

**AN HISTORICAL ACCOUNT OF THE SOCIAL
AND ECOLOGICAL CAUSES OF CAPERCAILLIE
Tetrao urogallus EXTINCTION AND
REINTRODUCTION IN SCOTLAND**

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Claire Harkess

"King of the Pinewood"

This thesis is dedicated to my late grandmother Maria T Buchanan (Nee Duncan): whose family were sawmillers on Deeside and who knew the 'capercailzie' well.

*Native forests, trees so widely spaced,
That natural creatures did enjoy the place,
Such as the Capercailzie and his mates
Childhood was a wondrous time,
Believing all the world was fine.*

'Childhood' by M.T. Buchanan

ABSTRACT

The capercaillie is the largest member of the grouse family extant in Scotland. This species is reported to have become extinct during the 1700s. It is also reported to have been reintroduced to Scotland from Sweden during the 1800s. There have been many assertions made about the underlying causes of the decline of the species; however the specific causal factors remain unknown. The reintroduction of the capercaillie to Scotland in the 1800s is the only successful reintroduction of a grouse species ever to have occurred in the world. The specific factors behind the success of the reintroduction also remain unknown. This thesis examines the extent to which a selection of historical documentary evidence can help to establish both the causes of the 18th century decline of the capercaillie in Scotland and the successes of the 19th century reintroduction.

The methodology of this thesis incorporates facets from the fields of both environmental science and history. The methodology includes three steps. The first step involves the selection of a series of potential critical factors that may have been responsible for the decline of the species in the 1700s; these critical factors were selected from the present day understanding of the ecology and the behaviour of the capercaillie. The second step of the methodology includes the surveying of a series of historical documentary sources. From these surveys historical observations of the species were gathered. The historical documentary sources selected for examination in this thesis include what are referred to here as ‘primary historical source material’ and ‘secondary historical source material’.

The majority of the primary historical source material was gathered from the hand written manuscripts of the Breadalbane estate, held at the National Archives of Scotland (NAS) and the Atholl estate held at the Blair Castle Charter Room in Blair Atholl. Other select primary historical source material consulted to a lesser extent, due to time constraints, includes the Forfeited Estates (1745) Inventory and the Baron Court Records for Strathspey and Urquhart (1617–1683) from the Grant estate muniments; both held at the NAS. The secondary historical source material was gathered from published and edited literary collections that include historical accounts of the species. The third and final step of the methodology involves the synthesis of

both the historical and environmental information in order to establish to what extent the causes of both the decline of the species in the 1700s and success of its reintroduction in the 1800s can be realised.

The findings from this thesis assert that the capercaillie was resident in Scotland from, at least, the end of the Medieval. Moving forward from the Middle Ages this thesis presents observations of the capercaillie throughout the historical period. These observations of the capercaillie appear in many different historical accounts. In some instances these observations are fleeting and do not form the main subject of the particular document in question. In other instances accounts of the species are much more detailed and include references to the ecology and behaviour of the bird. The level of detail included in an observation aside, the frequency with which the species is referred to in the sample of historical documents suggests that sections of the Scottish human population were familiar with the species, in various locations and at various times throughout history.

By the 17th century the capercaillie is reported as beginning to become rare in some locations while still remaining comparatively abundant in others. The number of instances where the species is referred to as becoming rare in the historical documents increases between the 17th and the 19th centuries. Despite the reported scarceness of the species in Scotland from around the 17th century onwards, the capercaillie is recorded as persisting in Scotland until around the end of the 1700s. By the early 1800s the number of observations of the species in the secondary historical source material increases. All of the observations in the secondary sources from the early 1800s record the absence of the species from localities and regions of Scotland. No new evidence was found in either the primary or secondary historical source material to challenge the supposition that the capercaillie did become extinct in Scotland after 1785.

No detailed quantitative data was available for analysis of the decline of the species. Thus, to investigate the extent to which the historical accounts can help explain the specific causal factors of the reported decline, a synthesis of the environmental and historical data was necessary. The findings of this synthesis suggest that the naturally occurring Scottish population of capercaillie probably persisted in the form of a

metapopulation. The two hundred years between the 17th and 19th century most likely saw the extinction of capercaillie sub-populations, before the loss of the overall population of capercaillie around 1785. The sample historical documentary evidence alludes to this pattern of local and/or regional extinction of sub-populations.

The cause or causes of the extinction of these sub-populations has focussed on five limiting or critical factors known to affect the species today. These five factors are climate change, particularly weather effects associated with the Little Ice Age, habitat loss and deterioration, disturbance, human hunting and predation by species other than humans also contributed to the species' extinction. The extent to which these critical factors affected each sub-population would have varied between regions of Scotland occupied by the capercaillie in history. This thesis proposes that there was no single or combination of specific critical factors that were ultimately responsible for the decline of the capercaillie in Scotland during the 1700s. In some areas the capercaillie sub-populations would have most likely died out as a result of habitat loss and deterioration and climate change. Whereas in others predation and inbreeding may have been the critical factors responsible for the species' demise.

More detailed information referring to the capercaillie was found in the historical documentary source material for the period post-extinction (i.e. 1800 onwards). Contrary to popular understanding numerous attempts to reintroduce the capercaillie to Scotland were carried out before the Marquis of Breadalbane's successful programme in 1837. The historical documentary evidence reports early attempts to reintroduce the species to locations such as the Isle of Arran in 1807, on the Duke of Atholl's estate in 1822 and on the Earl of Mar's estate in 1824. None of these reintroduction programmes are reported to have been successful in establishing a 'wild' population. However, in some instances the captive rearing programmes initiated did bear some fruit and captive reared birds were sent from Dunkeld by the Duke of Atholl to Kenmore and were used in Breadalbane's successful reintroduction in 1837.

The historical documents report two causes for the failure of these early reintroduction attempts. The first is the sudden death of captive birds, most likely as a result of choking due to stress as observed in recent rearing programmes (i.e. Moss

1986). The reintroduced Arran population is reported to have become extinct in this fashion. The second reported cause of failure is predation by species other than man. For example the entire population of birds brought to Scotland by the Earl of Mar were predated when released on his estate. This thesis offers two critical factors as explanations for the remarkable success of the capercaillie's reintroduction to Scotland in the 19th century. The first is the method by which the reintroduction was carried out; specifically, the re-establishment of a series of capercaillie sub-populations in different regions of Scotland. It is proposed here that the second critical factor that made the reintroduction a success was the reduction of capercaillie mortality throughout their life-cycle to a very low level; brought about by the human control of predators.

DECLARATION

I, Gilbert Stevenson, hereby certify that this thesis which is approximately 90,000 words in length, has been written by me, that it is the record of work carried out by me and that it has not been submitted in any previous application for a higher degree.

Date:

Signature:

I was admitted as a research student in October 2002 and as a candidate for the degree of Doctor of Philosophy in October 2003; the higher study for which this is a record was carried out in the University of Stirling between 2002 and 2007.

Date:

Signature:

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Since I started my PhD I have had four supervisors, Dr Patrick Osborne, Dr Fiona Watson, Prof. Richard Oram and Dr David Gilvear: I would like to thank all of my supervisors for their guidance and direction since October 2002.

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I am particularly grateful to Prof. Smout and Prof Simpson for the helpful comments and direction that they gave me in finishing my thesis. Thanks must also go to ESRC and NERC who, along with my parents, funded my PhD. I am also grateful to the numerous members of staff at the National Archives of Scotland who were always helpful and cooperative with my requests. Similarly, Jane Anderson, Archivist at Blair Castle, and her dog Ben deserve a special mention for making room for me in the small charter room at Blair. Thanks also to Dr Alasdair Ross for the references he pointed me in the direction of and for his comments on draft chapters of my thesis.

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FOREWORD

This thesis contains the findings from an interdisciplinary study, funded by the Economic and Social Research Council (ESRC) and the Natural Environment Research Council (NERC), between the fields of history and environmental sciences. This study initially began with an investigation into the causes of the extinction of two species in two regions of Britain: the great bustard *Otis tarda* in England and the capercaillie *Tetrao urogallus* in Scotland. Due to financial and time constraints the focus of this thesis moved from the study of the two avian species in two regions; to the study of the capercaillie in Scotland alone. This was, however, not before a year and a half of my studentship had been spent gathering data on the Great Bustard from archival sources held at the Wiltshire County Record Office in Trowbridge and the Bodleian Library. Although these species have dramatically different habitat requirements that there are some remarkable similarities between the historical accounts of their extinctions. Despite these similarities the consideration of the findings from the survey of historical manuscripts pertaining to the great bustard is not considered in this thesis as they form only a partial account of the extinction of the species.

This thesis is interdisciplinary in its nature; however it has been submitted to the faculty of Natural Sciences at the University of Stirling for examination; and thus, the format, style and referencing system used meet the requirements of the Faculty examining this thesis. However, footnotes and endnotes are also used to allow for the provision of additional information necessary for the adequate referencing of the historical information. The initial methodology drawn up for use in this thesis was based on two assumptions that proved to be inaccurate. Firstly that historical accounts of the natural population of capercaillie in Scotland would be widespread in the muniments consulted and secondly that these accounts would include a numeric factor (i.e. records of numbers of birds killed by hunters); no such information was forthcoming from the survey of historical manuscripts. Therefore, the methodology of this thesis had to be adapted in order to take into account the lack of regular, detailed and quantitative information on the natural population of capercaillie. Coming from an environmental science background the production of the synthesis proved to be the most challenging aspect of this study.

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“On the causes of the extinction of the capercaillie in Scotland I can say little. We can now, I believe, only speculate upon what changes of condition and what surrounding causes could have extirpated them.”

J. A. Harvie-Brown, 1879; page 32.

“Causes of decline or extinction can sometimes be inferred with reasonable certainty.”

Rackham (1986); page 42.

CHAPTER 1 – GENERAL INTRODUCTION

1.1) INTRODUCTION

The capercaillie *Tetrao urogallus* L., is the largest member of the grouse family and is believed to be a native species of the British Isles. There are four members of the family Tetraonidae (grouse and related taxa) resident in Britain, all are regarded as native and all are presently highly prized game birds hunted for sport. It is widely asserted in all modern publications considering the capercaillie in the UK (e.g. Moss 1986, Picozzi *et al* 1992, Moss & Picozzi 1994, Moss 2005, Kortland 2007 etc) that the bird became extinct as a breeding species in this country at the end of the 18th century. The authors of these modern works cite Harvie-Brown (1879), Ritchie (1920) or Pennie (1950) when making assertions about the extinction of the species. Thus from these accounts it appears that there is accepted, widespread and wholesale belief that the capercaillie became extinct in the UK when the Scottish population of the species died out sometime between 1770 (Harvie-Brown 1879, Ritchie 1920¹) and 1785 (Pennie 1950).

Following its reported extinction the capercaillie was successfully reintroduced to the UK with a population of capercaillie founded in Scotland. The orthodoxy of belief concerning the extinction of the capercaillie in the UK is matched with a similar concurrence of opinion concerning its reintroduction in Scotland. Again, modern publications examining the population of capercaillie extant in the UK today assert that the species was first successfully reintroduced on the Marquis of Breadalbane's estate in the County of Perth during the early 19th century. Authors of these modern works again cite Harvie-Brown (1879), Ritchie (1920) or Pennie (1950) when making these assertions. This reintroduced population, aided by translocations and augmentations, eventually spread throughout all areas of suitable habitat in Scotland (Harvie-Brown 1879).

Despite the reported success of the reintroduction of the capercaillie to Scotland the species is again threatened with extinction today (Kortland 2007). It is perhaps not

¹ Ritchie (1920) states that the extinction of the species is set at 1775 and cites as his source for this statement Harvie-Brown (1879).

surprising that given the present day crisis facing the Scottish population of capercaillie² the emphasis of recent and current research has been on understanding the causes of the recent decline rather than on considering the historical extinction of the naturally occurring capercaillie population. Nevertheless it will be demonstrated in this thesis that an examination of the dynamics of the naturally occurring, historical population of capercaillie in Scotland could aid the efforts of capercaillie ecologists and conservationists in the present day. The hypothesis and supporting argument presented here concerning the extinction and reintroduction of the capercaillie has ramifications for the subject species as well as other avians and the wider faunal assemblage in the UK.

For the subject species this thesis offers additional information that will aid in the understanding of both the current decline and the historical extinction. This additional information concurs with the findings presented by Storch (2002) and highlights the importance of giving adequate consideration to issues of time and scale in the methodologies of ecological research concerning the capercaillie. The underlying theories behind the final hypothesis used here to explain the dynamics and historical decline of the naturally occurring capercaillie population in Scotland is not novel. It is based, on two widely accepted ecological theories. Britain is an island in both a literal and ecological sense³. It is surrounded by a homogenous environment of saline water that is vast and extensive on the west coast and more compact on the east. To the east of Britain lies a large continental land mass.

The diversity and richness of species on islands is less than on continental land masses. But more importantly for this study, the rate of species turnover on islands is higher than on continental land masses (MacArthur & Wilson 1969). This Equilibrium Theory of Island Biogeography is the first of two theories that plays a part in the development of the final hypothesis for capercaillie extinction presented here. The second of the two ecological theories used in the development of the final

² Current population estimates for the species put the Scottish population at around 2000 individual birds. This is only 10% of the estimated population resident in Scotland during the 1970s. The current population size will be discussed in more detail later in this chapter.

³ An 'ecological island' can essentially be of any area. It can be a single biota or a series of biota arranged in a matrix. An ecological island must, however, be surrounded by a homogenous environment. For example: an area of woodland surrounded by agricultural pasture land can be considered as an ecological island.

hypothesis is related to the theory of Island Biogeography and can be used in the discussion of species inhabiting fragmented landscapes. The Metapopulation Theory; as first put forward by Levins⁴ (1969) and developed further for describing the dynamics of species inhabiting fragmented habitats by Hanski (1999) is the second ecological theory used in the development of the final hypothesis.

A metapopulation is a population of a species that is made up of sub-populations that are functionally linked by dispersing individuals. The functional link between the various sub-populations ensures the persistence of the metapopulation over time. The key factor in understanding the metapopulation dynamics of a population of species is the rate at which the dispersal of individuals occurs. The capercaillie is purported to exist in Scotland as a metapopulation at present (Kortland 2007). This thesis asserts that in history it is not only within Scotland that the capercaillie is exposed to the effects of metapopulation theory, but that the Scottish population may have also been part of a wider northern-European capercaillie metapopulation.

To conclude the introduction of this study it suffices to say that this thesis will offer a hypothesis for both the extinction and the reintroduction of the capercaillie in Scotland. This hypothesis makes reference to the two ecological theories already discussed and also examines in detail anthropogenic and ‘natural’ factors that played a part in the demise of the species and its successful restoration. These hypotheses are supported by information gathered on the subject species from historical documents and historical studies published in more recent times.

Detailed quantitative data is not available to critique and analyse the findings in this thesis from a sound and defensible scientific perspective. Nevertheless an ‘ecological synthesis’ is presented that has been developed through the analysis of the more qualitative historical data using an interdisciplinary approach. The findings of this thesis have validity in that this is the first study to examine the dynamics of both the natural and reintroduced populations of capercaillie using first hand data contained in historical documentary sources. The findings presented here will, at the least, provide a source and reference point for individuals researching or writing about the natural or

⁴ Levins (1969) first put forward the Metapopulation Theory after describing the dynamics of a population of insects in agricultural fields.

reintroduced capercaillie population. At the most, this thesis may help to explain the causes of the historical extinction and/or successful reintroduction of the species in Scotland.

1.2) AIM & OBJECTIVES

In common with other signatories to the Convention on Biological Diversity (2000), Britain is compiling and implementing Action Plans for priority species of conservation concern. In some cases, the threats facing a species are well-known but this is not always the case. In particular when some unknown detrimental event has occurred in the past, it may be difficult to develop accurate prescriptions for management that remove or overcome the threat. This becomes particularly acute when the species has become extinct and there is interest in its reintroduction. Under the EC Habitats Directive, the UK government is required to consider the feasibility of restoring species that have become extinct primarily through human causes.

Reintroduction is now promoted as a positive method of restoring the environment, contributing to aims for biodiversity conservation and sustainable development. The generally adopted Guidelines for Reintroductions published by the IUCN require that, before a reintroduction project goes ahead, the previous causes of the decline of the species have been identified and either eliminated or reduced to a sufficient level that they will not impact the reintroduced species (IUCN 1998). Furthermore, the IUCN also state that the reintroduction of a species is most appropriate where humans are believed to be the main cause of the extinction. This, therefore, requires the separation of the economic and social drivers of change, such as agricultural intensification or hunting or from environmental causes such as climate change. If the capercaillie is to become extinct in Scotland for a second time, as has been suggested (Moss 2001, Kortland 2007), then a second reintroduction of the species might be considered. This study aims to provide additional information on the naturally occurring and reintroduced capercaillie population in Scotland that has heretofore not been collected. The specific aim of this study is to examine the extent to which historical data can contribute to the analysis of a particular species' extinction.

This thesis has a primary and secondary research question. The primary research question is as follows:

Can historical documentary sources help to explain the causes of species decline?

If this question is answered positively and it is found that historical documentary evidence can indeed help to explain the causes of species decline then the secondary research question can be addressed. The secondary research question is as follows:

To what extent can the documentary evidence allow for assertions about the specific causes of the decline of the capercaillie in eighteenth century and successful reintroduction in nineteenth century Scotland?

Answers to these research questions will be given a full consideration in Chapters 5 and 6 of this thesis. In order to answer both the primary and the secondary research questions in this thesis a series of objectives and outcomes needed to be achieved. These objectives and outcomes of this thesis and can be summarised using the following bullet points:

- To construct a chronology of observations of the species using both primary and secondary historical source material for the period pre-1800.
- To construct a chronology of observations of the species using both primary and secondary historical source material for the period post-1800.
- To assemble from the scientific and historical literature a series of ‘critical factors’ that might have occurred within a time frame that could explain the decline/extinction.

1.3) AVIAN EXTINCTIONS

People have been talking about birds for as long as historical records exist. Maybe people have always been talking about birds? The strange thing is that, although people have been talking about birds for a long time, we still don't

understand the diversity very well in terms of the basic ecological mechanisms...we still don't have a general, proven explanation for avian life-history diversity. And the same applies to other aspects of avian diversity – colour, mating systems, extinction risk, and so on.⁵

There exists a scientifically accepted body of knowledge surrounding a variety of different aspects of avian behaviour and ecology. However, this body of knowledge is not as large as might at first be expected. There remains a substantial quantity of information about avian species that is still not fully understood. Indeed despite technological advances in surveying and sampling techniques and technologies it is not yet known how many avian species are extant today. A figure of around 9000 individual species has been proposed and is generally agreed upon as a reasonable approximate. However, when viewed over geological time periods this figure represents only around six percent of the total number of avian species that are believed to have ever existed⁶. The disparity between these figures supports earlier statements made in this chapter and illustrates that the Earth has lost around 94% of its avian species to extinction. Avian extinction is not a new phenomenon, although avian extinctions caused by anthropogenic factors are.

Avian extinctions are a natural phenomenon, caused by natural processes that are linked inextricably to organic evolution. Geological fossil records show that there have been five 'waves' of mass extinction in geological time, during each of these waves of mass extinction avian species have been lost. Mass extinctions are characterised by the loss of numerous different species from numerous different taxa and usually coincide with catastrophic events in the history of life on the Earth. During periods of mass extinction, the Earth's fossil record usually shows a sudden drop in the number of higher order taxa extant on Earth at that time. It is a common feature of mass extinctions for thousands of species to be lost over a very short time period.

Species extinctions also occur during the intervening periods between mass extinctions, although species losses occurring outwith periods of mass extinction are

⁵ Bennett & Owens, 2002 page 4

⁶ Total number of avians believed to have existed from the Earth's beginning until now is approximated at 150,000 species.

on a much smaller scale. It must be stressed that the causes of extinctions during these intervening periods are as 'natural' in their nature as they are during periods of mass extinction. Natural causes of extinction are the result of a host of 'natural' factors. The Earth's ecosystems and environment are not, nor have they ever been, in a fixed stationary state or condition. They are, in fact, in a constant and permanent state of flux. The Earth's environment changes over time and species either adapt to these changes over time or they are pushed towards extinction. Species adaptation is the key underlying feature of the process of natural selection. Species are constantly in competition with each other for a share of the Earth's finite resources. As the Earth's environment changes, the matrix of habitats that the Earth supports alters. As the Earth's matrix of habitats alters the composition of species occurring in these habitat units changes; species adapt and survive, different species become dominant and species that were once dominant become extinct and are replaced.

Much has been made in recent years of anthropogenic species extinctions and these are a relatively recent 'phenomenon' in terms of the history of life on the Earth. It is a popular belief that the actions of humans directly cause extinctions and this is an acceptable and accurate observation. Humans have both directly and indirectly, caused the extinction of other species and the current actions of humans continue to put species at risk. The hunting of species for food by humans is an example of one such direct cause of extinction. Indirect causes of extinctions are more subtle and usually related to the human ability to modify the natural environment. The modifications of environments by humans can have a positive, neutral or adverse impact on other species dwelling within the modified environment. The nature of the impact depends on a variety of factors including the sensitivity and the ecology of the species in question.

In order to assess current extinction rates modern ecological science has attempted to provide approximates for species losses over time. The Earth's background extinction rate is estimated to be the loss of one species per million species extant every year. The current extinction rate estimate is much higher and corresponds to a loss of around one percent of species every one hundred year period. This one percent of species represents the loss of around thirty four species on a daily basis (MacArthur & Wilson 1969). Thus it is argued that the current extinction rate is one thousand times

higher than the Earth's background extinction rate and has led to the dramatic assertion that we are at present in the middle of the 'sixth wave' of mass extinction in the Earth's history.

Quite how much credence can or should be given to these estimates is debatable and is outwith the scope of this study. Similarly, despite the differing opinions held by individuals about the process of species extinction it is important to at least recognise here that there is a part of the human psyche present in many that seeks to prevent or halt species losses, for whatever reason. This facet of the human psyche is expressed in the relentless daily efforts of many members of the public, ecologists and environmental scientists who seek to address the two paradigms of conservation biology (Caughley & Gunn 1996) all over the World. Today, thousands of species are threatened with extinction and in many cases these potential losses could be avoided if not for intra-specific competition between humans for resources. This no longer sits as well on the human conscience as it did in past and has been the driving force behind the development of nature conservation.

Nature conservation has its origins, interestingly, in one of the main human activities that has been responsible for many anthropogenic avian extinctions; namely hunting (Caughley & Gunn 1996). Nature conservation as it is known today has developed from the preservation of game for sport hunting. The purpose of game preservation was to ensure the survival of a population of a species so that they might be sustainably harvested by humans for what was essentially recreational use. The overlap between ecological science and hunting was observed in 1933 when the renowned author of several books on game management Aldo Leopold stated that:

So far we have the scientist, but not his science, employed as an instrument of game conservation.⁷

There exists a history of man maintaining a habitat and its surrounding environmental conditions in order to aid the survival of a specific species. In the past this practice was carried out for recreational or survival purposes, to provide quarry for the huntsman, whereas today it is more usually to ensure the persistence of a species. It is

⁷ Leopold, A. (1933), page 4

particularly important to bare this point in mind when considering the history and persistence of large game birds like the capercaillie where sport hunting was and still is extremely popular. It will be illustrated in this thesis that being the subject of pursuit for the hunter does not always result in extinction. This is not to say that humans have always protected the species that they have hunted for recreational or survival purposes. On the contrary there have been many human-caused extinctions of game species during the historical period, particularly from 1600 onwards⁸.

Since 1600 around one million three hundred thousand species are believed to have become extinct. Between eighty and one hundred and thirteen of these extinct species have been avians (IUCN 2000). Some of these avian extinctions have been spectacular and have occurred in relatively short spaces of time. The most dramatic of the avian extinctions come from the New World and include species like the dodo (*Raphus cucullatus*) (Plate 1) of Mauritius islands. The Dodo was first described to the World in 1601 by the sailor Van Neck; eighty years later the species is recorded as being extinct.

The passenger pigeon (*Ectopistes migratorius*) (Plate 2) of North America is an example of a game bird hunted to extinction. Indeed the passenger pigeon was probably at one point the most numerous avian on the planet. The last individual of the species died in captivity in 1914. Other avian extinctions have been less dramatic in the speed of their decline but are none the less significant. The last avian extinction in Europe was the decline of the garefowl or great Auk (*Alca impennis*) which was hunted to extinction by humans around 1844 (Caughley & Gunn 1996).

⁸ The historical records reflect this; however there exists an issue with the availability of historical records for many countries for the period pre-1600.

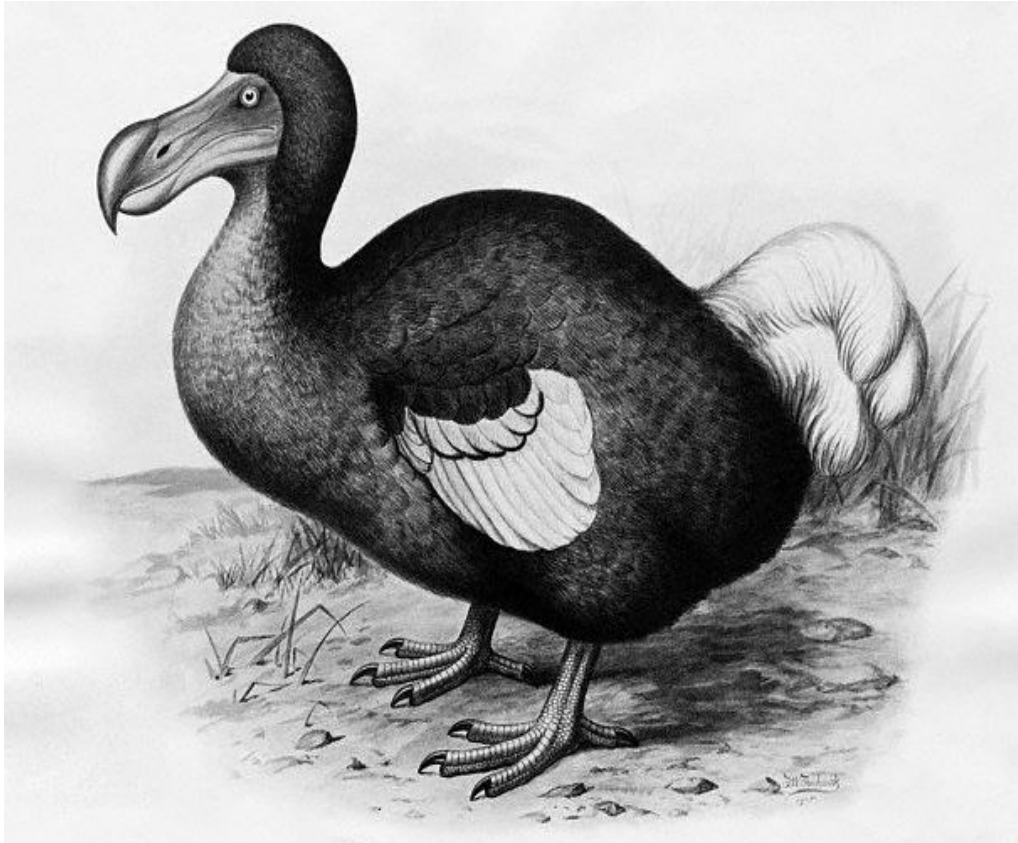


PLATE 1: THE DODO



PLATE 2: THE PASSENGER PIGEON

The majority of avian species extinctions that have been recorded since 1600 have been accurate accounts of species losses. However, there have been cases where some avian species that were believed to have become extinct have been rediscovered. One such example is the case of the New Zealand storm petrel (*Oceanites maorianus*). The New Zealand storm petrel, as the name suggests is a seabird endemic to New Zealand. This species was believed to have become extinct during the early 1800s. It remained so for two hundred years until 2003 when a population of these petrels was rediscovered by a party of ornithologists on New Zealand's South Island in 2003. The accuracy of the current methods of surveying for bird species, especially when they reach low population densities, is undoubtedly questionable and it is perhaps not surprising that many scientists believe that, in many cases, it is not possible to ascertain whether or not a species is, in fact, extinct. Given that we are at present in a period of mass extinction and that the range of many avian species is declining rapidly, it is not surprising that the debate surrounding the widely held premise that a species is extinct until proven extant is changing to an opposite paradigm, namely, that a species is extant unless proven extinct (Diamond 1987).

Since the extinction of the great Auk, there have been no other recorded extinctions of avian species in Europe. Nevertheless, this is not to say that the avifauna of Europe is not experiencing a decline in numbers as well as a contraction in the range of some species. The Tetraonids are one family of avians that have experienced a marked reduction in their range and numbers over the last 100 years or so (Storch 2000). This reduction in range and numbers has been attributed to a variety of different factors, of which, habitat loss and deterioration, climate change, illegal or over-hunting by humans and predation are the primary factors (Storch 2000, Cramp & Simmons 1980). The impact of these factors varies in strength between the different countries of Europe; however, in areas where they have been most pronounced, the extirpation or local/regional extinction of the species has occurred. The United Kingdom is one of the countries where a decline in the number and range of Tetraonids has taken place and one member of this family, the capercaillie, was believed to have become extirpated in history.

1.4) SPECIES REINTRODUCTIONS

Many species throughout the world have become extirpated or regionally extinct as a result of a variety of different factors. Some of these factors are ‘natural’ in their nature and are founded on the basic ecological principles of species turnover and coexistence. Other factors causing the extirpations or extinction of a species can be less ‘natural’ and are often caused by anthropogenic actions. The specific cause of these human extinctions is motivated by a variety of different factors. A species can be regarded as vermin and hunted in order to make life for humans more comfortable. Similarly, some species have become extinct as a result of being hunted by humans whether this is for food or for some other economic reason such as the hunting of species for their furs.

Modern conservation biology practices seek to attempt to redress the actions of our ancestors by restoring extirpated or regionally extinct species throughout their historical ranges. The taking or capturing of individuals of a population of a species and either captive rearing them and then releasing them or simply releasing them into an area that they once inhabited constitutes a reintroduction. During the 20th and 21st centuries many reintroductions have been carried out. Similarly, the interest in reintroductions has grown rapidly in recent times as the number of species that have become regionally extinct increases. Reintroductions have been carried out involving numerous different species over a variety of different habitats in both the New and the Old Worlds.

There are numerous examples of successful reintroductions of a variety of different species from a variety of different taxa in North America. These include the reintroduction of the fisher (*Martes pennanti*) in Montana during the late 1900s, the pronghorn antelope (*Antilocapra americana*) in Oregon in 1969 (Stephen *et al* 2005), the wolf in Montana in 1995 (Varley & Boyce 2006) and the bear (*Ursus americanus*) in Minnesota during the 1960s (Clark *et al* 2002). Similar successful reintroductions have also been carried out in Europe. For example, the lynx was reintroduced into the Pyrénées in 2000 (Hetherington 2005) and the wolf was successfully reintroduced to Sweden in 2002 (IUCN 2003).

There have also been several successful reintroductions of species in Scotland, for example the white-tailed eagle (*Haliaeetus albicilla*) was successfully reintroduced following releases of birds into the wild between 1975 and 1985 (Green *et al* 1996). Studies of the potential success and feasibility of reintroducing other species such as the beaver (*Castor fibre*) (Jones 2006) and wild boar (*Sus scrofa*) (Howells & Edwards-Jones 1997) have also been considered for Scotland although they have yet to be carried out. Similarly, given the current confinement of the capercaillie to the Highlands of Scotland, a study was carried out in 1996 to assess whether or not the species could be successfully reintroduced into the coniferous forests of Southern Scotland (Marshall 1996).

This interest in reintroductions combined with the number of times a reintroduction has been carried out has given researchers an invaluable opportunity to study and understand the dynamics and behaviour of the reintroduced species. Thus scientists feel that they have a reasonably sound understanding of what makes a reintroduction successful. In 1995 the IUCN with the help of scientists on the 'Re-Introduction Specialist Group' produced a series of guidelines recommended for use when carrying out a reintroduction. These guidelines have proved an invaluable tool to conservation biology practitioners carrying out reintroductions all over the World. The Guidelines proposed by the IUCN for a reintroduction to be successful include a series of biological and socio-economical considerations that should be addressed before beginning the reintroduction of a species (IUCN 1995).

The biological considerations highlight the importance of selecting appropriate release locations, evaluating the reintroduction site, assessing the availability of suitable release stock and assessing the capability of captive stocks of individuals if they are to be released. The socio-economic considerations highlighted by the IUCN stress the importance of ensuring that the factor that caused the extinction is no longer active. Despite the current level of scientific understanding of species extinction and reintroductions many reintroductions still fail. For example the recent attempt at reintroducing the great bustard on Salisbury plain failed as a result of higher levels of predation than expected (Osborne pers. comm. 2005). More importantly, for this study, despite numerous attempts to reintroduce various grouse species, including the capercaillie, to areas of suitable habitat in different European countries none have

proved successful (Storch 2002). The only successful grouse reintroduction ever to have occurred was that of the capercaillie in Scotland during the 1800s.

1.5) SCHOLARSHIP OF THE NATURAL CAPERCAILLIE POPULATION

In Section 1.1 of this thesis three early published works were mentioned and it was suggested that these works form the basis for the present day assertions on the extinction and reintroduction of the capercaillie in Scotland. The most widely cited of these three works is the monograph titled *The Capercaillie in Scotland* which was produced by J. A. Harvie-Brown FSA in 1879. It is not surprising that this work is so widely referenced as Harvie-Brown was one of the most notable scientists and ‘naturalists’ of this period. He studied under the tutorage of the famed Professor Newton of Cambridge University and Dr. W. Eagle Clarke, curator of the Scottish Natural History Museum in Edinburgh. This publication was the first comprehensive study of the capercaillie in Scotland. In this work Harvie-Brown discusses, in detail, both the 18th century extirpation of the species and then its subsequent restoration in the 1830s.

Harvie-Brown’s (1879) account of the restoration of the capercaillie in Scotland includes a detailed presentation of the ‘spread’ of the species from the point of reintroduction, its subsequent distribution in the 1870s and an estimation of the Scottish population size at that time. In this publication Harvie-Brown states that the capercaillie became extinct in Scotland around the year 1770⁹. Similarly, he attributes the successful restoration of the species to the release of birds that was carried out by Sir Thomas Fowell Buxton and the Marquis of Breadalbane 42 years prior to the publication of his book in 1837. Harvie-Brown’s text seems to have been well received by both scholars and naturalists of that period as *The Capercaillie in Scotland* received wide acclamation in both the press and in publications by his contemporaries¹⁰. Following comments that Harvie-Brown received regarding the history of the species from colleagues and other interested parties, he published an

⁹ Harvie-Brown (1879) cites Pennant (1780) as his source for the date of extinction of the species. Pennant’s references to the capercaillie will be dealt with in more detail in later chapters.

¹⁰ The ‘quality’ of Harvie-Brown’s work on the capercaillie is commented on by many contemporaries of his period (see Ritchie 1920).

additional amendment to his monograph in the journal, the *Scottish Naturalist*, in 1880.

The years between 1880 and 1920 saw little advancement in the study of the capercaillie in Scotland. During this period comments on the ecology of the species were occasionally mentioned in general naturalist monographs on avians and passing mentions of the species occurred in the issues of the *Scottish Naturalist*. The next publication to deal in detail with the species in Scotland did not come until shortly after the end of the Great War in 1920. The felling of timber in Scotland during the Great War is known to have had an adverse affect on the population size of capercaillie in Scotland¹¹. Given the devastation of the natural world during the Great War it is perhaps not surprising that this period should see the publication of the first seminal text on anthropogenic influences on faunal species in Scotland. In 1920 Dr. James Ritchie F.R.S.E. published '*The Influence of Man on Animal Life in Scotland*'. This monograph included a treatise on the extinction of the natural population of capercaillie in Scotland and its subsequent reintroduction from Scandinavia. In this text Ritchie concurs with Harvie-Brown (1879 & 1880) that the species was successfully reintroduced by the Marquis of Breadalbane in 1837 and that the natural population had become extinct in Scotland. Writing about the extinction of the capercaillie Ritchie (1920) states that:

[...] extermination is generally set down to about the year 1770.¹²

Very little consideration was given to the study of the species in Scotland until shortly after World War II when a decline in the national population of capercaillie was again recorded¹³. Between 1950 and 1951 Dr. Ian D. Pennie published three articles in the *Scottish Naturalist* titled *The History and Distribution of the Capercaillie in Scotland*. These articles, for all intents and purposes, took up the historical account of the species where Harvie-Brown (1879, 1880) left it. Two additional historical observations of the species were added to Harvie-Brown's chronology by Pennie (1950) and of more importance in these articles he offers an alternative date for the extinction of the natural population in Scotland citing an observation made by a W C

¹¹ The population size of the species in Scotland over time will be dealt with in more detail later.

¹² J. Ritchie, 1920; page 357.

¹³ The decline observed during this period will be dealt with in more detail in subsequent chapters.

Angus in 1886¹⁴. The tradition¹⁵ behind the discovery of this new information is as follows. Sometime during the 1830s a gentleman by the name of James Giles, R.S.A. was preparing notes for Dr. W. MacGillivray's¹⁶ book *The Natural History of Deeside and Braemar* when he became aware of a painting hanging in Balmoral Castle that depicted a capercaillie hunting scene.

Upon consulting the painting Giles discovered a brief hand written note on the back of the canvas. This note asserted that the scene depicted on the other side of the canvas captured the event of a hunt after a wedding near Braemar in 1785. The image depicts the slaying by gun of, what are asserted to be, the last two individuals of the natural population of capercaillie in Scotland. It is necessary to be cautious with this evidence and this assertion for at least one particular reason. There exists a certain amount of inherent dubiety surrounding any account of the killing of the last member or members of a species. Such events, particularly during the Victorian period, would have provided an individual with both status and kudos as both a hunter and a man¹⁷ of great renown¹⁸. Similarly, despite the efforts of early naturalists to track down the last remaining capercaillie during the 1700s and despite the thoroughness of Harvie-Brown's research, this painting is not referenced. Pennie (1950) certainly felt that the observation merited some consideration and states the following in support of the species' survival in Scotland into the 1780s:

Ballochbuie forest still contains some trees which are probably a remnant of the Caledonian forest, and it is not impossible that one or two of the birds remained there as late as 1785.¹⁹

On the topic of the reintroduction of the species in Scotland, Pennie (1950) concurs with the description and model presented by Harvie-Brown (1879 & 1880) and Ritchie (1920) that the first reintroduction of the species was carried out by Sir

¹⁴ Angus, W C (1886) *The Capercaillie Proceedings of the Natural History Society of Glasgow* New Service 1:380.

¹⁵ The author requested permission from the Crown to access and consult the said painting, but this was refused.

¹⁶ MacGillivray, W 1855 *The Natural History of Deeside and Braemar*. London

¹⁷ The majority of hunters during this period were men.

¹⁸ Take for example the accounts of the slaying of the last Scottish wolf.

¹⁹ Pennie (1950), Part 1 page 67.

Thomas Fowell Buxton and the Marquis of Breadalbane in the 1830s. Pennie (1950) states specifically that:

The first and largest introduction of capercaillies to Scotland took place at Taymouth in Perthshire in 1837 and 1838, and subsequent introductions of various size and success, which were made to many other parts of the country, greatly accelerated the attainment of the final distribution.²⁰

Despite the consensus of opinion that seems to exist on the matters of the extinction of the natural population and the reintroduction of the species there is a significant quantity of information still in existence on the natural population of the species which has heretofore never been consulted; or, if it has, no record of such a study exists today. As mentioned earlier there are difficulties associated with ascertaining whether or not a species has, in fact, become extinct²¹. Given the current conservation priorities associated with the capercaillie and the best practice guidelines provided by the IUCN, it would seem appropriate today to consider all surviving data on the native capercaillie of Scotland to aid conservation efforts for the species.

1.6) INTRODUCTORY HISTORY OF THE CAPERCAILLIE IN THE UK

The capercaillie is a species of the ‘Old World’ (Moss 2001). It is associated with climax pine-dominated boreal forests of the Palaearctic region and is the only species in the world to have a common English name derived from Scottish Gaelic. The capercaillie is regarded by many as an indicator of a ‘healthy’ forest ecosystem (Storch 2000) and as a flagship species for nature conservation today in Scotland (Moss 2001). Although this member of the grouse family has been recorded as a breeding species throughout the British Isles²² it is extant today only in Scotland. The capercaillie is believed to have become extinct in England and Wales by the end of the 1500s and in Ireland by 1760 (Harvie-Brown 1879).

²⁰ Pennie (1950), Part 1 page 67.

²¹ Proving an extinction remains today a tenacious matter – see discussion of ‘presence versus absence’ data in Chapter 6.

²² See Chapter 3 for a fuller discussion of the capercaillie’s inhabitation of Ireland, Wales and England.

As mentioned earlier in this chapter the capercaillie is commonly cited as being extinct in Scotland by 1785 at the latest. Most modern day authors of work on the capercaillie also concur on points about the reintroduction of the species in Scotland. The specific points relating to the reintroduction that are agreed upon are that the Marquis of Breadalbane (Plate 3) and Sir Thomas Fowell Buxton (Plate 4) were responsible for the first successful release of capercaillie, that these birds were brought from Scandinavia and that they were only, in the first instance, released at Taymouth Castle in Perthshire during the 1830s (Harvie-Brown 1879 & 1880, Ritchie 1920, Pennie 1950 & 1951).

The following is an account of the reintroduction of the species as it is generally accepted today. It has been mentioned previously that the majority of modern day publications on the capercaillie cite one of three authors when commenting on the extinction of the species in Scotland. The same is true for the reintroduction of the species and the following account comes from that provided by Harvie-Brown (1879 & 1880), Ritchie (1920) and/or Pennie (1950 & 1951) unless otherwise stated. In 1837 the 'Welsh Adventurer' Llewellyn Lloyd (Plate 5), a cousin of Sir Thomas Fowell Buxton and permanent resident in Scandinavia, captured several young capercaillies from the wild in Sweden.

These birds were then brought by Buxton's gamekeeper, Larry Banville (Plate 6) by sea to Scotland where they were captive reared and released at Taymouth Castle near the village of Kenmore. Much of the success of the reintroduction is attributed to Breadalbane's head gamekeeper, James Guthrie. Guthrie took personal responsibility for the rearing of the young and then their subsequent release into the woods on Drummond Hill, near Taymouth Castle in the spring of 1838. Thirteen capercaillie cocks²³ and twenty-nine capercaillie hens were released by Guthrie into woodland on Drummond Hill in the spring of 1838.

²³ Male capercaillie are referred to as cocks, the females as hens.



PLATE 3: BREADALBANE



PLATE 4: BUXTON



PLATE 5: LLOYD



PLATE 6: BANVILLE

Twenty-five years after the reintroduction, the population of capercaillie on the Marquis of Breadalbane's estate is believed to have increased to approximately 1000-2000 individual birds. Elsewhere in Scotland, the release of other capercaillies captured in the wild in Scandinavia and the translocations of other individual birds resident at that point in Scotland was carried out in numerous locations. Following these additional reintroductions and translocations throughout the Highlands of Scotland the size of the reintroduced population of the species grew rapidly throughout the 19th century. In the early 1900s the population is believed to have reached a peak before declining again during the First World War²⁴. The population then began to increase in the intervening years between the two World Wars before dropping slightly with the onset of World War Two.

Following the end of World War Two the size of the reintroduced population of capercaillie in Scotland increased to reach both a population and distribution peak in the 1970s. During the 1970s it was estimated that the Scottish population of capercaillie numbered as many as 20,000 individuals. This is the largest recorded population size for capercaillie in Scotland. Similarly, the current European Union funded Capercaillie Life Project states that its aim is to return the current extant population size today to this figure recorded in the 1970s. It is interesting to note that when the Scottish population of capercaillie was at its peak in the 1970s the Forestry Commission employed several members of staff to cull the number of birds in its woodlands out of the hunting season as the browsing habits of the species were putting large areas of Commission woodland in 'check'²⁵ (Palmar 1965). Thus suggesting that the species was existing on the upper limits of the capercaillie carrying capacity for Scottish woodlands.

Since the 1970s however there has been a marked decline in the population size of the species in Scotland and recent estimates have suggested that the Scottish population of capercaillie could be as little as 1500 individual birds (Moss pers. comm. 2005). Thus, to briefly summarise, despite its struggle at present the capercaillie was abundant in Scotland in relatively recent historical times and the reintroduction of the species in the 1830s remains, despite numerous other attempts in other regions of the

²⁴ Population sizes will be discussed in more detail later in this chapter.

²⁵ Woodland 'in-check': halt to the growth of young trees.

U.K. and in Europe, the only successful reintroduction of a grouse species in the world (Storch 2002). Finally it is important to record here that all of the members of the present day capercaillie population in Scotland are believed to be descendants of the birds used in reintroductions after 1837.

1.7) CAUSES OF THE EXTINCTION OF THE NATURAL SCOTTISH POPULATION

There have been many suggestions put forward to explain the perceived extinction of the natural population of capercaillie in Scotland during the 18th century. In the first account of the species in Scotland that is provided by Harvie-Brown (1879) the causes of the extirpation of the bird were proposed as being a result of habitat loss through natural and anthropogenic factors as well as hunting by man. He states that the causes of the decline were due to the:

[...] destruction of great forest tracts by fire, the cutting down of the same by man...the wasting away of the forests from natural causes [and the] increased [human] population.²⁶

The theory that the decline of the species is caused by habitat loss and hunting by man is one that is supported by both Ritchie (1920) and by Pennie (1950 & 1951) who state that:

The destruction of the forest, therefore, would tell directly against its welfare, and it is not surprising that it should have gradually dwindled in numbers and that its range should have been slowly but surely curtailed during the many centuries of the destruction of the woodland; until, with the climax of devastation brought about by the great slag-furnaces of the eighteenth century, it should have finally disappeared.²⁷

The capercaillie was exterminated in Scotland by the wholesale destruction of the old pine forests without which the species could not survive, and small

²⁶ Harvie-Brown (1879), page 32.

²⁷ Ritchie (1920), page 357

numbers are generally believed to have continued up to about 1760; the replanting of large areas of woodland was at that time only beginning—too late to save the Scottish capercaillie.²⁸

The importance that the work of Harvie-Brown (1879), Ritchie (1920) and Pennie (1950) has played in the current understanding of the dynamics of the natural population, the causes of its decline and the reintroduction of the species cannot be underestimated. Authors since 1950 that comment on the causes of the extinction of the natural population concur, on the whole, that habitat loss was the main driving factor behind the decline and loss of the species in Scotland. Given the recent work²⁹ on climate change and the impact that this has on the capercaillie, some authors have also cited climate fluctuations as a contributing factor to the 18th century decline of the natural population in Scotland (e.g. Moss 1984, Kortland 2007, Storch 2007).

Some accounts of the causes of the decline of the species are as follows:

The main cause of the caper's demise was probably the slow destruction of the ancient pine forests by felling, grazing and muirburn, though climatic factors, too, may well have played a part.³⁰

The demise of the indigenous capercaillie was brought about almost entirely by the deforestation of its woodland habitat in the seventeenth and early eighteenth centuries; at first this was done in order to clear the country of wolves, and later to provide timber.³¹

[The capercaillie became] extinct in Scotland c.1770 (perhaps to 1785) and England in the 17th century largely due to destruction of forests.³²

In this situation of heavy pressure, woodland fauna obviously suffered. The Scottish capercaillie was lost in these years, victim of being a large and obvious game bird in a dwindling natural environment full of hungry people.³³

²⁸ Pennie (1950), part 1, page 67

²⁹ See the next section for a fuller discussion on the effects of climate change on the species.

³⁰ Palmar (1965 & 1976), page 3 & page 2.

³¹ Lever (1977), page 321.

³² Cramp & Simmons 1980, page 434.

By the second half of the 18th century, Scottish forests were at a low ebb following widespread felling...this coincided with the 'Little Ice Age', a period when summers were cold and wet. Such conditions are known to reduce the survival of capercaillie chicks. Continued shooting may then have hastened the end of the Scottish race.³⁴

Reasons for the extinction were probably due to a combination of factors ranging from the degradation and destruction of native pinewoods to the affect of the 'little ice-age' which gripped the country over this period. The impact of game shooting may have delivered the final blow to an already ailing population.³⁵

Native capercaillie became extinct in 1783, largely due to previous deforestation.³⁶

Although they were once widespread, the destruction of the native coniferous woodlands of Scotland in the seventeenth and eighteenth centuries led to their demise and by the late eighteenth century they had gone.³⁷

Other species such as the polecat, red squirrel and capercaillie, became extinct or seriously reduced in number during the nineteenth and twentieth centuries.³⁸

1.8) THE CAPERCAILLIE

Introduction & Evolutionary Relationships

The grouse family of birds are members of the galliform order. Galliforms are ground dwelling birds that scratch or peck the ground while foraging for food (Feduccia, 1999). The galliformes, along with anseriformes (ducks and related taxa) are

³³ Smout (1993) in Smout (1993), page 47.

³⁴ Moss & Picozzi (1994), page 1.

³⁵ Stewart (2000), page 7.

³⁶ Petty (2000), page 1.

³⁷ Buczacki (2002), page 262.

³⁸ Worrell & MacKenzie (2003) in Smout (2003), 205-206.

descendants of paleognathous birds³⁹ and, in evolutionary terms, usually follow ratites and tinamous birds in classification systems. This order of avians includes the turkeys, grouse, pheasants and quails of the world and incorporates around two hundred and fifty six individual species. The physiological features displayed by paleognathous birds have brought many to the conclusion that they are one of the oldest races of avians in existence today (Feduccia 1999). Similarly, information gathered from the fossils of early galliforms combined with their physiological structure has led many to assert that the galliforms are descendants of a primitive lineage of birds (Johnsgard 1983).

Galliform birds are among the strongest birds in short distance flight (Johnsgard 1983) although these birds show remarkable variation in size (Feduccia 1999). Typically, the galliforms are usually stoutly built and have short thick bills that are primarily adapted for seed-eating or for the consumption of other plant material such as heather (*Calluna vulgaris*) shoots (Jones 1982). The young of the galliform order usually feed on protein rich insects during their early months and in many species the young do not have the ability to thermo-regulate (Johnsgard 1983). Although regional movements of populations of the extant galliform birds have been observed, they are on the whole a relatively sedentary species (Johnsgard 1983; Storch 2007).

A common trait of the galliform order is distinct and often pronounced differences between the sexes of the species, whether in size or in appearance or both (Storch 2007). The earliest fossil records of the galliforms can be traced back to the remains of the species *Gallinuloides wyomingensis* that was found in the lower Eocene Green River Formation in North America (Feduccia 1999). Johnsgard (1983) asserts that by this time the major groups of the Galliform order were well differentiated and that, today, the genera *Lagopus* (the red grouse *Lagopus lagopus* and its allies) is nearest in morphology to the ancestral stock of the members of the extant Eurasian galliform order. The capercaillie is a member of the genera Tetraonid which has been known in Europe for about 1.8 million years, from the Upper Pliocene to the Holocene (Johnsgard 1983). This was a period of dramatic climatic fluctuation and species

³⁹ Paleognathous birds: these are birds with a particular palate structure. Ducks, rails and grouse all have this structure and are thus deemed to be related in an evolutionary sense.

extinction in Eurasia and it was sometime during this period that the species *urogallus* emerged.

Grouse have a number of different features that distinguish themselves from other galliform birds including feathered tarsi⁴⁰ and nostrils, no spurs, and during the winter their toes are feathered or have small scales along the sides that help them to walk on top of the snow (Storch 2007). These features are most certainly adaptations to cold climates (Johnsgard 1983) and these physiological characteristics along with some aspects of their behaviour allow them to live in environments with enormous seasonal change without the need for migration during winter months. Grouse roost in snow-burrows when necessary to stay warm (Angelstam *et al* 1992). Their winter diet is typically composed of low energy but abundant winter foods, such as the buds and needles of conifer trees (Palmer 1965) and they have particularly long intestines with well-developed caeca that enable them to digest cellulose with the help of bacteria (Storch 2000).

The family Tetraonidae is made up of 18 recognised species at present that have a wide distribution throughout a variety of biomes in the temperate, boreal and Arctic biogeographical zones of the Earth's northern hemisphere (Johnsgard 1983; Storch 2007). Most grouse are 'habitat specialists' and they have very exacting habitat requirements (e.g. Palmer 1965; Johnsgard 1983; Moss & Picozzi 1994; Storch 2007) and throughout their distribution the different species occupy a variety of different habitats. The genus *Lagopus* is found in the alpine and arctic regions, the genus *Centrocercus* and *Tympanuchus* are found on the North American prairies and the genus *Tetrao*, *Bonasa*, *Falcipecten* and *Dendragapus* can all be found in various forest habitats (Johnsgard 1983). There are at present 18 recognised species of the grouse family (Storch 2007). None of these recognised 18 species has become globally extinct and none of these species are regarded as globally threatened according to IUCN criteria (IUCN 1996). On national, regional and local scales, however, many populations of these different species of grouse are declining and are threatened with extinction (Storch 2007).

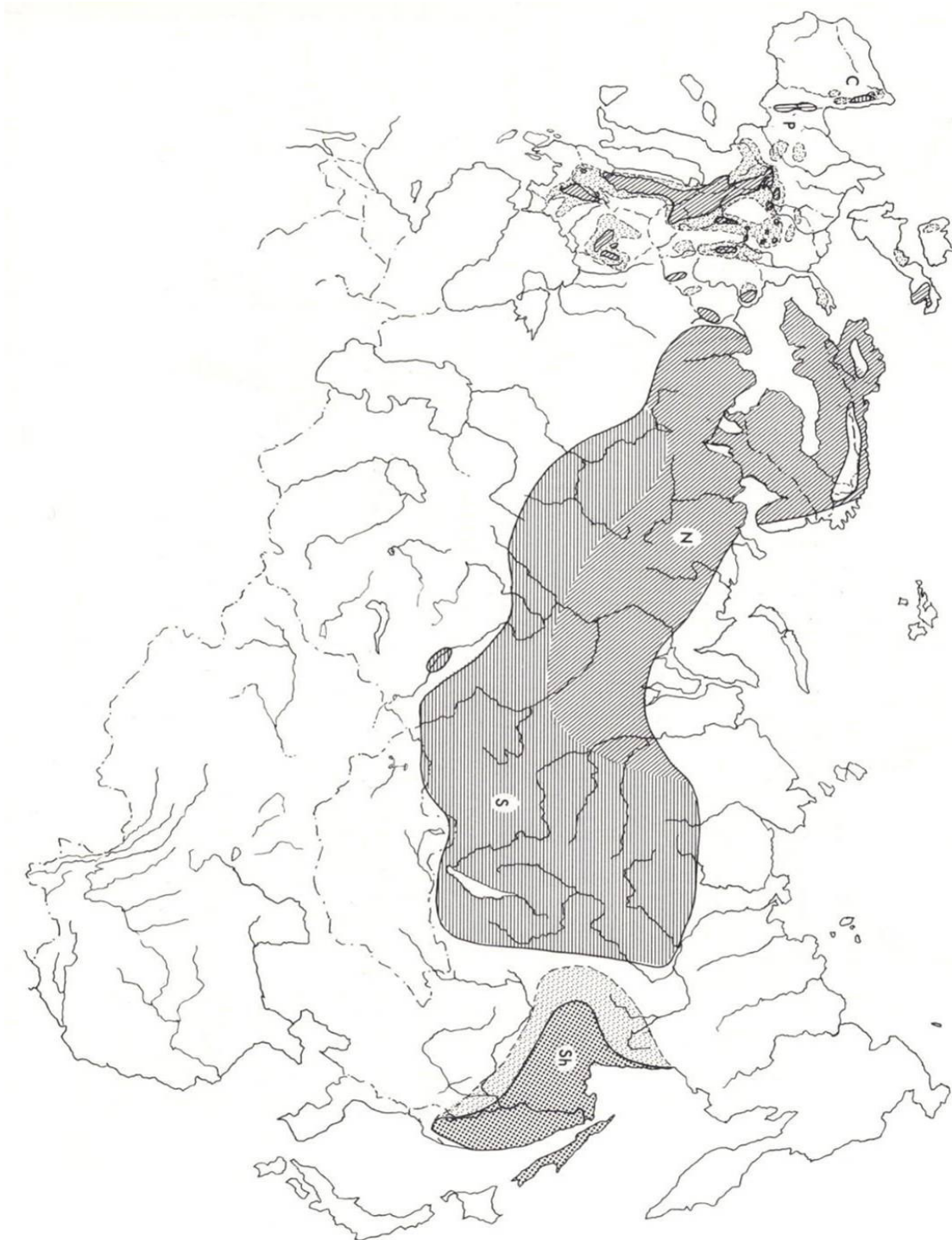
⁴⁰ The feathered tarsi of the grouse: their feet.

There are four members of the Tetraonidae family currently extant in Scotland, the ptarmigan (*Lagopus mutus*), the red grouse (*Lagopus lagopus scoticus*) the black grouse (*Tetrao tetrix*) and the capercaillie. These species do not usually compete for resources in the UK as they have quite separate and specific habitat requirements (Jones 1982). The ptarmigan's habitat preference is for upland ridges and the high plateaux; the red grouse inhabits areas of open moorland; the black grouse dwells around the woodland and moorland edge and the capercaillie prefers the interior of mature woodland habitat (Storch 2003). The capercaillie is the largest member of this family and is the only grouse species believed to have become extinct in Scotland (Moss & Watson 2001).

Within its range (Map 1) marked variations in the morphology of populations of capercaillie have been observed (Johnsgard 1983; Storch 2000). These variations occur between individuals of different regional capercaillie populations. This has led to the classification of the species as polytypic. Storch (2007) states that there are at present twelve subspecies of the capercaillie recognised in Eurasia. The nominate⁴¹ race of capercaillie, the northern or western capercaillie, is located in the north western part of the bird's global range *Tetrao urogallus urogallus* (Cramp & Simmons 1980; Storch 2007). This race is described as occurring in Britain, Scandinavia and central Europe and is distributed as far east as Siberia, and as far as 60° north (Cramp & Simmons 1980). The capercaillie sub-species *Tetrao urogallus aquitanicus*, occurs in the southern Pyrenees and north-west Spain. The capercaillie sub-species *Tetrao urogallus taczanowskii* occurs on the southern border of the nominate race's distribution in Russia (Cramp & Simmons, 1980).

⁴¹ Nominate race: most abundantly occurring morphological race.

MAP 1: GLOBAL CAPERCAILLIE DISTRIBUTION⁴²



⁴² Johnsgard (1987)-not to scale. Scottish capercaillie are part of the distribution of the 'N' race.

Three capercaillie subspecies are geographically isolated (Storch 2007). The Cantabrian capercaillie *Tetrao urogallus cantabricus* and is located in the Cantabrian Mountains of Spain and survives the winter months browsing on holly (*Ilex aquifolium*) instead of conifers (Banuelos *et al* 2005). The sub-species *Tetrao urogallus rudolfi* occurs in the southern and eastern Carpathians (Storch 2001; Saniga 2002). The Pyrenees capercaillie *Tetrao urogallus aquitanicus*, inhabits the Pyrenees Mountains between France and Spain (Menoni *et al* 2007). The other identified subspecies are *Tetrao urogallus major* found in Germany, western Belarus, the Balkans, Macedonia and Bulgaria (Storch 2007). The sub species *Tetrao urogallus kureikensis* found in northern Russia; *Tetrao urogallus volgensis* found in central and south-eastern Russia; *Tetrao urogallus uralensis* found in the Ural mountains of west-central Russia and *Tetrao urogallus taczanowskii* the Siberian capercaillie found in central Siberia, eastern Kazakhstan and north-western Mongolia (Cramp & Simmons 1980).

Size disparity between the sexes of members of the galliform order and, indeed, between the sexes of members of the grouse family is common. The capercaillie is no exception to this rule and exhibits the most marked sexual dimorphism of any grouse (Plate 8). The male bird, or cock, (Plate 7) is on average around a metre in length and weighs about 4kg. The female, or hen, on the other hand is much smaller and is, on average, only around 64 centimetres long with an average weight of around 2kg. There is also a marked difference in the appearance of the two sexes; the cock bird is of a dark slaty grey colour with a green breast, red streak over the eye and white markings on the tail, shoulder and abdomen (Plate 10). The bill of the cock capercaillie is stout, curved and of a white colour, the bird's legs are feathered to the toes and fully mature males usually have a "beard" of stiff feathers on the throat (Plate 9). The female on the other hand is mottled with shades of fawn, black, grey and white, she also has a reddish brown breast and rounded tail (Plate 11) (Storch 2001).



PLATE 7: MALE CAPERCAILLIE



PLATE 8: SEXUAL DIMORPHISM



PLATE 9: MALE CAPERCAILLIE - DISPLAYING BEARD



PLATE 10: UNDER-WING MARKINGS



PLATE 11: HEN CAPERCAILLIE

Global Population Density & Distribution

In Norway and Finland a decline in the population size of capercaillie has been reflected in annual shooting bag records for the species. Analysis of shooting bag data from Scandinavia in 1990 showed that the regional capercaillie population had dropped by more than 67% since the 1980s (Storch 2007). This decrease in population size has been proportionally observed throughout the capercaillies western range. The most recent estimate of the biogeographical European population size has suggested that there are between 209,405 – 296,085 pairs of capercaillie extant (Storch 2007). Its range has, however, been reduced substantially over the last fifty years or so, particularly in lower areas as a result of habitat destruction, over hunting and climate change (Storch 2007).

Habitat Requirements

Capercaillie, like other grouse are habitat specialists and have some very exacting habitat requirements. Across their range capercaillie are found in a variety of different, forest types up to altitudes of as much as 1000 metres that are dominated by conifers or evergreen tree species (Cramp & Simmons 1980; Storch 2001). Although the capercaillie has been observed to make use of broad leaved deciduous woodland and commercial forestry plantations of exotic conifers in the UK (Jones 1982; Moss 2002), its habitat preferences are for open or natural stands of Scots pine (*Pinus sylvestris*) dominated woodland (National Vegetation Classification, NVC W18, Scots pine with birch *Betula pubescens*) (Plate 12).

Ecologists have spent a substantial amount of time and resources attempting to understand what makes an ideal habitat for a capercaillie population. Numerous studies have been carried out assessing habitat suitability for the capercaillie on the European continent (e.g. Segelbacher & Storch 2002; Storch 2002; Segelbacher *et al* 2003; Hurstel 2005; Hurstel & Preiss 2005). Habitat Suitability Indexes (HSI) for the Scottish capercaillie population have been proposed by Picozzi *et al* (1992), Moss and Picozzi (1994) and Marshall (2002). These models of habitat suitability combine modern day understanding of the habitat requirements of the species with a study of the structure of a woodland area. Different aspects of the structure of the forested area are given a score based on understood capercaillie habitat requirements and the higher the end-score the more suitable the habitat. The method proposed by Moss and

Picozzi (1994) gives a 'GRANNY' score for an area of woodland based on the description of the structure of the different compartments of a forest stand.



PLATE 12: SCOTS PINE WOODLAND, GLEN AFFRIC

There are several steps to establishing a GRANNY score. In the first instance the landscape metrics (edge to area ratio, nearest neighbour distances etc) of a forest are calculated. This provides an assessment of the extent of fragmentation of the forest. Forest fragmentation is known to adversely affect the persistence of capercaillie populations (e.g. Menoni & Bougerol 1998, Stewart 2000, Wegge 2005). If the forest is highly fragmented then a low score is given to an area of woodland. The quantity of blueberry (*Vaccinium myrtillus*) and heather (*Calluna vulgaris*) on the forest field layer is also believed to be an important determining factor in the persistence of capercaillie populations (e.g. Moss & Picozzi 1994; Moss 2002).

The quantity of these plant species on the forest field layer is recorded and the higher the percentage of cover, the higher the GRANNY score given for that particular woodland feature. The structure and tree species that make up the forest or woodland stand are also known to affect the survival of a population of capercaillie (e.g. Moss *et al* 1978, Moss & Picozzi 1994, Summers 1997). Thus the height and age of the trees in the forest, the species of tree growing and the level of spacing between the trees are all recorded and given respective scores. Each of these scores is then added together to produce the final GRANNY end-score; the higher the end-score the more suitable the area of woodland is for the capercaillie.

The GRANNY score developed in Scotland during in the 1990s considered the suitability of an area of woodland on a regional scale, considering the entire forest area. In recent years interest has grown in the micro-determinants of capercaillie habitat selection (e.g. Sachot *et al* 2003; Summers 2004). One such Habitat Suitability Index (HSI) examining factors on a smaller scale was developed by Storch in 2002 using data gathered in the Bavarian Alps. Suchant *et al* (2003) build on the model produced by Storch (2002) to develop an integrated habitat model for capercaillie and chamois (*Rupicapra rupicapra*) in the Bavarian Alps that allows for the integrated management of woodland for more than one species.

Despite their popularity amongst conservation managers Habitat Suitability Indexes for populations of capercaillie are difficult to rationalise. This is primarily due to the variation between the male and female capercaillie habitat preferences; and the variations encountered when applying the findings from the models when examining

different countries. During the winter months the different sexes have similar habitat needs (Jones 1982). However, during the spring and summer months the habitat requirements between the sexes become different and specific. The location of lek sites, the communal display grounds are also usually located in areas of different habitat within a forest. The selection of lek sites by the species has been particularly difficult to quantify. In his study of eleven different capercaillie populations in Sweden, Hjorth (1981) noted five major features of lek site habitat. The habitat attributes identified by Hjorth (1981) included areas with a firm ground portion and a part of the pine bog, a certain amount of 'vegetational or topographical curtain' towards the surroundings of the arena, some aged pines, a certain amount of tall shrubs or dwarf trees under the woodland canopy and one or more open space free from herbs, tall grasses or shrubs.

Radio tracking studies of the habitat requirements of the species in the Bavarian Alps have shown that the species has a specific preference for areas of 'old growth forest' with a 50% canopy cover and a well developed forest field layer containing blueberry (Storch 1993). Similarly, studies that have been carried out in Sweden have shown that capercaillie express a preference for a mosaic (greater than 6% of the forest) of different woodland habitats and woodland that is over 40 years in age (Jansson & Andren 2003). This preference for areas of old growth open woodland is mirrored in the capercaillie populations in the Jura Mountains in Switzerland (Sachot 2005). Here capercaillie have shown no negative preference towards woodland at high altitudes (1100-1600 metres) or to the level of exposure of the woodland. This goes against the findings of other HSI models. The species was also observed in the Jura Mountains selecting areas of open forest, indeed some of the areas selected are also reported to have forest field layers that had been grazed by cattle. Here the species avoided areas of woodland with a dense understory or undercanopy and selected forests that had a canopy cover of around 30% and a forest field layer with a 20% cover (Sachot *et al* 2003; Sachot 2005). This illustrates dramatically the variation in findings between different HSI models produced in different European countries.

There have been several estimates of the natural density that the species occurs at in woodland however these seem to vary with location throughout the global range of the capercaillie (Grimm & Storch 2000). Marshall and Edwards-Jones (1998) stated

that natural carrying capacity of capercaillie in natural habitat is about 30 birds in 1000 hectares of woodland. They also state in this study that in order for a species to have a greater than 95% chance of survival over a fifty year period that the minimum viable population (MVP) size should be 60 individual birds in 5000 hectares of habitat. Grimm and Storch (2000) on the other hand state that in order for the chance of extinction of a population of capercaillie not to exceed more than 1% over a 100 year period the MVP is actually in the region of 470 individual birds in an area of 250 km² of suitable habitat. This represents a difference of about 30 hectares per individual bird, one estimate stating that each capercaillie requires around 83 hectares and the other only 53 hectares.

Diet & Foraging Behaviour

The feeding habits of the capercaillie are seasonal and can be separated into three distinct categories: (1) winter food (2) inter-seasonal food and (3) summer food (Jones 1982). The needles of the Scots pine are the dominant winter food of the capercaillie and during this period the species is normally found feeding in the crowns of trees (Palmar 1965, Storch 2005). Although the species exhibits a marked preference towards Scots pine the needles of larch, firs and spruces are also eaten, in descending order of preference (Moss & Picozzi 1994). During the spring and summer months the capercaillie feeds on the ground and takes a variety of ground vegetation that is largely composed of the leaves, flowers, berries and other material of suitable plants as well as a variety of herbs, mosses and sedges (Jones 1982).

An important habitat component across much of their distribution, including Scotland, is a forest field layer dominated by the floral species of blaeberry and ling heather (Plate 13) (Storch 1993; Moss & Picozzi 1994). These species are associated with mature pine forests in Scotland that have a relatively open woodland canopy and they provide food and cover for the capercaillie hen and her brood (Moss *et al* 1978). Blaeberry and heather are also an important source of lepidopteron larvae which provide protein that is essential for the development of the chicks (Picozzi *et al* 1999). Similarly, woodlands containing areas of bog vegetation are also particularly beneficial to the capercaillie, providing invertebrate larvae, moss fruiting bodies as well as grass and sedge inflorescences as food for both the adults and the young (Sjoberg 1996). Capercaillies are also known to eat the shoots and buds of deciduous

trees including birch (*Betula* spp.), rowan (*Sorbus* spp.), willow (*Salix* spp.) and oak (*Quercus* spp.) (Jones 1982).



PLATE 13: FOREST FLOOR, GLEN AFFRIC

Mobility & Movements

It has been mentioned earlier that the distribution of the capercaillie is closely linked to the distribution of the tree species, Scots pine. The symbiotic and co-existence relationship between the capercaillie and this coniferous tree species is one of the main determinants in the species' distribution (Cramp & Simmons 1980). Given the resilient nature of the capercaillies behaviour and the wide distribution of its primary feed source the species is largely sedentary. Regional movements of this species have, however, been observed although the specific factors that drive these movements are not, as yet, fully understood (Moss pers. comm. 2005). Winter movements of the capercaillie have been recorded in the North Eastern extremity of its range in Russia (Storch 2005). The species has been observed moving in Russia from areas of deciduous woodland during the spring, summer and autumn months to areas of coniferous woodland during the winter (Cramp & Simmons 1980; Storch 2005).

The male of the species appear to have a life-long fidelity to their restricted home ranges, although young males (<3/4 years) have been recorded as moving over wide areas and this is believed to help the distribution of the species (Cramp & Simmons 1980; Johnsgard 1983). The hen on the other hand has been observed moving considerable distances from the natal area during the first autumn and winter and movements that cover distances of as much as 25km have been documented although after this period the females are much more sedentary (Cramp & Simmons 1980; Johnsgard 1983; Storch 2001; Storch 2007). Sporadic events of longer movements have been recorded in this species. These episodes, where birds have been recorded appearing on village outskirts and on roof tops of houses, are believed to be incidences of exceptional behaviour by the species (Cramp & Simmons 1980; Moss pers. comm. 2005).

Reproductive Biology, Social Pattern & Behaviour

Like other grouse, capercaillie are a polygamous species that use the lekking system where breeding males congregate (Plate 14) and display for several weeks in April and May in order to attract the attention of females (Marshall & Edwards-Jones 1998). The initial beginnings of the lekking period are believed by some to be triggered at sites where melting water drips into pools, which sounds like the repeated clicks of the initial phase of the birds song (Hjorth 1970). During the lek up to 20 adult males occupy individual territories that radiate out approximately one kilometre from the central display area, like 'pieces of a pie' (see Figure 1) (Kortland 2007). As the forest is logged the number of males attending a lek is reduced (Figure 1: lower image).

The males attending a lek require a large area that is relatively disturbance free, as much as between 300 and 400 hectares of woodland, for the lek site to be viable (Moss & Picozzi 1994). The most intense of the lekking displays takes place in the early morning and involves a combination of song and posturing. Occasionally some rival dominant males may resort to fighting (Jones 1982, Storch 2001). The dominant male will normally mate with the majority of females present at the lek. However, a single male is not necessarily dominant over the whole lekking period (Moss 1986). Within Scotland a 2-4km spacing between different leks has been observed (Picozzi *et al* 1992; Storch 1995).

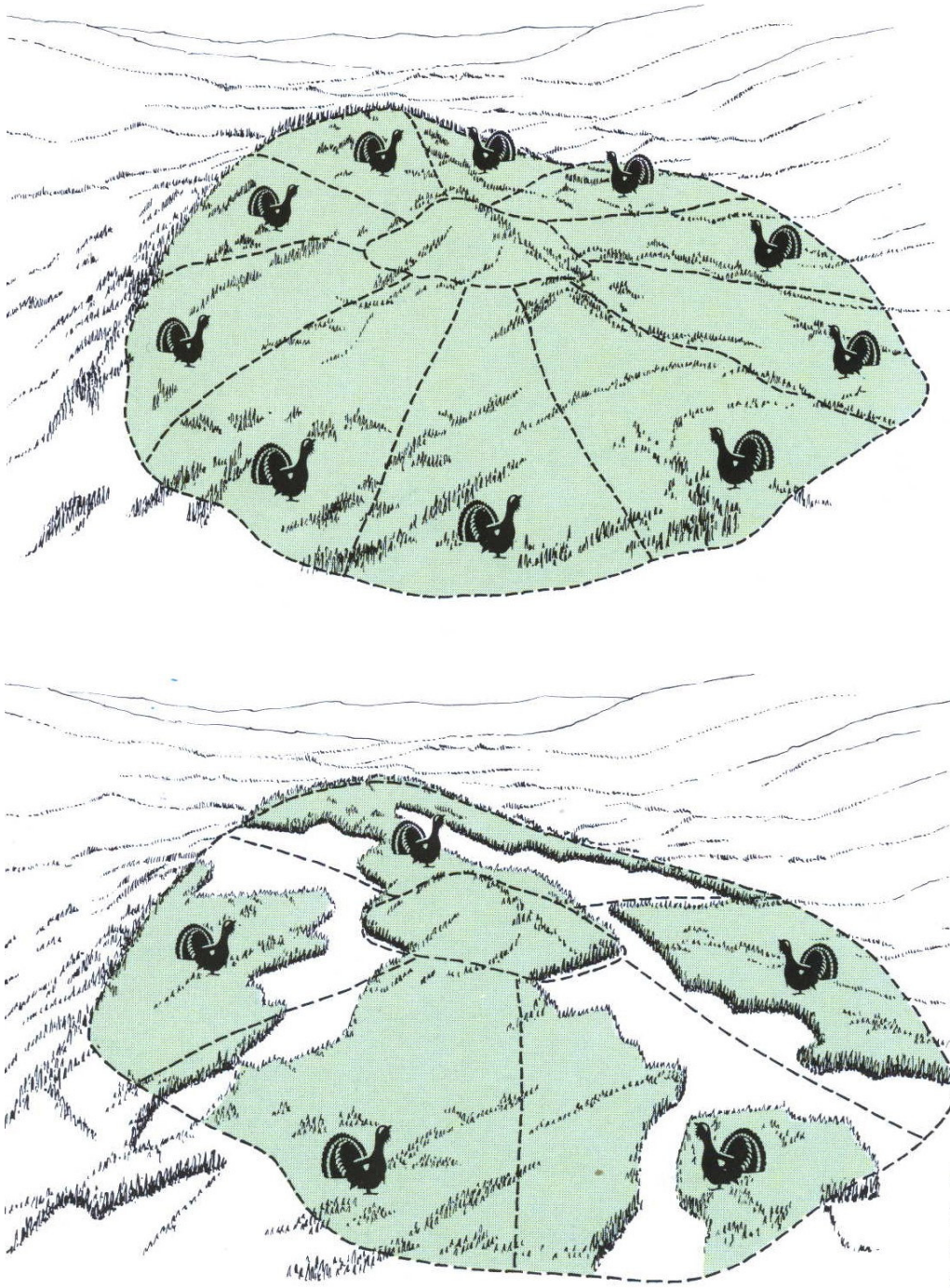


FIGURE 1: CAPERCAILLIE LEK

(Illustrates number of males attending a lek. Once a lek site has been fragmented the number of males attending is reduced)⁴³

⁴³ The 'pieces of cake' model for a group of lekking male capercaillie. The home ranges of the males radiate out from the lek at the centre. The lek range is up to 400 ha. When the old forest is logged, the number of males declines, but the lek range remains the same.



PLATE 14: A CAPERCAILLIE LEK

The nest of a capercaillie hen (Plate 15) has been referred to as a ‘scrape in the ground’ (Marshall & Edwards-Jones 1998). The nest is usually located in areas of mature open woodland under dense cover of blaeberry or heather, or in the hollows between tree roots (Picozzi *et al* 1992). Females are solely responsible for the incubation of the eggs and a hen may incubate up to as many as 16 eggs (Storch 2001). The chicks are usually hatched in May or early June, about 26 to 28 days after incubation begins (Jones 1982). As with the incubation of the eggs the capercaillie hen is solely responsible for the rearing of the brood and she selects an area of habitat within the forest specifically for this purpose. Capercaillie chicks, once hatched, must feed themselves and usually remain with their mother until they mature. Like those of the red grouse, new-born capercaillie chicks do not have the ability to regulate their own body temperatures (Sjoberg 1996).



PLATE 15: A CAPERCAILLIE NEST

During this period the chicks (Plate 16) are particularly sensitive to cold and wet weather and they depend on the hen for the thermoregulation of their bodies (Storch 2001). Studies of captive reared chicks have shown that a direct correlation between chick feeding time and temperature exists. Sjoberg (1996) demonstrated using chicks that were less than two weeks old that at 7°C they could only feed for ten minutes before they would get cold and need to return to the hen for warmth, whereas at 17°C the same chicks spent an entire hour foraging for food before they needed to return to their mother. The capercaillie chicks require a high protein diet during the first weeks of their lives and during this period they are particularly dependent on the invertebrate populations present on the flora of the forest field layer. Studies (e.g. Kastdalen & Wegge 1985; Spidso & Stuen 1998) show that in chicks of between one and two weeks old invertebrates make up as much as 80% of the total volume of stomach contents.



PLATE 16: A CAPERCAILLIE CHICK

The invertebrates that seem to be of greatest importance to the capercaillie are Lepidopteron larvae (e.g. geometrids, broad winged moths that include the measuring worm larvae) although invertebrates of all sizes and other families are also taken. As the chicks grow older their diet switches from invertebrates to plant material, and by the age of about 3-4 weeks, plant material dominates the diet (Rajala 1959; Spidso &

Stuen 1988). The chicks of both sexes resemble the mother until they reach maturity at one year old and remain with the hen until they disperse in autumn (Moss & Picozzi 1994). Both sexes will disperse over open ground. However this makes them particularly vulnerable to predation and other hazards and, therefore, where possible they prefer to disperse under cover of woodland (Moss pers. comm. 2005). Fully fledged mature females can move considerable distances and may disperse as much as 20km from the natal areas during the first autumn and winter but then remain more sedentary thereafter (Cramp & Simmons 1980). The cocks on the other hand show life long fidelity to restricted home ranges and it is very seldom the case that they will move more than 5km from the natal site (Cramp & Simmons 1980; Johnsgard 1983; Moss & Picozzi 1994).

The capercaillie can be both gregarious and solitary at times (Cramp & Simmons 1980) and capercaillie generally spend half of the year in groups. In autumn flocking may occur only after the dispersal of broods, although females with female offspring have been observed remaining together until the following spring (Johnsgard 1983; Storch 2001). Adult males on the other hand tend to remain solitary, but it has been recorded that juvenile males will pack together with females in groups of up to twenty individuals. These mixed flocks tend to be dominated by one sex and after the first winter the males will not usually tolerate females in their groups (Jones 1982). During periods of particularly bad weather, as has been observed in Norway during bad winter months, unisexual groups may temporarily form a larger flock (Hjorth 1970).

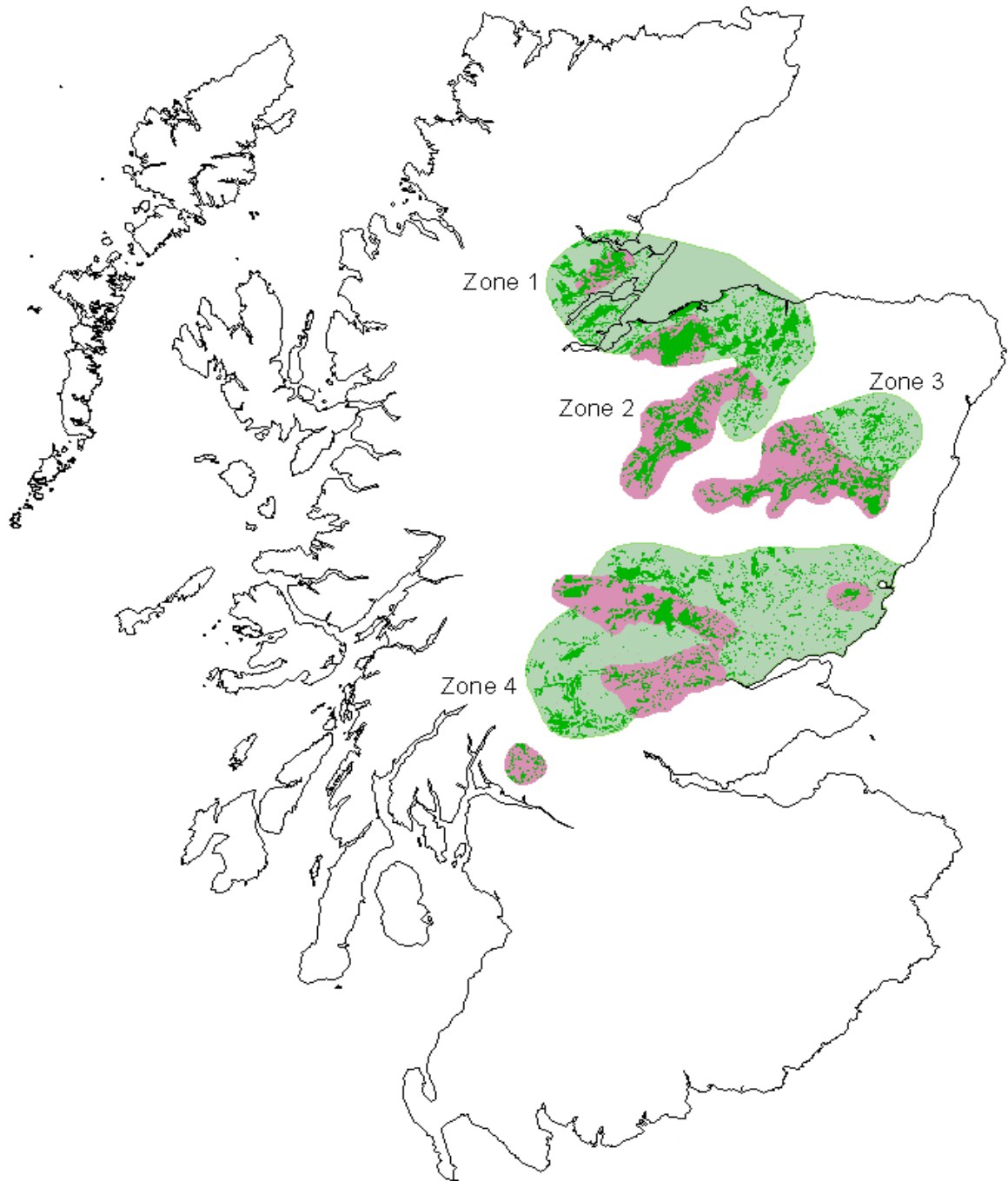
Current Capercaillie Distribution & Ecology in Scotland

The present day distribution of the capercaillie in the British Isles is confined to the pine woodlands of the central and eastern Highlands of Scotland in woodlands up to as high as 450m (Jones 1982; Petty 2000; Kortland 2007) (Map 2). The ecology of the species in Scotland is similar to that in continental Europe although there are some slight differences in behaviour although these are not significant enough to warrant comment here. Population densities of capercaillie in Scotland in the past have been around 5 to 10 birds in a square kilometre of suitable habitat during the autumn months (Moss & Picozzi 1994). The size and weight of the species in Scotland has been observed as being slightly smaller and lighter than in some other European populations and this has been suggested to be the result of habitat availability and

climatic conditions (Zwickel 1968; Moss & Picozzi 1994). Similarly, some slight differences in the clutch size of the species in Scotland has been observed. However the causes of these differences are as yet unknown. Clutches that contain between 5 and 11 eggs are regarded as normal in Scotland (Moss 1986; Jones 1982; Kortland 2005).

The population of capercaillie in Scotland is believed to exist as a metapopulation (Forestry Commission 2000; Petty 2000). Recent studies have questioned the extent to which the regional populations of capercaillie are linked (Kortland 2005; Moss *et al* 2005; Piertney 2005). There is genetic evidence to suggest that the current sub-populations are not necessarily linked by dispersing individuals. However, whether this is due to the natural dynamics of the population or aspects of forest fragmentation remains unclear. Scotland's national population of capercaillie is believed to be made up of four regional sub-populations, which are located in Strathspey, Perth, Sutherland and Tayside. Following the successful reintroduction of the capercaillie to Scotland during the 1830s the population grew until it reached its highest recorded levels in this country just before the First World War, when it was recorded as a breeding species in Sutherland, Argyll, the counties of Aberdeen and Stirling (Pennie 1950).

MAP 2: UK CAPERCAILLIE DISTRIBUTION ZONES⁴⁴



⁴⁴ After Forestry Commission (2002) – not to scale. Map illustrates core (red) and regional (green) capercaillie zones.

The requirement for timber at that time, it is supposed, led to a decrease in population size as many mature stands of Scots pine woodland were felled (Pennie 1950). After the First World War the organisation that is now known as the Forestry Commission was established and, with the help of introduced exotic coniferous species, new areas of suitable habitat for the capercaillie were established.

The number of capercaillie in Scotland began to increase again and reached a second peak during the 1960/70s when the national population was believed to number approximately 20,000 individuals in the early 1960's (HMSO 1995). The capercaillie's winter feeding habits often have an adverse effect on tree growth as they browse the leading shoots of pine trees and in order to protect the growth of their crops the culling of capercaillie was recommended by the Forestry Commission (Palmar 1965). Since the 1960s there has been a further decline in both numbers and range of the species that is demonstrated by the loss of birds in 64% of previously occupied 10 x 10km squares between the 1970s and 1990s and a decrease in numbers in 80% of woods that previously held capercaillie (Batten *et al* 1990). It appears that the decline in capercaillie numbers continued throughout the 1990s and current estimates show a slight increase in numbers over recent years (Kortland pers. comm. 2005). Since the mid-1960's however, a continuing decline in numbers of capercaillie has been recorded in Scotland (Moss & Picozzi 1994) and current estimates for population size suggest that there are as little as 1000 individual birds remaining in Scotland (Kortland 2005).

Current Limiting Factors

There is a variety of factors that are believed to be contributing to the current observed decline of the capercaillie populations across its global range. These factors can be classified into seven broad categories that are believed to be acting in concert and are adversely affecting the success of the species. These seven factors are, the loss and deterioration of habitat, climatic fluctuations, particularly wet spring months, high levels of predation and disturbance by natural predators, mortality due to fence strikes and illegal hunting, inbreeding depression and human disturbance (e.g. Catt *et al* 1992; Moss 1994, 2001; Lindstrom *et al* 1994; Baines & Summers 1997; Summers 1998; Smedshaug *et al* 1999; Bains *et al* 2004; Piertney 2004 etc.). Habitat loss, deterioration and fragmentation are believed to be the driving forces behind the

World's current extinction crisis and the main cause of capercaillie decline throughout its range (IUCN 2005; Storch 2007). Thus, it is perhaps no surprise that the majority of scientific research on the capercaillie to date has focussed on the species' response to the effects of the loss and deterioration of its habitat.

Current Limiting Factors: Habitat Loss, Deterioration & Fragmentation

The capercaillie is believed to be adapted to climax communities and thus it could be possible to assume that this species is particularly sensitive to changes in its habitat (Suchant & Baritz 2003). The effects that forest fragmentation, habitat loss and disturbance have on the capercaillie are extremely significant, although they are by no means unique to this species alone (Moss & Picozzi 1994; IUCN 2005). Modern silvicultural practices have played an important role in reducing the quantity and quality of capercaillie habitat (Atlegrim & Sjoberg 1996). In Sweden the harvesting practice of the organisation responsible for forestry (clear cutting rotations of even aged stands) was observed as having a detrimental effect of the quality of blaeberry on the forest field layer and thus on the quality of capercaillie habitat (Atlegrim & Sjoberg 1996). The effects of clear cutting have also been observed as having similar effects in Norway (Rolstad & Wegge 1989), in France (Menoni *et al* 2007) and in Switzerland (Sachot *et al*, 2003).

Similarly, as well as adversely affecting the forest field layer, these silvicultural practices also adjust the structure of a woodland in an unfavourable manner for the capercaillie (Suchant & Baritz 2003). Picozzi *et al* (1992) were one of the first to document the adverse reaction that capercaillie had to the creation of new plantation type woodlands. These plantation forests are characterised by a high number of stems per hectare and a regimented and regular spacing between stems. These woodlands are designed for timber production and are typically made up of fast-growing exotic tree species, such as Sitka spruce (*Picea sitchensis*) and traditionally have a very dense canopy and very little growth on the forest field layer and the trees have very few horizontal branches. Interestingly, however, although the capercaillie has had no evolutionary exposure to Sitka spruce it can digest the needles and buds of the tree and thus it has been stated that the capercaillie is pre-adapted to this tree species (Moss *et al* 1992). Woodlands planted close planted offer little habitat for the capercaillie and the felling of areas of woodland with a more natural, open structure

that are then replaced by woodland of this structure represents a loss of capercaillie habitat.

In order to try and address these factors the Forestry Commission is, at present, trying to incorporate the specific management for the capercaillie into the current Scottish Woodland Grant Scheme (WGS) (Forestry Commission 2002). The over-grazing of the forest understory by deer significantly reduces the vigour of ground vegetation, and thus suitable nesting and brood rearing habitat (Moss *et al* 2005). The research carried out by Kurki *et al* (2000) showed that severely fragmented forest habitat and the lack of areas of suitable old growth woodland have an adverse effect on the breeding success of grouse (*Tetra* spp.) living in boreal forest. Similarly, Keyser *et al* (1997) proved that the level of predation of ground nesting passerine birds was directly related to the size of woodland fragment and how exposed that fragment was to edge effects (i.e. – edge to area relationship). Furthermore, Storch (1997) showed that the breeding success of the capercaillie, and that the levels of predation of the species in the Alps, were directly related to the availability of favoured areas of old-growth forest and level of disturbance (edge effects) that the birds were exposed to.

In order to try and mitigate the adverse effects of habitat fragmentation on the species several studies have been carried out that attempt to establish how effective enhancing landscape connectivity is in the preservation of the capercaillie (Kortland 2005). It is believed that adult male capercaillie track available habitat when making daily feeding flights (Hjorth 1970). Thus, whilst in flight the species is following a ‘path’ of suitable habitat making stop over points to feed, similar to the movements of other migrating birds. These observations led Hjeljord *et al* (2000) to the conclusion that whilst the capercaillie habitat on the border between Norway and Russia was fragmented the capercaillie was moving successfully between areas of habitat using the entire landscape mosaic. Similarly, Linden *et al* (2000) demonstrated that although movement of the species between areas of suitable habitat in Finland/Sweden and Russia was limited due to the effects of forest fragmentation it was still taking place and that the birds making this journey were subject to high levels of predation.

Current Limiting Factors: Climatic Fluctuations

The association with rainfall, temperature and chick mortality was first noted by Hoglund (1985) in a study investigating brood rearing by capercaillie hens in Sweden. Then Moss (1986) observed that capercaillie in Scotland would not occur in areas which received more than 100mm of rainfall during the spring months. Following this discovery Moss (1986) put forward the 'wet spring scenario' as a limiting factor to successful chick rearing success by capercaillie hens. This may not necessarily be the case, because of the persistence and growth of the capercaillie population on the islands in Loch Lomond, where the ground cover of dwarf shrubs is as much as 1m deep in places (Kortland pers. comm. 2005). Thus suitability of habitat may once again be the underlining determining factor in chick survival and reproductive rate of a capercaillie population.

Current Limiting Factors: Predation

Capercaillie are exposed to predation throughout their lives. However, due to their size, fully-grown adult birds are very seldom attacked by any species other than foxes (*Vulpes vulpes*) and some raptors (Storch 2001). The eggs and chicks of the species, on the other hand, as with many other ground nesting birds, are very vulnerable to predation and even the most protective mother may lose some of her clutch or brood in this manner. Baines *et al* (2004) reported that the main predators of capercaillie in Scotland were foxes, crows (*Corvus corone*) and to a lesser extent raptors. The importance of fox and crow predation on capercaillie has also been illustrated by studies in Sweden (Lindstrom *et al* 1994, Andren 1992, Smedshaug *et al* 1999), in Norway (Storass *et al* 1981, Storass *et al* 1999), in the Bavarian Alps in Germany (Storch 1991, Sachot & Baritz 2003) and in Finland (Kurki *et al* 1997).

There is a wide variety of animals that prey on the young chicks, such as the stoat (*Mustels erminea*), the fox, the pine marten (*Martes martes*), the wild cat (*Felis sylvestris*), the crow, the goshawk (*Accipiter gentiles*) and the sparrow hawk (*Accipiter nisus*) (Linden & Wikman 1983; Lindstrom *et al* 1995; Kurki *et al* 1997; Petty 2000; Kortland 2005). There has been a marked increase in predation of the capercaillie in recent times, which is believed to be a direct result of the reduction in 'keeping' (Moss & Picozzi 1994; Moss *et al* 2005). Therefore it is encouraged, through the SWGS (Forestry Commission 2002) and UK wide Biodiversity Action

Plan (Petty 2000), that measures should be taken to try and reduce predation where ever possible by trapping crows and culling foxes. Predation of the capercaillie is closely linked to forest fragmentation and to the deterioration in the quality of the forest habitat (Storch 2005).

Current Limiting Factors: Fence Strikes

Fence strikes are becoming an increasingly more significant factor in the tale of the survival of the capercaillie. Numerous studies have been carried out examining the potential collision hazard that deer fencing presents to woodland birds (Moss & Picozzi 1994; Moss 2001; Summers 1998; Bains & Summers 1997; Catt *et al* 1992; Baines & Andrew 2003; Kortland 2005). In particular the study carried out by Catt *et al* (1992) in the forests of Abernethy and Glen Tanar in North-East Scotland showed that deer fencing does indeed lead to high mortality rates amongst adult capercaillie and black grouse. In fact, this study showed that 32% of adult capercaillie mortality in the Abernethy and Glen Tanar areas was due to fencing related deaths.

Moss (1994, 2001) states that on the whole fences around the outside edges of woodland do not pose such a significant hazard as forest deer fencing that runs through woodland. Research into the replacement of the traditional metal fencing with brightly coloured composite plastics that would be more visible to the species whilst at flight through woodland and has been underway for some time (Moss and Picozzi 1994; Kortland 2005 pers. comm.). Although, on the whole, tests with orange coloured fencing were somewhat successful they still resulted in forest bird impacts and deaths and thus fence removal is now advocated as the best management strategy for the capercaillie (Baines & Andrew 2003).

Current Limiting Factors: Inbreeding Depression

Inbreeding depression occurs when individuals in a population are exposed to the effects of deleterious recessive genes through matings between close relatives. Matings between close relatives can occur in a variety of situations, but from a nature conservation perspective they usually only occur in situations associated with the small populations paradigm where the effect of the “smallness” of a population’s size can have a detrimental effect on the persistence of the population over time (Caughley 1994). Today, inbreeding depression and the small population paradigm are usually

associated with the impact of anthropogenic habitat fragmentation. Fragmenting a particular species' habitat can leave habitat "patches" scattered amongst a relatively homogenous environment, such as woodland fragments separated by areas of agricultural land (Caughley & Gunn 1996). If individuals of a particular species cannot move between these habitat patches then they can become isolated from the rest of the population and are, thus put at risk of deleterious recessive alleles. Studies of the capercaillie in the Bavarian Alps in Germany, in the Pyrenees, in Central Europe and in Scotland have all shown that there is low genetic diversity between individuals in these populations (Segelbacher *et al* 2003; Piertney 2005).

Current Limiting Factors: Illegal Hunting & Disturbance

Throughout central Europe the capercaillie hunting season has been traditionally centred on the spring months while adult birds were at the lek (Storch 2001). In many countries the dominant cock capercaillie displaying at the lek was the most highly-prized bird of the hunting season (Moss pers. comm. 2005). An often-discussed problem related to the spring hunt is that it may disturb mating and result in reduced reproductive success (Storch 2002). In Scotland, the Pyrenees, Fennoscandia, and Russia, capercaillie of both sexes were legally hunted in the autumn months⁴⁵. The autumn hunt is often considered to be less critical in terms of population dynamics because leks are not disturbed and because hunting losses are assumed to be at least partly compensated by reduced winter mortality among the survivors. Thorough tests of this latter assumption however are still lacking (Storch 2001, 2005). Whereas trophy hunting and taxidermy are the major motivation for hunting capercaillie in western and central Europe, the species is hunted for food and sport in northern Europe and mostly for food in Eastern Europe and Russia. In recent times, however, trophy hunting by westerners is gaining economic importance in Eastern Europe. In the boreal forest, grouse hunting has long played a major economic role and is still culturally important. In Russia, the hunting bag of capercaillie during the early 1990s was estimated at 700,000 birds annually (Grabuzov 1995; Flint 1995).

Since the 1970s, capercaillie hunting has been restricted or banned in all western and central European countries (Petty 2000; Storch 2001). However these bans on hunting did not reverse the negative population trends that were observed in these western

⁴⁵ Hunting of the capercaillie during Autumn still occurs..

European regions. This led to the conclusion that in most areas of Western Europe hunting has not been a primary cause of population declines (Klaus *et al* 1989, Storch 2001). There are several countries where capercaillie are still hunted although the species is listed as endangered in the national Red Lists (e.g. Austria, Bulgaria). There is growing opposition to this practice from conservationists and the anti-hunting movement. Moderate, strictly controlled hunting, however, may also have a positive overall effect on capercaillie conservation (Storch 2005).

For example, in parts of Austria, where the hunting rights belong to small, private land owners, the chances to sell the right to shoot a capercaillie cock to guest hunters every other year appears to be a significant incentive for active habitat preservation (Storch 2005). The problem of hunting of the capercaillie by humans has been controlled in Scotland for the last twenty years or so by a voluntary ban on shooting. This ban was recently made into national law by including the capercaillie in the Wildlife and Countryside Act 1981 (Kortland 2005). The species is also included in European Union (EU) legislation on the EU Birds Directive: Annex I, Annex II part 2 and on Annex III part 2. In Eastern European countries however, the species is still popular game and a great deal of unregulated hunting goes on with an adverse effect on the population of the species.

Very little is known about the precise effects that disturbance, caused by mountain bikers, walkers and forestry workers, has on the survival of the capercaillie (Moss & Picozzi 1994; Marshall & Edwards-Jones 1998; Thiel 2007). If disturbance is localised and suitable habitat is available nearby then the birds may simply relocate. However, if this is not the case then due to the high feeding and growth rates required by the chicks before they are fully fledged may imply that both time and energy spent responding to disturbance may reduce the opportunities for feeding (Moss & Picozzi, 1994; Marshall & Edwards-Jones 1998; Kortland 2005; Thiel 2007). Thus continued interruptions to their feeding may result in slow starvation even when the food supply is reasonably adequate. Similarly, a recent study of the capercaillie population in Abernethy forest in Scotland showed that capercaillie avoided areas of suitable habitat that were located close to foot/cycle paths (Baines 2004).

The Tetraonids and, particularly, the capercaillie are some of the most intensively studied avian species in Europe (Petty 2000). It has been illustrated that the capercaillie is a secretive and complex species and that there exists a reasonably sound understanding of the ecology of this bird in Europe. Nevertheless, it is also apparent that there remains a significant amount about the ecology of the species that is not fully understood. Similarly, although many scientists have pointed to habitat loss and climate change as being the main causes of the decline of the species this is not known for certain (IUCN 2005).

1.9) THESIS OUTLINE

Chapter 1 of this thesis has provided the reader with a background to the study. Included within the foregoing chapter were brief notes about the process of species' extinction, a review of the ecology and behaviour of the capercaillie including the present day limiting factors to population size, an introduction to the history of the bird in the UK and an account of the current accepted understanding of the date and cause of the extinction and the successful reintroduction. Chapter 2 of this thesis will present the interdisciplinary methodology that has been used in this study. It also details the reasoning behind the selection of the different estate papers, their nature and extent; and also the potential critical factors examined in this study to attempt to explain the cause of both the extinction and the reintroduction.

Chapter 3 deals with the extinction of the natural population of capercaillie in Scotland. It presents a summary account of both the natural environmental conditions in Scotland and the interaction between human society and nature from prehistory until 1800; shortly after the accepted date of the species' extinction. Also included within the third chapter is a presentation of the findings from the historical document survey pre-1800 and an account of the distribution of species before its assumed extinction. Chapter 4 of this thesis moves on to review the events surrounding the reintroduction of the species in the 19th century. This chapter presents another brief account of the interactions between human society and nature in Scotland between 1800 and 1900; proposing how these interactions would affect the subject species. The origin of the birds used in the reintroductions and the locations of these reintroductions are also presented in this chapter.

Chapter 5 of this thesis examines the potential influence of the critical factors presented in Chapters 1 and 2. The potential influence of the different critical factors is presented in a chronological order; examining the extent of the influence for different time periods. Hypotheses for the dynamics and ecology of both the naturally occurring and the reintroduced capercaillie populations is proposed at the end of this chapter and this takes into account the issues of Island Biogeography and Metapopulation Theory.

Chapter 6 of this thesis presents and comments on the findings from this study. The chapter includes the discussion of the ecological synthesis of the historical information and investigates the accuracy of the hypotheses presented in this thesis. The ecological synthesis attempts to describe the dynamics of both the naturally occurring and the reintroduced capercaillie populations in Scotland as well as investigating other potential hypothetical causes of the decline that cannot be assessed from the historical documents. Also included in this chapter are comments about both the practical applications of the findings of this thesis and the limitations of the study. An appendix, including a sample account of the documents searched in this study follows Chapter 6.

CHAPTER 2 - METHODOLOGY

Inexplicable declines...a field in which scholars are reluctant to admit ignorance; but there are many declines for which no convincing explanation can be given.⁴⁶

2.1) INTRODUCTION

This chapter outlines the methodology used in this study. The methodology used in this thesis has both an Arts and a Science component. Historical source material is used to help explain and give context to a perceived avian extinction in Scotland during the 18th century. Today, this research neatly fits within the subject of environmental history, a theme that has been growing in popularity within the UK in recent times. Summary environmental histories have already been produced for the entirety of the UK (Simmons 2001) for particular biotas (Smout *et al* 2005) and for particular species (Hetherington 2005).

During the 18th and 19th centuries individuals involved in the study of zoology and ecology usually always had a historical component to their work; indeed they referred to themselves as natural historians. Their studies involved facets from the natural and biological sciences as well as aspects from archaeology and social history. In his text *Extinct Birds*, Errol Fuller (1987) states that since 1600, 113 bird species have become extinct. He then goes on to outline what the various causes of these extinctions are believed to be. His statement and the comments about the causes of the various extinctions are particularly pertinent to this study. There exists a certain amount of pressure on individuals involved in scientific study today to justify their methodologies based on published and accepted practices. For those involved in some interdisciplinary studies this justification can sometimes prove difficult; methodologies can often be novel or it may be difficult to reconcile the differences between the various methods of study. This is, however, not the case in this study as

⁴⁶ Rackham (1986); page 45.

history and the natural sciences as their methodologies both in the past and at present are commonly integrated.

If Fuller's (1987) statement is considered again there are several points that can be raised from it that are relevant to this study. In the first instance, it is important to consider how the scientific community today has become aware of the 113 avian extinctions that Fuller makes reference to. Some of these extinctions have occurred in relatively recent times and thus many have oral accounts of the extinction associated with them. The other extinctions allude to happened outwith living memory and have learnt of them through various historical documentary sources. Similarly, the date that Fuller quotes as the start point for these 113 extinctions, 1600, is not selected at random. Although there is a substantial amount of surviving historical documentation from before the medieval period in various different countries, it is important to note that the quantity of documents produced before the medieval was not as great as it has been since. The datum of 1600 represents the start point of an increase in the production of documentation by the human population, particularly in the UK. Hence, it could be argued that the methodology used in this thesis has had a 400 year history of use.

There are many cases of avian extinction in both historical and archaeological times, and in these instances little information about the ecology and behaviour of the species can be gained from the study of the species' biological remains. For example only partial information about the ecology of the moa (Aves; Dinornithiformes) (Plate 17) can be gleaned from the study of the biological remains of this species. Studies using archaeological and historical techniques have, in conjunction with the study of remains of these gigantic birds, helped to make better informed postulations about the ecology of the species (Gemmell *et al* 2004). Similarly, the ecology of the dodo of the Mauritius Islands is reasonably well known although there were only a handful of European sailors that had actually seen a living specimen of the species in its native habitat. In this instance the consultation of the historical sailing records has better informed modern science of a variety of different aspects of the species' ecology.

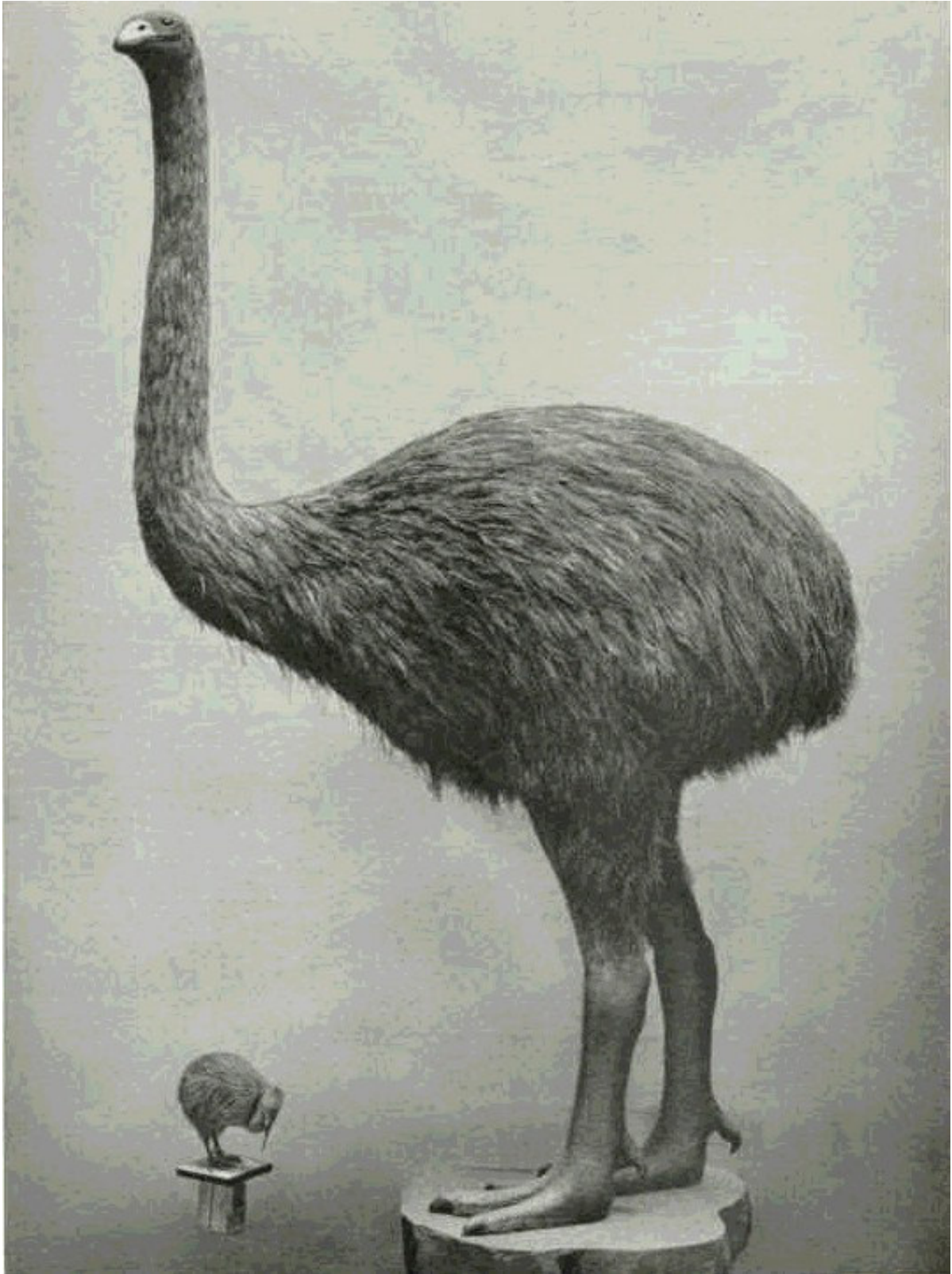


PLATE 17: MOA (right) & KIWI (left) (*Apteryx australis*)

Many of the interdisciplinary studies of extinct birds were carried out by the early ecologists or natural historians. However, there is also a substantial body of work produced in more recent times with an historical aspect. Some of these studies have focussed on species from greater taxonomic families than birds. Moreover, of relevance for this study is that many have been applied in instances of local or regional extinctions or extirpations. For example the 19th century extirpation of the wolf (*Canis lupis*) and the cougar or mountain cat (*Puma concolor*) in the State of Montana, North America has recently been studied (Riley *et al* 2004). The methodology used by Riley *et al* (2004) in this study is similar to the methodologies employed by the early natural historians more than 200 years ago. The methodology consists of the following steps: consult the historical documentary records, gather whatever data is available, consider the information and present a synthesis of the conclusions. A similar methodology has been used in this thesis in an attempt to examine the causes of the extinction of the naturally occurring Scottish population of capercaillie.

2.2) METHODOLOGY

The primary aim of this thesis, as stated in Chapter 1, is to investigate whether historical documentary evidence can aid the explanation of the perceived 18th century decline of the capercaillie in Scotland. In attempting to achieve this research aim there are three underlying issues that must first be addressed. The capercaillie is regarded as a native species in Scotland and thus at some point it must have naturally colonised this country. The first issue that must be addressed when considering the 18th century decline of the species is to make a reasonable assessment of when the bird first arrived in Scotland. Once the issue of colonisation has been addressed, it is then possible to investigate to what extent the historical documentary sources used in this study can contribute to the accurate assessment of the reported decline of the species. Given that the reported date of extinction of the species in Scotland is so close to the date of reintroduction, a mere 30 to 60 years or so, it is also necessary to investigate the accuracy, where possible, of the accounts provided of the reintroduction of the species using the historical documentary sources.

It has been stated in the preceding chapter that the specific causes of the 18th century decline of the capercaillie in Scotland are as yet unknown. A detailed historical account of the species has only ever been formally attempted once, by Harvie-Brown in the late 1870s. Harvie-Brown presents a chronology of important observations of the species that he collected from, predominantly, published histories of Scotland. Harvie-Brown (1879) did not in his analysis consult primary historical source material⁴⁷. Harvie-Brown's study remains today the only detailed historical account of the natural population of capercaillie in Scotland. It is therefore hoped that this thesis will provide an historical account of the natural population of capercaillie in Scotland by using primary historical sources that have, heretofore, never been used for this purpose.

This thesis will provide an original contribution to the understanding of the ecology of the native stock of capercaillie in Scotland and, through an analysis of the pertinent ecological information contained within these manuscript sources, will allow for a more detailed critique of the 18th century decline of the natural population of capercaillie in Scotland. Similarly, this thesis also provides a fuller account of the reintroduction of the species in the 1800s and comments on the reasons behind the dramatic success of the project.

2.3) THE HISTORICAL MODEL

It has been mentioned earlier in this chapter that there exists a long history of interdisciplinary between the environmental sciences and history, particularly when studying historical avian extinctions. The work carried out by Riley *et al* (2004) has already been alluded to, where historical documents, namely account books detailing prices for skins, have been used to establish the historical range and numbers of cougar (*Felis concolor*) and wolves (*Canis lupis*) in the western United States. In this study Riley *et al* (2004), were able to make use of information contained in historical documentary sources, in the form of 'Bounty Records' from between the years 1902 and 1930 to establish certain ecological facts about the populations of the wolf and cougar in Montana during the 20th century. The results of this study allowed for an

⁴⁷ Primary historical source material: in this thesis hand written historical manuscripts are referred to as primary historical source material. Secondary historical source material in this thesis refers to published historical sources.

accurate presentation of the historical population size and the demographics of these two mammal species that were once resident in Montana during the 1900s. Similarly, this study also allowed for the examination of the distribution of the species during this historical period and the results from this study have since been used to help with the reintroduction of the species and have helped to inform current conservation management practices of these two species in Montana.

There have also been many environmental history studies in Europe in recent times that have used historical documentation for a variety of purposes. An example of one such study is that carried out by Schulze-Hagen *et al* (2003) where historical documentation was used to examine the different methods employed in avian taxidermy in Europe from the Middle Ages until the Renaissance. Schulze-Hagen *et al* (2003) were able to establish that avian taxidermy was widespread during this period and they similarly propose that the ‘mummification’ of different avian species was carried out for a variety of purposes. Studies using a similar historical-environmental science methodology have also been carried out in Scotland. Watson and Allan (1990) for example used a collection of estate papers from the Duff House manuscript collection to examine game poaching on Deeside between 1766 and 1832. Watson (1983) used a hand written journal kept by the Earl of Fife, and known as his ‘Journal of Weather at Marr Lodge’, to establish 18th century deer numbers on this estate in the Highlands of Scotland.

Studies carried out in the more recent historical period have also attempted to assess the size of populations of a variety of different game species and their predators during the 1900s using historical manuscript sources. Tapper (1992) used regular historical records of hunting and shooting, collected in what is known as ‘Game Books’, to establish the size, extent and range of these species. Other studies, such as Durie (1998), have used game books to establish the size of red grouse populations in Scotland during the second half of the 19th century. Durie (1998) as well as commenting on the ecology of the red grouse population in Scotland during this period also discussed the economic importance of grouse shooting in Scotland during the 1800s.

Historical documentary evidence has also been used extensively in the investigation of land-use changes. Full and detailed historical accounts of the historical Scottish environment have been published using historical, archaeological and scientific data (e.g. Edwards & Ralston 1997; Simmons 2001; Rackham 1986; Smout 1993 etc). Similarly there have been a series of case specific studies such as investigating land-use in the forest of Abernethy in the Highlands of Scotland between 1750 and 1900 (O'Sullivan 1973). Historical documents have also been used extensively for examining woodland history in Scotland (Tipping 1993; Smout 1993; Smout *et al* 2005 etc). Given the substantial amount of published works that use historical documents to investigate issues in the environmental sciences it can once again be stressed that the methodology used in this thesis is by no means novel. The methodology used in this study follows the key steps of the methodologies previously employed by Durie (1998), Tapper (1992), Watson and Allan (1990), Watson (1983), Schulze-Hagen *et al* (2003) and Riley *et al* (2004).

Methodological Steps

The historical model used in this thesis has three distinctive 'steps'. The first step of the methodology was to select, consult and gather information from both the 'primary' and the 'secondary' historical source material. Before proceeding further there is an important distinction to make here between primary and secondary historical source material. The 'primary historical source material' refers to original collections, as well as more recent publications from original collections, of hand written archival manuscripts. 'Secondary' historical source material as it is referred to here relates to published edited works. These works include a variety of published and edited works commonly available such and include, for example, autobiographies and historical natural history works. The primary historical sources used in this thesis are from collections of manuscripts known as 'Estate Papers' or 'Muniments'. Examples of the types of secondary historical sources used in this study are publications such as *Game Bags and Shooting Records* written by Hugh Gladstone in 1922.

The consultation and gathering of data from primary historical sources is an extremely time consuming activity. For the purposes of this thesis it would have been ideal to have consulted primary historical sources from as many geographical locations in Scotland as possible. However, given the time and financial constraints of this study it

was only possible to consult two samples of the Estate Muniment collections. Other select primary historical source material was also consulted to a lesser extent. The selection of the primary sources used in this study was carried out using a two step procedure. The first step of the procedure was to consider information about the natural population of capercaillie that had been published by Harvie-Brown (1879, 1880), Ritchie (1920) and Pennie (1950). Data in these publications highlighted the significance of the Breadalbane, Atholl and Mar Lodge estates in 18th and 19th century history of the species.

The second step in the selection procedure was to examine the Indexes⁴⁸ of the estate paper collections and then to consult ‘summary accounts’ of the Estate Papers, where they were available. Following these selection procedure the Breadalbane and Atholl Estate Muniments were selected for examination in this study. Data on the ‘presence’ or ‘absence’ of the species was gathered from each of the respective Muniment collections in order to derive a ‘chronology of decline’ among the selected sites. The primary historical source material that was consulted to a lesser extent was guided by information contained in summary accounts. The primary historical source material consulted to a lesser extent includes the Forfeited Estates (1745) Inventory and the Baron Court Records for Strathspey and Urquhart (1617–1683) from the Grant estate muniments.

The next methodological step of the historical model was to assemble from the current scientific understanding of the species and from relevant historical sources a series of hypotheses or critical factors that could reasonably explain the reported decline and extinction of the species. The third and final step of the methodology was to investigate if there was any correlation between the timing of the extinction, as is put forward from the chronology of decline⁴⁹, and the critical factors developed in step two. In other words, an assessment was made of whether or not any of the critical factors could have taken effect within a timeframe that could explain the species’ decline. At this stage any potential hypotheses which looked improbable were eliminated from this study.

⁴⁸ The Estate Paper Indexes: The Indexes of the collections are reasonably detailed accounts of the contents of the various documents/bundles of documents held in the collection. The nature of the indexes will be discussed in more detail later in this chapter.

⁴⁹ Chronology of decline produced in step 1 of the methodology.

Critical Factors

The capercaillie is one of the most highly protected avian species in the UK. Although there are still some aspects of the natural history of the capercaillie that are not yet fully understood, the majority of participating scientists will argue that the factors that have an adverse impact on the persistence of the species in Europe and in Scotland are fairly well understood. Similarly, many notable scientists have, over the years, commented on what they felt to be the most significant causes of the demise of the natural population of capercaillie in Scotland. The depth of the literature that exists on the species from the present day and from historical publications has allowed for a detailed assessment of the potential critical factors that could have caused the decline of the natural population.

Thus the development of a series of critical historical factors that could possibly be responsible for the 18th century decline of the species was fairly straightforward to produce. There are two levels to the examination of the specific critical factors responsible for the decline of the capercaillie; a 'high' and a 'low' level. The high level of examination includes the consideration of the naturally occurring Scottish population as a whole. The focus of this examination is on scale (i.e. national population) and on the metapopulation and island biogeography theories. The 'lower' level examination considers the specific cause of the local or regional decline of the species and the strength of action of the specific critical factor. The specific critical factors that will be analysed in the 'low' level assessment can be categorised under the following headings, inbreeding depression has not been selected as it is symptomatic of low population density rather than being the cause of it:

- Capercaillie Habitat Loss and Deterioration
- Fluctuations In Climatic Conditions
- Human Hunting of Capercaillie
- Disturbance of Capercaillie
- Ecological Relationships and Natural Predation of Capercaillie

Historical Sources & Secondary Literature

The primary historical data used for analysis in this thesis has been gathered from a variety of different historical sources. The greatest part of this data comes from the manuscript collections of the two large estates; Atholl and Breadalbane. All observations of the capercaillie from before 1850 that were contained within these manuscript collections were recorded. The source material from the Estate Muniments was surveyed by first consulting the Indexes of the collections. The Indexes of these manuscript collections provide a brief account of the content of a particular individual document, or bundle of documents. The description of the content of a document provided in the Index formed the basis for selecting documents to consult⁵⁰. This method of surveying documents, by first considering the document summary in the collection Index was carried out for both of the estate manuscript collections.

Data for analysis in this thesis has also been gathered from other primary and secondary historical sources. The other primary and secondary source material referred to here includes a variety of published sources, such as newspaper extracts, Traveller Accounts, collections of early poetical works, biographies and edited memoirs. The Traveller Accounts are published collections of the writings of gentlemen travellers who visited Scotland during the 17th and 18th centuries. The observations made by these travellers to Scotland have proved useful for a variety of different historical studies. The travellers are particularly observant of a variety of different aspects of life in Scotland at that time and they include comments on various items such as the weather, the landscape, the habits and the customs of the inhabitants. The other sources consulted are self explanatory in their nature and more details can be found in the Bibliography of this thesis.

By the end of the 1700s the interest in the scholarship of natural history and in particular, the natural history of the United Kingdom, was growing rapidly. From the early 1800s onwards numerous works were published that dealt with the natural history and ecology of avifauna in the UK. In these texts there is a variety of different accounts of the capercaillie in Scotland and some pertinent observations in these texts have been recorded here. The observations of the species recorded from these historical sources, as well as supplementary information gathered from the published

⁵⁰ Consulted documents: individual manuscripts that were consulted or read.

secondary sources, has been analysed to provide an account of the distribution of the species over varying historical time periods.

Methodological Drawbacks & Assumptions

It was initially hoped that observations of the capercaillie would be included in many of the different types of historical manuscript material held within the Estate Muniments. In particular it was hoped that observations of the natural population of the species would be included within 'Game Books'; the detailed records of the different game species shot on estates during shooting excursions. Data on the number of birds shot and the frequency with which shooting was carried out on each of the two estates consulted would have been combined with an assessment of the 'hunting success rate' to allow for a quantitative assessment of the population size of the species in Scotland at that time. However, such data on the natural population of capercaillie was not available. The interest in sport shooting that was prevalent throughout Scotland by the 1900s did not reach the Highland counties of Scotland until the 1800s, after the reported date of extinction of the species. The Game Books did not, however, include any account of the capercaillie in Scotland during the 1700s.

It is important to briefly clarify here how the presence and absence data for the species was gathered from the consultation of the historical manuscripts. It was assumed that if the capercaillie is mentioned directly in a document then it is deemed to be resident at that location at that time. This follows the common conservation biology paradigm that a species is deemed extant provided that presence data for the species is available. Similarly, if the documents do not directly record the occurrence of the species then the species is deemed not to be resident in that locality. This follows the same conservation biology paradigm that asserts that a species no longer inhabits a particular area based on 'absence' data. Thus, it has been assumed here that where absence data exists, even though no 'searches' may have been carried out for the species, the population of capercaillie in that particular area or locality has declined to very low numbers or has been extirpated.

2.4) THE ESTATES & THEIR MANUSCRIPT COLLECTIONS

An initial background literature survey was carried out prior to selecting which sets of estate muniments would be consulted in this study. There were three main factors that were taken into consideration when selecting which estate manuscript collections to survey. These factors were the location and extent of the estate in relation to current areas of core capercaillie habitat, the size and quality of the surviving manuscripts and the interest expressed by the landowners in the capercaillie. The first two attempts at reintroducing the capercaillie into Scotland after its extinction in the 1780s were carried out on the Duke of Atholl's and the Earl of Breadalbane's estates. In addition these two estates are, historically, two of the largest in Scotland and include within their bounds, what are today, core areas of capercaillie habitat. Thus the Breadalbane and Atholl Estates were selected for this study.

The historical source material that has been used the most in this study is the Estate Manuscript collections from the Atholl and Breadalbane Estates. These handwritten primary historical sources come from surviving collections of the business and personal correspondence of two large landowning families in Scotland. Following the failure of the family line of the Campbells of Breadalbane the historical archives held by the family came into public ownership and are now referred to as the Breadalbane Muniments. These manuscripts are currently held by the National Archives of Scotland (NAS) at New Register House in Edinburgh. The Atholl Muniments still remain in the ownership of the descendants of the Stuart-Murray's of Atholl and are held by Atholl Estates Ltd at Blair Castle in Blair Atholl. The rationale behind the selection of these estate muniments will be presented here and, in addition, descriptions will be provided of the topography and the environment of the estates and the nature and extent of the manuscript collections.

When consulting historical documents in order to gather ecological information there are numerous problems that present themselves and subtleties in the data that are important to observe. In the first instance it is important to bear in mind the fact that, on the whole, these documents are not written in order to communicate scientific information about the abundance, distribution or behaviour of any species. The majority of these documents are focussed on human society and economy. Therefore,

the majority of observations of the capercaillie in the historical sources consulted are, with the exception of observations of the species made in the 1800s and onwards, are, on the whole, fleeting comments or asides and are very seldom the main subject that the author of the document is dealing with.

In the majority of the early documents searched in this survey, references to particular and individual species in the text are seldom made. Most comments relating to avian species in the historical manuscripts refer to game birds as either 'muir foull' or 'wyld foull'. There is no formal description of what species these two terms include. It would seem reasonable to propose that, in the first instance, 'muir fowl' could be assumed to refer to the avian species commonly found today on heath and heather dominated moorland. This category of birds would include grouse species such as the red grouse and ptarmigan and possibly other moorland avians. Similarly, it could be proposed that the second term 'wyld foull' could reasonably be assumed to include other game fowl, not usually found on moorland. The 'wyld foull' category could include species such as wild geese and ducks (*Anser* spp) as well as other avians such as woodcock (*Scolopax rusticola*).

Making an assertion about which category the capercaillie might fit into is difficult to propose for several reasons. The obvious suggestion is that the capercaillie, not being a moorland species, would most likely be included as a 'wyld foull'. Nevertheless there are descriptions of lists of 'wyld foull' from the historical manuscript collections that do not include the capercaillie; conversely, there are also lists of species from the historical manuscripts consulted that do include the capercaillie under the definition of 'wyld foull'. This suggests that the term 'wyld foull' included different species to different people or to people from different regions of Scotland. Nevertheless, it is asserted here that the wild fowl category of game birds would most likely include the capercaillie.

The Campbells of Breadalbane & the Estate Muniments

The Breadalbane Muniments are a collection of manuscript material that consists of the personal and public correspondence made by the staff and the family of the Campbells of Breadalbane. During the lifetime of the last Earl of Breadalbane who passed away in the 20th century, the estate records of his family were held in the

charter room of Taymouth Castle (Plate 18), the seat of Campbells of Breadalbane. Following the loss of the family fortune and shortly before his death, the Earl of Breadalbane gifted to the National Archives of Scotland the family muniments for posterity. The Earl was motivated in this decision following a survey of the charter room at Taymouth that revealed that as much as one third of the manuscript material held in the charter room had been damaged from damp. Despite this damage, a large proportion of the manuscript material has survived to this day.

The Breadalbane Muniments are held in the National Archives of Scotland at General Register House in Edinburgh. The documents are renowned for being one of the best indexed and most widely studied collections of historical manuscripts in Scotland. The collection contains a variety of historical documents of different types. These documents include, for example deeds of entail, rentals and tacks, petitions from tenants, factor's accounts and reports, factor's vouchers, miscellaneous estate papers and details of personal correspondence. The Index of historical manuscript collections has usually been created from a traditional historian's perspective rather than an environmental one. Thus the entire index of the Breadalbane Muniments was searched in this study and there was no single document or particular group of documents that proved to contain observations of the capercaillie.

At the height of their power the head of the Campbell family of Breadalbane held the title of Marquis and public office in Westminster. The family were one of the largest landowners in Scotland between 1700 and 1900. The members of the Clan Campbell of Breadalbane were directly related to the Clan Campbell of Inverary through a common ancestor. The Clan Campbell of Breadalbane is reported to have been the senior branch of the Campbell family. The history of the Clan Campbell is closely linked to the history of other Clans in Highland Scotland and a detailed account of the history of the family through the Middle Ages has been prepared by Boardman (2006).



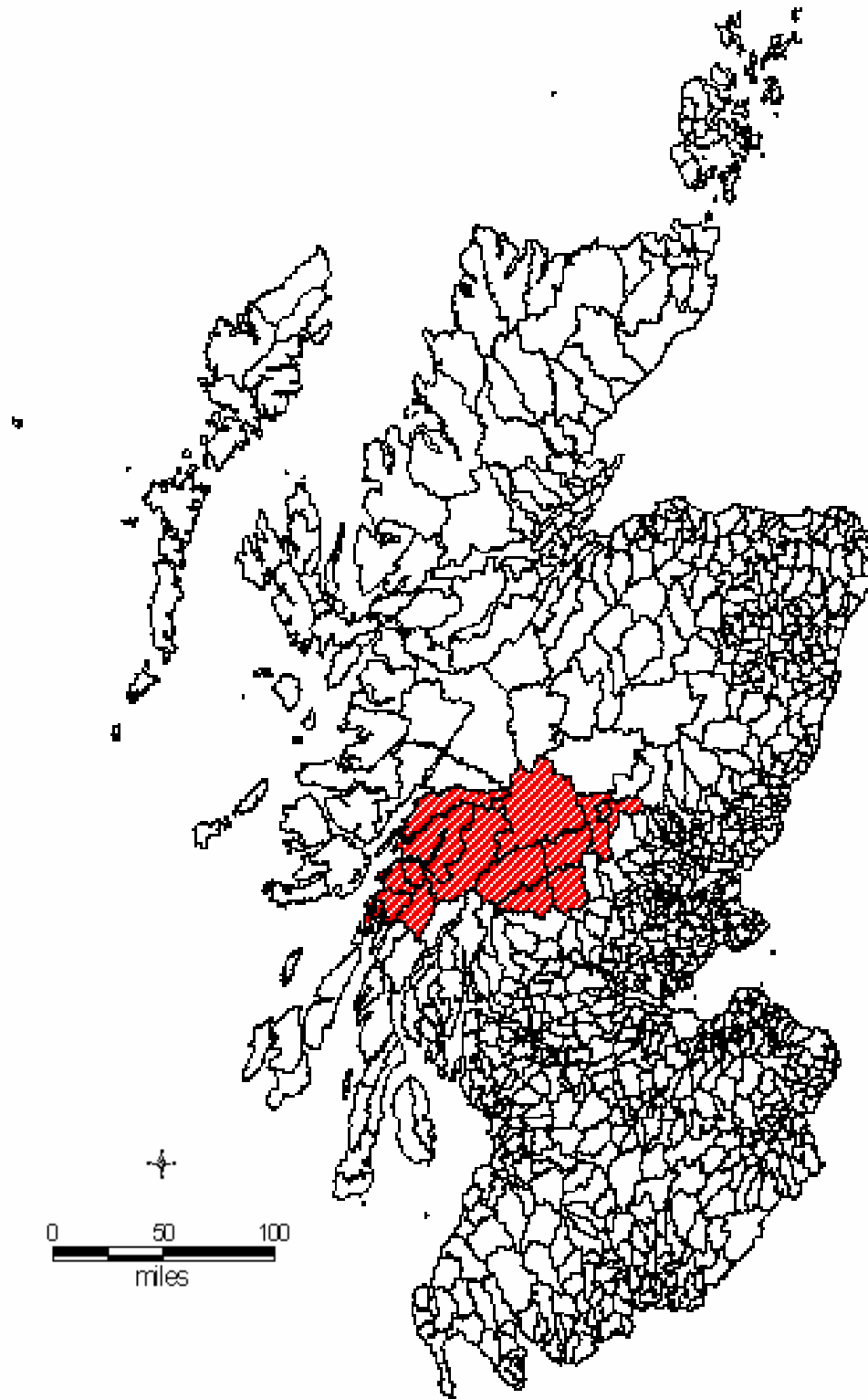
PLATE 18: TAYMOUTH CASTLE

The Lairds of Glenorchy, Earls (from 1681) and latterly Marquis's of Breadalbane were perhaps some of the most active of the early 'planters' in Scotland. There are numerous documents contained within the Breadalbane Muniments that testify to the interest that the Chiefs of Breadalbane had in silviculture and in the active management of their woodlands. This interest in woodland management has been the subject of recent studies (e.g. Watson 1997) and many of the woodlands created by the descendants of the Lairds of Glenorchy are still in existence today. The interest in the natural world that the Campbell Lairds of Glenorchy held, whether they were for aesthetic, sporting or other economic purposes, is also highlighted by the surviving plans that outlined the gardens around the family's more recent seat at Taymouth Castle. Similarly, it is perhaps not surprising that the first successful reintroduction of the capercaillie in Scotland was carried out by the 2nd Marquis of Breadalbane in one of the woodlands planted by his ancestors on Drummond Hill near Kenmore.

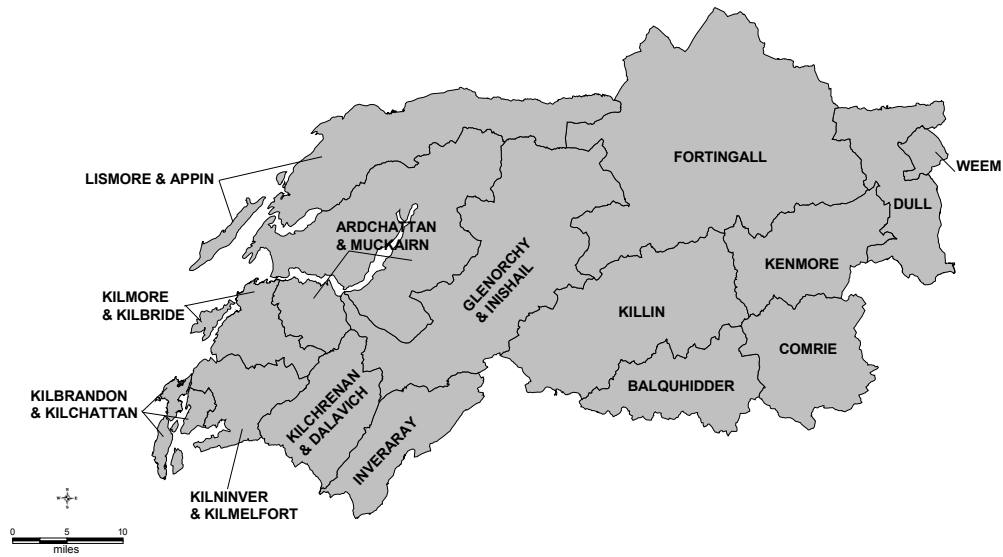
The Breadalbane Estate: Location & Extent

The word Breadalbane has its origins in Scottish Gaelic and is derived from the words 'Braid Albyn' meaning the 'Uplands of Scotland' (Firsoff 1954). This is a particularly accurate description of the lands held by the Campbells of Glenorchy as they contained some of the highest mountains in Scotland. By the time of the reintroduction of the capercaillie in Scotland the seat of the 2nd Marquis of Breadalbane was located at Taymouth Castle at the head of Loch Tay in Perthshire and the estate extended to around five thousand square kilometres of land. At this time the estate of Breadalbane (Map 3) stretched from this location in central eastern Scotland westwards into Argyll. At the greatest extent the Breadalbane estate included lands in the parishes of Appin, Fortingall and Weem in the north and Inverary, Balquhider and Comrie in the south. The eastern extent of the estate included the lands in the parishes of Kenmore and Weem and in the western extremity of the estate included lands in the parishes of Kilmore and Kilbride, and Kilbrandon and Kilchattan (Map 4).

MAP 3: PARISHES COMPRISING BREADALBANE ESTATE 1700 AD TO 1900 AD



MAP 4: BREADALBANE PARISHES

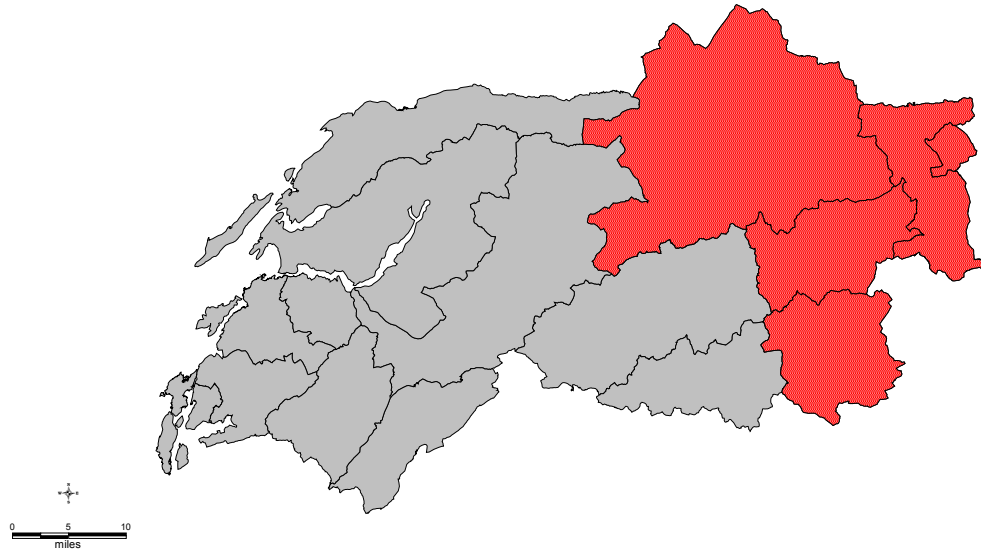


The topography of the estate varies substantially from both the eastern to western boundaries and from the northern to the southern boundaries. In the western end of the estate the microclimate is dominated by the influence of maritime conditions and usually experiences higher average annual levels of precipitation than in the east. Similarly, although this western part of the estate includes some notable areas of native pinewoods, it also includes some of the most important Atlantic Oakwood stands in Scotland. Moving eastwards across the estate the sea lochs give way quickly to fresh water lochs and the land becomes more fertile and experiences less average annual precipitation. The eastern half of the Breadalbane estate is located in the Central Highlands of Scotland and contains today some of the country's most productive agricultural land and forestry plantations.

The capercaillie is distributed today throughout many of the lands that were once owned by the Campbells of Breadalbane. This distribution is confined to the eastern end of what once was the Breadalbane Estate and capercaillie are believed to inhabit suitable pine woodland in the parishes of Fortingall, Kenmore, Comrie, Dull and Weem as shown on Map 5. Although the population size of the species in this locality has been declining recently the conservation management practices that have been employed by woodland managers in these parishes have proved successful and have helped to stop the species become locally extinct. The centre of capercaillie

population in the area that was once the Breadalbane estate today is located in the parish of Kenmore and in particular within the woodland in and around the vicinity of Drummond Hill.

MAP 5: BREADALBANE CAPERCAILLIE ZONES (IN RED)



The Dukes of Atholl & the Atholl Muniments

The second collection of estate papers consulted in this study is the Atholl Muniments. This collection of historical manuscript material remains in the private ownership of the Murray-Stuart's of Atholl. These papers are held in the Charter Room of Blair Castle (Plate 19) on the Atholl Estate in Perthshire. The individual documents and document bundles that constitute the Atholl Muniments are held in World War Two ammunition boxes; other historical archival material is also held in boxes that are numbered in sequence with the Muniments. The majority of the Atholl Muniments (with the exception of five boxes, 40, 41, 42, 43, and 44) were catalogued by the University of Aberdeen History Department in the 1960s.



PLATE 19: BLAIR CASTLE

The title of the Earldom of Atholl has its origins in Pictish times of the seventh and eighth centuries, and, in the later Middle Ages the Earldom of Atholl was passed on to various lines of the Stewart family. Early in the 1600s, two families bearing the same surname but unrelated, the Murrays of Tullibardine and the Murrays of Atholl, came together to form the succession that has resulted in Atholl lineage today. The Murrays

of Tullibardine were an important Lowland family in Scotland and were raised to peerage at the beginning of the seventeenth century. Early in the 17th century one of the Murrays of Tullibardine married a Murray heiress to the Earldom of Atholl and during the 1600s the title passed to their son.

The Murray Earls of Atholl have played an important part in Scottish history fighting for King Charles I during the Bishops Wars in the 1630s and 1640s and they were supporters of the royalist cause. In 1676 the Earl of Atholl was created Marquis of Atholl and made Duke of Atholl in 1703. During the 1715 Jacobite Rising, the 1st Duke of Atholl (1703-24) supported the Hanoverians while his eldest surviving son, William, Marquis of Tullibardine fought with the Jacobite cause. In 1724 the 1st Duke of Atholl died and the title passed not to his first son William, because of his actions with the Jacobites, but to the second son, James who was created 2nd Duke of Atholl (1724-1764) in 1724. The 2nd Duke of Atholl was renowned for his expenditure on beautifying his residences both in Scotland and in England and he died in 1764. His son the 3rd Duke of Atholl held the title for only four years and died in November 1774. The 4th Duke succeeded his father in 1774 and held the title until 1830 (Leneman 1986). For more details on the successors to the 4th Duke and on the lineage of the family from 1830 see Leneman (1986).

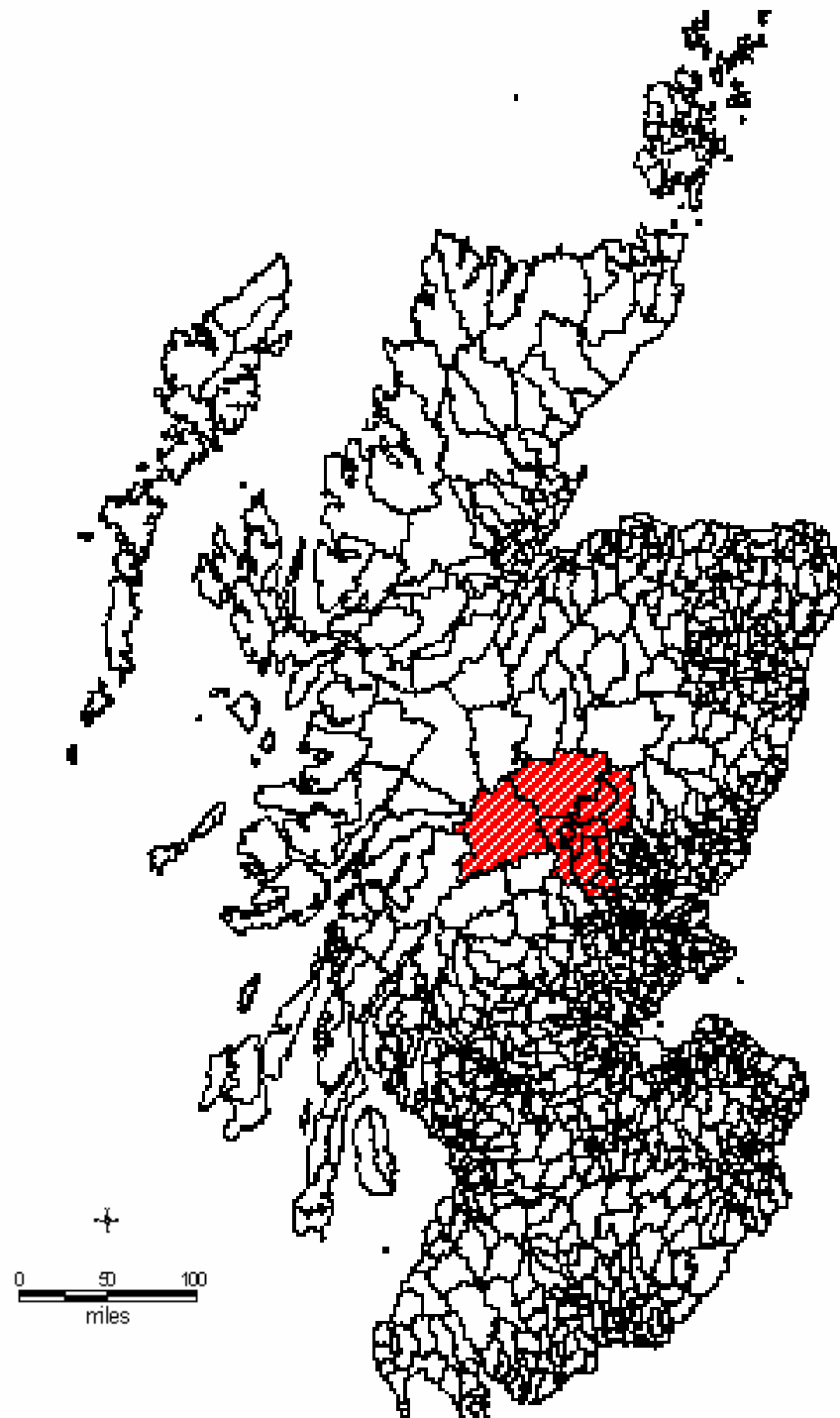
The Atholl Estate: Location & Extent

The Atholl Estate (Map 6) remains today one of the largest privately owned estates in Scotland and during the Earldom of the Lords of Breadalbane the Atholl Estate had several marches on its south western boundaries with the Campbells of Breadalbane. At various time throughout history the two estates owned lands in the same parishes and the estate boundaries overlapped. The Atholl Estate is around three thousand square kilometres in area and includes lands in the parish of Fortingall in the west and in the parishes of Kirkmichael, Dunkeld and Dowally and Auchtergaven in the east. The northern extremity of the estate is contained within the parish of Blair Atholl and the southern boundaries of the estate are contained within the parishes of Logiealmond, Moneydie and Auchtergaven as shown on Map 7.

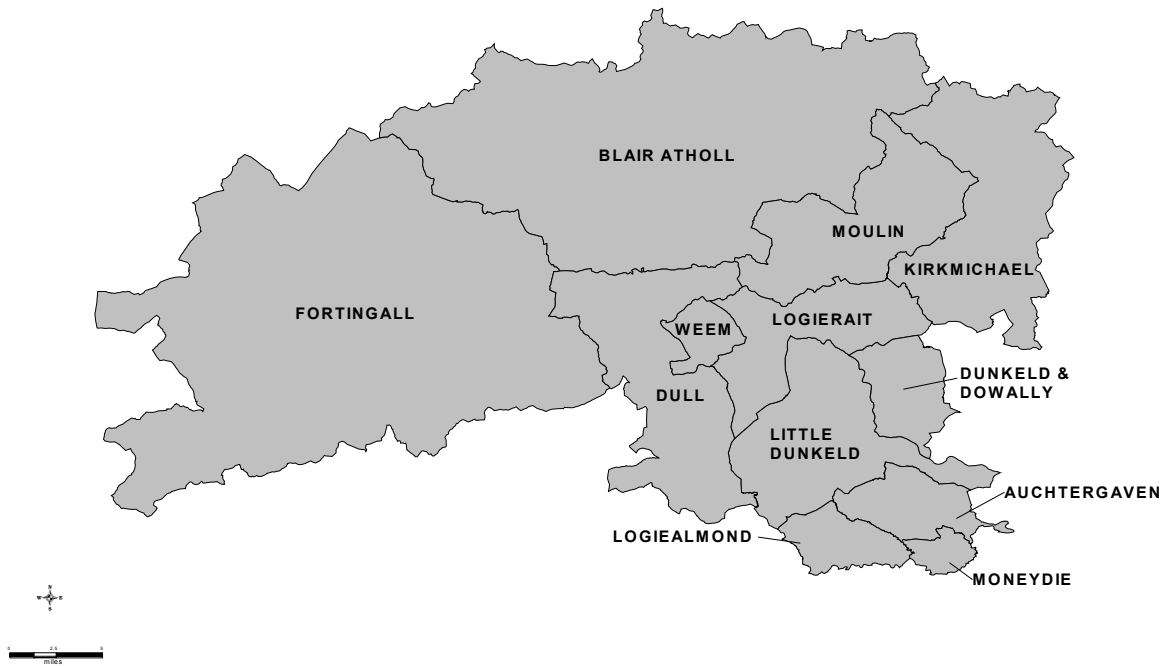
The Atholl Estate has a more northerly and easterly location in the Central Highlands of Scotland than the Breadalbane Estate. The lands of the Atholl Estate vary in height

but at their highest they rise to greater than three thousand feet. The Estate also includes many river catchments and fresh water lochs. The woodland on the Estate today is substantial and varied, ranging from areas that have been relatively recently established to woodland that has been classified as ancient. There exist substantial areas of coniferous plantations of exotic tree species that have been carried out both relatively recently and as much as three hundred years ago. Similarly there also exists areas of broadleaved and coniferous woodland on the estate that have received 'native', 'semi natural' and 'ancient' classification from the Forestry Commission and all of these woodlands are of significant conservation concern today. Small populations of capercaillie inhabit many of these protected woodlands today and the parishes of the Atholl Estate that contain capercaillie are illustrated on Map 8.

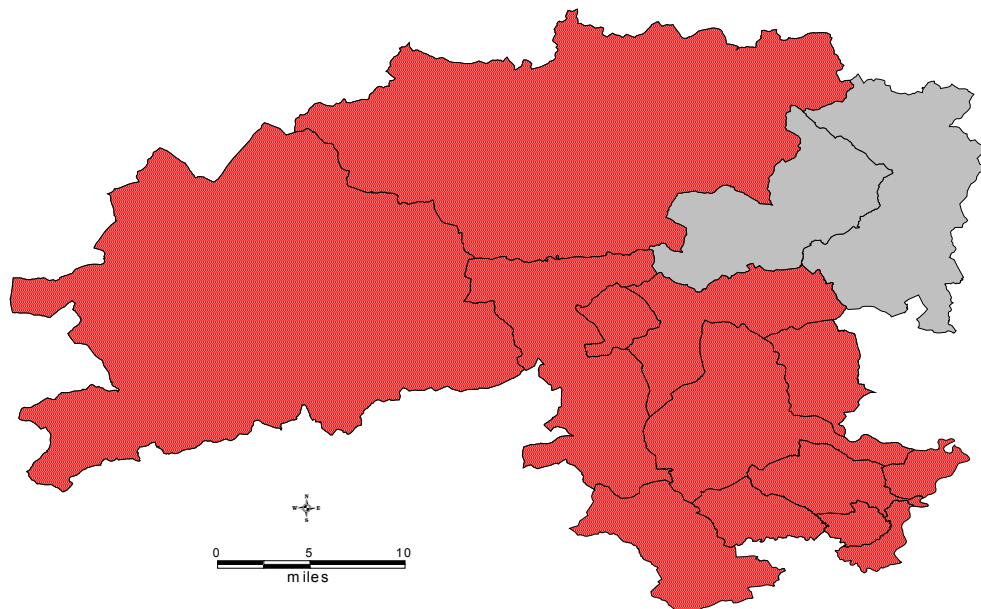
MAP 6: PARISHES COMPRISING ATHOLL ESTATE 1700 AD TO 1900 AD



MAP 7: ATHOLL PARISHES



MAP 8: CURRENT ATHOLL CAPERCAILLIE ZONES (IN RED)



2.5) SUMMARY

The fulfilment of the methodological steps, particularly combining the historical and ecological data gathered in this thesis proved to be the most challenging aspect of this study. The two chapters following this present the findings from the survey of the historical documentary evidence in the lead up to the extinction and around the date of reintroduction. The third and fourth chapters also include a series of assertions about the hypothetical state and condition of the natural population of capercaillie in Scotland at various times. This is provided in an attempt to illustrate when the critical point for the population's persistence was most likely reached. The fifth chapter of this thesis attempts to assess the extent of influence that each of the critical factors might have had on the decline of the species at the 'low' level. The sixth chapter provides the concluding discussion of this thesis.

CHAPTER 3 – THE CAPERCAILLIE IN SCOTLAND & THE UK: FROM PREHISTORIC TIMES TO 1800

3.1) INTRODUCTION

This Chapter provides an account of the capercaillie in Scotland from the time of its proposed date of arrival in the prehistoric period until 1800, by which date the species is commonly believed to have become extinct. When investigating the causes of the extinction of the natural population of capercaillie in Scotland it is necessary to consider when the species first colonised this area of the northern British Isles. It has already been mentioned above that a species is usually determined to be ‘native’ to an area through either observations of the species that occur in historical documents or through the discovery of remains of the species during archaeological excavations.

In Chapter 1 it was stated that the capercaillie is a species that is regarded as native to the UK and Ireland. To date, no remains of the capercaillie have been found during archaeological excavations in Scotland⁵¹ (Yalden & Carthy 2004). Remains of this species have, however, been found during archaeological excavations elsewhere in the UK⁵². Thus the capercaillie’s native status in Scotland comes from historical observations alone. There exists currently no formal recognition of which historical manuscript source has been used to give credence to the capercaillie’s position as a native species in Scotland. There are however several early historical accounts that could be selected to qualify the capercaillie’s ‘native’ status as a member of the Scottish fauna (e.g. Hector Boethius’ *Chronicles of Scotland*).

The capercaillie is regarded as a native species in England, Wales and Ireland through observations in historical documentation and in finds during archaeological excavations (Harvie-Brown 1879; D’Arcy 1999). As such the natural distribution of the capercaillie in the past must be considered to include Scotland as well as England, Wales and Ireland. The capercaillie is believed to have become extinct in England and

⁵¹ This could be due to poor identification of avian bones in middens already excavated.

⁵² For further details of the species occurrence in England and Wales see Witherby, Jourdain, Ticehurst & Tucker (1941). Remains of the capercaillie are believed to have been found in the ‘*caves of Teesdale and amongst the Roman remains at Settle in West Yorkshire*’ (Dixon 1893, page 31).

Wales by around 1300 (Yapp 1983). Given this early date of extinction the further discussion of the inhabitation and causes of the extinction of the capercaillie in England and Wales⁵³ is outwith the scope of this study and has been covered in more detail elsewhere (see Harvie-Brown 1879; Ritchie 1920; Yalden & Carthy 2004). Bannerman and Lodge (1963) suggest that the capercaillie survived in Ireland through the 1700s and that the last observation of the species in Ireland came during the 1770s⁵⁴. These assertions are unusual as that there are very few surviving areas of coniferous woodland in Ireland at the proposed time of extinction. Similarly, given the relatively close date between the reported extinction of the species in Ireland and in Scotland, the naturally occurring Irish population of the species is worthy of further discussion here.

3.2) THE CAPERCAILLIE IN IRELAND

Ritchie (1920) and Harvie-Brown (1879) both cite Pennant's (1776) observation that the species occurred in Ireland and survived there until around 1760. Ritchie (1920) handles the capercaillie's occupation of Ireland very fleetingly. Harvie-Brown (1879) on the other hand deals with it in more detail and presents a chronology of historical observations of the species in Ireland. Harvie-Brown (1879) cites observations of a species called 'pavonibus' in Latin or peacocks in 14th century Irish texts which he believes most likely refer to the capercaillie. There is also a 16th-century documentary reference to a 'Cock of the Wood' in County Tipperary that is believed to be the capercaillie. The next observation of the species presented by Harvie-Brown (1879) is from the 17th century where the bird is referred to again as the 'Cock of the Wood' or the 'Cock of the Mountain'. In the 18th century Pennant (1760) states that '*a few Cocks of the Wood*' were to be found in Tipperary and the final citation is of a reference by a natural historian by the name of J. Ruddy⁵⁵ in 1770 who states the following:

⁵³ The Welsh name for a capercaillie is purported to be *Ceiliog Coed* (meaning 'Wood Hen').

⁵⁴ Extinction of the species in Ireland is put down to roughly the same time as extinction in Scotland.

⁵⁵ Ruddy, J. (1772) *A Natural History of the County of Dublin* Volume 1. See Harvie-Brown (1879) page 31 for full extract.

The ‘Cock of the Wood’, British Zoology. One of these was seen in the County of Leitrim about the year 1710. But they have entirely disappeared of late, by reason of the destruction of our woods.⁵⁶

The understanding of the capercaillie’s inhabitation of Ireland is aided by the detailed account of the history of the species in Ireland provided by D’Arcy (1999). D’Arcy (1999) states that it was in 1982 that the first discovery of capercaillie bones was made during the excavation of a Mesolithic settlement near Coleraine. This prehistoric find was shortly followed by additional finds of capercaillie bones from the Medieval period in Dublin (from a 10th and 13th century site), Wexford (from a 12th century site) and Waterford (from a 12th or 13th century site) (Nicholls 2001). What is intriguing about the inhabitation of the capercaillie in Ireland during this period is the relatively scarce availability of suitable pine habitat for the species. The common and supported theory of woodland history in Ireland is that pine was present in Ireland from the prehistoric (Nicholls 2001). However, there is widespread belief that from the Bronze Age until the Medieval the quantity of pine growing on Ireland reduced substantially (Peterken 1996).

Despite the decline of pine in Ireland reported by Peterken (1996); D’Arcy (1999) states that ‘pockets’ of Scots pine survived in Ireland on ‘...*uplands and boglands at least until Early Modern times...*⁵⁷’. The fact that the quantity of pine extant in Ireland by the Medieval period was limited to small areas only is stressed by Nicholls (2001) who states that there is a shift in the composition of Irish forests from woodlands including pine to a forest dominated by mixed-hardwoods between prehistory and the Medieval. This description of the species composition of woodland cover on Ireland is one that is supported elsewhere (e.g. Rackham 1984; Peterken 1996; Smout *et al* 2005). Thus it would seem reasonable to suppose that the woodland cover of Ireland into Early Modern times was most likely dominated by areas of mixed hardwoods with very small pockets of pine growing on suitable soils and in suitable locations. This comparative lack of suitable habitat through the capercaillie’s inhabitation of Ireland up to the 18th century into question.

⁵⁶ Harvie-Brown (1879) page 31.

⁵⁷ D’Arcy (1999), page 103.

The lack of large tracks of suitable habitat for the capercaillie in Ireland is something that D’Arcy (1999) has given consideration to. D’Arcy (1999) has proposed that in a similar fashion to the capercaillie populations surviving in holly dominated woodlands it is possible that the capercaillie may have adapted to the woodland conditions in Ireland:

One can imagine therefore the gradual adaptation of the Capercaillie from conifer forest (in pre-historic times) to mixed hardwoods.⁵⁸

It is difficult to ascertain what specifically D’Arcy (1999) is referring to in terms of the level and extent of adaptation. It is possible that over time and through the influences of isolation and inbreeding that the capercaillie underwent mutation and adapted to feeding on trees in mixed-hardwood dominated woodlands. This is however an astounding adaptation if, given the physiology of the digestive system of a capercaillie, the species was able to live without an evergreen component in its diet. An alternative explanation is that perhaps the species was able to source a different food source during the winter months, such as some invertebrates or larvae, in place of the evergreen component. In such circumstances it may be the case that the capercaillie could persist over time with a slight behaviour change. A biological adaptation on the other hand, while possible, would seem unlikely without first considering two alternative possibilities.

The first of these alternative possibilities to suggesting that the species of capercaillie resident in Ireland is a genetic sub-species is one of misidentification. It is possible that despite the descriptions of the species in the historical documentary sources cited by D’Arcy (1999); the species known as the ‘Cock of the Wood’ in Early Modern times is not in fact the capercaillie. Undoubtedly the species was resident in Ireland from the pre-historic. However, as the dominant species of tree dominating Irish woodlands changed it would seem reasonable to suppose that, at the least the size of the Irish capercaillie population would have reduced, if it was not indeed lost. A simple explanation would be that it is possible that the species, given the similarity in appearance of the females was a black grouse. An alternative hypothesis is that, as the Irish woodland changed as did the composition of avian species dwelling within the

⁵⁸ D’Arcy, G (1999), page 103.

woodland change, perhaps there was the arrival or indeed expansion in range of a different member of the grouse species; namely the hazel grouse. The females of the hazel grouse are often mistaken for hen capercaillie and in many instances it is the type of woodland that they are found in alone that allows scientists to distinguish between them from site (Storch 2007).

The second alternative possibility is that as the woodland on Ireland changed, the capercaillie abandoned Ireland for the winter months alone. This is not to say that the species remained absent from Ireland, but perhaps during the winter months the species moved to Scottish pine dominated forests, before returning to Ireland in the spring and summer and for breeding. It is true that the capercaillie is not known to make seasonal migrations, however there are numerous instances of recorded regional movements that take place on mainland Europe between seasons of the year (e.g. capercaillie populations in Finland, Sweden and Norway). Indeed capercaillie can travel between 60km and 100km between forests during the spring and winter months in Scandinavia (Storch 2007). A distance which would make them most certainly physically capable of crossing the Irish Sea.

The condition of the Irish population of capercaillie in the 18th century is difficult to quantify. Its inhabitation in Ireland is not in question. Similarly, the historical documents certainly suggest, excluding the possibility of misidentification, that the species persisted in Ireland into the 18th century. For this to happen, adaptation would have certainly been necessary, whether behavioural or biological. Such an adaptation in Ireland would have certainly have ramifications for the Scottish population of capercaillie and for this study; and therefore it could be considered appropriate to explore this point in more detail. However, to argue the case for adaptation and exclude the possibility of misidentification or the hypothesis of Ireland being a refuge for Scottish (or vice versa) birds; would seem particularly bold. Attempting to adequately address these points is outwith the scope of this study. Thus, in order to address the aim and objectives of this study the possible implications of these Irish issues will not be considered further. Furthermore the Irish population of capercaillie will not be considered specifically when addressing the potential strength of influence of the specific critical factors responsible for the Scottish extinction.

3.3) THE EARLY ENVIRONMENT OF SCOTLAND & THE CAPERCAILLIE

The question of when the first capercaillie colonised these islands is one that has been given very little consideration in the past. This is perhaps not surprising; as such a question is very difficult to answer given the limited extent of data and information available on the naturally occurring population. Nevertheless, a consideration of the potential date of the arrival of the species is necessary for this study and it is argued here that a reasonable approximation can be provided through an examination of prehistoric and historical environment. The land comprising modern Scotland is part of the larger landmass of the north-west European archipelago known as the British Isles. Scotland is the northernmost component of the archipelago and is located on the eastern edge of the North Atlantic Ocean, off the north western coast of continental Europe.

Scotland's environment is determined and dominated by climatic forces. The climates of countries on oceanic coasts are particularly susceptible to sudden alterations and instabilities that are brought about by modifications in the conditions of the surrounding maritime environments. There are several oceanic and atmospheric mechanisms that affect the condition of the North Atlantic Ocean and thus Scotland's climate. These mechanisms are subject to many different influences that are, primarily, regulated by the intensity of solar radiation reaching the Earth's surface. The atmospheric and oceanic mechanisms that determine the condition of the North Atlantic Ocean are known as deep water formation, ocean upwelling, the North Atlantic Polar Front, the 'Gulf Stream' and Jet Streams. These mechanisms regulate the distribution of thermal energy received by the Earth from the Sun and recent research suggests that an alteration in the operation of at least one of these five mechanisms has been the major underlying cause of climate change events (see Parnell 2004)⁵⁹.

The alteration of these thermal circulation systems have been known to cause periods of either high or exceptionally low temperatures. Indeed, the movement of the North

⁵⁹ See Chapter 5 for a fuller discussion on the causes of climate change.

Atlantic Polar Front southwards towards the Scottish coast is believed to be the cause of the last period of glaciation in both Scotland and the rest of the UK. There have been major and frequent changes in climatic conditions in the North Atlantic region over millennia (Lowe 1993). Indeed, Scotland is reported as lying adjacent to one of the world's 'most sensitive ocean surfaces' (Simmons 2001) which has in the recent geological past experienced shifts of temperature of around 12°C (Lowe 1993). The present global climatic regime is one of high temperatures which extends to around 10,000 years BP (Whittington & Edwards 1997). This assertion is supported by biological and chemical evidence gathered from isotopic records of fossilised marine plankton which illustrate that the Earth has experienced cooler conditions over the majority of its history than are experienced today (Lowe 1993). Geological evidence has also illustrated that the countries located in the North Atlantic region were subject to the effects of glaciation. For example Ballantyne and Stone (2004) have shown that rock slides at Beinn Alligin in North Western Scotland were caused by late-Holocene structural failure rock. This structural failure of rock indicates that paraglacial stress took place in Scotland over a period of 'several millennia'.

Periods of glaciation are commonly referred to as 'ice-ages' and the last glacial maximum in Scotland, the peak of the last ice-age, is believed to have occurred around 18,000 years ago (Lowe 1993). At this time, it is argued that Scotland was entirely covered with ice⁶⁰; in the UK and Ireland, only central and southern England as well as the southern 'fringes' of Ireland were free of ice. The land around the edges of the 'ice-cap' would have only supported communities of lichens, mosses and resilient grasses and forbs. Moving southwards away from the edges of the ice-caps tundra⁶¹ vegetation communities would have existed supporting characteristic species of grasses, sedges, forbs, prostrate willows, dwarf juniper and birch. These communities in Scotland were resilient and capable of surviving the peri-glacial conditions extant at that time.

At this time in the UK and Ireland, the land free of ice was probably composed of a series of extensive shallow wetlands and large areas of lightly-vegetated mineral soils. It is argued that somewhere between 18,000 and 13,000 years BP the condition of the

⁶⁰ Glaciers are commonly referred to as ice-caps and ice-sheets depending on the topography of the underlying land that they are believed to exist on.

⁶¹ Tundra is a soil type that is also known as permafrost. For large periods tundra soils are frozen.

glaciers on the Scottish land mass changed as a result initially of reduced precipitation. This reduction of precipitation brought about the retreat of the ice caps, which in turn allowed for the northward movement into Scotland of the plant communities extant in England and Ireland. During this change, the vegetation present in Scotland, that included all plant forms ranging from trees to fungi, seaweed to ferns and diatoms to liverworts underwent a massive modification (Edwards & Whittington 1997). In addition, through the geological process of isostatic rebound, the retreat of the glaciers exposed land mass in the English Channel and the North Sea that linked Britain to Continental Europe. This 'land bridge' facilitated the movement of species from the continent to ice-free Scotland.

The succession of species colonisation and establishment in Scotland during this period is generally widely accepted. Initially, tundra communities were the first to spread into Scotland from the south and over the land bridges. As the climate warmed, the tundra communities in the south were replaced by woodland communities. The glacial retreat and the subsequent colonisation of Scotland by the tundra communities was initially a very slow process. However, this process accelerated between 13,000 and 10,000 years BP when the climate in Scotland experienced a change to warmer conditions. This increase in temperature is argued to have been caused by the movement of the North Atlantic Polar Front northwards, away from the Scottish coast. This movement of the North Atlantic Polar Front towards Iceland allowed for the circulation of warmer water around the Scottish coast and rapidly increased the speed of glacial retreat. It is generally accepted that by around 12,500 years BP Britain and Ireland were almost entirely ice-free and at this time extensive forests of birch and pine established themselves in many lowland areas.

This period of warmer weather did not persist for long and around 11,000 years BP the climate cooled again and glaciers had reformed in the upland areas of Scotland. The cooling of the climate in Scotland at this time caused a retraction in the distribution and extent of the woodland communities and much of the country was once again covered with tundra. This period of glaciation and colder conditions is referred to as the Loch Lomond Stadial and is reported as being, comparatively, a very brief period of glaciation, lasting for only 800 years or so. The Loch Lomond Stadial is recorded as ending around 10,200 years BP. Many assert that sea levels in

the North Atlantic increased around this time and that this caused the flooding of the land bridges connecting Britain with Continental Europe.

Erdtman (1929) states that during the maximum of the last glaciation and for a long time afterwards there were no forests in the British Isles. He goes on further to state that forest immigration was not determined by climate but on the proximity of forest centres on the Continent which had served as refuges for trees during glacial times. The end of the Loch Lomond Stadial saw the recommencement of the colonisation of Scotland by woodland species. The first immigrants were species of *Salix* and *Betula* and then a little later *Pinus* appeared. This order of immigration is characteristic of a large part of north-western Europe, although in Britain it would appear that *Salix* were more frequent than was generally the case on the Continent. The tree species came again in succession, starting with the pioneer species of juniper, dwarf willow and birch. These species were followed by hazel, pine, rowan, aspen, elm and oak around 9,500 years BP. This phase of geological time roughly coincides with the arrival in and occupation of Scotland by humans in the early Mesolithic period.

This general discussion has presented a brief summary of Britain and Ireland's prehistoric environment and has included a particular mention of environmental aspects that have particular relevance to a population of capercaillie. It was highlighted in Chapter 1 that the persistence of a population of capercaillie over time in an area is closely related to climatic conditions and to the quantity of available habitat. It is widely asserted that at the start of the Mesolithic the environment of Scotland was at its most 'natural'; with periods of 'climatic optimum' and maximum woodland cover occurring. Thus, assuming the capercaillie's position as an essential part of the fauna of a pine woodland biota in Western Europe, it seems reasonable to assert that a natural population of capercaillie may also have occupied Scotland at this time and that the species arrived before, around the same time as, or shortly after humans.

It was stated in Chapter 1 that the capercaillie is a species of the 'Old World' pine-dominated boreal forest and that its distribution is closely associated with the distribution of the Scots Pine tree species. Bennett and Owens (2002) assert that very little is known about some aspects of avian ecology. Colonisation of new areas of

suitable habitat by bird species, including the capercaillie⁶², is one such aspect of avian ecology that remains unexplained. There are numerous precursors to the colonisation of a new area of habitat by any species. Issues such as resource availability, competition, quality and size of habitat are just some of the factors that modern scientists believe affect the suitability of an area of habitat for a particular species. However, given the extent of ‘naturalness’ of the environment in Scotland during the prehistoric period it is affirmed here that these issues and factors are not worthy of further consideration.⁶³

On this premise, the only requirements for the occupation of an area by the capercaillie are suitable habitat and suitable climatic conditions. The environment of Scotland between 12,500 years BP and 11,000 years BP, before the onset of the Loch Lomond Stadial met both the habitat and climatic requirements to support a population of capercaillie before the onset of the Loch Lomond Stadial; between 12,500 years BP and 11,000 years BP. During this period the warm and dry climate combined with the spread of pine northwards and westwards would have been sufficient to support and would have favoured the survival of a population of the species. Thus, it is argued here that the capercaillie could have first colonised Scotland⁶⁴ at some point during the one thousand five hundred years before the Loch Lomond Stadial.

If the species was able to colonise Scotland during the period before the Loch Lomond Stadial then it is necessary to consider from where the first individuals arrived. It has been commented above that, during the glacial retreat around 11,000 years BP, various species moved northwards across the land bridges in the North Sea and the English Channel linking Scotland to Continental Europe. Thus it is quite

⁶² It has already been stated that the reintroduction of the capercaillie in Scotland is the first and only successful reintroduction of a grouse species in the world. Harvie-Brown (1879) and Pennie (1950, 1951) have provided a detailed account of the expansion of the capercaillie’s range in Scotland following the reintroduction. This account documents the colonisation of new areas of suitable habitat by a capercaillie population. The findings from these accounts are not discussed here however as, it will be argued later, this spread was not ‘natural’.

⁶³ Humans make suppositions and recommendations about habitat suitability for a species. But these suppositions and recommendations fade into insignificance when compared to naturally occurring habitats of the Mesolithic. To attempt to make an assessment of the suitability of the Mesolithic pine forests for the capercaillie is farcical. It is proposed here that the pine woodlands of Mesolithic Scotland are considered to be flawless capercaillie habitat.

⁶⁴ By the start of the Holocene about 10,000 years ago all the thirty one orders of birds known today were in existence.

feasible that capercaillie could have reached Scotland by spreading northwards from the south (over land) and by spreading westwards from the east (over the land bridges or by air⁶⁵). The former and latter scenarios generally support the assertion that the capercaillie was once resident in all parts of the British Isles⁶⁶.

Assuming then that the capercaillie was resident in Scotland during the period before the Loch Lomond Stadial its range would be limited, to a certain extent, by the range of the pine-dominated woodland in Scotland. Thus, the distribution of the species in Scotland at this time was probably confined to the Lowland areas of the country. It has been previously stated that the range of the capercaillie is closely linked to the range of the extant pine species both today and in history. At the start of the Loch Lomond Stadial the range of the pine forest present in Scotland is observed to reduce in size and extent and to have been replaced by tundra in some locations. Due to the falling temperatures and the deteriorating climate during this period, it is reasonable to suggest that the range and size of the capercaillie population in Scotland and indeed in the rest of Britain and Ireland would have also reduced.

If the capercaillie did indeed arrive in Scotland during the period before the Loch Lomond Stadial, the species would have been forced into areas of suitable habitat south of the glaciation during that time⁶⁷. Assuming that during this Stadial the species was absent from Scotland, it would then have had to re-colonise Scotland after the ice caps retreated again around 10,200 years BP. On this occasion the re-colonisation of Scotland by the capercaillie would have had to have taken place over

⁶⁵ Movements of individual capercaillie over large distances have been observed occasionally; however large scale movements are not accepted as typical for individuals of the species. Indeed, the species is regarded as largely sedentary. Nevertheless, the frequency of these accounts of individuals and packs of capercaillie travelling over large distances are numerous; particularly when considering historical anecdotal data (e.g. Lloyd 1870, 1854). In addition the physiology of the capercaillie certainly suggests that the bird is capable of travelling over large distances (Moss pers. comm. 2005).

⁶⁶ This argument assumes that the capercaillie was distributed throughout all suitable areas of pine habitat in Europe in prehistory and that the area of pine habitat was one solid unit. The areas of suitable pine dominated habitat were located to the South of the glaciers and thus so were the extant populations of capercaillie at that time. As the ice caps retreated northwards, so too did the southern boundary of the pine forests. In the first instance, the ice caps retreated due to lack of precipitation and secondly due to increased temperatures. The southern boundary of the pine forests moved northwards due to arid conditions initially and then due to increasing temperatures. The capercaillie would have thus moved with the pine forests; reaching Scotland by spreading northwards through Ireland, Wales and England. The alternative argument is that the species spread westwards by air or across the North Sea land bridge.

⁶⁷ It is possible that the first extinction of the capercaillie in the UK and Ireland took place with the onset of the Loch Lomond Stadial. This is mere postulation and it is impossible to qualify this statement. Nevertheless it is worthy of note here.

land from the south or by air from the east, as the land bridges connecting Britain to Continental Europe were being flooded by rising sea levels around this time⁶⁸. Although it is possible that the capercaillie did not colonise Scotland before the onset of the Loch Lomond Stadial it is difficult to argue that the species was not part of the Scottish faunal assemblage at the start of the Mesolithic period. It is asserted here that when the Mesolithic peoples arrived in Scotland they would have encountered a naturally occurring population of capercaillie, isolated for perhaps as much as 2000 years from Continental Europe.

3.4) MESOLITHIC TO 43 AD

The Mesolithic period occurred in Scotland sometime between 12,000 years BP and 6000 years BP (Warren 2005). There are several key features of the Scottish Mesolithic that are particularly important when discussing the persistence of a population of capercaillie. These are the first evidence of occupation by humans (Wickham-Jones 1994; Finlayson 1998; Warren 2005), the attainment of maximum woodland development when almost all of Scotland was covered with trees (e.g. Bennett 1988; Smout 1993; Tipping 1995; Tipping *et al* 1999; Maroo & Yalden 2000) and the occurrence of a period of ‘climatic optimum’ or hypsithermal during the middle part of the Holocene⁶⁹ (Simmons 2001). Assuming that a population of capercaillie was resident in Scotland during the Mesolithic, each of these key features would have had a very significant effect on the population size and distribution of the species.

The direct and indirect impacts that humans could have had on a resident population of capercaillie in Scotland when they arrived around 8000 years BP is difficult to ascertain. These human colonists were hunter-gatherers and the environment in Scotland at that time would have provided an abundance of resources to support large groups of individuals (Finlayson & Edwards 1997). If the capercaillie was resident in

⁶⁸ Most authors would agree that the land bridge between Britain and Continental Europe was severed at some point between 10,200 years BP and 8,500 years BP. Due to the relatively short period of time that the land bridges were accessible for some species from continental Europe did not make it to the UK and Ireland. For example both reptile and amphibian groups are represented in the UK by a single native species. It is assumed here that the capercaillie along with the other grouse species were able to colonise Scotland before the flooding of the land bridges; or that they did not require them.

⁶⁹ Holocene (c. 10,000 BP)

Scotland during this period it could potentially have been a regular quarry for the Mesolithic humans. These early humans settled initially on the fringes of the forest and on the coastal areas of Scotland. The diets that sustained these people were usually composed of marine foods including various fish and shellfish and were supplemented by wildfowl, game and nuts (Warren 2005).

The subsistence regime or lifestyle of the country at this time was based on the harvesting of wild resources by hunting, gathering and fishing. The Mesolithic people would, most likely, have had a direct effect on a population of capercaillie through hunting of the species for both subsistence and possibly also for trade. The Mesolithic peoples used hunting implements from the most easily worked resources available such as flints, other stone or shells. These hunter-gatherers appear to have employed spears and arrows and as well as hunting for the kill they are also believed to have trapped animals and fish (Simmons 2001). In addition to the various hunting implements manufactured by Mesolithic peoples they also had access to 'controllable animals'. Domesticated dogs are known to have been used in the hunt and are believed to have been used to seek out and flush game species.

It is also asserted that the hunter-gatherers studied their quarry in detail in order to make their efforts more efficient and rewarding. Mesolithic peoples regularly used fire for social and domestic purposes to provide warmth and to aid in the preparation of foodstuffs. There is also evidence that indicates that these hunter-gatherers used fire to improve conditions for edible plants and for game species (Maroo & Yalden 2000). The only possible source of indirect impacts on the capercaillie would most likely result from such minor modifications that they made to the woodland environment. Indeed, the extent of the Mesolithic peoples' minor modifications to the environment are in themselves a contentious issue (e.g. Brown 1997) and the indirect impacts that they might have had on a population of capercaillie are much more difficult to quantify, if indeed their actions did have any indirect impacts.

Some authors assert that the impact of Mesolithic peoples on their surrounding environment was only slight. For example, Simmons (2001) states that during the majority of the Mesolithic period natural pressures dominated the environment more than human pressures. Others dispute this and argue that the impact of the Mesolithic

people on the Scottish environment has been underestimated. For example Tipping (1995) has shown that the use of fire to clear areas of woodland was apparently commonplace during this period and the impact that Mesolithic people had on woodland cover in Scotland at this time was substantial. Much of this debate stems from the fact that the Mesolithic period in Scotland lasted for 5,600 years. Given such a relatively long period of time in human history it is perhaps not surprising that it has proven difficult to quantify the impact of the hunter-gatherers on the environment. Smout's (1997) account of the impact of the hunter-gatherers on the environment is perhaps the most accurate description, that the '*...modification of the environment was begun during the Mesolithic period, and became significant in the Neolithic...*' (Smout 1997, page 6).

The environment that the Mesolithic peoples encountered when they first arrived in Scotland was dominated by woodland. Writing about the prehistoric woodlands, Rackham (1986) states that:

In the beginning, and for millennia after the end of the last Ice Age, the British Isles were covered with natural forests collectively known as wildwood. In the British Isles...our great wildwoods passed away in prehistory and have left neither written record nor legend.⁷⁰

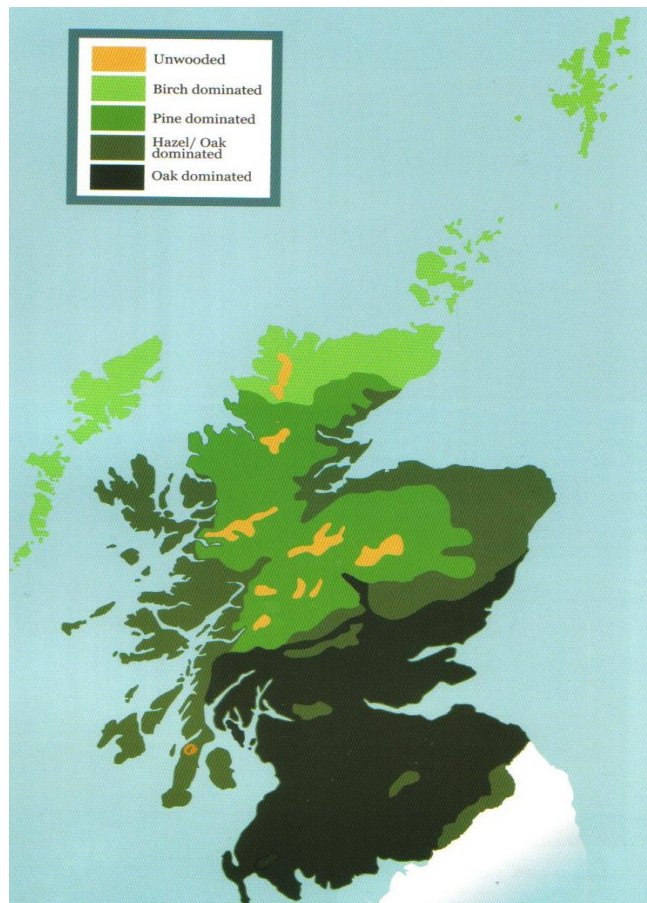
Most contemporary understanding of the early woodland of Scotland comes from the study of the past presence and distribution of higher plants from palynology. The analysis of subfossil pollen and spores preserved within peat, lake and soil deposits, coupled with satisfactorily dated and stratified contexts, has permitted the reconstruction of past vegetation communities and their associated environments (Tipping 1993; Edwards & Whittington 1997). During the Mesolithic period it is asserted that the majority of the country was covered by a variety of woodland taxa. It is estimated that woodland covered about 80% of the total land surface in Scotland (Birks 1988; Bennet 1989; Tipping 1995; Tipping *et al* 1999). The pine component of this woodland dominated the majority of Scotland north of the Highland Boundary Fault; from the central Highlands north east into Strathspey and north into Caithness and Sutherland (Map 9). Maroo and Yalden (2000) estimated areas of vegetation

⁷⁰ Rackham (1986); page 64.

cover in Britain during the Mesolithic from averages of the ‘pollen rain’ at twenty two sites (c. 7000 years BP). Their findings (Table 1) have shown that during the Mesolithic there was approximately 13,000 km² of pine woodland extant in Scotland:

<i>Vegetation Type</i>	<i>Area (km²)</i>
<i>Birch woodland</i>	20426
<i>Pine woodland</i>	13207
<i>Mixed deciduous woodland</i>	95154
<i>Grassland Gramineae</i>	42371
<i>Fenland</i>	24234
<i>Heathland</i>	18687
<i>Other</i>	6032
TOTAL	220,111⁷¹

TABLE 1: EDITED FROM MAROO & YALDEN (2000), PAGE 244



MAP 9: MESOLITHIC WOODLAND ZONES & COVER IN SCOTLAND

⁷¹ Maroo & Yalden (2000) provide a figure of 220,111 km² to represent the total area of Britain. This figure does not include Orkney, Shetland or the Outer Hebrides.

At this period of woodland maximum during the Mesolithic, the diversity of plant and animal life that the Scottish forests supported was very different to the diversity of life that they support today. Also, these Mesolithic wildwoods were very different in size and character compared to modern coniferous woodlands. High order taxa are known to have inhabited these wildwoods and their presence was as important to the maintenance of the forest ecosystem as was the fertility of the soil and the condition of the climate. The Mesolithic wildwood of Scotland is the fabled primeval ‘Old Wood of Caledon’, the living, breathing, climax forest of the warm dry Atlantic period. Questions, however, still remain about the accuracy of popular understanding of the structure of the wildwoods (Tipping *et al* 1999).

It is asserted (Warren 2005) that the treeline vegetation at that time would have developed into a natural ‘ecotonal zonation’ of scrub communities between the upper edge of the forest zone and the upper edge of the subalpine zone. Little is known about the nature of these scrub communities above the forest zone. Juniper (*Juniperus communis*) was probably widespread over much of the central mainland in association with the *Pinus-sylvestris* and *Pinus-Betula* communities. The maximum elevation of the treeline during the Holocene has been estimated at around 880 metres in the Cairngorms, 716 metres in the Grampians, 550 metres in Torridon and 457 metres on the Isle of Skye (Birks 1988).

The Mesolithic peoples are believed to have settled on the fringes of the woods and to have travelled along and round the edges of the tree lines during the summer months. They are believed to have made use of wood and timber from the forests for a variety of purposes, including firewood, shelter and stockades and may also have cleared trees in some areas to entice grazing animals onto the ‘lawns’ or glades so created. Archaeological evidence has illustrated that the Mesolithic wildwoods supported a significant quantity of mammalian biomass (Maroo & Yalden 2000). Maroo and Yalden (2000) have provided a useful estimation of mammalian species and their population densities for the Mesolithic period (Table 2). Given the diversity of life that the wildwoods of the Mesolithic supported are proposed to have supported it seems reasonable to assert that the capercaillie was a member of the extant taxa.

<i>Species</i>	<i>Density (per km²)</i>	<i>Numbers</i>
Red Fox	0.33	72,637
Wolf	0.03	6,603
Weasel	2.2	484,244
Stoat	0.3	60,033
Polecat	0.5	110,055
Pine Marten	0.67	147,474
Brown Bear	0.06	13,207
Wild Cat	0.3	66,033
Lynx	0.03	6,603
Wild Boar	5.9	954,378
Aurochs	0.5	83,869
Man	0.01	2,500

TABLE 2: EXTRACT AFTER MAROO & YALDEN (2000)

All over Britain pine forests were encroached upon during the Boreal period, but in Scotland they reached a secondary maximum in Sub-Boreal time. During the Sub-Atlantic time the natural pine forests in Britain disappeared with the exception of a few locations in Scotland. One of the main factors that caused the decline of the pine forests in Scotland was the formation of soligenous peat (Erdtman 1929). Peat formation in the form of raised mires had been developing since about 9000 years ago in Scotland. Blanket bog formation probably started about the same time (Birks 1988) but became more widespread from about 7500 years ago during the wetter Atlantic period. In late Mesolithic times, the removal of woodland cover in upland areas to provide, amongst other purposes, improved grazing, is likely to have accelerated the development of extensive tracts of blanket bog and this process continued further under the cooler and wetter conditions which pertained between about 4,000 and 2,000 years ago.

About 6,000 years BP a significant human cultural change occurred, represented traditionally by the migration of people from the continent who employed a new stone technology and who practised agriculture, including the husbandry of cattle and sheep, and the cultivation of primitive forms of wheat and barley. These, the so-called Neolithic peoples, are reported to have had the most significant impact on the Scottish

forests when land was 'systematically cleared for agriculture and more permanent settlements' (Kitchener 1998, page 72). During this period, fields were laid out and cleared of rocks, which were taken to the field boundaries to form banks or were heaped in stone cairns. The fields were hand ploughed, and when exhausted were grazed or were left to revert to woodland. There is evidence in several parts of the country of extensive, apparently planned, field systems being developed towards the end of the Neolithic period and during the subsequent Bronze Age. In other areas, and sometimes superimposed on these 'planned' field systems, were large numbers of small, square, 'Celtic' fields. The square design of these fields reflected the custom of ploughing in two directions, and this field system flourished during the Bronze Age. A few centuries before the arrival of the Romans, iron tipped ploughs came into use and enabled the ploughing of heavy clay soils. When the Romans did arrive they found an extensive agricultural system already in place based on semi-regular fields, individual farmsteads and small hamlets.

The result of this agricultural activity was to accelerate the clearance of woodland which had started in Mesolithic times, leading to extensive tracts of cultivated land and grassland. Woodland was cleared from the majority of the lighter soils in the lowlands. In the uplands, woodland clearance for arable and grazing land was carried out actively during the Bronze Age in southern Britain and, in northern England and Scotland, during the Iron Age. By the end of the Iron Age, extensive areas of moorland had been produced, characteristically over a shallow layer of peat. Cultivated areas provided open ground conditions suitable for many herb species of the former tundra, such as plantains, docks, mugwort and shepherd's purse, which became arable weeds. Other species, such as knapweed, sheep's bit, scabious, rock-rose, buttercup, birds-foot trefoil, salad burnet and thrift, became characteristic species of different kinds of grassland.

The natural colonisation of plant and animal species from continental Europe was reduced dramatically when the land bridge was severed as a result of sea level rise about 8,500-8,000 years ago. However, successive human colonists during the Neolithic, Bronze and Iron Ages, and during the Roman period, brought with them a range of food animals and crop species, together with attendant accidental introductions, that added significantly to the native complement of species. The post-

glacial period also witnessed the evolution of coastal landscapes, and this has been reviewed by May and Hansom (2003). At the height of the Loch Lomond Stadial, the abstraction of water from the oceans to build the land-based ice caps had reduced sea level to some 120m below that of the present day. Release of water by the melting glaciers, and thermal expansion of the oceans, resulted in a rise in sea level to some 40m below its present level by 10,000 years ago. Subsequently, sea level continued to rise, with the configuration of the present shoreline of Britain and Ireland being achieved about 6,500 years ago, at which point the rate of rise slowed considerably.

The areas of central Scotland which had been covered by the greatest depth of ice had sunk about 100m under its weight. This depression of the land surface had been accompanied by a rise in land in areas not covered by ice, particularly in southern and eastern England, with intermediate values between these extremes occurring elsewhere in the country. With the weight of the ice removed, the areas which had been depressed rose, while those that had risen subsided. The combination of these effects resulted, from about 5,000 years ago, in a 'rocking' of the land surface relative to sea level which continues to the present day. During the Bronze Age, the sea level was actually higher in many parts of the country than it is now, causing extensive flooding (some of it never to be recovered) of low-lying coastal areas which had been settled in Neolithic times. During the Iron Age, the sea level dropped, and then, in the later Roman period, rose again, although there was considerable local variation.

By the beginning of the historic period, the principal habitat types and general species complement which, today, we regard as characteristic of the United Kingdom's biological heritage, had developed, and were distributed, broadly, as they are now, albeit they were generally more widespread. In most essentials, these biological communities reflected those of adjacent areas of north-west Europe, because of the similar climate and shared pool of colonising species. The number of overall species was fewer than in adjacent areas of Europe as a consequence of the severing of the land bridges. On land, the nature and distribution of habitats and communities had been heavily influenced by human land use and to some extent by the introduction of additional animal and plant species. Locally, the composition of biological communities reflected the physical conditions (temperature, substrate and soil development, topography, water availability etc) under which they needed to maintain

themselves over time, and also the chance nature of the colonisation events which had occurred to create them.

The woodland component of the Scottish environment is asserted to have decreased from the Mesolithic period until 43 AD. This decrease is believed to have been primarily caused by human pressures on the woodlands and deteriorating climatic conditions (e.g. Tipping 1995; Tipping *et al* 1999; Warren 2005 etc). The extent of the impact of humans on the woodland environment had significant local and regional variations. The climatic impact on the other hand was much more widespread across the country. Increased levels of precipitation affected the forest and large areas of woodland 'gave way' to the natural process of the formation of peat. The period between the Mesolithic and 43 AD saw the reported extinction of several faunal species from Scotland. These species include the lynx (*Lynx lynx*) (Hetherington 2005), the wild horse (*Equus ferus*), the reindeer (*Rangifer tarandus*), the Auroch (*Bos primigenius*), the collared lemming (*Dicrostonyx torquatus*) and several species of vole (*Microtus* spp.) (Kitchener 1998).

The changes in the climatic conditions combined with the deterioration of the woodland habitat would have had significant impacts on a resident population of capercaillie. It is difficult to quantify the extent of this impact; it could be argued that the capercaillie went through several periods of local, regional and national extinction and subsequent colonisation between the Mesolithic and 43 AD⁷². The fragmentation of the woodland habitat would have exposed the capercaillie, at various stages of its life cycle, to predation. This deterioration of habitat combined with a worsening climate would have had a negative impact on the species' breeding productivity which, when combined with the deaths of adult birds through the firing of the woodland and hunting by humans, could have had serious implications for the persistence of the population.

Conversely it could also be argued that the changes to the capercaillie's habitat between the Mesolithic period and 43 AD had very little impact on the persistence of the population. It may have been the case that the local and regional nature of the firing and fragmentation of the forest and the direct and indirect impacts that this

⁷² See Chapter 6 for a fuller discussion of this point.

would have on the population simply forced individuals of the population to other less disturbed areas of habitat. As historical documentary evidence exists to support the species' inhabitation of Scotland after 43 AD, for the purposes of this discussion the theory of continued and sustained inhabitation of Scotland by the capercaillie will be maintained as accurate.

3.5) 43 AD TO 16TH CENTURY

The end of the Iron Age is usually defined as starting at 43 AD with the Claudian invasion of southern Britain. Given the finds from archaeological excavations, it appears that wild fowl were a common feature of the human diet during the Roman period in Britain. The excavation of a cave⁷³ in Somerset that was known to have been used during the Roman period yielded the bones of a variety of avian species including geese, duck, crows, pigeons and, surprisingly, the capercaillie⁷⁴ (Gurney 1972; Hull 2001). Excavations in Scotland, such as that carried out at Haddington in East Lothian have yielded buzzard and raven bones⁷⁵ (Gurney 1972). It is apparent then that the hunting of game birds was likely being carried out during the Roman period in Scotland was most likely carried out. Similarly, the Roman period in Scotland is also traditionally the age of the 'Great Wood of Caledon', a vast tract of forest that is believed to have stretched from Stirling in the south and covered Menteith, Strathearn, Atholl and Lochaber (Smout *et al* 2005). There exists a substantial debate about the extent of the Caledonian forest that is commented on during the Roman period in Britain and many believe that a 'Great Bog' is perhaps a more accurate representation of the forest described by the Romans (Smout 2000).

The traditional opinion of the woodland component of the Scottish landscape is that when the Romans arrived in Britain around 43 AD a great consolidated mass of woodland existed in the Highlands. This wood has been referred to by many writing about the natural history of the Highlands by such names as the 'Great Wood of Caledon' or the 'Caledonian Forest'. Popular belief in the existence of this vast forest

⁷³ This reference is cited by Hull (2002); there appears to be no formal recognition of the location of this cave.

⁷⁴ Gurney, J H. (1972) *Early Annals of Ornithology*.

⁷⁵ Gurney (1972) mentions these finds but does not give any further details on the nature of the site or any specific details of the remains found.

at the time of the arrival of the Romans still remains current today. Many recent studies (e.g. Smout 1997, Tipping *et al* 1999, Smout 2003, Warren 2005), however, have suggested that the 'Great Wood' was not as extensive during this time period as is popularly believed.

The Romans' brief occupation of Southern Scotland is believed to have had relatively little impact on the extent of the woodland in Scotland (Smout 2003). The general woodland trend from the arrival of the Romans in Britain until 1500 is difficult to fully understand in detail, however the majority of the literature suggest that the 'tide' of woodland cover in Scotland 'ebbed and flowed' up to 1500 but on the whole a general decrease in woodland cover is believed to have taken place. Gilbert (1979) and Crone and Watson (2003) report that there was a timber scarcity in Lowland Scotland during the 14th and 15th centuries and it certainly appears that although the woodland in the Highlands might have 'ebbed and flowed', woodland in Lowland Scotland was decreasing dramatically. It is reasonable to suggest that during this period of woodland contraction and expansion the population of capercaillie resident in Scottish forests would have responded in similar fashion. Likewise, as the quantity of suitable habitat decreased it would have had significant implications for the overall size of the population and thus it is most likely that the population of capercaillie in Scotland during this period was decreasing in line with the reduction of habitat.

The coexistence of the capercaillie and other faunal species in Scotland during this period is important to consider. Maroo and Yalden (2000) have commented on the diversity of mammalian fauna that may have been present in Scotland from the Mesolithic period onwards. At the beginning of the historical period in Scotland, several mammalian species formerly present in Scotland had already become extinct. The majority of these recorded extinctions are herbivores. The reason for this increased level of reportage of herbivorous species extinction from the prehistoric period is due to several factors. In the first instance, herbivores are more numerous than predators in any particular biota. In addition, herbivorous species are on the whole larger than carnivorous species and thus their remains are usually better preserved and survive for longer periods (Warren 2005).

When investigating the coexistence of the capercaillie with other species in the historic environment it is of the utmost importance to consider the number and type of carnivorous or omnivorous predatory species present. This assumes that the number of herbivorous species present within Scotland's historical matrix of habitats would not affect a population of capercaillie, directly or indirectly, and that these herbivores would be 'naturally regulated' by inter- and intra-specific competition. Of greatest importance to a population of capercaillie is the natural regulation of predatory species. Chapter 1 discusses in detail species that have coexistence relationships with the capercaillie through predation.

It is probable that the range of species affecting the capercaillie today through predation is different to the range of species that have affected the species in the past. For example, it is commonly reported that the capercaillie has a close ecological relationship with corvids today. Capercaillie egg shell fragments and capercaillie chicks regularly appear in analyses of corvid diets. Corvids are, however, 'opportunistic' predators of capercaillie (e.g. Moss *et al* 1978; Moss & Picozzi 1994; Catt *et al* 1998 etc) and it has been recorded that their impact on capercaillie populations is directly related to the extent of the fragmentation of the forest habitat (e.g. Storch 2000; Menoni *et al* 2007). Thus it seems reasonable to suppose that the capercaillie had predator-prey ecological relationships with different species dependent on the quality of the forest habitat at that time. In the period between the Mesolithic and 43 AD it is asserted here that the adult birds, eggs and chicks of the capercaillie would most likely have been regular prey to the following species: the lynx, the wolf, the brown bear (*Ursus arctos*), the polecat, the pine marten, the wild pig, the wild cat and various ungulates⁷⁶.

As the woodland became more 'open' and as some of these mammals became extinct the capercaillie would have developed predator-prey relationships with different species. These species include the more opportunistic predators such as the corvid, but they also include other predatory species that normally operate on the forest edge or on moorland habitats such as the arctic⁷⁷ and red foxes, the golden eagle, buzzard, sparrowhawk, kestrel and goshawk (Swann & Etheridge 1995; Baines *et al* 2004). By

⁷⁶ Ungulates are commonly reported to consume capercaillie eggs (Moss pers comm 2005).

⁷⁷ The Arctic fox it is proposed here would prey on the capercaillie as it does on western continental Europe until its reported extinction in Scotland during the Mesolithic.

43 AD the woodland cover in Scotland is reported to have reduced to a level close to what exists today and thus it is asserted here that the capercaillie was most likely prey for both the opportunistic predators extant at that time and also to other now-extinct species, including the wolf⁷⁸, brown bear⁷⁹, polecat, pine marten, wild pig⁸⁰, wild cat and naturally occurring ungulate species.

Little is known about the inhabitation of Scotland by the brown bear. Archaeological remains of the species have been found in both northern and southern Scotland (Kitchener 1998) and documentary references of ‘Caledonian Bears’ being sent to Rome exist to give additional credence to the archaeological evidence (Ritchie 1920). Much more is known about the wolf however and this canine species is said to have inhabited this country from the prehistoric period. The first observation of the species in any historical manuscript is in 668 AD in the form of bounty payments for wolfskins and although the species is persecuted at high levels throughout the medieval period the population seems to have been large enough to survive.

Wolves continued to persist in Scotland throughout the Middle Ages and were popularly believed to have been a significant problem to the livestock economy of the time (Gilbert 1979). There are numerous acts made by Scottish kings relating to the wolf and encouraging nobility, landowners and tenants to destroy any that they could find. Alexander II (1214-1249) passed laws regarding the setting of traps for wolves; in 1283 an allowance was made for a hunter of wolves in Stirling; and in 1427 and 1457 James I and James II passed acts regarding the destruction of wolves in their kingdom (Harting 1880). Bounties were regularly put on wolves’ heads in Scotland and Rackham (1986, page 35) suggests that ‘the warlike and sparsely populated’ nature of Scotland during the Middle Ages allowed the wolf to survive later in Scotland than elsewhere in the British Isles⁸¹. Indeed, even in the Lowlands of Scotland, a bounty was paid for two wolves in 1491 that were resident near Linlithgow. The low population density of humans and social disorder in the Highland region are believed to have provided suitable habitat for the species and

⁷⁸ Extant in Scotland until 18th Century AD.

⁷⁹ Extant in Scotland until 10th Century AD.

⁸⁰ Extant in Scotland until 17th Century AD.

⁸¹ A critique of this assertion by Rackham (1986) is outwith the scope of this thesis. Nevertheless recent work on wolves in Scotland has illustrated that Rackham’s description does not accurately reflect the situation.

reduced the level of persecution that the wolf was subject to⁸² (Harting 1880). Records of wolves in the Highlands are frequent in the 16th century, although by 1570 difficulty was reported in getting wolfskins. There are many accounts referred to by Harting (1880) as ‘legends’ that have not been substantiated of woods being burnt to deny cover to wolves. If wolves were controlled in this fashion these actions would have undoubtedly had a significant affect on any population of capercaillie resident in the same forests.

The lynx is regarded as a native species in Scotland. There was, however, a widespread belief held that earlier periods of climate change that affected Scotland were responsible for driving the species to extinction. Recent research carried out by Hetherington *et al* (2005) shows, however, that the species persisted in Scotland into historic and possibly even early medieval times⁸³ before reaching extinction at around the late medieval period as a result of deforestation and persecution by man. As there is no documentary data to suggest that this carnivorous species was as numerous as wolves during this period and as no bounties were placed on lynx pelts, it has been asserted that this species became extinct in Scotland before the Middle Ages (Kitchener 1998; Hetherington *et al* 2005).

Large mammalian predators, such as the brown bear, wolf and lynx probably had an impact on a population of capercaillie while they were extant in Scotland. The quantification of this impact is again difficult to achieve. There would be positive and negative impacts on the capercaillie of having populations of wolves and lynx present. Examples of positive impacts include the effect of these large carnivores on forest ungulates. Today red deer are known to cause the deterioration of the forest field layer through their grazing habits today; a population of wolves and lynx would most likely regulate the size of the deer population in Medieval Scotland at more ‘natural’ levels than at present.

It is also possible that the presence of these carnivores would have affected the extent to which humans ‘wandered’ in the woods and thus would have reduced the potential

⁸² Questions surround this assertion, particularly in relation to the comments on population density and the level of social disorder. References and a discussion of this statement will be made in Chapter 6.

⁸³ Early medieval in Scotland covers the period down to c.1050, high medieval is c.1050 to c.1300, and late medieval is c.1300 to c.1500 or 1560.

level of human disturbance during this period. The negative effects that these carnivores would have had on the capercaillie are direct in their nature. For example, a population of wolves would only have been regulated in history by disease, competition for resources or by human control. High population densities of wolves would have had very significant adverse impacts on a population of capercaillie through predation. The extinction of these predatory species is believed to have been caused, primarily, by anthropogenic factors although in some cases climate change is believed to have affected the species to a certain extent.

Although the first reliable barometers and thermometers were developed during the late 1600s problems with their accuracy have been reported (Jones 2001). Thus, studies of the changes in the climate of Scotland during the historic period have, in the majority of cases, been carried out using what can be referred to as largely qualitative data. This data has illustrated that the first interval of significant climatic fluctuation during the historic period occurred between 1000 and 1200 AD and is referred to as the 'Medieval Warm Epoch'⁸⁴ (MWE) (Bokwa *et al* 2001; Simmons 2001). Although there exists some debate in the literature regarding the estimation of the duration and precise chronological brackets associated with this epoch⁸⁵ most agree that the temperature during this two hundred years or so was warmer than the average experienced outwith these dates. The literature suggests that during this period the summer temperatures were about 1°C warmer than they were during the two centuries preceding 1000 AD and that rainfall was on average 10% less. During this period, the breeding productivity of the capercaillie would not have been affected by any climatic fluctuations. Indeed this period of warm and dry weather would have most likely assisted the natural reproduction of the species.

Studies of Scotland's climate from qualitative data have also generally agreed upon the fact that post 1250 AD there was some deterioration in the climatic conditions experienced in northern Britain. There is evidence of poor harvests and accounts of flooding in historical documents that suggest that this period of relatively poor weather continued until the 1500s and the occurrence of what has been referred to as

⁸⁴ See Jones *et al* (2001) for justification for the use of this term.

⁸⁵ See for example Lowe (1993).

the 'Little Ice Age'⁸⁶. This cool and wet period occurred during the 14th to 18th centuries AD, when average annual temperatures were around 2-3°C cooler than those of the period of 'climatic optimum' and 1-3°C colder than those of the present day.

There exists a variety of assertions in the literature as to the specific causes and climatic conditions experienced during the Little Ice Age. There is, however, a consensus of opinion regarding the fact that there was a marked depression in the average temperatures in Scotland during this period. Its cool temperatures and increased levels of precipitation are believed to have had continued effects into the 19th century⁸⁷. The impact that the cool temperatures and higher levels of precipitation during this period had on a population of capercaillie is complex in its quantification. Nevertheless, provided that the temperatures did not have too adverse an effect on the habitat and food sources for the species, the temperatures would not have adversely affected the species. The average rainfall during the summer months is, however, an important factor and the increased levels of precipitation would have adversely affected the breeding productivity of the species, particularly during the period referred to as the 'Late Maunder Minimum' (MM) between 1645 and 1715⁸⁸.

Despite the problems that may have faced a resident population of capercaillie between 43 AD and 1500 AD in Scotland there exists no direct evidence to suggest that the species became extinct. The discussion of the inhabitation of the capercaillie in Scotland between the end of the Loch Lomond Stadial, through the Mesolithic period and up to the Middle Ages will be discussed again in Chapter 5. Here, for all intents and purposes, the following inhabitation model is proposed. The 'native' population of capercaillie present in Scotland had reduced in size and in the extent of the species distribution from the Mesolithic period of woodland maximum. By 43 AD the species was distributed throughout all of the available surviving fragments of pinewood in Scotland and the size of the population was at a natural level equal to the carrying capacity of the surviving woodland fragments. The species held predator-prey relationships with a variety of woodland taxa and was also highly susceptible to predation from opportunistic predators. The number of individual birds taken by

⁸⁶ The Little Ice Age LIA: c.1300 to 1900: See Jones *et al* (2001) for justification for the use of this term.

⁸⁷ Termination of the effects of the Little Ice Age in Iceland is put down at circa 1920 (Jones *et al* 2001).

⁸⁸ See Jones *et al* (2001) for a more detailed discussion of the MM.

opportunistic predators increased as the extent of fragmentation of the forest increased.

The extinction, extirpation and control of various mammalian and avian predators carried out by humans to protect themselves and their stock had a positive effect on the persistence of the population. This positive effect would have been countered, however, by human hunting and trapping of the species. It is proposed here for the purposes of discussion that the capercaillie was not over-hunted during the period between 43 AD and 1500 AD. Thus, at the start of the Middle Ages, the naturally occurring population of capercaillie in Scotland existed and persisted as a metapopulation and in a 'fragile' state of balance. Abundant in some areas and rarer in others.

3.6) 16TH CENTURY TO 17TH CENTURY

The first surviving documentary observation of the capercaillie in Scotland occurs during the 1500s. This reference occurs in the form of a poem from the Scottish poet William Dunbar. Dunbar died around 1522 and in the absence of a specific date for the composition of his piece this date has been assumed as the date of observation. In a composition detailing an exchange between a gentleman and lady, titled variously, "*Ane Brash of Wowing*" or "*In a Secret Place*", Dunbar mentions the species in the seventh stanza:

Quoth he, my kid, my capircalyeane,⁸⁹

Dunbar is believed to have been born in East Lothian around 1460 and lived for sixty years or so, or until 1522 at the latest. He was educated at St. Andrews University and was originally a Franciscan novice before travelling extensively in Europe and eventually becoming a salaried member of the court of James IV. Dunbar was a member of the group of poets active in the reign of James IV known to literary historians as the 'Scottish Chaucerians'. Dunbar is perhaps most famous for the pieces "*The Flyting of Dunbar and Kennedy*", a piece that gives an account of the argument between Himself and the poet Walter Kennedy. Dunbar also wrote the relatively well

⁸⁹ Taken from Watson 1995 page 83.

known pieces “*The Goldyn Targe*” and what is considered by some to have been his greatest composition “*The Twa Mariit Wemen and the Wedo*”. By 1504 Dunbar had taken ‘priest’s orders’ and later on in his life he is referred to as a chaplain. It appears, however, that Dunbar was never successful in obtaining a position outwith the court. The last mention of William Dunbar in the court records is on 14 May 1513 (Watson 1995).

Dunbar’s decision to make reference to the capercaillie in this piece is an interesting one. The species is not mentioned in any of Dunbar’s other surviving works and, as he was normally domiciled in the central lowlands of Scotland it can not necessarily be assumed that the audience for whom this piece was intended, if indeed it was for public consumption, would have been familiar with the species. It may be the case that he selected this term simply for poetical rhyming purposes and in order to compare the lady who is the object of the affections of a gentleman in this piece with animals both wild and domestic. Dunbar compares this lady to the woodland dwelling grouse and also to a young goat. Dunbar’s ‘bony ane’ is also compared to other animals in this composition including a calf and a sheep.

It is reasonable to suppose that Dunbar travelled a great deal around Scotland during his time at University, as a ‘wandering friar’ and latterly during his employment at James IV’s court. Dunbar is known to have travelled through Fife, the Borders and north-east Scotland, as well as travelling through England to London and through Europe to France and Scandinavia. It is possible that during these journeys he encountered the capercaillie in the wild and his comparison of his ‘bonny ane’ in this piece could suggest that the species was already rare during the 16th century. Although this fact is perhaps countered by his comparison of her to kid goats, bullocks and sheep that were not, on the other hand, particularly rare during this period. It is also not known if this poem was written as a private or a public piece. If it was a public piece then it would seem to be the case that the members of the royal court were acquainted with the capercaillie and would understand the reference. Whether the species was resident in the neighbouring woodland of Stirling or if it was simply encountered at the market or during feasts at the court is undeterminable.

The next observation of the capercaillie in Scotland is made by Hector Boece (c.1465-1536) in his 1526 history of Scotland *Scotorum Historiae a Prima Gentis Origine*. This publication was one of the first 'histories of Scotland' to be produced and many early 'natural historians' believe it to be among one of the best historical works of its period because of its reference to a variety of species (e.g. Harvie-Brown 1879; Ritchie 1920; Lever 1977). Boece's history of Scotland begins with an account of prehistoric Scotland and continues down to the accession of James III in 1460. Hector Boece was born in Dundee and studied in Paris, where in 1497 he became a professor of philosophy in the College of Montacute. He then went on to serve as the first principal of the College of Saint Mary in Aberdeen, later renamed as King's College. During his time as principal there, he successfully built up a respected teaching body and was awarded the degree of Doctor of Divinity in 1526.

In his History of Scotland, Boece comments on a variety of different aspects of natural history and mentions various species including, amongst others, the bear, wolf and capercaillie. Interestingly, in the following passage, Boece states that the capercaillie might only be found in Scotland and that within these same forests there are many rapacious birds. Similarly, when writing about the capercaillie, Boece makes particular mention of the feeding behaviour of the species, indicating that he may have possibly seen live birds, although it is the pine needles rather than the bark of the tree that they feed on:

Many other fowls are in Scotland which are seen in no other parts of the world, as the capercailye⁹⁰, a fowl more than a raven, which lives only on the barkis of trees.⁹¹

With the exception of the comment regarding the food of the capercaillie, Boece's observation is a particularly interesting one for several reasons. In the first instance, he asserts that the species is extant in Scotland but not in any other part of the world, an unusual assertion for a gentleman who had travelled on the continent. It is known that Boece lived in France where he pursued his academic career. To declare that the species is endemic to Scotland only, despite his level of education and the fact that the

⁹⁰ Bellenden translates the word capercailye from the Latin 'Auercaize'.

⁹¹ Taken from John Bellenden's translation.

species is present in southern France, only makes this assertion more unusual. There are two potential explanations that are proposed here that address Boece's opinion of the endemic status of the species in Scotland.

The first explanation relates to the status of the capercaillie in France and the origins of the employees of the College of Montacute in Paris during the 1500s. It might have been possible that the species had become extinct on the French side of the Pyrenees during this period and was thus unknown to the scholars at the College of Montacute. Alternatively it is also possible that there were no individuals at the College in Paris who were aware of the species. This scenario may have been possible but it seems highly unlikely. The second and perhaps more accurate explanation of Boece's statement about the global distribution of the capercaillie might be extrapolated from his error in the description of the species' feeding habits. Boece states that the species survives solely on bark, which is incorrect. The capercaillie's winter food is the needles of pine trees as distinct from bark. At first, this might appear a slight error in the description however; it is proposed here that this slight error is, actually, a reflection of the fact that Boece had never seen a capercaillie in the wild.

It is not disputed that Boece had been in the presence of a capercaillie, given his comments about the size of the species in relation to the size of a raven which are particularly accurate. However, it is argued here that the comments Boece makes about the species reflect the fact that he had only ever witnessed dead birds and, in addition, dead birds that were most likely set before him at table for consumption. There are many authors who comment on the flavour of a capercaillie (e.g. Shaw 1775; Hull 2001) and describe the flesh of the bird as having a distinctive 'resinous fir' taste; a flavour that, it is argued here, could cause an individual to assume that they were almost consuming the bark of a pine tree. During his time at the University of Aberdeen, it is unclear if Boece, occasionally consumed capercaillie, however being so closely situated to one of today's core areas of habitat of the species in Strathspey it seems reasonable to suggest that he did. It is thus suggested here that

Boece believed the species to be endemic to Scotland because he did not encounter it when dining during his travels in Europe and during his time in France⁹².

The next observation of the capercaillie comes from a collection of Latin manuscripts from between 1528 and 1529 written by Robert Lindsay of Pitscottie. These were collected, translated and published in English under the title '*Chronicles of Scotland*' by J G Dalrymple in 1814. Pitscottie's *Chronicles* contain a number of accounts of different aspects of Scottish history including the natural history of the country. An account of the capercaillie during the 16th Century is given in the second volume. It describes how in the summer of 1529, King James V went hunting in Atholl in the Central Highlands of Scotland. The *Chronicles* record that in preparation for the king's visit and during his stay in Atholl the earl made for the king:

[...]great and gorgeous provisioun for him in all thingis pertaining to ane prince, with fleshis, beiff and mutton, lamb, veil and venison, goose, gryse, capon, cunning, cran, swan, pairtrick, plover, duick, drake, cock and paunies, black-cock, muir-foull and capercaillies.⁹³

It is interesting that despite the fact that woodland cover on the Earl of Atholl's estate during the 16th century is reported as being significantly reduced the capercaillie was resident in the vicinity. It is also interesting that during the king's hunting trip to Atholl he was able to hunt, or to have hunted for him, all four grouse species that are currently extant in Scotland, the red grouse or muir-foull, the black grouse or black cock, the ptarmigan or termagant and the capercaillie. Each of these four grouse species are still present on the Atholl estate and it is interesting to note that the capercaillie is included with what could be referred to as both 'grand' and also more common foodstuffs such as heron or crane (cran) and young pigs (gryse) as well as mutton and beef. The wide variety of foods or prey reportedly prepared for the king's hunting visit is particularly interesting for the simple reason that the list contains the meats of almost all of the domestically reared animals, as well as almost all of the 'edible' large wild bird species regarded as native in Scotland. Thus, it appears that

⁹² If the capercaillie is assumed to have been resident in France during this period, this assertion also suggests that the species may not have been consumed to the same extent in France as it was in Scotland. A more detailed discussion of this point is outwith the scope of this thesis.

⁹³ Lindsay (1528-1529), Vol II page 343-344: taken from Dalrymple's edition (1814).

when preparing the feast as many wild and domestic meats as could possibly be obtained were presented.

The next mention of the capercaillie in Scotland is given by the mathematician and natural philosopher known as Jerome Cardan (1501-1576) in English, Girolamo or Hieronimo Cardano in Italian and as Hieronymus Cardanus in Latin. Cardan is perhaps most famous for his efforts in attempting to solve cubic and quartic equations using radicals, however, he also practised medicine and on 19 June 1551 he journeyed to Scotland at the request of the Scottish court to come to the aid of John Hamilton, Archbishop of St. Andrews. He successfully managed to help the Archbishop make a full recovery from what is reported to have been severe asthma attacks and was subsequently offered a permanent position in the Scottish Court. He did not accept this position however and returned to Milan on 13 September 1551. During his lifetime Cardan published numerous texts on a host of subjects, from cosmology to theories of mechanics and from natural science to cryptology.

In the year following his return from Scotland, Cardan published a series of texts that are known as his ‘Encyclopaedias of Natural Science’. In these texts, Cardan makes a variety of interesting observations about the natural world. These observations include references to things that he had encountered during his trip to Scotland, including the following observation:

[...] in Scotland they have the Avercailzie, which is found nowhere else.⁹⁴

This is the second reference to the capercaillie being endemic to Scotland and it is unusual again because of its inaccuracy and because the capercaillie is a native species to Italy, Jerome’s homeland. The distribution of the capercaillie is limited and the species is confined to areas of suitable habitat in the north of the country where it is known as the ‘*Gallo cedrone*⁹⁵’. It might seem reasonable to suggest here that Cardan might never have come in contact with the species during his lifetime. This is unlikely however, as Cardan was born in Pavia, in the Duchy of Milan, close to the core areas of capercaillie habitat in modern Italy. It is proposed here that Cardan had

⁹⁴ Cardan (1552).

⁹⁵ Translated as the ‘large galliform’ (Menomi Pers. Comm. 2005).

encountered and was familiar with the *Gallo cedrone* from his life in Italy. A native familiarity with the species, however, makes the explanation of his assertion of the species' endemic status to Scotland difficult. Assuming that Cardan was aware of the species suggests that while he was in Scotland he never encountered the bird in the wild. If he had it would seem reasonable to assume that he would have recognised the species. Similarly, given the unique flavour of the flesh of a capercaillie if he had consumed the species while he was in Scotland he would have most likely recognised the species. Thus, it is proposed that while in Scotland, Cardan never encountered the species alive or dead and that the most likely explanation for his comments on the endemic nature of the species can be arrived at from the spelling of the form of the name he gives to the capercaillie.

The various English names given to the capercaillie have been discussed in detail in Chapter 1. Of the names given to the species the noun used by Cardan, 'Avercailzie', is only used on one other occasion; by Hector Boece in 1526. Thus, it seems reasonable that Cardan, while he was in Scotland and being an educated man with a keen interest in science, spent a significant amount of time in discussion with his learned Scottish peers and in reading the available texts. During this time he would most likely have encountered Boece's history and it seems reasonable to suggest that he had a keen interest in its contents. Given that the capercaillie is the only species in the world to have a common English name derived from Scottish Gaelic, it seems reasonable to propose that when he read the word 'Avercailzie' in the text, no familiar species came to mind. Indeed, given Boece's additional comments about the endemic nature of the species it seems rational for Cardan to have concluded that the species was indeed endemic and not a close relation of the *Gallo cedrone* of his homeland.

The next observation of the capercaillie during the 16th Century occurs in the 1570s. In 1578 the Bishop of Ross, John Lesley or Leslie (1527-1596) published a ten volume history of Scotland titled *De Origine Moribus et rebus gestis Scotorum*. In keeping with the productions of his contemporaries, this text includes comments on the origins of the Scottish people and observations from the natural world. Included within this text is a description of his bishopric in which Leslie mentions that the capercaillie is resident in Ross, Lochaber and in other places of suitable habitat:

In Ross and Lochaber, and other places among hills and knows that are not in missing fir tree sufficient, where oft sits a certain fowl and very rare called the Capercayle to name, with the vulgar people the horse of the forest, less indeed then the corbie which pleases their mouth, who eats her, with a gentle taste, most acceptable, she licks of only the twigs or tender branches of this tree.⁹⁶

The description of the capercaillie provided by Lesley is ecologically accurate and the most precise of all of the historical observations of the species included in this thesis. The comments on the feeding habits of the species and its habitat are exceptionally exact and suggest that the Bishop of Ross was very familiar with the species and its habits. Indeed the extent of Lesley's accuracy is highlighted when it is considered that it has only been in the last forty years or so that modern ecological science has come to accept that the feeding preferences of capercaillie during winter months are for the needles of Scots pine or 'fir' trees.

Lesley's description of the species is interesting for several other specific reasons. In the first instance, Lesley provides comments on the precise locations that the species inhabits at the end of the 1500s. The localities that Lesley states the species frequents are Lochaber, Ross and other areas containing 'sufficient' pine trees. It is interesting that the species is resident in these areas of Scotland during the 1500s for several reasons. Firstly, the distribution of the capercaillie in Scotland today does not include Lochaber or Wester Ross. Indeed it is reported that the current levels of precipitation in these regions make the areas unsuitable for the capercaillie for the reasons associated with brood rearing by the capercaillie hen as presented in Chapter 1. Secondly, in addition to fixing the distribution of the species Lesley also comments on the habitat of the species and its behaviour. These comments are interesting in that they make a slight and partial reference to the extent of forest fragmentation in the Highlands during the 1500s and the behaviour of the species.

The Bishop states that in *other places among hills and knows that are not in missing fir tree sufficient [...] oft sits a certain fowl*. It is tempting to 'over-extrapolate' from this statement a variety of points about the condition of the natural population of

⁹⁶ Lesley (1578), page 24: From the translation of James Dalrymple edited by E G Cody and published in 1895.

capercaillie and the Highland forests at the end of the 1500s. From a conservative perspective however, it seems safe to assume the following: Lesley's comments about the species' presence in the 'hills' and 'knows' with sufficient woodland cover allude to the fact that he had a rough idea of the quantity of woodland required to sustain a population of capercaillie. Thus, it seems reasonable to assert that during this period the capercaillie would most likely have been distributed in the larger forest fragments located at altitudes and other 'knows'.⁹⁷

Similarly, although the Bishop may have had literary reasons for describing the species as 'oft' sitting in the forests, it is argued here that Lesley is actually presenting a specific aspect of the species' behaviour. It is regularly recorded in various accounts of hunting the capercaillie that during and around the winter months, before the start of the lekking season in spring and after the chicks have fledged in the autumn, capercaillie can regularly be found roosting in the branches of 'old' pine trees, particularly after dusk. In these accounts, the 'hunters' regularly report that the 'sitting' birds are the easiest to hunt. Thus it seems reasonable to suppose that Lesley, whether through 'wanderings' in the forest or through the direct hunting of the species himself, was aware of the particular habits of the capercaillie.

Also of interest from Lesley's observation of the species is the comment he makes regarding the rarity of the birds. The capercaillie is known today to be a secretive and retiring species that prefers to remain undisturbed (e.g. Moss & Picozzi 1994). Thus, it is possible that, due to this particular behavioural characteristic, the Bishop of Ross seldom encountered the species. Given the level of knowledge of the species that he demonstrates, however, it suggests that this is, in fact, not the case. The specific references to the distribution of the capercaillie as well as the comments he makes about the habitat quality that the bird was usually found in suggests that Lesley's comment about the abundance of the species can be considered to be accurate. Thus, it appears that by the end of the 1500s in Scotland the capercaillie was already becoming rare in some parts of the country on the west coast that it had normally inhabited.

⁹⁷ The Forestry Commission's Ancient Woodland Inventory illustrates that the majority of surviving fragments of woodland from the 1700s were located at altitudes and by lochs and rivers.

Lesley's account is also interesting, on a different note, because of his comment about the flavour of the flesh of the capercaillie and the account he provides of another avian species regularly consumed by the 'vulgar people'. The Bishop of Ross records that the raven and/or⁹⁸ other corvids (the corbie) were regularly consumed in the Highlands during this period. This is interesting because corvids are known to be opportunistic predators of capercaillie. The fact that corvid species are hunted and consumed during the 1500s in some parts of the Highlands of Scotland is important when considering the persistence of a population of capercaillie. The hunting of corvids by humans would regulate their numbers to a certain extent, depending on the intensity of the hunting, and thus would help to reduce their impact on the predation of the capercaillie.

The final point of interest from the Bishop of Ross's account of the capercaillie is his reference to the flavour of the flesh of the species. It has been noted above that Boece regarded the species as having a 'bark-like' taste. Thus, the flavour of the flesh of the birds was undoubtedly distinctive compared to other wild meats consumed during the 1500s. This idea of a distinctive bark-like taste does not necessarily infer either a general like or dislike of the meat of a capercaillie by the general populace of the Middle Ages in Scotland. However, the Bishop of Ross's account goes one step further in his description of the flavour of the flesh of the capercaillie and describes it as 'most acceptable' and states that it has a 'gentle taste'. Given these comments, it seems more than reasonable to suggest that the species was most likely a highly prized dish for the medieval table.

The next observation of the capercaillie's occurrence in Scotland during the 1500s is made by Raphael Holinshed (died c.1580) in his *Chronicles of England, Scotland and Ireland* published in 1578, the same year as John Lesley's history. Holinshed's account of the capercaillie is copied exactly from Boece's earlier account of the species and thus it is not provided here. Holinshed's account of Scotland begins with the following statement:

⁹⁸ The term 'corbie' is sometimes used to describe other corvid species.

The description of Scotland, written at the first by Hector Boetius in Latine, and afterward translated into the Scottish Speech by John Bellenden archdeacon of Murrey and now finallie into English by WH.⁹⁹

No further observations of the capercaillie in Scotland during the 1500s have been found in the historical sources searched in this study. This includes the documents found in the surveys of the Breadalbane and the Atholl muniments as well as the existing non-manuscript material. There are references to the hunting of wild fowl and game contained within the muniment collections but none of these specifically mention the capercaillie by name. For example, a document from the collection of transcribed documents published in the *Black Book of Taymouth* (1855) illustrates the way in which wild meats were used during the 16th century. This particular document¹⁰⁰ is a transcript of a letter from King James VI (1567 – 1625) to Sir Duncan Campbell of Glenorchy, dated 31 July 1594 and stating:

Transcript 1:

To our Rycht traist friend The Laird of Glenurquhy.
Richt traist friend, we greit yow hartlie weill. The incertantie of the tyme of the arrival of remanent foreynn ambassadouris and sum uthir speciall occasionis hes constraint ws to prorogat the tyme of oure deirest sonis baptisme to Sonnday the xvij of August, quhair of we haue thocht guid to adverteiss yow, desiring yow effectuoslie that ye will not fail to be ws the xv day of the said moneth at the farthest, and to haist in sick quick stufe as ye haif in reddienes to support to the chairgis to Striuling betwixt and the sevint day of the said moneth, and vennesoun and wyld foull as it may be had about the day of the solempntie, as ye will gif pruiiff at this tyme of your guid effectioun, to the honoure of ws and the cuntrey: sua we commit yow to God.
At Stirling, the last day of July 1594.
James R

This document highlights the nature and type of occasion when the wild animals of the Highlands of Scotland were harvested. In addition, this document reinforces the view drawn from Pitscottie's observation of the capercaillie that during a particularly auspicious occasion the importance of providing a great array of wild meats was

⁹⁹ Holinshed (1578) Chronicle of Scotland, Chapter 1, Page 7: Holinshed's Chronicles of England, Scotland and Ireland were accessed online at the University of Pennsylvania's website.

¹⁰⁰ The original manuscript of the transcribed document published in the Black Book of Taymouth no longer survives in the Breadalbane Muniment collection held at the National Archives of Scotland. Nevertheless, a similar document from the Atholl Muniments has been found and this would suggest that the contents of the transcription are most likely accurate.

particularly important. It is difficult to ascertain whether or not James VI expected to receive several capercaillies along with the other wild fowl and venison he requested for the feast to celebrate Prince Henry's baptism. It is interesting to simply note here that although wild fowl were requested the capercaillie was not specifically mentioned. This certainly gives credence to the idea that they were suitable for a royal feast although they were not specifically desired or requested.

3.7) 17TH CENTURY TO 18TH CENTURY

Specific observations of the capercaillie in the period between the 17th and 18th century are much more numerous in the surviving material from the historical sources consulted for this period rather than the previous period. The first observation of the species found during this survey occurs in a document from the Atholl Estate. The original of this document no longer exists within the collection of Atholl Muniments held at Blair Castle; however, a transcript of this particular document is contained within the account of Blair Atholl in the Statistical Account of Scotland (1791-1793). This is the earliest chronological observation of the capercaillie during the 17th century and is, again, a request from James VI dated 14 March 1617. In this document, James, writing from Whitehall, asks the Earl of Tullibardine, an ancestor of the Dukes of Atholl, to send to him at various times, capercaillies and black grouse during his journey into northern England and Scotland. The document reads as follows:

Transcript 2:

JAMES,
Right trustie and right well beloved cosen and counsellor, We greet you well. Albeit, Our knowledge of your dutiful affection to the good of Our service, and your countries credite, doeth sufficienthe persuade us that you will earnestlie endeavour yourself to express the same be all means in your power; yet there being some things in that behalf requisite, which seem, notwithstanding, of so meane moment, as in that regard, both you and others might neglect the same, if Our love and care of that Our native kingdom, made Us not the more to trie their nature and necessity, and accordingly to give order for preparation of every thing that may in any sort import the honour and credite thereof. Which consideration, and the known commoditie yee have to provide, capercallies and termagantis, have moved Us very earnestlie to request you, to employ both your oune paines and the travelles of your freendis, for provision of each kind of the saidis foules, to be now and then

sent to Us be way of present, be meanes of Our deputy thesaures; and so as the first sent thereof may meet us on the 19th of April at Durham, and the rest as we shall happen to meet and rancounter them in other places, on our way from thence to Berwick. The raritie of these foules will both make their estimation the more precious, and confirm the good opinion conceaved of the good cheere to be had there. For which respectis, not doubting but that yee will so much the more earnestlie endeavour yourself to give Us good satisfactions a tent the premises as ye will do Us acceptable service. We bid you farewell.
At Whitehall, the 14th Marche, 1617¹⁰¹

This request to send capercaillie south for the king is very similar to the request made to Campbell of Glenorchy in 1594. It is interesting that on his first return visit to Scotland after the Union of the Crowns, King James VI and I should request to have capercaillie and ptarmigan sent to him during his journey northwards. Indeed, it is also interesting to note that the king should write to the Earl of Tullibardine to request this. There are two potential explanations for this request. In the first instance, it is possible that the king was aware that Tullibardine had capercaillie on his land and, secondly, it is possible that the king may have known that the earl had the means to obtain capercaillie and ptarmigan from some other location other than his land. It is asserted here, given the nature of this request and the request made to Glenorchy in 1594 that King James regularly requested ‘wild meats’ that would be sourced from the estates of Highland landowners.

There are two other interesting points of discussion raised by this document. Firstly, it is worthy of note that both capercaillie and black grouse are specifically requested to be sent south during the king’s journey north. Also of interest is the fact that both of these species are reported as being rare and that being thus, the party travelling north with the king would have higher estimations of the *the good cheere to be had* in Scotland. It would appear possible, given both this request and the request made to Glenorchy during the 1590s, that King James VI and I was particularly fond of capercaillie and ptarmigan meat. The proposition that wild meats played an important part in the diet of the Scottish aristocracy during the 16th and 17th centuries is given credence by other documentary evidence that has been found in the course of research for this thesis.

¹⁰¹ Atholl Muniments (1617): Statistical Account of Scotland; Vol. XX, page 473. Letter from James VI to the Earl of Tullibardine requesting black cock and capercaillie.

During his *Pennyles Pilgrimage* by foot through Scotland in 1618, John Taylor (1580-1654) the ‘Water Poet’, visited the area around modern day Braemar. Taylor’s journey through Scotland in 1618 is reminiscent of the journey made by fellow poet Ben Jonson (1572-1637) earlier that year. Taylor was born in Gloucester and educated at the Crypt Grammar School in that city. Early in his life he was ‘press-ganged’ into the Royal Navy and after his service he returned to England and took up employment on the River Thames in London as a ‘Waterman’, ferrying people between the banks of the river. Taylor published over one hundred and fifty separate literary pieces during his life, many of which were related to internal and external disputes of the guild of boatmen on the Thames. He also published numerous pieces of prose and verse that were usually paid for in advance by subscription.

It is reported that for his journey into Scotland, Taylor received in excess of one thousand six hundred subscribers and upon his return he had four thousand five hundred copies of the account of his travels published. In this account of his travels he makes a *Visit to the Brea of Marr* in 1618 and during his sojourn there he travelled and lodged with Lord Erskine. Taylor records that during his travels through Braemar, Erskine’s kitchen was:

[...] always on the side of a bank, many kettles and pots boiling, and many spits turning and winding, with great variety of cheer; as venison baked, sodden, roast, and stewed beef, mutton, goats, kid, hares, fresh salmon, pigeons, hens, capons, chickens, partridge, moor-coots, heath-cocks, capercailzies, and termagants; good ale, sack, white, and claret, tent, or alicante, with most potent Aquavitæ...all these, and more than these, we had continually in superfluous abundance, caught by faulcons, fowlers.¹⁰²

It appears that Taylor was out on a hunting trip with Lord Erskine and it is interesting again to note that whilst travelling through the countryside that his host had falconers and fowlers in what could be construed as constant attendance. Once again this account helps to illustrate the fact that all members of the grouse family could be found in this region and that they were regularly caught.

¹⁰² Taylor (1618)

In 1621 the first occurrence¹⁰³ of the capercaillie in Scottish legislation is observed when James VI and I passed an Act in the Scottish Parliament for provision against the buying and selling of *wyld foulles* at markets. These wild fowls included *termigantis*, *quailzeis*, *caperkailzeis*¹⁰⁴; namely ptarmigan, quail and the capercaillie. The penalty incurred by any individual caught buying or selling these wild fowl at a market place was £100 Scots. This Act appears to illustrate that by the 1620s in Scotland various species of wild fowl had declined in numbers. This decline in numbers of various species of wild fowl, it could be inferred, was more dramatic in its nature than had ever been perceived previously in Scotland. Indeed it could be argued that the decline in numbers of wild fowl was so great that it required legal intervention to try and redress the decrease. The motivations behind the passing of such an Act are, however, unclear and difficult to quantify¹⁰⁵ at this point, but it bears comparison with a number of other contemporary legislative measures designed to conserve or protect scarce commodities and items.

The next mention of the capercaillie in Scotland occurs nine years later in Sutherland. Sir Robert Gordon's account of the *History of the Earldom of Sutherland, up to the year 1630*, first published only in 1818, states that the capercaillie was a resident of the county of Sutherland. He asserts that:

All these forrests and schases are verie profitable for fieding of bestiall and delectable for hunting. They are full of reid deir and roes, woulffs, foxes, wyld cattis, brocks, skuyrrells, whittrets, weasels, otters, matrixes, hares and fumarts. In these forrests, and in all this province, ther is great store of partridges, pluivers, capercalegs, blackwaks, murefowls, heth-hens[...].¹⁰⁶

On King Charles I's return to Scotland in 1633, several requests by various different people were made of Sir Duncan Campbell of Glenorchy between March and June of that year to provide capercaillies and venison for feasts in honour of the king's

¹⁰³ The capercaillie has been reported by Harvie-Brown (1879) as occurring in Act XXIII (1600) of the Acts of the Scottish Parliament. Upon consulting the Act no reference was found to the capercaillie.

¹⁰⁴ Acts of the Scottish Parliament: James VI, XXX 1621.

¹⁰⁵ For a more detailed discussion of the potential motivations behind the passing of this Act see Chapter 6.

¹⁰⁶ Gordon (1630)

Scottish coronation. The requests for game were sent to Glenorchy from earls and other gentlemen residing at Holyroodhouse that may have possibly comprised the king's privy council in Scotland. On 5 March 1633, they wrote:

Transcript 3:

Document 1 of 2

After our verrie heartlie commendationis The Kingis Majesty being resolved God willing in this approaching sommer to honnour this his antient Kingdome with his royall presence It is therefore verrie necessar for the creditte of the Countrey that there be had of all suche thingis for furnishing his housse as the Countrey may affoord sufficient provisionis in that behalf, It must thairfoir be suppleyed be the affectioun of his Majesteis affected subjectis Off the whilk number yow being one These ar thairfoir to requeist and desyre yow to provyde and send be way of present, To his Majesteis housse At Halyruidhous the saxtene day of Junij nixt or thereabout some veale, fed caponis, dovis, partridges, poutis, murefoullis, blakcockis, greyhennis, turkeis, dottrellis, young haireis, and pairyridges with egis as yow best may Wherin yow will do unto his Majestie acceptable pleasoure, and soe wee committ yow to Godis protectioun frome Halyruidhous the fyft day of Marche 1633.
Youre verrie good freindis Strathyrne Wintoun Lorne Arskyne Dunkeld Carnegy Traquaire Arch: Acheson
[addressed] To our right traist freind the Laird of Glenurquhie

Document 2 of 2:

Ryght Honorable Sir and our loveing good friend
Wheras his Majesties entre To this his native kyngdome now approaches Quhairin all his Majesteis Loyall and trew subjectis wilbe most willing To Contribute ther best helpe for his Majesteis royall receptione And because we intend besyid many uther chargeable services for the honor of this kyngdome and Credite of this burgh To prepar ane Royall banquet for his Majestie and nobilitie Alsweill straingeris as of this his ancient kyngdome That sall repair to this burgh At suche tyme as his Majestie salbe best pleased to appoynt, And becaus we intend besyid many uther chargeable services for the honor of this kyngdome and Credite of this burgh To prepar ane Royall banquet for his Majestie and nobilitie Alsweill straingeris as of this his ancient kyngdome That sall repair to this burgh At suche tyme as his Majestie salbe best pleased to appoynt, And becaus we have no vennesone or wyld meattis for that use Bot suche as ar brocht frome remoit pairtis of this kyngdome We have thairfore taken the boldnes as to Intreatt yow as ane of our most trustie and approved good freindis as ane quha regairdis the honor of the Natioune and Credite of the good toun that we may have some vennesone and Caperkealzieis frome yow upone our nixt advertisement quhen we ar better acquainted with his Majesties dyett, ffor ye quhilk as We sall think our selffis most grettumlie ableged to your honor so sall we be most redde to mak retributioun as zow sall have occasioun to use ws sua expecting your ansuer we sall ever remayne
Edinburgh the 18 Maij 1633.

Your Loving Freindis The Provost and Baillies of Edinburgh A. Clark provest
Johne Sinclair Baillie Williame Gray Baillie Ja. Murray Baillie George Baillie
[addressed to] To the Rycht Honorable and our most loveing freind Sir Coline
Campbell of Glenurquhay knyght Barronet.¹⁰⁷

Glenorchy was requested to provide the writers on 16 June 1633 with *some veale, fed caponis, dovis, partridges, poutis, murefoullis, blackcockis, greyhennis, turkeis, dottrellis, young haireis, pairyridges with eigs as yow best may*. The second request to the Laird of Glenorchy was made by the Provost and Baillies of Edinburgh on 18 May 1633. The Provost and Baillies explain that they desire to begin making preparations for *ane Royall bancquett* in celebration of the King's coronation. However, they explain to Sir Duncan that they *have no vennesone or wyld meattis for that use Bot suche as ar brocht frome remoit pairtis of this kyngdome*. These men from Edinburgh request *some vennesone and Caperkealzies frome yow upone our nixt advertisement quhen we ar better acquainted with his Majesties dyett*¹⁰⁸.

A third request for wild meats was made by the Earls of Morton and Traquair from Holyroodhouse in June 1633. They do not mention the capercaillie specifically in this document, but they do request that Glenorchy provide *venesone and wyldfoullis* for feasts to be held in the king's honour. In addition, Glenorchy was asked to provide the same *frome weik to weik during his Maiestie's jestis herin inclosed, als fresche and in alsdew tyme as convenientlie [he] may*. There is a note attached to the foot of this document detailing the king's itinerary during his stay in Scotland and intimating that Glenorchy should send wild fowl and venison to Edinburgh, Linlithgow, Stirling, Dunfermline and Falkland:

Transcript 4:

To the Laird of Glenwrqwhy.

Sir, – These ar to intreat yow to do all dilligence to caus slay and send to his Maiesties house at Halyrudhouse, against the threttene day of Junii instant, suche sortis of venesone and wyldfoullis as ar to be found within your boundis, and so frome weik to weik dureing his Maiestie's jestis herin inclosed, als fresche and in als dew tyme as convenientlie you may. Not doubing to your love to his Maiesties service, we rest
Youris gude freindis, Morton Traquaire
Halyrudhous, 6 Junii 1633.

¹⁰⁷ These documents are bundled and referenced together as one document: *NAS*, GD112/3/64/8b.

¹⁰⁸ *NAS*, GD112/3/64/8a.

His Maiesty commeth to Halyrudhowse the xv of Junii, and stayeth till the first day of Julii, quhilk night he will be in Litquhow, the next twa nights in Stirling, from that to Dumfermling i night, from that to Falkland foure nights, and from that to Halyrudhowsse, and thaire during pleasure.¹⁰⁹

There are no observations of the capercaillie in any of the documentary sources consulted here until 1651, shortly after the coronation of another Stuart king in Scotland. Following his return from exile in France in 1650 and despite the defeat of his army at Dunbar later that year by Oliver Cromwell, Charles Stuart, was crowned Charles II, King of Scots at Scone in January 1651. It appears that King Charles was still resident at Scone the following month, and there is evidence that suggests that while he was in Perth he encountered a Scottish capercaillie (see Transcript 5). On 3 February 1651 a servant of Glenorchy's, Jo Dickson, who was at that time resident in Perth, wrote to inform his master that he had presented the king with the capercaillie as instructed. Interestingly, the document states that the king was presented with the bird in his bedchamber but unfortunately the document does not state whether the bird was living or not. If the bird was living it suggests that the populous at that time were able to tie snares and traps that could procure a living capercaillie, something that is particularly difficult to achieve (see Lloyd 1870). However, Dickson went on to state that King Charles accepted the bird [...] *weel as a raritie, for he had never seen any of them before.*

Transcript 5:

To the Right worshipfull his much honoured friend the Laird of Glenorquye thes.

Much Honoured Sir, – Immediatlie after the receat of your letter on Saturday, I went and shew your capercaillzie to the king in his bedchamber, who accepted it weel as a raritie, for he had never seen any of them before. I have been telling your man that I have a mind to send a letle tronk with some of my wifes and my oune best clothes to the Highlands, and therfor, as I desire rather to be beholden to yow then others, so I must in this calamitous tyme crave pardon to be so far troublesome to yow as to desire that yow wold any time within this fortnight send one of your tenants with a naige and creiles on him with the bearer heirof, also to cary the said little tronk to your house of Finlarg, ther to remaine till I have occasion to dispose on it; which courtesie of yours I sall be ready to acknowledge really by all the service which God in better times sall enable me to doe unto yow.

And howsoever I sall still remaine, Sir, Your worships affectionat servant, Jo. Dickson

¹⁰⁹ *NAS*, GD112/3/64/12

Perth, the 3 Februar 1651.¹¹⁰

It is suggested here that this document, when considered in conjunction with the information provided earlier in this section¹¹¹, illustrates that the capercaillie had indeed become 'rare' certainly in Lowland Scotland or to Lowland Scots by 1651 AD. Furthermore, it is proposed here that the rare status ascribed by authors to the capercaillie during the 1650s, as well as earlier in the 17th century in Scotland, is similar to the modern interpretation of a 'rare' species¹¹². The fact that Glenorchy could still produce a capercaillie suggests that the species may still have been resident on his lands at this time. Conversely, it is also possible that the species had become extinct on his estate during the 17th century and the bird that he presented to Charles II was obtained from elsewhere. For the purposes of discussion in this thesis the capercaillie's residence on Glenorchy's estate at this time will be assumed to be accurate¹¹³.

The next chronological observations of the capercaillie in Scotland come from the Baron Court Records for Strathspey and Urquhart (1617-1683)¹¹⁴. The following transcripts are extracts from the Baron Court Records and they illustrate that the capercaillie were, most certainly, still resident in Strathspey and on the Laird of Grant's estate between 1667 and 1675 (Transcripts 6 to 10). The extracts document instances of bonds of caution being passed; these bonds are sworn promises by individuals that, should they be convicted of breaking them, are required to pay the associated fines. These documents also list the species for which the bonds were passed:

Transcript 6:

Court held at Culnakyle (Abernethy) on 17 August 1667

The said day Jon Grant of Featoche, Gregor Grant of Dell, Robert Grant his brother, Jon Grant of Riemore, William Grant in Conniche hes actit themselffis that they sall not in tyme cumming kill dear, roe, Capilkyllyir,

¹¹⁰ Transcribed from the collection of documents published within the Black Book of Taymouth.

¹¹¹ Including the assertions presented from the discussion of Transcripts 2 to 4.

¹¹² See Chapter 6 for a more detailed discussion of the justification behind this assertion.

¹¹³ This is assumed here for the sake of discussion; fuller comments on the historical distribution of the species are given in Chapter 6.

¹¹⁴ The following Transcripts come from GD248/76/2: Documents 1-130.

blackcock or their motheris or ressait anie from otheris that salbe killed Within the Laird of Grantis boundis under the pain of £100¹¹⁵

Transcript 7:

The court of Glencharnie holdin at Duthil 12 August 1667, Swyne Grant of Gartinbeg & Robert Grant of Ochterblair Bailzies etc.

Jon Grant laufull sone to the deceast Jon Grant of Delrachnie hes actit himself that he sall not kill dear or roe, Capilkylie, blackcock or their motheris in tyme cumming Wnder the pain of ane £100 or ressait of thame that salbe killed in the Laird of Grantis boundis Without libertie¹¹⁶

Transcript 8:

The court of Glencharnie holdin at Gartinbeg 9 October 1668

The said day Alexander Grant of Delrachnie hes actit himself that he sall not kill dear, roe, capilkyl or black cock or their motheris or ressait aine of thame in tyme cuming Wnder the pain of £200¹¹⁷

Transcript 9:

The court of Cromdol, Innerallan, Abernethie & Glencharnie holdin at Bellintounn 3 of Januarii 1671, James Grant of Auchernake Bailzie, Jon Grant & Donald roy officeris etc.

The said day James Grant of Clurie hes actit himself as cautioner for Jon ewer? in Easter Tulloche that the said Jon sall not in tyme cumming kill aine dear, roe, Capilkealache, blackcock or their motheris Within the Laird of Grantis boundis Wnder the pain of £100 etc

The said day Grigor Grant apperand of Gartinmoir hes actit himself that he sall not kill dear, roe or Capilkelache within the Laird of Grantis boundis in tyme cumming Wnder the pain of £200

The said day William grant in Conniche hes actit himself that he sall not kill dear, roe or Capilkelache within the Laird of Grantis boundis in tyme cumming Wnder the pain of £200¹¹⁸

Transcript 10:

The barron court Att Bellintomb 19 of Aprill 1675

Duncan Grant in Lettoch deponed he killed ane rae in winter last before the sheriff of Murray late deceist his death without warrand And fried himself fra blackcockis and yrfore fyned himself in £100: Lykeas Duncan Grant enacted himself to be frie of killing deir, rae, blackcock each hen or Caperkelie in tym remaining within the landes forrestis under the paine of £100 Scots without the Lairdis libertie¹¹⁹

¹¹⁵ Document 85.

¹¹⁶ Document 100.

¹¹⁷ Document 80.

¹¹⁸ Document 102.

¹¹⁹ Document 127x.

The information contained within the documents displayed above highlight a variety of interesting points about the natural population of capercaillie in Scotland. In the first instance, it has already been illustrated that the capercaillie was regularly consumed by the aristocracy of Scotland during the 1500s and 1600s and these documents confirm that they were also consumed by the lower social classes during this time period. These documents are also interesting because of the lists of different species for which poaching fines were issued. These lists all include one or more of the same species in each of the transcripts; namely red deer, roe deer, capercaillie and black grouse. This is interesting because each of these species are forest dwelling animals. In addition, these transcripts also highlight that the hunting of the female of these species, their ‘motheris’, is also a fineable offence. This highlights the fact that the populous of the time¹²⁰ were aware of the ecological implications of hunting females of a species.

Another interesting point from these documents is the discrepancy between the sizes of the fine issued for each incident of poaching. For example in Transcripts 6 and 7 the fine for poaching all of these forest dwelling species is £100. On the other hand, Transcript 8 illustrates that for poaching [...] *dear, roe, capilkyl or black cock or their motheris...* Alexander Grant of Delrachnie was fined a sum of £200. The reason for this higher level of fine is unclear. Possible explanations for the discrepancy between the size of the fines could include things such as the quantity of animals poached or incidences of repeat offenders, however without any additional information it is difficult to assess why the fines differ in magnitude. It is also interesting to note that the £100 sum issued as a fine to the individuals in Transcripts 6, 7, 9 and 10 corresponds exactly to the size of fiscal penalty laid down in James VI’s 1621 Act¹²¹.

In 1678 the capercaillie is recorded as being resident in the County of Angus although by the 1670s it had not been seen [...] *for many years*. This report of the capercaillie in Angus comes from a translation of a Latin account of the County, published in 1793 and entitled *A Description of Angus, translated from the original Latin of Robert Edward, Minister of Murroes, Dundee*. In addition to the comments made by the

¹²⁰ This level of ecological knowledge is perhaps not surprising given the fact the economy of this time in the Highlands of Scotland was largely agricultural. The importance of the female of any species would be easily apparent to anyone involved in animal husbandry.

¹²¹ For a fuller discussion of the incidences of poaching the capercaillie occurring in the Baron Court records see Chapter 6.

minister, the translator of the document adds the note stating that the capercaillie had not been seen for thirty years in Angus and that the last recorded sighting of the species was in the region of Strathspey.

Angus is well stored with tame fowl and the larger kinds of birds, as hens of Brazil, peacocks, geese and ducks. The mountains and heaths abound with partridge, Capricalcis, and plover.

In the above extract there is a footnote placed beside the word ‘capricalcis’ which states that:

It is still an inhabitant of Sweden and Norway and also some parts of Wales. The last one was seen about 30 years ago in Strathspey.¹²²

The final instances of the poaching of the capercaillie occur in the Baron Court Records of Strathspey and Urquhart¹²³ (1617-1683) in 1683:

Transcript 11:

The said day William Grant of Lurg hes actit himself that he sall not kill dear, roe or capilkealie within the Laird of Grantis boundis in tyme cuming Under the pain of £200

The said day William Grant of Lurg hes actit himself as cautioner for the said Donald gow that the said Donald sall not kill dear, roe or Capilkealie within the said Laird of Grantis boundis in tyme cuming under the pain of £100 and the said Donald hes actit himself to releive his cautioner

The said day Robert Grant in Kinhirdie hes actit himself that he sall, Will Grant cationer, not kill dear, roe or Capilkealie within the Laird of Grantis boundis Wnder the pain of £200¹²⁴

The final mention of the capercaillie in any 17th century documentary accounts surveyed in this thesis comes as a fleeting observation by the Scottish physician, geographer and natural historian Sir Robert Sibbald (1641-1722) in 1684. Sibbald states in his monograph *Scotia Illustrata* that the capercaillie still inhabits areas of Scotland and that it is part of [...] *de animalibus Scotiae*.

¹²² Colvill (1793) page 17.

¹²³ The following Transcripts come from GD248/76/2: Documents 1-130.

¹²⁴ Document 77.

3.8) 18TH CENTURY TO 19TH CENTURY

No observations of the capercaillie in Scotland have been reported in this study during the early 1700s. The first 18th-century description of the species comes in the published account of the travels and exploits of Edmund Burt, a British Army captain. During his time stationed in Scotland, Burt sent a series of letters to an acquaintance in London that were later published in a single volume called *Letters from a Gentleman in the North of Scotland*. These letters contain a variety of observations of both the social and environmental nature of the Highlands of Scotland during the 1700s. Burt comments on a great variety of different aspects of ‘Highland life’ ranging from things such as the etiquette of the people to the weather and the agricultural production of the region. In his account of the interesting foodstuffs consumed by the Highlanders, Burt mentions the variety of wild game that could at that time be taken from the hill, forests, rivers and sea lochs. In his description of this game he provides the reader with a detailed account of a ‘wild turkey’ from the mountains that he found particularly peculiar:

Of the eatable part of the feathered kind peculiar to the mountains is, first, the ‘cobberkely’, which is sometimes called a wild turkey, but not like it, otherwise than in size. This is seldom to be met with, being an inhabitant of very high and unfrequented hills, and is therefore esteemed a great rarity for the table.¹²⁵

Burt’s account of the ‘cobberkely’ is an interesting one for several reasons. Firstly, and perhaps most strikingly, despite the species’ apparent rarity in the late 1500s and 1600s, as is related from Bishop Leslie’s account of the species and the passing of the 1621 Act, the natural population of capercaillie in Scotland had somehow persisted into the 18th century. Burt’s account of the species is again interesting as he observed that the bird is ‘peculiar to the mountains’ and his description of the species being a bird of the mountain suggests that Burt might not have actually seen the species in the wild. Indeed it is also possible that he was only relating facts about the ecology of the bird that he had been informed of by someone else.

¹²⁵ Burt (1754), page 169.

An immediate assessment of his statement on the habitat of the species would lead the reader to assume that he was mistaken in this point, the capercaillie having habitat preferences for open stands of coniferous woodland, rather than the open moor or hill. However, the mountains that Burt refers to could have had substantial stands of woodland cover upon them, or it is also possible that his witness had mistaken a black grouse, a species of the moorland-woodland edge for the capercaillie whilst travelling in the surrounding area. Black grouse are known to have been resident in northern England and in the mountains of Wales during the 1700s and therefore it is reasonable to assume that Burt would have been familiar with this member of the grouse family before journeying north to Inverness. Thus, it is possible that Burt's mountains had a substantial covering of woodland or, perhaps more likely, that Burt is relating information on the habitat of the capercaillie to the reader that he received from another.

Burt goes on to state that the capercaillie is seldom to be met with as a result of its preference for 'very high and unfrequented hills'. It is worthy of note that this British officer made a very accurate assessment of the retiring nature of the capercaillie and its disdain for humans. The impacts of disturbance on the capercaillie are one of the most poorly understood factors that are believed to be causing the decline of the species throughout the western portion of its range today and it is perhaps not surprising that Burt found that the bird was [...] *seldom to be met with*, but it is perhaps more likely that this was due to the species' behaviour rather than its residence in 'high and unfrequented hills'. It is also interesting that Burt notes that the species is known to some as a 'wild turkey' but he also comments that the 'cobberkely' is not like it other than in size.

The members of the family Meleagrididae (turkeys and related taxa) are substantially different in appearance, physiology and morphology from the members of the family Tetraonidae, a fact that Burt observes. They do, however, have similar habitat preferences. Turkeys are of a reasonably similar size to the capercaillie with male turkeys weighing between 6.8 to 11 kg and hen turkeys between 3.6 to 5.4 kg, whereas the cock and hen capercaillie weigh around 4 kg and 2 kg respectively. The turkey is also of a similar height to the capercaillie: a gobbler (male turkey) stands at between 110-115 cm and a cock capercaillie stands at around 74 – 90 cm, the males

of both species also have a distinctive fanned tail. It is also interesting that Burt comments on the accuracy of referring to the capercaillie as a turkey as it is 'not like it, otherwise than in size'. Thus it is reasonable to suggest that Burt must have been familiar with the members of the family Meleagrididae, whether in their wild form through perhaps other military postings or in their domesticated forms.

If it is the case that Burt was familiar with the 'wild turkey' then it appears that his interest in ornithology or avian ecology, from a hunting perspective or otherwise, is perhaps greater than is expressed in the edited accounts of his letters. Thus, this potential interest that Burt might have had gives, perhaps, more weight to his comments on the habitat of the capercaillie and it could be the case that, due to a relatively sparse covering of woodland habitat in the hills to which Burt referred to the capercaillie was forced to make use of sites containing marginal areas of habitat that may have been more suitable for a different reason such as disturbance. The final and perhaps most important point that Burt informed his correspondent of was the fact that the capercaillie was 'esteemed a great rarity for the table'. Burt suggested that the bird was esteemed in this fashion because the species was seldom to be met with, therefore it could be construed that Burt suggested that there remained a substantial population of capercaillie in the vicinity, but because they were so hard to find, they were not often eaten.

This last point is interesting as it suggests that, as the bird was esteemed in this fashion, if the species were to be on the verge of extinction then this absence would be detected by the local populace. Then again, it is also possible that the local people of the region would have more pressing matters absorbing their time than the availability of a game species. This comment also suggests that, despite accounts to the contrary, the capercaillie was regularly consumed by humans resident in Scotland and that the flavour of the meat of the capercaillie was, to the majority, regarded as flavoursome. In Jamieson's 1818 edition of Burt's *Letters from the North of Scotland*, the editor also adds an interesting footnote asserting that:

The capercaillie, capulcoillie, avercailye became extinct in Great Britain about this time or shortly after (ie: 1754).¹²⁶

There are no observations of the capercaillie in the Breadalbane and Atholl Muniments until the 19th century. Nevertheless, given the growing interest in sport shooting in Scotland during the 1700s the state of the game on both the Atholl and Breadalbane estates is regularly reported upon¹²⁷. The condition of the game on the Breadalbane and Atholl estates is reported as being poor during the 1700s. For example, there exist several documents in the Breadalbane Muniments from the 1700s that highlight the low population sizes of the game on the respective estates. Transcript 12 highlights the fact that by 1759 the game on Breadalbane's Argyll and Perthshire lands had reduced significantly in size from earlier years. In addition, it is also interesting to note that the earl had requested that no shooting was to be carried out on his estate that year in order to 'preserve' the game. This document was published as an advertisement in two Edinburgh newspapers in circulation during the 1700s, the Edinburgh Mercury and Edinburgh Courant:

Transcript 12:

2nd July 1759

Advertisement for preservation of the Earl of Breadalbane's Game 2nd July 1759.

The Game upon the Earl of Breadalbanes Estates in Perth and Argyllshire being much decayed dimenished of late years for which reason His Lordship has resolved to do Strictly to preserve the Game on all His Grounds and muirs this season, and to prosocute transgressors according to Law, hoping no Gentleman will take it amiss that he's refusd a warrant for Sport to hunt 'tile the Game recovers.¹²⁸

This document suggests that the various species of game on Breadalbane's estate were low in number and that something was having an adverse impact on their survival. Although it is possible that the capercaillie may have been included here under the term 'game', it is unlikely that they were. During the 1700s the development of 'sport

¹²⁶ Jamieson (1818), page 71.

¹²⁷ There are numerous documents in both the Breadalbane and Atholl Muniments that report the state of the game on the estates during the 1700s. None of the documents surveyed in this study however include specific references to the capercaillie. See the Appendix to this thesis for extracts from these game reports.

¹²⁸ The Breadalbane Muniments: GD112/16/12/1/2

shooting' was growing¹²⁹ in Scotland, particularly grouse and deer hunting. It is asserted here that the game referred to in Transcript 12 is in actual fact red grouse that were hunted on the 'muirs' and red and roe deer that were hunted, both on the moors and on other parts of Breadalbane's 'grounds'. It is likely that if, when out shooting, any of the sportsmen encountered another wild fowl they would have most likely shot at the species. Nevertheless, black grouse or indeed capercaillie, if they were still extant during this period, was not the intended quarry or the reason for applying for the hunting warrant.

Despite the shortfall of game recorded on Breadalbane's estate it appears that the capercaillie was still resident in Scotland and still persisted in some locations. In 1887, Kemp (1887) published the letters of the Right Reverend Richard Pococke's journeys through Scotland in the 1740s. Pococke was the Bishop of Meath and travelled extensively throughout Europe and Wales in the early 1700s. He made tours to Scotland in 1747, 1750 and in 1760, and the collection of letters published by Kemp includes accounts of these visits. Although Pococke did not encounter a wild capercaillie on any of his trips, on his 1760 visit he was shown the carcass of a recently killed capercaillie. The carcass of the bird was reported to have been recently procured from the woods near Fort Augustus in Inverness-shire.

It is possible that there was no improvement in the condition of the game on Breadalbane's estate during the eight years between 1759 and 1767, as on 16 July 1767 another advertisement was placed in the Edinburgh Mercury and Courant regarding the state of game on Breadalbane's moors:

Transcript 12:

16th July 1767

The game on the Earl of Breadalbane's Moors in Perthshire being considerably diminished, his Lordship finds it necessary to preserve it for some years, & therefore gives notice that all persons who kill any game on his grounds will be prosecuted according to law, & hopes that no Gentleman will ask for a licence to sport there this season, his Lordship being obliged, tho unwillingly, to refuse it.

¹²⁹ For a more detailed discussion of the development of sport shooting see Chapter 6.

NB. The grounds abovementioned being in a part of the Country disarm'd by law, Every person carrying a Gun there, unless specially qualified for so doing, is liable to the penalties entailed by that law.¹³⁰

The 1767 notice is particularly interesting for several reasons. In the first instance, it is interesting to note that in the summer of 1767 it is the game on only the Perthshire lands of Earl of Breadalbane's estate that is again reported to have declined in numbers, whereas in 1759 it was the game on the Perthshire and the Argyllshire lands that were reported to have reduced in number. In addition, the 1767 document also intimates that the Earl of Breadalbane intends to 'preserve' the game on his estate for 'some years' and to request any gentlemen shooters not to apply for a licence to shoot. This is something that does not seem to have appeared necessary in 1759; or at least it did not appear necessary enough to include it in the advertisements placed in the Edinburgh Mercury and Courant.

The 'tone' of the advertisement is also worthy of note as in this instance the earl reinforces his request to avoid shooting over his moors with the threat of legal action, something that he did not do in 1759. Also interesting in this document is the note appended to the end of the draft advertisement; citing the post-1746 Disarmament Act which had been aimed at removing the military threat from pro-Jacobite Highland clans. The document states that the [...] *grounds abovementioned being in a part of the Country disarm'd by law, Every person carrying a Gun there, unless specially qualified for so doing, is liable to the penalties entailed by that law.* This highlights the Earl of Breadalbane's intentions to enforce the shooting ban on the Perthshire lands of his estate; as it appears that anyone caught carrying or poaching with a gun on his estate would be tried for a breach of the disarmament acts rather than simply poaching.

The next observation of the capercaillie in Scotland comes from one of the foremost naturalists of the 18th century, the Welshman Thomas Pennant (1726-1798). Pennant comments on the capercaillie in the published accounts of his journeys though Scotland in the 1760s and 1770s. Pennant made two 'Tours' of Scotland and published the account of his first trip in 1769 in a monograph that extended to three volumes and was titled *A Tour in Scotland*. Pennant's second tour occurred in 1772,

¹³⁰NAS, GD112/16/12/1/1

when he was accompanied by Reverend Lightfoot, a botanist who recorded much of the botanical information presented in his second monograph *A Tour in Scotland and Voyage to the Hebrides*. The accounts Pennant gives of his ‘Tours’ have been some of the most useful source of information on the condition of the natural environment in the Highlands and Islands of Scotland during the eighteenth century and have been cited extensively (e.g. Ritchie 1920, Lever 1977 etc). During his first tour of Scotland in 1769 Pennant was informed of a species of bird known, in English, as the ‘cock of the wood’. Although he did not see the species in the wild during that trip, he inserted the following note about the capercaillie in the second appendix of his first monograph:

Cock of the Wood: This bird is found in a few woods north of Lough Ness; perhaps in those near Castle Grant? Formerly, was common throughout the Highlands, and was called capercalze, and auercalze; and in the old law books, capercally. The variety of the black game, mentioned by M. Brisson under the name of coq de Bruyere piquetè, was a mixed breed between these two birds; but I could not hear that any at present were to be found in North Britain. Linnaeus has met with them in Sweden, and describes them under the title of ‘Tetrao cauda bifurca subtus albo punctata.’¹³¹

This comment about the capercaillie is interesting as Pennant has obviously had access to, and consulted, the ‘old law books’¹³² and from his observations there he states that the species was formerly common throughout the Highlands. Indeed, it must have been quite aggravating for such a keen naturalist to hear rumours of a forest bird that was as big as a turkey and still living in the woods north of ‘Lough Ness’ and yet never to encounter it. It is worthy to note that Pennant comments about the ‘hybrid’ produced between the mating of a capercaillie and a black grouse and the fact that Linnaeus’ had encountered the species in Sweden.

Prior to Pennant’s second tour to Scotland another naturalist, by the name of James Robertson (c. 1747-1817) from Edinburgh, made a journey through the Highlands of

¹³¹ Pennant (1769), page 181.

¹³² Possibly, Baron Court Records.

Scotland in 1771¹³³. Robertson was a keen natural historian and made several trips through the Highlands documenting the flora and fauna between 1769 and 1772. During his journey in 1772 he reports that hearing that a capercaillie had been seen in Abernethy Forest ‘..a few years earlier’, no more information on the observation is available. During Pennant’s second tour of Scotland and his voyage into the Hebrides in 1772 he recorded further details about the species and reported the location and extent of his encounters with it:

The cock of the wood, or capercaillie, or ‘capercalze’, a bird of this genus, once frequent in all parts of the Highlands, is now confined to the pine forests north of Loch Ness. From the size it is called ‘the horse of the woods’; the male sometimes weighing fifteen pounds. The colour of the breast is green, resembling that of the peacock: above each eye is a rich scarlet skin, common to the grouse genus: the feet of this and the black cock are naked, and the edges of the toes serrated; for these birds, sitting upon trees, do not want the thick feathery covering with which nature hath clothed those of the red game and ptarmigan, who, during winter, are obliged to reside bedded in the snows. Bishop [Lesley] describes three of the species found in Scotland: the capercaillie, which he truly says feeds on the extreme shoots of the pine: the common grouse, with its feathered feet; and the black cock. He omits the ptarmigan. It has been my fortune to meet with every kind: the three last frequently; the capercaillie only at Inverness.¹³⁴

Pennant’s account is particularly valuable for the level of detail it provides about the species. For example, he fixed a location for the species that he had alluded to in his previous publication (1769) stating that it was, in 1772, confined to the pine forests north of Loch Ness. Pennant demonstrated from his comments that he was aware of the species’ preference for pine forests and, in addition, he cited and remarked on the accuracy of Bishop Lesley’s 1578 observations about the feeding habits of the species. Pennant described the physical characteristics of the species accurately and revealed a marked level of understanding of the family Tetraonidae through his comparisons with other species of the genus. These observations suggest one of two

¹³³ Henderson & Dickson Eds. (1994).

¹³⁴ Pennant (1772), page 396.

things; firstly that Pennant had encountered and studied the species in the wild in Scotland on at least one occasion or possibly that following his tour in 1769 he researched the ecology and the behaviour of the species¹³⁵. Pennant stated that he has encountered [...] *the capercaillie only at Inverness* and thus, for the purposes of discussion in this thesis, it is asserted here that he most likely encountered the species both in the wild and, in addition, he most likely examined individual dead birds in order to provide such an accurate description of the species.

The next observation of the capercaillie was made by the Reverend Lachlan Shaw in his 1775 *History of the Province of Moray*. Shaw's observations on the species are perhaps the most accurate, in terms of the ecology of the bird, of any of the accounts given heretofore. Shaw wrote in detail about the social history of the province in his account and included a discussion of the wildlife of Moray, where he stated that:

The harmless wild fowls are the swan, Caperkylie (called also Cock of the Wood); in Latin, Capricalea, as if he infested the goats; but properly, in Erse Capal-coil – i.e., the Wood Horse, being the chief fowl in the woods. He resembles, and is of the size, of a turkey-cock, of a dark grey, and red about the eyes; he lodges in bushy fir trees, and is very shy; but the hen, which is much less in size, lays her eggs in the heather, where they are destroyed by foxes and wild cats, and thereby the Caperkylie is become rare. His flesh is tender and delicious, though somewhat of a resinous fir taste.¹³⁶

There are a number of important features in this observation. Shaw firstly suggests the origin of the English name of the species and also makes note that the species is sometimes referred to as the '*Cock of the Wood*', the name given by Pennant to the capercaillie. Secondly, his description of the physical appearance of the species, his assessment of the habitat of the bird and their predator avoidance behaviour is also very accurate. Furthermore, Shaw is the first individual to give an account of the striking difference between the male and female of the species. Not only does he

¹³⁵ The justification for this is as follows: capercaillie are commonly reported to roost overnight in Scandinavia by packing themselves in burrows of snow on the ground. Although this behaviour is commonly reported in countries such as Finland and Norway; it has never been observed occurring amongst any Scottish population of the species in recent times. Perhaps Pennant is citing other studies of the species when making this assertion about the survival of the birds during winter.

¹³⁶ Shaw (1775), page 207.

observe the size dimorphism between the sexes he also makes a very accurate assessment of the hen's nest site selection. Furthermore, Shaw's account of the predators and level of predation that the capercaillie hen, with her clutch and brood, faced is exceptionally accurate and his assessment of the causes of the rarity of the species that he reports is also remarkable. His level of observation is all the more remarkable when it is considered that these factors have only recently been shown by modern science to be a major factor contributing to the decline of the species today.

Shaw's account of the capercaillie is unique in that it shows that he had a detailed understanding of the ecology of the species, something that is not apparent from the other accounts of the species presented here. Thus, it could be presumed that he derived this intimate knowledge of the bird from having spent a substantial amount of time studying the behaviour of the species. His motivation for studying the species seems straightforward enough, given that he finds capercaillie meat 'tender and delicious, though somewhat of a resinous fir taste'. It is probable that he had hunted the species. Nevertheless, despite this probability, it is interesting that he did not feel that the hunting of the species by man was the cause of the capercaillie's rarity in Moray by 1775. There is a variety of possibilities that could explain the opinion that Shaw expressed. Initially, it is possible that he felt that man's hunting of game species was a 'natural act' that, despite the intensity of the hunting, was too natural in nature to cause the extinction of the species. Similarly, it is also possible that Shaw did not feel that the level of hunting of the capercaillie in Moray at the time of writing was significant enough to cause the species to become rare or, perhaps he felt that the level of hunting of the species by man did not compare to the level of predation that the capercaillie experienced from 'foxes and wild cats'.

In assessing Shaw's account of the cause of the rarity of the capercaillie it is difficult to distinguish whether or not he believed that the fox and the wild cat were responsible for solely taking the hen capercaillie's eggs or whether he felt that they also took adult birds. Although the fox has been observed taking adult capercaillies in Scandinavia, however, there have been very few studies of predation of the capercaillie by wild cats in recent times. There is no evidence to suggest that either the capercaillie or the wild cat take capercaillie eggs, therefore it could be suggested that Shaw was probably stating that it was predation of adult birds by foxes and wild

cats, combined with some unknown destruction of clutches of capercaillie eggs by another species. It is also worthy of note that Shaw believed the main cause of decline of the capercaillie during the late 1700s was poor breeding success as a result primarily of predation.

Poor breeding success in the capercaillie is known to be the primary cause of the current decline of the species in Scotland but in this case as a result of adult mortality due to impacts with forest fences and poor brood rearing productivity associated with climate change. It should be noted that although the topic of capercaillie predation is one that is highly disputed at present it is a subject that has only recently been seriously examined. Thus, it could be possible that the impacts of predation on the extant population of capercaillie in Scotland at present are underestimated and that predation could have been one of the major causes of the 18th century decline of the species in Scotland.

Many believe that the capercaillie become extinct or was extirpated in Scotland at some point between the late 1770s and the late 1780s. Thomas Pennant mentioned the species again, albeit briefly, in his “*British Zoology*” of 1776 and then again in his contribution to Reverend Lightfoot’s “*Flora Scotica*” published in 1777. In these accounts he suggested that the species might still possibly have been resident in Scotland in the late 1700s. This chronological account of observations of the species has now reached Pennie’s (1950) date of extinction of the last members of the native Scottish population. There are no observations of living capercaillie included in the first *Statistical Account of Scotland* (1798) and the lack of any observation of the species in that account gives credence to Pennie’s assertion that the species had become extinct by around the 1780s.

The *Statistical Account* does include several references to the earlier inhabitation of the capercaillie in several parishes and it would thus suggest that the lack of any positive ‘presence’ information from the accounts of any of the parishes in the Old Statistical Account supports the position that the species did become extinct shortly before the start of the 1800s. This point is given credibility given the relatively detailed level of comment made on the species in several of the accounts from different parishes about the capercaillie. For example:

The caper-coille, or Wild Turkey, was seen in Glenmoriston, and in the neighbouring district of Strathglass, about forty years ago; and it is not known that this bird has appeared, or that it now exists in Britain.¹³⁷

In addition there are also accounts of the capercaillie's historical occurrence in the Parish of Dowally in the county of Perth and in the Parish of Kirkmichael in the County of Banff; where it is stated that the capercaillie was:

[...] once a native here, is now totally extinct, and known only by name. He continued in Strathspey till the year 1745. The last seen in Scotland was in the woods of Strathglas, about 32 years ago.¹³⁸

These comments on the capercaillie are the last observations of the species in this chronology of the decline of the capercaillie in Scotland. Most contemporary scientists publishing on the species agree that the capercaillie became extinct in Scotland around this period and, at first glance, the historical documentary evidence surveyed in this study seems to a degree to support this assertion¹³⁹. Nevertheless, there are observations of the species during the 1800s and ecological points of importance that will be discussed later that serve to question this assertion. Similarly, there are issues surrounding the remarkable success of the reintroduction of the species within a fifty year period from the perceived date of extinction that also question the assertion of extinction.

3.9) SUMMARY

This chapter began by presenting a case for the date of the arrival of the capercaillie in Scotland. It has been proposed that the ancestors of the native population of capercaillie¹⁴⁰ arrived in Scotland sometime after the end of the Loch Lomond Stadial, by which time areas of suitable habitat had been established and, most likely,

¹³⁷ Statistical Account of Scotland (1978), Vol. XX, page 307.

¹³⁸ Statistical Account of Scotland (1798), Volume XX, page 248.

¹³⁹ See Chapter 6 for a more detailed discussion.

¹⁴⁰ The 'native population' being the population of capercaillie commented upon from the 1500s to the 1700s – not any potential 'native' population that existed prior to the end of the Loch Lomond Stadial.

before the arrival of humans in Scotland during the Mesolithic. At this time the Scottish capercaillie population was at its greatest and the species played an integral part in the ecology of the 'wild' forest biota, holding ecological relationships with a variety of species from higher and lower order taxa. Between the historic and the prehistoric period the quantity of suitable habitat available for the capercaillie reduced in size and deteriorated in condition. The reduction of the area of habitat available for the species created greater competition between individuals of the species for survival. This increased level of competition, brought about by a reduction in the availability of resources, caused the population to decrease.

Similarly, the deterioration of the quality of the remaining fragments of habitat brought greater pressures to bear on the mortality levels of the population; individuals of the species were exposed to higher levels of predation from opportunistic predators and the micro habitat features important to the species were lost or degraded. In the run up to the historic period in Scotland, the capercaillie lost ecological relationships that it held with many species through the process of extinction. Similarly, this period also saw the capercaillie in Scotland develop ecological relationships with species that it had no relationship with heretofore. The change in the quality of the available fragments of habitat also brought about a decline in the size of the extant population of capercaillie.

The quantity of suitable habitat in Scotland continued to decrease throughout prehistory into the historic period. As the quantity of habitat reduced in size so did the persisting population of capercaillie. The species is recorded as being widely distributed throughout areas of suitable habitat in Scotland during the 1500s and is known to gentlemen from the Scottish Lowlands and from the districts of Strathspey, Ross, Lochaber, Atholl and Glenorchy. Between 43 AD and the start of the 17th century the size of the extant population of capercaillie in Scotland remained at a relatively constant level in some areas, reduced in others and was lost entirely from some.

Requests for capercaillie and other game were being made by the aristocracy of Scotland during the 17th century to prepare for 'feasts' and other royal occasions. Similarly, the local populace was also regularly hunting the species in certain areas.

Predation by man is a factor that most likely impacted the extant population of capercaillie at this time and into the 1700s. As is the standard case in modern day conservation biology practices when the population of a species drops to levels that threaten the persistence of the population over time legal protection of the species is usually enacted. Interestingly, the historical documentary evidence illustrates that during the 17th century in Scotland such legal protection was afforded to the species and substantial fiscal penalties were issued for the killing or trading of capercaillie. The naturally occurring capercaillie metapopulation was in danger of extinction during the 18th century. It seems possible that in the two hundred years or so from the 16th century until the 18th century various capercaillie sub-populations were lost to extinction.

In the first instance these did not affect the overall national population. There still remained healthy capercaillie sub-populations and core areas of habitat that remained suitable to aid the persistence of the species. By 1700 however, it seems that there were only a couple of sub-populations remaining, apparently in Angus which possibly extended into Tayside and in the north-east of Scotland around Strathspey. Sometime during the 1700s would appear to be the critical point at which the national capercaillie population reached a critical point and it is perhaps not surprising that by the time of the publication of the *Statistical Account of Scotland* in 1798 the capercaillie was not recorded as persisting in any Scottish parish.

CHAPTER 4 – THE RESTORATION OF THE CAPERCAILLIE IN SCOTLAND

4.1) INTRODUCTION

The successful reintroduction of the capercaillie in Scotland during the 1800s is the only successful grouse reintroduction in a global context. This accomplishment is particularly difficult to explain for two reasons: first, because the species had become extinct in Scotland approximately fifty years earlier; second, because there have been recent failures in modern times at reintroduction despite scientists having greater knowledge about the species. The latter is particularly disappointing as environmental factors have not altered significantly since the nineteenth century and neither has the total quantity of suitable habitat for the bird.¹⁴¹

During the 1800s, the capercaillie was successfully reintroduced into a very similar environment in which it had become extinct fifty years or so earlier. It will be argued here that an examination of why this initial reintroduction of the species proved so successful will help to aid the assessment of the causes behind the observed decline of the species in Scotland during the 1600s and 1700s centuries. Accordingly, part of this chapter will give an account of the restoration of the capercaillie in Scotland between 1800 and 1900.

Modern accounts of the restoration of the species in Scotland are commonly presented by citing the descriptions of the reintroduction provided by both Harvie-Brown (1879) and Pennie (1950 & 1951). The first of these commentators, Harvie-Brown (1879), stated that following several failed attempts in the early 1800s the first successful reintroduction of the species in Scotland occurred following the release of birds reared on the Earl of Breadalbane's estate at Kenmore in Perthshire in 1837 and 1838. Further information is provided by Pennie (1950) who stated that from this initial release of birds at Kenmore the capercaillie spread throughout 'all areas of suitable

¹⁴¹ The quantity of timber in Scotland had certainly increased during this period. However, it is proposed here that the quantity of habitat suitable for the capercaillie did not increase to the same extent between 1800 and 1900.

habitat in Scotland' by 1900. This spread was aided both by subsequent introductions of birds and by the translocation of birds already settled in Scotland.

This chapter begins by examining the restoration of the species in Scotland starting in the early 1800s with the first attempted reintroductions and will continue until 1900, the date by which it has been proposed that the species had colonised 'all areas of suitable habitat in Scotland' (Harvie-Brown 1879). The chapter provides and comments on historical documentary information relating to the reintroduction of the species that has not previously been used for this purpose. This has been gathered from manuscript sources and provides detailed information on the movement of live animals between Scotland and continental Europe during the 1800s. An additional bonus is that this historical material supplies new information on earlier reintroductions of the species that have not previously been discussed. The chapter will conclude by providing a brief summary account of the history of the extant population of capercaillie in Scotland between 1900 and 2002. This latter date has been chosen because it was when the second extinction of the species in Scotland was first perceived as a possibility (Moss 2002).

The previous chapter of this thesis concluded by providing a summary of the proposed state and condition of the naturally occurring population of capercaillie in Scotland over time, from its arrival in Scotland after the Loch Lomond Stadial until its recorded absence from Scotland in the late-eighteenth century. Many commentators have stated that the ultimate cause of the perceived extinction of the naturally occurring population of capercaillie in eighteenth-century Scotland was brought about by the reduction and deterioration of the quantity of suitable habitat for the species (for example, Harvie-Brown 1879). This thesis concurs with this assertion at the national (Scotland) level as the total quantity of woodland cover in Scotland is known to have decreased rapidly between the Mesolithic and the Middle Ages. It would be incorrect, however, to state that the woodland continued to decrease at a similar rate from the Middle Ages up to the 1800s, as the woodland cover in Scotland had reached its lowest ebb by *c.*1600AD.

House and Dingwall (2003) have stated that since the Middle Ages, individuals in Scotland have had an active interest in the management and planting of trees. Indeed

they go on to argue that this interest grew in eighteenth and nineteenth century Scotland into a 'burgeoning interest in tree planting and forestry'. The first evidence for the relatively widespread planting of trees and areas of woodland in Scotland first comes in the second half of the seventeenth century with the passing of various acts by the Scottish and English parliaments. In Scotland, during the seventeenth century the planting of trees differed between localities and regions and was largely dependent on the motivations of the landowners of that time. This initial interest in the planting of trees and the establishment of new areas of woodland grew into a much larger movement during the eighteenth century and this has, to a certain extent, continued until the present day.

The eighteenth and nineteenth centuries in Scotland saw a dramatic change to the woodland component of the Scottish landscape. The 1700s saw the development of substantial planting regimes by various landowners. At this time large planting regimes were undertaken in the Highlands by the Duke of Atholl, the earls of Breadalbane and Argyll, the earls of Fife and Moray, Farquarson of Invercauld, and Archibald Grant of Monymusk. The majority of the species planted in these regimes was Scots pine and the Earl of Moray is reputed to have planted over 10,000,000 Scots pine trees that were all collected from seedlings on his estate. This interest in planting continued into the 1800s and, by 1812, it has been argued that there was around 914,000 acres of woodland in Scotland, 45% of which had been 'planted' (House & Dingwall 2003). By 1845 this percentage of planted woodland had increased to around 595,000 acres and included plantations of exotic tree species brought from overseas. The vast majority of these introduced tree species were conifers.

House and Dingwall (2003) have also stated that the rate of planting new areas of woodland in Scotland between 1750 and 1850 was approximately 4,000 to 6,000 acres each year. The majority of these new plantations were composed of coniferous tree species and were located in the counties of Inverness, Aberdeen and Perthshire. It has also recently been suggested that by 1812 the total estimated woodland cover in Scotland was around 9% of the total area of Scotland, only 7% of which was semi-natural in origin (Smout *et al* 2005).

Despite the increase in woodland cover during the latter part of the 1700s the capercaillie was still forced towards extinction. In the previous chapter it was suggested that sub-populations of capercaillie were lost between the 16th and 17th centuries, but that the overall national population was still able to persist. It was not until the 18th century, with the loss of some ‘core’ capercaillie populations that the persistence of the national population began its final demise. Evidently, given the success of the reintroduction, the impact of this critical factor had been mitigated during the 1800s by some change of conditions, natural or otherwise. The historical documentary evidence presented in the following sections of this chapter provides new information on the reintroduction. Similarly, this data provides a basis for the assessment of the impact of various driving factors of a population of capercaillie extant in Scotland at that time.

4.2) HISTORICAL CONTEXT OF THE REINTRODUCTION

The occurrence of observations of the capercaillie in the manuscript sources consulted in this study increases during the 1800s. There is no doubt that part of the reason for this can be accounted for by the increasing interest in shooting for sport in Scotland during the late-eighteenth and nineteenth centuries. As interest in shooting for sport increased so did the management of estate lands for this purpose. This increase in managing land for what would become known as ‘field sports’ is reflected in the muniments of estates between 1700 and 1900, as a greater number of individuals are employed, either specifically or partly, to manage wild game on the estates. Within these family records there are numerous documents detailing the specific actions that must be carried out by employees of estates working in the field. Similarly, interest in the natural environment of these estates also appears to increase, as the estate muniments understandably contain more documents on the subject of the local environment.

In addition to specific information on the capercaillie the historical documentation also illustrates the extent of ‘wild animal trade’ that existed in eighteenth and nineteenth century Britain. Indeed, this is a movement which has continued up to present day with the operation of zoological institutes and establishments. This information also serves to illustrate that on the large estates of Scotland in the

eighteenth and nineteenth centuries the reintroduction of other species believed to be native that had become extinct earlier in history and in prehistory was being carried out. The evidence from these historical documents also highlights the importance of the estate factor in the 1700s and 1800s as there is evidence to suggest that some of these reintroductions were being conducted without the knowledge of the landowner in question. Similarly, the number of incidences of wild animals being presented as gifts from members of the upper classes in continental Europe to the aristocracy in Scotland was also high.

These documents highlight the fact that the interest in the management of the Scottish estates was entering a new era towards the end of the eighteenth century and into the nineteenth century. It is perhaps not surprising that this new period of estate management occurred around the so-called ‘era of improvement’ which saw a dramatic transformation of rural society in Scotland. During this time, the perception of the natural environment as an enduring constant that humans were subject to changed to something entirely different. Instead, the natural environment increasingly came to be seen as a resource that should be managed, using a variety of different techniques, for human ends. As well as using the land for the production of crops and livestock the natural environment now also became something both to take delight in and to splendour in. This was the time of the creation of parklands around large estate houses and the deliberate alteration of the landscape to make it more pleasing to the human eye¹⁴².

Somewhere, in amongst this interest in the beautification of the natural environment for humans came the introduction of species. These introduced species were both translocated from the collection of extant flora and fauna in Britain at that time and introduced from overseas¹⁴³. During this time plants like the rhododendron and Japanese knotweed mammals like the grey squirrel and the muntjak deer and birds

¹⁴² *NAS GD112/12/1/6/27*: this document refers to the clearing away of old townships to ‘improve’ the visual landscape for Breadalbane.

¹⁴³ Species introductions and translocations were by no means exclusive to this period (for example, the introduction of the rabbit in prehistory). However, the interest in introductions and translocations during this period grew in popularity with landowners during this period.

like the pheasant¹⁴⁴ and the peacock were introduced into lands of large estates. The aforementioned introductions were so successful that populations of these species have expanded out their original range into other areas where they have survived up to present day.

Other species of fauna, particularly from the higher orders of life, were also introduced during this period. These, however, did not meet with the same success. The historical documents consulted in this study illustrate this interest in what could be referred to as the ‘husbandry of wild animals’ during the late 1700s and early 1800s. Indeed, it may be possible to go so far as to state that a significant amount of competition existed between various landowners in Britain as to who could have the most unusual collection of species on their estate lands. This was not a new phenomenon in human society: the keeping of a diverse range of wild animals has been a popular pursuit in human society since biblical times and still persists today.

Examples of this introduction, reintroduction and translocation are present in the historical records of both the Atholl and the Breadalbane estates. For example, the Atholl estate muniments record an account of the attempted reintroduction of reindeer in 1790. This account of the ‘Atholl reindeer’ highlights the substantial efforts and resources that were expended on these species and on their attempted reintroductions. In August 1790 the Duke of Atholl had seven reindeer, comprising three males and four females, delivered by sea to Edinburgh from Archangel in Russia. The Duke’s agent in Edinburgh, George Farquhar, was then responsible for transporting the animals from Edinburgh to Blair Atholl and, on 30 August 1790, he wrote to the Duke to inform him of the progress of the project:

Transcript 13

Edinburgh, 30 August 1790

I hired three men, careful and sober to guide the reindeer and lest any of them should sicken or die by the way, I sent a cart enlarged by spars to attend them. My orders were to walk them very slowly and rest frequently, especially in the heat of the day. I put on the Cart 40 sixpenny loaves, a bag of rusks and a quantity of fresh hay. I accompanied them myself four miles and left them

¹⁴⁴ There are detailed accounts of the beginnings of the captive rearing of pheasants on the Duke of Atholl’s estate from documents held in the Blair Castle charter room (for example, documents held in Box 54/3/246 concerning the captive rearing of ‘gold’ and ‘silver’ pheasants).

well and hearty. I ordered them to stop at the ferry all night and not to exceed a few miles the next day.

Judge my feelings when late last night I received an express telling me that one buck and a doe were dead at a place called Croftgates, four miles beyond the ferry. I have ordered them to stop there and as soon as the present hurricane of wind abates a little so I can get across the ferry, I shall set out and accompany them the rest of the way. The disappointment of part of my hopes, to put Your Grace in possession of what the King has often tried in vain to procure, cuts me to the bone. Had they been my own children I would not have taken more pains about them.

I am, Your Grace, yours faithfully George Farquhar.¹⁴⁵

By the time these reindeer reached Blair Castle four of them had died. Nevertheless, in December 1790 the surviving three animals (two females and a male) were released ‘into the wild’ on the Atholl estate. It appears that the Atholl reindeer acclimatised well to their new environment during the winter of 1790 as it was reported that they grew ‘[...] fat and seem to enjoy themselves’ in the hills around Blair Atholl.¹⁴⁶ The Duke then had additional individual reindeer brought to Scotland from Archangel in both 1791 and 1792 in an attempt to augment the population. None of these individuals survived, however, and, by the autumn of 1792, the last of the Russian reindeer surviving on the Atholl estate had died. The passage quoted above is also interesting for its description of the pains and efforts undertaken to ensure the safe delivery of the reindeer to Blair castle and it is also remarkable for the comment Farquhar made about the king’s attempts to reintroduce the species.

There are several instances where reintroductions and introductions of species on the estates of Scottish landowners was carried out shortly after the king had attempted to captive rear and release a species on his parks and grounds.¹⁴⁷ Indeed, in many cases it could be argued that the release of species on many Scottish estates was motivated by landowners who were attempting to gain favour with the ruling powers of the day. To sum up so far, the historical source material indicates that by 1800 a number of wild animal species were being transported from abroad to Scotland. These species were from many different taxonomic orders of life and little consideration was given to whether or not the species was at one time naturally occurring in the country. It is into this setting that the first attempted reintroductions of the capercaillie to Britain

¹⁴⁵ *Atholl muniments*, Box 65/8/143

¹⁴⁶ *Ibid.*

¹⁴⁷ This point will be discussed in more detail in Chapter 6 of this thesis.

occurred. The specific motivation and purpose behind the reintroduction of the species, however, remains a mystery at present.¹⁴⁸ In order to try and shed some light on this, the following historical account of the reintroduction of the species is divided into two sections. The first section will deal with the period before the Breadalbane reintroduction. The second section will deal with the period after the Breadalbane reintroduction.

4.3) HISTORICAL ACCOUNT OF REINTRODUCTION: 1800–36

The first mentions of the reintroduction of the capercaillie to Scotland in the 1800s come from the writings of a minister on the Island of Arran. Interestingly, in his *Natural History of Arran*, written in 1807, the Reverend J. Headrick stated that the capercaillie had only '[...] recently been lost from that island'. More importantly perhaps, he also stated that attempts to reintroducing the capercaillie to the woodland around Brodick Castle were in progress.¹⁴⁹ This is one of the first of several early attempted reintroductions of the capercaillie in nineteenth century Britain that met with failure.

Following the attempted reintroduction of the bird on Arran in 1807, the next recorded attempt was carried out in 1823 by Thomas Fowell Buxton on his estate in Norfolk in England. Buxton's cousin, Llewellyn Lloyd, had a pair of capercaillie (one male and one female) transported from Sweden to Buxton's estate at Northrepps. After a brief period of captive rearing the two birds were released onto Buxton's estate by his gamekeeper Larry Banville in autumn 1823. Within two months, however, both birds had disappeared from the woods round the house at Northrepps and Banville believed that they had fallen prey to foxes.

Around the same time as the previous attempt to introduce capercaillies in Norfolk, a similar attempt was made in Scotland on the Atholl estates. I.J. Leslie Melville, residing in London, wrote to the Duke of Atholl in 1822 to inform him that Melville's brother-in-law could send to him some living capercaillie. Melville also thought that

¹⁴⁸ A fuller discussion of this point is provided in Chapter 6.

¹⁴⁹ There exists no historical documentation to support the fact that the capercaillie was naturally extant on the Island of Arran in the nineteenth century.

due to his 'high fir plantations' the species would most likely thrive on the Duke's estate:

Transcript 14

My Lord Duke

My brother-in-law Mr Humphrey Miles Thornton who has lately returned from Russia has now at Gottenburg a Great Cock of the Wood and two hens, alive which are ready to be sent to this country as soon as he fixes a proper destination for them. From the extent of Your Grace's property, with the advantage of high Fir plantations, I think they would be much more likely to thrive at Blair than upon my Brother Leven's estate at Melville for which they had been intended. I avail myself with pleasure at Mr Thornton's desire of my very slight acquaintance to offer them to your Grace, and in the hope that they might be acceptable to you I propose directing that they might be sent by the first ship from Gottenburg to Leith or Dundee. Waiting the favour of Your Grace's reply I have the honor to be, My Lord Duke, your most noble servant

I. J. Leslie Melville

79 Wimpole Street London

17th July 1822.¹⁵⁰

It is unclear from this document where these capercaillie had been sourced though the reference to Gothenburg might imply that they were of Swedish origin. Similarly, there are no surviving documents that state whether or not the Duke accepted this offer of birds from Melville or if he ever corresponded with Melville again. What is interesting from this document, however, is that these birds were initially intended for the lands around Melville Castle in Midlothian. It is also interesting to note that I.J. Leslie Melville was either familiar with the species or was well informed about the habitat requirements of the bird as he commented on the suitability of Atholl's coniferous woodland for the capercaillie.

The next observation (1824) of an imported capercaillie in this survey of historical documentation again comes from the Atholl estate. It was reported in the Atholl chronicles that a hen capercaillie was sent to Atholl as a gift to the Duke from an Austrian prince. While there are no documents surviving within the Atholl archive to corroborate whether or not the gift actually came from a prince, there are several documents relating to the arrival of the capercaillie. The first of these is a letter from the Duke's factor (J. Graham) on 8 January 1824 to the Duke in London. In this letter Graham informed the Duke of a variety of things including the condition of the

¹⁵⁰ *Atholl muniments*, Box 68/14/9

turnpike road and the weather. At the end of the letter he added the following comment:

[...] I have the honor to transmit a copy of a letter from consulate Elismore – the bird arrived last night and is this morning quite healthy.¹⁵¹

Unfortunately, the letter referred to from consulate Elismore is no longer contained within the Atholl archives, although this reference may give some credence to the Austrian origin of the bird¹⁵². Fortunately, correspondence between Atholl's head gamekeeper, John Crerar, and the Duke gives a full account of the arrival and ultimate fate of the bird. In Crerar's letter to the Duke, who was residing in London at that time, he gave a detailed description of the delivery of the capercaillie to Blair castle:

Transcript 15

9 January 1824

My Lord Duke,

Last Wednesday night Thomas Stewart came up here with a Capercoille hen. It is a fine looking bird. It takes its meat very freely, picks the juniper berries of the bushes neatly and eats corn, barley, likewise it seems in excellent condition. John Rusle is making a larger cage than the one it came in. I understand its own cage is coming from Edinburgh. It eats oat bread. I shall get some of the Loch of the Lows gravel, as it must have gravel along with other provisions. The weather has been excellent since the later end of last week, got no salmon the river keeps so high the nights much warmer than the daytime. There were sent in last box 13 brace of partridges and one brace of woodcocks. MacIntyre says that the young laird of Glengarrie killed a hart shooting at a hind which pleased Glengarrie and the young man as much as if it had been a hart in season – after there sport was over the Gentlemen went to the North and MacIntyre says they took three Pieces of that poor hart with them. MacIntyre says that they did not disturb the forest but very little tho he had eight dogs – the dogs did not get loose among them – MacIntyre would not let them.

My Lord Duke Your Grace's Obedient and faithful servant John Crerar.¹⁵³

Unfortunately, little is known about the provenance of this female capercaillie if the assertion in the Atholl chronicles that it was of Austrian origin is not acceptable. It is, however, interesting to note how well informed Crerar was about the capercaillie's need for grit in its diet. Like other grouse species, the capercaillie requires grit to

¹⁵¹ *Atholl muniments*, Box 68/14/8.

¹⁵² Unfortunately no further information could be gathered about the nature of this gift of a capercaillie.

¹⁵³ *Atholl muniments*, Box 68/14/9

digest food held in its crop, particularly winter foodstuffs which are usually composed of pine needles. The fact that Crerar was aware of this requirement of the capercaillie suggests that he either had experience of captive rearing the species previously or had been informed of this fact by others who had that experience. It is also remarkable that despite his knowledge about the species Crerar did not mention providing needles from coniferous tree species for the hen. This is something that is recommended in any modern day captive rearing programme for capercaillie.¹⁵⁴

Nevertheless, the food provided for the capercaillie hen by Crerar appears to have been suitable and the conditions that she was kept in appear to have been sufficient because she survived in captivity for several months. Crerar, in his regular 'Gamekeeper's Report', recorded the condition of the species (see extracts from Crerar's reports below). It is also interesting to note the attention that Crerar paid to the species, taking notice of the hen's feeding habits and her preference for ripe berries. Also of interest was the fact that the hen became more 'lively' in May with the onset of the lekking season and that Crerar observed the hen moving from her roosting spot to the ground where she built her nest and eventually laid several eggs. The final point of interest in Crerar's reports was the account of what appears to be an outbreak of louping-ill virus in the red grouse population on the estate (details of the account are included in these extracts for discussion in Chapter 6).

Extracts from John Crerar's Reports:

January 1824

The capercoile is quite hearty and takes its food very well. John Rusle has made a larger cage in which I shall put her tomorrow morning.

February 1824

The capercoile is in excellent health, its plumage is getting in order since it came and its beginning to look beautiful. She eats a vast amount of Juniper berries, those that are ripe and none of the green ones.

March 1824

The capercoile is quite well it crops the heather saim as the Moor fowels do.

Aprile 1824

The capercoile is quite well and eats a great deal of the bell heath – the Black junipers berries are getting scarce plenty of green berries growing on.

Crerar made another three reports in May 1824:

¹⁵⁴ Although it is recommended in modern captive rearing programmes that capercaillie have access to some coniferous pine needles; the needles do not always form the largest part of the winter diet (e.g. the capercaillie being captive reared at the RZSS facility in Kincaig exhibit a preference for cabbage as a winter food despite the availability of pine needles).

May 1824 (1)

The capercoile is hearty and very lively.

May 1824 (2)

The Moorfowel cocks all dying over the Hills which is very remarkable. I shall write him [MacIntyre] to look sharp at any dead ones to see if he can observe anything uncommon within or without them to occasion such a death among them. The capercoile is quite well.

May 1824 (3)

[MacIntyre] says he cannot see anything about the moorcock to occasion such numbers to die only he says that the gizzard is quite full and so hard tho it were dry. The capercoile is in good spirits.

Crerar made a further two reports in June 1824:

June 1824 (1)

Also the Moorcocks I seed one of them and I rather think it is themselves fighting that occasion them to die as all the Mark I could observe about the one I seed was a little bloody about the eye and all I hear from MacIntyre there is plenty alive of cock still – the cocks had been more numerous than the hen. The capercoile has laid an egg yesterday. She was making a nest in the cage sum days before – of a redish colour with small brown spots.

June 1824 (2)

The capercoile has laid two more eggs one smaller than the other two, the largest not much less than a common hens – she is more laying upon the hay bottom of the cage then on her roosting place since she has been laying, the weather is extremely dry still.¹⁵⁵

The account of this capercaillie hen is continued in the Duke of Atholl's personal journal (see extract below). From this, the ultimate fate of the eggs that this hen bird laid can be established and it is interesting to note that the Duke found the flavour of the eggs of the capercaillie so appetising. No previous accounts of the consumption or the flavour of the eggs of a capercaillie have been encountered in this investigation and it appears that from the Duke's account that they were of an acceptable flavour.

Extract from the Duke's Journal:

As a matter of great curiosity I must mention what at first will appear a very curious fact viz. that I eat two eggs of a capercailzie, laid by a hen which was sent me early in Spring. Unfortunately there was no cock sent. She has, however, at times laid several eggs – larger than a pheasant, and speckled brown and white, some a light chesnut brown. These eggs being of no use, I tasted them, and found them the finest eggs I have eat. I mean to eat two more, and blow two, which will account for all she has hitherto laid, and do my endeavour to procure a cock bird for next season.¹⁵⁶

¹⁵⁵ *Atholl muniments*, Box 68/14/22

¹⁵⁶ *Atholl muniments*, Duke of Atholl's Journal

The Duke was able to successfully obtain a cock capercaillie in 1825 which was sent to him by a gentleman by the name of Charles Mackintosh from the Crossmarket in Glasgow. Nothing is known about the origins of this male bird or indeed if it was part of a larger importation of birds. In any event, the male capercaillie arrived in Blair Atholl in November 1825 and was put in the same pen as the female in an effort to make them breed. It seems appropriate that the placing of a male and female capercaillie together would have warranted a significant amount of comment from those employed with looking after the birds. However, in their reports and other correspondence with the Duke no mention of the capercaillie was made by either Graham or Crerar until May 1826. In fact, the following extracts are the only references that Crerar made to the species:

Extracts from John Crerar's Reports:

May 1826

The capercoile is beginning to squat. I suppose she is having eggs as she used to do this before she has them.

June 1826 (1)

The capercoile has begun laying. She has laid two but seems not so well as she used to be at this time.

June 1826 (2)

The capercoile has laid five eggs. She was very restless all the time and I thought she could have gone.

Extract from a letter from John Crerar to James Stewart, House Steward 28 July 1826:

As I am not able to move upon my legs to go so far as the house, I send the capercoile's six eggs. Let His Grace know that the first egg was hatched about the 1st of June, and there has been about ten days and a fortnight betwixt each egg. The hen was taken badly yesterday morning hatching another egg, but cannot get it away, and I rather think it will be her if not soon hatched. She has been worse this year than former times hatching.

There is no account of the male or female capercaillie, or the eggs that she had laid, in the Duke's journal,¹⁵⁷ and the next occurrence of the capercaillie is in Crerar's report from August 1826, where he states that the hen bird had died. No further mention is made of the cock capercaillie and the ultimate fate that this individual suffered is unknown. These comments about the capercaillie are the only surviving accounts of the species that were encountered in the collection of manuscripts searched in this study from the Atholl Muniments. No further observations of the capercaillie have

¹⁵⁷ It is suggested here that Crerar, in his letter to the house steward, used the term 'hatch' to mean egg laying.

been found in the Atholl Muniments between 1826 and the 1860s when records of capercaillie being shot start to occur later in the Atholl game books. This silence in the records might indicate that the initial failed experiment to breed capercaillie in Atholl was not repeated for some period of time.

The next attempts to reintroduce the capercaillie to Scotland were carried out by the Earl of Fife on the Mar Lodge estate near Braemar (Dick-Lauder 1829). The earl made two attempts to reintroduce the species using birds from Sweden to the pine woodland on his estate between the years of 1827 and 1829. None of these attempts met with success. Ritchie (1920) attributed the failure of these attempts as a result of the small number of birds imported from Sweden. For example, it was reported that in 1827 only a single male reached Mar Lodge alive, the hen having died during the journey from Sweden. A second attempt was then made by the earl in 1829 when he again imported a single pair of birds from Sweden which he hoped to use in a captive rearing programme with the surviving male from 1827. On this occasion both members of the imported pair survived the journey from Sweden and it has been alleged that they reared healthy broods, although conflicting accounts concerning this exist.

For example, Lever (1977) stated that the hen from the 1829 captive rearing programme at Mar Lodge laid twenty-four eggs, all of which proved to be addled.¹⁵⁸ Ritchie (1920), on the other hand, asserted that the pair reared a healthy brood before the hen and cock, as well as all their progeny, all died. Harvie-Brown (1879), who should perhaps be regarded as the authority on this topic, provided more details about this attempt to breed capercaillies. He stated that the hen, from the pair of birds imported in 1829, laid two clutches of eggs: one clutch year in 1829 and another the following year. In 1829 she laid twenty-four eggs and some of these proved to be addled though others had been fertilised.¹⁵⁹ It was also reported that the hen showed a strong tendency to break the eggs and the one remaining undamaged egg was removed from her and 'set' under a common hen. This egg reportedly hatched though the chick died shortly afterwards.

¹⁵⁸ Lever (1977) did not comment on what happened to the two individuals after they laid the addled eggs.

¹⁵⁹ Twenty-four eggs is a particularly large number for a single hen to lay in one year and/or in one clutch; this could suggest that the hen was suffering from some duress. See Chapter 1 for details on the size of average clutches in Scotland and elsewhere today.

In 1831 the hen capercaillie laid a clutch of fertilised eggs and Harvie-Brown (1879) recorded that these eggs hatched. Two of the five chicks seem to have survived for a period long enough to develop their adult plumage.¹⁶⁰ Harvie-Brown (1879) also recorded that the chicks were initially fed ants until they became older, at which time they were fed the same as the three adult birds: grain, heather and the young shoots of the Scots pine. Despite the conflicting accounts about the success of the captive rearing programme at Mar Lodge all three authors on the subject agree that neither of the attempts made there were successful. Harvie-Brown (1879) attributed the failure of the Mar Lodge attempt to three factors. First, an insufficiency of adult birds imported from Sweden. Second, the conditions of captivity. Third, the food supplied. Ritchie (1920) and Lever (1977) concurred with Harvie-Brown (1879) on one point: both asserted that it was as a direct result of the low number of birds imported that was the direct cause of the failure of this reintroduction.¹⁶¹

4.4) HISTORICAL ACCOUNT OF REINTRODUCTION: 1837–1900

It is widely asserted that the first successful reintroduction of capercaillie in Scotland was carried out on the 2nd Marquis of Breadalbane's estate and had its beginnings in an importation of birds from Scandinavia in 1837. There was, however, an additional and parallel capercaillie captive rearing and reintroduction programme being carried out in Scotland in 1837 that is seldom commented on. In June 1837, as Lord Breadalbane's birds were arriving in Dundee, six capercaillie (one cock and five hens) had already been released by the duchess on Atholl on the grounds around Dunkeld House (Yarrell 1885, Lever 1977). By the winter of 1837, unfortunately, the male capercaillie had died and the duchess then had the five remaining hens sent to Breadalbane.

¹⁶⁰ The death of three of the chicks was caused by the following: Harvie-Brown (1879) records that one chick hatched by the capercaillie hen died after an 'accident'. Two fertilised eggs were placed under a common barn fowl and these chicks are reported to have died from some unknown disease 'after lingering for some time'; it is asserted here that the disease that most likely killed these chicks was pneumonia.

¹⁶¹ The discussion of the causes of the failure of the Mar Lodge and Atholl reintroductions will be provided in Chapter 6.

An account of the Breadalbane reintroduction is provided in a variety of different texts (for example, Harvie-Brown 1879, Ritchie 1920 and Moss & Picozzi 1994) and a brief summary of the key points will suffice here. Most authors agree on the main points of the reintroduction like the Swedish provenance of the birds,¹⁶² the method by which the reintroduction was carried out and the location of the various releases. Similarly, all are agreed upon the key actors in the successful reintroduction of the species: these include Llewellyn Lloyd, Sir Thomas Fowell Buxton and his gamekeeper Larry Banville, and the Marquis of Breadalbane and his gamekeeper James Guthrie. Despite the consensus of opinion on some aspects of the reintroduction, however, there exist several discrepancies between different authors concerning the number of birds reported to have been shipped from Sweden to Taymouth. For example, between the years 1837 and 1838, Knox (1850) stated that fifty-four birds were transported. In contrast, Harvie-Brown (1879) stated that the number of birds was forty-eight. Muddying the waters even further, Ritchie (1920) stated that ‘at least’ thirty-two birds were transported to Taymouth, while Lever (1977) argued for a shipment of sixty-five birds.

There is also a discrepancy between the figures provided by the men who procured the birds in Sweden, namely Lloyd and Banville. In his journal Banville asserted that nineteen days before he left Gothenburg on 12 June 1837 he had with him eleven male capercaillie and thirteen females, twenty-four birds in total.¹⁶³ Three days after leaving Gothenburg one of the male capercaillies started to refuse to feed and died shortly afterwards. Thus, by the time of their arrival in Dundee it would seem that Banville had with him twenty-three birds in total, thirteen females and ten males. Lloyd (1867), on the other hand, provided a different figure for the number of birds shipped to Scotland. According to him, twenty-nine birds in total were shipped in June 1837 and these were followed by a further twenty birds in September 1837. Fortunately, the newspaper reports of Banville’s arrival in Dundee in June 1837 also provide the same figure of twenty-nine birds in total shipped with one dying during the crossing. Assuming the newspaper was accurate, it seems that a total of twenty-eight birds (thirteen cocks and sixteen hens, with one bird perishing during the

¹⁶² Only Knox (1850) asserts that the reintroduced capercaillie came from elsewhere (Norway). Given the political and sovereignty issues in Scandinavia during the nineteenth century it is perhaps not surprising that he makes this assertion.

¹⁶³ A hen capercaillie was killed in her coop shortly before departing Sweden on 2 June 1837 by a rat (Banville 1837).

crossing from Sweden) arrived at Taymouth in the first shipment and that this was followed shortly afterwards by a further twenty birds.¹⁶⁴ These figures provide a total of forty-eight birds, which agrees with Harvie-Brown's (1879) figure.¹⁶⁵

Banville's account of the capture and keeping of the capercaillie in Sweden is excellent for the detail it provides about the care of the birds and the cost of the 'wild capture' programme. While a full account of Banville and Lloyd's efforts to procure the birds in Sweden is out with the scope of this thesis, Banville's account of how he cared for the birds while in captivity bares a remarkable resemblance to modern day 'wild capture' programmes. Similarly, Buxton's financial contribution to the project was by no means paltry and Banville estimated that the total cost of the 'wild capture' aspect of the project would amount to between, '[...] £150 to £200 to do it well. What a lot of money to spend after the great birds' (Buxton 1837: 174-75).

The contribution to the project made by Banville and Buxton is understated by many (for example, Lever 1977), with the exception of Harvie-Brown (1879). Yet another under-estimation is the interest that the general population in Scotland had in the project. The arrival of the Swedish capercaillies in 1837 at Dundee is reported to have been of popular public interest and substantial crowds are alleged to have made their way to the docks. The event was widely reported in the national press. For example, the *Dundee Courier* printed the following article after interviewing Banville upon his arrival in Dundee:

THE COCK OF THE WOOD – T. F. Buxton, Esq. MP has procured twenty-eight birds of the cock of the wood species, and brought them over to Britain. They were collected throughout Sweden, notices having been circulated in every district offering rewards for each living cock or hen which could be obtained. Mr Buxton has presented them to the Marquis of Breadalbane, Taymouth Castle, Perth. Twenty-nine were shipped, only one died on the passage. In plumage they resemble the black cock, but in size they far surpass. The cocks, when full grown, will average 16 pounds. They betrayed none of the trepidation and uneasiness of wild birds of a less noble species. The cock of the wood, once the inhabitant of the pine forests and heath-clad hills has

¹⁶⁴ There exists some question over both the sexual distribution and the number of birds that arrived at Taymouth in the second shipment. Lloyd (1867) asserted that Breadalbane had twenty birds delivered in the second shipment. Harvie-Brown (1879), however, stated that only thirteen hens safely arrived at Taymouth from the second shipment. Perhaps the other seven birds perished during the crossing.

¹⁶⁵ Although Larry Banville regularly made entries into his journal, he did not make these entries on a daily basis. The last comment made by Larry about the number of birds that he had in his charge was made on 22 May 1837. It is proposed here that between the 22 May and 12 June Banville received another five birds that he does not mention in his journal.

long since disappeared from Scotland – the northern and most uncivilised portion of which was the last place in Britain where it was seen. In some countries on the Continent, especially Sweden, it continues to live free from molestation. The difficulty of penetrating to the retreats chosen instinctively by a bird of all others the most chary of connection with mankind, the delicacy of its flesh, and the symmetrical beauty of its form, rendered it a bird of great value.

Dundee Courier (1837)

The above account from the *Dundee Courier* is interesting for several reasons. First, because the name of the birds published in the press was the ‘Cock of the Wood’, not the capercaillie. This suggests that the general population of Scotland during the 1830s was not aware of the Gaelic name for the bird, despite the negative associations the Gaelic language held during this period (Gillies 1938). Indeed, from this testimony it could even be argued that the species had, to a certain extent, fallen out of the collective memory of the Scottish population. Second, the article is also interesting for the comments it makes about the cause of the extinction of the species in Scotland. Third, because it gives a favourable opinion of the flavour of capercaillie meat: that it was delicate and was prized at least as highly as the meat of other game birds. Fourth, and perhaps more importantly, the comments the journalist made about the fact that the species could live unmolested in Sweden might suggest that either molestation or persecution was the cause of the extinction of the species in Scotland.

Once the birds arrived in Taymouth, Banville had a coop constructed for them and, in July 1837, he left the birds in the charge of James Guthrie, Breadalbane’s head gamekeeper, and returned to Norfolk. The care and attention paid to the birds by Banville was replicated, if not improved upon, by Guthrie who was ultimately responsible for the successful release of the species. The contribution to the project by Guthrie is again understated by some authors (for example, Lever 1977)¹⁶⁶ although most that give an account of the reintroduction comment on Guthrie’s passion for the project. For example, Harvie-Brown (1879) stated that Guthrie tended the birds with the greatest possible care and he included a description of Guthrie’s character provided to him by a friend as follows:

Mr Guthrie’s only delight or pleasure was to look after the ‘beasties and birdies’, ‘puir things,’ for which he had great affection; but woe betide the vermin. The affection and humanity was of a different kind for the ‘dirty

¹⁶⁶ Again with the exception of Harvie-Brown (1879).

vermin'. I have seen him hang a wounded crow to die over a caged hen with a brood of young pheasants, caressing the one, while to the other he was absolutely cruel; justifying the latter acts by the assertion that the one was 'vermin,' the others 'puir bonnie creaturs.' He came from Arbroath, when quite young, to Taymouth, and I believe the shooting interest in Perthshire owes his memory and zeal a debt, for he 'haated' hawks, foxes, eagles, most sincerely, and spent three nights a week for years on the hill.

(Harvie-Brown 1879: 46)

The idea of Guthrie's zeal for the destruction of vermin was continued by Lever (1977) who stated that:

Guthrie appears to have been a peculiarly schizoid character; although lavishing much care and even affection on the game-birds under his care, he was capable of acts of considerable and premeditated cruelty against any 'vermin' which threatened the welfare of his charges.

(Lever 1977: 324)¹⁶⁷

Guthrie's passion for the project certainly helped to ensure that the captive breeding programme and the release of the birds was a success. The captive rearing programme was carried out differently at Taymouth than it had been at both Blair Atholl and at Dunkeld. Captive capercaillie are known to exhibit behavioural traits that suggest that they are suffering from high levels of stress, like the breaking of her own eggs by the hen capercaillie (Jones 1981). In an attempt to successfully hatch these eggs and rear them they were set under domestic chickens at Blair Atholl and at Mar Lodge. None of the chicks that were hatched in this fashion survived, however, and it is argued here that the reason for this failure was due to the relative inattentive nature of a domestic fowl compared to a wild one.¹⁶⁸

The hen capercaillies in captivity at Taymouth exhibited the same instinct to break their eggs though on this occasion the eggs were removed and placed in the nests of wild 'grey hens', female black grouse. This 'experiment', as Lloyd (1867) and Buxton (1848) referred to it, was successful and the chicks were hatched by female black grouse and successfully reared by her. The success of the project and the hatching and rearing of the chicks by female black grouse on Drummond Hill, adjacent to Taymouth Castle, continued into 1839 and, by September of that year, Guthrie

¹⁶⁷ Lever (1977) most likely came to this opinion of Guthrie's character after reading the description provided by Harvie-Brown (1879).

¹⁶⁸ It was reported in Chapter 1 that capercaillie chicks require high levels of attention from their mothers during the rearing period; to take them to suitable feeding areas and to thermo-regulate their bodies. Domestic fowl chicks do not require the same quantity of attention.

recorded that, ‘With regard to the capercaillies, I think we shall have between 60 and 70 young.’ (Harvie-Brown 1879: page 45)

Similarly, on 17 August 1839 the following remarks were also published in *The Scotsman*:

THE CAPERCAILZIE – This bird we learn from the Sporting Magazine, is again to become once more a native of Scotland.

The Scotsman 17 August 1839, page 3

Surprisingly, there are no accounts of the reintroduction programme carried out at Taymouth in 1837 and 1838 that survive in the Breadalbane Muniments. As a result, the provision of further details concerning the specifics of this project is outwith the scope of this thesis.¹⁶⁹ It suffices to say that the project met with remarkable success given the complexities of captive rearing and reintroducing avian species. Indeed, the success of this project has, if anything, gained greater repute because of the failure of more recent avian reintroduction programmes. In any event, the Earl of Breadalbane was also happy with the breeding programme and his thoughts on the matter appear in a letter written in 1841:

I have the pleasure in informing you that the Capercali have thriven most excellently. The experiment of putting the eggs under the Grey-Hen was attended with perfect success, and there are now a goodly number of these birds hereabouts.

Lloyd (1867) page 35.

Indeed, the success of the reintroduction at Taymouth was so great that by the 1840s the capercaillie was already being hunted on Breadalbane’s estate. In November of 1841 there is a document from a gentleman by the name of Laurence Oliphant to Breadalbane requesting another day’s shooting with him, ‘[...] among the capper [...]’.¹⁷⁰ Similarly, during the visit of Queen Victoria and Prince Albert to Taymouth in September 1842, the Marquis ensured that Albert had the opportunity to hunt capercaillie. On Thursday 8 September 1842, Prince Albert, along with the Marquis of Breadalbane and a large hunting party, set out onto the hills between Taymouth and Aberfeldy. His bag for the day has been reported by Gillies (1938) as including the following, ‘20 roebucks, 4¹/₂ brace of black game, 3 brace of grouse, 1 brace of capercaillie, 1 partridge, 1 woodpigeon, 12 hares and 7 rabbits’ (Gillies 1938: 213).

¹⁶⁹ For a detailed account of the reintroduction see Harvie-Brown (1879).

¹⁷⁰ NAS, GD112/53/1/20.

That same year, on 19 November, Breadalbane was contacted by Llewellyn Lloyd, the gentleman responsible for procuring the living capercaillie from Sweden for their reintroduction at Taymouth. In order to avoid inbreeding among the capercaillies then resident in Scotland, Lloyd offered around thirty more birds to Breadalbane. Interestingly, it also seems that Lloyd had been sending living capercaillie to other locations within the UK including, ‘[...] the park of Buckingham [...]’:

Transcript 16

L. Lloyd Esq.
2 Little Ryder St.
St. James’s
London

19th November, 1842

Dear Lord Breadalbane

If your Lordship just now happened to stand in need of a few more living Capercaillie I could supply you, as I have recently brought over from Sweden a very large number of these birds. Some 14 or 15 brace of which I have still undisposed of.

I take leave to ask the question, as though I know your Lordship has now abundance of Capercaillie at Taymouth I fancy you may require a little fresh blood. For the season that as many of your birds have been hatched under the grey hen the males so produced will in consequence exhibit an inclination toward the grey hen and a number of Hybrids will thus be created – so say Naturalists at least.

Indeed the old ladies in this country never, I am told, reserve as a Stock Drake a bird that has been hatched under a Barn Floor fowl because he always shows a liking to make love to the common hen.

Bilur hre, Dear Lord Breadalbane, Yours truly, L. Lloyd

PS – I have nearly as many cocks as hens. For particular birds the park of Buckingham has paid me 7/- given the brass. But was someone disposed to take what I have remaining, sensibly, I should be disposed to make more highly deductions of the price.¹⁷¹

This document is particularly interesting for several reasons. First, because of the Buckingham reference. Second, because there is a note attached to the reverse of the document stating the following, ‘Answered 21st November: Lord B. does not want any more for the present.’¹⁷²

¹⁷¹ *NAS*, GD112/74/46/37

¹⁷² *NAS*, GD112/74/46/37.

This note is important because it appears that despite Lloyd's recommendations Breadalbane either did not wish to have to pay for any further birds or he was convinced that he no longer required any more and that the genetic pool on his estates was sufficiently diverse. This document is also remarkable for two further facts. First, that Lloyd was still importing capercaillie to Britain in the 1840s. Second, that he was aware of the tendency of the capercaillie, if hatched under a 'Grey Hen', to mate with black grouse and produce sterile hybrids. The point about the hybrids is particularly important as it illustrates the high level of knowledge of the behaviour and ecology of the capercaillie that Lloyd possessed. Indeed, the production of capercaillie-black grouse hybrids has been accepted in modern science and has been commented on by Cramp and Simmons (1980), amongst others.

Although little is known about what happened to the capercaillie that Lloyd had ready to send to Breadalbane in 1842, possible destinations for these individuals could be proposed from alternative accounts of attempted reintroductions in 1842. For example in 1842 there are records of attempted reintroductions at both Taplow Court in Buckinghamshire and Knowsley Hall in Lancashire using birds brought from abroad (Harvie-Brown 1879, Yarrell 1885, Lever 1977). Lloyd is known to have sent six capercaillie, three hens and three cocks, to Ireland in 1842 for an attempted reintroduction on Lord Bantry's estate in County Cork. Lever (1977) reported that the accounts of this last reintroduction illustrated that the captive rearing of the birds progressed well for six months but they all died shortly afterwards.

In addition, Knox (1850) reported that in 1843 a Mr Drummond of Albury Park, Surrey, refused to accept six capercaillie that he had received from Sweden and presumably from Lloyd. The six birds were evenly distributed between the sexes, comprising three cocks and three hens. The account of the reintroduction given by Knox (1850) was that it had been particularly unsuccessful. One of the male capercaillie was killed the same night when it was 'set down' by a fox and, within a period of three days, two of the hens were shot, reportedly by mistake, because they were 'unknown birds'. No account is given of the remaining birds. This report highlights the extent and the nature of shooting that was carried out in parts of Britain during the nineteenth century. The idea that if a species was shot because it had not been recognised was something that was reported as being particularly prevalent

during this period. Further north, activity was also taking place in Scotland in 1843 when capercaillie introductions are reported to have been carried out in Arran, using both translocated and foreign birds from Taymouth and Sweden (Ritchie 1920).

There is a document within the Breadalbane Muniments that suggests that there was also the possibility of the ‘illegal’ hunting of the capercaillie during the 1800s.¹⁷³ In a letter from John Harrison, Blackwell Gate, Darlington, on 11 March, 1843 he informs the Marquis of an encounter with a stuffed capercaillie in Perth earlier that month. In March 1843, Harrison had been in Perth where he sought the services of a taxidermist. While at the taxidermist’s premises he had observed a preserved capercaillie and thought it best to inform the Marquis in case the bird had been poached. Although there is no indication that Breadalbane ever replied to Harrison, it appears possible that the preserved capercaillie Harrison encountered was most likely a bird that Breadalbane had asked to be stuffed. In fact, there is evidence to suggest that Breadalbane was preparing preserved birds for a variety of people.

For example, from approximately the same time as Harrison’s letter to Breadalbane there is a surviving document relating to the taxidermy of a capercaillie. This document is dated between 1843 and 1844, and is held together in a bundle of manuscripts titled *Household accounts due while Breadalbane was at Holyrood House*.¹⁷⁴ The document is an invoice for a sum of money due to a lady called Isabella Carfrae at 97 Princes Street for the preservation of ‘[...] capercailzie, blackcock, grouse and hares [...]’ and for the ‘fitting up’ of a display case for these specimens so that they might be presented to Prince Albert. Given Prince Albert’s reported hunting bag from his visit to Taymouth (Gillies 1938), it seems possible that the display case and the items contained within it were the remains of the individual species that he had shot that day.

Despite the hunting of the capercaillie on Breadalbane’s estate during the 1840s and the apparent interest in the species, observations on capercaillie do not occur regularly in all of the documents relating to game on that estate. For example, the following extract from James Guthrie’s ‘Gamekeeper’s Report’ or ‘Gamekeepers Journal of

¹⁷³ NAs, GD112/74/47/11

¹⁷⁴ NAs, GD112/74/657/5

Occupation Each Day' provides detailed accounts of the condition of the game as well as providing an insight into the other types of matter that he concerned himself with on a daily basis. The capercaillies are not, however, mentioned anywhere in the document; although it is possible that this is simply because there was either nothing new to report about the birds or that they were not being harvested to the same extent as the other grouse species on the estate:

Sample extract from James Guthrie's Journal of Employment

Two Blood Hounds were sent to Taymouth in October last by Lord Ossulton as a present to Lord Breadalbane – The dogs may be useful in Deer hunting or breeding from, only I have no orders from Lord Breadalbane regarding them – I believe Mr Wyllie will mention this to his Lordship in order that these Dogs may be turned into use. The Game have stood the winter pretty well, except the hares; a good many of them died during the snow storm – there is a fine show of Grouse on the Taymouth Moors at present – I have not been able to do much to the moor burning this spring, owing to the wetness of the ground – I also sent in a list of the number of Heads of Game, killed for the most part in the neighbourhood of Taymouth – from the 12th of August up to the present time – Rabbits 2947 – Hares 373 – Grouse 1157 – Partridges 267 – Pheasants 83 – Woodcocks 64 – Wild Ducks 40 – Snipes 37 – Plovers 35 – Fallow Deer 31 – Black Game 15.¹⁷⁵:

A further attempt at introducing the capercaillie, this time to Stronvar in Perthshire, was carried out in 1845 by David Carnegie using birds brought by sea from Sweden, presumably again supplied by Lloyd. This attempted introduction was unsuccessful and the two cocks and four hens died shortly after their arrival in Scotland (Lever 1977). By 1845, however, other woodlands in parts of Perthshire did support populations of capercaillie as the birds released at Taymouth had spread into adjoining areas with suitable habitat. For example, the first incidence of a capercaillie shooting being recorded in the game books from the Atholl estates occurred in 1846. In the record of game shot by the Duke of Atholl, the first capercaillie is shot and recorded thus, '1 capercaillie shot by His Grace in Blair Watcher Woods and Tilt Side' (Blair Castle Game Book 'Game Shot by Own Gun' 1846)

The species is not mentioned again in any of the Atholl game books until the Duke and his hunting party went shooting in woodland around Dunkeld on 18 November 1850. Capercaillie, it appears, were still being hunted during the 1850s and the

¹⁷⁵ *NAS*, GD112/16/12/5/8: April 1844

interest in the bird by local people in Scotland following its restoration is apparent in a variety of accounts. For example, on 19 January 1846, Breadalbane's factor, Mr J F Wyllie, wrote to Sir Alexander Campbell of Barcaldine informing him about a variety of different events including the fate of the sunk steamer on Loch Katrine and the fact that the preserved remains of two capercaillie were ready to be forwarded to the Free Church Museum:

Transcript 17

To Sir Alex Campbell of Barcaldine.
Bolfracks, January 19th 1846
Dear Sir,
I have received your letter of the 13th.

The Sunk Steamer in Loch Katrine

Last season two attempts were made to lift her, but owing to the misfavourable state of the weather we failed in getting hold of the boat, & after incurring some four pounds of expense we had to give it up. By the Agreement if we failed to put her up last season & pay the price both parties were released from the bargain. The boat is in such deep water, that unless in the finest weather it is in vain to attempt lifting the boat in the present season, were it the bargain was still in force, I could not have recommended making the attempt, as I find it would only be throwing away more money. From the people on the spot we found that little or no assistance could be got. There is reason to think that tales would be told on some of them if she could be got up & if this is so, no wonder they would like her to remain where she is.

Capercaillie

I have given Guthrie orders to forward a Male & Female bird to Lambie for the Free Church Museum. Perhaps you will case and give him the necessary directions.

Drummond Free School Kinfauns

He is a very good harmless creature & I believe is very poor – If his Lordship is pleased to grant him his croft rent free for last year, be so good as to let me know in a few days, as this is settling time for such matters.

Cart Horse Captain

Blair had him shot a week ago – the case was hopeless.

Dewar Overseer

His Lordships orders about Copper Mines & Forth Furnace have been given him.

Steamer on Loch Awe

I have no hope, after what has passed, of the Loch Lomond Captain undertaking in this. I will try and get up another Captain if Possible.
I remain, [document damaged] J. Wyllie.¹⁷⁶

As two stuffed capercaillies were needed for a local museum it seems logical that the local population in the vicinity of Taymouth, the administrative centre of the

¹⁷⁶ *NAS*, GD112/74/80/10

Breadalbane estate, had a keen interest in the species. They were not alone in this- Interest in capercaillies was also evident elsewhere in Scotland and there are documents in the Breadalbane archive from individuals requesting the opportunity to see both living capercaillies and their eggs. For example, on 12 May 1846 a timber merchant from Glasgow called Thomas Waters requested the opportunity to see living capercaillie and to have some of their eggs. It appears that he was interested in rearing them himself because he requested eggs from Breadalbane so ‘[...] that he can set them by a common hen [...]’.¹⁷⁷ However, it appears that this request came too late in the breeding season and he was forced to make a further request for eggs on 6 April 1847.¹⁷⁸ There is no sign that Breadalbane agreed to this request. In any event, this was not the only solicitation that Breadalbane received regarding capercaillie eggs. In a collection of bundled documents titled *Secretaries Correspondence* there is a letter from Thomas Watts to Sir Alexander Campbell of Barcaldine, dated 15 May 1847, thanking him for the eleven capercaillie eggs that he had been sent, ‘[...] 10 of which arrived safely [...]’.¹⁷⁹

Towards the end of the 1840s references to the capercaillie begin to occur in the gamekeeper’s and other ground officer’s reports. For example, in 1847 it is evident that the capercaillie population of Breadalbane’s estate was healthy and was growing rapidly as Guthrie made note of the species in one of his reports. In Guthrie’s journal of work and in a letter to the estate factor he recorded an encounter with a large group of capercaillie on 1 October, 1847 while he was out searching on Drummond Hill for deer:

Transcript 18

[Table including figures for numbers of game and vermin killed displayed overleaf]

One day when I was searching for an Old Fallow Deer at the west end of Drummond Hill I saw several Hundreds of Capercaillie rising out of that wood which was Blown Down last Season by the wind a Great part of it is still alive which produces both Feeding & Cover for them if some small clumps of young wood was planted through the old woods wharethine it would soon make shelter for Game & Deer the Capercaillie is a Harmless Bird & will never trouble the Farmers.¹⁸⁰

¹⁷⁷ *NAS*, GD112/74/50/12

¹⁷⁸ *NAS*, GD112/74/51/3

¹⁷⁹ *NAS*, GD112/74/126/8

¹⁸⁰ *NAS*, GD112/74/217a

There is a second document that is catalogued together with Guthrie's report. This is a letter detailing the capercaillie incident and an additional occasion of poaching that he had discovered. The letter from Guthrie is addressed to Sir Alexander Campbell, Breadalbane's agent in 1847:

Transcript 19

Report Guthrie Oct 1st 1847

Sir Alexander

I have shot last week 2 of the old Fallow Deer in the west end of Drummond Hill – also six of the old ones in the Deer Park – those that was most likely to die during the coming winter – the heaviest one was a 11 stone – there is still one old Deer in the west end of Drummond Hill that ought to be killed – there is so much cover that I cannot get a sight of him – when I was looking through the thick wood at the west end of the Hill a few days ago – I seed in a Small thicket from 2 to 4 hundred Capercaillie young & old I have never seen so many in such a small space before – I was in the Glen of Ardtalinaig a few days ago I found the McDarmaids Tenants of the Farm Tamflaioir – busily Trapping Grouse in their nets in fields of Corn – I found a Brace of Grouse in the Traps – and I went to the Farmers & made them deliver up to me 2 Brace of Grouse which they had taken out of the traps that day before I went – so I carried off with me 3 brace of Grouse & 7 Traps – I gave in their names to Mr Wyllie – that man Lees who was shooting on our Aberfeldy Marches on the 12th of August – was fined £910 – that Mason who was Snawing in the Ministers wood – has agreed to Pay a small fine – I want to put in a man to keep the red Deer of the Turnpike road – betwixt the Turn at Kenmore and Farnan for a week in turn till they settle – the red Deer in the Park is all confined in the law gat – I have wrote to the Gun Maker for your Cartridges – he is to send them every week – but they never come – since you all came to the Forest we have killed 31 Ravens & 14 Buzzard hawks – besides a number of other vermin – their must be Bad Game Keepers in Some Places – the Grouse appairs to be getting Prety healthy I do not see any neraly dead – I am Sir Alexander yours faithfully James Guthrie.¹⁸¹

These two documents are exceptionally interesting for numerous reasons. In the first instance they confirm the assertions about the success of the reintroduction made in the accounts by the likes of Harvie-Brown (1879) and Ritchie (1920). To quantify this success these documents illustrate that within ten years of the arrival of the birds from Sweden the population on the Marquis of Breadalbane's estate had reached at least between 200 and 400 individuals. This represents an estimated annual increase in the

¹⁸¹ *NAS*, GD112/74/217b

population of around 30%, a figure larger than any that has been recorded elsewhere in the world (Cramp and Simmons 1980). The report that the capercaillies were ‘packing’ or ‘flocking’ together is also exceptionally interesting because this is a phenomenon that is not generally understood. Guthrie’s comments in Transcript 18 about the capercaillie’s impacts on farming are also of interest and suggest that Wyllie, the factor of the estate at that time, was either unfamiliar with the species or had been receiving complaints from farmers of capercaillies damaging their crops.

These two documents are also remarkable for the comments Guthrie made both about an incident of poaching and for the report he made on the numbers and types of vermin that he had recently killed. The McDarmaid poaching incident is interesting because the document highlights that fact that traps and trapping were still common practice amongst the farm tenants. As the traps had been set in fields of corn, perhaps there was some relationship between this and Guthrie’s explanation of the impact that capercaillie might have on farming. The account of the vermin that Guthrie killed in the week preceding 1 October 1847 is also of particular interest. The figures that Guthrie provided in the chart supplied with Transcript 18 (overleaf) and the figures he quoted in Transcript 19 are substantial.¹⁸² Indeed Guthrie’s comment about the bad keeping being carried out elsewhere is also interesting and suggests that he feels that these birds are coming onto Breadalbane’s lands from elsewhere. The efficient and widespread killing of ‘vermin’ is reported by Tapper (1992) as being a significant factor in promoting the breeding success of the capercaillie.

The next account of the capercaillie by Guthrie came on 20 December 1848 in his list of the contents of the last ‘Game Box’ sent to Breadalbane in London from Taymouth. The preparation and delivery of ‘Game Boxes’ containing wild meats to Highland landowners while they were residing in London seems to have been common practice for many, including Queen Victoria, and also occurred on both the Atholl and Breadalbane estates during the nineteenth century. The game box sent by Guthrie from Taymouth to Breadalbane in London in December 1848 contained a wide variety of wild meats including four capercaillie:

¹⁸² For a fuller discussion of the level of ‘vermin’ control during the reintroduction at Taymouth see Chapter 6.

Transcript 19

Game Sent to London by the Servants: 16 Brace of Grouse, 10 Brace of Partridge, 12 White Hares, 2 Pheasants,

Game Sent to Her Majesty: 15 Brace of Grouse, 8 Brace of Black Game, 6 Brace of Woodcocks, 3 Brace of Wild Ducks, 4 Capercailzie, 2 Roe Deer, 12 White Hares.

Game Sent to Lady Breadalbane: 6 Brace of Grouse, 4 Black Game.¹⁸³

The next chronological account of the capercaillie found within the documents of the Breadalbane archives is in the form of a letter from Percy Grace who was a friend and colleague of the Marquis. From this letter it is apparent that in 1849 Llewellyn Lloyd was importing a wider variety of faunal species from Scandinavia than he had, or he had been recorded doing, previously. It seems that in the 1849 Lloyd had a considerable number of capercaillie, swans (*Olor cygnus*) and young bears that he wished to dispose of. The letter reads as follows:

Transcript 20

19th July 1849

Wiston Park

Hurst

Pierpoint

Dear Lord Breadalbane

Just as I was leaving town yesterday to come here – I had a visit from Mr Laney – an intimate friend of Llewellyn Lloyd viz (The Brute Slayer). Who said that he had received a letter from Mr Lloyd – Who had requested him to tell me that he had a considerable number of Capercailzie – some Hoopers – or wild swans and a couple of young bears. All of which he wished to dispose of – they were domesticated – and the birds had been in his possession for about two years – Let me know if you wish for any of them and I will endeavour to arrange through Mr Laney - that they maybe sent over according to any directions you may give – those only to be paid for that are delivered in a satisfactory state – and direct to me in Mount – where I shall return to – early next week. I came down here with my friends Sir Wiston and Lady Dixie from Shoreham whose place this is – and is engaged to be married to Miss Julia Dixie – it is possibly situated under the range of hills – which run from Brighton, Eastward – they are to be married early in August at Bosworth Park – and our visit is for her to see her future residence. Always My Dear Lord Breadalbane Sincerely and truly yours, Percy Grace.¹⁸⁴

This document is interesting because it highlights the extent of the trade in wild animals that was taking place in Scotland and Britain during the 1800s. There is,

¹⁸³ *NAS*, GD112/74/189

¹⁸⁴ *NAS*, GD112/74/55/14

however, no surviving indication in the archive that Breadalbane applied to Lloyd for additional capercaillie, or indeed for the swans or bears. The next chronological observation of the capercaillie in the Breadalbane papers comes in the form of a letter from Prince Albert to Breadalbane in 1850. Prince Albert wrote to him in response to a game box that he had been sent to him earlier that year. It appears that the game box most certainly contained capercaillie, as Prince Albert states in his letter that, ‘[...] the capercailzie was excellent [...]’.¹⁸⁵

Following his failure at Mar Lodge and the subsequent success of the introduction of capercaillie onto the Breadalbane estate, it is perhaps not surprising that in 1851 and 1852 the earl of Fife attempted two further capercaillie restoration programmes on his estates. In 1851 he unsuccessfully attempted to captive rear the birds on his estate at Duff House but all of the birds died in captivity. Then, in 1852, the earl imported birds from Norway and tried to reintroduce them on his lands at Lochnabo. This attempt also proved to be unsuccessful (Lever 1977). The earl of Fife again attempted to reintroduce the species in 1860 at Castle Grant, this time using translocated capercaillie eggs placed in the nests of Grey hens. Unfortunately, this attempt also proved to be unsuccessful (Harvie-Brown 1879). Successful introductions of capercaillies were reportedly made, however, by the earl of Airlie at both Cortachy Castle in 1862 and at Stracathro in 1865.

Despite the fact that there were no recorded releases of any capercaillie on the Duke of Atholl’s estates after the 1830s the capercaillie was reported to have reached Blair Atholl by 1845 (Harvie-Brown 1879). It was mentioned earlier in this chapter that the first recorded shooting of a capercaillie in the surviving Atholl game books was in 1846. Thereafter, the species does not occur in the game books again between 1851 and 1857 which might either suggest that the shooting of the species, or perhaps the recorded shooting of the species, was reserved for the Duke. By the 1860s, however, the species had firmly established itself within the woodlands on the Atholl estate and thereafter regularly appears within the estate game books.

In ‘His Grace’s Game Book’, which details the game killed by the Duke in Atholl between the years 1862 and 1916, there are several recordings of successful

¹⁸⁵ *NAS*, GD112/40/59 (1850).

capercaillie kills. For example, the first capercaillie shot by the Duke was killed in January 1862 in Butterson and Lowes at Dunkeld. The species then regularly appears (see extract below) annually. In fact, the total number of recorded capercaillie kills in the Duke's game book between the years 1862 and 1916 is 337 birds.

Extract from Duke of Atholl's Game Book (1862 – 1916):

November 1863: 1 Capercaillie killed in East Beat at Gask
December 1864: 1 Capercaillie killed at Dunkeld
December 1864: 1 Capercaillie killed at Blair Athole on the West side of Banvie
October 1865: 1 Capercaillie killed in Laighwood, Dunkeld
November 1865: 1 Capercaillie killed in Gask, East Beat
November 1865: 1 Capercaillie killed in Gask, West Beat
December 1866: 1 Capercaillie killed in Cuilts and Blair

The possibility of the capercaillie being a prey that was reserved solely for the Duke does certainly not hold true for the period after 1860 as the species regularly appeared in the Atholl estate game book for the years between 1866 and 1871. This game book details the quantity and species of game shot by every qualified individual across the estate. It documents the species killed, the location of the kill, the date of the kill and the members of the hunting party who could take credit for the kill. Interestingly, it appears that it may have been etiquette for the entire hunting party to take the credit for the kill as the particular individual responsible for the kill is not recorded. For example, the entries for capercaillie shot between the year 1866 and 1871 are displayed in the extract below and these figures are just part of the total number of capercaillie kills recorded between the years 1866 to 1893 which amounted to 204 birds:

Extract from Atholl Game Book (1866 – 1871)

October 1866: 2 Capercaillies killed in '5 mile wood' by His Grace, the Earl of Mansfield, Sir I Moncrieff, Sir Rob Menzies & Mr C Murray.
January 1867: 1 Capercaillie killed in Craig Urrard Woods in Blair by His Grace.
February 1868: 12 Capercaillies killed by His Grace, Sir Thomas Moncrieff and William Campbell in the woods of Blair Uachdair and Craig Urrard.
February 1868: 9 Capercaillies killed in Blair Uachdair and Craig Urrard Woods by His Grace.

Introductions of capercaillie using birds naturalised to Scotland and from abroad continued during the 1860s and into the 1870s. In 1868, for example, Lord Tweedmouth had thirty-nine birds transported from Norway to his estate at Guisachan. Although he hoped to carry out a captive rearing programme using these Scandinavian birds, Lever (1977) reported that shortly after they arrived all thirty-nine capercaillie were killed in their pens by polecats. Lever (1977) also reported several attempts to introduce the species at Inverernan, Strathdon in Aberdeenshire between 1870 and 1873. However, both of these attempts proved to be unsuccessful. Attempts were also made to introduce capercaillie taken from the naturalised Scottish population into Yorkshire in the years 1872 and 1877 but these were also unsuccessful.

The earl of Fife made another attempt at reintroducing the species to the woods around Lochnabo in 1878 but this project met with the same fate as his earlier attempts. Additionally, at the time of writing his monograph *The Capercaillie in Scotland*, Harvie-Brown (1879) reported that attempts were being made to introduce naturalised capercaillie from Scotland into the woodlands of County Cork in Ireland in 1879. From the survey of literature carried out in this study it appears that none of the attempts made to reintroduce the capercaillie into the woodlands of Ireland ever proved to be successful. In spite of these failures, the introduction of birds from abroad and the translocation of naturalised capercaillie within Scotland continued throughout the 1800s and into the 1900s. Indeed, there have also been numerous incidences of unrecorded releases of capercaillie carried out throughout the nineteenth and twentieth centuries and indeed, that have continued until fairly recently (Moss Pers. Comm. 2005).

According to Ritchie (1920), at the end of the 1800s the extant capercaillie population had naturally colonised all areas of suitable habitat in Scotland. A discussion of the extension of the range of the capercaillie and its spread from the centres of reintroduction through Scotland is outwith the scope of this thesis.¹⁸⁶ Nevertheless, it seems appropriate to reiterate the comments made by Harvie-Brown (1879) and Ritchie (1920) that the species spread through Scotland by moving along the wooded glens or valleys. From 1900 onwards, records of capercaillie are more detailed within

¹⁸⁶ A detailed account of the 'spread' of the species is provided by Harvie-Brown (1879).

the muniments than in the preceding centuries and the species is regularly recorded in the surviving game books of many estates. Despite this substantial quantity of information, a study of this documentation does not aid or develop the argument of this thesis and detailed accounts have been provided by both Harvie Brown (1879) and Pennie (1950, 1951).¹⁸⁷

4.5) SUMMARY

The capercaillie is believed to have become extinct in Scotland by the end of the eighteenth century. Although the data to corroborate this perceived extinction is imperfect it seems most likely that the species had been extirpated from several regions of Scotland, if not the whole country. This absence of the capercaillie from the Scottish avifauna was noted by persons living in these regions, the owners of land, and enthusiastic naturalists in eighteenth and nineteenth century Britain. However, strong cultural and trading links between Britain and the Scandinavian countries existed at this time. Since the capercaillie is known to have existed in large populations in the Scandinavian countries at this time, it does not seem unreasonable to suggest that the idea of reintroduction of the species to Scotland occurred as a direct result of these cultural and trade links.

One of the first recorded attempts of capercaillie reintroduction in the UK was carried out in England by Sir Thomas Fowell Buxton MP on his estate in Norfolk in 1825. This attempt failed and the failure is attributed both to the low number of birds released and to the lack of pine woodland at Northrepps (Buxton's estate). Buxton had a cousin of Welsh origin who was a keen hunter and naturalist who lived in Scandinavia and it was he who provided him with the capercaillie. Buxton is known to have had a keen interest in the natural world and particularly in this avian species, mainly because he admitted to this in his memoirs (Buxton 1848). The original idea for the reintroduction of the species to Scotland lies with this gentleman although they may have been influenced by accounts of attempted capercaillie restoration and captive rearing programmes being carried out elsewhere in Scotland (for example, at Mar Lodge and Blair Atholl).

¹⁸⁷ Tapper (1992) provides a good summary account of the status of the capercaillie population in Scotland from c.1900 until c.2000.

Anthropogenic species introductions were by no means a new phenomenon in nineteenth century Britain.¹⁸⁸ There already existed a trade in wild animals between Britain and abroad and in some instances these animals were purchased and delivered or arrived unexpectedly as gifts. Similarly, the reintroduction of capercaillie to Scotland was not the first attempt to reintroduce a ‘native’ species of the Scottish fauna that had become extinct. The documentary evidence from the Atholl estate highlights an attempted reintroduction of reindeer during the late 1700s. The nineteenth century capercaillie restoration programme is, however, the first recorded successful species reintroduction in Scotland. Similarly, it is the only recorded successful capercaillie or indeed grouse reintroduction ever to have occurred, making this nineteenth century achievement all the more remarkable.

Buxton regularly journeyed to Scotland and leased the shooting rights to moors and forests on the Marquis of Breadalbane’s estate. In the 1700s and 1800s ‘sport shooting’ had grown in popularity in England. The interest in shooting for sport took longer to develop in Scotland. However, during the latter half of the eighteenth century, Scottish landowners began to realise the potential revenue that they could generate from the leasing of shooting grounds on their estates. Buxton’s interest in the capercaillie, along with his connections in Scandinavia, when combined with Breadalbane’s fiscal interest in sport shooting, set the scene for the reintroduction of the species. Buxton provided the financial resources for the project and charged his head gamekeeper, Larry Banville, with the task of travelling to Sweden to collect a number of living capercaillie from his cousin Llewellyn Lloyd and to return them to Breadalbane’s estate in Scotland.

Banville returned from Sweden in July 1837 with twenty-eight capercaillie, thirteen cocks and sixteen hens. In 1838, thirteen more hen capercaillie were reported to have arrived at Taymouth. The reintroduction programme was managed by James Guthrie, Breadalbane’s head keeper and was carried out in a series of stages. First, the birds were initially captive reared in pens located on the grounds around Taymouth castle. Second, fertilised capercaillie eggs were then taken from the captive reared birds and placed in the nests of black grouse on Drummond Hill where the eggs were hatched by the black grouse hens and successfully reared to adults. Third, at some point

¹⁸⁸ Anthropogenic introductions of ‘exotic’ species had occurred in Scotland centuries earlier.

between 1838 and 1840 the captive reared birds were then released into the woodland on Drummond Hill. These birds and their progeny formed a population that grew rapidly. For some reason their reproductive levels were higher than any recorded in the wild. It has been argued in this chapter that the success of this reintroduction was due to very low mortality levels of the birds at the various stages of their life cycle. It is likely that these low levels of mortality were caused by a very intensive predator control regime that was in operation on the estate, working in parallel with regulated human hunting of the population.

The Taymouth population grew rapidly in size and increased its distribution on the estate. Within a short period capercaillie from the Taymouth estate had begun to colonise new territories outside the estate boundaries, reaching as far afield as Dunkeld in the first five years after the reintroduction. This was the start of the spread of the species throughout areas of suitable habitat in nineteenth century Scotland which was aided by numerous augmentations to the extant population, as well as by translocations and introductions of birds naturalised to Scotland. The reintroduction did not take place over a fixed period of time and additional introductions and translocations of the species continued throughout the 1800s and into the 1900s. It has been argued that at the start of the twentieth century the extant capercaillie population in Scotland and its future persistence was inextricably linked to human-environment interactions. It is also likely that this population persisted because of the human regulation of its ecological relationships with other species and its habitat.

CHAPTER 5 – ASSESSMENT OF CRITICAL FACTORS FOR DECLINE

5.1) INTRODUCTION

Chapter 2 presented a series of critical factors that may have been responsible for the decline of the capercaillie in Scotland during the 1700s. In order to assess which of these factors had the greatest impact on the persistence of the natural population it is necessary to examine the potential influence that each of these factors had on the population over varying time periods. Detailed quantitative data is not available, or it is not available in sufficient enough detail, to allow for a numerical analysis of their respective influence. Therefore in order to assess these critical factors it is necessary to use proxy information that will allow for the production of an ecological synthesis of the historical data that will attempt to describe the ecology and the dynamics of the capercaillie population extant in Scotland for various time periods.

The findings from recent scientific studies of the capercaillie were reviewed in Chapter 1 and considered in order to produce a series of ‘critical factors’ for the ‘low’ level assessment that would represent the most likely cause or causes of the perceived historical extinction of the natural population of capercaillie in Scotland. Data of a detailed quantitative nature was not forthcoming from the historical manuscript sources for the period before the perceived extinction. Thus in order to establish whether or not historical documentary evidence can help to establish the specific causes of the decline of the naturally occurring capercaillie population in Scotland a more qualitative approach had to be taken. This chapter begins by outlining the nature and findings of the qualitative analysis. The chapter then continues with an assessment of the extent to which the various critical factors could have potentially impacted the extant population of capercaillie for various time periods. In these sections, evidence to support the different assertions made about the extent of the influence of the various critical factors is provided from relevant published literature and additional historical manuscripts.

5.2) ASSESSMENT OF INFLUENCE OF CRITICAL FACTORS FOR DECLINE

The potential critical factors that may have been responsible for the decline of the naturally occurring capercaillie population in Scotland were presented in Chapter 2. The potential critical factors selected for examination in this study are:

- Capercaillie Habitat Loss & Deterioration
- Fluctuations In Climatic Conditions
- Human Hunting of Capercaillie
- Disturbance of Capercaillie
- Ecological Relationships and Natural Predation of Capercaillie

Each of the potential critical factors selected for examination are essentially interlinked and the strength of their influence varied between regions in Scotland. For example, capercaillie habitat loss through the felling of woodland also constitutes some form of disturbance to the species and, depending on the scale, may result in an adjustment of the ecological relationships that the species holds with other species. Similarly, although the capercaillie in Tayside may have been adversely impacted by forest felling, this may not have been the case in Speyside. For all intents and purposes, these factors have been separated as much as possible.

5.2.1) Capercaillie Habitat Loss & Deterioration

Habitat loss and deterioration has been highlighted as one of the potential critical factors responsible for the decline of the naturally occurring population of capercaillie in Scotland. It was mentioned in this thesis that humans have directly and indirectly impacted capercaillie habitat in Scotland since earliest times. The direct impacts that humans have had on the quantity and quality of habitat available for the capercaillie can be classified as being as the result of the destruction of areas of woodland through felling and burning and the increasing level of fragmentation of the forest. The indirect effects on the forest include actions that were not carried out directly to the trees that make up the forest but to the other component parts of the capercaillie's habitat.

It is difficult to provide a summary account of woodland cover and as a consequence, the potential availability of capercaillie habitat in Scotland between prehistory and the end of the Middle Ages. This point is supported by Smout *et al* (2005) and it is highlighted that the cause of this difficulty is as a result of the lack of information concerning the cover of woodland during the medieval period. Nevertheless, Tipping (1993, 1995) and Smout *et al* (2005) provide an account of the fate of the woodlands in Scotland from prehistory until the end of the Medieval period that summarises the key points in woodland history in Scotland at this time. Some key points that are known about the extent of woodland cover in some regions of Scotland are that there existed no large timber in the Scottish Borders by the end of the Medieval and that by 1400 there was a serious shortage of good quality building timber in Scotland as a whole. This is reflected in accounts of the increasing levels of timber being imported from the Baltic and Scandinavia. Scotland was short, therefore, of wood by the end of the Middle Ages (Smout *et al* 2005) and it can most likely be assumed that if the capercaillie was ever resident in the Scottish Borders the sub-population was most likely lost by the 15th century.

More detailed accounts of the quantity of woodland extant in Scotland between 1500 and 1700 have been provided. Tipping (1993 & 1995) has proposed that the majority of the extant woodland cover was ‘semi-natural’ in its nature. This semi-natural woodland was composed of native tree species growing by natural regeneration on their original sites; however, these woodlands had been directly and indirectly modified by humans. In the two hundred years between 1500 and 1700 the regional imbalance in the distribution of woodland cover in Scotland remained between the Highlands and the Lowlands. Indeed, so much so, that the lowlands of Scotland have been described as being relatively treeless (Gilbert 1979). However, Smout and Watson (1997) have asserted that although there was less woodland in the Lowlands of Scotland compared to the Highlands this did not mean that Lowland counties were entirely ‘bereft of woodland cover’ and that it was simply the fact that the woods were more restricted in scale in the Lowlands.

Lindsay (1974) has proposed a figure of around eight percent of land in the Highlands being covered with woodland between 1600 and 1800. Similarly, Smout and Watson

(1997) state that the natural regeneration of pinewoods in the Eastern Highlands of Scotland was much easier after fire or the disturbance of the ground than it was in the west and north. Hence, areas of pine dominated woodland survived in the Eastern Highlands over time, in a semi-natural state. Protection of the woodlands was common in many areas. Watson (1997) for example has described how the control of each individual woodland or sections of larger woodland on the Laird of Glenorchy's estate during the 1600s was carried out by tenant foresters. The level and extent of this protection varied and depended on the action taken by the individual tenant foresters themselves.

Watson (1997) suggests that the actions of many of these tenant foresters was ineffective and that they were not suitably encouraged by the landlords to act fervently. This meant that in many instances areas of woodland were still exploited. Simply put, tenant foresters were responsible for managing the woodland on the land that they held a tenancy for and they were not professional foresters. Indeed, the idea of professional foresters was not to come about in Scotland until the 18th century. Watson (1997) describes how some tenants on the Glenorchy estate had customary rights to make use of their woodland for the maintenance of their houses and farm buildings. These rights could not be taken away from the tenants by the foresters employed by Glenorchy and woodland on the estate continued to be exploited.

The problem of animals pasturing within woodlands is one commonly cited in secondary woodland history studies (e.g. Gilbert 1979, Smout *et al* 2005). Watson (1997) is one author that also has highlighted the problems caused by goats in Scottish woodland during this period and that goats were particularly important in the Highlands at this time. Indeed, the problem with goats was so great that in order to better protect their woodlands, landowners created woodland enclosures and removed grazing stocks of animals from the woodland components of the landscape at the expense of the goats (Lindsay 1975b). Dodgshon (1998) has argued that livestock production before and after the highland clearances was one of the mainstays of the Highland economy. Thus the pasturing of animals within areas of woodland can be considered as a factor of deterioration.

The first flocks of sheep appeared in the south west of Scotland in the 1760s, some were established north of the Great Glen by 1790 and few parts of the highlands remained unaffected in 1820. The wintering of the stock on the outfield continued to be important for the introduced sheep stocks and the remnants of the traditional Highland husbandry. Smout and Watson (1997) state however that sheep and deer numbers in the Highlands were not a problem for the woodland. The main grazing livestock kept by the people at that time were horses, goats and cattle. Although the grazing habits of the traditional 'black cattle' of the Highlands are reported as being good for woodland regeneration, if they were stocked at high levels the cattle had a significant adverse impact on the regeneration of the woodland.

Watson (1997) also highlights the fact that Baron Court Books show that enclosed woodland parks existed during the sixteenth century and that cattle were commonly pastured within the woodlands. Similarly, Scots pine and oak timber was highly prized by landowners from as early as 1576. The case of large pine and oak woods located in the Laird of Glenorchy's estate is also discussed by Watson (1997) and it is apparent that these old growth areas of woodland were afforded some protection during the 1700s. In this instance an agreement was made to ensure that the woodland remained untouched up to 1720. Protection was also afforded to areas of woodland during this period through the baron courts where fines could be imposed for the illegal cutting of woodland. The 18th century also saw the introduction of a different form of woodland management in the Highlands that came from the Lowland regions of Scotland and was coordinated by estate factors or professional foresters (Smout & Watson 1997).

A case study of the Scots pine plantations in Rothiemurchus and at other areas of Strathspey has shown that timber on these estates was exploited both during and after the Napoleonic Wars (Smout 1997). The reason for this exploitation during the Napoleonic Wars is reported to have come as a result of the disruption of the timber trading links with the Scandinavian and Baltic States at that time (Smout 1997). The woods of Rothiemurchus were also exploited during the 1700s by individuals in the local area. The local people living in the near vicinity of these woodlands used the timber they cut for a variety of domestic purposes and this timber was not carried large distances from the woodland areas themselves.

Dunlop (1997) states that the first profitable exploitative felling of native pine woods in Strathspey was begun in 1784 at Glenmore and this felling was completed in 1805. This timber was transported using water, floating the timber down rivers to sawmills. In order for this floating of timber to be successful dams had to be constructed. There are records of dams being constructed elsewhere in Strathspey, at Abernethy, and Rothiemurchus. O'Sullivan (1973) in his analysis of land-use changes using documentary evidence as well as pollen analysis in the forest of Abernethy in Inverness-shire between 1750 and 1900 AD showed that the forest of Abernethy had a long history of exploitation. O'Sullivan (1973) comments on the fact that the forest of Abernethy was exploited for timber purposes and for the grazing of livestock and that by the mid-eighteenth century a regular pattern of exploitation had developed. Similarly, he asserts that almost every part of the forest of Abernethy had been felled for timber at some point.

There have been many misconceptions about the time, rate and extent of deforestation in some early woodland history studies in Scotland, particularly for the period between 1700 and 1800. The commonly held belief was that the deforestation of the Highlands began in the 1600s and increased in earnest after 1745 onwards (Lindsay 1975a, 1975b). This theory of the fate of Highland woodlands has been shown to have been incorrect in recent studies (e.g. Smout *et al* 2005) and the eighteenth century is now believed to have been when an increase in the commercial activity of the Highlands and their forests took place. Smith (1988) showed that both the Duke of Atholl and the Earl of Breadalbane were keen on improving their estates and particularly their ornamental gardens from the 1720s onwards and this included the planting of areas of woodland. Dingwall (1997) highlights that the coppice management of oak and birch woodland was widespread on the Duke of Atholl's estate during the 18th century and particularly at and around Dunkeld. Dingwall's (1997) observation represents evidence of not only the exploitation of the woods but also the management of the timber resource. Substantial fragments of natural or semi-natural woodland survived in Highland Perthshire well into the 18th century even in some of the most densely populated areas.

Woodland cover in the Highlands of Scotland in 1750 is believed to have been only around 5% (Lindsay 1975a). After 1700 there was an increasing incentive for land owners to cut and manage their woods. There existed some conflict between landowners interested in agriculture and in forestry as the majority of woodland at this time was located near ocean and loch shores, on the lower sides of river valleys and glens and on the banks of other watercourses all of which was land suitable for wintering livestock (Lindsay 1975b). Forest management was not a traditional part of the Highland economy and its adoption therefore required a positive decision on the landowner's part and by the end of the 18th century coppice management of broadleaved woodland and other systems of woodland management were being applied widely in the Highlands, but not uniformly and some landowners continued to exploit their woods. However it is generally the case that, on the whole, woodland management was employed when prices of woodland produce rose markedly.

It has been asserted by Dunlop (1997) that in 1869 deer forests began to be established in Strathspey as a result in the increase in the interest of sport shooting and the decrease in the value of timber. The conversion that landowners initiated in turning their estates from agricultural businesses to sporting estates has resulted in a significant decrease in employment during the 20th century in Highland Scotland (MacGregor 1987). The formation of deer forests began around 1750 in Scotland and the rate of formation of deer forests rapidly increased during the first five decades of the 19th century (Watson & Allan 1995). Watson (1983) asserts that the high level of deer poaching on the Earl of Fife's estate proved to be detrimental to the regeneration of pine. The interest in sport shooting brought about harsher penalties for poaching which discouraged this activity to a certain extent. A reduction in poaching meant an increase in deer numbers on the estate and the increase in deer numbers led to a reduction in the natural regeneration of pine on the estate.

Dunlop (1997) also states that from the 1870s onwards a great deal of planting was carried out in this area until the start of the Great War when planting levels dropped. The timber demand for the Great War brought about a reduction in the woodland cover and woodland quality of the forests extant in Strathspey at that time. Smout *et al* (2005) state that by the start of the nineteenth century up to 9% of the land was still in some sense wooded, though probably more than half of this was non-commercial

woodland, scrubby pasture or montane scrub. The coming of sheep farming and the arrival of commercial forestry had a major affect on this woodland cover. Lindsay (1975) argues that the increase in the timber industry did not result in a timber famine, although there were certainly areas of Scotland that were, relatively un-wooded and where there was a shortage of timber between 1700 and 1850.

It is apparent from the information presented that the history of Scotland's woods is closely linked to the history of the Scottish people. The influence of humans on the woodland component of the Scottish landscape has been both direct and indirect since prehistoric times. Of most significance to persistence of a population of capercaillie is the quantity and quality of available habitat for the species. It was mentioned in Chapter 1 that the capercaillie is commonly regarded as an indicator of a healthy forest ecosystem. Similarly, recent work on woodland history in Scotland has illustrated that the greatest reduction in the quantity and the quality of capercaillie habitat in Scotland occurred during prehistory. Thus, it is argued here, that the presence of the capercaillie in sixteenth century Scotland suggests that the level of woodland extant at that time was sufficiently large enough to support a population of the species.

The fate of any capercaillie population is tied to the quality and quantity of its habitat. The fact that the quantity of woodland cover from the end of the Middle Ages in Scotland onwards reduced in some areas and increased in others had ramifications for the capercaillie. In areas where the reduction of forest occurred habitat loss and deterioration was a major factor for the local capercaillie population. Differently, in areas where the economic value of the woods during this period increased the forests were generally better protected and this aided local populations of capercaillie. Thus, it is most likely the case that, on a regional and sub-population level, habitat loss and deterioration was a critical factor that contributed to the extinction of the capercaillie in Scotland.

5.2.2) Fluctuations in Climatic Conditions

It has been highlighted earlier in this thesis that climatic fluctuations have a significant impact on the persistence of a population of capercaillie and, thus, climatic fluctuation has been selected as a potential critical factor responsible for the decline of

the natural population of capercaillie in Scotland during the 1700s. Until relatively recently there existed only little information on the climate history of Scotland for short 'human' time periods. The first reliable barometers and thermometers were not developed until the second half of the seventeenth century; however the only consistent surviving climate recordings do not appear until the mid-1800s. Nevertheless, historical climatology has grown in interest over the last forty years or so and there have been several studies (e.g. Jones *et al* 2001) published that attempt to present an account of historical climatic conditions in North Western Europe using information from historical documentary sources.

These studies have highlighted several climatic 'episodes' in Europe over the last 1000 years or so. Some of these climatic episodes have been touched on in earlier chapters of this thesis; however a fuller discussion of these and their potential impact on the natural population of capercaillie is provided here. These two climatic episodes are the Medieval Warm Epoch (MWE) between 1150 AD and 1300 AD and the Little Ice Age (LIA) between 1300 AD and 1900 AD. Also included in the following summary of the LIA is a brief review of the impacts of the associated climax of this episode, known as the Maunder Minimum (MM), between 1645 AD and 1715 AD. The MWE is reported by Lamb (1995) as being a period of warm and dry weather that ended in 1300 AD with the onset of the LIA. It is reported by Bokwa *et al* (2001) that the climate during the LIA exhibited significant fluctuations in levels of temperature and precipitation.

Cold temperatures and high levels of rainfall were not necessarily characteristic of the entire duration of the LIA episode and periods of warm and dry weather are reported (Jones *et al* 2001). Both Bokwa *et al* (2001) and Lamb (1995) report the generally accepted point that there were periods of warmer conditions in the first half of the fifteenth century and between 1700 AD and 1750 AD in North Western Europe. Lamb (1995) gives a detailed account that is widely accepted by many, of the temperatures and precipitation levels in England during the LIA. Lamb's account, it is proposed here, can be extrapolated to a certain extent to include Scotland. In summary the account explains that during the first half of the sixteenth century the climatic conditions were generally warmer and drier than they had been in the previous century and than they were in the latter part of the sixteenth century. Despite the fact

that this period of warm weather reported by Lamb (1995) occurred in the middle phase of the LIA it is supported by findings from Russia (Borisenkov 1995) and from Poland (Bokwa *et al* 2001).

Lamb (1995) reports that a period of colder and wetter conditions persisted in Scotland for around one hundred years following the warm period during the first half of the sixteenth century. The next observed period of warming in North Western Europe is recorded as occurring during the latter half of the seventeenth century (Bokwa *et al* 2001). This period is commonly reported as being the time of the culmination of the LIA and the solar activity associated with MM. Lamb (1995) has reported a period of warm and dry weather in England during the latter part of the 1600s and Pfister (1995) has highlighted that the temperatures in Switzerland were relatively warm in the 1650s and 1660s although the temperature fell to a low level in the 1690s. Lamb (1995), Jones *et al* (2001) and Bokwa *et al* (2001) all report cold and wet winters and springs and high precipitation levels during the summers of the latter part of the seventeenth century.

The influence of the LIA climate episode continued into the 18th century although the climate in England began to recover during the initial period of warming reported by Lamb (1995) in the early 1700s. Recent studies have attempted to model the climatic conditions in Scotland for the period from the end of the LIA to relatively recent times. Some of these models are the subject of significant debate and are reviewed by Luterbacher (2001). Reliable records relating to precipitation in Scotland exist from around 1861 onwards and these figures have been agreed upon by a variety of different researchers (Smith 1995). Using this data the United Kingdom Meteorological Office (UKMO) has produced an earlier dataset that gives monthly areal average precipitation for Scotland. Smith (1995) modified the UKMO's model using a correction factor¹⁸⁹ to make the model more representative and more accurate (Chart 1).

¹⁸⁹ Smith (1995) has argued that the UKMO's model of precipitation in Scotland is flawed because the data used to generate the model was gathered from a site in Carlisle. He has applied a correction factor to make the data more representative to other parts of Scotland.

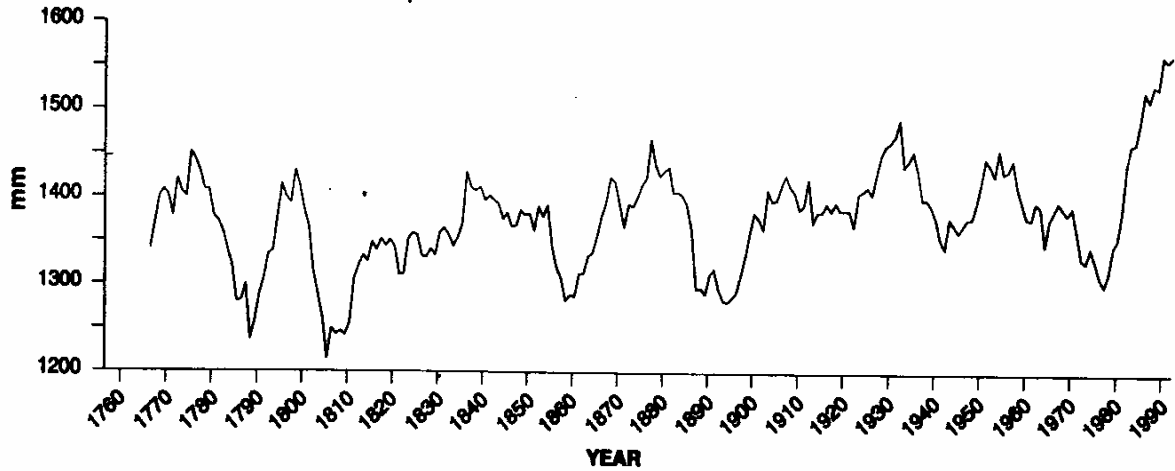


Chart 1: Reproduced from Smith (1995) page 546

Models of historic temperature conditions in Scotland have also been developed using proxy and indirect data. For example, Hughes (1987) has used dendrochronological records from Scots pine tree rings to show climatic changes in temperature during the summer months for Edinburgh between 1760 and 1810. Hughes (1987) has shown that the average temperature during the summer months between 1760 and 1810 was between 12°C and 16°C (Chart 2)¹⁹⁰.

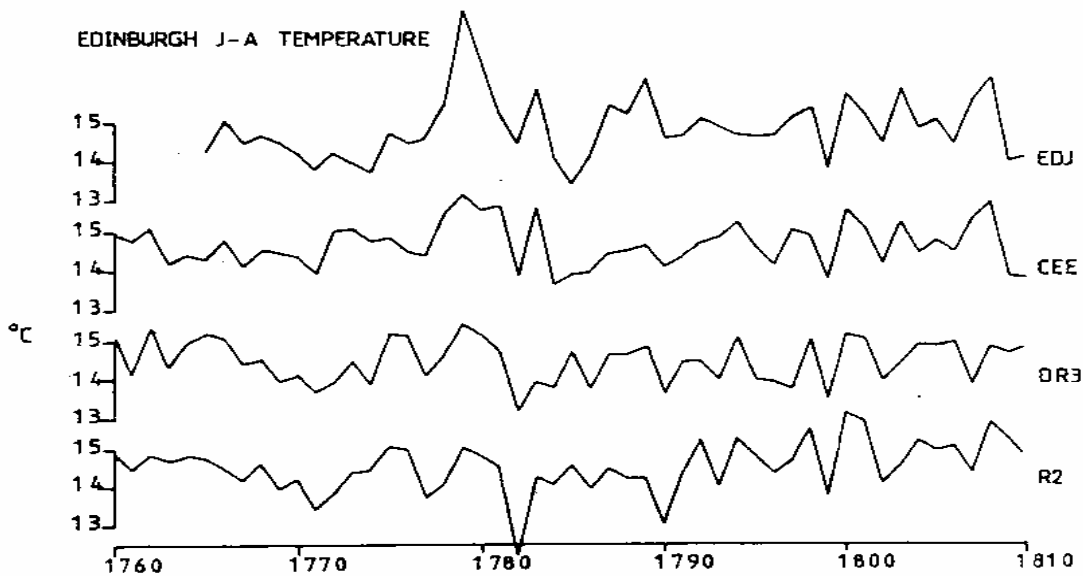


Chart 2: Reproduced from Hughes (1987) page 102: four dendrochronological samples of temperature in Scotland

¹⁹⁰ Data displayed from different sets of dendrochronological records.

This historical climatic data reported wet and cold springs during the late 1500s and late 1600s that are associated with the LIA. The 1700s saw an improvement in the Scottish climate to warmer temperatures and reduced levels of rainfall. The average temperatures in Scotland remained fairly constant into the 1800s until an increase, associated with climate change, brought about by carbon emissions in the twentieth century. For the period between 1700 and 1900 precipitation levels in Scotland averaged around 1400 millimetres of rainfall per year until the 1900s when the influence of carbon emissions began to drive climate change. It is apparent from this information that the wet and cold springs associated with the LIA would have undoubtedly impacted the breeding productivity of a population of capercaillie. Indeed it is most likely that climatic deteriorations to wetter and cooler weather would have adversely impacted the capercaillie throughout time.

The cooler and wetter weather experienced in Scotland during the 1700s would have adversely affected the capercaillie. Again, this adverse impact would have been felt on a regional basis. For example, the capercaillie is known to persist on the islands of Loch Lomond today, despite the wetter climate compared to the north-east of Scotland, due to the high quality of habitat available (Moss pers. comm. 2005). Thus where capercaillie sub-populations were located in areas of good habitat the effects of climate change would have been minimal. In locations where capercaillie sub-populations were in areas of poor habitat the effects of climate change would have had a significantly adverse impact on the species' persistence in that area.

5.2.3) Human Hunting of Capercaillie

Human harvesting of capercaillie populations has been shown to be one of the main causes of the decline of the population in some parts of its range. Hunting of capercaillie by humans is reported to have occurred from the Middle Ages in Scotland until relatively recent times. Little is known about the specific aspects of the hunting of the capercaillie in prehistory. Nevertheless, given the hunting technologies that the Mesolithic and Neolithic peoples are known to have access to, specifically traps, trapping and domesticated dogs, it seems reasonable to suppose that they would have hunted the capercaillie. It is proposed here that this hunting would have been opportunistic and sustainable in its nature, rather than systematic and detrimental to the population; human hunting efforts being confined to the edges of the forest. There

does, however, exist the possibility that humans in prehistory systematically and unsustainably harvested the population, for example, during the capercaillie lekking season. Capercaillie populations have been shown to be particularly vulnerable to human hunting during the breeding season. However, given that there remained an extant population of capercaillie in Scotland during the Middle Ages this type of exploitation of the population appears unlikely or, if it did occur, it was not significant enough to drive the population to extinction.

The impact of human hunting of the capercaillie during the historic period in Scotland is closely linked to the reduction in available capercaillie habitat. Nevertheless, for the purposes of discussion in this section, human hunting of the species will be considered separately. Again little is known about the specific aspects of human hunting of the capercaillie during Roman times in Britain (43 AD to 410 AD) although evidence from excavations of a cave in Somerset have revealed capercaillie remains that date to the Roman period in Britain. This suggests that the species was consumed at this time and would have most likely been hunted by humans. Similarly, little is known about the different aspects of hunting the capercaillie for the historical periods following 410 AD until the nineteenth century. Schulze-Hagen *et al* (2003) have shown however that between 1200 and 1700 avian taxidermy was widespread in Europe and that birds both from Europe and from abroad were often the subjects of the taxidermist. Thus it is assumed here that, for as long as the population of capercaillie persisted it was hunted. Again, it is presented here that the hunting of the capercaillie in the period between Roman times in Britain and the sixteenth century was, given that the population appears to have persisted through this period, carried out on a sustainable level.

A greater quantity of information is available on the methods of hunting during the Medieval period in Scotland. Gilbert (1979) has produced a detailed account of the methods of hunting employed by humans in Scotland during this period and an account of the species that were commonly hunted. The list of species commonly hunted by humans produced by Gilbert (1979) does not specifically mention the capercaillie. Wild fowl are reported as being a quarry of the medieval hunter and it is most likely that capercaillie were hunted along with other miscellaneous fowl during

the Medieval period. There are two methods of hunting used by those ‘qualified’¹⁹¹, that are reported by Gilbert (1979) and can be summarised as ‘the drive’ and ‘the pursuit’. The employment of ‘the drive’ method of hunting would involve the hunter waiting at a location for their prey to come to them whereas ‘the pursuit’ would involve the hunter setting off after the prey.

Gilbert (1979) states that in Scotland during the Medieval period the drive was more important than the chase for hunts involving the upper classes of society at that time. Royal hunts are commonly cited as occurring during the Medieval period. Such royal hunts would involve the king and his nobles waiting in a predetermined location with ‘weapons, spears, bows and arrows and hunting hounds’ for their prey to be driven towards them. Most huntsmen during the medieval period in Scotland were equipped with a hunting knife and a hunting sword although axes, spears and clubs were also used when hunting. The use of axes has also been reported by hunters on the West Coast of Scotland. The bows most commonly used for hunting were the crossbow and the short bow as both could be fired from horseback. During the drive the prey would be driven towards them by others sometimes on horseback or on-foot. The use of dogs and ‘horns’ to alarm the game is also reported to have been used by the drivers.

The driving of game in this fashion developed in a particular type of hunting method known in Scotland as the ‘tinchell’. Hunting using the tinchell method of driving prey was used to kill several individuals of different species. Tinchell hunting was popular with the king and the nobility of Scotland during the sixteenth century and Gilbert (1979) reports that the size of the drive that a king could muster had social and political implications. For example the size of a drive that an individual could muster often reflected the individual’s power. Although it is not expected that this method of hunting would not have been directly used to hunt capercaillie, the indirect impacts of this method of hunting on the species would have been significant. The movement of individuals through an area of woodland, driving all resident species before them towards the waiting hunters would, at the least, have had a significant disturbance impact and raised chick and egg mortality levels; as well as possibly the occasional direct loss of adult birds to the hunters.

¹⁹¹ Qualification to hunt in some parts of Medieval Scotland was usually restricted to individuals who owned a particular quantity of land or to individuals also had been given permission by the owner of the land to hunt on it.

Of less potential impact to a population of capercaillie, depending of course on the level of the intensity on which it was carried out would be the 'pursuit' method of hunting game. Gilbert (1979) reports that when hunting a single animal the chasing, coursing (usually involving 'running' dogs) and stalking of the species was carried out by humans. Gilbert (1979) states that the pursuit method of hunting game was popular with both the nobles and the commoners of Medieval Scotland. The coursing technique of hunting involved the running down of game with dogs. Although it would be very difficult for a domesticated dog to run down a male capercaillie before taking flight, a female would be more vulnerable to this type of hunting. Female capercaillie nest on the ground and they show a tendency to remain on their nests even if threatened with a predator. Hen capercaillie are regularly reported to have been predated on their nests by foxes in Scotland (Moss pers. comm. 2005).

The use of dogs in hunting during the Middle Ages in Scotland is commonly reported and Gilbert (1979) has gone further to state that the hunt was often centred on the dogs. There are two main types of hound that were used in hunts in Medieval Scotland; dogs that hunted by sight and dogs that hunted by scent. Gilbert (1979) reports that the term 'greyhound' is a generic term used for dogs that hunt by sight. Similarly, Gilbert (1979) also reports that dogs that hunted by scent, no matter what breed they were, were referred to as running hounds. Gilbert (1979) has stated that hunting '*par force*' was the classic form of medieval hunting and was carried out using running or scenting hounds. Hunting *par force* involved the release of a captive wild animal that was then sent running by one man and then the hunter on horseback would pursue the game with a pack of dogs. Gilbert (1979) states that this method of hunting was most likely carried out in Scotland after 1124. However unlike the rest of Medieval Europe the most popular method of hunting in Scotland was the drive which had been current in Scotland before 1100, and not the *par force* method preferred in England and Europe.

Another form of the pursuit method of hunting game that is reported by Gilbert (1979) is stalking. Stalking in Scotland during the Medieval period was very similar in its practical employment during that time as it is today. Stalking during the Medieval period in Scotland involved the approach of the quarry in a stealthy fashion,

sometimes using a scenting dog and sometimes without one. Stalking could be carried out during this period using some sort of disguise, such as leaves or tree branches or using some sort of mobile cover¹⁹². When using a scenting dog the dog would usually walk before the hunter and flush or alert the hunter to the location of the prey. Once the prey had been identified, the hunter would try to kill the game with a bow and arrow or crossbow. This method of hunting would certainly have been effective against the capercaillie again particularly during the lekking season. It is difficult to quantify the extent to which this form of hunting would have affected the overall persistence of the population in Scotland and would depend on the intensity to which it was carried out.

An indication as to the possible extent of stalking that took place in Medieval Scotland can perhaps be gathered from the following account provided by Gilbert (1979). The stalking method of hunting was reportedly ideally suited to poaching and in an effort to reduce the level of poaching occurring in Scotland at that time James I outlawed stalking in 1424, although the king's subjects were still allowed to practice this form of hunting after the passing of this act. Indeed it is reported that James II and III had a salaried stalker employed in Menteith and at the end of the Medieval period. There are also early accounts of the use of guns in the stalking of game in Scotland from the reported accounts of James IV stalking in Falkland Park at the end of the Medieval period. Yet again the impact of the stalking method of hunting on the extant population in Scotland during the Middle Ages is once more intensity-dependant. Stalking was most likely a successful method of killing capercaillie. However, the national population at that time would, it is proposed here, have been able to support the losses of capercaillie to hunters stalking the birds.

Another commonly reported method of poaching and hunting game involved the use of traps and trapping. Gilbert (1979) has reported that the use of snares, nets and traps was routine by the common people of Scotland 'throughout the ages'. Similarly, Gilbert (1979) states that fowling¹⁹³ with nets was regularly carried out by the common people of Medieval Scotland and was regularly used to kill birds. Irvine

¹⁹² One example of stalking using mobile cover includes the use of devices such as the 'stalking horse'. Which could be a living horse, ox or cow that the hunter would hide behind or a device constructed from lightweight wood and was fashioned in the image of a horse which could be moved to allow the hunter closer access to their prey.

¹⁹³ Fowling is the term used to describe hunting for game birds.

(1883) in his *Treatise on the Game Laws of Scotland* gives an account of the recruitment of a fowler by the Laird of Glenorchy who must:

[...] oblige himself to be fowler to the laird, and to go to the hills with a sufficient lying dog and fowling nets, to seek for, take, and kill wildfowl and moorfowl of all kinds as convenience and the season shall offer, and as he shall be required, and on the laird's desire to send to his house one of his sons skilled in fowling.

The use of traps and nets in Medieval Scotland was regarded as an inferior method of hunting and was deemed socially unacceptable for the king and nobility at that time. Nevertheless nets and snares were widely used in Scotland and this method of hunting would have successfully been used to capture and kill capercaillie. The impact of this method of hunting on the persistence of a capercaillie population is again intensity-dependant. Given that the common people of Scotland during the Middle Ages regularly made use of traps and trapping it seems reasonable to suppose that the level of intensity of this type of hunting would have been equal to, if not greater, than stalking in terms of the number of trapping incidents. Similar to the assertions made about the impact of stalking on the persistence of a capercaillie population, it is proposed that the impact that trapping had on a population of capercaillie during the Middle Ages in Scotland was not great enough to cause the decline of the population.

Another popular form of hunting in Medieval Scotland was hawking; the hunting of game using captive reared raptors. This form of hunting was popular with royalty and nobles during the Middle Ages in Scotland. Indeed the importance of this form of hunting in sixteenth century Scotland is highlighted from the following extract:

Seeing in time of peace in all tyme bygane, the saids pastimes of hunting and halking were the only meanes and instruments to keep the hail lieges bodies fra not becoming altogether effeminate.¹⁹⁴

¹⁹⁴ Breadalbane MSS:GD112/16/12/1/33 – 1796, (Page 11)

The two most common birds used in this form of hunting were falcons such as the peregrine, the kestrel and the merlin and hawks such as the goshawk, the sparrowhawk and the buzzard (Gilbert 1979). In Medieval Scotland hawking was regularly carried out but the extent to which capercaillie were hunted in this fashion is difficult to quantify. For example, although the hawks and falcons reported to be used during the Medieval for these hunting purposes could kill both adult and juvenile capercaillie, it is asserted here that this would be particularly difficult to carry out within a woodland habitat. Thus, it is probably most unlikely that this form of hunting would have any kind of significant impact on the extant population of capercaillie in Scotland during the Middle Ages. Losses of individual capercaillie to hawkers may have occurred while the grouse were moving between woodland locations although the systematic pursuit of capercaillie by hawkers and falconers is unlikely to have occurred.

Gilbert (1979) has reported that distinct hunting seasons existed for deer in Medieval Scotland. The 'close season' occurred during the winter months and only female red and roe deer could be hunted during this period. The 'open season' occurred during the summer months when the hunting of male deer was permitted. The open season is believed to have started as early as March and to have continued till at the latest the end of October but the most popular months to hunt were July, August and September. These seasons were supplemented by other hunting laws passed by parliament such as in 1474 when parliament prohibited the hunting of any deer, whether doe, roe or red deer in snow or in storms. These are the only hunting seasons recorded in Scotland during the early Medieval period although Gilbert (1979) states that hunting seasons for other species may have existed although they haven't been recorded.

Hunting of deer outside of these dates was regarded as illegal and as poaching. Gilbert (1979) states that the fine for poaching in Scotland was £10 up until the late 12th century when the laws concerning poaching were beginning to become more significant. Similarly, Gilbert (1979) also states that by the fifteenth century, certain wild fowls were beginning to be afforded some protection by the establishment of hunting seasons. For example in 1427 and 1428, 'partridges, plovers, blackcocks, grey hens and moorcocks and other such wild fowls' were not to be hunted between the

beginning of Lent and August. Individuals caught hunting these species between these dates would be fined 40 shillings. In 1457 and 1458 a further act was passed that prohibited the hunting of any 'edible fowls' during the moulting period as the birds were more vulnerable during this period, being flightless. Gilbert (1979) reports that this Act afforded protection to partridges, plovers, wild ducks, pheasants, crane, heron and quails, but not to fowls (such as grouse). Gilbert (1979) also reports that the heron was forbidden to be hunted by anyone other than the King from 1493 onwards.

The introduction of firearms had a significant impact on the development of hunting practices in Scotland. Gilbert (1979) has reported that the first firearms appeared in Scotland at the start of the sixteenth century and that they were used to hunt game from that point onwards. By 1551, however, the use of firearms in hunting was forbidden in Scotland and Gilbert (1979) reports that this was because game species were becoming scarce. These early firearms used for shooting game were large 'fowling pieces' which discharged hail-shot (Tapper 1992). These fowling pieces worked on a match lock¹⁹⁵ principle at first which was then developed into the wheel lock¹⁹⁶ principle. The time taken to reload these fowling pieces was long and in the case of a match lock a lit taper was required to fire the weapon. This presented some serious problems when hunting fowl using these weapons given that the game could often detect the lit taper.

The primary objective when hunting using these fowling pieces was to shoot birds on the ground and to kill as many birds as possible with one shot. Firearms during this period were usually used with the stalking method of hunting. In the late sixteenth century the flint-lock was introduced and thus the standard sporting shotgun of sorts was established which remained in use for some 200 years. The accurate shooting of game birds in flight with this weapon was difficult due to the lack of consistency of powder or shot used and the delay between the ignition of the powder and the delivery of the shot from the barrel. Similarly all of these early fowling pieces including the flintlock were all barrel loading and thus the time taken to reload between shots was

¹⁹⁵ The match lock principle: match lock guns included in their design a lit taper that was used to ignite the gunpowder and discharge the hail shot.

¹⁹⁶ The wheel lock principle: as opposed to the match lock, the wheel lock did not require a lit taper to ignite the gunpowder. The design of the wheel lock incorporated a flint on a wheel and spring mechanism that would produce a spark to ignite the gunpowder and discharge the hail shot. The flint lock or bridle-lock was a refined design of the wheel lock.

significant. This design of sporting shotgun continued to be used into the 1800s when breech loading shotguns and rifles were eventually developed.

The development of firearm technology went hand in hand with the growing interest in the sport shooting of wild fowl. The growth of this interest in sport shooting developed faster in England than it did in Scotland. Tapper (1992) reports that sport shooting using muzzle loading shotguns was a popular pastime for the upper classes in England during the 18th century. However this interest in sport shooting did not develop in Scotland until the latter part of the eighteenth and early nineteenth centuries. A grouse shooting season was established in Scotland by Parliament in 1773 and the primary interest in sport shooting in Scotland came from the gentleman shooters travelling north from England. By the end of the 19th century in Scotland, grouse shooting had become so popular that demand was often greater than availability.

The impact that the development of firearm technology had on the persistence of the national population of capercaillie is, once again, intensity-dependant. The design of the early fowling pieces would not have made hunting capercaillie any easier for humans than it had been in the previous centuries. Indeed it is asserted here that losses of individual capercaillie to hunters using guns may actually have been only equal to or perhaps smaller, particularly when the hunters were using the matchlock, than they had been earlier. What is not in question during this period, however, is the fact that the capercaillie along with various other fowl was hunted. For example in the account of a Scottish aristocrat's diet in 1671 in Edinburgh, Smith (1982) highlights that there are numerous fowl being consumed but the capercaillie is not mentioned specifically in the account. However given the vast quantity of game consumed, it seems reasonable to suppose that the capercaillie was most likely available from time to time at the Edinburgh markets.

There are historical documents contained within the estate muniments that attest to the influence of firearms on game. For example in the case of an incident of poaching on Breadalbane's estate the following account is given:

[In 1551] it appears that a great many deer, roe, wild beasts, and wild fowls had been killed by shooting at them with particular instruments, viz. half hag, culvering, and pistolet, to the great hinderance of the noblemen of the realm's getting the pastime of hawking and hunting.¹⁹⁷

Watson (1983) in his investigation into eighteenth century deer numbers and pine regeneration in Braemar used historical documentary evidence to estimate the size and potential impacts of deer herds in this part of north-eastern Scotland towards the end of the eighteenth century. It is apparent from this study that extensive poaching was taking place on the Earl of Fife's estate between 1783 and 1792 and that this was having a substantial impact of the size of the red deer population on his estate. In order to redress this problem the Earl set about punishing poachers severely for the illegal hunting of deer on his estate. It is also suggested in this paper that many large parts of the Earl's estate had been cleared of people during the clearances some years earlier.

It is apparent from the information provided above that humans during the historic period have always had the means to capture and kill capercaillie. This capturing and killing of capercaillie, although it is not mentioned specifically in the any secondary studies, was most likely carried out throughout history in both legal and illegal fashions. The impact of human hunting throughout time on the capercaillie is intensity dependant and difficult to quantify. The legal hunting of capercaillie would have most likely taken place throughout history and would have been carried out using the stalking, driving and possibly other methods of hunting. The driving method of hunting would have had a much greater impact, indirectly, than the stalking method may have had directly on the persistence of the naturally occurring population of the species.

Illegal hunting of capercaillie can also be reasonably assumed to have taken place throughout history. The methods of illegally hunting capercaillie that would have most likely been employed were, in order of greatest use, trapping and stalking. MacPherson (1897) has written extensively on the history and development of fowling in the UK and elsewhere in the world. In his monograph he devotes an entire chapter to the trapping and hunting of capercaillie and black game. MacPherson states

¹⁹⁷ *NAS*, GD112/16/12/1/33 – 1796 (Page 7).

that various traps and snares were commonly used to capture both capercaillie and black game. These include gravity traps, nets and snares (Plates 21, 22, 23, 24 & 25).



PLATE 20: THE BLOSS



PLATE 21: THE KASSE



PLATE 22: CAPERCAILLIE SNARE

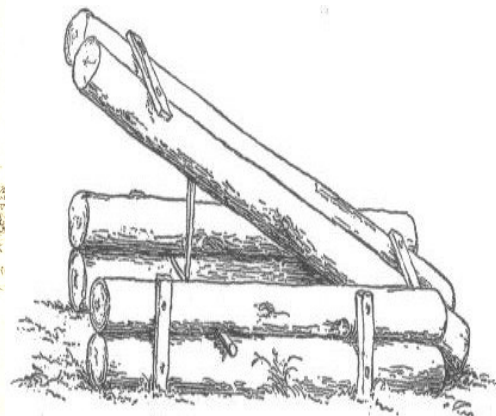


PLATE 23: DEADFALL TRAP

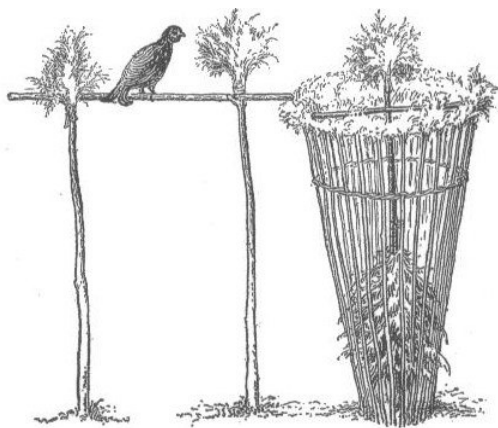


PLATE 24: CAPERCAILLIE GRAIN TRAP



PLATE 25: CAPERCAILLIE TREE SNARES

The illegal hunting of capercaillie using the stalking method of hunting was aided by the development of the firearm and Lloyd (1854) reports from Scandinavia that capercaillie were regularly stalked both legally and illegally using firearms. Indeed, Lloyd reports an interesting account from Sweden of the hunting of capercaillie at night where the hunter and an assistant would go into the woods with a ‘torch’, referred to in Scandinavia as a ‘bloss’. The torch would be lit when a group of capercaillie were found roosting in an area of the woodland and this would ‘dazzle’ them on their perches. The hunter would then shoot the capercaillie from the trees. This method of hunting is reported by Lloyd as being so effective that if the hunter shot first at the bird on the lowest branch of the trees the rest of the capercaillie would remain on their perches and could all be captured.

Evidence for the increase in the levels of human hunting is also contained within the Breadalbane and Atholl Muniments as game certificates are regularly being requested by parliament and issued from the 1700s onwards. For example:

Transcript 24:

Game certificate in favour of the Earl of Breadalbane:

31st August 1796

Game Certificate In favour of the Right Honble John, Earl of Breadalbane
£3..4Str

I James Paton Sheriff Clerk of the County of Perth do hereby declare, That the Right Honble John Earl of Breadalbane hath this Day delivered into my Office here his Name and Place of Abode, which I do hereby certify, in pursuance of an Act of Parliament, passed in the Twenty-fifth Year of King GEORGE the Third, intituled *An Act for repealing and Act, made in the Twenty-fourth Year of the Reign of His present Majesty certain Duties on Certificates issued with respect to the Killing of Game, and for grnating other Duties in Lieu thereof*; and also in pursuance of an Act of an Act of the 31st of His said Majesty, intituled, *An Act for granting to His Majesty an additional Duty on Certificates issued with respect to the killing od Game*; as witness my Hand at Perth this Thirty first Day of August One thousand seven hundred and Ninety six Years. James Patton

Are these two included in any of Mr Stewarts accots They were sent by him from Perth¹⁹⁸

¹⁹⁸ NAS GD112/16/12/1/3: Date of document 1796

The growing interest in sport shooting during the 1800s in Scotland is reflected in the historical documents of both the Breadalbane and the Atholl Muniments. For example, in the early 1800s, rules for those with rights to Breadalbane's moors are being set out. The nature of the rules for sportsmen on Breadalbane's estate is interesting as these rules specifically mention both the method of hunting to be used and the gender of the species to be hunted. For example, in 1833 the following rules are laid out:

Transcript 25:

Rules for Sportsmen Who go out a shooting August 1833.

Orders for the Gamekeeper

He is not to allow any Sportsmen to kill Roes or any other Game within the bounds of the public Roads at the foot of Drummond Hill in the north + by the Fort on the South, nor between the Easter Lodge + Kenmore Bridge. Not a shot must be fired within these boundaries except at the Park Deer when one is wanted. Any sportsman whatever who Kills a female deer in the Buck Season will forfeit a guinea to the gamekeeper, as also the same sum by any person who kills a grey hen, or a pheasant hen.¹⁹⁹

By 1841 these rules have been refined further and it is now only the stalking method of hunting using ball rather than shot that is deemed to be acceptable to Breadalbane. The point that the following transcript raises about the forbidding of the driving of the woods on Breadalbane's estate is interesting as it minimises the disturbance levels within the forest, which is beneficial for many species including the capercaillie and also reduces the number of game encountered by the sportsman during a day's hunting.

Transcript 26:

20th August, 1841

Rules for Sportsmen who have Lord Breadalbane's permission to Shoot at Taymouth

Rules to be observed by all Sportsmen who have Lord B's permission to shoot at Taymouth and with which the Gamekeeper is desired to acquaint all Gentlemen previously to their going out. Fallow Deer & Roe Deer are to be shot at only with Ball, the female is to be respected under the penalty of a guinea to the Keeper. The woods are to be driven on no account whatever, and those shooting in them are to disturb their repose as little as possible. No dogs are allowed to hunt in the large woods. The parks in which the Red Deer are kept are to be disturbed on no account whatever. Any person shooting a hen Pheasant forfeits five shillings to the Keeper.²⁰⁰

¹⁹⁹ Breadalbane MSS: GD112/16/12/5/4 – Lord B. to the Gamekeeper - August 1833

²⁰⁰ *NAS*, GD112/16/12/5/6 – 20 August 1841

The intensity-dependant nature of human hunting of capercaillie in the period pre-extinction is an essential aspect of determining the potential influence of this critical factor on the persistence of the naturally occurring population in Scotland. However, given the information gathered in this study, it is almost impossible to determine the extent of the intensity of the human hunting of the species in Scotland before the 1850s. Nevertheless, the potential indirect consequences of large drives through areas of woodland and the frequency of occurrence of poaching of other species, it is argued here, reasonably allows for the supposition that human hunting of the naturally occurring population, whether legal or illegal, would have been a critical factor in the decline of the species in 18th century Scotland.

5.2.4) Disturbance of Capercaillie

It was stated earlier in this chapter and in Chapter 1 that disturbance of capercaillie, particularly at certain times of the year, is a potential cause of the current decline of the species throughout its range. Despite these assertions a quantification of the impact that a disturbance episode has on the species has not yet been satisfactorily reached. Again, however it cannot be ruled out here. Firstly it is worth noting that, during the historic period, the lives of the inhabitants of Scotland were very closely tied to the land through their dependency on agriculture and hunting for survival. This is an important point to consider when discussing the potential historic disturbance of the capercaillie population in Scotland.

Areas of woodland in historic Scotland were known ‘intimately’ to the neighbouring human inhabitants and it is reasonable to suggest that human use of the woodland for various purposes was an everyday event, whether legal or illegal. Even the simply passing through an area of woodland while travelling between two farmsteads could essentially represent a capercaillie disturbance episode, particularly if the individual travelling had a domesticated dog with them and it was during the lekking season. To provide a fuller discussion of this point is unnecessary and it suffices to say here that these types of episode represent a ‘background level’ of capercaillie disturbance. It is then necessary to briefly comment on the events that may have represented a substantial increase in capercaillie disturbance above the background level for the period leading up to the extinction of the species.

Potential disturbance episodes include the indirect impacts of hunting as alluded to earlier. Another is the construction of the military roads in Scotland carried out by General George Wade (1673-1748). Wade's 'military roads' first began construction in the Highlands of Scotland during the summer of 1725 in order to allow the government a fuller control of the Highland region. The roads that General Wade constructed linked the following locations:

- Great Glen to Inverness: 1726-1727: 60 miles
- Dunkeld to Inverness: 1728-1730: 102 miles
- Crieff to Dalnacardoch (Connecting link for Stirling and Inverness): 1730: 43 miles
- Dalwhinnie to Fort Augustus: 1731: 28 miles.

All of these roads run through areas of potential capercaillie habitat and both the human interference with neighbouring areas of woodland and the works carried out during the construction of these roads may have possibly disturbed a resident capercaillie population. Another potential disturbance factor comes from the development of the charcoal manufacturing industries in Scotland. The manufacture of charcoal was regularly carried out in Scotland within areas of woodland between the 17th and 18th centuries. The movement in and out of compartments of woodland by humans engaged in this industry would have represented another disturbance episode greater than the background level. A more detailed discussion is difficult to provide. Nevertheless, Smout *et al* (2005) state that in the run up to the period of industrialisation the woods in Scotland became to become more utilised, whether for the wintering of livestock or some other purpose. Therefore, disturbance cannot be ruled out and must be considered a critical factor causing capercaillie decline in certain regions.

5.2.5) Ecological Relationships and the Natural Predation of Capercaillie

Every extant species holds ecological relationships with other species on Earth. Some of these relationships are cooperative in their nature and are related to the coexistence of two or more separate species. Other relationships are less cooperative and result in the death of individuals of a species. These uncooperative relationships occur naturally and are one of the key features of life on Earth. The capercaillie, like other

animals, holds both of these types of relationships with various other species. Due to the nature of species turnover these relationships do not remain fixed or constant over time. It has been mentioned earlier in this thesis that the capercaillie held ecological relationships with species in prehistory that it no longer does today. Similarly, the capercaillie holds ecological relationships with species today that it did not do in the past.

The aim of this section is to highlight any potential changes in the ecological relationships, particularly predator-prey relationships, which the capercaillie held with any other species in history that might be responsible for causing the decline of the naturally occurring population in Scotland during the 1700s. Capercaillie are and have been prey to numerous other species over time and habitat is an important factor when discussing species that hold predatory relationships with the capercaillie. Given the capercaillie's ecology and behaviour at the time of maximum forest cover in Scotland, only predatory species able to venture away from the forest edge and into the centre of the forest would have held a predatory relationship with the bird.

As the Scottish forests reduced in size and became more fragmented many forest dwelling species were lost to extinction. This in turn altered the capercaillie's ecological relationships. Similarly, the reduction in the size and extent of the forest fragments also altered the capercaillie's ecological relationships. Thus, it is proposed here that the species with which the capercaillie holds ecological relationships with today, on the basis of predation, are very similar to those it held the same relationships with at the time of the reduction of the forest. Therefore, it is proposed here that the capercaillie has held ecological relationships based on predation with the same group of species for the last four hundred years or so.

There is, however, one species that is no longer extant in Scotland today, that the capercaillie would have most likely held an ecological relationship with in the past, namely, one such species is the wolf. Wolves are known to hold ecological relationships with capercaillie in other parts of Europe and are believed to have persisted in Scotland into the 16th century. Wolves were the subject of an eradication programme in Scotland and there are several instances where the King passed further acts regarding the destruction of wolves during the 16th century. During the reign of

James V the wolf was still widely distributed throughout Scotland in the counties of Ross, Inverness, Cromarty, Perth and Argyll. Indeed there are accounts of King James himself slaying wolves while hunting in Atholl in 1528.

The hunting of wolves was a popular pastime for the aristocracy of that time and there are accounts of the hunting of wolves in Atholl in 1563. On this occasion John, 4th Earl of Athole slew 360 deer and 5 wolves during a drive involving 2000 highlanders. Wolves were continually numerous in Scotland throughout the reign of James VI and they continued to be so until the last wolf was believed to have been shot in 1680 by Sir Ewan Cameron of Locheil (Harting 1880). While the wolf was extant in Scotland it most likely held a predatory relationship with the capercaillie. This relationship would have been regulated, however, by the wolf population size and density in Scotland at that time; the size of the wolf population in Scotland was, in turn, regulated by humans.

Human regulation of the population size of predatory species is a topic that has been given little credence from a nature conservation perspective. Indeed there are many predatory species today that are some of the rarest species in the UK and their past persecution is seen as a negative action. Nevertheless, human efforts to keep the population sizes of predatory species low, whether it was for the protection of their own livestock, protection for themselves or for some other purpose plays an important part in this discussion. Given that the naturally occurring population of capercaillie in Scotland held very similar ecological relationships, excluding the wolf, to the reintroduced and extant population today, the predators of the capercaillie in the past can be considered to be essentially the same as today.

Direct losses of capercaillie at various periods during their life cycles to these predators is, again, related to the size and density of the populations of predatory species. Provided that these predators were at the top of the 'food chain' the size of the populations of these predators would only be regulated naturally by resource availability. In many cases humans were also in competition with the predators for the same resources and, in an effort to secure these resources for themselves, humans have controlled the population size of many predatory species throughout history. The population sizes of species such as the fox and golden eagle, it appears, have been

controlled throughout the historical period in Scotland in order to protect livestock. Prior to the late 1700s, predator control in Scotland was not as systematic as it was during the Victorian period. Nevertheless, predatory species were persecuted by humans and there are numerous accounts of petitions from tenants on Scottish estates following the passing of the ‘Disarming Acts’ of 1716 and 1725 stating that without their guns they had no means of controlling predator numbers.

The first of the ‘Disarming Acts’ was passed in the autumn of 1716 under the title of ‘*An act for the more effectual securing the peace of the highlands in Scotland*’. This Act prohibited anyone in the majority of the Highlands of Scotland from having in ‘...*his or their custody, use, or bear, broad sword or target, poignard, whinger, or durk, side pistol, gun, or other warlike weapon*’²⁰¹ unless they were allowed or authorised to do so. The second of the ‘Disarming Acts’ was passed in 1747 and was called the *Act of Proscription*. This act reinforced and continued the application of the Act of 1716 and forbid the use of the aforementioned weapons in the localities:

[...]within the shire of Dunbartain, on the north side of the water of Leven, Stirling on the north side of the river of Forth, Perth, Kincardin, Aberdeen, Inverness, Nairn, Cromarty, Argyle, Forfar, Bamff, Sutherland, Caithness, Elgine and Ross[...]²⁰².

There are two issues that the passing of the ‘Disarming Acts’ raises. The first is the impact that the enforcement of the Act would have had on the hunting of capercaillie by humans. The second is the impact that the passing of this Act would have had on capercaillie predator numbers. In the first instance it can be assumed that the Disarming Acts would have lessened the impact that hunting with guns would have had on the persistence of the capercaillie population. The extent to which the impact was lessened depended on the extent to which the proscriptions of the Act were applied. It is apparent from both primary and secondary historical sources that the level of enforcement of these Acts varied between regions of Scotland. For example, in Dr. John Walker’s *Report on the Hebrides in 1764 and 1771* there are records of a high level of enforcement of the ‘Disarming Acts’ (McKay 1980). Walker states that

²⁰¹ NAs GD1/44/7/1/7 – Letters from members of the Mackenzie of Coul family.

²⁰² NAs GD36/454/5 – Acts of Parliament relating inter alia to the Disarming of the Highlands (1748).

the number of '*pernicious wild Animals*' in these areas has increased as a result of the disarming and to the detriment of their livestock.

The historical documents also provide accounts to the contrary. For example, Withers (1988) highlights the fact that the 'Disarming Acts' were only effective in areas that were in close proximity to garrisons. Similarly, the primary historical source material also provides evidence of this fact. For example there are accounts of warrant's for arrest for being in breach of the Acts being issued to many, such as the 'Laird of Mcnaughtan' and his tenants for refusing to disarm²⁰³. Wight (1784) also highlights that the 'Disarming Acts' did not necessarily apply to everyone by the 1780s and that those qualified were allowed to bear arms²⁰⁴. Wight (1784) provides an account of Farquharson of Invercauld's programme for the control of predators and in the 1780s where he had one '*hundred stout men*' employed in predator control. The primary historical source material also refutes the idea that, bereft of guns, capercaillie predator populations expanded rapidly. Thus it is difficult to conclude that the 'Disarming Acts' may have directly or indirectly affected the persistence of the capercaillie population.

An increase in predator numbers during this period is supported by the accounts provided in other chapters. Similarly, the low number of game species reported on both the Breadalbane and the Atholl estates is also backed up by historical information. Similarly, there are numerous documents from the Breadalbane Muniments that testify to the rigorous predator control that was being carried out on the Breadalbane estate. For example the following extract from a document within the Breadalbane collection highlights the number and species of 'vermin killed' and the value attributed to this level of predator control:

²⁰³ NAS GD/26/8/21: warrant for the arrest of the Laird of Mcnaughtan, Mcnaughton of that Ilk, and disarming of his tenants.

²⁰⁴ In many cases gamekeepers and sportsmen were allowed to carry firearms.

Extract²⁰⁵:

Vermin Killed from 1782 to 1797 by John Sinclair

	Polecats	Martins	Wildcats	Weasels	Badgers	Payment
1782	17	2	5	-	4	£1.13.6
1783	13	-	3	-	5	£1.0.6
1784	15	6	1	-	2	£1.9.6
1785	10	7	2	-	3	£1.17-
1786	12	3	-	5	1	£1.0.6
1787	3	2	1	1	7	£-10-
1788	7	4	-	-	1	£-15-
1789	9	5	-	-	-	£-18-
1790	9	3	-	6	2	£1.7.6
1791	11	4	2	7	3	£1.1.6
1792	7	3	1	12	2	£-10.6
1793	6	2	-	1	1	£-10-
1794	5	1	-	6	-	£1.0.6
1795	9	4	-	7	3	£-19-
1796	11	4	-	-	3	-
Total	151	50	15	45	37	£15.11 ²⁰⁶

These figures may not at first appear particularly dramatic. However John Sinclair is only one of the many involved in predator control on the Breadalbane estate during this period. The effort to control ‘vermin’ continued throughout the latter part of the 1700s and the accounts of the state and condition of the game on both the Atholl and Breadalbane estates presented in Chapter 4 illustrate that the conditions in the second part of the 1700s were damaging the size of some game populations. Vermin control continued in Scotland into the 1800s, by which time the lists detailing the quantity of predators killed no longer included the species names and were referred to simply as ‘winged’ vermin and ‘four-footed’ vermin²⁰⁷. Indeed, predator control it appears was one of, if not the, main activity required of the gamekeepers on both the Breadalbane and Atholl estates. For example, in 1807 a petition was sent to Breadalbane requesting a gamekeeper for Glenorchy as the ‘vermin are becoming very numerous’²⁰⁸. Similarly the contracts of employment between Breadalbane and his gamekeepers usually specifically mentioned the control of predators and the preservation of game (transcripts overleaf):

²⁰⁵ *NAS* GD112/16/7/3/24

²⁰⁶ There is a note appended to this document stating that John Sinclair was also paid an additional £1 for out of pocket expenses.

²⁰⁷ *NAS*, GD112/16/12/5/43; *NAS*, GD112/16/12/5/21x; *NAS*, GD112/74/217

²⁰⁸ *NAS*, GD112/16/4/6: 14 – 15.

Transcript 21:

Articles of Agreement with James Brook Gamekeeper June 10th 1819
London June 10th 1819

I agree to engage you James Brooks as my Gamekeeper for One Year for the Sum of One Hundred and Forty Marks, Including all perquisites killing of Vermin &c

The above includes also the Wages of the Lad who accompanies you.

[Signed] Breadalbane

I agree to serve his Lordship for One Year on the above terms.

James Brook [His Mark] X²⁰⁹

Transcript 22:

Ext. Regt. Depulation

The Mearques of Breadalbane to James Guthrie, Gamekeeper 1848

At Perth the Eighteenth day of November Eighteen hundred and forty eight years in presence of Robert Whighorn Esquire Sheriff of Perthshire Compeared Archibald Reid Writer in Perth as Procurator for the person after named and designed and gave in the Depulation underwritten desiring the same to be registered in the Sheriff Court Books of the said Shire conform to law which desire the said Sheriff finding reasonable he ordained the same to be done accordingly the tenors whereof follows Viz. Know all men by these presents, that I the most noble John Marquess of Breadalbane proprietor of the Estates of Breadalbane in the County of Perth have (by) virtue of the Statute in such case made and provided nominated authorised and appointed, and by these presents do nominate authorise and appoint James Guthrie, residing at Taymouth in the County of Perth, to be my lawful Game Keeper to preserve and kill the Game within the said lands for my sole use and immediate benefits, with full power and authority, so far as allowed by Law, to prevent all others not authorised by me from trespassing upon the said lands in the pursuit of Game or otherwise and further to do execute and conform, all and every act and acts, thing and things within the limits of the said lands, which by virtue of the Said Statute in such case made and provided, or of any Laws of this Realm, belong and appertain to the office of a Gamekeeper, during my will and pleasure, and for which this shall be his sufficient warrant, and I consent to the registration hereof in the Sheriff Court Books of the County of Perth and thereto constitute.

Procurators: In Witness whereof I have subscribed these presents written upon Stamped paper by William Archibald McEwan Clerk to Messers. Davidson & Syme Writers to the signed at Taymouth Castle upon the Eighteenth day of november Eighteen hundred and forty eight before these Witnesses Sir Alexander Campbell of Barcaldine Baronet and John McPherson my Butler signedof Breadalbane. Alexander Campbell Witness Jn McPherson Witness:-
Extracted upon this and the two preceeding pages by me Sheriff Clerk of Perthshire. James McPatton²¹⁰

²⁰⁹ *NAS*, GD112/16/12/2/1

²¹⁰ *NAS*, GD112/16/12/5/9

By the 1900s the duties of the gamekeepers had been more firmly established and vermin control was again high on the list of daily activities for the gamekeeper. Indeed it was during this period that the ‘vermin board²¹¹’ saw regular use and in 1905 Breadalbane’s ‘rules’ for his gamekeepers specifically mentioned the maintenance and use of the vermin board:

Transcript 23:

RULES for the GAMEKEEPERS on the BREADALBANE ESTATE

The Keeper shall regularly fill up and send in to the Estate Office a monthly report of all Game and Vermin killed, and shall immediately report to the Ground Officer any irregularity or damage which may come under his notice. He shall at all times be civil and obliging, and shall make himself useful to the Shooting Tenants within his duties as a Keeper. He shall do his utmost to protect the Game and Fishing under his charge, and report all cases of poaching. He shall attend as far as possible all heather burning, and in conjunction with the Ground Officer of the district go over the Moor for the purpose of ascertaining the amount of heather to be burned each year. He shall keep a Vermin Board upon which all Vermin got by him shall be exhibited. He shall trap rabbits when necessary. The Keeper residing nearest the Kennels shall look after the Dogs in the Kennel, unless where there is a Kennel boy kept by the Shooting Tenant. During the Tenant’s absence the Keeper will render any necessary assistance to the Housemaid, and see that all Drains and Water Supplies to the Lodge and Offices are in proper working order, and also that the Rhones and Rain Conductors are not choked, and will report any defect at once. The Keeper shall see that dykes are not damaged by the removal of stones for the purpose of dislodging Rabbits or other similar reasons. The Keeper shall roughly mend all wooden Plantation Fences on his beat. The Keeper shall assist at looking after the private Walks, and in the cropping of the Garden in the case of Shootings where a resident Gardener is not kept, but such duties must not in any way interfere with his duties as Gamekeeper. The Keeper shall at all times furnish Lord Breadalbane’s Head Gamekeeper or Head Deer-Stalker with any information they require.²¹²

There are also numerous documents from within both the Breadalbane and the Atholl Muniments that testify, to the increase of predator species on Breadalbane’s estate. For example, in November 1786 a gentleman by the name of James McQuary from Ardtalnaig writes to Breadalbane to request a gun; so that he might be able to *kill eagles, hawks and other wild beasts so very destructive to Breadalbane's game* (NAS G112/11/1/4/51)²¹³.

²¹¹ Vermin boards were commonly used to display the carcasses of vermin killed by gamekeepers and ground officers.

²¹² Breadalbane MSS: GD112/16/12/5/23 & GD112/16/12/5/34x – 1905

²¹³ It is assumed that these requests are genuine.

It is apparent from the forgoing documents that the control of vermin was deemed to be an important factor in preserving the size of the populations of game birds in history. Indeed, the intensive nature of vermin control in historic Scotland has been highlighted by numerous authors. Smout (1997) cites the reported heavy game bags of the 1700s as well as the ‘raptor slaughter’ of the Victorian period as evidence to suggest that the eighteenth-century ecosystem may have been able to support a much larger volume of prey species than the modern Highland environment. This point gives credence to the idea that predator populations were a indeed problem during the 18th and 19th centuries in Scotland.

Despite the uncertainties, what is apparent is that the documented human interest in the control of predators grew rapidly during the 1700s and 1800s in Scotland. Perhaps as the interest in sport shooting grew and as estate management and agricultural practices improved. This interest in producing large game bags for the sportsman resulted in the employment of gamekeepers that had specific duties to control predator numbers. Tapper (1992) has asserted that the key ingredient in producing wild gamebirds in all habitats has always been predator control. Similarly, he goes on to state that the early gamekeepers referred to anything from a ‘rat to a badger or a jay to an eagle’ as vermin. Similarly Tapper (1992) asserts that these gamekeepers also regarded the fox, stoat, carrion crow and magpie as important predators. Control of the population size of predatory species by humans would have been beneficial to the capercaillie; however, periods of a lower intensity of control would be detrimental to the persistence of a population of capercaillie. Given the information presented it seems reasonable to assert that predation of the capercaillie by species other than humans or, indeed, extent of regulation by humans of the size of predator populations could have reasonably caused the decline of the naturally occurring population of capercaillie in some locations in Scotland. Again, this critical factor cannot be ruled out.

CHAPTER 6 – GENERAL DISCUSSION & CONCLUSIONS

This chapter provides a general discussion of the information presented heretofore and comments on the extent to which conclusions to the research questions can be drawn. The first research question to be addressed was to establish to what extent historical documentary sources could help to explain the causes of a species decline. It is apparent from the foregoing chapters that the survey of the historical manuscripts has yielded information on the capercaillie in Scotland not previously published. This represents an original contribution to the knowledge of the species in Scotland and provides, at the least, contextual information on the naturally occurring population of capercaillie in Scotland. Following a positive outcome from addressing the primary research question, the secondary research question could then be addressed.

The secondary research question was to establish to what extent the documentary evidence could allow for assertions about the specific causes of the decline of the capercaillie in eighteenth century Scotland. Establishing the causes of the decline of a species in the present day can be difficult and usually involve a series of intensive studies into the ecology and behaviour of the species. These modern day ecological studies usually seek to provide detailed scientific information on various aspects of the population dynamics of the species. Such information includes counts of the population size of the species as well as information on the sex ratio of the population, breeding productivity rates, adult mortality rates, habitat preferences and availability for example. Detailed information of this kind was not available from the historical manuscript sources.

Thus in order to answer the secondary research question this thesis set out to try and establish when the capercaillie might have first arrived in Scotland, when it became extinct and when the species was reintroduced. To achieve answers to these questions this thesis had three key steps. The first was to assemble from the present day understanding of the ecology of the species a series of critical factors that may have been responsible for the decline. The second step was to assemble all observations of the capercaillie from within the sample historical documents. The third step was to

examine which of the critical factors may have taken place within a time frame that could account for the decline and successful restoration of the species as reported in the historical documents. Detailed quantitative data was not available from the historical manuscript sources. Thus this thesis presents an ecological synthesis of more qualitative data. The critical factors were assessed on the basis of this qualitative data.

The historical documents presented in Chapter 4 do not illustrate that the capercaillie was still extant in Scotland after the 18th century. Nevertheless, given the shift in paradigms in modern conservation biology between ‘absence of evidence’ to ‘evidence of absence’; there is no information in the historical documents to confirm the extinction. Despite this lack of extinction confirmation and in the absence of information to the contrary it is proposed in this thesis that the species did in fact become extinct as a breeding population in 18th century Scotland. This is not to say that there were no individuals birds remaining, but it is most likely that by 1800 numerous regional extirpations of the species had occurred. In defence of this position the historical source material presented in the foregoing chapters confirms that many landowners in Scotland and other individuals in Britain appear to have been aware of the absence of the capercaillie from the Scottish avifauna.

Given that the historical documents seem to support the common assertion about the fate of the natural population of capercaillie in Scotland, one aspect of the initial research question of this thesis has been positively answered. From the information presented in the two preceding chapters, it seems reasonable to conclude that historical documentary evidence can indeed help to, at the least, establish the accuracy of assertions about the historical extinction of the capercaillie in Scotland. It is evident from the foregoing chapters that the information gathered from the historical documents certainly adds to the knowledge of capercaillie in Scotland and can assist in the understanding of the 18th century decline of the species. Similarly, as presented in Chapter 4 this thesis has helped to explain how

The secondary research question deals with the specific causes of the decline and reintroduction of the species. Unfortunately, although the survey of historical documentary evidence has revealed information about the capercaillie that heretofore

has not been reported; for the period pre-extinction, the documentary evidence cannot aid in the explanation of specific causes of the species' extinction. However, it is proposed here that for the pre-extinction period a 'high level' theoretical hypothesis for the loss of the capercaillie can be provided. Differently, the survey of historical documentary sources has, as presented in Chapter 4, yielded sufficient information to answer the secondary research question for the reintroduction of the species in Scotland.

Despite the difficulties experienced in the present day with grouse reintroductions the 19th century restoration was made a success due to several factors that resulted in extremely low levels of adult mortality and high levels of breeding productivity. The low levels of adult mortality and high levels of breeding productivity were brought about, specifically, by three factors. Namely, high levels of predator control, regulation of human hunting and through the maintenance of the genetic diversity of the reintroduced stock of birds. An historical inhabitation model has been prepared from the documentary sources and the present day understanding of the ecology of the capercaillie, which is as follows:

By the end of the Middle Ages the quantity of woodland in Scotland was large enough to support the population of capercaillie extant at that time. The woodland habitat had reduced in size from the primeval and had become fragmented. This in turn reduced the size of the naturally occurring capercaillie population over the same time period. By the end of the Middle Ages the capercaillie population in Scotland existed and persisted as a metapopulation. Sub-populations of capercaillie were located in areas of suitable habitat and individual birds dispersed between these sub-populations and over open ground in some cases. The overall capercaillie population and regional sub-populations at the end of Middle Ages was 'healthy' and the species was abundant in certain areas while also lost from others.

The faunal species assemblage in Scotland at the end of the Middle Ages had been altered due to environmental stochasticity and anthropogenic activity. The population sizes of capercaillie predator species were able to grow and were regulated naturally through resource competition. At this time humans also predated capercaillie. In addition humans also regulated the size of other capercaillie predator populations.

The climatic conditions during the Maunder Minimum increased the breeding productivity of the species. Whereas, wet and cold weather associated with the Little Ice Age negatively influenced the breeding productivity of capercaillie. Thus, the national population of the species survived into the 1700s as a result of the availability of high quality habitat areas with little disturbance, which in turn improved breeding productivity; the human regulation of other predatory species and low adult mortality.

In the period between the 16th and 19th centuries the Scottish human population increased. With this increase in human population there came an increased use of the Scottish woodlands. This impacted the capercaillie on a sub or regional population basis. In relatively isolated locations small areas of good habitat still existed into the 1700s. These areas were low in disturbance, contained a high quality of chick rearing habitat and had low numbers of predators (such as the islands in Loch Lomond today). In these habitat areas the capercaillie sub-population avoided the effects of inbreeding depression through the dispersal and arrival of other individuals from different sub-populations. In these locations the naturally occurring capercaillie population persisted, perhaps into the 1800s. Three possible locations of these key habitat areas in 18th century Scotland are recorded in the historical documents; Strathglass, Ballochbuie and Abernethy.

In other locations, capercaillie sub-populations were becoming extinct or extirpated from around the 15th century onwards, starting with any population that may have existed in the Scottish borders. The specific stresses and critical factors of greatest influence behind each of the regional extirpations would have been different in the different locations. In some areas the deterioration of habitat as a result of further tree felling, high deer numbers, human hunting or predation may have been the cause. In other areas where the capercaillie's habitat had reduced in quality; climatic changes and the 'wet spring' scenario would have been the critical factor; and so on. The critical point of persistence for the national capercaillie population was reached when the dispersal of individuals between the sub-populations stopped and the size of the last sub-population reached the minimum viable population (MVP) level. This most likely occurred sometime during the 1700s.

Thus it is proposed here that the specific cause of the decline of the national capercaillie population in Scotland during the 1700s varied between different areas of inhabitation. If this is considered at the national population level it is reasonable to propose that a series of critical factors, regionally felt and acting in unison were the main cause of the species' demise. For example, any capercaillie population existing in the Scottish borders was likely exterminated by the end of the 16th century as a result of several factors, including habitat loss. In other areas the resident capercaillie population, on the other hand, was lost later, primarily through habitat deterioration rather than direct habitat loss as a result of the actions of livestock in the woods; and so on. Although the historical information gathered in this study has been unable to identify the specific causes of the decline; it is asserted here that the information is sufficient to propose a reason for the decline on a theoretical level. Thus, on a theoretical level, it is proposed here that the failure of the metapopulation structure was the single critical factor responsible for the extinction.

The information presented in the foregoing chapters of this thesis supports this hypothesis and has not provided any information that could reasonably rule out any of the critical factors. For example it was stated in Chapter 5 that habitat loss and deterioration had been occurring throughout history and over the whole of Scotland at different levels of intensity. The loss of woodland in the Scottish Borders during the Middle Ages would most likely have caused the regional extirpation of any capercaillie sub-population residing there. Similarly, populations functionally linked with any population in the Borders would now also be more at risk to predation. Chapter 5 also presented information on the pasturing of animals in the woodlands of Breadalbane and elsewhere at high stocking levels. This practice would have caused the existing forest habitat to deteriorate in quality for the capercaillie. In some cases this would have again caused a regional extirpation and in others this would have exposed individuals of the population to other limiting factors. The introduction of professional foresters in the 18th century and protection offered to areas of woodland by the Baron Courts may or may not have helped some capercaillie sub-populations.

The preceding chapters of this thesis have also presented similar information for the other critical factors selected in this study. For example, for the impact of climate change on the species, Chapter 5 has presented evidence reporting higher levels of

rainfall and colder weather around the proposed date of extinction (between 1760 and 1790). If this factor could be assumed to be applied to the entirety of the Scottish population of capercaillie then given the capercaillie's known response to wetter and colder weather it could be assumed that there is sufficient evidence to highlight this factor as one of the main causes of decline. However, recent studies on the capercaillie population resident on the island of Loch Lomond have illustrated that despite the wetter weather this sub-population experiences, the high quality of habitat mitigates the effects of the 'wet spring scenario'.

Indeed, the historical documents presented in Chapter 4 support this case. In Chapter 5 reports of higher levels of rainfall around the period of extinction between 1760 and 1780 are provided. However, Chapter 5 also reports a period of similar levels of rainfall around 1830-1840 and the reintroduction of the species. Thus, it seems reasonable to assume that despite the high levels of rainfall, the capercaillie reintroduction programme that was underway at Kenmore was made successful by providing high quality habitat and/or mitigating some other potential limiting factor. The case for maintaining the theory that the extent of impact of each of the critical factors varied between the different regions of Scotland is maintained through further similar examples. For predation by species other than humans, in areas such as on the Breadalbane estate, as reported in Chapter 5, predator control was carried out at a high level of intensity. In other areas, such as in the Hebrides, predator control was not carried out to the same extent.

The gradual extinction of the national capercaillie population as a result of the failure of the capercaillie metapopulation is supported by accounts of residence and loss from the historical documents. For example it has been shown in Chapter 3 that by the 16th century some capercaillie populations have already been lost and some were also still surviving. The account given by the Bishop of Ross illustrates that the capercaillie remained in Ross and Lochaber, although it was 'very rare'. Chapter 3 also presented positive information as to the capercaillie's inhabitation of Glenorchy in the 17th century. Interestingly, the capercaillie's residence in Glenorchy also supports the idea that areas of good habitat can allow the capercaillie to overcome the adverse effects of climate change. There exists no capercaillie population in Glenorchy today and this absence is reported to be due to the high levels of rainfall.

There are observations of the capercaillie contained within the historical documents from throughout the 17th century. Chapter 3 has reported that the species is still surviving in Atholl, Braemar, Argyll, Angus and Abernethy. Into the 1700s it would appear that the species is becoming rarer from Burt's account of the 'cobber-kely'. Similarly, it also appears that the species is absent from many areas it most likely previously occupied as no mention of the species occurs in the index of the Forfeited Estates Inventory (1745). Additional weight is given to the idea that the critical point for the national population of capercaillie was reached sometime in the 1700s from the information on the state of other game species on the Atholl and Breadalbane estates presented in Chapters 4 and 5. However thirty years later, in the 1770s, a population of the species or at least individuals from a population are still surviving for Pennant and Robertson to observe them. Thus it would seem reasonable to propose the following. The historical documents illustrate that the species was distributed over a much wider area in Scotland than at present. The national capercaillie population was reduced in size through the extinction of sub-populations and that the critical point was reached in the mid-1700s. At this time it is possible that only one sub-population remained. Perhaps around Strathglass, Ballochbuie and/or Abernethy as reported by Pennant and Robertson.

The observations made of the species during the 1700s do throw up an important point related to island biogeography and metapopulation theory that is worth of further consideration. Firstly, if it is assumed, which it must be that the capercaillie was not always extant in Scotland, then it is apparent that at some point in the past, when the conditions were suitable, the species naturally colonised this country. The conditions that drove this colonisation can only be speculated upon here. However Lloyd (1870) offers one possible explanation from Sweden where he states that during particularly harsh winters he had seen large flocks of capercaillie flying westwards out over the North Sea. Lloyd (1870) offers no final destination for these flocks but it is proposed here that these flocks could have been making for Scotland. Indeed, it is also suggested here that Scotland does in fact offer a refuge for the capercaillie in times of harsh winters and extreme competition for resources.

The species is reported commonly as being largely sedentary (Cramp & Simmons 1980) nevertheless; the physiology of the species suggests that the bird is capable of flying over large distances (Moss pers. comm. 2005). It is impossible to make conclusions on this point here, especially given the fact that no recent studies have observed capercaillie making such flights. Nevertheless, the capercaillie is physically capable of flying long distances. It is possible that the species is 'designed' specifically for this reason to allow for migration. But to establish a trigger for this behaviour is more difficult; but it is likely that the species, if it does so, migrates in response to harsh conditions.

It could be proposed that the driver behind the capercaillie's colonisation of Scotland was either harsh conditions or competition for resources on continental Europe. Scotland is on the western fringe of the European landmass and it is also on the western fringe of the distribution of the Scots pine tree. Similarly, and more importantly for this study, Scotland is also on the western fringe of the capercaillie's range. With any area of woodland the edges of the forest are the most vulnerable and change in structure and composition most rapidly. Thus it seems only reasonable that the distribution of species within the forests of Scotland should change at a faster rate than on continental Europe. Hanski (1994) has presented several points that are worthy of further consideration in this respect; namely blinking metapopulations, rescue populations and areas of refuge.

Before moving on to discuss Hanski's theories it is important to consider that the 18th century extinction of the capercaillie in Scotland was not simply the result of the action of any specific critical factor but that there were several factors acting in different levels of intensity. This brought about the extinction of sub-populations as discussed earlier, and disrupted the metapopulation structure causing the demise of the national population. Although it is most certainly the case that specific factors caused the extinction of the sub-populations, no single or combination of one or two factors is responsible for the extinction of the species throughout Scotland. If considered since prehistory, the range of the capercaillie, along with other species has always been growing and reducing over time. Testament to this is the fact that shortly following the extinction of the species in Scotland, it also was lost from Denmark and Austria; indeed it is in decline now throughout all of its western range.

Hanski (1994) has observed several phenomena in his study of metapopulations which he has described as blinking metapopulations, rescue populations and refuge areas. These phenomena can help to halt the potential decline of a species close to extinction. A blinking metapopulation involves the re-colonisation of an area of habitat a species has almost or very recently been lost from by dispersing individuals. A rescue population relates to a dispersing group of individuals that integrate with a population in decline and thus halt extinction. A refuge area is an area that is not always occupied by a population and is often only used in times of extreme events. Thus the following must be considered, that the capercaillie in Scotland is part of a wider European metapopulation and is naturally subject to the effects of extinction and re-colonisation and that the species in Scotland persists in this fashion. Alternatively or similarly it may also be the case the Scotland acts as a habitat refuge for the European capercaillie metapopulation.

Comparisons can be drawn here between the largest of the grouse species and the largest of the bustards. The great bustard and the capercaillie are both deemed to be native species to the British Isles and both became extinct in the UK around the same time²¹⁴. A more detailed discussion of the causes of the decline of the bustard is outwith the scope of this thesis, however, there is an interesting point about the bustard's inhabitation of Britain that is worthy of consideration in this thesis. Both the capercaillie and the great bustard are largely sedentary species that do not migrate; however forty years or so following its extinction, the great bustard re-colonised the British Isles by natural means on two separate occasions. Despite the fact that all of the birds were quickly exterminated by humans eager to secure specimens of the species these incidents are worthy of consideration.

Without any more detailed scientific studies to confirm the existence of a capercaillie metapopulation the preceding discussion is little more than speculation. To return to the historical documentary information the absence of the species from the Statistical Accounts of Scotland certainly suggests that by the start of the 1800s the bird had been lost from all of the counties in Scotland and was most likely extinct.

²¹⁴ The great bustard went extinct in England in 1832 and although numerous explanations for its demise may be postulated, the exact reasons for its extinction remain unknown (Collar, 1979).

Nevertheless, without firm evidence of absence it must be accepted that the possibility of a remnant population of capercaillie may have existed in Scotland after 1770 or 1785. Given the short time between the reported date of extinction and the date of reintroduction it could be assumed that any existing remnant population integrated with the reintroduced and translocated capercaillies during the 19th century. It is also possible that the observations of the species made in the late 1700s were migratory capercaillie from Europe. Indeed, it is possible to go further and state that the Scottish capercaillie population is subject to island biogeography and metapopulation and that the persistence of the national population has 'binked' on and off throughout history. Again, however, without evidence of this such a conclusion is only speculation.

In conclusion to this thesis if the specific information gathered in this study is considered the following points can be asserted with reasonable certainty. In the first instance the capercaillie was distributed over a wide range in Scotland over history; including forests in the west of Scotland not currently inhabited. Similarly, the species persisted in these areas until the 1700s. By the start of the 18th century the capercaillie metapopulation in Scotland had lost numerous sub-populations and was in decline nationally due to the removal of the functional link between subpopulations. The cause of the removal of the functional link was the extinction of sub-populations caused by different critical factors in different locations. The critical point for the national population was most likely reached sometime in the late 1700s and the size of the population dropped to such low levels individual birds were no longer observed by humans.

Although the species is reported as being extinct, its extinction cannot be assumed and there remains a possibility that a remnant population survived into the 19th century. Finally, the reintroduction of the species was made a success in the short term due as a species specific habitat management and animal husbandry. Producing a founding population of birds that had a high level of breeding productivity and low adult mortality. The reintroduction was a success in the longer term because of the fashion in which the release of birds was carried out. The landowners responsible for the 19th century reintroduction successfully reinstated a metapopulation of capercaillie in Scotland through captive rearing, introductions, translocations and augmentations of capercaillie. A feat that has not been replicated since.

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APPENDIX

This Appendix is limited by the word limit set by the Faculty of Natural Sciences at the University of Stirling for thesis submitted for higher degrees. Nevertheless, it presents a summary list and extracts of the documents searched from the Indexes of the Atholl and Breadalbane Estate Muniments.

1) THE BREADALBANE MUNIMENTS

The following part of this appendix gives an account of the sections of the Breadalbane Muniments that were searched in this study. This is then followed by an account of the documents from the index that were consulted and a brief summary of the content of the documents. The Breadalbane Muniments index is broken up into eighty separate sections (GD112). The following sections were searched in this study, and the entire indexes of each of these sections surveyed:

Section 3	–	Family Papers
Section 4	–	Entails
Section 9	–	Rentals
Section 10	–	Tacks
Section 11	–	Petitions from tenants and others (1716 – 1862)
Section 12	–	Estate Improvements (1728 – 1918)
Section 13	–	Papers relating to marches.
Section 14	–	Factor's accounts and reports
Section 15	–	Vouchers of Factor's Accounts (1643 – 1797)
Section 16	–	Miscellaneous Estate Papers (1615 – 1908)
Section 17	–	Local Courts (1498 – 1823)
Section 21	–	Household Accounts & Account Books
Section 35	–	Accounts of Special Interest
Section 39	–	Correspondence (1550 – 1915)
Section 43	–	State Papers (1542 – 1820)
Section 41	–	Letterbooks

- Section 42 – Miscellaneous Items
- Section 70 – Warden of the Royal Forests, Trent (1757 – 1765)
- Section 71 – Testament of Duncan Laideus
- Section 73 – Miscellaneous Papers (1597 – 1907)
- Section 74 – Taymouth Castle Papers
- Section 78 – Purchased Items – 1977

There are other collections of documents that form part of the Breadalbane Muniments but are held out with the GD112 collection. The following documents from out with the GD112 collection were consulted:

GD1/641 – Ground officers reports (1818 – 1914)

GD50 – Glenorchy Cookery Book (1821)

2) THE ATHOLL MUNIMENTS

The entire index of the Atholl Muniments was surveyed in this study. The documents held within the five boxes not included in the index were also surveyed.

The boxes have been sorted and numbered as follows:

Box 40 – Mixed Dates

Box 41 – Mixed Dates

Box 42 – Mixed Dates

Box 43 – Mixed Dates

Box 44 – Mixed Dates

Box 45 – 1699 to 1720

Box 46 – 1721 to 1744

Box 47 – 1744 to 1761

Box 48 – 1800 to 1810

Box 49 – 1762 to 1769

Box 54 – 1770 to 1774

Box 59 – 1794 to 1799

Box 65 – 1775 to 1793

Box 68 – 1811 to 1824

Box 69 – 1815 to 1830

Atholl Game Books

Game Book 1: 'List of Deer & Game Killed from 1776 to 1834'

Game Book 2: 'Atholl Game Book' 1866 – 1890

Game Book 3: 'Blair Castle Game Book' 1890 – 1920

Game Book 4: 'His Grace's Game Book' 1862 – 1916

Game Book 5: 'Game Book – Dunkeld & Blair' 1843 to 1851'

Game Book 6: 'Game Book' 1851 – 1857

Game Book 7: 'His Grace's Game Book' 1858 - 1863

3) SAMPLE OF DOCUMENTS SEARCHED

- GD112/14/6/7: Documents 2-19:
 - Papers concerning oak woods/papers concerning the employment of James MacGregor, woodkeeper/Enclosure of woods in Finlarig 1700s.
- GD112/14/6/9:
 - Vouchers of factors accounts 1700s.
- GD112/14/6/10:
 - Information concerning enclosures 1700s.
- GD112/14/8/2/33:
 - Balances of factors accounts 1700s.
- GD112/14: Bundles 9 – 11:
 - Factors accounts, 1900s.
- GD112/12/1/43:
 - Taymouth stock report.
- GD112/12/1: Bundles 44 – 45:
 - Factors business notes, 1830s.
- GD112/12/1/52:
 - Copy of stock report including sheep and black cattle, 1830s.
- GD112/14/12: Bundles 2 – 4:

- Reports from the Taymouth Park Keeper, 1850s.
- GD112/14/12/9: Bundles 27 – 28:
 - Lists of numbers of harts shot, including weights, 1800s.
- GD112/14/13/3/31:
 - Control of rats at Taymouth Castle.
- GD112/14/13/5/30:
 - Appointment of fowler.
- GD112/14/13/6/31:
 - Death of a poacher in Finlyon, 1830s.
- GD112/14/13/9/29:
 - Memo from Lady Breadalbane regarding dogs and roe deer in Kenmore.
- GD112/14/13/12/3:
 - Papers regarding grouse shootings.
- GD112/14/13/13: Bundles 9 – 11:
 - Papers relating to game watchers.
- GD112/14/13/14/25:
 - Lease of the Glenquaich shootings.
- GD112/14/13/17:
 - Estate letters from Taymouth.
- GD112/14: Bundles 14 – 15:
 - Estate Report Books.
- GD112/14/6/5/1:
 - David Harper, accounts of the use of woods.
- GD112/14/6/5/2:
 - Use of woods.
- GD112/14/6/5/3:
 - Papers concerning Donald Sutherland.
- GD112/14/6/5/4:
 - Rents from tenants; bere, meall and oats.
- GD112/14/6/5/5:
 - Monies received by Donald Sutherland from tenants.
- GD112/14/6/5/6:

- Papers concerning Donald Sutherland.
- GD112/14/6/5/7:
 - Account of the monies given to the Laird of Glenorchy.
- GD112/14/6/5/8:
 - Papers concerning Lord Glenorchy.
- GD112/14/6/5/9:
 - Grant of land by the Earle of Dunbar.
- GD112/14/6/5/10:
 - Clerk of Caithness reports.
- GD112/14/6/5/43:
 - Stated account of John Campbell, charge and discharge.

Edited Transcript (1729):

Fines levied off the tenants of Glenorchy and Monish for cutting and destroying of the woods...32”.

Fines levied in the East end of Loch Tay for cutting and destroying the woods...23”.

Fines levied of the tenants of Strathfillan for destroying the Firr Woods...180”.

Fines levied of sundrys in Glenorchy for keeping goat by which the woods were destroyed...39”.

Price of timber sold by the Chamberlain out of the woods conform to the regulations...19.1”.

Price of more timber sold by the Chamberlian...12.16”.

Price of the timber sold by the Birlawmen and others out of the woods conform to the regulations...16/7/2”.

Price of the Firr Woods of Rolo, some casual rents and the under millar of Stratharry’s fine...675/6/8”.

Fines levied

- GD112/14/9/1 – 24: Factors accounts from Shootings 1900s.
- GD112/14/13/5/30: Appointment of fowler 1671 – 1744.

- GD11214/13/6/31:

Edited Transcript:

22nd March 1830

Please inform His Lordship that a poacher from Glencoe was killed in the forest about a fortnight ago by falling over a rock in Finglen near Fletchers Wake. Him and some others had put into the forest about this time for the purpose of killing Deer.

- GD112/14/13/9: 'Wood Threats'. Papers forbidding the cutting of wood and suggesting that peat or coal are used instead.
- GD11214/13/10: Papers concerning game watchers.