)

Marshall, H A Few Suggestions for Restoring and Preserving the Salmon Fisheries of Great Britain. Also Extracts from Reports Showing how to Breed Salmon Artificially (1855)

Marston, RB 'Can the sea be fished out?' Nineteenth Century 50 (1901)

Mascall, L Booke of Fishing with Hooke and Line (1590)

Mather, F Modern Fish Culture in Fresh and Salt Water (1900)

Mather, F 'Recollections of the Early Days of the American Fish Cultural Association' Transactions of the American Fisheries Society 8 (1879)

Mather, F 'Trout Culture' Popular Science Monthly 47 (1895)

Matthews, RCO, Feinstein, CH, and Odling-Smee, JC British Economic Growth, 1856-1973 (1982)

McCloskey, D and Sandberg, L 'From Damnation to Redemption: Judgements on the Late Victorian Entrepreneur' Explorations in Economic History 9 (1971)

McDonald, M 'Objective Points in Fish Culture' Transactions of the American Fisheries Society 14 (1885)

McDonnell, J Inland Fisheries in Medieval Yorkshire 1066-1300 (1981)

Meehan, WE 'Mortality Among Trout Fry' Transactions of the American Fisheries Society 28 (1899)

Millenbach, C 'Rainbow Broodstock Selection and Observations on its Applications to Fishery Management' Progressive Fish Culturist 12 (1950)

Miller, D 'Spearfish National Fish Hatchery: The DC Booth Era' Papers of the 16th Dakota History Conference April 1984 (1985)

Mills, D Scotland's King of Fish (1980)

Milne-Home, D Salmon and Salmon Fisheries (1883)

Milton, JS 'Observations and Experiments Proving Parr or Brandling to be the Young Variety of the Salmon' Quarterly Journal of Agriculture 6 (1836)

Ministry of Agriculture Fisheries and Food, Fish Culture (1969)

Mitchell, WS The Place of Fish in a Hard-Working Diet, with Notes on the Use of Fish in Former Times (1883)

Moeller-Christensen, J 'A Century of Fisheries Research and Management' Dana 8 (1989)

Morrell, JB 'The Patronage of Mid-Victorian Science in the University of Edinburgh' in Turner, GL'E (ed.) The Patronage of Science in the Nineteenth Century (1976)

Mottram, JC Trout Fisheries - Their Care and Preservation (1928)

Munro, ALS and Waddell, IF 'Growth of Salmon and Trout Farming in Scotland' in Bailey, RS and Parrish, BB (eds.) Developments in Fisheries Research in Scotland (1987)

Musson, AE 'The Diffusion of Technology In Great Britain During the Industrial Revolution' in Mathias, P (ed.) Science, Technology and Economic Growth in the Eighteenth Century (1972)

Musson, AE and Robinson, R Science and Technology in the Industrial Revolution (1969)

Nein, J 'Fifty Years Experience in Fish Culture' Transactions of the American Fisheries Society 50 (1920)

Nelson, K and Bodle, R Ninety Years of Salmon Culture at Little White Salmon National Fish Hatchery (1990)

Netboy, A 'The Revolution in Salmon Culture' Sea Frontiers 31 (1985)

Netboy, A 'Brave New Breeds' Atlantic Salmon Journal 36 (1987)

Newton, S and Porter, D Modernization Frustrated: The Politics of Industrial Decline in Britain Since 1900 (1988)

Nicholas, S 'The Overseas Marketing Performance of British Industry, 1870-1914' Economic History Review 37 (1984)

Nicol, A Domesday Book (1981)

Nordquist, O 'Some Notes about American Fish Culture' Bulletin of the United States Commission on Fish and Fisheries 13 (1894)

Norris, T American Fish Culture (1874)

North, JS The Waterloo Directory of Scottish Newspapers and Periodicals (1989)

Nosho, T (ed.) Salmon Broodstock Maturation (1981)

Page, GS 'Fish Culture Abroad' Transactions of the American Fisheries Society 2 (1873)

Page, WF 'The Most Recent Methods of Hatching Fish Eggs' Bulletin of the United States Commission on Fish and Fisheries 8 (1890)

Parker, NC 'History, Status and Future of Aquaculture in the United States' Aquatic Sciences 1 (1989)

Paterson, J Treatise on the Fishery Laws of the UK (1864)

Paterson, J 'The English Salmon Fisheries' Edinburgh Review 137 (1873)

Payne, PL British Entrepreneurship in the Nineteenth Century (1974)

Payne, PL 'Entrepreneurship and British Economic Decline' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990)

Perry, PJ British Farming in the Great Depression, 1870-1914: An Historical Overview (1974)

Phelps-Brown, EH and Weber, B 'Accumulation, Productivity and Distribution in the British Economy, 1870-1914' Economic Journal 63 (1953)

Piscarius, The Artificial Production of Fish (1852)

Playfair, L 'A Foreigner's Opinion of American Fish Culture' Bulletin of the United States Commission on Fish and Fisheries 5 (1885)

Pollard, S Britain's Prime and Britain's Decline: The British Economy, 1870-1914 (1989)

Pollard, S 'Reflections on Entrepreneurship and Culture in European Societies' Transactions of the Royal Historical Society 40 (1990)

Pollard, S The Development of the British Economy, 1914-1990 (1992)

- Pollock, F Fishery Laws (1883)
- Poole, JB and Andrews, K (eds.) The Government of Science in Britain (1972)
- Potter, ED 'Pioneer Experiments of Theodatus Garlick in Fish Culture' Transactions of the American Fisheries Society 19 (1890)
- Practical, Fish Farming for Pleasure and for Profit (1903)
- Rabanal, HR History of Aquaculture (1988)
- Rackham, H Translation of Pliny's Natural History (1962)
- Radcliffe, W Fishing from the Earliest Times (1926)
- Ramsden, R 'Piscicultural Experiences' Journal of the National Fish Culture Association (1887)
- Raveret-Wattel, C 'The Past and Future of Fish Culture: A Historical Glance at the Cultivation of the Waters' Transactions of the American Fisheries Society 21 (1892)
- Richardson, HW Economic Recovery in Britain, 1932-1939 (1967)
- Robbins, K 'British Culture Versus British Industry' in Collins, B and Robbins, K (eds.) British Culture and Economic Decline (1990)
- Roberts, BK 'Medieval Fishponds' Amateur Historian (1966)
- Robertson, IA The Tay Salmon Fisheries in the Nineteenth Century Unpublished Ph.D. Thesis, University of Stirling (1989)
- Robertson, JI Harvesting The Field: An Anthology of Letters from 1853 to the Present (1991)
- Rodd, JA 'The Stretch of Development of Fish Culture in Canada' Transactions of the American Fisheries Society 54 (1924)
- Rodd, JA 'Founders of Fish Culture: Samuel Wilmot, Pioneer Canadian Fish Culturist' Progressive Fish Culturist 21 (1936)
- Rose, H and S Science and Society (1969)
- Rose, RN The Field: 1853-1953 (1953)

Royal Dublin Society 'A New Method of Breeding Salmon and Trout'
Transactions Royal Dublin Society 1 (1800)

Rozwenc, EC and Roehm, AW The Entrepreneur in the Gilded Age (1965)

Rubinstein, WD Capitalism, Culture and Decline in Britain, 1750-1990
(1993)

Rubinstein, WD 'Cultural Explanations for Britain's Economic Decline -
How True?' in Collins, B and Robbins, K (eds.) British Culture and
Economic Decline (1990)

Rubinstein WD 'Social Class, Social Attitudes and British Business Life'
Oxford Review of Economic Policy 4 (1988)

Rushton, W 'British Isles' Transactions of the American Fisheries Society
66 (1936)

Russell, JC 'Fontinalis in Scotland' Blackwoods Magazine 154 (1893)

Salisbury, C 'An Anglo-Saxon Fish Weir at Colwick' Transactions of the
Thoroton Society 85 (1981)

Sandberg, L 'The Entrepreneur and Technological Change' in Floud, R and
McCloskey, D (eds.) The Economic History of Britain Since 1700, Volume
II - 1860 to the 1970s (1981)

Sanderson, M The Universities and British Industry, 1850-1970 (1972)

Schley, BA A Century of Fish Conservation (1971)

Seal, WP 'The Present Status of Trout Culture' Transactions of the
American Fisheries Society 21 (1892)

Senior, W Angling in Great Britain (1883)

Shackleton-Bailey, DR Translation of Cicero's Ad Atticum (1978)

Shackleton-Bailey, DR Translation of Martial's Epigrams (1993)

Shaw, J 'An Account of Some Experiments and Observations on the Parr
and on the Ova of the Salmon: Part 1' Edinburgh New Philosophical
Journal 21 (1836)

Shaw, J 'Experiments on the Development and Growth of the Fry of the
Salmon: Part 2' Edinburgh New Philosophical Journal 24 (1838)

Shaw, J 'An Account of Some Experimental Observations on the Development and Growth of Salmon Fry: Part 3' Transactions of the Royal Society Edinburgh 14 (1840)

Smart, J Remarks on the Present Condition and Prospects of the British Fishery (1818)

Smiley, CW 'Loch Leven Trout Introduced in the US' Bulletin of the United States Commission on Fish and Fisheries 8 (1889)

Smith, HM 'Some Observations on European Fisheries and Fish Culture' Transactions of the American Fisheries Society 36 (1907)

Smith, HM 'Our Fish Immigrants' National Geographic 18 (1907)

Solow, RM Capital Theory and the Rate of Return (1963)

Spearer, AC The Franklin's Prologue and Tale (1994)

Steane, JM 'The Medieval Fishponds of Northamptonshire' Northamptonshire Past and Present 4 (1971)

Steane, JM 'The Royal Fishponds of Medieval England' in Aston, M (ed.) Medieval Fish, Fisheries and Fishponds in England (1988)

Stewart, CA Treatise on the Law of Scotland Relating to the Rights of Fishing (1869)

Stirling, J 'Trout Fishing on Our Highland Lochs: Causes of its Deterioration and Remedies' in Herbert, D (ed.) Fish and Fisheries (1883)

Stoddart, TT The Angler's Companion to the Rivers and Lochs of Scotland (1847)

Sullivan, CR 'The History, Structure and Function of the American Fisheries Society' Fisheries 6 (1981)

Summers, DW 'Scottish Salmon - The Relevance of Studies of Historical Catch Data' in Smout, TC (ed.) Scotland Since Prehistory: Natural Change and Human Impact (1993)

Sykes, A 'Inbreeding Pond-Reared Trout' Transactions of the American Fisheries Society 31 (1902)

Tannahil, R Food in History (1988)

- Taylor, RS 'Falkirk's Fight for Water' Proceedings of the Falkirk Archaeological and Natural History Society, 1935-1946 (1946)
- Thomas, WA The Finance of British Industry, 1918-1976 (1978)
- Thompson, P Living the Fishing (1983)
- Thompson, PE 'The First Fifty Years - The Exciting Ones' in Benson, NG (ed.) A Century of American Fisheries (1971)
- Thompson, P Living the Fishing (1983)
- Thomson, J The Value and Importance of the Scotch Fisheries (1849)
- Titcomb, JW 'Wild Trout Spawn' Transactions of the American Fisheries Society (1897)
- University of Stirling, The Story of Howietoun (1989)
- Walsh, GE 'Breeding Fish by the Million' Scientific American 78 (1898)
- Walton, JK Fish and Chips and the English Working-Class, 1870-1940 (1992)
- Warwick, P 'Did Britain Change? An Enquiry into the Causes of National Decline' Journal of Contemporary History 26 (1985)
- Watkins, MG 'A Fush at Last' (sic) Longmans Magazine 4 (1884)
- Welcomme, RA 'A History of International Introductions of Inland Aquatic Species' ICES Marine Science Symposium 194 (1992)
- Wemyss-Fulton, T 'The Territorial Waters' Blackwoods Magazine 158 (1895)
- Wemyss-Fulton, T 'Review of the Trawling Experiments of the Garland in the Firth of Forth and St Andrews Bay in the Years 1886-1895' Fourteenth Annual Report of the Fishery Board for Scotland (1896)
- Wengen, D 'Fish Culture in England' Report of the United States Commission on Fish and Fisheries for 1884 (1886)
- Went, AEJ 'History of the Ballisodare Fishery' Scientific Proceedings of the Royal Dublin Society 22 (1940)
- Westwood, T and Satchell, T Bibliotheca Piscatoria (1883)

- White, A 'Medieval Fisheries in the Witham' Lincolnshire History and Archaeology 19 (1984)
- Whyte, W 'On Fish Ponds' Transactions of the Highland and Agricultural Society 1 (1847)
- Wiener, MJ English Culture and the Decline of the Industrial Spirit, 1850-1980 (1981)
- Wild, JP 'The Roman Fishponds at Lynch Farm' Dubroviae 1 (1973)
- Wilkins, N Ponds, Passes and Parcs: Aquaculture in Victorian Ireland (1989)
- Williamson, DS Thoughts on the Present Scarcity of Salmon (1852)
- Wilmot, S Report on Fish Breeding Operations in the Dominion of Canada During the Year 1881 with Remarks on the Decline of the Salmon Fisheries etc. (1882)
- Wilson, C 'Economy and Society in Late Victorian Britain' Economic History Review 18 (1965)
- Wood, EM 'A Century of American Fish Culture' Progressive Fish Culturist 15 (1953)
- Wood, JC 'Acclimatisation' Longmans Magazine 8 (1886)
- Yamey, BS 'Scientific Book-Keeping and the Rise of Capitalism' Economic History Review 1 (1949)
- Yamey, BS 'Pious Inscriptions, Confused Accounts, Classifications of Accounts: 3 Historical Notes' in Yamey, BS (ed.) Essays on the History of Accounting (1978)
- Yarrell, W On the Growth of the Salmon in Freshwater (1839)
- Young, A Salmon Fisheries (1877)
- Young, A The Natural History and Habits of the Salmon with Reasons for the Decline of the Fisheries. Also an Account of the Artificial Incubation of the Salmon (1854)
- Zeepvat, RJ 'Fishponds in Roman Britain' in Aston, M (ed.) Medieval Fish, Fisheries and Fishponds in England (1988)

