

The Welfare of Sheep

Animal Welfare

VOLUME 6

Series Editor

Clive Phillips, *Professor of Animal Welfare, Centre for Animal Welfare and Ethics,
School of Veterinary Science, University of Queensland, Australia*

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Cathy M. Dwyer

The Welfare of Sheep

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Dr. Cathy M. Dwyer
Scottish Agricultural College
Sustainable Livestock System Group
Animal Behaviour and Welfare
King's Buildings
Edinburgh
United Kingdom EH9 3JG
cathy.dwyer@sac.ac.uk

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Animal Welfare Series Preface

Animal welfare is attracting increasing interest worldwide, but particularly from those in developed countries, who now have the knowledge and resources to be able to improve the welfare of farm animals. The increased attention given to farm animal welfare in the West derives largely from the fact that the relentless pursuit of financial reward and efficiency has led to the development of intensive animal production systems that disturb the conscience of many consumers. In developing countries, human survival is still a daily uncertainty, so that provision for animal welfare has to be balanced against human welfare. Welfare is usually provided for only if it supports the output of the animal, be it food, work, clothing, sport or companionship. In reality there are resources for all if they are properly husbanded in both developing and developed countries. The inequitable division of the world's riches creates physical and psychological poverty for humans and animals alike in many sectors of the world. Livestock are the world's biggest land user (FAO, 2002) and the population is increasing rapidly to meet the need of an expanding human population. Populations of farm animals managed by humans are therefore increasing worldwide, and in some regions there is a tendency to allocate fewer resources, such as labour, to each animal with potentially adverse consequences on the animals' welfare. Land is one of the most important resources for sheep production, as it mostly utilises marginal areas and competes not with other forms of agriculture but with forestry and land for recreation.

Increased attention to welfare issues is also evident for companion, laboratory, wild and zoo animals. The key issues of provision of adequate food, water, a suitable environment, companionship and health remain as important as they are for farm animals. Of increasing importance is the ethical management of breeding programmes, now that genetic manipulation is easier but there is less tolerance of deliberate breeding of animals that are not suited to their environment. However, the quest for producing novel genotypes has fascinated breeders and scientists for centuries, and where dog and cat breeders produced a variety of extreme forms with adverse effects on their welfare in earlier times, nowadays the quest is pursued in the laboratory, where the laboratory mouse is genetically manipulated with even more dramatic effects.

The intimate connection between animal, owner or manager that was a feature of the animal management in the past is rare nowadays in the animal industries,

having been superseded by technologically efficient production systems, in which animals on farms and in laboratories are tended by fewer and fewer humans in the drive to increase labour efficiency. In today's busy lifestyle, pets too may suffer from reduced contact with humans, although their value in providing companionship for the sick and the elderly is increasingly recognised. Consumers also rarely have any contact with the animals that produce their food. In this estranged, efficient world man struggles to find the moral imperatives to determine the level of welfare that he should afford to animals within his charge. Some aim for what they believe to be the highest levels of welfare provision, such as certain owners of companion animals, others deliberately or through ignorance keep animals in impoverished conditions because it is most profitable to do so. Religious beliefs and directives encouraging us to care for animals have been cast aside in an act of supreme human self-confidence, stemming largely from the accelerating pace of scientific development. Instead, today's moral codes are derived as much from media reports of animal abuse and the assurances that we receive in supermarkets that animals used for the products that we purchase were not exploited in any way. The young have always been exhorted to be kind to animals, through exposure to fables whose moral message was the benevolent treatment of animals. Such messages are today enlivened by the powerful images of modern technology, but essentially still alert children to the wrongs associated with cruelty to animals.

This Animal Welfare series has been designed to provide academic texts discussing the provision for the welfare of the major animal species that are managed and cared for by humans. They are not detailed blue-prints for the management of each species, rather they describe and consider the major welfare concerns, often in relation to similar species or the wild progenitors of the managed animals. Welfare is also considered in relation to the animal's needs, concentrating on nutrition, behaviour, reproduction and the physical and social environment. Economic effects of animal welfare provision are addressed where relevant, and key areas identified that require further research.

In this volume, Dr Cathy M. Dwyer has drawn on her extensive experience of research in sheep management systems to gather a team of experts who describe aspects of sheep welfare from a variety of different perspectives. Dr Dwyer herself has contributed to several of these chapters, which is invaluable for this topic, since she is one of the world's leading researchers into the welfare of extensively-kept sheep. In contrast to earlier volumes of this series, which concentrated on intensively managed animals, this volume explores in detail the welfare concerns in situations where labour and other management inputs are at low levels, usually for economic reasons. Although not often considered to be a cause for serious concern in the past, primarily because of the apparent naturalness of the production systems, it becomes clear in this book that extensive sheep production can also suffer from major welfare problems. In fact, it is increasingly recognised that adequate nutrition, health and environmental comfort are particularly difficult to assure in systems occupying harsh terrains and extreme climatic regions. Despite these real concerns, the areas of concern in intensive systems, such as space availability, abnormal behaviours, social structure and fear of humans are often less of an issue in extensive sheep production

systems. At a time when livestock management systems are increasingly questioned for their impact on the environment, it is an opportune time for this volume to explore the issues surrounding the welfare of sheep in detail.

With the growing pace of knowledge in this relatively new field of research, it is hoped that this volume in the series will provide a timely and much-needed text for researchers, lecturers, leading sheep farmers and veterinarians, advisors and students. My thanks are particularly due to the publishers for their support, and to the authors and editors of the series for their hard work in producing the texts.

Clive Phillips
Series Editor
Professor of Animal Welfare and Director,
Centre for Animal Welfare and Ethics,
School of Veterinary Science,
University of Queensland,
Australia

Reference

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Preface

Concern for the welfare of farmed livestock, and the scientific research that this has sparked, has been increasing since the 1960s when public attention was drawn to confined conditions under which some animals were kept (Harrison, 1964). For much of this period attention has focused on those animals typically kept in confined and restrictive housing (initially pigs and poultry and, latterly, dairy cows). The livestock species traditionally managed extensively have received relatively little attention. Much of the concern for animal welfare that arose in the 1960s was related to the behavioural restriction and unnatural environments that the animals were living in, thus the apparent naturalness and freedom of behavioural expression afforded to extensively managed animals suggested that there were few welfare concerns for these animals. Freedom to express natural behaviour is, however, only one of the universally-accepted welfare definition, the Five Freedoms (Brambell, 1965), and an extensive environment may not serve the animal well in meeting the other four aspects of welfare. In his book, *A Cool Eye Towards Eden*, John Webster paints a vivid picture of a flock of aged ewes outwintered on poorly drained pasture where animals are chronically underfed, many are chronically lame, they suffer frequent cold stress and often frightened and injured by domestic dogs, yet do have the freedom to engage in natural behaviour, such as panic and flight (Webster, 1994). He argues that in this, admittedly extreme, example the intensity of animal suffering may be as great as or greater than that of a battery chicken. The aim of this book, therefore, is to consider the welfare of this important livestock species, and to assess the needs and requirements of sheep for good welfare, not just for behavioural expression, but also for other aspects of welfare.

In this book, my co-authors and I have considered the welfare of the sheep from the perspective of evolution and ecological environmental requirements, the behavioural patterns and cognitive abilities of the sheep, health, management, breeding and economics. Perhaps uniquely amongst livestock species, the sheep is kept for a variety of uses (ranging from meat and milk to fibre and portage) and in a diversity of management systems, often traditional and specific to a region or environment. The ability of these different systems to provide good welfare for the sheep is addressed, and suggests that different aspects of welfare are emphasised in different situations. Thus much could be learnt about providing good welfare by looking to other systems that may provide facets of management that might be more generally

incorporated. The book concludes by placing welfare in general, and that of the sheep in particular, into the wider context of society and global trade, and considers the pressures facing farming and offers potential solutions to improve welfare. In reading this book, I hope the reader will gain or enhance their understanding of the often complex lives of sheep, their fundamental place in maintaining many communities, and develop, as I have, a respect and concern for the welfare of this often overlooked species. Those who have worked with sheep often come to understand and appreciate the rich behavioural and emotional repertoire of the sheep. I hope that, in reading this book, those readers who have not had that opportunity will also come to see something of the 'point of view' of the sheep.

In editing this book I am indebted to all the contributing authors for their hard work and great patience, who have produced diverse chapters that have explored the welfare of the sheep from many perspectives and provided a fascinating insight into the life and times of the sheep. Their patience, understanding and support during the long genesis of this book have greatly aided the final production of this volume.

Edinburgh, UK

Cathy M. Dwyer

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Contributors

S. Agenäs

Swedish University of Agricultural Science, Uppsala, Sweden,
sigrid.agenas@huv.slu.se

D. Blache

School of Animal Biology of Natural and Agricultural Sciences, University
of Western Australia, Australia, dbla@cyllene.uwa.edu.au

J. Conington

Sustainable Livestock Systems Group, SAC, Edinburgh, EH26 0PH, UK,
jo.conington@sac.ac.uk

C.M. Dwyer

Animal Behaviour and Welfare, Sustainable Livestock Systems Group, Scottish
Agricultural College, Edinburgh, EH9 3JG, UK, cathy.dwyer@sac.ac.uk

P. Goddard

Macaulay Institute, Craigiebuckler, Aberdeen, AB15 8QH, UK,
p.goddard@macaulay.ac.uk

J.P. Hogan

Centre for Animal Welfare and Ethics, University of Queensland, Australia,
jim.hogan81@hotmail.com

I.D. Ivanov

Research Institute of Agricultural Science-NIGO, 6000 Stara Zagora, Bulgaria,
iv.dimitrov@dir.bg

K.M. Kendrick

Cognitive and Behavioural Neuroscience, The Babraham Institute, Babraham,
Cambridge, CB22 3AT, UK, keith.kendrick@bbsrc.ac.uk

R.J. Kilgour

NSW Department of Primary Industries, Agricultural Research Centre, Trangie,
NSW 2823, Australia, bob.kilgour@dpi.nsw.gov.au

A.B. Lawrence

Sustainable Livestock Systems Group, SAC, Edinburgh, EH26 0PH, UK,
alistair.lawrence@sac.ac.uk

C.E. Milne

Land Economy Group, SAC, Aberdeen, UK, cath.milne@sac.ac.uk

R. Nowak

Equipe Comportement, Neurobiologie, Adaptation, Unité de Physiologie de la
Reproduction et des Comportements, INRA, Nouzilly, France, nowak@tours.inra.fr

C.J.C. Phillips

Centre for Animal Welfare and Ethics, University of Queensland, Australia,
c.phillips@uq.edu.au

R.H. Porter

Equipe Comportement, Neurobiologie, Adaptation, Unité de Physiologie de la Re-
production et des Comportements, INRA, Nouzilly, France, porter.rh@gmail.com

P.A. Roger

Veterinary Consultancy Services, Victoria Cottage, Reeth, Richmond, North
Yorkshire, DL11 6SZ, UK, paul.roger@btinternet.com

J.M. Santarossa

Land Economy Group, SAC, Aberdeen, UK, john.santarossa@sac.ac.uk

A.W. Stott

Land Economy Group, SAC, Aberdeen, UK, alistair.stott@sac.ac.uk

T. Waterhouse

Sustainable Livestock Systems Group, Scottish Agricultural College, Edinburgh,
EH9 3JG, UK, tony.waterhouse@sac.ac.uk

Chapter 1

Introduction to Animal Welfare and the Sheep

C.M. Dwyer and A.B. Lawrence

Abstract Concerns for the lives of animals have been voiced for centuries, with concerns about the welfare of agricultural animals increasing since the 1960s. Animal welfare concerns arise for many reasons: care about the quality of lives of animals, concerns about human health, product quality, the environment, and trade and marketing issues. Some of these concerns, therefore, include animal welfare as part of a package of issues involving ‘green’ or ethical living, whereas others may arise through direct impacts on animal welfare as a consequence of, for example, trade issues. A consensus on the definition of welfare has not been reached, however definitions have been proposed based on (i) the ability of the animal to perform natural behaviour, (ii) the animals’ subjective experiences, or (iii) the biological functioning of the animal. Integrated hypotheses suggest that all are important but that different concerns may arise depending on the interaction of the animal with the environment. For example, use of ethological knowledge gained from the existing species of wild sheep can help to determine how far genetic selection of domestic sheep has altered their behaviour from that of the wild progenitors. Investigation of how different the modern farming environment is from that in which sheep first evolved will help determine where mismatches exist and where suffering might be expected to occur. Animal welfare concerns have tended to focus on those animals that are kept in confinement agriculture (e.g. pigs and poultry). Extensively managed species have received less attention, often as these animals are perceived to be free to engage in natural behaviour, because farming is considered more traditional or because the ruminant is considered to be ‘tough’. However, welfare concerns do occur in sheep systems, for example, arising from the lack of inspection in extensive systems, surgical procedures, or management practices.

Keywords Sheep · Welfare · Extensive · Natural behaviours · Feelings · Biological function

C.M. Dwyer

Animal Behaviour and Welfare, Sustainable Livestock Systems Group, SAC, Edinburgh, UK
e-mail: cathy.dwyer@sac.ac.uk

1.1 Introduction

1.1.1 A Brief History of Animal Welfare

Concerns for the lives of animals have been present for as long as humans and animals have co-existed. Enshrined in Eastern religions and the animal mythology of many cultures are the concepts of respect for animal life, living in harmony with nature and enjoying the co-operation of animals for human survival. In the West, however, arguments have been made, particularly by Descartes and Kant (1600 and 1700s), for the uniqueness of humans and this was held to justify the use of animals by man for any purpose. By the early 19th century evidence was amassing to challenge these opinions with the evolutionary theories of Charles Darwin being pivotal to changing attitudes. In Western philosophy, also, writers such as Herman Daggett in 1791 and Henry Salt in 1892 were advocating rights for animals, and these arguments continue today in the writings of, for example, Tom Regan and Peter Singer. These concerns became more crystallised and expressed in legal terms, in the UK, with the first animal welfare law: ‘The Ill-treatments of Horses Act’ of 1822, and the founding of the Royal Society for the Protection of Animals in 1824. Darwin, with other leading biologists, argued for more humane treatment of animals (e.g. with the publication of his book ‘The Expression of the Emotions in Man and Animals’ in 1872), and was instrumental in the setting up of a Royal Commission in 1875, which led to the Cruelty to Animals Act (1876). Other acts of parliament followed, specifically related to the prevention of cruelty to animals, culminating in the Protection of Animals Act in 1911, which is still in force to this day. This law, the ‘grandfather’ of all other animal welfare legislation in the UK, essentially sets out to protect all animals from unnecessary suffering whether through omission or commission. Although this law has a broad brief, encompassing all animals whether captive or not, its initial concerns were to regulate the use of animals in medical experiments. The good treatment and husbandry of farm animals was considered to be an integral part of the success of livestock farming, thus it was in the interests of both the farmer, and his livestock, for the animals to be treated well.

Alongside the changes in legislation and sensibilities regarding animal welfare in the west, the late 19th century also saw a shift in agricultural practices resulting in the New Agriculture. This period saw an increase in agricultural production, promoted by an increased use of selective animal breeding (pioneered by the sheep farmer Robert Bakewell in the 18th century)¹ and crop growing strategies (such as

¹ Robert Bakewell (1725–1795) is generally considered the father of modern animal breeding, and the first to use selective breeding for meat production (previously cattle and sheep had been used largely for labour and wool respectively) and to improve carcass quality. He is largely credited with the first production of distinct sheep breeds by separating males from females for the first time, and using in-breeding to exaggerate characteristics he considered desirable. Starting from the old Lincolnshire sheep he created the New Leicester – a large longwool breed with fatty forequarters to meet the then popular taste for fatty mutton. In addition to his animal breeding (which seem to have been carried out in some secrecy to avoid public controversy arising from prejudice against

those advocated by Lord ‘Turnip’ Townshend)². These developments were associated with an increased interest in rigorous scientific evaluation, a more universal access to education and the increased requirement for efficient food production from the rapidly urbanising population following the Industrial Revolution. In the first half of the 20th century the drive for increased local food production during the two World Wars, typified by poster slogans such as ‘Dig for Victory’, galvanised agricultural production across the Western world. This provided the additional motivation to increase production, alongside the growth of the use of science in agriculture (principally genetics, nutrition, and hygiene). Many of the scientific societies for animal production (in the UK, Europe, Australia and New Zealand) were founded in the 1940s and early 1950s, reflecting the increased application of science to food animal production. Thus science, education, the motivation to produce more food and increased mechanisation (occurring in all sectors of society) were the drivers for the move from ‘animal husbandry’ towards intensified animal production.

In 1964, the publication of ‘Animal Machines’ by Ruth Harrison was hugely influential in the UK and Europe in raising awareness and concern for the welfare of farmed animals. Her book was an exposé of what she termed ‘factory farming’ and drew attention to the use of animals purely as ‘products’ and the close confinement of many agricultural animals but also emphasised the risks to human health of feeding antibiotics, growth stimulants and hormones to farm animals. The book promoted such an intense public reaction that the British Government commissioned Professor Roger Brambell to investigate intensive farming practices in Europe. The Brambell Committee Report (published in 1965) defined animal welfare both in terms of mental well-being as well as the animal’s physical state, and is perhaps best known for providing a list of principles for rearing farm animals, which have since become known as the Five Freedoms (see below). These two events ushered in a new era of farm animal welfare with the Agriculture Act of 1968, its accompanying Codes of Recommendation for the Welfare of Livestock and the setting up of the Farm Animal Welfare Council (FAWC) in 1979. Elsewhere in Europe similar investigations into the welfare of intensively farmed animals were also taking place (e.g. the Husbandry and Animal Welfare Committee in The Netherlands, 1975), and in 1976 the Council of Europe drew up the European Convention on the Protection of Animals kept for Farming Purposes. A landmark decision took place in 1997 (the Treaty of Amsterdam) that animals should be defined as ‘sentient creatures’ in European law and no longer just as agricultural products. Elsewhere, such as the Animal Welfare Act in New Zealand (brought into law at the beginning of the 21st

‘close’ breeding), he also pioneered changes in animal husbandry, designing raised platforms for his cattle winter stalls to prevent them lying in their own manure, and doing away with the need for straw bedding.

² Lord Charles Townshend (1674–1738) retired from politics in 1730 to concentrate on the development of agriculture and was known colloquially as ‘Turnip’ for his introduction of the turnip into the Norfolk crop rotation system. Norfolk had become the focus for agricultural improvements, largely through his efforts, and through the uptake of ideas from France and Belgium.

century), moves are taking place to extend animal welfare legislation beyond the absence of cruelty by placing emphasis on care, animal husbandry and prevention of suffering by reference to the Five Freedoms.

In Europe, although the pressures were brought to bear by public concerns, the main route to improving farm animal welfare has been through legislation. In North America, however, a recent concern for animal welfare has been brought about by very different means. The infamous McLibel trial, brought by McDonalds against two members of London Greenpeace in 1994 and concluded in 1997, brought animal welfare issues, particularly slaughter handling and conditions, to the forefront of the public conscience (McSpotlight 1998). In efforts to redress the balance the fast food industry has been instrumental in beginning an improvement in animal welfare in the USA by setting up scientifically-based Animal Welfare councils and codes of practice for its suppliers. This may have had a knock-on effect on legislation. The United States has had legislation covering humane methods of slaughter since 1958, in 2002 President George Bush signed the Farm Security and Rural Investment Act including a resolution that act be fully enforced³. This broad ranging bill, encompassing subsidy payments, conservation and trade, supports sustainable agriculture and introduces animal welfare provisions at a Federal level.

At a global level, the Office International des Epizooties (OIE, also known as the World Organisation for Animal Health) identified animal welfare as an important priority area in 2001 and established a permanent Working Group on Animal Welfare in 2002. Following a conference in Paris in 2004, the OIE adopted four animal welfare standards in 2005 covering the transport of live animals by land and by sea, and the slaughter of animals for meat or disease control purposes. Welfare standards for the housing and management of animals kept for food production are set to follow. Thus, animal welfare is now seen as a global concern, requiring standards for appropriate welfare to be applied in all countries.

1.1.2 Why be Concerned About Animal Welfare?

The foregoing short discussion of the major events in the development of concern for farm animal welfare has touched on several of the reasons why concern for animal welfare has continues to be an issue. These concerns appear to be consumer-driven, it is the action of the general public and their perception of welfare that drives legislative and other animal welfare changes. So why are we, as consumers, concerned about animal welfare?

³ This history has concentrated mainly on the development of concern for farm animal welfare in Europe. For a more detailed discussion of farm animal welfare in the USA see *Farm Animal Welfare: The focus of animal protection in the USA in the 21st century* by Rowan, O'Brien, Thayer & Patronek (1999) available on line at <http://www.tufts.edu/vet/cfa/faw.pdf>. Discussion of developments in animal welfare in New Zealand can be found in Stafford et al. (2002).

Broadly speaking farm animal welfare concerns fall into four main camps:

- Ethical or moral concerns about the lives of animals;
- Concerns about human health and product quality, and beliefs that improving the lives of animals on farm will have associated benefits for these other areas of concern;
- Environmental and biodiversity concerns, where animal welfare is seen as part of a package of concerns about modern farming practices and how we treat the planet;
- Trading and marketing concerns, either where there is concern for animal welfare arising due to the impact of these issues, or where animal welfare can be used as a marketing tool to leverage higher prices.

Discussion of the differing philosophical positions underlying why we should, or should not, be concerned about the lives of animals are beyond the scope of this chapter and the reader is referred to other texts. Broadly, there are three main philosophical positions in our dealings with animals (see Appleby 1999):

- (1) *Consequentialism* (such as utilitarianism), which argues that it is the consequences of our actions, rather than the actions themselves, which are of moral concern. This argument is widely used to argue that we should act to produce the greatest good and cause the least harm. The philosophy of animal liberation (Singer 1975) uses these arguments to stress that, generally, the benefits are to humans and the costs to animals, and advocates equal rights to all sentient beings (see Fraser 1999 for a more detailed assessment of these arguments).
- (2) *Deontology*, which focuses on the actions and whether it is morally right to use animals for certain things, regardless of the consequences. These arguments lead to discussions of our duties and the rights of animals (Regan 1983).
- (3) *Agent-centred ethics*, which argues that it is neither the action nor the consequences that is important but the agent involved.

In animal welfare science, writers have proposed hybrid views, e.g. Sandøe et al. (1997), combining elements of utilitarianism and deontology (such that mostly it is the consequences that guide actions, but that there are things that may not be done, regardless of the beneficial consequences). Other philosophers have emphasised the care aspects of animal husbandry and welfare (see Fraser 1999). Bernard Rollin (1990) argues for an extension of animal welfare beyond merely the prevention of cruelty or harm. He argues that, in democratic societies, our 'consensus social ethic' (the excepted moral norms of rights and behaviours) should also be extended to animals. Thus the needs, desires and predilections of animals matter as much to the animal as our own do to us, and therefore the fundamental nature and interests of the animal (it's *telos* – of which more later) should be encoded and protected. Thus what we feel it is acceptable to do with, or to, animals depends on our ethical position.

In 'Animal Machines' Ruth Harrison also expressed concern for the impact on human health of the growth promoters and antibiotics fed to food animals. More recently human health concerns are also being expressed about manipulations

of the animal's genome (although these may also be through moral concern for the animal's quality of life). For example, the use of recombinant (derived from *Escherichia coli*) bovine somatotrophin (rbST) to increase milk yields in dairy cattle is causing concern in Europe for its potential cancer risk through elevations of insulin-like growth factor-I (IGF-I) in milk and because milk composition may affect the triggering of allergic reactions⁴. Incidentally, rbST is also associated with health risks in the cows too, as treated dairy cows suffer an increased incidence of clinical mastitis, foot and leg problems and reproductive effects, probably secondary to increased milk yield⁵. Under some circumstances poor welfare can also lead to poor meat quality (Gregory 1993). Thus concerns about the way farm animals are kept can be expanded to encompass concerns about the potential consequences to the consumer, in the absence of any particular concern for the quality of life of the animal.

Concern for animal welfare is also part of a wider raft of concerns encompassing sustainability, climate change, protection of the environment and rural communities, biodiversity, maintenance of family-run farms (an 'agrarian ideal', Fraser 2001) and the production of 'real foods'. This diverse spectrum of interests range from concerns about how to handle the waste products produced by modern intensive agriculture to a view of animal welfare within an agricultural concept of working in harmony with the land. Improved animal welfare, seen as access to fields, the ability to express natural behaviours, using natural feedstuffs, management without antibiotics and routine drug administration (The Soil Association requirements), form part of the organic ideal of healthy land, food and people.

At a local level in some countries, animal products produced to high welfare standards command a premium price in relation to conventionally reared food animals. Thus some actions to improve animal welfare, for example requirements demanded by retailers, may be related to maintaining market share and meeting consumer requirements, rather than ethical interests in animal welfare *per se*. Of course, these routes to improved animal welfare are driven by the consumers ethical or other interests in animal welfare so can not be completely divorced from other categories of concern for animal welfare. Market forces may also impact on animal welfare at the level of meat processing as bruised or blemished carcasses, as may occur with rough handling, are scored as lower quality and hence of lower value. On a more global level, animal welfare has been charged with being simply a mechanism for trade protection and a barrier to free trade. The conflicting views of the European Union, which sees animals as sentient and not to be treated as commodities (see above), and the World Trade Organisation, which classes animals simply as commodities or resources, make these issues difficult to resolve. However, as described in the previ-

⁴ The outcome of discussions on the health aspects of rbST have been summarised in an online report (March 1999) produced by the European Commission for Food Safety (From the farm to the fork) and can be found at http://europa.eu.int/comm/food/fs/sc/scv/out19_en.html#.Toc446393145.

⁵ Discussions about the animal welfare aspects of rbST use, produced by the European Commission Scientific Committee on Animal Health and Animal Welfare (March 1999), can also be found online at http://europa.eu.int/comm/food/fs/sc/scah/out21_en.pdf.

ous section, Europe has a long history of concern for animal welfare, and actions to improve animal welfare have largely been consumer-driven and science-based. This suggests that concern for animal welfare exists primarily through ethical and moral issues surrounding the quality of animal lives, or through concerns about human health and protection of the environment.

1.2 Welfare Definitions

1.2.1 *Can we define Animal Welfare?*

Most people would probably agree that concern for animal welfare⁶ is a good thing, however whether they would agree on what actually *is* animal welfare is quite another matter. This lack of consensus over a universal definition of animal welfare has been a thorn in the side of animal welfare science for over a decade. Once we add to that the differing philosophical positions underpinning our moral concerns for animal welfare (as alluded to above), discussions about how (or even if) animal welfare can be measured, and arguments about the objectivity and value-free nature of scientific assessments of animal welfare (or not; e.g. Tannenbaum 1991; Rollin 1996) then we seem to be deep in a quagmire through which little progress can be made. In an attempt to separate these issues some writers have proposed that animal welfare acts as a ‘bridging concept linking science to ethics’ (Fraser et al. 1997). The conception of animal welfare thus needs to be both accessible to scientific method and to reflect the ethical concerns of society. Fraser (1999) then suggests that animal welfare values can be divided into ‘descriptive statements’, which describe some property of a housing system, the environment, the animal etc., ‘evaluative statements’, which gives value to that statement (that it is better, worse, more important etc. for the animal’s quality of life), and ‘prescriptive statements’, which reflect ethical concerns and what should or should not be done to that animal. In this scheme animal welfare is seen as an evaluative concept, where we attempt to scale the animal’s perception of its quality of life. Although this links animal welfare to ethics, and potentially separates what is and is not accessible to scientific enquiry we still need some methods of measurement that defines the animal’s perception of what is ‘better’ or ‘worse’ for its welfare.

There are some general concepts about animal welfare that most people accept: (i) that animal welfare is a property of the animal (rather than of the environment, or something given to the animal); (ii) that animal welfare concerns are ‘quality of life’ concerns; and (iii) that welfare exists on a continuum from very poor to very good.

⁶ Throughout this chapter the term animal welfare is used to encompass both welfare and well-being. Some authors (e.g. Tannenbaum 1991; Gonyou 1993) have suggested different usages for these terms, however we suggest that, for the sake of simplicity, having one poorly defined term is better than two.

One of the first definitions of farm animal welfare, that proposed by the Brambell Report (paragraph 25), defined animal welfare thus:

Welfare is a wide term that embraces both the physical and mental well-being of the animal. Any attempt to evaluate welfare therefore must take into account the scientific evidence available concerning the feelings of animals that can be derived from their structure and functions and also from their behaviour.

In this definition animal welfare was explicitly defined as being composed of both physical and mental aspects of quality of life, and extending beyond the absence of disease. This definition was supplemented by a proscribed list of freedoms that should be extended to all farm animals, the well-known Five Freedoms (as used by the codes of recommendations for the welfare of livestock of many countries):

- Freedom from thirst, hunger and malnutrition – by ready access to fresh water and a diet to maintain full health and vigour.
- Freedom from thermal or physical distress – by providing an appropriate environment including shelter and a comfortable resting area.
- Freedom from pain, injury and disease – by prevention or by rapid diagnosis and treatment.
- Freedom to display most normal patterns of behaviour – by providing sufficient space, proper facilities and company of the animals' own kind.
- Freedom from fear and distress – by ensuring conditions and treatment to avoid mental suffering.

These concepts contain elements of the animal's health status, emotional state, and physical and behavioural functioning, and are, sometimes in a modified form, incorporated into the welfare codes of farm animals in many countries. In attempts to derive measurable components to describe an animal's welfare state three main schools of thought have arisen:

1.2.1.1 Natural-Living Based Definitions of Animal Welfare

This welfare definition suggests that good welfare depends on the animal being able to live a 'natural' life and be allowed to express its evolved behaviour patterns. This picks up on the views expressed in the Brambell Report (paragraph 37):

... we disapprove of a degree of confinement of an animal which necessarily frustrates most of the major activities which make up its natural behaviour.

However, some early proponents of this definition extended this from 'most of the major activities' to hold that to prevent suffering an animal needs 'to perform all the behaviours of its repertoire' (Kiley-Worthington 1989). However, as many behaviours have evolved as an adaptation to deal with an adverse situation (distress calls in isolation, fleeing from a predator and so on), it seems that performance of the whole behavioural repertoire is not necessary, only those parts of it that the animal perceives to be important (Dawkins 1998). The natural-living definition has been reworked by Rollin (1990; 1993) who proposes that welfare, in addition to

the control of pain and suffering, should also include nurturing and fulfilling the animals nature or, as he terms it, its *telos* (also see above). He suggests that it is the ‘wants and desires’ of animals (including humans) that separates them from plants or even cars (which can have needs) and thus why we have moral concerns about the welfare of animals. An ethical parallel of the ‘natural-living’ definition is the concept of animal integrity, which has been defined as

the wholeness and completeness of the species specific balance of the creature, as well as the animal’s capacity to maintain itself independently in an environment suitable to the species (Rutger & Heeger 1999).

These ideas suggest we should not infringe the animal’s physical wholeness (such as castration or tail-docking), and also create conditions where the animal has a life that accords with their species-specific capacities and adaptation patterns: conditions where the animal can be fulfilled and flourish. These ideas extend the concept of welfare beyond the absence of suffering to include concepts of pleasure, contentment or positive experiences (e.g. see Mench 1998; Fraser & Duncan 1998 for discussion).

1.2.1.2 Feelings-Based Definitions of Animal Welfare

This welfare definition, which we were edging towards at the end of the previous passage, argues that animal welfare concerns are, in fact, concerns about the subjective experience, the ‘feelings’, of the animal involved (see for example: Dawkins 1980; 1990; 1998; Duncan & Petherick 1991; Duncan 1993; 1996). What distinguishes an animal from a plant is its sentience, and its capacity to experience pain, fear, distress, pleasure etc., and thus it should be the experience of those emotional states that plays a central role in the determination of its welfare. The role of feelings in welfare was stated in the Brambell Report (see quote from paragraph 25 above) which also concluded (paragraph 28):

We accept that although pain, suffering and stress are certainly not identical in animals and men, there are sound reasons for believing they are substantial in domestic animals and that there is no justification for disregarding them . . . We accept that animals can experience emotions such as rage, fear, apprehension, frustration and pleasure . . .

Thus feelings, particularly the experience of pain and suffering, have always been part of the definition of welfare. This definition is probably closest to the public perception of animal welfare, and the reason that farm animal welfare first received public attention. Within this definition there are variations of views, from the relatively narrow view that welfare is *only* about feelings (Duncan 1993; 1996), such that welfare measurement, rather than being concerned with biological functioning (see below) should be concerned with the animal’s affective experience of that biological functioning. This, he argues, is the evolved and cognitive experience (the wants and desires mentioned earlier) of having biological needs. Other writers have also argued for an evolutionary basis to feelings (Baxter 1983; Dawkins 1998; Fraser & Duncan 1998) as they play an important role in motivating the animal to respond to situations which will increase fitness, either immediately (e.g. escaping a

predator) or in the long term (e.g. play or exploratory behaviours). However, many animal welfare scientists find it hard to accept a view of animal welfare, based solely on feelings, such that an animal with a disease condition that has not yet begun to cause it feelings of pain or discomfort would be regarded as being in a state of good welfare. Others have argued that feelings are transitory or incidental and not necessarily of relevance to welfare, what matters are the long-term impacts on functional design (Barnard & Hurst 1996). Other anomalies arise (as Duncan (1996) acknowledges) as drug taking could conceivably be described as improving welfare, by promoting pleasurable feelings, when it's continued use is likely to lead to suffering and reduced welfare.

The measurement of feelings and subjective states (requirements if we are going to use this definition to assess welfare) are, of course, far from straightforward and deal with the thorny issues of consciousness, cognition, and accessing the subjective experience of others. Similar arguments can be levelled at the 'natural-living' definition of welfare, that it is hard to determine precisely what is natural in both the animal's behaviour and what constitutes a natural environment for a particular species. Some authors have used the difficulty of assessing animal emotion as arguments against these definitions of welfare altogether (Moberg 1985; McGlone 1993), preferring to confine assessment of animal welfare to biological functioning and physiological states that are readily scientifically accessible, such as stress.

1.2.1.3 Biological-Functioning Based Definitions of Welfare

The biological-functioning based welfare definition looks primarily at the animal's physiological responses, particularly the functioning of the hypothalamic-pituitary-adrenal (HPA) axis, the sympathetic-adrenal medullary system (SAM), immune function, health, and agricultural productivity measures. The HPA axis is a neuroendocrine system that registers changes in homeostasis and triggers a cascade reaction to deal with the change. The SAM is an autonomic system that brings about changes in heart rate, metabolic rate, respiratory rate etc., in response to stressors. Within this definition there are, as before, variations in interpretation of what constitutes welfare. At one extreme are views that suggest the only measures of unacceptable welfare should be where the survival and reproduction of the animal are compromised (e.g. McGlone 1993). However, the productivity of an animal has been widely criticised as a sensitive welfare measure, and was rejected by the Brambell Committee (1965; paragraph 30):

... a satisfactory growth or egg production rate is a reliable guide to the welfare of the animal in certain respects – for example that it is being well-fed – but it is inadequate in other respects. Growth, on occasion, can be a pathological symptom, although it is more often a mark of health. Growth rate and condition ... are not inconsistent with periods of acute, but transitory, physical or mental suffering.

Alternative views, dealing with biological functioning, have been expressed by Broom (1986) who defines the welfare of an individual as 'its state as regards its attempts to cope with its environment'; by Wiepkema and Koolhaas (1993) who

define welfare in terms of the ability of the animal to control and predict environmental events; and Moberg (1996) who defines poor welfare as when the animal suffers from sufficient stress to elicit a prepathological stress state. Broadly speaking, these welfare definitions all deal with how the animal perceives and deals with the stressors it encounters in its daily life. Animals have evolved to be constantly monitoring the environment (not always consciously, responses to thermal disturbances, for example, may elicit physiological alterations that the animal is unaware of) and reacting to minor deviations from set points using species specific behavioural and physiological mechanisms. Thus when the animal is able to predict and control events, and adjust to disturbances using species typical responses, the welfare of the animal is not threatened. For these authors, welfare declines when the animal's responses are no longer sufficient and a consequence of the altered biological function, in attempts to deal with the stressor, is a depression of the immune system such that the animal becomes more susceptible to disease.

This view of animal welfare is not necessarily incompatible with either of the other interpretations outlined above. An animal living in a natural environment may be able to express more of its evolved species typical responses to a stressor than an animal in confinement, however its biological functioning may still be overwhelmed in the presence of some stressors. Thus the biological functioning argument may concur with the natural-living definitions view of animal welfare in some states, but not all. Likewise, Broom (1998) has expanded upon his initial welfare definition to suggest that feelings are important parts of the animal's coping system. However, (as discussed by Fraser et al. 1997) there may be evolved adaptations that have no function in an agricultural environment (foraging, for example) thus the animal may be highly motivated to perform a behaviour with no opportunity to do so. The animal may then experience, for example, frustration or fear in the absence of effects on its agricultural productivity because those now non-functional behaviours were important aspects of biological fitness in the environment in which it evolved.

1.2.1.4 Towards a Consensus View?

At their most extreme there seems to be little consensus on what constitutes animal welfare, and use of differing definitions could lead to completely different conclusions being drawn about the welfare of an individual. In reality, many animal welfare scientists use operational definitions that might comprise parts of some or all of the three definitions. Many of the concepts can be brought together, particularly when we view both feelings and biological functioning as evolved and adaptive responses of the animal to its environment. Thus feelings can be related to both the natural living and biological functioning arguments if we conceive of feelings as evolutionary mechanisms designed to enhance fitness. In the natural environment the animal may be able to deal with minor stressors through evolved mechanisms (even though this may involve short-term negative emotions, such as fear at the presence of a predator) and to be able to express positive emotional states through play, exploration and social encounters. Animal integrity, or *telos*, can be related to the

biological functioning definition through allowing the animal to display its species typical adaptations in an environment in which it has evolved those adaptations.

An integrated hypothesis for animal welfare has been proposed (Fraser et al. 1997), which seeks to draw out the important elements of each of the animal welfare conceptions and integrate them into a single definition. The essential features of this hypothesis are the animal (made up of all the adaptations that it has evolved) and the environment (comprising a series of challenges that the animal experiences). In the natural environment in which the animal has evolved (with the proviso that it may be difficult to ascertain exactly what that was after thousands of years of domestication) we can imagine that there is an almost perfect overlap between these two, that is the animal possesses the adaptations that allow it to meet the challenges that occur in that environment (Fig. 1.1a). This does not mean, however, that the animal is in a constant state of good welfare (here, then, we begin to deviate from the natural-living definition of welfare). There may be occasions when the animal's adaptations are insufficient to cope with the challenges it experiences. For example, in times of drought there may be an acute shortage of food where, despite expressing

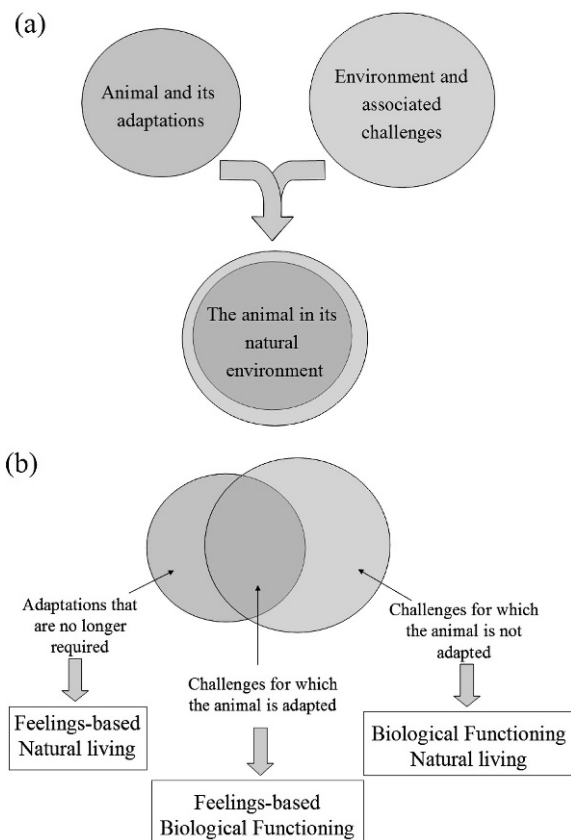


Fig. 1.1 Model of an integrated hypothesis of welfare concerns (after Fraser et al. 1997). **(a)** The animal living within the environment with a full set of adaptations to meet challenges presented by the environment. **(b)** The potential mismatch that can occur when the animal is domesticated and the environment may be less than optimal. Different classes of welfare concern then arise depending on the region of mismatch

evolved foraging behaviours, the animal may experience hunger, and show changes in biological functioning associated with malnutrition (tissue mobilisation, slowed growth, altered reproductive function etc.). Under these circumstances, although the welfare state of the animal is not good, we would expect that the animal's biological functioning would be reflected in its subjective feelings.

With domestication and intensive agriculture we can envisage that there may be increasing mismatch between the animal and the environment (Fig. 1.1b). This mismatch leads to different types of quality of life concerns dependent on where the mismatch occurs. The animal may have adaptations that are no longer required in the environment in which it now lives, but are associated with strong reinforcing affective experiences, both positive and negative. In the sheep, flocking and the presence of social companions are important anti-predator defences (see Chapter 2). Thus a socially isolated sheep may experience feelings of fear and panic, appropriate for an isolated sheep in the wild, without any actual threat to its biological functioning or fitness. Under these types of mismatch between animal and environment the animal may experience negative affective states (or fail to experience positive states) without there necessarily being any impact on its biological function. The other area of mismatch concerns where the environmental challenges differ from those in which the animal has evolved, thus the animal has no adaptations to deal with the challenge. Animals may typically fail to show avoidance on exposure to environmental toxins or overeat when given access to highly concentrated feed if they do not have adaptive mechanisms to deal with these challenges. Thus biological functioning may be impaired under these circumstances in the absence of, at least to begin with, the animals experiencing negative emotional states.

Fraser et al. (1997) thus suggest that the different welfare definitions could be conceived as reflecting the impact on the animal's quality of life in different parts of the model. Feelings-based concerns or concerns about the animal's subjective experiences, would occur primarily where the animal has adaptations that are no longer required, although these animals may show normal biological functioning, and in the overlap where subjective experiences may be associated with impaired function. Biological functioning concerns also occur in the overlap but are additionally seen where the environment is providing new challenges for which the animal has not evolved adaptations. Welfare concerns perceived as natural-living definitions occur in either condition when the animal and environment are not matched.

This model provides a conceptual framework which seems to address most welfare concerns: in general we imagine that the welfare of an animal is poor if it is in a state of ill-health (or at least heading that way) and if it is experiencing negative feelings. We may also feel that to deny the animal the opportunity for positive feelings might be an infringement of good welfare. The ways in which we might attempt to ascertain whether the animal is in an environment where it is strongly motivated to perform adaptive behaviours but cannot, or where the environmental challenges are greater than the animals adaptation will be discussed later in this Chapter.

1.3 Public Perception of the Welfare of Sheep

Much of the public concern for animal welfare has been directed towards animals other than the sheep, with pigs and poultry probably being the focus of greatest concern and research effort. Exceptions to this arise only when there is a highly visible challenge to sheep welfare, such as the suffering of the sheep trapped on the Como Express in 2003, or high levels of lamb mortality in years of extreme spring snowfall, and a regenerally short-lived. The stimulus for increased concern for farm animal welfare, and pressure to change the way farmed animals are kept, has been the increase in intensive agriculture and confinement. Although there are many different systems of sheep farming (see Chapter 6), they can nearly all be loosely classed under a definition of extensive where the animal spends at least part of the year outdoors, and gets some of its food from the environment. Being outdoors, in particular, has many positive associations with good animal welfare, health, naturalness and traditional agriculture. Contrasting these images with those of animals reared indoors in crates and cages and we might rapidly conclude that extensive or outdoor agriculture is a more animal friendly rearing environment. In this we may well be correct, although, for example, the continuing drought conditions in Australia might begin to make outdoor animal raising less appealing from a welfare perspective. However, we should not extrapolate from this comparison of indoor and outdoor agriculture to conclude that there are few welfare concerns in sheep production. Some of the differing perceptions surrounding the welfare of the sheep will be considered in this section.

1.3.1 Importance of Performing Natural Behaviours

Public perception of animal welfare places great weight on the ability of the animal to perform natural behaviours. In comparison to the hen in a battery cage or the pig in a gestation crate the sheep can move about, forage, engage in social behaviour and rarely, if ever under these conditions, show behavioural abnormalities, such as stereotypy. However, as argued by Webster (1994) and discussed above, most definitions of animal welfare extend beyond simply being given the freedom to behave naturally. This is only one of the Five Freedoms and extensive animals may still experience other threats to good welfare: hunger, thirst, thermal and physical discomfort, pain, injury, disease, fear or distress. For example, Webster proposes a hypothetical example where sheep are wintered on a poorly drained pasture with little shelter where they are chronically underfed, are forced to stand and lie in rain and mud, suffer from untreated chronic foot rot, and are regularly frightened by uncontrolled dogs. These sheep do, however, have the freedom to express their natural behaviour, even if this is predominantly panic and flight, but this can hardly be seen as an example of animals in good welfare.

The assumption that the extensive animal can show its full behavioural repertoire can also be challenged. Even if extensive, animals are generally not kept in habitats that resemble those in which their wild ancestors may have evolved. With the

possible exception of hefted hill sheep in parts of the UK and range-managed sheep (e.g. in USA and Australia), most sheep may still be confined, sometimes at relatively high stocking density, may be exposed to limited numbers or types of plant species and may be kept in relatively featureless paddocks. In certain situations sheep may be highly motivated to perform various behaviours, such as seeking isolation (e.g. at lambing) or cover (e.g. if threatened) which will not be possible even in an outdoor environment. Some of these factors will be elaborated on in later Chapters, however, as an example, the frequency of alarm behaviours shown by Merinos has been reported to increase with a decrease in physical complexity of the environment (Stolba et al. 1990). Thus being able to move around and being outdoors do not automatically equate to an animal being able to perform all the behaviours that it perceives to be important, perhaps only those behaviours that *we* perceive to be important.

1.3.2 Responsibility Issues

Many of the threats to the Five Freedoms that can face an extensive animal come from the environment: rain, snow, wind, thermal extremes, lack of feed, predation (see Chapter 2). There is a tendency to perceive these as ‘natural’ or ‘fate’ and that these are outside our responsibility. The RSPCA in the UK, and the Animal Act of 1911, consider acts of cruelty (or causing unnecessary suffering) to occur both by abuse or commission and by neglect or omission. Thus, failing to provide feed or shelter to an animal kept on a hillside with little grazing and no natural shelter could be seen as causing unnecessary suffering by omission, assuming that the shepherd was able to provide that feed or shelter but chose not to. In addition, many of the decisions affecting the lives of the animals will have been made by man (e.g. the land and plants the sheep will have access to, the sheep genotypes that will use the land, the flock structure, etc.) and will have a direct effect on the ability of the animal to cope with the natural environmental situations. Thus it is not sufficient to conclude that, for example, lamb mortality is a ‘natural’ death and therefore outside our concern for good welfare.

1.3.3 Traditional Farming Practices

There is a strong perception that sheep farming and extensive farming systems retain the most traditional elements of agriculture. Since it is the more intensified modern agricultural systems that are considered to be worst for the animal’s welfare, the converse might argue that traditional forms of agriculture are best for welfare. Part of this assumption lies in the belief that traditional agricultural practices depend on good husbandry and stockpeople, and hence better animal care, to be productive. Whilst this relationship may sometimes be the case, in places like the European Union many extensive sheep farms are not economically viable without subsidy. If

subsidy is paid on a per head basis then this emancipates the care of the animal from economic productivity, the only financial benefit to the farmer is for the animal to be alive. The lack of individual monetary worth of a sheep may mean that the costs of shepherding, supplementary feeding, and veterinary care may exceed the financial return on the animal. Linking subsidy to production in a way that encourages good husbandry is essential to ensure that subsidised farming is associated with good welfare.

Adopting very traditional farming practices may, in some instances, negate some of the welfare benefits that research and improvements in, for example, nutrition and health have brought, albeit with the aim of improving productivity. As an example, scientific advances in reproductive management of pregnant ewes through the use of ultrasound scanning to determine litter size and the provision of better nutrition at critical times in pregnancy have halved hill sheep ewe and lamb mortality rates over the last four decades (Waterhouse 1996). Although these practices have undoubtedly improved productivity, they have also improved the lives of the animals as well. Belief in traditional methods, particularly as they are often accompanied by a fatalistic acceptance of misfortune (e.g. high levels of neonate mortality, lameness), do not inevitably lead to improved animal welfare.

Within traditional farming practices management interventions occur that can cause the animal to experience pain, fear and distress, at least temporarily and even if their ultimate aim is to improve animal welfare. For example, castration and tail-docking without anaesthetic cause pain and distress, working sheep with dogs and shearing cause high levels of fear and occasionally result in injuries and death. However these practices have been carried out for centuries and are accepted and unquestioned by the general public. As pointed out by Kilgour (1985) the absence of a tail in sheep is so much part of the public perception that, in books, sheep are rarely illustrated with a full tail. Likewise the idea that sheep should be worked with dogs is so much part of our perception of traditional sheep farming that we even have competitions to demonstrate how well the dogs can move sheep. Whilst some of these practices may improve animal welfare in the long term (reduction of fly strike in tailed sheep, for example) it would be unlikely that a plan to use a predator to manage free range hens would be considered an ethically acceptable practice, whereas this is accepted in traditional sheep farming. In the same way high levels of lameness in sheep (in the UK around 10% of sheep annually are lame with footrot, Royal Veterinary College survey, 1999) are perceived as being an integral part of sheep farming and the pain and chronic suffering associated with lameness under-emphasised.

1.3.4 Characteristics of Sheep

Ruminants, and sheep in particular, are frequently described as ‘stoical’ or ‘physically tough’ (Webster 1994). Unlike pigs and poultry, they are considerably more resistant to thermal extremes and the presence of the rumen means they can survive

for longer periods without access to food and water. Physically, they are capable of surviving under conditions, for example during transport, which would result in high levels of mortality in other animals. Clearly there are strong financial and moral pressures to effect change to a system which causes high levels of mortality, that are not so easily brought to bear where the animals can survive the insult. However, because these things do not kill them, can we conclude that they do not suffer?

Ecologically, the sheep has evolved as a predated animal and as such has developed subtle behaviour patterns to avoid communicating disease, injury or physical impairment to a watching predator. To the casual observer it may be that the first indication that anything is wrong with a sheep is its death. Sheep are sometimes described as behaviourally cryptic, where their behaviour may not be readily interpreted. In particular the sheep is not particularly vocal in response to stressors (with the exception of lambs separated from their mothers where there is a clear functional purpose to vocalisation), and vocalisation is inhibited in the presence of predators. A vocal commentary is an integral part of our assessment of the internal state of other humans and animals, thus it is all too easy to conclude that the animal that does not complain does not suffer.

We have already discussed the relatively low monetary worth of sheep. In addition, they may also be perceived as having relatively low intrinsic worth. Sheep are generally perceived as being rather stupid in comparison to pigs for example, even by members of the public with little or no direct experience with either animal. In a survey of staff and students at a university in the USA (Davis & Cheeke 1998) sheep were consistently rated as being of lower intelligence than dogs, cats, horses, pigs and cows, and were ranked only slightly above chickens and turkeys. Does this matter for animal welfare? After all, as pointed out by the utilitarian philosopher, Jeremy Bentham, in 1789 ‘the question is not can they reason, nor can they talk, but can they suffer?’, a sentiment reiterated by Dawkins (2001) as ‘you don’t need to be very clever to feel pain or hunger or fear’. It is the effect on public pressure for animal welfare change that perceived relative intelligence may have the greatest impact. For example, a farm animal that is perceived to be of lesser intelligence may be considered to have lower intrinsic worth, and therefore be less likely to have its welfare protected. In the survey by Davis and Cheeke many of the respondents felt that animal intelligence should influence how they were kept. About half the respondents considered that more intelligent animals needed better care to prevent boredom. Rather worryingly, some of the respondents to the survey, who clearly had a very low opinion of animal abilities, considered that animals of perceived low intelligence required extra husbandry attention to prevent them from killing or injuring themselves! A caveat: there is in fact no scientific evidence to support the public perception of the stupidity of sheep, relative to other domestic animals. As should become clear in later Chapters sheep show well-developed abilities to learn about the environment, have a highly organised and complex social structure and, having evolved as a predated animal and therefore needing to constantly outwit predators to survive, might be expected to be the most likely to have evolved consciousness (Griffen 2001).

1.4 Specific Welfare Issues Pertaining to the Sheep

Unlike many other farmed animals, sheep are maintained under a variety of conditions, even within the same country (this is expanded on in Chapter 6). Sheep farming may be extremely extensive, such as the range management systems of Norway and USA or Scottish hill sheep where, although highly managed, the sheep may be treated virtually as wild animals for weeks or months at a time. Other extensive systems include the nomadic pastoralism practised in some countries of Europe, Asia and North Africa where the sheep are free to wander but are accompanied by a herder. At the other end of the scale dairy sheep, or finishing lambs, may be kept indoors for all or much of the day, usually group housed at relative high stocking density in straw-bedded pens, fed on concentrates and will have high levels of human contact. The sort of welfare issues that cause concern in any of these systems will differ from intensive confinement agriculture but may also differ between the differing management systems. Generally, concerns about sheep welfare can be seen as falling into three major areas, the relative prevalence of any area of welfare concern may change with different systems of sheep farming.

1.4.1 Problems Connected to Extensive Systems

As we have argued above, although the extensive environment allows the animal much greater freedom to express its behavioural repertoire, this does come with some costs. Animals are exposed to much greater environmental challenges than animals maintained in temperature and humidity controlled housing. This environmental variability is not, of itself, likely to cause poor welfare, and may even be an important and neglected aspect of good welfare (Appleby 1996). However, prolonged exposure to extreme environmental conditions, particularly if they are accompanied by other challenges (undernutrition, poor body condition, lack of shelter, for example), may be a source of chronic stress. In addition extensively managed animals in particular may suffer similar predation risks to wild animals. These issues are dealt with in more detail in following chapters. Extensively managed animals also differ from intensively managed animals in the frequency of interactions with stockpersons, and those interactions that do occur are often aversive.

An important part of assessing welfare is clearly to inspect the animals on a regular basis and, generally, failure to do this can lead to prosecutions for neglect and animal cruelty. However the nature of extensive systems means that the degree of inspection is likely to be less than in other systems. For example, in a modelling exercise Waterhouse (1996) demonstrated that it is almost impossible for a single farmer to observe all ewes in a 800 strong flock at lambing time when the area available to the sheep exceeded 800 hectares (at this level it required the shepherd to cover 40 km per day and spend over 10 h just to observe the sheep once without considering the time needed to provide care to mother and offspring if required). Does a lower level of inspection carry a welfare cost to the sheep when they are able