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An investigation of the management options available to secure a future for the pony on Dartmoor: A behavioural and opinion based evaluation.

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**AN INVESTIGATION INTO THE MANAGEMENT OPTIONS AVAILABLE TO SECURE A
FUTURE FOR THE PONY ON DARTMOOR: A BEHAVIOURAL AND OPINION BASED
EVALUATION.**

by

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Abstract

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AN INVESTIGATION OF THE MANAGEMENT OPTIONS AVAILABLE TO SECURE A FUTURE FOR THE PONY ON DARTMOOR: A BEHAVIOURAL AND OPINION BASED EVALUATION.

The management of the pony (*Equus Caballus*) herds on Dartmoor commons has become a contentious issue between all stakeholders. There are three types of pony being bred on common land and only one of these is the recognised Dartmoor breed. However all originate from the same stock thought to have been introduced by Phoenician traders around 2000 years BCE. Recent changes to export laws and consequently market demand have meant the unhandled pony from Dartmoor now has little or no market. With no enforcement in place to control breeding, and as a consequence of the lack of market demand, up to 1500 ponies are being destroyed annually which is considered by many pony keepers, charities and members of the public to be an unacceptable form of management causing much negative media attention. Questions over what impact changing the management would have on the herds have caused there to be no agreed change. The results of this report have the potential to allow a management plan to be developed for common land, notably on Dartmoor, but also on other similar areas such as Bodmin. A semi structured questionnaire was designed and 51 farmers approached to gain a clear picture of the issues being faced. This report found that in 2014 a significant majority (92%) of Pony keepers are in agreement that the management should change as opposed to staying as it is and a similar majority (69%) wish to see Stallion Removal implemented as the method of breeding control. The behavioural impact on pony herds of three different breeding control strategies including stallion removal, stallion vasectomy and mare immuno-contraception were assessed based on extensive stallion and mare ethograms. All behavioural measures were non-parametric for both mare and stallion behaviours (all AD $P < 0.05$). The results show that the removal of the stallion has no negative impact on behaviour. The proportions of time spent engaging in identified behaviours by mares under the three management plans differed. In the Stallion Removed herd the individuals within become less closely grouped ($P < 0.05$). However, contrary to expectation (of those against SR) lairages (the areas the herds graze in) were not broken by mares when the stallion was removed. Overall the most effective form of breeding control on Dartmoor to reduce the unwanted foal 'crop'

and achieve a high level of welfare which is supported by the majority of pony keepers, is the complete removal of 'entire' males from the open commons. In addition to removal of stallions, sterilisation of stallions was also found to be an effective option with herding behaviour kept high in this management option, which is highly supported by pony keepers. The findings of this report can be utilised to inform the future management of ponies on the moor. With the UK currently in a National Equine Crisis and with charities full of unwanted ponies a change to the existing management and implementation of a new breeding control plan is crucial on Dartmoor.

CONTENTS

Page No.

CHAPTER 1 Overview of the current situation and the aims of this research

1.1 Introduction	10
1.2 The Pony on Dartmoor	12
1.3 Research aims	14

CHAPTER 2 Pony keepers' opinions

2.1 Introduction	16
2.1.2 <i>History and market changes</i>	18
2.1.3 <i>Farming ponies today</i>	21
2.2 The governing bodies	21
2.2.1 <i>Dartmoor National Park Authority</i>	21
2.2.2 <i>Natural England</i>	22
2.2.3 <i>Dartmoor Commoners' Council</i>	23
2.2.4 <i>The Duchy of Cornwall</i>	24
2.3 Pony types and pony organisations	25
2.3.1 <i>The registered pony</i>	25
2.3.2 <i>The heritage pony</i>	25
2.3.3 <i>The hill pony</i>	25
2.3.4 <i>The Dartmoor pony society</i>	26
2.3.5 <i>The Dartmoor pony heritage trust</i>	26
2.3.6 <i>The Dartmoor hill pony association and friends of the Dartmoor hill pony</i>	27
2.4 Conservation Grazing	27
2.5 The value of ponies on Dartmoor	29
2.6 Methods adopted to conduct qualitative research	29
2.7 Data results and analysis	30
2.7.1 <i>Advantages and disadvantages of the proposed plans</i>	30
2.7.2 <i>Opinions of the organisations</i>	32
2.8 Discussion	39
2.9 Conclusion	44

CHAPTER 3 The behavioural assessment of three herds of ponies under different management systems

3.1 Introduction	46
3.2 Possible breeding management systems	46
3.2.1 <i>Stallion removal</i>	47
3.2.2 <i>Mare contraception</i>	48
3.2.3 <i>The drug Improvac® as a form of contraception in the mare</i>	52
3.2.4 <i>Sterilisation of the stallions</i>	53
3.2.5 <i>Welfare implications of each breeding management option</i>	55
3.3 Methods adopted to conduct the behavioural observations	58

3.4 Data results and analysis	65
3.5 Discussion	82
3.6 Conclusion	84
Chapter 4 The implications associated with the implementation of a change to management, and analysis of other contributing factors to the future of the pony on Dartmoor	
4.1 Main findings	85
4.2 The future of the pony on Dartmoor	86
4.3 Market options	86
4.4 Conclusion	90
References	92
Authors Declaration	103
Appendices	
Appendix 1	105
Appendix 2	109

FIGURES

	Page No.
Fig. 1.1 Map of the Dartmoor Commons	11
Fig. 2.1 Overview of the current situation and ideas from interested stakeholders	17
Fig. 3.1 Endocrine control of the mare's reproductive cycle	50
Fig. 3.2 Interaction plot for grazing close together	72
Fig. 3.3 Interaction plot for grazing herd spread out	73
Fig. 3.4 Interaction plot for sleeping lying down	73
Fig. 3.5 Interaction plot for watching	74
Fig. 3.6 Interaction plot for interacting with opposite sex	74
Fig. 3.7 Interaction plot for in foal mare away from herd	75
Fig. 3.8 Interaction plot for mutual grooming opposite sex	76
Fig. 3.9 Interaction plot for vocalising	76
Fig. 3.10 Interaction plot for mount same sex	77
Fig. 3.11 Interaction plot for interacting opposite sex	77
Fig. 3.12 Interaction plot for kicking	78
Fig. 3.13 Interaction plot for being herded by stallion	78
Fig. 3.14 Interaction plot for sleeping lying down	79
Fig. 3.15 Interaction plot for grazing herd spread out	80
Fig. 3.16 Interaction plot for grazing close together	81

TABLES

Page No.

Table 2.1 Potential advantages and disadvantages of the proposed plans identified by the pony keepers.	31
Table 2.2 Opinions of the organisations regarding the need for change in pony management.	32
Table 2.3 Opinions of other connected bodies involved in the welfare of the pony on Dartmoor	33
Table 2.4 Anonymous opinions gathered from the semi-structured interviews	35
Table 2.5 Anonymous suggestions and comments made by pony keepers and organisations in addition to the management plans discussed	36
Table 3.1 Ethogram of pony behaviours	61
Table 3.2 Normal distribution test for mares	65
Table 3.3 Kruskal Wallis test for mares	67
Table 3.4 Normal distribution for stallions	70
Table 3.5 Mann Whitney test for stallions	71

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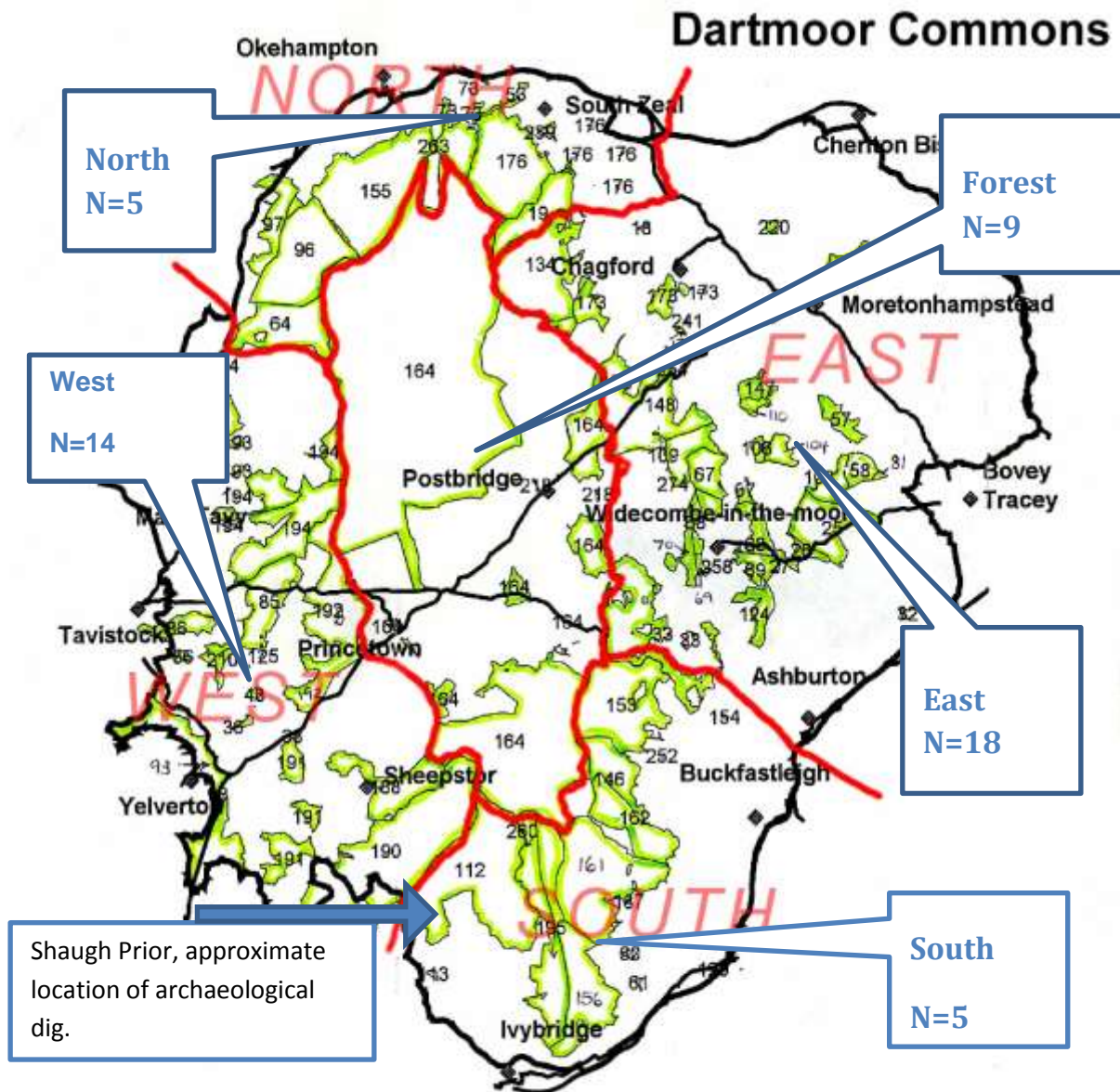
CHAPTER 1 Overview of the current situation and the aims of this research

1.1 Introduction

The Dartmoor National Park is the largest area of open country in southern England and is home to a diverse range of protected species, flora and fauna (Natural England 2014), and currently 65,069 recorded head of livestock (Commoners' Council 2014). It covers an area of 368 square miles, and is divided into five commons; the North, South, East and West quarters and a fifth central area identified as the Forrest of Dartmoor (Figure 1).

The pony (*Equus Caballus*) herds on the open commons are under threat due to changes in market demand, the impact of recent legislation, and disagreements between pony keepers about their management. Many farmers are being forced to have young ponies culled annually on the farms. These actions have raised ethical questions by many of the interested stake holders which has attracted a great deal of media attention about continually breeding animals which have no market and are therefore destroyed.

This thesis examines three potential management plans which could be implemented to help maintain the pony herds on Dartmoor while reducing the annual foal 'crop'. This chapter provides an overview of the current situation, the importance of the pony on Dartmoor and the aims of this research. Chapter two assesses the views of pony keepers on the management plan options. Chapter three provides a detailed behavioural analysis of how the management plans impact on the ponies' behaviours. Chapter four discusses the possible future market options for the pony including the views of pony keepers and organisations connected to the welfare of the pony with ideas for future research.



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The Dartmoor Commoners' Council (DCC) do not have an exact number of pony keepers recorded. The numbers shown in the boxes are the actual number of pony keepers spoken to. It should be noted that many of the Commoners' have grazing rights on two or more commons, but primarily live within or adjoining the commons shown above. Not all listed Commoners' are pony keepers and some have elected to be non-graziers. Shaugh Prior is an area where pony hoof prints dating to 1600BC were discovered (see section 2.1.2)

Figure 1.1 Map of the Dartmoor Commons

1.2 The pony on Dartmoor

The free living herds of pony within the Dartmoor National Park are considered a valuable asset to both the rich cultural heritage and diverse eco-system of the park (Dartmoor National Park 2014). Each pony herd belongs to a moorland grazier, most of whom are Dartmoor hill farmers who earn a living from their livestock. Today livestock numbers are dependent upon the agri-environment scheme each common is signed up to, with stocking guidelines produced by the government's advisors on the natural environment, Natural England (NE). Cattle, sheep and ponies are thought to have grazed together on Dartmoor since the introduction of farming in the Neolithic period (4000-2300BC) (Plymouth Museum 2014). The Dartmoor Commoners' Council act to maintain the commons and to promote proper standards of livestock husbandry on the commons. (DCC 2014). Local commoners' associations, such as Throwleigh Commoners Association and Chagford Commoners Association are responsible for the allocation of funding amongst those with grazing rights on their common (Natural England 2014). Currently as there is no payment specifically for ponies it makes more sense for farmers to keep fewer ponies as other stock can collect a Natural England payment and unlike ponies, their offspring can be sold for a profit. However the importance of mixed grazing for conservation management is discussed by many authors including Loucougaray *et al.* (2004) who highlight that for conservation and biodiversity purposes, mixed grazing with both cattle and horses constitute the best management regime. Some farmers have been forced to reduce their pony herds to comply with the reduced stocking levels required by Natural England if they wish to collect any payment. Moss & Dickinson (1979) state effective conservation management of an ecosystem must be based upon a sound knowledge of the processes operating within that environment in addition to an awareness and appreciation of its earlier development and evolution. Stewart (2002) suggests that despite a vast scientific literature, the ecological processes at work in the upland grazing systems of Britain are still not fully understood. This author goes on to say, UK conservation agencies provide information and guidance on how sites can be managed to meet a variety of conservation objectives. However detailed research to inform these management recommendations is often lacking and therefore further research is required, to assess the suitability of the proposed management protocols for the effective conservation of upland grazing systems, particularly in unstudied upland regions such as Bodmin Moor in Cornwall (an area similar to Dartmoor).

The registered Dartmoor Pony is recognised as category three 'vulnerable' on the Rare Breeds Survival Trust list (2014) which means there are only between 500-900 breeding mares in the U.K. However, there are also unregistered ponies on Dartmoor whose ancestors have inhabited the region for as many generations as the registered pony. There are many arguments regarding which type of pony should be maintained on the moor. Organisations such as the Dartmoor Pony Heritage Trust and the Dartmoor Hill Pony Association support the continuation of breeding different types of pony on the open commons. Breeding different types on common land inevitably results in some unwanted mixing between herds. Due to changes in legislation such as the Department for Environment, Food and Rural Affairs (Defra's) transportation laws in 2007 which states that unbroken horses and ponies must not be transported in groups of more than four animals, export is no longer viable. Breeders have no outlet for unwanted stock and many are destroying healthy young-stock each year. According to the Dartmoor Commoners Council farmers are also dramatically decreasing the size of their ancient herds (some known to be 200 years old) in an attempt to reduce these unwanted offspring. It is agreed by the Dartmoor National Park, Natural England and the Dartmoor Commoners Council (2014) that the pony is vital in terms of cultural heritage and conservation within the Dartmoor National Park and therefore the changes to the market are potentially damaging many aspects of Dartmoor. The Dartmoor Hill Pony Association (2013) have suggested that the pony will be impossible to replace once gone, and that Dartmoor and its eco-system have been shaped by the pony, with some other species (such as Brown Fritillary Butterflies and Bog Hoverfly) heavily dependent upon it (Butterfly Conservation 2014).

The Dartmoor National Park Authority (DNPA), Natural England (NE) and the Dartmoor Commoners' Council (DCC) are the three main bodies responsible for the management of the commons and all they encompass. Currently the management of the ponies depends solely on the breeders themselves. With the reduction in market demand some pony breeders have changed their management practices by, for example, removing stallions in a bid to reduce numbers whilst others have continued with the system they have always used and still run stallions. This differing approach to pony management has resulted in much unease between neighbouring pony keepers as unwanted foals are produced when stallions move into stallion-free herds and cover the mares. There are considerable difficulties in disposing of unwanted foals from semi-feral herds, without consigning them to slaughter. A system has been put in place by the Dartmoor Hill Pony Association (DHPA), with unwanted

offspring being slaughtered and used to feed carnivorous zoo animals. This practice has become a contentious issue and does not encourage pony keepers to retain their herds as ponies are not paid for through this system, they are simply destroyed on the farm and taken to Dartmoor Zoo. Producing the ponies for human consumption has been discussed privately between interested stakeholders but recently brought into the public domain (BBC Inside Out 29.09.2014). The marketing of pony meat is considered by many, including Brenin (2014) and Stacey (2014) as unviable, not least because of the 'National Equine Crisis' (World Horse Welfare 2014) being experienced in the U.K. This crisis means that theoretically thousands of unwanted horses and ponies who have come to the end of their ridden career and are of the right weight and age would be able to supply a meat market, should it become popular, without the need to continue to breed small ponies whose only market would be meat.

1.3 Research aims

There is now a critical need to adapt the management of the pony, if the semi-feral herds are to survive. The results of this report could have a positive impact on semi-feral herds on other areas of common ground such as Bodmin moor (Stacey, 2014), Exmoor (Westcott, 2014) Welsh commons and the New Forest (Westwood, 2013), that are facing similar challenges.

Chapter two assesses the difficulties and challenges individual farmers are facing on Dartmoor which vary depending on the area they are in, and are subject to change as agri-environment agreements adapt over time. This chapter therefore aims to document current opinions of interested stakeholders and to reveal any preferences held by pony keepers over the possible management plans and future of their herds.

Chapter three assesses breeding management options and then focusses on three plans which have been proposed for Dartmoor. The detailed behavioural analysis aims to answer some of the questions raised by pony keepers during chapter one and produce scientific evidence to clarify how management plans will impact upon herds.

The overall aim of this document is to improve equid welfare through better understanding of breeding management options, which have the potential to reduce the number of unwanted offspring each year. The current annual disposal system of culling healthy animals is described by Brenin (2010) as an unacceptable management technique.

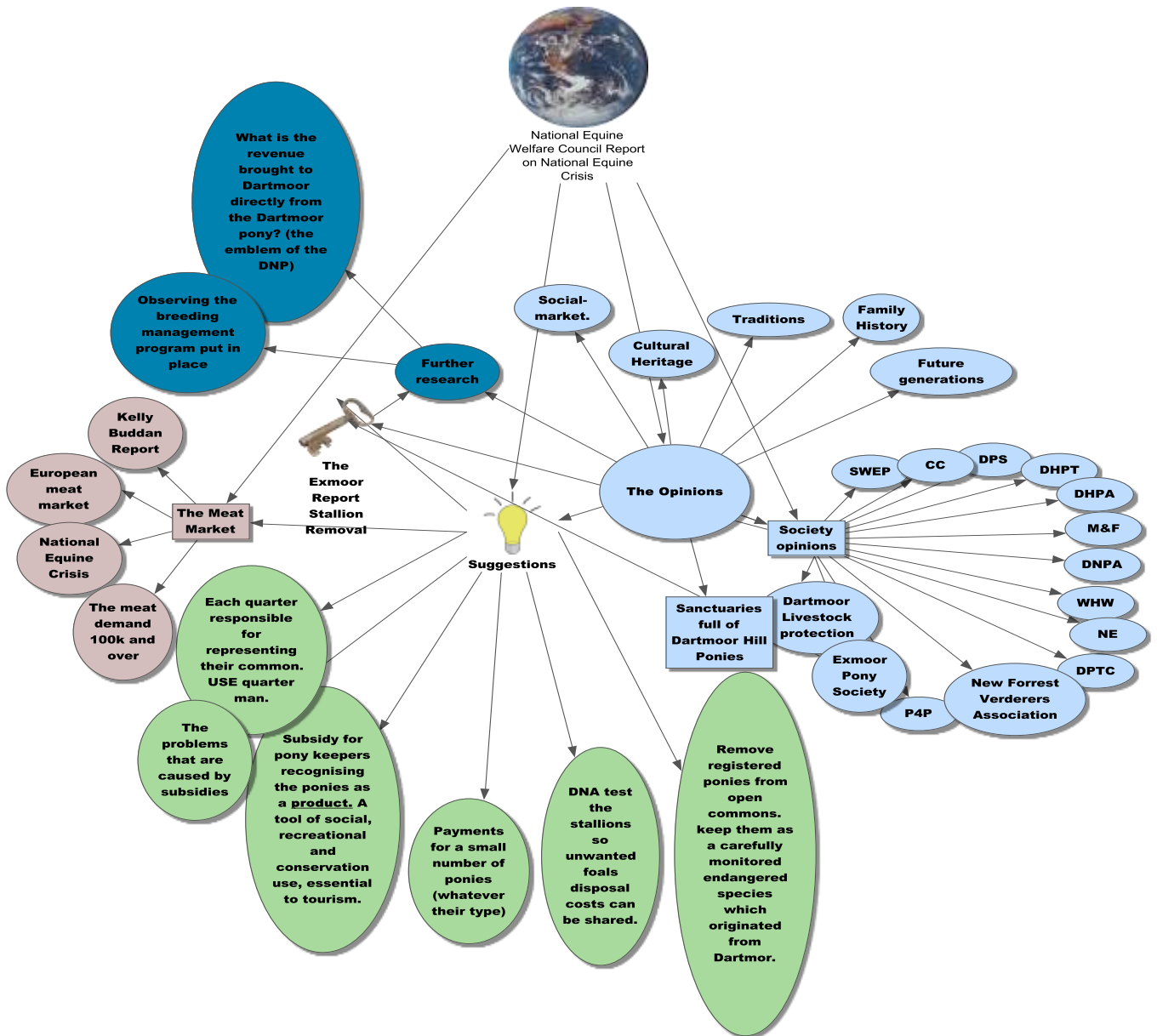
Therefore gaining an understanding of the potential management plans based on investigation of how they affect pony behaviour, and the socio-economic impact changes to the current system may bring for their keepers will enable decisions grounded in science, to be made.

The author has produced this report as an independent piece of research, unconnected to any particular body representing the pony herds or organisations involved in the management of the stock on Dartmoor.

CHAPTER 2 Pony keepers opinions

2.1 Introduction

Many organisations are aiming to protect the future of the pony on Dartmoor (Petrie-Ritchie 2012), all with different ideas on the management of pony breeding. The Pony Action Group brought these differing views together with regular meetings to discuss management options with representatives from NE, the DNPA, DCC, Dartmoor Hill Pony Association, Dartmoor Pony Heritage Trust and the Dartmoor Pony Society. In 2012 the group voted to utilise the results of this thesis when developing a new management system, however shortly after this in 2013 the group dissolved. The information held within the Dartmoor Commons Act 1985 part iii (Regulation Of The Commons) section 5 (iv) suggests that the Dartmoor Commoners' Council holds the statutory right to enforce a standardised management plan should they so wish, meaning any decisions over changes to management falls to them alone. This is currently disputed by the council with the DCC chairman (Waldon 2014) confirming legal advice was being sought over this issue. Figure 2 demonstrates the complexity of the situation regarding interested stakeholders and highlights the fact that there are global factors contributing to the overall problem.



Light blue represents the society and charity opinions and areas potentially affected should a new method of management be introduced.

Green represents a selection of the suggested changes which could be implemented as part of a change to management.

Purple demonstrates some of the issues over the option of a meat market for the ponies.

Dark blue shows the suggested further research.

The globe at the top recognises the National Equine Crisis outlined by the national equine council which overshadows all the decisions made concerning horse breeding today.

The key links in a piece of research undertaken on Exmoor which suggests the removal of breeding males from open commons.

Figure 2.1 Overview of the current situation and ideas from interested stakeholders

The Dartmoor pony is the emblem of the Dartmoor National Park making it a widely recognised icon for the area. Sadly there is little or no market for small unhandled ponies and with charities full of them, the destruction of a large number of healthy young-stock on farms each year has become the only option for their keepers who are limited to certain stocking numbers dependant on the Dartmoor common they graze animals on. Even pedigree stock has a very small niche market, with homes being found only for the best ponies which have been regularly handled, are quiet and of good conformation. The market for conservation grazing is also minimal; there are small herds of ponies on areas which respond positively to pony grazing specifically, such as on Natural England's Goss Moor National Nature Reserve (NNR) in Cornwall (Natural England 2014). Since most ponies live for around 25 years the need for replacement stock is low.

In every area of the country the prices for horses have dramatically declined and the U.K is suffering from a 'National Equine Crisis' (World Horse Welfare 2014). The RSPCA took in more than twice the number of horses (306) between April 2011 and March 2012 as it did the previous year. World Horse Welfare has seen the numbers of horses taken into its centres rise by 31% in 2013. Similarly the equine charity Redwings has seen a 28 per cent increase in equids being taken in from 2006 to 2011 and abandonments (i.e horses left untended) rise from 160 in 2009 to 450 in 2011. Last winter (Oct–Feb 2013) HorseWorld Charity saw a threefold increase in the number of abandoned and neglected horses it rescued, compared with the previous year. The fact that ponies from Dartmoor continue to be bred, only to fill up charities with unwanted young-stock is seen by many as careless and does little for marketing Dartmoor as producers of responsibly farmed, quality stock (Brenin 2013).

2.1.2 History and Market Changes

An archeological dig at Shaugh Prior on the Southern edge of Dartmoor disclosed amongst the earliest evidence for horses in Britain. The hoof prints found date to 1600 BC. The proceedings of The Prehistoric Society (1981) describe the animal hoof prints found as mainly of domesticated animals such as sheep and cows but ponies and badgers were also noted. Plymouth Museum has archived the silicon cast taken from the bottom of the dig site. The dimensions of the hoof prints of this particular prehistoric equid were almost exactly the same size as a pedigree Dartmoor pony.

Gilby (1900) suggests that horses arrived on British shores in Cornwall with Phoenician traders. This knowledge that horses were present prior to the Roman invasion suggests that the ponies on Dartmoor and other areas such as Exmoor (Green 2013) evolved from Cornish stock.

The first mention of wild ponies on Dartmoor appears in 1008 in the will of the Bishop of Crediton, where 'wild horses' are found listed under his personal possessions, running on his land near Ashburton (Fox 2012). The next reference comes from the Exon Domesday book (1012) describing un-broken mares at Cornwood, again on the South Quarter of the moor, near Ivybridge (see Figure 1.1). The first written record of tin extraction on Dartmoor is in 1156 (Dartmoor National Park Authority, 2014) and in 1305 Ashburton, Chagford and Tavistock were created as Stannary Towns. Ponies were known to play an essential part in tin extraction. The Dartmoor National Park Authority explains that the pack pony will have preceded the use of wheeled carts. In the 1479 – 81 court rolls 'horses with foals', 'mares,' 'bay horses', and 'castrated horses' are described as strays (Fox, 2012). Early demand of the pony is demonstrated in Fox's description of how in the fifteenth century the Reeve of Bishop's Clyst in East Devon sent all the way to Ashburton for a pony. The first evidence of deliberate management of the breeding of the pony is in 1535 when Henry VIII is said to have introduced a law that only mares above 13hands (132 cm) were to be bred, and there was a fine of 40 shillings (around £2) should anyone breed a pony below this height, and a further 40 shilling fine for keeping an 'entire' male of less than 14 hands (142cm) with a breeding mare (Palmer 1990).

In 1869 the introduction of the sport of Polo directed the breeding of native ponies in a new way. The use of a small compact Arab or Thoroughbred sire put to the best New Forest or Moorland mares became very popular and produced a fast, strong and sure footed animal for the Polo field (Palmer 1990). While the market for the larger Polo Pony increased the trade for the small pit ponies remained strong and reached a peak just before World War I in 1913, with 70,000 ponies underground in the UK. With both larger and smaller animals being bred from Dartmoor stock the Dartmoor Pony Society formed with the intention of acting as an improvement system, but which also maintained the original type of pony (unadmired by Henry VIII). The pedigree Dartmoor pony has become less common on the moor today, since breeders who wish to run pedigree stock on the open commons have the problem of unregistered stallions covering their mares, consequently creating an unsalable

foal. This situation has caused disagreements for many years, with newspapers dating back to 1954 discussing the problem of keeping a mixture of pony types on the moor. The initial divide in opinions is likely to have stemmed from the formation of the Dartmoor Pony Society in 1925 as two different sectors emerged, those able to register their ponies as pure bred, and those who could not. At that time the unregistered ponies had a strong meat market and therefore continued to be bred in large numbers whilst the registered Dartmoor ponies became a popular, versatile native breed sought after as children's riding ponies around the globe due mainly to 'showing' classes increasing their profile.

The number of pit ponies declined after 1913, firstly due to the demands of the War, and after that, as more machines were introduced to mining. This meant that by 1932, only 32,000 ponies were used in mines. In 1947 the coal industry in the UK was nationalised resulting in rapid modernisation and a further decline in the number of ponies needed (6,400 in 1962-149 in 1978). A very small number of mines continued to employ ponies until the 1990s (National Coal Mining Museum Online 2014). During this period of decline the meat market for the pony of any shape and size was strong. Auctioneer Tim Garret explained that UK based slaughter houses would purchase the ponies, which within 24 hours were processed, packaged and being exported to the continent (Garret personal comms 2013). Ponies were also bought for live export, travelling to France and Italy for human consumption and, more recently (2000) for skins used in the fashion industry. Garret (2013) and Shears (pony keeper and speaker at the Dartmoor Society Debate 2013), report there have been many variations in market prices during this time. The meat trade acted as a secure bottom line for the ponies that did not sell as riding ponies or make the grade as replacement stock for their breeders. Since the introduction of new transport laws in 2007 and then compulsory passports and micro-chipping in 2009 the market for the unregistered pony has declined further. Although a special derogation was allowed for Dartmoor, Exmoor and the New Forest meaning that passports were not necessary until the animal was moved from the designated areas defined in those three parks legislation states: **3.—(1) It is an offence to move a horse without a passport off the designated area (other than temporarily for welfare reasons) unless the horse is marked with a sticker issued by a passport issuing organisation dated with the date on which it was attached to the horse and bearing a unique identification number** (Defra 2014). The recent closure (February 2014) of one of the only two markets left to sell ponies brought in on the autumn drifts (annual gathering in of the ponies from the hills of Dartmoor) reflects the decline in the market since these changes.

2.1.3 Farming Ponies Today

Many young pony keepers who are taking on the family business at the present time are not willing to retain the pony herds according to the opinions gathered during the semi-structured interviews conducted for this report. Although some subsidy money from agri-environment schemes is available to have them grazing on the commons, most pony keepers are not comfortable with breeding these animals simply to slaughter them on the farm. Whilst many pony keepers have attempted to reduce their foal crop through removal of stallions, others have not. This means that stallions cover neighbouring farms' herds, resulting in large numbers of unwanted foals continuing to be produced each year.

2.2 The Governing Bodies and Pony Organisations

The management of the livestock on Dartmoor is influenced by the following organisations: The Dartmoor National Park Authority, Natural England, The Dartmoor Commoners' Council and The Duchy of Cornwall. The pony organisations are: The Dartmoor Hill Pony Association, The Dartmoor Pony Heritage Trust, and The Dartmoor Pony Society.

2.2.1 The Dartmoor National Park Authority (DNPA)

The DNPA has duties, responsibilities and powers derived from a number of Acts of Parliament. The Environment Act 1995 sets out two statutory purposes: To conserve and enhance the natural beauty, wildlife and cultural heritage of the National Park and to promote opportunities for the understanding and enjoyment of the special qualities in the National Park by the public. The DNPA also seeks to maintain the economic and social well-being of the communities within the National Park.

The DNPA's Dartmoor Pony Factsheet (2006) describes the pony as part of the cultural heritage of the area and an intrinsic part of the landscape. The Dartmoor Commons Act of 1985 (Commoners' Council, 2014) states that all of Dartmoor should be open to public access on foot and horseback. Only balanced and skilfully managed grazing keeps the vegetation below knee height, through which walking and riding are possible. This same grazing ensures that the rich mosaic of plants (and thus insects, birds and mammals) on which the biodiversity value rests, is maintained. The grazing allows the opportunity for public access, which is a contributing factor to its status as a National Park (NE 2014).

Dartmoor National Park Authority describes Dartmoor as holding the richest concentration of prehistoric sites in Europe. Bronze Age hut circles, pounds and ceremonial monuments are particularly numerous (www.dartmoor-npa.gov.uk 2014). They only remain visible if the vegetation is grazed to at least the intensity that it was by the builders of those structures. The DNPA Management plan for 2014-2019 directly references the ponies in section 7.2.14, stating that “Conserving and enhancing biodiversity is not just an issue for wild species. It also applies to cultivated plants and farmed animals, including native breeds of farm animals which are often associated with traditional land management”. The plan also clearly states that Dartmoor has three native species which are at risk due to declining numbers: the Dartmoor White Face and Dartmoor Grey Face sheep, and the iconic Dartmoor Ponies. The conservation of these species is described as important in maintaining genetic diversity, but also because they play a vital role in the conservation of key habitats through their selective grazing of moorland. Although the vital role the pony plays has been identified by the National Park Authority, it has yet to be financially acknowledged by the government’s advisor on the natural environment, Natural England.

2.2.2 Natural England (NE)

Natural England provides practical advice, grounded in science, on how best to safeguard England’s natural wealth for the benefit of everyone. Its remit is to encourage sustainable stewardship of the land so that people and nature can thrive. Its responsibility is to ensure that England’s rich natural environment can adapt and survive intact for future generations to enjoy (NE 2014). NE works with pony keepers and land managers, business and industry, planners and developers, national and local government, interest groups and local communities to help them improve their local environment (Natural England 2014).

On Dartmoor many of the commons are entered into agri-environment agreements such as the Higher Level Stewardship and Uplands Entry Level Scheme (Commoners Council, 2014). Under these schemes the grazing livestock numbers are controlled and only a certain number of cattle sheep and ponies can be grazed at particular times of the year. Natural England set stocking rate guidelines for the Local Commoners’ Associations to adhere to within the schemes they are in.

Some of the Local Commoners’ Association who govern the schemes do pay members for keeping ponies under the agreement. However as the negotiations for payments are

discussed internally, that is within the Association, there is no set formula for specific grazing animals to receive a payment. Where there are payments, rates vary from common to common. If no agreement can be reached on an individual common (controlled by the Local Commoners' Association), Natural England can apply an overriding restriction to that common to ensure it is not over grazed.

Currently the Higher Level scheme includes a supplement for Native Breeds at Risk (NBAR) HR2, where supplementary payments are made for livestock that are pedigree, registered with the breed society and appear on the native breeds list produced by Natural England. The supplement acts as an incentive to keep the less commercial but traditional rare breeds. Such a payment is available for registered Dartmoor ponies. However, Natural England has since changed the rules and the HR2 supplement is now not payable on common land. There is therefore, a variety of agreements across Dartmoor with some commons being successful in the application and receipt of HR2 and others where the supplement is not available, despite the native breeds being kept.

2.2.3 The Dartmoor Commoners' Council (DCC)

Under the Dartmoor Commons Act (1985), the Commoners Council are elected to represent the Commoners', make regulations about most matters affecting the management of the commons and oversee the welfare of stock. The Council also have regard for the conservation and enhancement of the natural beauty of the commons, and their use as a place of recreation for enjoyment by the public. The council has twenty members elected from the 850 registered Commoners drawn equally from the commons within the four quarters and Forest of the moor. Another six members are representatives from the DNPA, land owners and one veterinarian living or working within the Dartmoor National Park.

The Dartmoor Commoners' Council has the duty to maintain the commons and to promote proper standards of livestock husbandry on the commons. In order to achieve this, the DCC have introduced a stallion approval scheme to improve the quality of the ponies, where an independent veterinary surgeon inspects the stallions before they are depastured onto the open commons. The inspection criteria are that the stallion must be (i) healthy, (ii) hardy and (iii) of good conformation. However there are disagreements over the type of pony approved by the DCC. Pony keeper (PK) 12 (2014) makes the valid point that without a

breed standard the DCC has no objective measure regarding the type of stallions to allow through.

The Commoners' Council currently regulates total livestock numbers grazing on the commons, but species specific numbers are not recorded. They state the overall number of cows sheep and ponies combined is 65,069, they wish to introduce a better policy on accurate stock number records for the individual grazing species in the future (Herrington 2014). The numbers of ponies which have run on the commons over the years is much debated with a figure of 30,000 widely reported seventy years ago. However, interestingly, Greeves (1999) pointed out that in 1963 the DCC estimated a total of 2,000 ponies, while the RSPCA believed 3,000 to 4,000 was more realistic, and the Horse and Pony Protection Association reported 6,000. It would seem that no one had a clear idea of numbers of the ponies on the commons. Today the estimated numbers are produced by the Dartmoor Hill Pony Association, the Dartmoor Pony Heritage Trust and the Dartmoor Commoners Council and between them they have estimated a figure in the region of 1,000-1,200, with 350 of these believed to be of pedigree or heritage type (NE 2014).

2.2.4 The Duchy of Cornwall

The Duchy of Cornwall owns about one third of the total Dartmoor National Park area. It financially supports the Dartmoor Pony Moorland scheme which allows pony keepers with ponies that have been bred on the commons to have their mares accepted into an upgrading scheme where they can run with an approved pedigree stallion. The DPS encourages the offspring of these ponies to return into a new-take (an enclosed area of common ground) once they reach sexual maturity so that they may produce offspring which can also be upgraded i.e. controlling the breeding. A small financial incentive of £15 is awarded when a mare is entered into the scheme. The progeny of this stock can obtain full registration after four generations. This breeding system for ponies of the 'right type' is considered a way of creating a fresh gene pool for the registered Dartmoor breed.

2.3 Pony Types and pony organisations

At present there are three types of pony running on the commons of Dartmoor. They are the Registered Dartmoor Pony, the Heritage Pony, and the Hill Pony. The registered Dartmoor pony is the only 'official' breed and is classified as a Category 3 Endangered Species, considered 'vulnerable' by the Rare Breeds Survival Trust (2013). Interestingly, Calmady-Hamlyn's (1953) 'A short history of the Dartmoor Pony' states it was never the intention of the Dartmoor Pony Society to register all ponies running on the Moor. The registration and documentation process of the breed was intended as an improvement system by which ponies of the right Dartmoor type would be chosen as foundation stock for registration, ensuring the breed would improve and ultimately become more saleable.

2.3.1 The Registered Pony

The pedigree or registered pony (identified by the rare breed survival trust) has originated from the opening of the official stud book which outlines the breed standards. The Dartmoor Pony Society started in 1925 with the aim of recognizing the Dartmoor Pony as a breed and maintaining and encouraging a good standard of pony. The DPS represents the registered Dartmoor Pony. This pony is no taller than 12.2 hands high (127cm) and is a plain colour (i.e. bay, brown, black, grey) rather than colored (i.e. spotted, piebald, skewbald).

2.3.2 The Heritage Pony

The Dartmoor Heritage Pony may have partially unknown parentage, having been bred on the open commons. They are described as true to type due to being of the right colour and conformation to fit the breed standard described by the DPS. They are represented by the Dartmoor Pony Heritage Trust who acknowledges that owners of these ponies often have records of their breeding going back many generations. They are therefore considered to be as much a true Dartmoor as any of the registered ponies (DPHT 2013).

2.3.3 The Hill Pony

The third type of pony found on Dartmoor is known as the 'Hill Pony' and is a mix of many different breeds. This hill pony does not meet the criteria outlined by the Dartmoor Pony Society and is therefore not included into the stud book (DPS 2014). The hill pony has been adapted over the years to fit ever changing market demands, including polo pony, pit pony, and then as produce for the meat and skin trade. This pony has not been bred for

conformational traits or for any one specific purpose and has therefore developed into many shapes and sizes.

2.3.4 The Dartmoor Pony Society (DPS)

There is not one sole society overseeing the welfare of ponies on the Dartmoor Commons. There are three main groups: Dartmoor Pony Society, The Dartmoor Pony Heritage Trust and The Dartmoor Hill Pony Association. Although the DCC are the only group with statutory rights to influence the management of the ponies, the groups representing non registered types of pony are extremely influential via much media attention including BBC programme Inside Out (22.09.14), local Newspaper The Western Morning News (2010, 2011, 2013, 2014) as well as national papers such as The Telegraph (Harley 2014) and the Independent (Johnston 2014). According to Brewington (2010) and Newbolt-Young (2014) they directly affect the market and have a substantial influence on the formation of opinions held by the general public concerning the value of 'Dartmoor ponies'.

The Polo Pony Society, or the National Pony Society (there was some confusion over the name) was formed in 1893 (Palmer 1990). The DPS evolved out of the Mountain and Moorland section of the National Pony Society in 1925. It was never the intention of the society to register all ponies on the hills of Dartmoor, but simply to act as a preservation society and improvement system by which the pony would retain all its hardiness and become recognised and saleable.

2.3.5 Dartmoor Pony Heritage Trust (DPHT)

The DPHT is a registered charity established in 2005 in response to widespread concern about the future of heritage type ponies on Dartmoor. The Trust aims to retain the traditional pony type on Dartmoor which cannot be fully registered with the DPS. The DPHT education centre at the Dartmoor National Park Authority headquarters assists with training of ponies as well as marketing, and sales. The trust has advocated the use of vasectomy as a breeding management tool which will allow pony keepers to breed to their own individual choice of market. The DPHT has also launched a 'Ponies Inspiring People' initiative. Primary and secondary school children, including those with learning difficulties and profound multiple disabilities, are encouraged to work with the ponies with the aim of providing children with a set of social and emotional skills which will enable them to participate more effectively in everyday life (DPHT 2013).

2.3.6 Dartmoor Hill Pony Association and Friends of the Dartmoor Hill Pony

The Dartmoor Hill Pony Association and its sister charity the Friends of the Dartmoor Hill Pony are dedicated to supporting all the ponies on Dartmoor, maintaining that all the ponies are of ecological value to the moor regardless of shape or size as long as they can do the job they have evolved to do: to graze and maintain the moorland environment. The DHPA does not agree with the DPS directive (1925) that the pony on Dartmoor should fit a breed standard defined by certain sizes and colours. The DHPA relies heavily upon charity money raised to help with the 'plight of the Dartmoor Hill Pony' and have put in place a slaughter system which allows farmers to more easily dispose of unwanted stock each year. This system involves a mobile slaughter-man who travels to individual farms across Dartmoor to destroy the unwanted animals and make use of the carcasses by transporting them to Dartmoor Zoo where they are used to feed carnivores. However Dartmoor Zoo only requires a small percentage of the carcasses, taking only 80 each year (Dartmoor Zoo 2014) meaning there is still a great deal of wastage. The DHPA have been trialling the use of the drug Improvac® to vaccinate the mares against pregnancy and reduce the annual foal 'crop'. They do not believe stallion removal or vasectomy will be effective and hold concerns over valuable paternal blood lines (Alford 2014).

2.4 Conservation Grazing

The use of Dartmoor ponies and other breeds as conservation grazers has been successfully implemented throughout the country. The grazing characteristics of Dartmoor ponies make them particularly appropriate for use as conservation grazers on poor quality or rare grassland habitats. They are known to prefer both coarse and fine grasses but are able to switch to browse on bramble, heather and gorse or even willow, birch and blackthorn (Freshney 2001; GAP 2001). The Grazing Animal Project (GAP) promotes the benefits of grazing livestock with the natural environment and our cultural heritage in mind (GAP 2013). The outcomes of research focusing on the positive impact ponies can have on conservation areas, particularly delicate habitats such as the DNP, have been collated by GAP. For example Nolan and Connolly (1989) and, Loucougary *et al.* (2004) found that mixed grazing can benefit both the environment and the species themselves. Loucougary *et al.* (2004) found the combination of horses and cattle could encourage plant diversity and heterogeneity in vegetation. Nolan and Connolly (1989) conclude that under mono grazing

10-13% more area was required to produce the same grazing season output as under mixed grazing.

Dartmoor National Park Authority ecologist, Barker, explains that the ponies are considered an excellent habitat management tool (Personal Communications 2013). Their grazing habits allow smaller plants, such as mosses and bog asphodel (*Narthecium Ossifragum*), a chance to persist. Their small hooves also result in minimal damage to the wet ground (Dartmoor National Park Authority 2014). Unmanaged, this habitat would eventually be overgrown by scrub and the current botanical and invertebrate interest would be lost.

Typical moorland plants such as bell heather, bog mosses, and bog asphodel are home to a number of insects, including the Fritillary Butterfly, Southern Damselfly and Bog Hoverfly (*Eristalis cryptarum*) which is exceedingly rare and is now restricted in its UK range to Dartmoor (Walters 2008). The Damselfly is an example of a species heavily dependent upon the grazing of ponies on the northern edge of Dartmoor. This group of species was thought to be in danger of extinction when first located, as the small breeding runnels in which the larvae live were swamped with coarse vegetation. One particular colony remained under threat for 10 years despite much effort to control scrub growth, improve fencing and achieve better cattle grazing. However, when some additional grazing of the site with a small herd of Dartmoor ponies was organised, Damselfly numbers increased rapidly, proving the worth of Dartmoor ponies as conservation grazers. Freshney (2001) describes the impact ponies had on bracken stands through trampling, largely the formation of 'pathways' opened-up by mid-summer through the bracken. The ponies were also noted rolling in the bracken, particularly after heavy rain, creating small 'glades' within the stands which the author suggested could possibly be due to the texture of the bracken helping to force water out of the coat. Overall, Freshney (2001) confirms that the ponies helped to create mosaics and micro-mosaics, favourable for insect, spider and bird life, and therefore increasing diversity.

On Dartmoor, the ponies' knowledge about territories (lairages) is said by many farmers, to be passed down from one generation to the next. Without these behaviours being learnt the 'conservation tool' function of the pony is lost. Goodwin (2007) explains that foals in feral and free ranging herds remain with their natal groups until they approach maturity. During this time young horses learn essential social and survival behaviours e.g. habitat and forage selection. The learning of these behaviours enables the pony to be the 'tool' of conservation

it is often described as, and any changes to management have the potential to alter this. Hunter (1962) acknowledges the correlation between forage availability and hefting behaviour of sheep which Freshney (2001) also identifies as a contributing factor for lairages with the ponies on Dartmoor.

2.5 The Value of ponies on Dartmoor

As a tool of conservation the pony has a value, though to date there has been no formal/ financial recognition of this by the governing bodies. It can be safely assumed that the emblem of the Dartmoor National Park, the pony, is influential in drawing visitors to the area. The total numbers of day visitors to countryside areas in Devon during 2011 totalled 8,676,000, with a total spend during those visits of £162,150,000 (The South West Research Company 2011). According to the DNPA's data (2011), visitors specifically to Dartmoor in 1997 (their latest estimated numbers) were in the region of 10.98 million. Many pony keepers from a preliminary study (Petrie-Ritchie, 2012) state they do not wish to be subsidised to keep any animal. They would prefer to have a saleable product. If however there is no market for the pony and it is to be lost, then a small subsidy specifically for the pony, to keep it and use it as a tool of conservation and to sustain and enhance tourism would potentially enable many young farmers to maintain a small herd.

2.6 Methods adopted to conduct the qualitative research

With the aim of this section being to document the opinions held by all interested stakeholders and identify whether there were any preferences held over the possible management options Pony Action Group (PAG) meetings were attended. These included representatives from all the essential parties including: Dartmoor National Park Authority, Natural England, Dartmoor Commoners' Council, Dartmoor Hill Pony Association, Dartmoor Pony Heritage Trust and the Dartmoor Pony Society. Research ideas were presented to them initially towards the end of 2012 and then discussed further in meetings through 2013. Suggestions were received positively as useful independent research to further elucidate the situation. The aim of the PAG meetings were for all those involved in the management of the ponies to raise issues and concerns and encourage working together. Unfortunately this group has now been discontinued due to their inability to agree on any issues. However all groups were in agreement that there are many issues being faced, and that the research to be presented in this report is fundamentally important to their resolution. There was a

vote taken on which all in attendance agreed that the results of this study would be essential in producing any future management plan.

Fifty-one pony keepers were approached independently by the author, and asked if they would participate in the interviews. All respondents took up the formal offer of anonymity, demonstrating how political this situation has become. A semi-structured interview was used to gain a true individual perspective and to gather a series of representative views of the current situation. The questions used can be found in Appendix 2. These semi-structured interviews were selected as the means of data collection due to their suitability for the exploration of the perceptions and opinions of respondents regarding the complex and sometimes sensitive issues (Oppenheim, 1992). This enabled probing for more information and clarification of answers. In the context of this chapter it is important to note that the flexibility of the semi-structured interview method ensured that, through the careful use of appropriate wording, valid and reliable data could be obtained from respondents. The varied histories, situations, types of ponies bred and market choices of the sample participants precluded the use of a standardized interview schedule.

May (1989) has highlighted that; given the dynamic nature of interviewing and the subtle problems of topic control and data interpretation, the procedures used to log data must be carefully considered. For this reason a dictaphone (OLYMPUS DM-450) was used where permitted by the interviewee to help validate the accuracy and completeness of the information collected. May (1989) suggests dictaphone use during interviews reducing the likelihood of interviewer bias. This method was specifically helpful on Dartmoor with the complex individual ideas and issues raised.

Responses were categorised according to positive impacts that a suggested management alteration option could have, and negative effects identified by the existing pony keepers. The data shown are not attributed to any particular quarter of Dartmoor, in order to avoid the identification of individuals.

2.7 Data results and analysis

2.7.1 Advantages and Disadvantages of Proposed Plans Identified by Pony keepers

Responses from fifty one pony keepers were collated and are summarised in Table 2.1. Criteria for inclusion in Table 2.1 were that the suggestions listed had been made independently on two or more occasions.

Table 2.1 Potential advantages and disadvantages of the proposed management plans identified by the pony keepers.

Breeding Management Methods	Potential Advantages	Potential Disadvantages
Vasectomy Of Stallions	<ul style="list-style-type: none"> • The stallion will keep mares together. • He will keep other 'entire' males away. • The full spectrum of herd behaviours will be maintained. • Some of the unwanted colts could be used in this scheme. 	<ul style="list-style-type: none"> • The stallion will be overworked by mares repeatedly 'cycling'. • Takes time to implement. • Risks during surgery. • Cost of surgery.
Removal of Stallions	<ul style="list-style-type: none"> • Individual Pony Keepers (PK's) will be able to breed to their own market demand/choice. • There will be far fewer unwanted foals. • There are fewer stallions than mares, the matriarch mares will be able to remain. • Safety of riding on the commons will be increased. 	<ul style="list-style-type: none"> • The mares will leave their lairages. • Young colts will be more likely to cover their family members, if not gathered. • Where are the stallions to be kept securely? • Impossible to implement as there are so many unmarked colts.
Contraception of Mares	<ul style="list-style-type: none"> • The groups will be able to remain almost exactly as they are. • Replacement stock can be produced from a small selection of mares. 	<ul style="list-style-type: none"> • Increased workload for pony keepers, with the number of injections needed. • Unknown side effects to mares. • Ecological effect on Dartmoor. • Financial cost to farmers. • Implications in terms of group behaviour. • Long term physical and behavioural effects.

The statements shown represent the concerns and questions pony keepers have regarding the three potential management plan changes.

2.7.2 Opinions of the Organisations

The organisations which influence the management of the ponies were asked for their own views on the available options. Some did not commit to one management tool, but rather stated whether they believed the management of the ponies needed to be addressed or left unchanged. All respondents believed the management of the ponies needs alteration. Responses of organisations are summarised in Table 1.2. In addition to the associations involved in the management of the ponies on the commons, the views held by other charities and groups also involved in the welfare of the ponies are detailed in Table 1.3.

Table 2.2. Opinions held by organisations regarding the need for change in pony breeding management

Management Plan	Management change needed	Vasectomy	Stallion Removal	Contraception for mares
Dartmoor Commoners' Council	✓			
Dartmoor Hill Pony Association	✓			✓
Dartmoor Pony Heritage Trust	✓	✓	✓	
Dartmoor Pony Society	✓	✓	✓	
Natural England	✓			
Dartmoor National Park Authority	✓			

The ticks indicate the opinions held by the organisation in terms of which management plan they support.

Table 2.3 Opinions of other connected bodies involved on the welfare of the pony bred on Dartmoor.

Society	Opinions
The Dartmoor Pony Training Centre (DPTC)	<p><i>“The DPTC aim to rehome as many ponies from Dartmoor as possible, with a total 460 from the commons rehomed since the centre opened in 2005. We are aware of the fact we are not directly dealing with the cause of the problem of overbreeding. We support any programme dealing with the overbreeding issues. Our new system finds homes for ponies directly off the farms on Dartmoor. This was introduced to reduce the problem of 80% of the adopters returning ponies in the winter months to us. The previous system meant that ponies came to us before going to their new homes. We provide a strong educational package to people rehoming ponies through us supporting them with all aspects of keeping and training them. A donation of £80 is requested to cover micro-chipping and passport costs.”</i></p>
South West Equine Protection (SWEP)	<p><i>“SWEP was formed due to the demand for a locally based society to follow up concerns about equine welfare, whether moorland, privately owned or abandoned. Enquiries and requests for help are received from members of the public and from other organizations, such as the RSPCA. SWEP is increasingly concerned about the continuous overbreeding of Dartmoor Hill ponies and Bodmin Moor ponies, when there seems to be a limited market for them.”</i></p> <p><i>“Countless numbers of foals are still being born each year with many not living to a year old. Some are sold directly to the local zoo to be fed to the carnivores, the majority still ends up at the annual pony sales each autumn and we have been informed that one farmer shoots and incinerates excess ponies on their farm.</i></p> <p><i>Some pony keepers are trying to control the numbers born by taking their stallions off the moor, however other pony keepers are keeping their stallions out all year and they will cover any mare they come into contact with, regardless of who owns them. This means most mares are still continuously pregnant and caring for youngsters, which means they have no rest between seasons. This can lead to poor quality foals with more cases of low birth weights, angular leg deformities and inability to feed properly.</i></p> <p><i>Our native moorland ponies are a unique part of the region’s heritage and play an important role in habitat management on the moors; they are a priceless asset among the tourist attractions of Devon and Cornwall. SWEP is active in Devon and Cornwall and works in partnership with other organisations such as the Devon & Cornwall Constabulary (including Horse Watch), World Horse Welfare, Defra, Trading Standards, local Dartmoor Commoners’ Associations, Dartmoor National Park, as well as other animal welfare groups. We have worked for a number of years on Dartmoor and more recently, on Bodmin Moor. One of SWEP’s aims is to encourage responsible ownership – this includes moorland equines as well as domestic horses and ponies.</i></p> <p><i>Ownership of moorland ponies is often difficult to establish, allowing unscrupulous owners to escape their responsibilities.</i></p>

Apart from dealing with immediate welfare problems, SWEF is also campaigning to raise the profile of some of the underlying issues that contribute to them. Of the 411 ponies owned by SWEF 99% of them are of Dartmoor Hill Pony Origin."

World Horse Welfare (WHW)

"The contraceptive trial project write up by the Dartmoor Hill Pony Association has been financially supported by WHW in an attempt to find an effective way to reduce foal numbers. Our local officer deals with welfare cases on a regular basis. WHW aim is to work towards a world where every horse is treated with respect, compassion and understanding. World Horse Welfare is pleased to be involved in the exciting new project that could help to tackle the problem of overbreeding amongst ponies on Dartmoor." Veterinary Consultant Keith Meldrum has been working closely with the Dartmoor Hill Pony Association. "A project of this kind has never been carried out before in the UK and I am delighted to be a part of it. We are hoping that, if successful, this could become a long-term solution to the issue of overbreeding within semi-feral horse and pony populations." (2013)

People4Ponies (P4P)

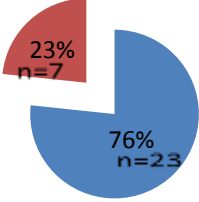
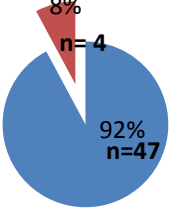
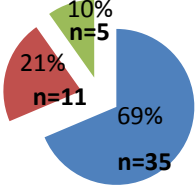
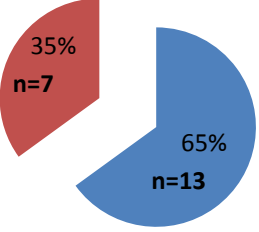
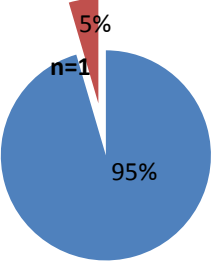
"As well as caring for our charity ponies, P4P are also very successful and pro-active with campaigning work to improve the welfare of wild ponies. A recent article produced by P 4 P explained how they had traced Dartmoor Hill Ponies from South West markets to France where Equine Rescue France had discovered these ponies during transport and were described as being dead on their feet. P4P support the enforced removal of stallions from the commons of Dartmoor. Also the benefit of vasectomy is seen as a potential solution in some areas of Dartmoor." (Jan 2014)

The Mare and Foal Sanctuary

"The Sanctuary's aims are not just to rescue neglected, unwanted or abused horses but when possible to rehabilitate, retrain and eventually re-home them into loving, knowledgeable environments. We also try to educate people on all aspects of horse welfare. 135 of the 293 horses in our care are unwanted ponies off Dartmoor." (03.07.14)

The charities involved in the handling of the ponies have strong views over their management and have a strong influence over the public's perception of Dartmoor pony breeding.

Table 2.4 Anonymous opinions gathered from the 51 farmers during the semi structured interviews on their favoured management system. Note the first pie chart represents data from the commoners' council's questionnaire circulated in 2011.

 <ul style="list-style-type: none"> ■ In Favour of Stallion Removal ■ Not in Favour of Stallion Removal 	<p>In 2011 the Dartmoor Commoners' Council circulated a questionnaire to all the pony keepers officially registered with them. The main objective was to determine what type of breeding management they would most like to see enforced. The results show the percentage of pony keepers wishing to try a pilot scheme where stallions are removed from the open commons.</p>
 <ul style="list-style-type: none"> ■ Change the management ■ Leave the management as it is 	<p>Pony keepers wishing to see the breeding management change as opposed to those who do not.</p>
 <ul style="list-style-type: none"> ■ In Favour of Stallion Removal ■ Leave stallions on ■ Unsure 	<p>Figure 1.4 Pony keepers within this study who wish to see Stallion Removal enforced.</p>
 <ul style="list-style-type: none"> ■ Vasectomy or Geld ■ Contracept the Mares 	<p>The number of Pony keepers wishing to sterilise their stallions as opposed to their mares.</p>
 <ul style="list-style-type: none"> ■ Mares had Remained in Leers After Stallion Removal ■ Mares had Left Their Leers After Stallion Removal 	<p>The effect that stallion removal had on mare's lairing behaviour.</p>

Ideas generated by the Pony keepers were often stated by more than one individual during the interviews. Some ideas were separate from the three management plan options proposed. These suggestions can be seen in Table 2.4 which demonstrates how many of the pony keepers were in agreement.

Table 2.5 Anonymous Suggestions and Comments Made By Pony keepers And Organisations In Addition To The Management Plans Discussed **Frequency**

DNA testing of stallions-: all registered stallions (Commoners' Council have 150 registered) should be DNA tested, then the unwanted progeny could be tested and the disposal costs of offspring shared.	5
Geld some of the stallions which have a well-established territory. They will still retain their lairages and keep other young colts off.	3
Commoners' Council have a statutory right and legal obligation to which they are not adhering. Stallion removal should not be an option. It should be enforced.	25
Either attempt stallion removal or watch the next generation give up keeping ponies.	5
The Dartmoor Commoners' Council(DCC) have made a huge effort to clear up unmarked animals but they now need to enforce stallion removal which will in turn reduce the number of unwanted young stock including the rogue colts.	21
If the New Forest (NF) has more than halved their foal crop with their system (described in chapter two), then why can we not do something similar?	12
The minority are overriding the majority and should be held accountable (through prosecution) for the problems we are having.	15
An enforced clear period as we have with the other livestock should be implemented.	20
With stallion removal, everyone has to remove stallions otherwise the mares will be pushed around by the few left out.	5

Continued Over

With the stallions removed a small subsidy should be introduced for between five and ten mares or geldings only. A subsidy could also be implemented to keep stallions in.	15
The meat market should be encouraged.	10
Some farmers have over their limit of ponies on one common, better policing is needed.	5
Some run just stallions to use up their pony rights, this is incredibly irresponsible. The number of stallions allowed in each herd should be reduced from the five allowed now.	12
Vasectomy causes overworking of the stallion and therefore contraception is the only option.	2
We are worried that the mares will leave their lairages if we remove the stallions.	8
We have concerns over the long term reproductive health of the mares being injected with Improvac®, regardless of what the drug companies say.	15
Vasectomising stallions will kill the paternal gene pool.	4
Concerns over the six month booster and mares having heavy late seasons, resulting in late foals the following year.	10
When we remove stallions we still have unwanted foals due to other stallions being out on commons.	35
Most of our ponies are in country (on farm) now to stop unwanted breeding.	5
We believe running a certain percentage of geldings and reducing mare numbers would help.	3
Castrate the colts as soon as possible and then turn them back out with mares. They are then more likely to retain their lairages. They should be allowed to run in their second year until stones have dropped.	2
Introduce a certain percentage of vasectomised stallions to “entire” stallions.	4

Continued Over

If the stallions were removed we would continue to run the family's ponies on Dartmoor.	6
There is no difference between bulls, rams and stallions. Stallions should be kept in, and mares brought in to cover. They can still foal on the moor.	10
We are spending large sums of money to dispose of all the foals. It is the worst day of the year.	11
Some of the charities are selling the ponies under the guise of rehoming, which should not be allowed.	5
Europe and other areas of the world provide far more incentive to pony keepers to encourage them to retain their traditional stock. Sadly here there is little encouragement for young British pony keepers today.	3
Negative media attention is doing nothing for the ponies.	3
We need to stop flooding the pony market.	10
Policing of stallion removal could be problematic, therefore vasectomising to keep stray colts at bay would be beneficial.	12
The welfare of colts is a problem as they are pushed around by pony keepers due to them being unwanted on their common. Unlike the normal bachelor groups which form, these young colts spend much of their time alone and drifting from common to common.	13

The suggestions made by the pony keepers in terms of management. The Criteria for inclusion in Table 2.5 were that a suggestion had been made by more than one pony keeper.

The cost to the pony keepers for Management Plan One would be £250 per stallion (DPHT 2013). If a Heritage pony is vasectomised the Trust will fund the vasectomy, with only the V.A.T (£50) left for the owner to pay. When considering the fact that many pony keepers are paying for the disposal of unwanted stock (up to £400 in a year according to PK 14) this cost appears minimal.

2.8 Discussion

Chappell (2005) investigated the politics involved in managing semi-feral pony herd populations after the Australian aerial cull of horses in 2005 on the Guy Fawkes River National Park caused widespread public reaction. Four years later the management of feral horses is still largely unresolved and remains a contentious issue. That report highlighted the problem of semi-feral horses in national parks and how it is not just an ecological and welfare problem, but also has significant social and political dimensions which also must be addressed. Taggart (2008) reinforced this view, highlighting how public sentiment can influence the development of policies where semi-feral horses are concerned.

Dartmoor National Park has various stewardship schemes in operation (Dartmoor National Park Authority 2014). Scruton (2012) described the need for current stewards of land or such like, to reform their systems in order to conserve. Scruton discussed this on a Radio Four programme presented by Mark Tully, where it is emphasized that when people find themselves restricted by old patterns reform is needed, and the ability to examine inherited practices is essential if a heritage is to be handed on intact. Tully goes on to quote the early conservationist Leopold (1949) who emphasized that community is not just made up of the people, but also the soils, water, plants, and animals, and that land stewardship therefore should encompass all of these components. Many of the opinions viewed in table 1.2 are not based on scientific evidence but simply unfounded concerns influencing the overall picture. According to Draper (2011) Dartmoor's stock management system is flawed by the lack of an independent body which can make informed decisions without becoming entangled in the differing opinions. Clearly, from the opinions gathered in this report, a management plan to include all types of pony will be vital if an overreaching plan is to be successful.

Despite concerns being frequently raised over many years by individual pony keepers and pony organisations, no data have been produced upon which reliable decisions could be made. A survey administered by the Pony Action Group through the Dartmoor Commoners' Council in January 2011 revealed that there was a general agreement by the pony keepers that there should be a reduction in foal numbers. In accordance with this there was also a general consensus that breeding a smaller quantity of foals would improve the market value. Interestingly in the New Forest, actions taken by the Verderers Association support this theory, and after implementing a compulsory stallion removal scheme for eleven

months of the year, they have more than halved their foal crop and noted market prices have marginally increased (Westwood 2013).

Whilst qualitative data enables subjective opinions to be captured there is still a need for objective assessment of pony behaviour in order to confirm whether concerns over the three plans are based on fact or are simply anecdotal. Of the three suggested management plans, the first option is vasectomising the stallions. Howe (2006) describes vasectomy as the most reliable method of contraception in many animals. The question of which type of sterilisation they would prefer to use on their ponies if stallion removal were not an option, was posed. Sixty five percent were found to prefer the idea of stallion vasectomy. However, the participants stated this was due to concerns over the policing of unmarked colts or other “entire” stallions. The vasectomising of stallions raised concerns among pony keepers over cost, implementation and welfare. Many people argued that the stallions would be overworked due to mares repeatedly ‘cycling’.

There were a total of six vasectomized stallions running on commons from the sample of pony keepers approached in the making of this report. All of the six stallions were reported to have a good Body Condition Score (BCS) with a similar weight to that of other ‘entire’ males running on the commons (four of these were seen by the author, experienced in Body Condition Assessing, who can confirm the BCS). This did not support the theory of the stallion becoming overworked which had been a concern raised in Table 1.1 Furthermore mares were reported to have remained within their lairages despite concerns that they would leave their lair in search of an ‘entire’ stallion. All owners of vasectomized stallions confirmed it had significantly reduced the unwanted foal crop, and was a management tool they would recommend to all those who wished to avoid indiscriminate breeding. The overall consensus of those using vasectomy as a breeding control method was that it is the simplest option if some pony keepers refused to remove their stallions. There are surgical risks attached to anaesthesia in equids but compared to the time and potential risk to mares through contraception (Imboden 2013), the cost benefit was considered greater by the pony keepers supporting vasectomy.

The second proposed management plan is the removal of stallions from the commons. This has resulted in much disagreement between neighbouring pony keepers. Those against this form of breeding control insist that the mares will leave their lairages. A lair is the term used to describe an area an animal remains in. All stock on Dartmoor run under Commoners’

agreements specific to individual commons, therefore stock must stay within a certain area in order to avoid losing payment entitlements. Stallions are said to keep the lairages of their herd, however this is not supported by scientific evidence. Most available evidence suggests that horses' social groups are based on a matriarchal society (Goodwin 2007), with equine family bands generally being led by mares (Haupt and Keiper 1982). Pony keepers are therefore arguing on some issues from a false perspective unsupported by evidence. Studies of other species lairing behaviours identify a number of reasons effect the areas animals remain laired to, for example Hunter (1954) found grazing varied seasonally in Scottish Blackface sheep. The reason for this was described as obscure, but may arise from either instinctive or learnt behaviour and be related to available grazing, meteorological conditions, nutritional requirements and the presence or absence of lambs.

The favored management plan (stallion removal) has been implemented by 21 of the 51 pony keepers interviewed. Only one of these had found that some mares had left their lair. One group of mares running with an "entire" stallion had spread over a larger area joining the mares of a neighboring herd where the stallion had been removed. However when this stallion was also removed the groups separated back out into their natal family groups. Interestingly of those who said the mares would leave their lairage 99% had not tried to remove the stallion.

The DCC have confirmed via personal communications (Walden 2014) that despite the regulations under section 5 of their Act, they have sought legal advice and cannot enforce stallion removal or any other management plan on the commons of Dartmoor. They can only support a majority vote on such issues.

The Dartmoor Commoners Council Act (1985) states under section 5:

5.-(1) For the purpose of fulfilling their functions under section 4 of this Act, the Commoners' Council-

(a) Shall make regulations for the following purposes:-

(iv) to control stallions, rams or other male entire commonable animals and to prescribe or provide for proscribing conditions (as to time, or as to the class, description, age or characteristics of animals) under which male entire commonable animals may be depastured on the commons.

The third management plan is the use of immuno-contraception (IC) for the mares; a method that very few have found to be an effective form of contraception in wild species. However although Gionfriddo *et al.* (2011) found GonaCon™ reduced reproduction in wild adult female white-tailed deer, it was concluded that greater contraceptive efficacy may be required for it to gain widespread acceptance and use by natural resource managers. Twenty seven pony keepers have now signed up to the second phase of a trial programme for contraception for their Dartmoor mares (Dartmoor Magazine 2014). However, all of the pony keepers who were supporting the trial during this report were doing so because they believed it may lead to the drug company Pfizer producing a more efficient drug. They all agreed it is currently unviable due to the six-monthly boosters needed after the already time-consuming initial injections. The mares are required to have two injections within four weeks, then boosters every six months. The number of mares who need to be injected instead of simply removing the stallions is an argument many uphold. Ponies would need to be gathered each time an injection was due which is very time consuming. Facilities for handling the wild ponies are not available to the majority of pony keepers meaning handling is complex and time consuming for the pony keepers and often of high risk to the ponies themselves, posing serious welfare issues.

One concern evident from the data presented in Table 3 is that after the initial six months, if any pony keepers do not continue with the trial or any ponies are missed during gathering, they face risking a mare 'cycling' in the autumn which could result in winter foals being born the following year. The extension of reproductive 'cycling' later in the year has important social consequences, including decreased group stability according to Nunez (2009). In addition, reproductive 'cycling' into the autumn months could have long-term effects on foal survival and as Cassandra *et al.* (2012) state, managers should consider these factors carefully before instigating immuno-contraceptive programmes in new populations.

There are some significant findings included in the author's previous study (Petrie-Ritchie 2012) which add scientific groundings to some of the previously disputed management issues. One of the arguments against vasectomy of the stallions is that the condition of the stallion will drop due to being overworked by mares repeatedly 'cycling'. Pharo (2014) disputes the evidence of overwork in the bull, stating that poor quality of stock is to blame for a lack of libido, and physical weaknesses brought on by conformational weaknesses are a bigger problem than repeated sexual practice. Interestingly, in the author's previous

research the stallion with the lowest body condition score was the 'entire' stallion running with fourteen mares. The vasectomised stallion was running with thirteen mares and had a significantly better body condition score than his 'entire' counterpart. However more research is needed to identify whether the stallion maintained his condition or lost condition over the breeding season. The general consensus was that the positive aspect of having a vasectomised stallion running with the mare herd was that the mares would be kept together in their lairages. However, some argued that the mares would go elsewhere when they realised that the vasectomised stallion was not working, and would seek out the nearest "entire" stallion. This is simply an opinion and not grounded in science. Thirteen of the pony keepers who took part in this study made it very clear that they held serious concerns over the policing of stallion removal. This was the main reason for using vasectomisation for those who had already used it.

In terms of implementation of the vasectomy procedure, the veterinarian advice gained from DPHT suggests that this operation is best conducted in the winter months when there is less likelihood of flies irritating the affected area post operation. It can also take up to six weeks for the stallion to become completely infertile (The National Academy of Science, 2014). As with any veterinary procedures, such as gelding, post-operative problems can occur. However the majority of cases are said to recover well and the full range of stallion behaviours are retained (DPHT 2014).

Through the gathering of opinions phase, concerns were raised over all of the proposed management plans. The Dartmoor National Park, Natural England and The Commoners' Council state that they have worked hard to reach some resolution, and many issues have been tackled, such as the Commoners' Council's removal of many unmarked colts which were adding to the overbreeding problem.

The Dartmoor Hill Pony Association continues to support the breeding of Hill Ponies and works hard to ensure homes are found for them. They maintain that finding a market through the sales of meat and skins is the way forward, to secure a viable base line for lower quality stock. They are encouraging support for the use of a contraceptive vaccine for the mares as a form of breeding management. The Dartmoor Heritage Pony Trust wishes to promote the pony as a riding pony or conservation grazer. There is little difference between the aims of these two societies, but there is a large divide. With the breeders of different types of pony all wishing to continue the breeding of their own particular stock on the open

commons, it is little surprise problems have occurred. The Dartmoor Commoners' Council's study in 2011, details the majority vote on the issue of indiscriminate breeding and the consequential flooding of the market. With this report revealing the same majority vote, a thorough assessment of the Commoners' Council and how they represent the Commoners' appears to be required. Beetham and Boyle (1995) describe democracy as the essential form of collective decision making required for any association.

Subsidizing the keeping of ponies as conservation grazers on Dartmoor is available through agri-environment schemes but is often not accessed due to local associations being unable to agree on how to distribute this money. Many of the pony keepers stated that they had serious concerns about the viability of subsidising ponies on the commons. The issues subsidies can cause are discussed by Wesley & Peterson (2009), within a global farming context, where subsidies are found to affect those farming in all areas of the world. There is already so much contention between pony keepers due to differing agreements on neighbouring commons, the suggestion of subsidies available to the existing pony keepers does not impress those who either do not keep ponies or who had recently given up pony keeping. They believe this would cause even more problems.

2.9 CONCLUSION

There are few areas of the world where truly semi-feral populations of horse or pony remain. The situation on Dartmoor is unique in that there is more than one type of pony being bred on common land within the National Park. Brenin (2011) discusses the issues on Dartmoor compared to the other areas that only breed one type, identifying that the New Forest and Exmoor breed just one identified breed. However Green (2013) has suggested that Exmoor too is beginning to have issues with unmarked colts covering pedigree Exmoor mares, reinforcing the fact that a management plan is essential on open commons. Clearly a management plan needs to be implemented on Dartmoor allowing all types of pony to remain on the commons. It is quite apparent that not everyone will be happy about the decisions made, but in order to safeguard welfare, a definitive decision is essential. Interestingly, a committee to review the Bureau of Land Management in Washington DC (2013) concluded that science alone, even the best science, cannot resolve the divergent viewpoints on how best to manage free-ranging horses on public lands. With the annual unwanted foal production on Dartmoor averaging between 600 – 1500 the cull of healthy

young-stock will continue if no management plan is enforced. Evidence-based scientific findings in the case of Dartmoor can be used to determine the best management options available to improve welfare. The results of chapter one demonstrate that a significant majority of pony keepers wish to implement a breeding management plan in order to reduce the annual foal production. Significantly more pony keepers are in favour of management change than are not and the favoured management plan was shown to be stallion removal. However there are concerns raised by Pony keepers over what effect the favoured management plan, stallion removal, will have on the behaviour of the herds with changes in behaviour potentially impacting upon the livestock and ecology of the moor (Dartmoor National Park Authority 2013). The qualitative data collected from interested stakeholders demonstrates the complexity of the current situation, to which they all contribute. The need for scientific study of the behaviour of the pony herds managed in different ways is crucial to ascertain the way forward.

CHAPTER 3 The behavioural assessment of three herds under different management systems

3.1 Introduction

On Dartmoor the management of the pony has always been left to the individual pony keeper. Whilst chapter one indicates what the majority of the Pony keepers would like to see happen in terms of breeding control, this chapter aims to discover what effect this will have on the ponies themselves. There is limited research on semi-feral horse population breeding control methods, so assessment of other species has also been drawn upon.

3.2 Possible breeding management systems

The social organisation of bands of horses has been found to have a direct impact on their grazing behaviour. For example Freshney (2003) focused on the grazing patterns of the Dartmoor ponies, and monitors how they affect conservation areas. She notes that social factors may, in some situations, be more important than the availability of forage in terms of where and how the ponies spend their time.

Assateague Island National Seashore (USA) has a population of free-ranging horses considered to be one of the longest studied groups and has contributed greatly to knowledge of feral horse behaviour. It has also been described by Eggert *et al.* (2005) as a natural laboratory for the development and testing of new methods of remote pregnancy testing and Immunocontraception. The National Park acquired ownership of the horses in 1968 with a population of 28 which since rapidly grew. In 2001 there were 175 horses present having negative effects upon other natural resources. Studies such as Furbish and Albano (1994) and Zervanos and Keeper (1998) found that the horses significantly influence the distribution and abundance of native plant species and can affect the dynamics of plant community composition. This fact makes them particularly suitable for some conservation areas and also completely unsuitable in others. Seliskar (2003) and De Stoppelaire *et al.* (2004) for example found that both sensitive dune features and marshlands with soil binding vegetation had been badly damaged through overgrazing and trampling. Garcia *et al.* (2012) observed the impact of free-ranging goat grazing on a conservation area taking note of interactions with other herbivores and assessing biodiversity and conservation issues. These authors underline that many environmentally harmful effects arise from improper management practices, and point out that when managed adequately goat grazing can be a

useful tool of conservation. If an overreaching breeding management system were put in place on Dartmoor it could impact on the way the ponies graze, and the areas in which they live. Any management plan implemented on Dartmoor must take the potential behavioural changes into account to ensure as little disruption as possible is caused to the often long standing territories held by herds.

3.2.1 Stallion removal

Stallion removal may seem to be the simplest option but it has been faced with much dispute. Some pony keepers believe strongly that mares are kept laired (kept in a territory) by the stallion. Consequently there is concern that the mares will form large herds drifting away from their lairages should stallions be removed. An early account by Tyler (1972) describes how, in the New Forest the stallions are removed from the commons outside of the breeding season and when released collect together a mare group or several mare groups in early spring. During the breeding season stallions exert control over the movements of the herd, occasionally fighting with neighbouring stallions to maintain their harem. However Pollock (1980) states that because the stallions are taken off the Forest in winter they attach themselves to different mare groups each year rather than maintaining a stable 'harem' (comprising the same or mostly the same individuals year after year). Freshney (2003) explains that when this approach was implemented on the New Forest it appeared to reduce the exclusivity of the home range each group occupied and increased the area of overlap between neighbouring home ranges which as a result caused large numbers of ponies to share the same favoured grassland feeding areas, consequently disrupting lairages.

Gates (1979) found that there is usually some overlap between each harem's home range, possibly dependant on the maturity of a stallion and how long he had been established there as a breeding male. When looking at rank within a herd Boyd and Houpt (1994) and Von Dierendonck et al. (1995) found that length of residency was a factor in dominance shown in behaviours. Rutburg (1986) suggested that through youngsters learning to submit to elders due to their social experience and physical strength, dominance relationships would be maintained by individuals' recognition. It has been suggested that the length of residency may account for the often low ranking positions held by stallions within a herd. In contrast to this however, Feist and McCullough (1976) and Waring (1983) found an adult stallion was the highest ranking individual based on behavioural observations. Houpt et al.

(1978), Wells and Von Goldsmidt- Rothschild (1979), Houpt and Keiper (1982) and Keiper and Sambraus (1986) all found that the highest level of aggression was shown towards a new stallion joining the herd rather than towards a new mare.

The majority of research suggests that it is more likely to be the removal of older mares which causes mares to drift, and not the removal of stallions. This could be valuable information on Dartmoor as many pony keepers are having their older mares destroyed in an attempt to reduce numbers (e.g. PK 22).

The issue of where to keep the stallions when they are removed from the moor was raised during recent discussions. Some said they had kept their stallion off the moor, on their own land and were perfectly happy to do this (e.g. PK12 and PK22). Others said this was completely impractical as their stallion would escape (PK31). In the New Forest, Westwood (2012) reports that they had an area designed specifically to keep the stallions in for the eleven months of the year while they were off the Forest. This option was supported by many of the pony keepers, some even offering to set aside an area of ground to help ensure stallions were kept securely in. Some breeders (PK 22, PK12, and PK15) also argued that unless breeding simply for a meat market, then breeding from a stallion that would constantly escape and was generally unmanageable was considered bad practice particularly at this critical time.

3.2.2 Mare Contraception

Davies Morel (2008) and Bergfelt (2000) explain the mare is a seasonal breeder, showing sexual activity only during the summer months, generally ranging from April until November. Breeding cycles commence at approximately 10-24 months of age with each cycle lasting on average 21 days.

The Dartmoor Hill Pony Association is currently trialling the use of Improvac® as an immuno-contraceptive. Improvac® has been produced to chemically castrate male pigs and is currently unlicensed for use in horses. Jowett (2010) explains that the Pharmaceutical Company Pfizer developed the drug to allow farmers to grow pigs bigger before slaughter, but without them releasing the hormones that cause boar taint, a taste many consumers reportedly dislike. Jowett goes on to explain that Improvac® has so far been rejected by the Assured Food Standards (AFS) agency, which licenses its Red Tractor

symbol to 90% of British pig producers. Although all of Pfizer's documentation about the drug maintain that it is safe to use, many pony keepers (Brenin 2012, PK 2, PK5 2014) raised concerns over the use of drugs for animals on Dartmoor. As custodians of the land, farmers (pony keepers) have a duty to ensure that correct decisions are being made now and for the future. Concerns focused on the effect of using the drug Improvac® on the delicate eco-system of Dartmoor. Also the long term effect on the mares is so far unknown and the idea of trialing this product on Dartmoor mares has been described as short sighted by pony keepers opposed to it.

Improvac® stimulates the immune system to produce antibodies, with an action mode similar to that of a vaccine. The active substance in the product is an analogue of gonadotropin releasing factor (GnRF) linked to a carrier protein obtained from the bacterium *Corynebacterium diphtheriae*. (European Medicines Agency 2013). GnRF is responsible for maintaining the activity of the testicles in the male pig. In the mare it is the first in the cascade of hormones produced when day length changes and inhibition of the hypothalamus is lifted. When Improvac® is injected (intramuscularly) it causes the animals immune systems to recognise the synthetic GnRF as 'foreign' and produce antibodies against it. These antibodies are then able to attach to natural GnRF and stop it from having its effect.

The endocrine control of the mare's natural reproductive cycle begins in the pineal gland in the base of the brain which produces the hormone Melatonin nocturnally. In response to short day lengths, melatonin dominates the reproductive system, inhibiting the activity of the hypothalamic-pituitary-ovarian axis. As day length increases, inhibition of the axis is removed, allowing gonadotrophin- releasing hormone (GnRh) to be produced by the hypothalamus, this drives luteinising hormone (LH) and to a lesser extent follicle- stimulating hormone (FSH) production by the anterior pituitary. Melatonin is secreted by the pineal gland in two phases: photophase (daytime) and scotophase (nighttime). It therefore demonstrates a circadian secretion, with the highest levels of secretion being evident during the scotophase. The presence or absence of daylight is perceived by the pineal gland via neural messages from the retina of the eye. In the absence of light the conversion of tryptophan to melatonin in the pineal gland is driven as shown in Figure 2.1.

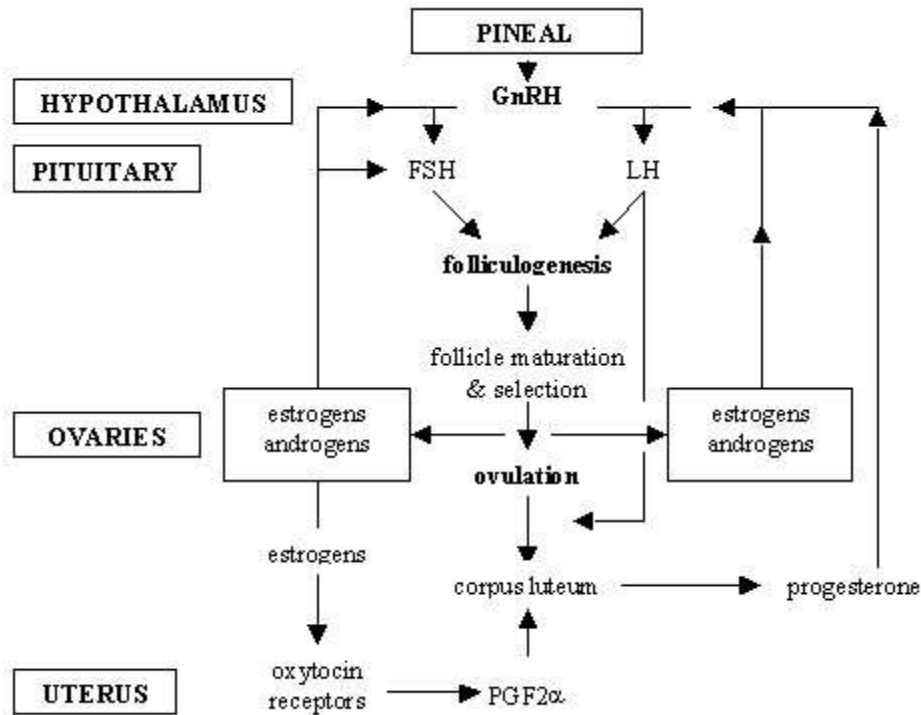


Figure 3.1. Endocrine control of the mare's reproductive cycle. (www.equine-reproduction.com 12.08.14)

Effective contraception by injection or by darting has significantly reduced or even eliminated population growth in many wild free-ranging species (Fraker & Bechert 2007; Turner *et al.* 2007; Herbert & Vogelnest 2007). Plowman *et al.* (2005) assessed the behavioural and psychosocial effects of female based contraception in hamadryas baboons, concluding that the contraception did not increase social tension in the group as a whole. However Stoinski *et al.* (2009) found that the use of contraceptive drugs on females affected the sexual behaviour of Gorillas and therefore had potential consequences for group social dynamics.

The effects of Immunocontraception used as an elephant management tool were documented by Druce *et al.* (2011). Interestingly Druce *et al.* (2011) suggest that a rotational immuno-contraception plan may be preferable, which simulates the natural process such as predation or episodic catastrophic events (e.g. drought), as long term consequences of consistent contraception may have as yet undocumented detrimental effects.

The use of immunocontraception has generally been implemented in areas where there is no alternative due to the large areas inhabited by the animals or handling of animals is

unfeasible. Improvac® has been available for use in Australia for some years, however in a newsletter published in April 2012 the Australian Brumby Alliance describes discovering the news that Improvac® had been exported to England for Dartmoor Ponies as ironic, bizarre, and even hypocritical, as they are still pushing to get Australian officials to further develop this humane option for their semi-feral horses.

World Horse Welfare chief veterinary consultant Keith Meldrum explained that a project of this kind has never been carried out before in the UK and if it is found to be a successful form of contraception, it could become a long-term solution to the issue of overbreeding within Britain's semi-feral horse and pony populations (BBC News 2012). Meldrum (Personal comm. 2013) confirmed that the government issued a special licence for the contraceptive to be imported into the UK to use on the Dartmoor ponies.

The effect of female sterilisation on the mare physically and on the behaviour of the herd has been subject to limited research. However Madosky *et al.* (2010) provides the most definitive conclusion for the effects of immunocontraception on harem fidelity in a feral horse population. Porcine zona pellucida (PZP) contracepted mares changed harems significantly more often than control mares and mare behaviour was found to be altered long term. Feh (2012) found that 4 of the 9 mares which had been given only one treatment with PZP vaccination (one primer injection followed by one booster) never regained fertility after 4-8 years of observations. While the mechanism for explaining this protracted infertility in *E. ferus przewalskii* is unknown Powell and Monfort (2001) documented a similar response in the Assateague Island horses injected with PZP vaccination and they were found to have experienced ovulatory failure. Studies of non-equid species such as Wood *et al.* (1981) and Stoops *et al.* (2006) have demonstrated atrophic changes in ovarian morphology, folliculogenesis, and reproductive endocrine function indicating that sperm binding prevention may not be the only effect acting on fertility in PZP-inoculated animals. Apart from the physical changes being observed Nunez *et al.* (2009) suggested that PZP application in a gregarious species such as the horse may disrupt social ties among individuals and inhibit normal social functioning. It is clear from this that successful management of feral horse populations requires a comprehensive understanding of how reproductive management strategies may alter and consequently impact on existing social structure. Ransom *et al.* (2013) conclude that humans are increasingly attempting to manage the planets wildlife often with new tools which are not fully understood. These

authors insist that that the transient nature of immunocontraceptive PZP can manifest into extraordinary persistence of infertility with repeated vaccinations, and ultimately alter birth phenology in horses. As a direct result of the use of Improvac® on Dartmoor herds Bassett (2013) explained that basic behavioral observations had been made by the project manager with the only obvious unexpected behavior noted the day following the injections. The mares spent most of the day lying down and were described as “extremely lethargic” (Bassett 2013). Brenin (2014) explained that being at the forefront of a new idea can be appealing, but that pony keepers, veterinarians and charities should be cautious about encouraging drug trials here on Dartmoor. His campaign ‘Think Before You Breed’ is wholly committed to finding a resolution to the problem of overbreeding but believes if other options, such as stallion removal are available then they should be fully explored first.

3.2.3 The drug improvac® as a form of contraception in the mare.

In a closely monitored trial by Imboden *et al.* (2006) on the physiological and behavioral impact of Improvac® on 9 mares, the following critical observation was found: One mare remained in oestrus continuously from week 5 after vaccination until plasma progesterone concentration increased at week 84. Under their test conditions the mares were not running with a stallion. Should this mare have been running with an “entire” stallion there are serious welfare concerns to consider. Not only is there the potential of the stallion being overworked under these conditions (more than in the vasectomised method) but there are also serious welfare complications for the mare remaining in oestrus for that long. Constant ‘hassling’ and covering from the stallion could cause internal bruising and increased behavioural tensions in the herd. A further significant finding of using Improvac® was that one mare showed neither luteal activity nor follicle development for two years after vaccination. Imboden *et al.* (2006) concludes that reproductive cyclicity in adult mares can be successfully suppressed by immunization against GnRH but the timing of resumption of cycling is highly variable and oestrus behaviour may occur in spite of ovarian suppression. Without having conducted further tests these authors were unable to say whether immunisation resulted in reduced sensitivity of the pituitary gland to GnRH or decreased pituitary production and/ or secretion of Luteinising Hormone and Follicle-Stimulation Hormone. It was also not possible to completely exclude the possibility of some degree of permanent impairment of hypothalamic or pituitary function, as observed by Gokdal *et al.* (2008) after the immunisation of ewes against GnRH early in life.

The Assateague Island National Park Society has controlled the equine population growth using immune contraception of females since 1994 and a steady decline in population size has been seen of forty five in eight years. However one unexpected result was that the lifespan of the mares increased by five to ten years suggested being a result of a release from the stresses of pregnancy and lactation. Turner and Kirkpatrick (2002) Kirkpatrick and Turner (2007) point out that this in itself extends the amount of time needed to reduce population size using contraception alone. This is an important factor to consider on Dartmoor due to the costs involved and the amount of injections needed over the breeding life of each mare. Comparing this to the costs of having an 'entire' stallion in country (kept in, on the farm) for breeding replacement stock and a vasectomized stallion with the ponies on common ground should be carefully evaluated. Killian *et al.* (2008) conclude that long-term contraception of mustang mares with a single dose of either the Spay Vac® or GonaCon™ vaccine is possible. Bartholow (2007) also confirmed that contraception results in a significant reduction in the number of foals produced with 17% less offspring in the breeding season. Both studies revealed that the number of horses bred would be reduced with contraceptive treatment. The Guy Fawkes River National Park Horse Management Plan (2006) suggests that technology may be useful once the horses have been transported off the park and are in captive herds. In contrast the United States Geological Survey outlines one reason for using contraception on the mares is so that gathering is not required, and according to the United States Geographical Survey [online] (2014) mares can be injected via a dart gun. This is obviously of benefit to large wild horse populations with little or no possibility of handling. Some of these herds are running on large open areas such as the Guy Fawkes River National Park which spans 106,803 hectares, considerably larger than Dartmoor's 36,000 hectares (Commoners' Council 2014).

3.2.4 Sterilisation of the stallions

Castration of the stallions would alter behaviour through the removal of the primary source of androgen production, which creates the characteristic male-type aggressive and sexual behaviours (Samper 2000). Davies-Morel (2008) describes how individuals are said to differ in terms of how their behaviour changes after castration, with some stallions maintaining much of their herding and mating type behaviour, but there is expected to be at least some loss of sex drive. The National Academy of Sciences and the Bureau of Land Management

(2013) in Washington DC states this is counter to the often-stated public interest in maintaining natural behaviours in free-ranging horses.

Vasectomy blocks the passage of sperm without affecting testosterone synthesis or secretion, sparing androgen-supported natural behaviours. Asa (1999) investigated the reproductive success of large herds of horses in South Eastern Oregon where vasectomy was used. A herd of 320 horses in the Flannigan area and another herd of 167 individuals in Beatty Butte were studied. Both of these herds had dominant stallions as well as subordinate stallions and bachelor groups. The vasectomy procedure was 100 percent effective in preventing foal production in stable bands that had no subordinate stallions, but some of the bands that had intact subordinate stallions contained foals. The stability of bands did not differ between treated and untreated groups. However, limiting treatment to dominant stallions leaves subordinate band stallions and bachelors fertile and thus reduces overall efficacy. The conclusion from the National Academy of Sciences and the Bureau of Land Management (2013) was that vasectomizing a larger proportion of males, regardless of age or social status would reduce mating by subordinate stallions. This factor (unwanted mating's with subordinate stallions) could be eliminated on Dartmoor through policing the removal of any unmarked 'entire' colts as set out under section five of the Dartmoor Commons act (1985) currently enforceable by the Commoners' Council. Another argument against vasectomy or stallion removal brought up in the author's previous research (Petrie-Ritchie 2012) has been that it is logistically impossible to gather all the colt foals each year for removal. The stallions in the two herds examined by Asa (1999) first acquired mares at 5 years of age and first sired foals at 6 years. Therefore by the time the colts are sexually mature there should have been several opportunities to gather them. Another study to confirm the success of vasectomy in the control of breeding was carried out by Kirkpatrick *et al.* (1997). Two adult wild stallions inhabiting the Pryor Mountain Wild Horse Refuge in Montana were vasectomized and returned to their herds. After 2 years, no foals were produced by the mares accompanying the vasectomised stallions.

Failure rates for vasectomy are 10 times lower than those for female sterilization according to research by Brechina and Bigrigg (2005). Phoenix (1973) found vasectomy had no statistically significant effect on the sexual behavior of vigorous adult rhesus monkeys. Of two groups of males matched for level of sexual performance, one was vasectomized and the other underwent sham vasectomy. In sex tests administered within the month after

surgery, the groups showed no statistical difference ($P>0.05$) in rate of mounting, intromission, or ejaculation, or in any other measure of sexual or sex-related behaviors. More recent research also supports vasectomy as the most reliable method of contraception in animals (Howe 2006).

3.2.5 Welfare implications of each breeding management option

With welfare at the core of the aims of this study, the legal aspect of livestock ownership outlined by Defra lays down guidelines (within the farm animal welfare codes) which many charities in the South West of England believe are not adhered to in the existing management of the semi-feral pony herds (Brenin 2011, Stacey 2014). Defra describes the legal guidelines for care of all livestock and pets, and states that local councils have the statutory responsibility in relation to animal health and welfare on farms, at markets and in transport (Defra 2014). Responsibilities in cases of severe weather are listed by Defra, with the general rule that animals must not be left in circumstances where they may suffer. These guidelines also recommend that livestock is checked regularly (daily) and that if horses or ponies are usually kept outside during the winter months, they should have access to shelter at all times and a regular provision of feed and water. These basic requirements are underpinned by the Animal Welfare Act 2006 and the previous 1965 Brambell Report which recommend that animals should have the freedom to stand up, lie down, turn around, groom themselves and stretch their limbs. The Farm Animal Welfare Council (FAWC) developed these into the Five Freedoms, which provide a framework for the analysis of animal welfare. The Five Freedoms are well known in farming, policy making and academia. They form the basis of much animal welfare legislation, and are currently listed by Defra (2014) as:

1. Freedom from Hunger and Thirst achieved by ready access to fresh water and a diet to maintain full health and vigour.
2. Freedom from Discomfort achieved by providing an appropriate environment including shelter and a comfortable resting area.
3. Freedom from Pain, Injury or Disease achieved by prevention or rapid diagnosis and treatment.
4. Freedom to Express Normal Behaviour achieved by providing sufficient space, proper facilities and company of the animal's own kind.

5. Freedom from Fear and Distress achieved by ensuring conditions and treatment which avoid mental suffering.

On Dartmoor there is much criticism of the general management of the ponies by welfare organisations, particularly during the winter months. A study by Freshney (2003) suggests that in the case of moorland ponies the requirement for shelter did not seem to have a significant effect on the distribution of the ponies within study sites (at various locations on Dartmoor). Despite the exposed and often harsh nature of the open moorland, ponies on all study sites were rarely seen to utilise areas of woodland for shelter. Ponies generally remained higher on the slopes even in the winter months. Freshney describes the ponies as being adept at utilising whatever shelter was available on the open moor, such as gorse and stone walls. However this report does not directly mention the body condition scores of the ponies in the study groups and Brenin (2011) argues that a clear idea of body condition is almost impossible to gain due to the ponies often having distended bellies through heavy worm burdens and/ or pregnancy. He goes on to explain that ponies will favour a better source of food over shelter and that if worth more financially the ponies would be fed and cared for in the same way as other livestock over the winter months. In an article in the Western Morning News on 24th April 1954 the Dartmoor Pony Society secretary replies to a letter suggesting that the registered ponies were becoming weaker and less able to survive on the hills of Dartmoor. She argues that one cannot breed the best possible stock by feeding it on no more than “*air, snow, and water*”. This may be very old news but it is certainly relevant and emphasises the low level of argument against a change to management. Brenin (2012) suggests that if a pony keeper is simply breeding for the meat market or for skins then putting money into feed or hay is not worthwhile. Those ponies who survive bring a small income with little or no outlay. During a dissection at Dartmoor Zoo, slaughterman Goatman (2014) revealed that the majority of the ponies he collects through the Dartmoor Hill Pony Association’s slaughter scheme have a high worm burden. The four year old mare being dissected was clearly carrying a heavy burden of both bot fly larvae and tape worm. Goatman went on to explain that the ponies self-medicate themselves by eating the gorse (*Ulex europaeus*), a plant found all over Dartmoor. However there is no scientific evidence to back up this claim. Contrary to this, horses which go untreated with appropriate anthelmintics can be at risk of severe, sometimes fatal conditions caused by worm burdens (Matthews, 2008). Matthews (2014) suggests worm control is an essential part of maintaining high levels of welfare.

The ponies are part of the culture of the area with the pony drift and markets being a well-known social event in the farming calendar. There are some who believe passionately that the heritage and economic value of the ponies is far greater than the welfare implications if the system continues unchallenged. Fraser (2000) assesses cattle grazing the Victoria Alpine National Park examining whether an opportunity has been missed to resolve the ongoing conflict which accompanies the grazing of cattle in this area through protecting cultural heritage rather than conservation. Similarly on Dartmoor Brenin (2011) suggests the ability to distinguish between the legal obligation the owners have to provide for the needs of their animals is being missed through the desire to safeguard the culture of Dartmoor in relation to ponies with the two perhaps mutually incompatible. Some pony keepers, who wish to remain anonymous, from the author's preliminary study conveyed very clearly that they want to continue with their family's 'Hill pony breeding lines' without interference, regardless of the market (Petrie- Ritchie, 2010). Green (2013) suggests that under the 2006 Animal Welfare Act the owners of the free living ponies need to take full responsibility for their livestock. The fourth of the five freedoms: to express normal behaviour, is a particularly important consideration in this instance when attempting to determine the most appropriate breeding management plan for semi-feral herds kept on common ground. The expression of normal behaviour is one of the tools those interested in conservation wish to retain. The introduction of a management plan should take this important factor into account. Freshney (2003) investigated the grazing behavior of Dartmoor Ponies and the impact they had in terms of conservation. Her findings reveal some important conservation issues. The ponies exhibited considerable adaptability in forage choice across the seasons; a useful trait in a conservation grazing animal (Grazing Animals Project, 2014). A significant increase in gorse consumption was observed during the winter months, with a corresponding decrease in grasses. Gorse increased from about 2% of the summer diet to around 45% in winter. Putman *et al.* (1987) observed a similar pattern in the New Forest, with grass consumption declining to about 50%, and a corresponding increase in gorse and holly (*Ilex Aquifolium*) consumption. Harris's (2000) study of Dartmoor ponies found the ratio of grasses to gorse in late December to be a 50/50 ratio based on dung samples and field observations. Interestingly after swaling (controlled burning of heathland), ponies were observed feeding almost exclusively on charred mature gorse. Caseldine and Hatton (1993) discuss the development of the landscape of Dartmoor and the influence controlled burning has had on the vegetation and animals grazing it through the ages. Freshney (2003) described how during the winter season ponies dug through the snow and fed almost

entirely on gorse, exhausting one 'feeding hole' after another. Although little loss of condition was observed in the majority of the ponies during Freshney's report she states that it would have been useful to monitor their condition beyond February, as March and April are considered the most testing months for livestock on Dartmoor (a view confirmed by PK 12 and PK 30, 2014).

One welfare issue raised by pony keepers in the current study (2014) focused on the welfare of young unmarked colts found on many commons. They insist there is a general belief held by the general public that due to the ponies seemingly living wild, welfare levels are high. There are some young colts who would under normal feral conditions remain in bachelor herds or on the margins of their own family groups until sexually mature but which are forcibly driven off commons repeatedly by pony keepers or other pony keepers who do not wish them to be there. Goodwin (2007) explains that solitary, young 'entire' males are rarely seen and Miller (1981) confirms that subordinate status for the young stallion is reproductively advantageous, as they may have access to some mating's, and follows the normal behaviours for the social community of the horse. If they are driven off a common away from their social group then they are forced to live in solitary areas of moorland which would not normally be a chosen area. This can cause other welfare issues such as food and shelter shortage, often resulting in the death of the pony (Brenin 2012).

3.3 Methods adopted to conduct the behavioural observations

Three pony herds were studied.

Group A. comprised one vasectomised stallion running with eleven mares including eight heritage pony mares, plus three mares of hill pony breeding belonging to a different pony keeper.

Group B. had no stallion, fourteen mares including mixed registered and heritage breeding all belonging to the same Pony keeper.

Group C. included one 'entire' stallion and twenty eight hill pony mares which had been injected with the contraceptive drug Improvac®. They belonged to a number of Pony keepers.

Ages ranged between three and twenty three years for all three pony groups.

Observations for Group A took place over six days, starting on day one 10.06.13 at 12.00–14.35pm, day two 11.06.13 at 14.00 -17.00pm, day three 12.06.13 at 13.30 – 16.05pm, day

four 18.06.13 at 09.00am – 19.00pm, day five 19.06.13 at 08.00am- 19.00pm and day six 20.06.13 at 08.00am – 12pm. A total of thirty three hours of behaviours were observed. This was 363 Equid Hours.

Observations for Group B were taken over four days. Day one started on 13.06.13 at 08:00am – 18.00pm, day two 14.06.13 08.00am – 18.00pm, day three 21.06.13 at 08.00 – 18.00 and day four 22.06.13 at 08.00am – 12.00pm. A total of thirty four hours of behaviours were observed in group B. This was 476 equid hours.

Observations for group C were taken over four days and began on 16.05.13 at 08.00am – 18.00pm on day one, day two 17.06.13 at 08.00am – 18.00, day three 23.06.13 at 08.00am – 18.00pm and day four 24.06.13 at 08.00am – 12.00pm. A total of thirty four hours of behavioural observations were made on group C. This was 952 Equid hours.

The climate for all days remained dry and mostly sunny, with some light mist/drizzle early on 19th 20th 21st and 24th. The temperature stayed between 15 -17°C with minimal cloud cover.

In order to safeguard confidentiality it is not possible to illustrate the precise location of the study ground (two observation areas were in one Dartmoor quarter and one in another).

Group A covered 4 square kilometres and were on ground of between 90 and 152 metres above sea level.

Group B covered 3 square kilometres and were on ground of between 90 and 121 metres above sea level.

Group C were contained within an enclosed area of Dartmoor (New-take) covering approximately one square kilometre at 90 – 106 metres above sea level.

A selection of appropriate observation points had been established for each herd. This was generally on higher ground with a wide ranging view, enabling the capture of the behaviours in the whole herd. During the day many different positions were used to maintain good visibility.

To record the data, one zero time sampling was used because it was impossible to clearly identify each individual animal. Observation sessions were divided up into five minute intervals. Time sampling ensured that several different categories of behaviour could be recorded simultaneously. Successive sample points were denoted by a beeper (small electronic timer), at which point the behaviours observed in the preceding sample interval were noted (Martin and Bateson, 2007). They suggested that one-zero sampling does not give true or unbiased estimates of durations or frequencies. However they later describe one-zero sampling as valuable for recording certain types of behaviour (Martin and Bateson, 2007). Tyler (1979) found that one-zero sampling actually produced better estimates of frequencies and durations for certain types of behaviour. Martin and Bateson (2007) agree that time sampling can also condense information recorded and reduce workload to the observer, allowing a larger number of categories to be measured and a larger number of subjects to be studied. If each individual had been observed cyclically only one behaviour would have been noted in each observation, therefore not representing the overall group and potentially missing important interactions between individuals. Observing them in this way would also have increased the observer's proximity to the group, potentially interfering with their behaviours.

In groups A and C the stallion's body condition score was also recorded. The body condition scores set out by the British Horse Society were used as a guide to assess condition.

(Based on the British Horse Society, Carol and Huntington 5 point scale)

Materials used included clip board, pencil, paper, electronic beeper (Salter mini-timer) for five minute interval timings, and camera (Pentax Optio L50) all contained within a waterproof back pack.

An ethogram (Table 3.1) was developed after an initial observation of two hours being made on each group in order to assemble a catalogue of behaviours prior to the study and also based on Petrie-Ritchie (2012).

Table 3.1 Ethogram of pony behaviours

Behaviour Identified	Code	Definition
Grazing Close	GC	The herd are grazing within close (three horses length between each) proximity of each other.
Entire herd on the Move	EHM	The whole group are purposefully moving off from where they have been.
Grazing Herd Spread Out	GHSO	The herd are grazing but are separated out over an area (more than three horses length between each).
Sleeping Lying Down	SLD	Asleep, eyes at least partially closed and lying down.
Standing Asleep	SA	Standing but in a resting position, head down, eyes at least partially closed.
Standing Awake	Saw	Standing in an alert position, neither interacting with others or the world around.
Defecating	D	Discharge faeces from the body.
Urinate	U	Discharge urine from the body.
Mark Urinate	MU	Urination of small amount after smelling the ground, and sometimes accompanied with pawing at the ground.
Mark Defecate	MA	Defecation of small amount after smelling the ground, and sometimes accompanied with pawing at the ground.
Flemen	F	Curling back of the upper lip, exposing front teeth, inhaling air and usually holding this pose for several seconds.
Walking	W	Purposefully walking from location A to location B.
Trotting	T	Purposefully trotting from location A to location B.
Cantering	C	Purposefully cantering from location A to location B.
Gallop	G	Purposefully galloping from location A to location B.

Drinking	Dr	Take water into mouth and swallow.
Being Herded by Stallion	BHS	Where a mare or several mares are being moved by the driving behaviour of the stallion.
Being Herded by Mare	BHM	Where other members of the group, male or female are being moved by the driving behaviour of a mare
Stallion Herding	SH	Where the stallion is performing driving behaviour, snaking of neck, head lowered, ears back and other members of the group are moving away from him.
Mare Herding	MH	Where a mare is performing driving behaviour, often head lowered, ears back.
Hassling Mare and Foal	HMF	Where the stallion is hassling a mare with a foal at foot.
Sweating	Sw	Where one or more of the group is exuding sweat.
Biting	B	One attacks another with the front teeth.
Kicking	K	One attacks another with the hind legs striking out.
Squealing	S	Loud interacting noise, high pitched.
Covering	C	Stallion mounts mare and serves.
Mounting	M	Stallion mounts mare but does not serve.
Playing	P	Interaction, usually between foals, in an obviously joyful way.
Rolling	R	Where the pony lies down and rolls over onto back, and rolls back and forth.
Suckling	S	Foal sucking milk from mare.
Interacting Same Sex	ISS	Where two ponies of the same sex are touching, sometimes with noises

such as squealing or gentle neighing.

Interacting Opposite Sex	IOS	Where two ponies of the opposite sex are touching, sometimes with noise such as squealing or gentle neighing.
Mount Same Sex	MSS	Where a mare mounts another mare.
Aggression	A	Obvious signs of directed aggression towards another, usually a combination of biting, kicking, and squealing with ears pinned back.
Eating Gorse	EG	Pony picking at gorse bush with lips back and teeth bared, carefully chewing off tips of gorse bush while not getting pricked.
Scratching	S	Rubbing body against object in environment, such as stone wall.
Vocalising	Sh	Neighing.
Heading to Water Hole	HWH	Moving purposefully towards the water hole.
Mutual Groom Opposite Sex	MGOS	Where two ponies of the opposite sex are scratching each other with their teeth at the base of the neck (withers).
Mutual Groom Same Sex	MGSS	Where two ponies of the same sex are scratching each other with their teeth at the base of the neck (withers).
Smelling Mare Urine	SMU	Stallion sniffing an area of ground where a mare has recently urinated.
Watching	Wa	Standing and staring at a particular object/ event occurring.
Investigate Observer	IO	Individuals showing interest and concentrating attention on me, the observer.
Foal Mount Mother	FMM	Foal standing on hind legs in covering position as a stallion would to mount mother.
In foal Mare Away from herd	MA	One in foal mare separating herself from the main group.

Foals Interacting	FI	Foals close together and touching or investigating the same object.
New Arrivals Join	NJ	New mares joining group from a neighbouring farm.
New Arrivals Separate Out	NSO	New members of the group separating out.
One or Two Mares On Move	MOM	Mares separating from main group in purposeful way.
Coughing	Co	Pony forcing air from lungs through throat with a short loud sound.
Farmer Herding Sheep	FHS	Where a farmer on a horse causes the ponies to move through driving sheep through the area.

The behavioural data for analysis were collated in Excel and transferred into Minitab (version 17) for statistical analysis. Behavioural data were converted into proportion of time values. Behavioural data were tested for normality. Kruskal-Wallis test were used to investigate differences in behaviour of the three mare groups. Post hoc analysis was conducted using z scores. Mann-Whitney tests were used to compare the behaviour of the two groups with stallions.

3.4 Data results and analysis

A total of 101 hours of behavioural observations were conducted including: Group A 33 hours (396 equid hours), Group B 34 hours (476 equid hours) and Group C 34 hours (986 equid hours). A total of 1858 equid hours were observed.

Before the ethogram 53 behaviours were identified for observation from the pilot study. There were a total number of six observation periods for group A and four observation periods each for Group B and C.

Data for each of the behaviours within the three mare groups were subjected to normality testing. The results of a series of Anderson Darling tests are shown in Table 3.2.

Table 3.2. Normal Distribution Test Mares

Behaviour	N	AD Test Statistic	P	Normally Distributed
Grazing Close	216	35.6	<0.005	NO
Entire Herd on the Move	216	68.731	<0.005	NO
Grazing Herd Spread Out	216	39.236	<0.005	NO
Interacting With Cows	216	81.189	<0.005	NO
Sleeping Lying Down	216	33.533	<0.005	NO
Standing Asleep	216	35.792	<0.005	NO
Standing Awake	216	55.369	<0.005	NO
Defecating	216	79.032	<0.005	NO
Urinating	216	72.345	<0.005	NO
Walking	216	43.930	<0.005	NO
Trotting	216	72.905	<0.005	NO
Cantering	216	79.334	<0.005	NO
Gallop	216	80.622	<0.005	NO
Drinking	216	80.120	<0.005	NO
Being Herded by Stallion	216	62.269	<0.005	NO
Being Herded by Mare	216	78.626	<0.005	NO
Mare Herding	216	81.189	<0.005	NO
Sweating	216	82.579	<0.005	NO
Biting	216	81.739	<0.005	NO
Kicking	216	32.834	<0.005	NO
Squealing	216	67.267	<0.005	NO
Covering	216	77.123	<0.005	NO
Mounting	216	76.627	<0.005	NO

Playing	216	77.672	<0.005	NO
Rolling	216	81.739	<0.005	NO
Suckling	216	73.128	<0.005	NO
Interacting Same Sex	216	61.634	<0.005	NO
Interacting Opposite Sex	216	63.179	<0.005	NO
Mount Same Sex	216	81.263	<0.005	NO
Aggression	216	79.945	<0.005	NO
Eating Gorse	216	6.058	<0.005	NO
Scratching	216	79.032	<0.005	NO
Vocalising	216	79.945	<0.005	NO
Heading to Water Hole	216	78.863	<0.005	NO
Mutual Groom Opposite Sex	216	34.009	<0.005	NO
Mutual Groom Same Sex	216	65.471	<0.005	NO
Investigate Observer	216	70.758	<0.005	NO
Foal Mount Mother	216	81.629	<0.005	NO
In foal Mare Away from herd	216	65.561	<0.005	NO
Foals Interacting	216	78.622	<0.005	NO
New Arrivals Join	216	78.622	<0.005	NO
New Arrivals Separate Out	216	82.579	<0.005	NO
One or Two Mares On Move	216	77.672	<0.005	NO
Coughing	216	81.849	<0.005	NO
Farmer Herding Sheep	216	81.339	<0.005	NO

All mare behaviour data shown were non parametrically distributed.

The following hypotheses were tested using Kruskal Wallis tests.

Hypotheses

Ho= There is no significant difference in the behaviours shown by the different mare groups.

Ha = There is a significant difference in the behaviours shown by the different mare groups.

In Table 3.3 Z scores are shown for significant results to establish source of differences. Interpretation is given for each of the behaviours following post hoc analysis using z scores.

Table 3.3. Kruskal Wallis Test Mares

Behaviour	H ₂ =	P=	Z Score Contracepted	Z Score Stallion Removed	Z Score Vasectomised	Interpretation
Grazing Close	17.78	0.0001	0.16	-3.19	3.03	Less than average GC in SR group more than average GC in V group.
Entire Herd on the Move	8.42	0.015	-0.59	-0.83	1.42	No Significant difference in this behaviour between CG,V,SR
Grazing Herd Spread Out	19.30	0.0001	1.29	2.36	-3.65	Less than average GHSO in V group, more than average GHSO in SR group.
Interacting With Cows	6.06	0.048	-0.25	0.50	-0.25	No Significant difference in this behaviour between CG,V,SR
Sleeping Lying Down	172.31	0.0001	-6.24	-5.73	11.97	Less than average SLD in CG and SR More than average SLD in V group.
Standing Asleep	1.33	0.515				No Significant difference in this behaviour between CG,V,SR
Standing Awake	3.18	0.204				No Significant difference in this behaviour between CG,V,SR
Defecating	2.77	0.250				No Significant difference in this behaviour between CG,V,SR
Urinating	3.03	0.220				No Significant difference in this behaviour between CG,V,SR
Walking	3.20	0.202				No Significant difference in this behaviour between CG,V,SR
Trotting	9.96	0.007	-0.41	-0.90	1.32	No Significant difference in this behaviour between CG,V,SR
Cantering	7.18	0.028	-0.25	-0.50	0.75	C only occurred in V
Gallop	6.06	0.048	-0.25	-0.25	0.50	G only occurred in V
Drinking	8.11	0.017	-0.33	0.67	-0.33	D only occurred in SR
Being	21.25	0.0001	-0.33	-2	2.32	Less than average

Herded by Stallion	12.28	0.002	-0.50	-0.50	1.00	BHS in SR more than average in V
Being Herded by Mare	6.06	0.048	-0.25	-0.25	0.50	MH only occurred in V
Mare Herding	7.17	0.028	-0.25	-0.50	0.75	HMF only occurred in V
Hassling Mare and Foal	2.00	0.368				No Significant difference in this behaviour between CG,V,SR
Sweating						
Biting	8.11	0.017	-0.33	-0.33	0.67	B only occurred in V
Kicking	193.11	0.0001	11.97	-6.97	-5.40	Less than average K in SR and V more than average in CG
Squealing	7.67	0.022	0.25	-1.25	1.00	Sq Only occurred in CG and V
Covering	18.69	0.0001	-0.75	-0.75	1.50	Cv Only occurred in V
Mounting	11.15	0.004	-0.42	-0.67	1.08	M only occurred in V
Playing	18.69	0.0001	-0.75	1.50	-0.75	P only occurred in SR
Rolling	3.55	0.170				No Significant difference in this behaviour between CG,V,SR
Suckling	9.03	0.011	-1.33	0.92	0.41	No Significant difference in this behaviour between CG,V,SR
Interacting Same Sex	0.60	0.741				No Significant difference in this behaviour between CG,V,SR
Interacting Opposite Sex	15.97	0.0001	0.24	-2.00	1.76	Interacting Opposite Sex only occurred in CG and V.
Mount Same Sex	8.11	0.017	-0.33	-0.33	0.67	MSS only occurred in V
Aggression	2.86	0.239				No Significant difference in this behaviour between CG,V,SR
Eating Gorse	0.00	1.000				No Significant difference in this behaviour between CG,V,SR
Scratching	2.77	0.250				No Significant difference in this behaviour between CG,V,SR
Vocalising	10.19	0.006	-0.42	-0.42	0.83	S only occurred in V.
Heading to Water Hole	3.78	0.151				No Significant difference in this behaviour between

Mutual Groom Opposite Sex	202.01	0.0001	11.97	-6.07	-5.90	CG,V,SR Less than average MGOS in the SR and V. More than average in CG
Mutual Groom Same Sex	1.45	0.484				No Significant difference in this behaviour between CG,V,SR
Smelling Mare Pee						No Significant difference in this behaviour between CG,V,SR
Investigate Observer	3.03	0.220				No Significant difference in this behaviour between CG,V,SR
Foal Mount Mother	4.02	0.134				No Significant difference in this behaviour between CG,V,SR
In foal Mare Away from herd	51.07	0.0001	-1.91	-1.91	3.82	MA only observed in V
Foals Interacting	9.03	0.011	-0.58	0.91	-0.33	Only occurred in SR group
One or Two Mares On Move	18.69	0.0001	-0.75	-0.75	1.50	Only Occurred in V group.
Coughing	4.02	0.134				No Significant difference in this behaviour between CG,V,SR
Farmer Herding Sheep	4.02	0.134				No Significant difference in this behaviour between CG,V,SR

Within the two stallion groups, data for all behaviours were subjected to normality testing, the results of a series of Anderson Darling tests which are in Table 3.4.

Table 3.4. Normal Distribution Stallion Behaviours

Behaviour	N	AD	P	Normal Distribution
Grazing Close	816	20.771	<0.005	No
Entire Herd on the Move	816	53.285	<0.005	NO
Grazing Herd Spread Out	816	37.053	<0.005	NO
Sleeping Lying Down	816	48.224	<0.005	NO
Standing Asleep	816	30.633	<0.005	NO
Standing Awake	816	43.919	<0.005	NO
Defecating	816	53.745	<0.005	NO
Urinating	816	51.958	<0.005	NO
Mark Urinate	816	44.331	<0.005	NO
Mark Defecate	816	43.125	<0.005	NO
Flemen	816		<0.005	NO
Walking	816	38.617	<0.005	NO
Trotting	816	42.315	<0.005	NO
Cantering	816	53.795	<0.005	NO
Gallop	816	54.740	<0.005	NO
Drinking	816		<0.005	NO
Stallion Herding	816	37.036	<0.005	NO
Hassling Mare and Foal	816	54.740	<0.005	NO
Sweating	816	54.740	<0.005	NO
Biting	816	53.745	<0.005	NO
Kicking	816	54.319	<0.005	NO
Squealing	816	50.183	<0.005	NO
Covering	816	50.862	<0.005	NO
Mounting	816	48.349	<0.005	NO
Playing	816	54.740	<0.005	NO
Rolling	816	54.319	<0.005	NO
Suckling	816		<0.005	NO
Interacting Same Sex	816	48.286	<0.005	NO
Interacting Opposite Sex	816	37.336	<0.005	NO
Aggression	816	54.740	<0.005	NO
Eating Gorse	816	53.745	<0.005	NO
Scratching	816	53.745	<0.005	NO
Vocalising	816	50.862	<0.005	NO
Heading to Water Hole	816	53.981	<0.005	NO
Mutual Groom	816	54.319	<0.005	NO

Opposite Sex Smelling Mare Pee	816	54.740	<0.005	NO
Watching	816	12.562	<0.005	NO
Investigate Observer	816	48.966	<0.005	NO
New Arrivals	816	54.740	<0.005	NO
Join Coughing	816	53.981	<0.005	NO

All stallion behaviour data shown in Table 3.4 were non-parametrically distributed.

A series of Mann-Whitney tests were carried out in order to compare the difference between group A and C for the different behaviours.

The following hypotheses were tested:

Ho= There is no significant difference in the behaviours observed in the different stallion groups.

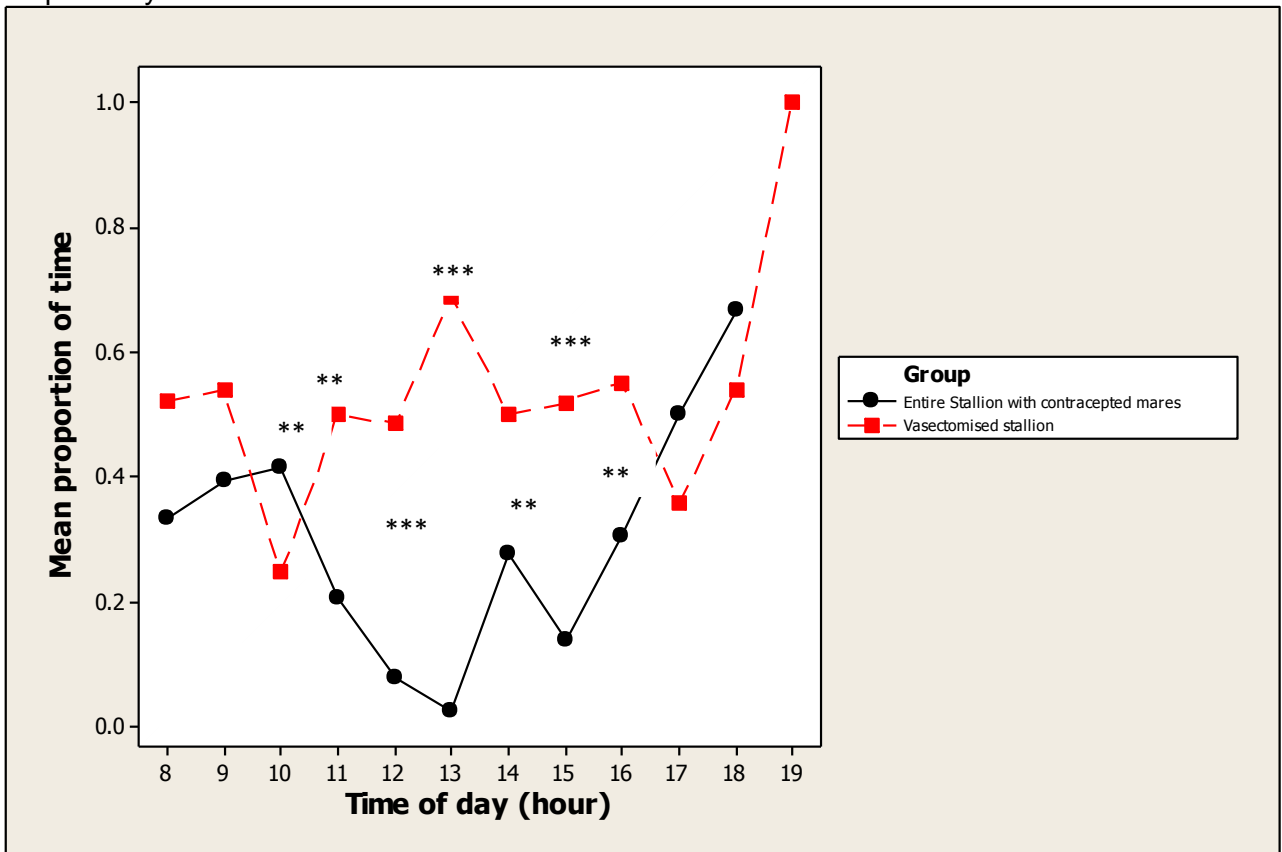
Ha = There is a significant difference in the behaviours observed in the different stallion groups.

Behaviour	W=	P=	V Median	CG Median
Grazing Close	5869.0	0.0033	0.0833	0.0001
Entire Herd on the Move	5183.5	0.5610	0.0001	0.0001
Grazing Herd Spread Out	4409.5	0.0001	0.0001	0.0001
Sleeping	5442.0	0.0446	0.0001	0.0001
Lying Down				
Standing Awake	5291.5	0.6965	0.0001	0.0001
Standing Asleep	5219.5	1.0000	0.0001	0.0001
Urinating	5185.5	0.6684	0.0001	0.0001
Marking	5368.0	0.2796	0.0001	0.0001
Defecating				
Flemen	5328.0	0.3056	0.0001	0.0001
Walking	5270.0	0.7420	0.0001	0.0001
Trotting	5400.5	0.0535	0.0001	0.0001
Stallion	5608.0	0.0133	0.0001	0.0001
Herding				
Kicking	5184.0	0.5664	0.0001	0.0001
Squealing	5293.5	0.4623	0.0001	0.0001
Mounting	5296.5	0.4442	0.0001	0.0001
Rolling	5256.0	0.5664	0.0001	0.0001
Interacting	5040.0	0.0873	0.0001	0.0001
Same Sex				

Interacting	5536.0	0.0001	0.0001	0.0001
Opposite Sex				
Eating Gorse	5220.0	1.0000	0.0001	0.0001
Vocalising	5325.5	0.2601	0.0001	0.0001
Mutual Groom	5184.0	0.5664	0.0001	0.0001
Same Sex				
Watching	2628.0	0.0001	0.0001	0.0001
Investigating	5073.0	0.1403	0.0001	0.0001
Observer				

Table 3.5 Mann-Whitney Test shows only the behaviours of the stallions which were analysable with the significant (<0.005) behaviours highlighted in **bold**.

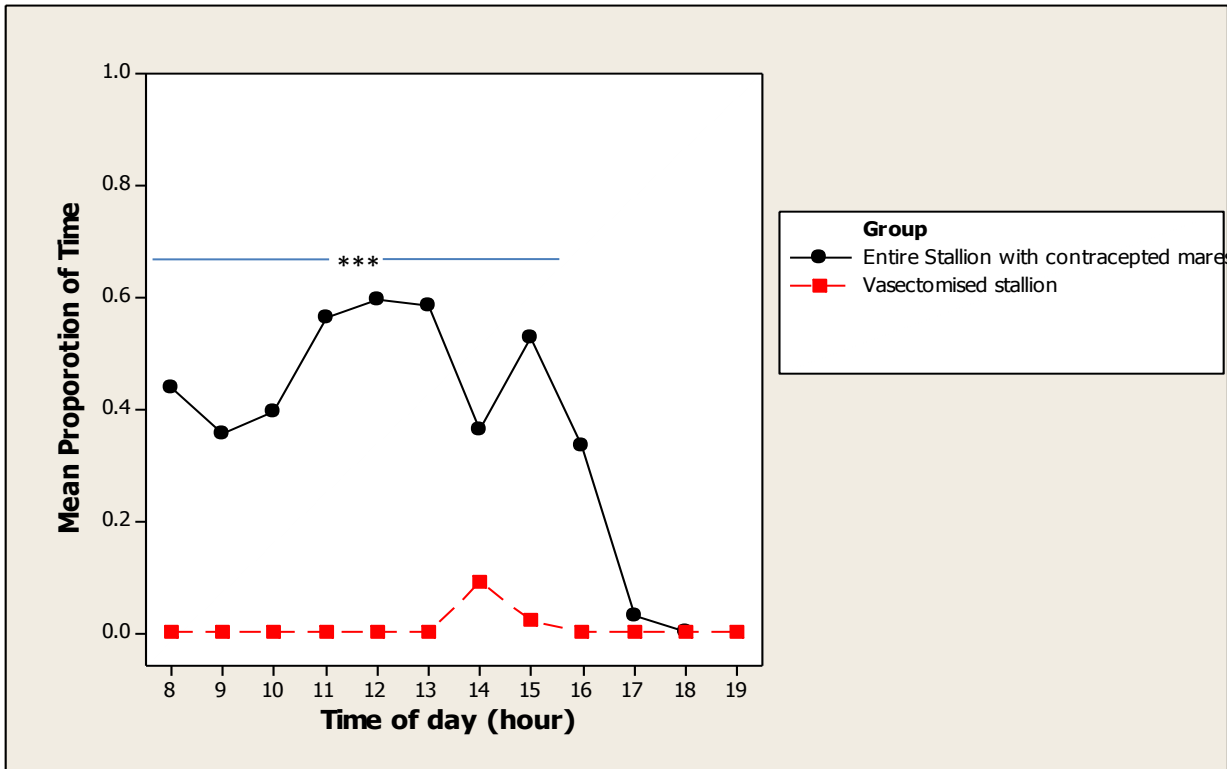
The significantly different behaviours identified between the two stallions are shown below in Figures 3.2-3.5 which illustrates how their daily rhythms differed for the identified behaviours: Grazing Close Together, Grazing Herd Spread Out, Lying Down, Watching and Interacting, respectively.



** = The difference between the two groups is significant at p<0.01
 ***= The difference between the two groups is significant at p<0.001

The vasetomised group spend more time Grazing Close Together than the contracepted group.

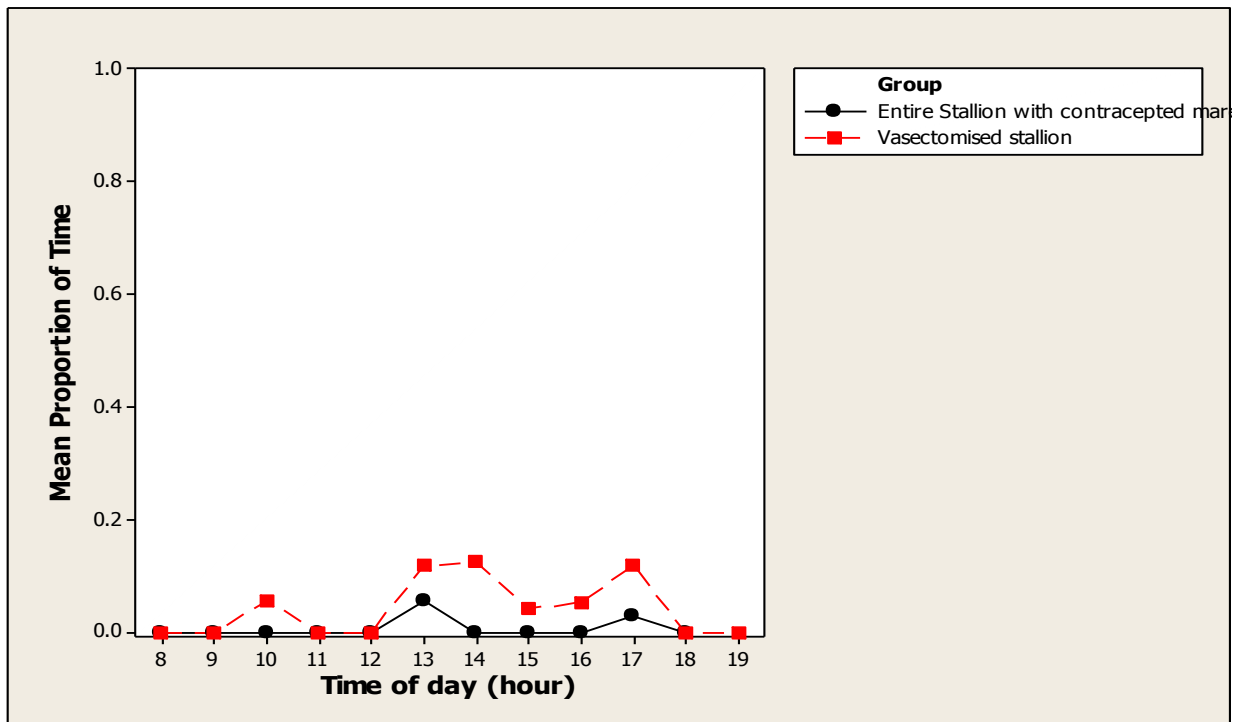
Figure 3.2 Proportion of time spent grazing close together by the different stallion groups.



***indicates differences are significant at $p < 0.001$

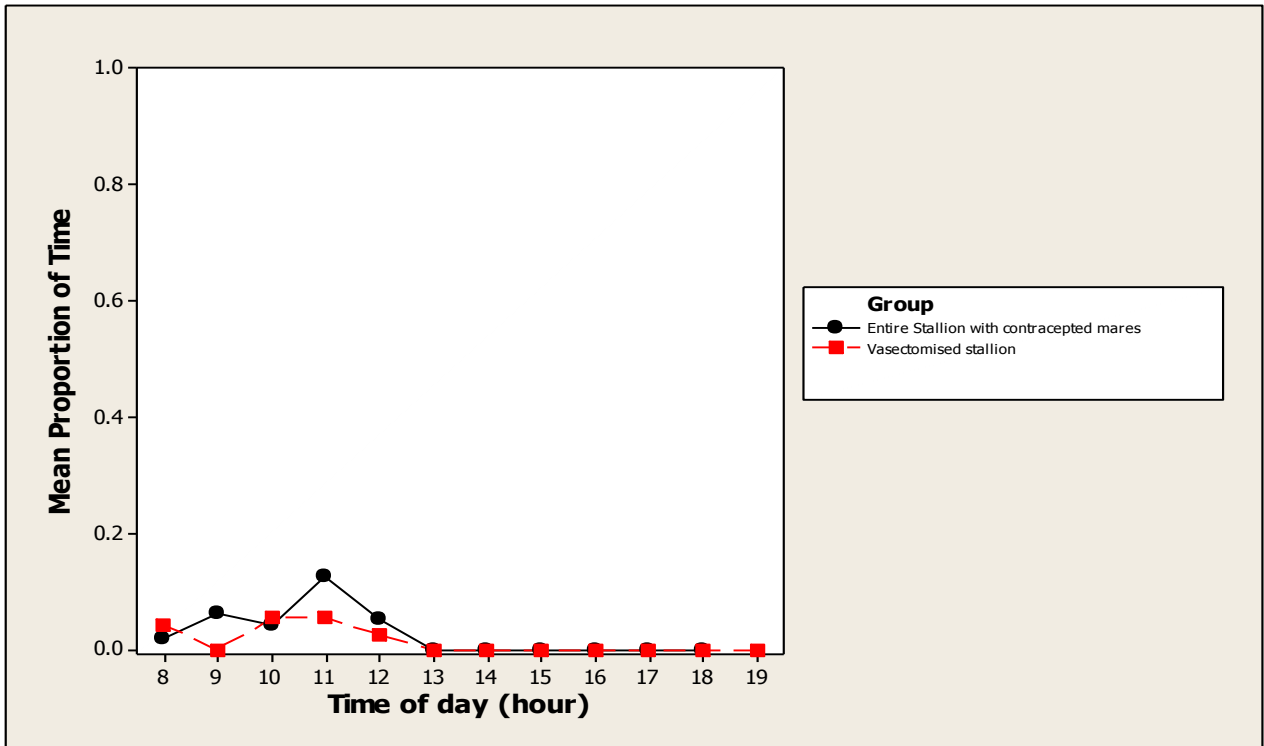
The stallion running with the contracepted mares spent a significant amount of his time spread out grazing.

Figure 3.3 Mean proportion of the day the two stallions spent grazing spread out (not closely grouped)



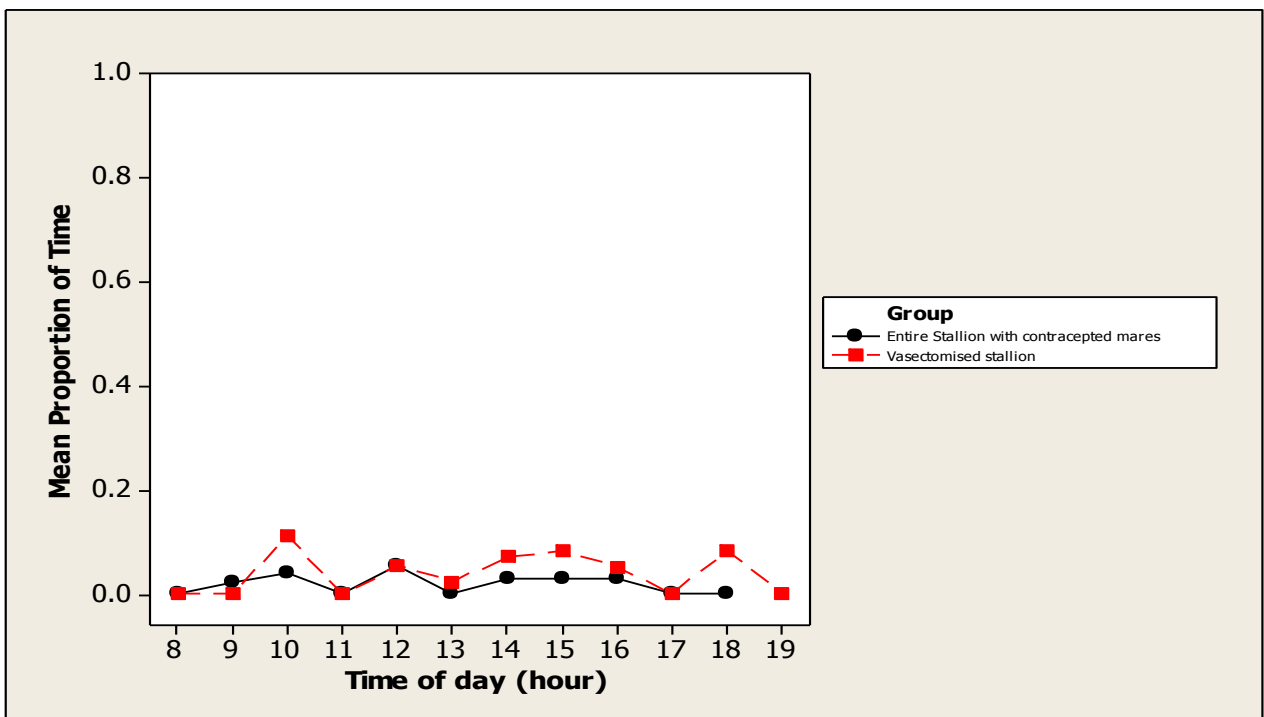
The vasectomised stallion spent more time lying down than the stallion with the contracepted mares.

Figure 3.4 Mean proportion of the day the stallions spent lying down.



A similar amount of time was spent by both stallions watching over their herd.

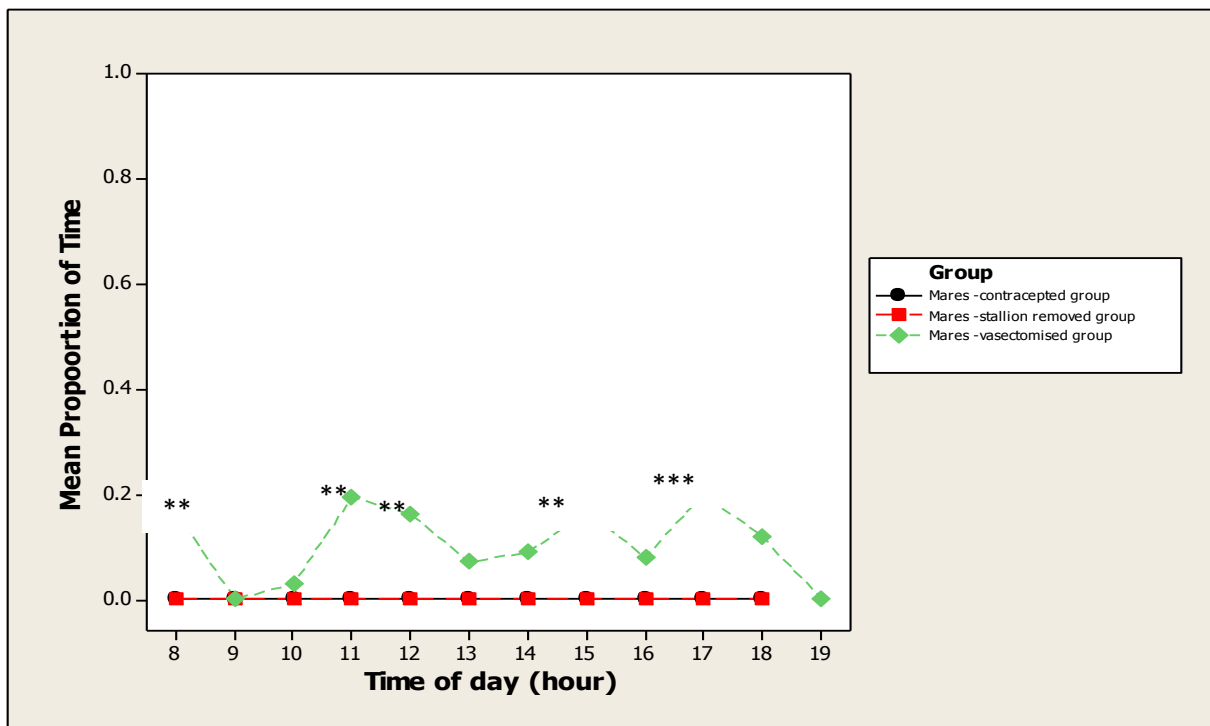
Figure 3.5. Mean amount of time the stallions spent watching over their herd.



The vaxtomised stallion spent slightly more time interacting with his mares but the overall pattern was not very different.

Figure 3.6. Mean proportion of time the two stallions spent interacting with their mares throughout the days. Figures

3.7-3.16 show the daily rhythms for the mares and how their patterns of behaviour differed throughout the day. The behaviours shown are for the significantly different behaviours observed during the ethogram with the degree of significance indicated by the stars.

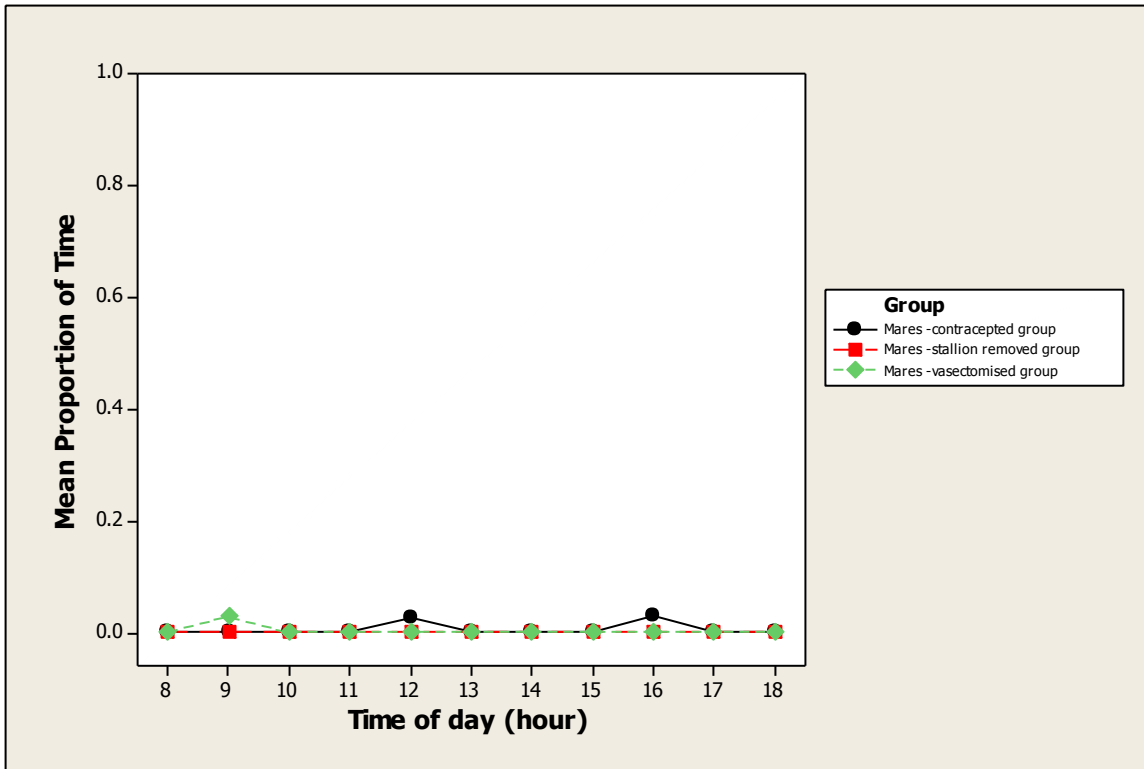


** = The difference between the two groups is significant at $p < 0.01$

*** = The difference between the two groups is significant at $p < 0.001$

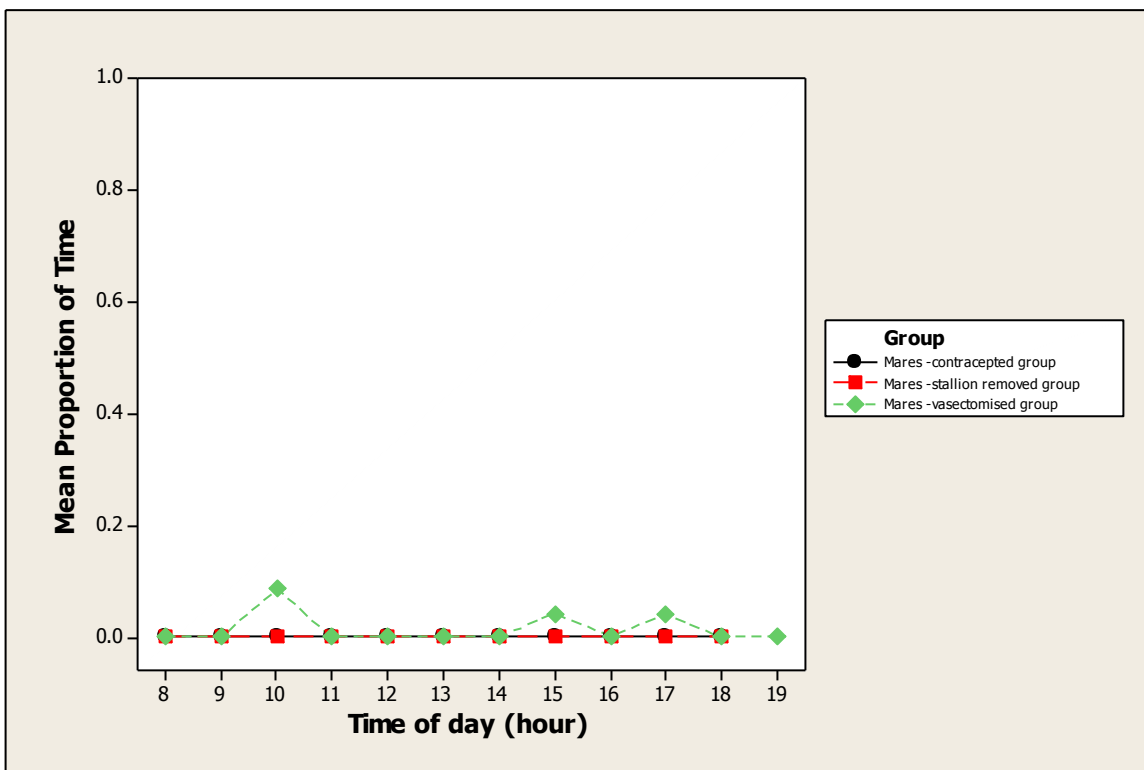
The mare that was in foal spent a substantial proportion of her time away from the rest of the herd.

Figure 3.7 Frequency by hour throughout the day the 'in foal' mare was away from the rest of the herd in the vasectomised stallion group.



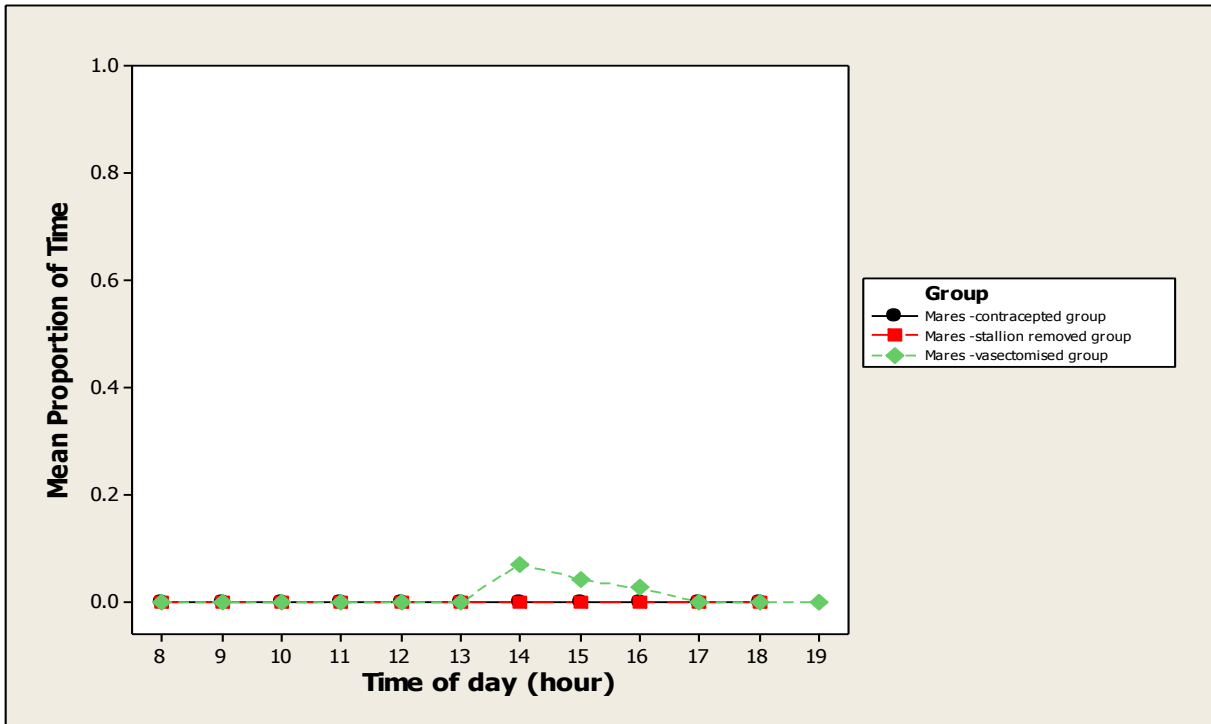
The group where the mares had been injected with the contraceptive spent marginally more time than the vasectomised stallion group mutual grooming in this way.

Figure 3.8. Mean proportion of time spent mutual grooming with the opposite sex.



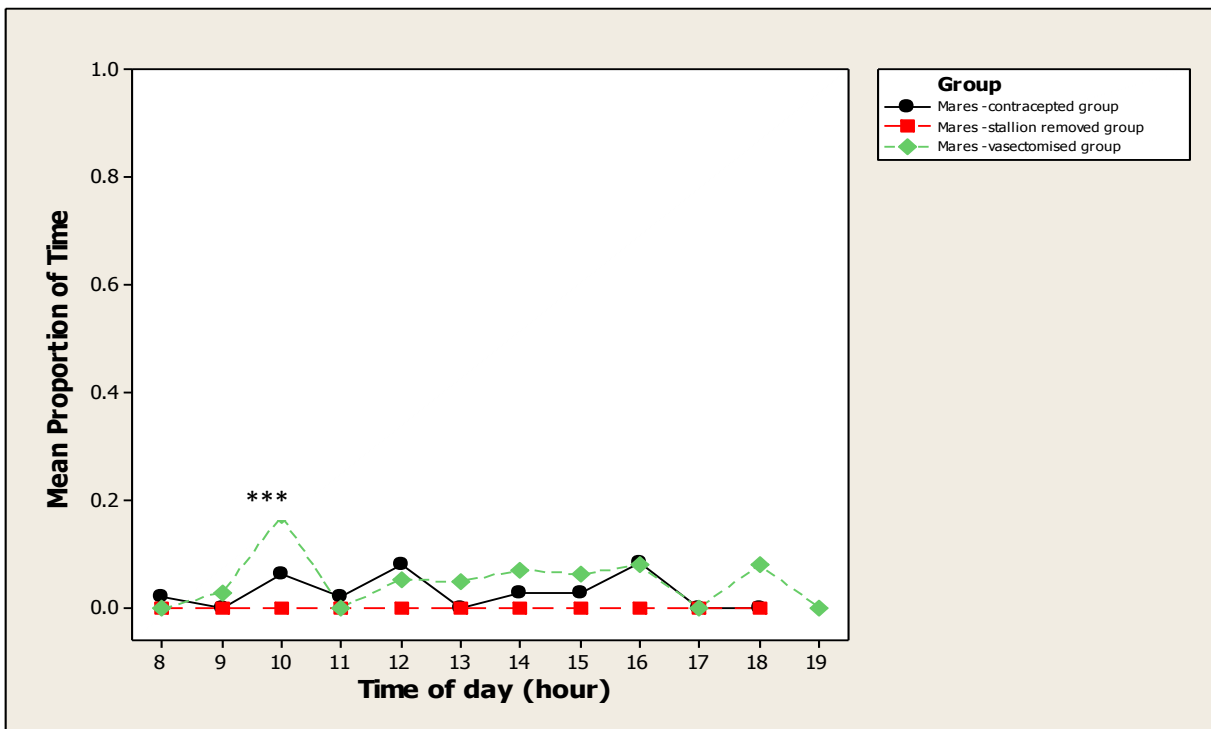
The vasectomised stallion group are the only ones to demonstrate any obvious vocalisation.

Figure 3.9. Mean proportion of time spent vocalising.



The vasectomised group was the only one to demonstrate behaviour of one mare mounting another.

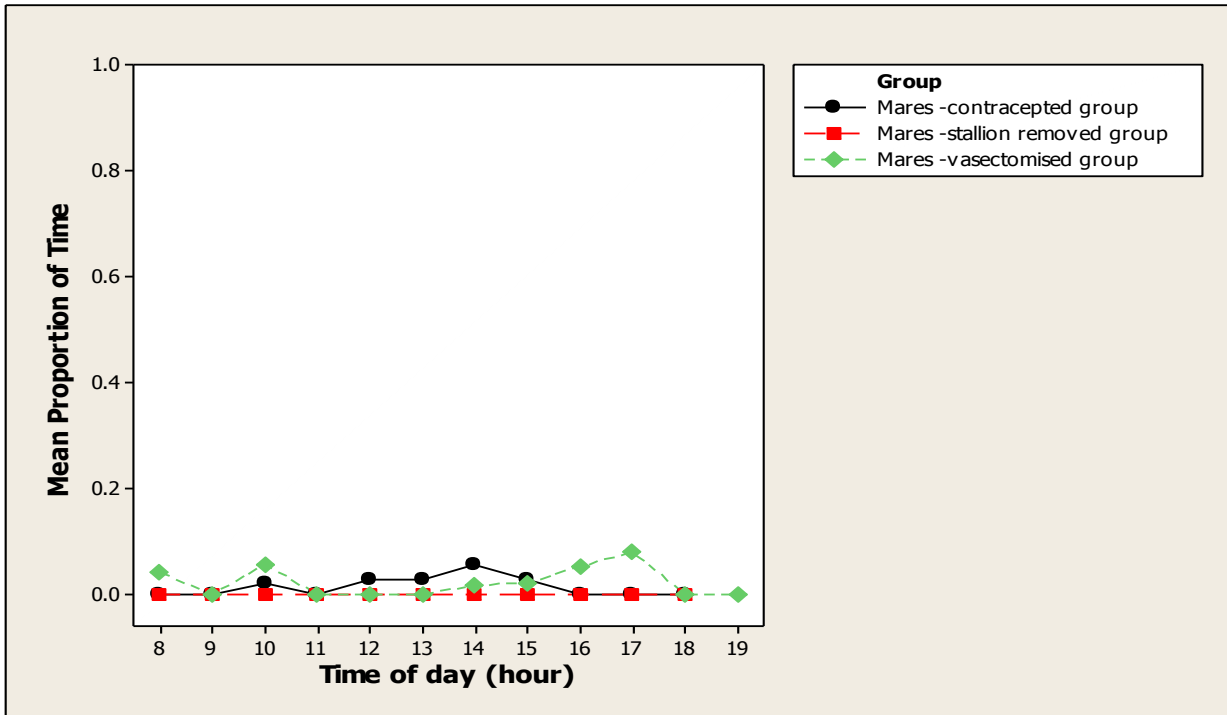
Figure 3.10. Mean proportion of time same sex mounting occurred.



*** Indicates difference is significant at $p < 0.001$ Vasectomised Herd versus Stallion Removed Herd.

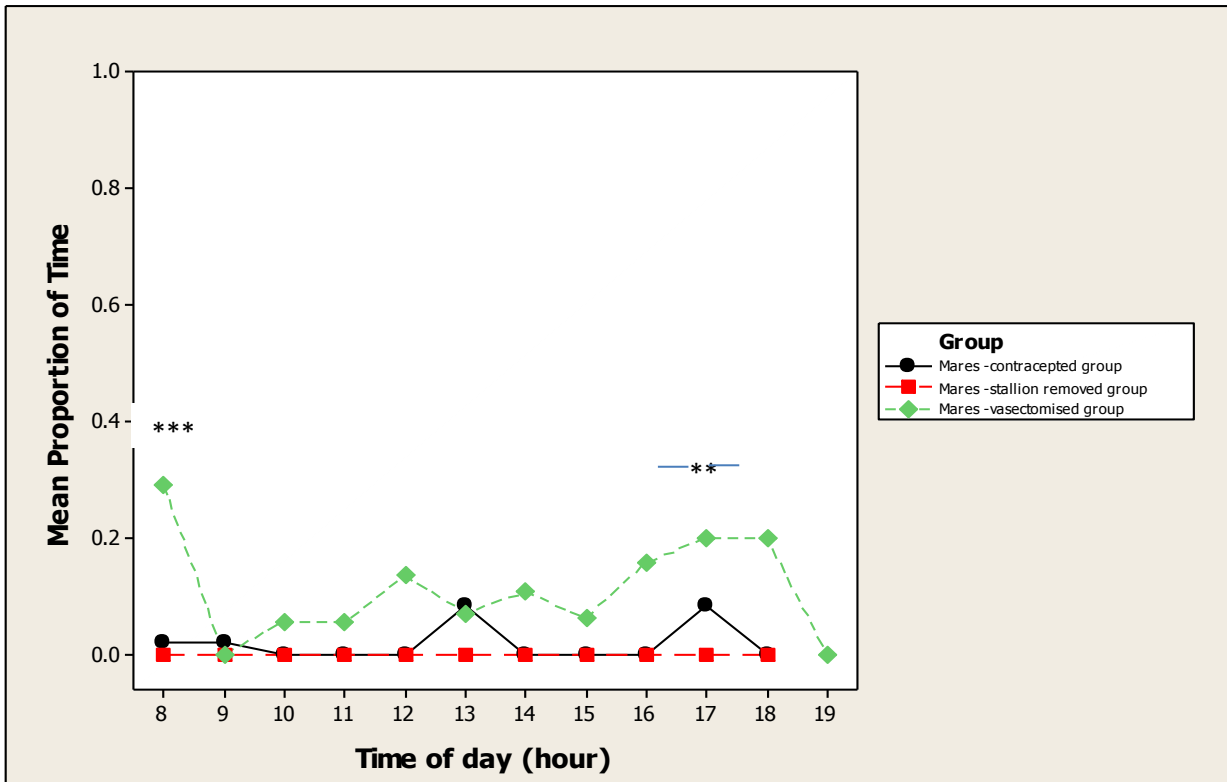
Similar patterns for the vasectomised and contracepted groups are shown, the vasectomised group are marginally more interactive.

Figure 3.11. Time spent by the mares interacting with the opposite sex.



The mares where the stallion had been removed showed no kicking behaviour.

Figure 3.12. Frequency during the day kicking behaviour was noted.

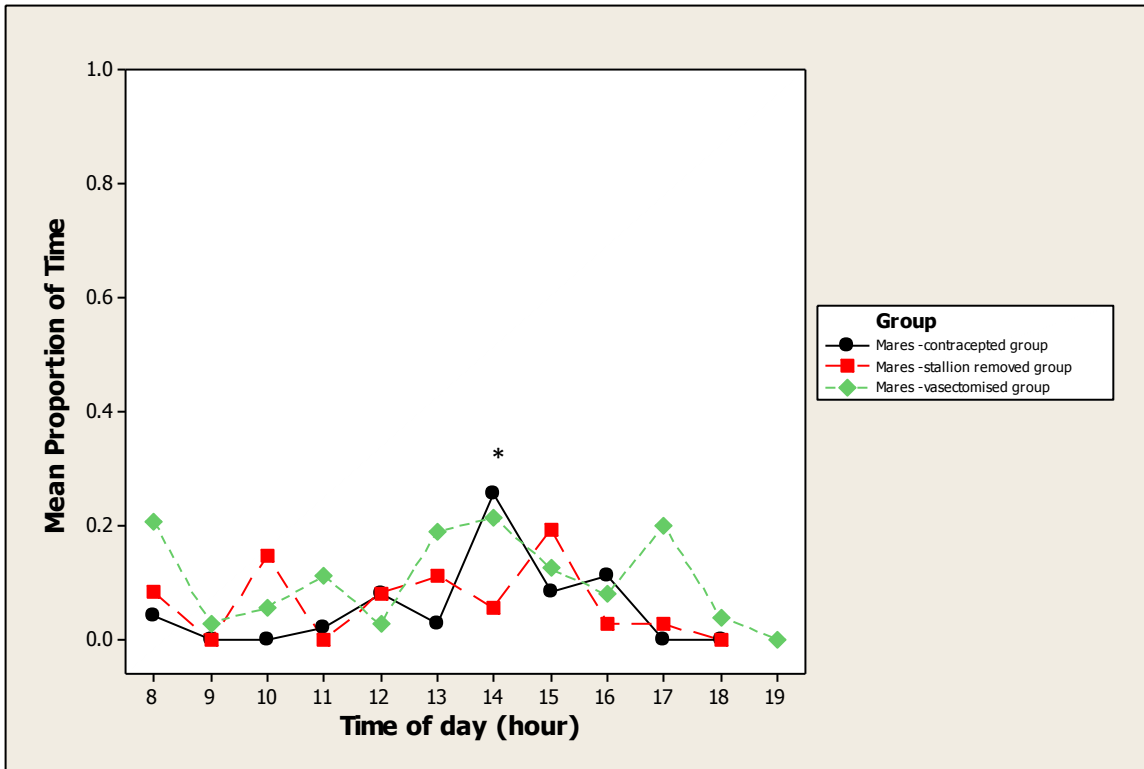


Herding behaviour is most often performed in the vasectomised stallion herd.

** indicates difference significant at $p < 0.01$

*** indicates difference significant at $p < 0.001$

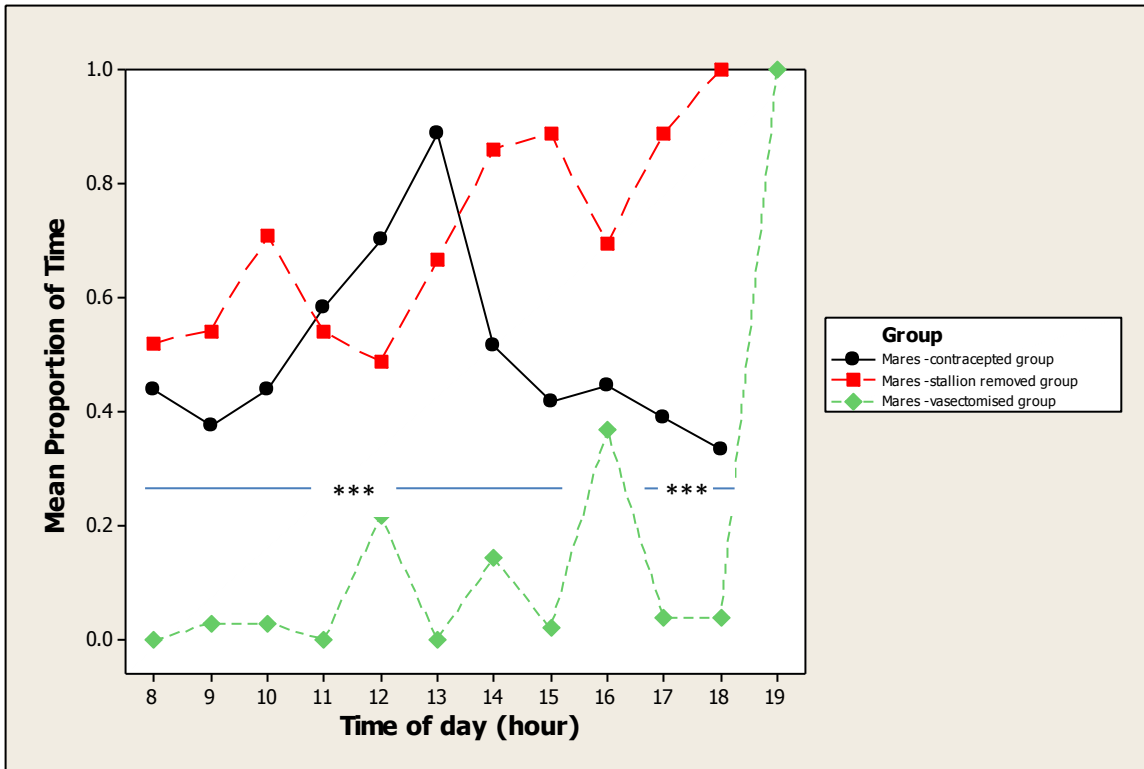
Figure 3.13. Mean proportion of time the mares were seen to be being herded by the stallion.



* indicates difference significant at $p < 0.05$ between the mares injected with the contraceptive injection and mares running under Stallion Removed conditions.

The mares were seen to sleep lying down at regular intervals throughout the day.

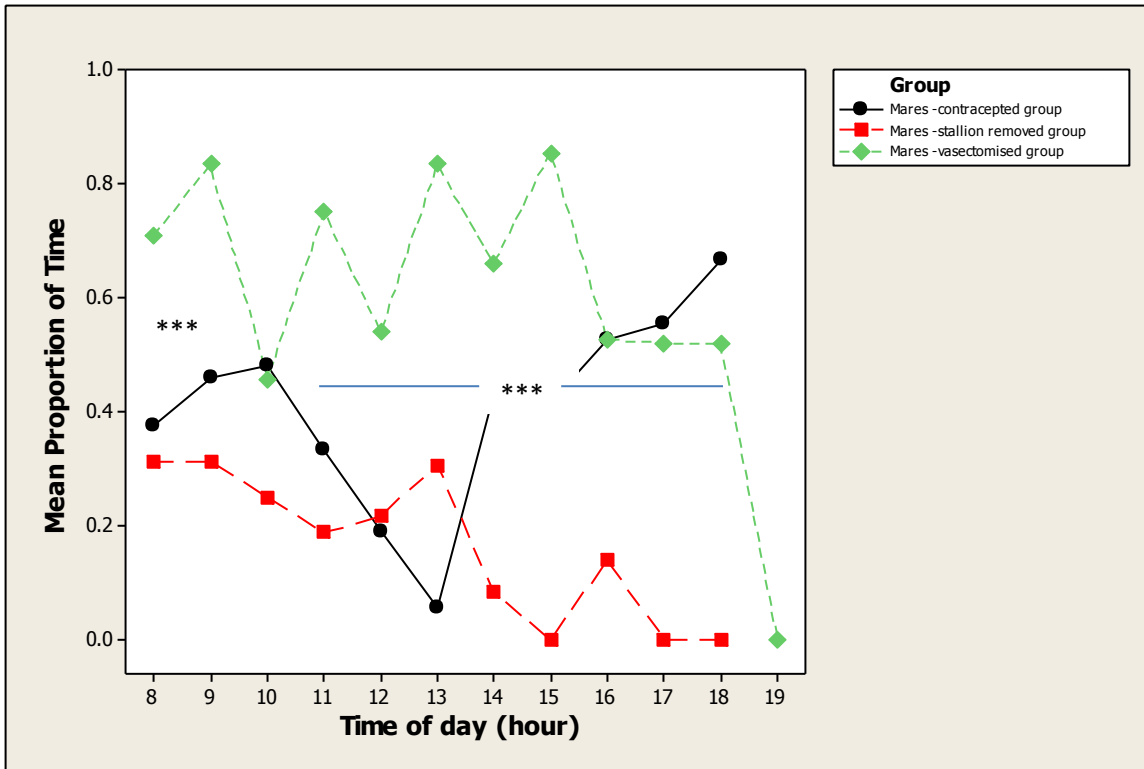
Figure 3.14. Mean proportion of time through the day the mares were seen to be sleeping and lying down.



*** indicates difference significant at $p < 0.001$. Both the contracepted and stallion removed groups differ significantly from the vasectomised group apart from at 1600 hours.

The vasectomised stallion group spent very little of their time spread out, they were most often to be found grazing within close proximity of one another. They did however show that towards the end of the day this behaviour changed, and they spread out more. The other two groups spent a larger proportion of their time spread out with the mares running without a stallion maintaining a relatively spread out herd position at all times.

Figure 3.15. Mean proportion of time the mares spent grazing spread out.



*** indicates difference significant at $p < 0.001$ between the stallion removed group and the vasectomised group.

The mares with the vasectomised stallion spent the majority of their time positioned closer together. The mares with no stallion were unlikely to be close together and the contracepted mares were mostly between the two.

Figure 3.16. Mean proportion of time the mares spent grazing close together.

3.5 Discussion

The results of the behavioural observations reveal some answers to the questions raised by pony keepers during the qualitative data collection in chapter one. Perhaps the most significant were:

- 1) Would the mares running without a stallion leave their lair?
- 2) Would the vasectomised stallion be overworked due to the mares continuously “cycling”?
- 3) Would the use of the drug Improvac® act as an effective form of contraception on the mares and maintain as far as possible their natural behaviours?

Group A consisted of mainly heritage breeding with a vasectomised stallion. They were shown to be the group who spent the greatest majority of their time close together.

Furthermore it can be affirmed from the behavioural data analysis that the stallion appears to influence how close the mares stay to one another. However the dominant mares in the hierarchy of the herd appeared to dictate where the herd spent their time, with one or two mares often being noted moving off (MOM); the ‘entire’ Herd on the Move (EHM) behaviour usually consisting of a lead mare near the front and the stallion bringing up the rear. The concern over the condition of the stallion deteriorating through overwork was shown to be unfounded as he scored a body condition score of 3 (‘good’, see Appendix 3) throughout the breeding season. The mares running with the vasectomised stallion also appeared to be in good condition throughout the observations. They exerted the most energy, being the only group to demonstrate both canter and gallop. They also were the only group seen to sweat during the days observed. They demonstrated the highest level of social interactions compared to the other groups but seemed to be content in their group, showing high levels of mutual grooming and long periods of resting, lying down and sleeping. These are typical behaviours found in feral groups of horses (McDonnell, 2002). The differences noted between the herds are significant in many of the graphs shown, however it is also clear to see how many similarities occurred. This would suggest that the implementation of a change to management could be done without the numerous disruptive consequences discussed throughout chapter one.

Although the mares in Group B did graze over a larger area they did not at any point leave their lair. This evidence is supported by Goodwin (2007) who states that despite the popular ‘leader’ image of the stallion, equine family bands are generally led by mares.

Haupt and Keiper (1982) describe all of the stallions studied in their feral and domestic groups to be subordinate to some of the mares in their group. According to Wells and Goldsmidt-Rothschild (1979) horse society is basically matriarchal and consists of stable relationships between mares and their offspring. The mares running without a stallion showed the same level of 'Interaction Same Sex' and were the only group to show foals playing.

During the course of the observations it was noted that the mares in the vasectomised herd that were in foal spent a significant amount of time separated from the rest of the herd. The reason for this is unclear, but could stem from the stallion being uninterested in keeping them together with the others if they were not "cycling". This point accords with earlier findings by Gill (1988) who documents that, during the breeding season stallions may collect several family bands of mares together, forming fairly large but temporary harems. The stallions on the New Forest are now removed for the majority of the year (May – April), being turned out for only one month. However prior to this those that remained on the open Forest were described by Gill (1988) as generally associating with a preferred mare and her family group over the winter months. They did not attempt to maintain the large harems that they held during the breeding season. The stallion running with the mares that had been injected with the contraceptive injection did not spend the same amount of time herding his mares as the vasectomised stallion. It is hard to definitively conclude that this was due to the use of the contraceptive vaccine. This group were running in an enclosed area which could potentially have affected the lack of herding behaviour shown by the stallion. However from research such as Gill (1988) it seems reasonable to assume that the "cycling" behaviour of the mare influences the stallion's herding behaviour toward her (Tyler, 1972). The contracepted herd showed a more than average percentage of time 'Kicking', however they also spent a more than average amount of time 'Mutual Grooming Opposite Sex'.

3.6 Conclusion

It is possible to conclude from the data collected that a reduction in annual foal numbers could be achieved through the removal of all 'entire' stallions from the commons of Dartmoor without negatively impacting on behaviour patterns. The stallion that had been removed from the open commons in group B was kept at home on the owner's farm. The mares, throughout the study period (including the author's previous research, Petrie-Ritchie, 2012), did not leave their lair. Stallion removal could be accompanied by the use of sterilized stallions, with the emphasis on leaving the matriarchal mares within their family bands. The vasectomised stallion in Group A observed during the data collection for this report (as in the author's preliminary study, 2012) maintained his body condition. The herd was able to carry out most normal herd behaviours including covering and interaction with the opposite sex, such as stallion herding, grazing close and mutual grooming. The mares injected with Improvac® and running with an 'entire' stallion were not 'cycling' normally and were uncovered by the stallion. He was therefore not able to perform his normal seasonal sexual behavior and questions over the effect of this long term are so far unanswered. Questions over how the injection affects the mare's reproductive health and behavioral patterns also remain unanswered. The practical implications of sterilization of the relatively small number of stallions as opposed to mares confirm that this is the best method, behaviorally, for the ponies.

CHAPTER 4 The implications associated with the implementation of a change to management, and analysis of other contributing factors to the future of the pony on Dartmoor

4.1 Main findings

The main findings reported in this thesis can be used to resolve the problems associated with previously proposed management plans. The finding that the mares in the Stallion Removed group (Group B) did not leave their lair is pivotal in evaluation of the different proposed management plans, and leads to the conclusion that stallion removal will not cause mares to disperse (leave their lairages). This is backed up by the opinions of the pony keepers presented in chapter one, where twenty one of the pony keepers questioned confirmed their mares had also remained in their lairages. This is crucial evidence to support the proposed removal of stallions from open commons.

The use of vasectomy has been proved to be successful in many areas of the world and for those who have implemented it on Dartmoor. The concerns raised by pony keepers over the condition and welfare of the stallion were proven to be inaccurate. The stallion observed in group A showed a good body condition score and was performing the same behaviours as expected for an 'entire' stallion. This provides evidence to support the sterilisation of stallions rather than mares.

The mares that had been given the contraceptive injection were running with an 'entire' stallion in a new-take (enclosed area of moorland). This limits the findings from the behavioural observations. Whilst the "entire" stallion did not perform as much herding behaviour as the vasectomised stallion, it could be argued that he did not at any point feel threatened by other stallions, as he was aware of being enclosed. However it was also noted that mares not 'cycling' (due to being in foal) in the vasectomised group, were not herded up with the others. It could be assumed that the stallion loses interest in the mares that are not 'cycling' and instead shows a greater interest in performing herding behaviours towards mares that are sexually active. This finding adds evidence against the use of contraception for the mares, as the aim of using it is to allow the stallions to remain and keep their mares laired. It could potentially have the opposite effect and result in mares being pushed around more, breaking up lairages. Careful behavioural monitoring should be involved in the development of this trial.

This investigation has identified other areas, within the management of semi-feral ponies, which could benefit from continued monitoring. The management plan the Commoners decide to implement will affect how many ponies are kept on Dartmoor. Whichever method they choose, if any, will require careful monitoring and could alter the behaviours which have been ingrained in the pony for hundreds, if not thousands of years.

The revenue brought to Dartmoor directly from the pony is an important area of research suggested by many of the individuals who contributed to this report. This would enable bodies such as Natural England and the Dartmoor National Park Authority to calculate how much the ponies are worth to the economy and therefore deliver carefully constructed incentives to encourage pony keepers to keep at least a selection of their traditional pony herds on the open commons.

4.2 The future of the pony on Dartmoor

The future of the pony is currently hanging in the balance, with the majority of the pony keepers spoken to in this report having doubts over whether the next generation will take on the ponies. The general feeling from the younger generation who are taking on, or should be taking on, the ponies is that they wish to continue with the herds for the sake of sentimentality and family history, but if they are thinking sensibly about the issues of running hill farms today which is already pressured, the addition of the yearly disposal of healthy foals is not something they wish to undertake within their farming future.

4.3 The Market Options

The various market options for the ponies have been extensively explored by the Dartmoor Hill Pony Association and the Dartmoor Pony Heritage Trust. A great deal of promotion and advertising has resulted in many unwanted ponies finding homes. However it is widely acknowledged that the markets for the child's pony and for the conservation grazer which ponies from Dartmoor are most suited to, are very small, niche markets. One option which has been discussed by all interested parties is the idea of securing a meat market for the pony as a way of ensuring a bottom line to the market.

Some pony keepers have mentioned the idea of encouraging human consumption of horse meat in the UK. This has been highlighted in recent years (starting in May 2013) due to the Horse Meat Scandal. Lawrence (2013) discusses the scandal and explains that

ignorance is being used as an excuse to avoid prosecution. Many articles highlight the mislabelling of products as being the most unacceptable part of the scandal (Guardian 2014). As a well-known and respected horsewoman and associate of equine welfare charities such as the Horse Trust and World Horse Welfare a debate was caused when HRH Princess Anne, claimed owners might take better care of their horses if they believed they could sell them for meat (BBC News 2013). At a time when charities warn of a horse welfare "crisis", with 7,000 at risk of abandonment and neglect next (2014) winter World Horse Welfare concluded that a fuller debate was needed. The core issue identified is that the UK is in the grip of a national equine crisis and all options of solving it should be assessed. Owers (2013) of World Horse Welfare warned that owners who chose to put their animal into the human food chain should "not be castigated for it". About 10,000 horses from the UK went into the human food chain last year, he said. The RSPCA confirmed they welcome any debate into the increasing problems surrounding horse welfare, about which they have 'very grave concerns'.

Equine charities are overflowing with horses which have been abandoned, neglected and abused and charities are struggling to keep up with the demand (World Horse Welfare 2013). The charity said the killing of horses for meat was 'an emotive subject', a sentiment the RSPCA had sympathy with. World Horse Welfare states its primary concern is that horses are well cared for while alive and slaughtered in a humane way. It is quite clear that should there be an increase in demand for horse meat in the UK we have plenty of horses to supply the demand. A question raised by all the charities involved interested in horse welfare spoken to in this report confirmed they hold serious concerns about encouraging farming of ponies for the meat trade. One spokesperson for the campaign 'Think Before You Breed' Brenin (2012) concluded that we have so many unwanted horses and ponies in the UK, even if this idea begins with using up surplus stock, breeding of ponies such as Dartmoor's for a meat market could be disastrous. There are ethical issues involved in breeding semi-feral ponies to shoot. The practical problems of humanely destroying a wild pony are very different to a domesticated animal. The wild ponies are said to be far more stressed during the handling and are often run through a cow crush designed for handling bullocks, not wild ponies. "It is a traumatic experience for a wild pony, far removed from the handling of a trained animal" Brenin (2013).

One farmer (PK 30 2014) explained that although a number of pony keepers had secured an abattoir able to process the ponies, they needed them to be 100k deadweight to make it financially worthwhile, which even the larger Dartmoor mares may struggle to reach. This is certainly not a secure market for the young stock. Some Dartmoor pony keepers argue that pony meat has always been exported from Dartmoor and the general public should understand that through eating pony meat they would be helping to create a market for the pony. Others suggest that through encouraging the meat market we are only encouraging the hill pony breeders and therefore pushing the true to type Heritage or Pedigree pony off the open moor. With the 100k weight mark, it is clear to see the type of pony would rapidly change to reflect the demand. A bigger pony would undoubtedly be bred, which could cause further contention between pony breeders, especially those attempting to retain their traditional Dartmoor type herds on the open commons. Beef breeding demonstrates how the meat market has dictated the size and shapes of breeds; the Aberdeen Angus for example has seen numerous changes in height and market through differing consumer demands (BBC Four 30.04.14). There was a suggestion by Luxmoore, during the Dartmoor Society conference (2013), that a meat market which introduces the Ardennes (a breed of horse known for meat production in France) could ensure a more saleable meat animal of hardy type which would improve the pony on the commons. Those interested in the Dartmoor pony staying on Dartmoor were not impressed by this suggestion. Their reasons for this were based on the fact that with the introduction of another type of animal to the open common there would be even less room for the pedigree pony to retain its rightful place on its native moorland.

The Dartmoor Hill Pony Association has suggested the only way to save the ponies on Dartmoor is to eat them (BBC Inside Out 29.09.2014). However this has been said by Newbolt –Young (2014) to potentially damage the market for the traditional pony by lowering the perceived value and only help those producing mixed breed stock. The DHPA state that ponies will only be accepted into the 'Conservation Meat Project' if they are already part of the contraception scheme. Drug Company Zoetis (2014) have, via personal communication, confirmed that mares treated with Imporvac® will not be eligible for human consumption until the drug is licensed for horses which they currently have no plans to do. Owers (2014) emphasized that the use of the meat market for horses should only be used as a means to give a value to a previously unwanted animal in the hope that this may discourage owners from abandoning their horses, ponies or donkeys. The meat

option should not be used to allow the continuation of indiscriminate breeding (Owers 2014). This was reinforced by HRH Princess Anne at the 2014 World Horse Welfare conference where she stated that her previous comments regarding horsemeat had been taken in the wrong way by the media. Molnar (2014 WHW conference) confirmed that irresponsible overbreeding is at the root of the equine crisis in the UK and needs to be addressed promptly rather than focusing on what to do with the unwanted animal once it is here. This problem is combined with the ecological need to retain pony herds on Dartmoor stated in documents such as Stewart (2002) and Seabrook (2006) where ponies are identified as essential conservation grazers. A management plan to retain the herds while reducing the breeding rate is needed.

Based on the analysis presented in this report it can be concluded that the management plan best suited to the herds of semi-feral ponies within the Dartmoor National Park is complete stallion removal, combined in some areas with the use of vasectomy of the stallions. A policy where no “entire” stallions run on the open commons would involve careful policing but is supported by the majority of pony keepers who contributed to this report and the Dartmoor Commoners’ Council’s own report in 2011. The behavioural analysis showed there is no reason to believe that mares will leave their lairages, should stallions be removed. This statement is backed by authors such as Goodwin (2007) who suggests that lead mares dictate where herds spend their time and Lynch *et al.* (1992) who discuss the grazing behavior of sheep and note that other factors, such as forage availability effect distribution, as well as social influences.

If, through the production of a smaller number of ponies, the market increases then the use of an improved contraceptive injection could play a part in management. However, for the foreseeable future a concerted attempt to stop indiscriminate breeding and the resulting culling is considered essential for Dartmoor. The economy of Dartmoor relies heavily upon farming and tourism, both of which are at risk of continued negative media attention, which does not represent the majority of pony keepers who are producing top quality stock, and does little in the way of attracting revenue through tourism. This report is a basis of scientific evidence to underpin suggested management plans to ensure that a physically and behaviourally healthy equid population is maintained on Dartmoor. If the relevant parties are interested in conducting ethical farming practices then a management

plan will be enforced to reflect the wishes of the pony keepers and eliminate indiscriminate breeding of unwanted ponies.

4.4 Conclusion

Both the qualitative opinion based results and the quantitative behavioural results support the same management plan implementation: that is the complete removal of 'entire' males from the commons of Dartmoor. A non-breeding strategy is shown to have no negative behavioural impact and is supported by 69% of the Pony keepers. The use of stallion sterilisation could also be utilised to keep herds in closer proximity to one another. However, these results suggest it is not the stallion who dictates where the herd reside. Concerns over the loss of paternal lines can be addressed and should be discussed, as many suggestions have been made. Maintaining 'entire' males 'in country' (i.e. on enclosed farmland) has been one of the suggestions made by pony keepers and welfare organizations who have shown some interest in supporting this idea financially. This is the only form of breeding management control to support all types of pony on the open commons, allowing pony keepers to continue with their own lines unaffected by neighboring stallions.

Management options such as 'clear days' used in other species on Dartmoor could be drawn upon. For example sheep are cleared from the Dartmoor commons for two weeks of the year (DCC 2014). This allows them to be 'run' in-country (on the farm) with a ram, and allows basic care such as worming to be kept up to date, they are then returned to the open commons and lamb the following spring. Other areas of the UK such as the New Forest's pony management system could be used to guide the production and instigation of a positive management change. For example, the stallions are kept together in an enclosed area, only returning onto the open Forest for one month, effectively reducing their foal crop. There are many opinions to consider, and factors to influence decisions made. However, this report clearly demonstrates an option which ensures an increase in welfare where little financial outlay is required. The Dartmoor National Park Authority and Natural England have an essential role to play in assessing the worth of the pony on Dartmoor. Pony keepers must have some financial incentive to enable them to retain their herds, without having to rely on the sale of the pony to accomplish this. The export of the pony for meat is no longer a viable option and it would be irresponsible to continue to push

this avenue, as it will not support the production of quality stock on Dartmoor. The market for the pony has changed and all interested stakeholders now have the opportunity to ensure a future for the next generation of pony keeper based on comprehensive scientific research. Leaving the management unchanged will inevitably lead to the demise of the ponies on Dartmoor and will see many families destroy their ancient herds, potentially changing the ecology of Dartmoor irreversibly. The image of Dartmoor as a tourist destination and as a positive proactive farming community must be protected and supported. A management plan to increase welfare of the pony needs to be implemented with immediate effect.

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AUTHORS DECLARATION

At no time during the registration for the degree of ResM in Biological Sciences has the author been registered for any other University award without prior agreement of the Graduate Committee.

Work submitted for this research degree at the Plymouth University has not formed part of any other degree either at Plymouth University or at another establishment

Relevant scientific seminars and conferences were regularly attended at which work was often presented; external institutions were visited for consultation purposes and several papers prepared for publication.

Presentations and Conferences Attended:

The Dartmoor Society Debate 2013- What future for ponies on Dartmoor?

The Dartmoor Society Research Lecture 2014- Pony Herds and Pony Management on Dartmoor, new observations by Robyn Petrie-Ritchie

World Horse Welfare Conference London 2014-What is the value of the Horse?

External Contacts:

The Dartmoor Society

Dartmoor National Park Authority

Natural England
Dartmoor Commoners' Council
Duchy of Cornwall
Dartmoor Pony Society
Dartmoor Pony Heritage Trust
Dartmoor Hill Pony Association
Friends of the Dartmoor Hill Pony
The Dartmoor Pony Training Centre
The New Forrest Verderers Association
Exmoor National Park Authority
World Horse Welfare
The Mare and Foal Sanctuary
People 4 ponies
South West Equine Protection

Word Count of main body of thesis:

Word count of main body of thesis: 19,557

Signed

Date

Appendix 1

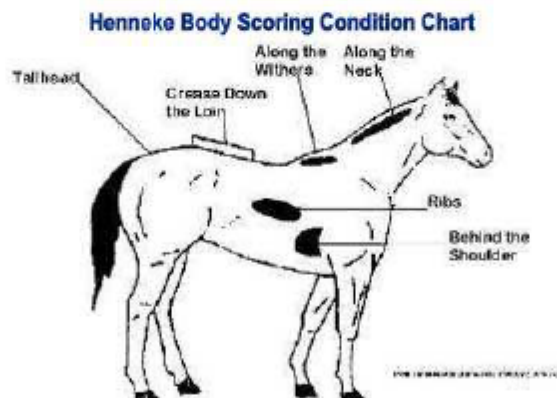
HOW TO CONDITION SCORE

Introduction

- Condition scoring your horse is an objective assessment of his current body condition, essentially scoring fat cover.
- The level of fat cover is assessed using a numeric grading system.
- There are a number of factors that can affect the condition score of a horse. Primarily condition is related to feed in-take, but also other factors such as fitness, age, pregnancy and general health will be influential.
- Many horse owners find it difficult to differentiate between fat and muscle. Condition scoring needs to be hands-on in order to feel the relevant areas of the horse.
- The areas where horses store fat are:
 - Neck – including their topline
 - Over their shoulders
 - Ribs
 - Backbone
 - Rump (pelvis area)
 - Top of the tail
- A top tip is to divide your horse into three sections, condition score each area and then divide your score by three to give an average score.
- If you see your horse everyday it can be very difficult to fully notice any slight differences in your horse. It is advised to condition score your horse every two weeks, and taking photos will help maintain a very useful record.

Condition Scoring Systems

There are two numerical grading systems which can be used to condition score your horse. One system devised by Henneke scores from 1 (emaciated) to 9 (extremely fat).



The other system which is more regularly used in the UK, was devised by Carroll and Huntington (1988). This system is based on a grading system of 0 (emaciated) to 5 (obese). Within this system half points can be awarded to provide more accuracy.

CONDITION SCORE 0 - Emaciated (word descriptions taken from *Equine Industry Welfare Guidelines Compendium for Horses, Ponies and Donkeys Second Edition*).

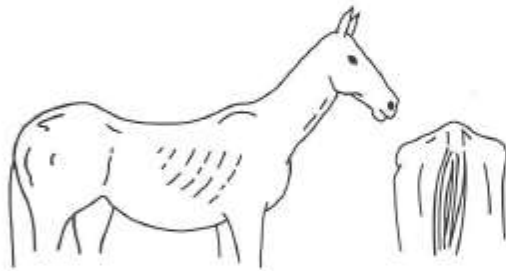


Pelvis: Angular, skin tight. Very sunken rump. Deep cavity under tail.

Back and Ribs: Skin tight over ribs. Very prominent and sharp backbone.

Neck: Marked ewe neck. Narrow and slack at base.

CONDITION SCORE 1 - Poor



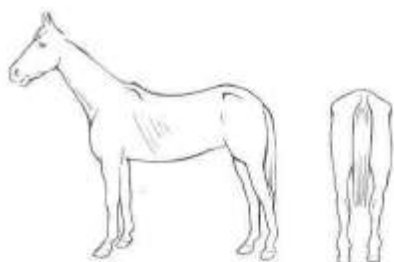
Pelvis: Prominent pelvis and croup. Sunken rump but skin supple. Deep cavity under tail.

Back and Ribs: Ribs easily visible. Prominent backbone with sunken skin on either side.

Neck: Ewe neck, narrow and slack base.



CONDITION SCORE 2 – Moderate



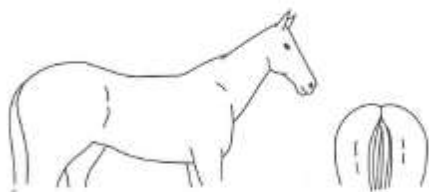
Pelvis: Rump flat either side of back bone. Croup well defined, some fat. Slight cavity under tail.

Back and Ribs: Ribs just visible. Backbone covered but spine can be felt.

Neck: Narrow but firm.



CONDITION SCORE 3 – Good



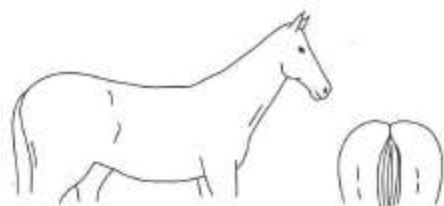
Pelvis: Covered by fat and rounded. No gutter. Pelvis easily felt.

Back and Ribs: Ribs just covered and easily felt. No gutter along the back. Backbone well covered but spine can be felt.

Neck: No crest (except for stallions) firm neck.



CONDITION SCORE 4 – Fat



Pelvis: Gutter to root of tail. Pelvis covered by fat. Need firm pressure to feel.

Back and Ribs: Ribs well covered – need pressure to feel. Gutter along backbone.

Neck: Wide and firm.



CONDITION SCORE 5 – Obese



Pelvis: Deep gutter to root of tail. Skin distended. Pelvis buried, cannot be felt.

Back and Ribs: Ribs buried, cannot be felt. Deep gutter along back. Back broad and flat.

Neck: Marked crest very wide and firm. Fold of fat.



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Appendix 2

Interview Questions

All information given is Confidential and used purely to build a clear picture for the purpose of my own study; no names will be included in any part of the write up or results.

Farmers Name

Address

E mail

How Many Ponies?

Ages of ponies (roughly)?

Any stallions, if so how many?

Type (Hill Pony/ Heritage/ Registered)?

Breeding History/ how did you start breeding ponies?

Who is going to take on the ponies?

Why do you still keep them?

What do you need to keep going?

Where do you see the value of your ponies?

Any Agreements on your common, HLS etc?

Grazing units allowed on common?

Replacements each year/ number of foals retained if any?

What is done with young stock, Local market/ privately sold?

How many unsold young stock in the past few markets?

Are you using/ have you used Dartmoor Hill Pony Association (DHPA) slaughter scheme (Andrew Goatman collects unwanted ponies from farm)? Or do you use another system?

Do you run all ponies on commons or some in country?

Any New takes?

Below are the options I have seen being offered, could you share with me your views on them?

Option one.... To continue with the current breeding program where some people run hill pony stallions some heritage stallions and some no stallions at all.

Option two All Stallions are removed from the commons. Or for certain periods of time (e.g The New Forest run stallions for one month of the year to reduce foal crop).....

Option three..... The contraceptive injection is used on the mares once the trial has been completed.

Option Four..... Vasectomy of stallions is carried out (Vasectomy is the permanent sterilization of the male in which hormone levels and therefore stallion behaviours are not reduced they simply cannot breed.)

Important bit! Your own view of future management, the best way forward is?